Otay Water District
Water Resources Master Plan Update

OCTOBER 2008

FINAL DRAFT

PBS&J 9275 Sky Park Court, Suite 200, San Diego, California 92123 • p. 858.874.1810 • f. 858.514.1001 • www.pbsj.com

Otay Water District
Water Resources
Master Plan Update

October 2008

FINAL DRAFT

Prepared For:

Otay Water District
2554 Sweetwater Springs Boulevard
Spring Valley, California 91978-2096

Prepared By:

9275 Sky Park Court, Suite 200
San Diego, California 92123

PBS&J Project No.: 491292

Mark B. Elliott, P.E.
Project Manager

REGISTERED PROFESSIONAL ENGINEER
MARK B. ELLIOTT
No. 42064
Exp. 3/31/10
CIVIL
STATE OF CALIFORNIA

Table of Contents

Tables

Figures

Exhibits

Appendices

Abbreviations

ac	acre
ac-ft/ac	acre-feet per acre
ac-ft/ac/yr	acre feet per acre per year
ADD	average day demand
ADWF	average dry weather flow
AFY	acre feet per year
ARC/VIEW	GIS software by Environmental Systems Research Institute, Inc.
Basin Plan	Comprehensive Water Quality Control Plan Report Report, San Diego Region (9)
Cal-American	Cal-Am
CCI	Construction Cost Index
CDPH	California Department of Public Health
cfs	cubic feet per second
CIP	Capital Improvement Program
District	Otay Water District
DOHS	Department of Health Services
DU	dwelling unit
ENR	Engineering News Record
FCF	flow control facility (i.e. flow metering facility)
fps	feet per second
ft	feet
GIS	Geographic Information System
gpd	gallons per day
gpm	gallons per minute
H2ONET	Hydraulic Network Analysis software by MW Soft, Inc.
Helix WD	Helix Water District
HGL	Hydraulic Grade Line
HWL	high water level (reservoir maximum water surface spill elevation)
LA	Los Angeles
LMSE	La Mesa Sweetwater Extension
LOPS	Lower Otay Pump Station
LUC	land use code
MD	maximum day
MDD	maximum day demand
mg	million gallons
mgd	million gallons per day
MWD	Municipal Water District
MWDSC	Metropolitan Water District of Southern California
MWWD	Metropolitan Wastewater Department
NAFTA	North American Free Trade Agreement
No.	Number
Otay Ranch GDP	City of Chula Vista Otay Ranch General Development Plan, Otay Subregional Plan, Volume 2
OTC	Olympic Training Center

Padre Dam MWD	Padre Dam Municipal Water District
PF	peaking factor
PH	peak hour
PL	potable water pipeline
PRS	pressure reducing station
PS	pump station
psi	pounds per square inch
RecPL	recycled water pipeline
RecPS	recycled water pump station
RecRes	recycled water reservoir
Res	potable water reservoir
RWCWRF	Ralph W. Chapman Water Recycling Facility
RWQCB	Regional Water Quality Control Board
SAMP	Sub-Area Master Plan
SANDAG	San Diego Association of Governments
SBWRP	South Bay Water Reclamation Plant
SDCWA	San Diego County Water Authority
SPA	Specific or Sectional Plan Area
SR	State Route
SVSD	Spring Valley Sanitation District
Title 22	Wastewater Reclamation Criteria, an excerpt from the California Administrative Code, Title 22, Division 4, Environmental Health
UC	University of California
USGS	United States Geologic Survey
WD	Water District
WRMP	Water Resources Master Plan
WTP	Water Treatment Plant

Chapter 1
Introduction

The Otay Water District (District) is a publicly owned water and sewer service agency serving the needs of approximately 186,000 people in a 125.5 square mile area encompassing the San Diego County communities of southern El Cajon, La Mesa, Rancho San Diego, Jamul, Spring Valley, Bonita, Eastern Chula Vista, EastLake and Otay Mesa along the international border with Mexico. A vicinity map of the area is provided in Figure 1-1.

The District was authorized as a California Special district by the State Legislature in 1956, under the provisions of the Municipal Water District Law of 1911, and thereby gained its entitlement to imported water. The District is revenue neutral: each end user pays their fare share of the District's costs of capital improvements, water acquisition, and the operation and maintenance of its facilities. Its elected Board of Directors sets ordinances, policies, taxes, and rates for providing sewer, potable and recycled water services.

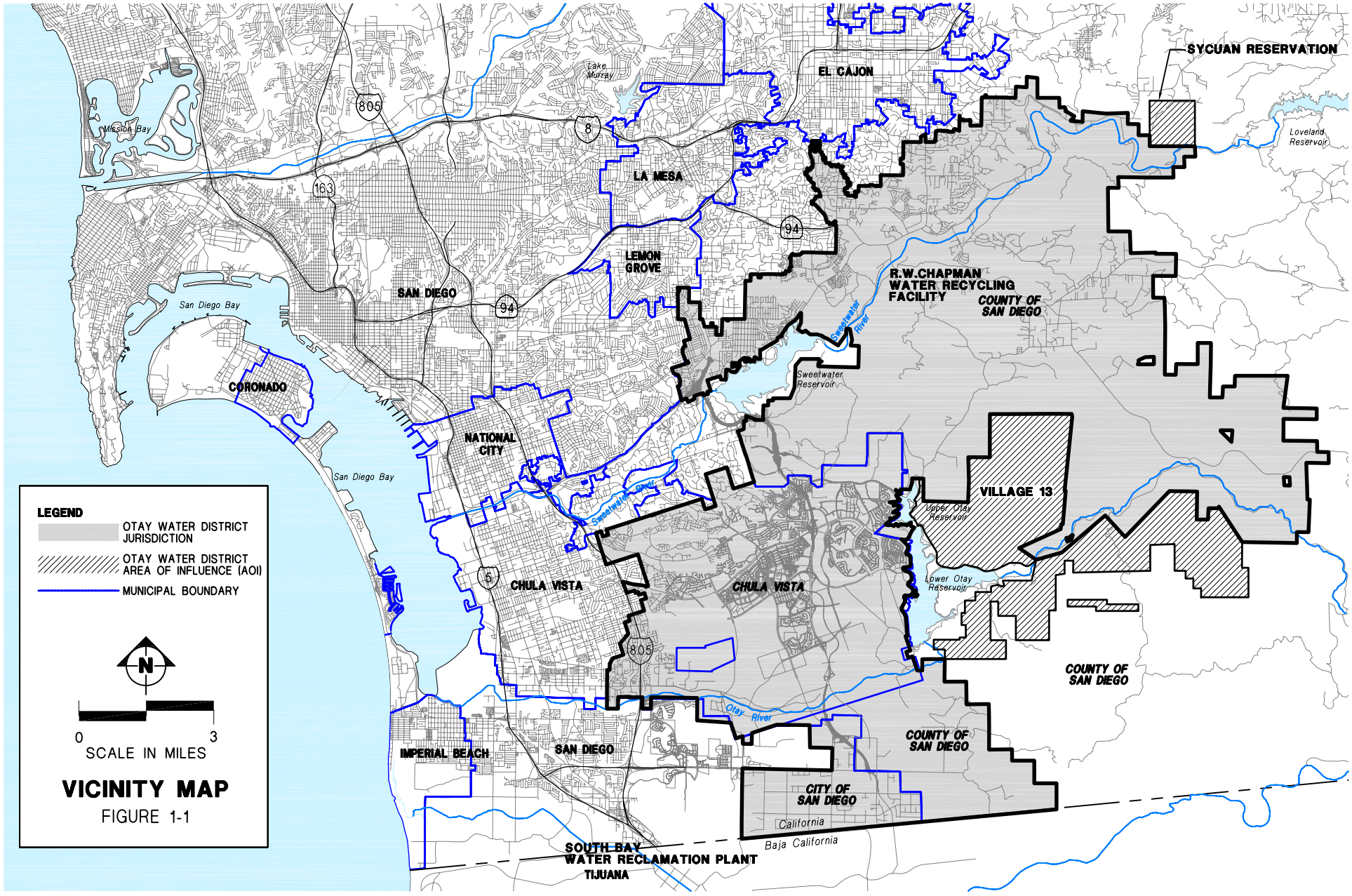
The District is a member agency of the San Diego County Water Authority (SDCWA), and all the potable water it delivers is purchased from SDCWA. SDCWA is responsible for transmission of the imported water supply within San Diego County to all its member agencies. SDCWA is a member of the Metropolitan Water District of Southern California (MWDSC). The District receives imported potable water from the aqueduct systems owned and operated by SDCWA and MWDSC. Through agreements with neighboring water agencies, the District can also purchase potable water from local water treatment plants. The District continues to be active in reducing demands through conservation measures while pursuing other sources of supply to increase its system reliability and flexibility, such as interagency agreements, recycled water and groundwater wells.

1.1 District Services

The District is divided into two distinct area systems: the North District, serving San Diego County communities above Sweetwater Reservoir, and the South District, serving the City of Chula Vista and Otay Mesa. The District's potable water infrastructure consists of five primary operating systems. The La Presa, Hillsdale, Regulatory Systems are in the North District and the Central Area and Otay Mesa Systems are in the South District.

The District currently obtains its potable water supply via four separate connections to Pipeline No. 4 of the Second SDCWA Aqueduct Flow Control Facilities. Supply is also available from the Helix WD R.M. Levy Water Treatment Plant (WTP). Recycled water is produced at the District's Ralph W. Chapman Water Recycling Facility (RWCWRF) and the City of San Diego's South Bay Water Reclamation Plant (SBWRP). Distribution of recycled water is currently limited to the Central Area System in the South District, until additional pipelines can be constructed to expand service the Otay Mesa Area System. A concept study is currently underway to evaluate the feasibility of recycled water service in the North District Area System.

The District also provides sewage collection, treatment, and disposal services in a small portion of the North District.



VICINITY MAP

FIGURE 1-1

H:\Waterres\100 Otay WD\Otay WRMP\Report\2008WRMP\graphics\0491298-MP-Vicinity.dwg 11/19/08

1.2 District Planning Efforts

In 2002, the District developed a comprehensive Water Resources Master Plan (WRMP) that combined all previously existing master plans and facility plans into one system-wide plan outlining the water system required to serve their customers at build-out conditions. The overall growth rate for the District was estimated to be 3 percent per year. Based on this growth estimate, the master plan identified $465 million in capital improvement projects in three phases: Phase I (2002-2006); Phase II (2007-2016) and Phase III (2017-Ultimate).

More recently, the District has explored opportunities to expand its local resources as a means to offset the risk of interrupted imported water supplies. To address the uncertainties surrounding imported water supplies as a result of potential drought shortages or emergency seismic conditions, in addition to the rising costs of imported water, the District has prepared an Integrated Resources Plan (IRP) to develop a flexible, long-term strategy for its future supply portfolio. The 2007 IRP identifies new supply options beyond the planned facility expansions and upgrades through 2010. These recommendations are discussed in Chapter 3 of this WRMP Update.

The District's current Capital Improvement Plan budget anticipates the expenditure of $252 million in capital improvements in fiscal years 2009 through 2015. This Water Resources Master Plan (WRMP) Update has been prepared to incorporate previous District planning efforts and to update the current list of long-range capital improvement program (CIP) projects to correlate with the recommendations in this WRMP.

1.3 WRMP Update Goals and Objectives

This 2009 WRMP Update identifies the capital facilities needed to provide an adequate, reliable, flexible, and cost effective potable and recycled water system for the delivery of District, City of San Diego, SDCWA, and/or MWDSC water supply to meet approved land use development plans and growth projections within the planning area consistent with the San Diego Association of Government (SANDAG) forecasts through 2030. The proposed potable and recycled facilities, and expansions to existing facilities, have been identified with required capacity, phasing, and estimated probable capital costs to meet the projected customer demands in five years (2016) and for anticipated development through 2030.

In addition, the process to finalize the 2009 WRMP Update requires addressing environmental impacts for each recommended CIP project. Pursuant to California Environmental Quality Act (CEQA) Guidelines, Otay WD must prepare a Program Environmental Impact Report (PEIR) to obtain approval and formal adoption of the WRMP. The PEIR is an informational document that provides an overview of the projects identified in the WRMP and their impacts in terms of land use/planning, noise, geology, biological resources, cultural resources, landform alteration, growth inducement, visual aesthetics, energy, public safety and circulation, air quality, hydrology and water quality.

1.3.1 WRMP Update Objectives

The 2009 WRMP Update will generate a comprehensive system-wide plan for both the potable and recycled water systems, incorporating the following primary objectives:

- **Update Planning Criteria**: Update the District's Land Use Database to incorporate recent and future population projections and planned development projects. Review system performance criteria based upon planning criteria and make recommendations for revised or new criteria, as required. Evaluate existing potable and recycled water distribution system ability to meet established planning criteria.

- **Update Hydraulic Model:** Convert the District's 2002 hydraulic models into a new InfoWater modeling program that incorporates the District's GIS capabilities. Calibrate the hydraulic models to observed actual conditions utilizing data derived from the SCADA system.

- **Evaluate Existing Potable and Recycled Water Systems**: Evaluate the existing and future system operation, and make recommendations for system improvements to correct deficiencies of existing system and meet demands of the future area system. Evaluate future potable water and recycled water systems needs based upon current development patterns, types, location, and timing.

- **Evaluate Future Potable and Recycled Water Systems**: Conduct additional hydraulic modeling for each pressure zone and system to analyze distribution system facilities under 2016 and ultimate demand conditions. Recommend future capital program improvements to serve these conditions.

- **Update Capital Improvement Program:** Develop a phased implementation plan for recommended capital improvement program and estimated costs for identified projects. Incorporate water resource strategies and implement short-term implementation strategies and consider infrastructure needs for the long-term strategies identified in the District's Integrated Water Resources Plan (IRP), and determine phased capital improvement program projects, as required.

Through the implementation of a phased capital improvement program for potable and recycled water infrastructure, the District will be prepared to serve planned ultimate development within its area system and adjacent areas of influence.

1.3.2 Program Environmental Impact Report Objectives

It is the District's goal to obtain approval of the Final Draft of its 2009 WRMP Update through a process of development and subsequent approval of a Program Environmental Impact Report (PEIR) in conformance with the California Environment Quality Act (CEQA) requirements. The PEIR is intended to guide the District in subsequent environmental evaluations of individual CIP projects included in the 2009 WRMP Update and to streamline subsequent detailed project specific environmental evaluations.

1.4 References

The following references were used to update the 2009 Water Resources Master Plan:

1. CDM, Otay Water District Integrated Resources Plan, March 2007
2. City of Chula Vista, 2008 Growth Management Annual Report, June 2008
3. Harris & Associates, Otay Mesa Recycled Water System VE Study, February 2005
4. HDR, Final Program EIR for the Otay Water District Water Resources Master Plan, 2004
5. Lee & Ro, Preliminary Design Report Otay Mesa Recycled Water System Transmission Pipeline, June 2008
6. Otay Water District, Water Resources Master Plan, August 2002
7. Otay Water District, Design Report for North District Modifications, March 2004
8. Otay Water District, Urban Water Management Plan, 2005
9. Otay Water District, Proposed Operating and Capital Budget FY 2008-2009, 2008
10. RBF & Associates, Otay Mesa Raw/Reclaimed Water Transmission Facility Feasibility Analysis, August 1997
11. RECON, Final Master Environmental Impact Report for the Otay Water District Water Resources Master Plan, 1996
12. PBS&J, Ralph W. Chapman Water Recycling Facility Engineering Report on the Production, Distribution and Use of Recycled Water, January 2007
13. PBS&J, North District Recycled Water Study Development Project, Phase 1 Concept Study, DRAFT, October 2008

This page is intentionally left blank.

Chapter 2
Study Area

The study area for the 2009 WRMP Update is similar to the 2002 WRMP and includes the areas within the District and the recommended Area of Influence, encompassing known existing and planned developments logically served in the future. This chapter describes the physical attributes of the study area, existing and future land uses and the current status of major specific planned development projects.

2.1 Description of Study Area

The District's service area is generally located within the south central portion of San Diego County and includes approximately 137 square miles, of which 125.5 square miles are within the District's boundaries and 11 square miles are in the District's Area of Influence. The topography of the service area is diverse, consisting of a variety of valleys, hills, mountains, mesas, lakes and rivers.

The climate in this part of San Diego County is characterized by mild temperatures and low annual rainfall, although temperatures in the summer can vary significantly the further inland. The average annual rainfall is approximately 9.4 inches. The service area includes both urban and rural development. The major transportation arteries serving the area include State Highway 94 in the north, Interstate 805 in the southwest and the newly constructed State Route (SR-) 125 (Toll Road) to the east. Interstate 905 and State Highway 11 are in the process of being constructed in the Otay Mesa area.

The District serves a wide spectrum of communities including, southern El Cajon, La Mesa, Rancho San Diego, Jamul, Spring Valley, Bonita, eastern City of Chula Vista, EastLake, Otay Ranch and Otay Mesa areas. The water purveyors that border the District include Padre Dam Municipal Water District on the north, Helix Water District on the northwest, and the Sweetwater Authority, and the City of San Diego on the west. The southern boundary of the District is the international border with Mexico. A map showing the regional jurisdictional boundaries within the District is shown on Figure 2-1.

There is currently no adjacent water purveyor located to the east of the District, which provides an opportunity for service for future land uses, such as the Otay Ranch General Development Plan (GDP) Area of Influence. Some of these lands to the east are outside the imported water service area of SDCWA and MWD and would require annexation to obtain service. The District's primary Area of Influence is to the east of the current service area and is bounded on the west by the Upper and Lower Otay Reservoirs. It is comprised of portions of the Proctor Valley Parcel and all of the San Ysidro Mountains Parcel of the Otay Ranch GDP. The District's Area of Influence also includes the Sycuan Indian Reservation, located to the northeast of the District boundary. Representatives of the Reservation have expressed interest in obtaining a more reliable water supply, and may seek annexation in the future.

2.2 Land Use

The water service planning area comprises three distinct land use planning agencies. They are the City of San Diego, the City of Chula Vista, and the County of San Diego, shown in Figure 2-1. Documents that govern land use planning in these jurisdictions consist of the City of San Diego General Plan, the City of Chula Vista General Plan, and the County of San Diego's General Plan. All three include various sub-regional and community level plans within the District.

The City of Chula Vista's General Plan Update was adopted on December 13, 2005. In 1993, the City of Chula Vista and the County of San Diego adopted the Otay Ranch GDP and Subregional Plan for the Master Planned Community of Otay Ranch consisting of nearly 23,000 acres east of Interstate 805 and south of Telegraph Canyon Road. The Otay Ranch GDP land areas are defined as the Otay Valley Parcel, Proctor Valley Parcel, and the San Ysidro Mountains Parcel. A portion of the Otay Ranch area was noted as a deferred area in the 2005 Chula Vista General Plan.

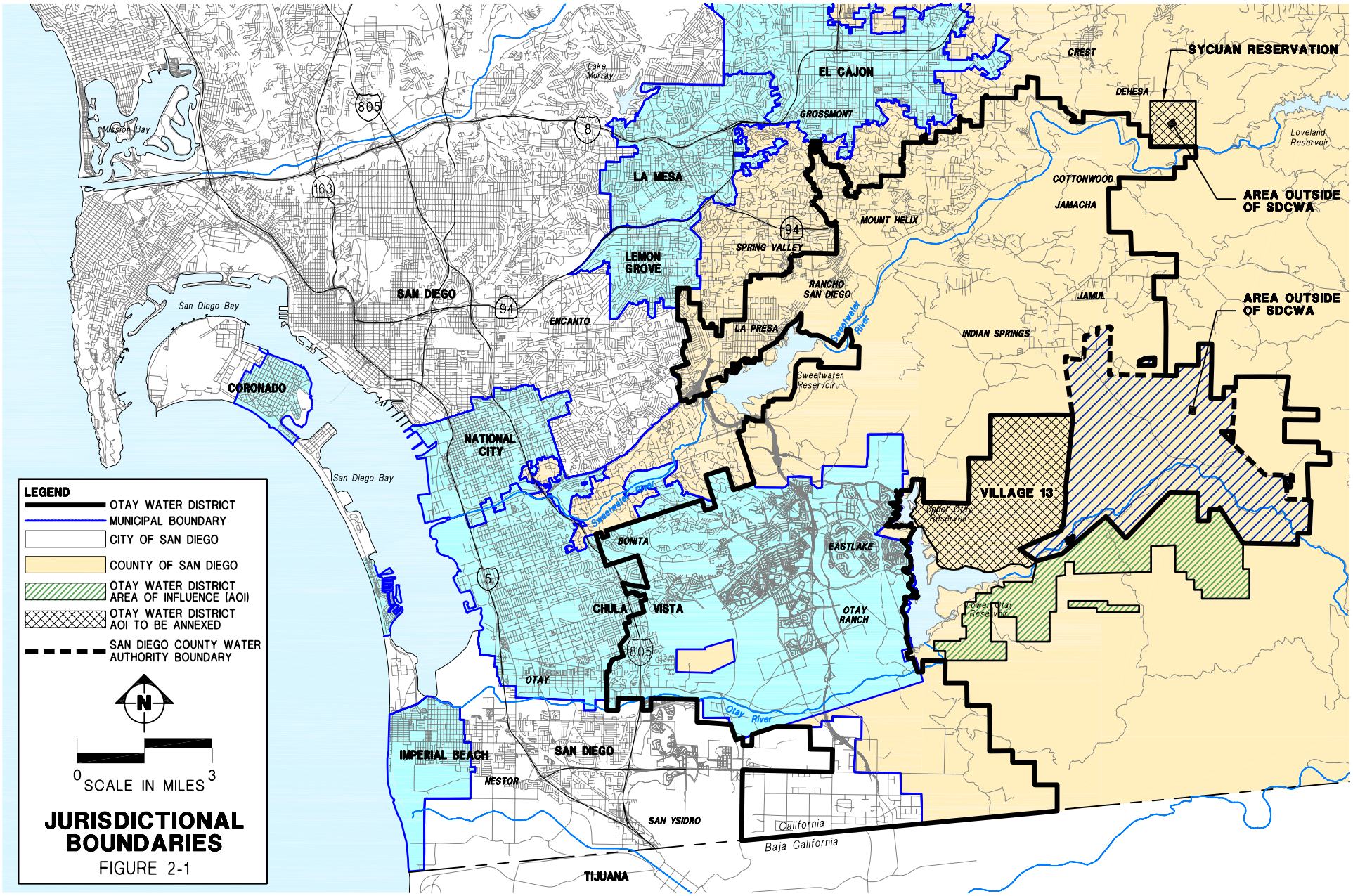
The County of San Diego General Plan area includes the Spring Valley Community Plan, Crest-Dehesa Community Plan, Valle de Oro Community Plan, Jamul-Dulzura Community Plan, Sweetwater Community Plan, and the East Otay Mesa Specific Plan. The County General Plan is currently undergoing a comprehensive update and is not anticipated for approval until late 2010.

The only area in the City of San Diego served by the District is covered by the Otay Mesa Community Plan, which is also going through a major land plan update.

2.2.1 Land Use Database Development

As part of the 2009 WRMP Update, a land use database of all parcels within the District's service area containing the corresponding land use classification(s) and average water use has been compiled. Data on existing land use was obtained from several sources including the District's Geographic Information System (GIS) database, and the San Diego Association of Governments (SANDAG). SANDAG serves as the regional, intergovernmental planning agency and maintains a regional GIS database, which includes existing land use, general and community plan designations, and annual estimated projections of dwelling units and population.

Assessor's Parcel Map updates to the District's GIS database are made monthly by District staff through coordination with the County of San Diego, the City of San Diego, the City of Chula Vista, SANDAG, and other local agencies. GIS parcel data provided by the District for the land use database development work was up-to-date as of September 2007. The current parcel data, however, does not include a complete record of (or updates to) current or zoned land use information associated with each parcel. The approach to updating the land use database for this WRMP Update is described in the following sections.



H:\Waterres\100 Otay WD\Otay WRMP\Report\2008WRMP\graphics\0491298-MP-JurisdictionBnds.dwg 09/01/2009

2.2.2 Current Land Use Data

Land use data for the District has not been consistently updated in its parcel database since the 2002 WRMP. For the 2002 WRMP, an ARCVIEW computer software application was utilized to compile the land use data in GIS format. The ARCVIEW computer files include two basic file types: map coverages and databases. ARCVIEW is a spatial analysis program which integrates cartographic data (maps) with tabular data (databases). In order to aggregate and correlate the various land use codes (LUCs) contained in all the various data sources, a distinct set of land use codes was established. The LUCs were assigned to every existing assessor's parcel within the District's planning area. SANDAG land use categories are also listed in the District's current GIS database.

In order to prepare a current land use database, the District's GIS parcel and land use database was compared against the latest 2007 SANDAG land use database. SANDAG uses approximately 50 types of land use classifications, which is more than is used by the District. Therefore, the land use classifications were simplified for both the District's GIS data and the 2007 SANDAG data. The land use classifications listed in the 2002 WRMP essentially remain the same for the 2009 Update and are presented in Table 2-1.

A number of major Sub-Area Water Master Plan (SAMP) or Specific Planning Area (SPA) planning documents for projects under construction in 2002 have now been constructed and are existing land uses. The most recent SAMPs and SPAs were reviewed to confirm the appropriate land use classification for these projects. Any areas within the District that had conflicting land use classifications were identified and discussed with District staff. Several customers, such as the prison and landfill, have unique land use types and are identified as "Other" in the database.

Once the current land use database was completed, the data was linked to each existing parcel within the District by Assessor's Parcel Number (APN) and/or service address using the capabilities of ARCVIEW. Those parcels with multiple land uses were identified and areas within that parcel were assigned a land use designation.

2.2.3 Future Land Use Data

In the 2002 WRMP, an ARCVIEW database of land uses was prepared for the projected ultimate development. The data sources for future development were evaluated to determine the best source of information and a hierarchy of data resources was established. The land use data resource hierarchy used in the 2002 WRMP included the existing development, existing environmental open space preserves, SAMPs, Otay Ranch General Development Plan (GDP) and proposed Amendments (City of Chula Vista approved MOUs), SPAs, Community Plans, City and County General Plans, and SANDAG.

For this WRMP Update, a comparison of the existing 2007 land use data was made against SANDAG 2030 land use data. Any areas within the District that had different land use classifications for the future condition were identified and discussed with District staff. Currently available SPAs and SAMPs were evaluated to provide detailed future land use data for areas within the District yet to be developed.

For the purpose of this WRMP Update, only the adopted 1984 Otay Mesa Community Plan land uses were considered for the land use database and model development. Currently proposed land use scenarios by the City of San Diego to the Otay Mesa Community Plan Update were not included, however a general discussion of the potential impacts on the water demands and system is presented in Chapter 4.

In addition, the Otay Ranch Villages deferred in the 2005 Chula Vista General Plan are currently undergoing a plan update and are not included. However, a general discussion of these Villages is presented in Chapter 4.

Table 2-1. WRMP Land Use Classifications

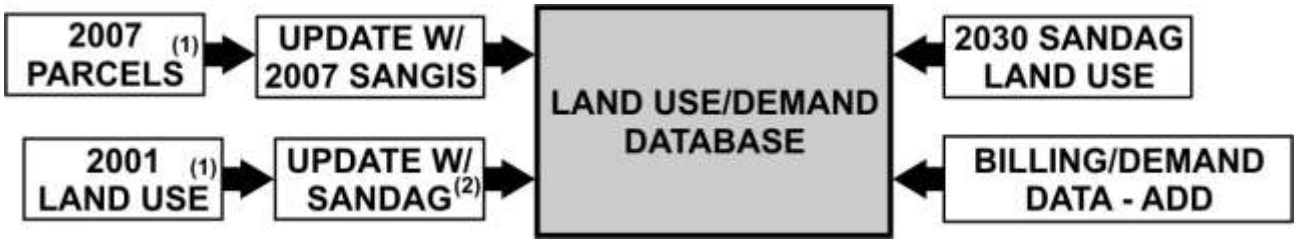
Land Use Classification[1]	Land Use Type[1]	2002 WRMP Land Use Code[1]	2009 WRMP Land Use Code[5]
Residential			
Very Low Density	SFD[2]	VL	VL
Low Density	SFD	L	L
Medium Density	SFD/MFD[3]	M	MD
High Density	MFD	H	HD
Education			
Elementary School	n/a	ES	E
Middle School	n/a	MS	E
High School	n/a	HS	E
Community College	n/a	CC	E
University of California Campus	n/a	UC	E
Others			
Parks	n/a	P	IRR
Community Purpose Facility	n/a	CPF[4]	CPF
Commercial	n/a	C	C
Hospital	n/a	HP	HP
Industrial	n/a	I	I
Resort Facilities	n/a	Resort	H
Golf Course	n/a	GC	IRR
Open Space and Flood Plain	n/a	OS	OS
Arterial	n/a	A	A
Highway	Freeway	HWY	HWY
Richard J. Donovan	Prison	SP	Other
George F. Bailey	Jail	CJ	Other
Border Crossing	n/a	BC	Other
Otay Landfill	Landfill	OL	Other

(1) Land Use Classifications, Types, and Codes taken from the 2002 WRMP Table 4-3
(2) Single-Family Dwelling
(3) Multi-Family Dwelling
(4) Community Purpose Facility (churches, libraries, police stations, fire stations, etc.)
(5) New 2009 Land Use Codes: E = Education/Institutional; IRR = Irrigation User; H = Hotel/Resort; Other = Unique land use types, such as prisons and landfills

2.2.4 Final Land Use Database

A comprehensive Land Use Database has been developed for the District for each parcel within the District that includes up-to-date parcel information, associated land use(s), average day water demand (ADD) based on billing information for existing users and land use for future users, and the assigned water demand in the hydraulic model. It should be noted that if land use is anticipated to significantly change for an existing parcel (e.g., a 20 acre parcel is projected to subdivide, going from one dwelling unit to 100 dwelling units), then a future demand will also be included based on the projected land use. This database provides the District with the means to readily determine what land use was assumed for a particular parcel, where the demand is located, and how it was calculated. Figure 2-2 illustrates the process of developing the land use database model. Table 2-2 provides an example of how the data is presented in the database. Appendix A includes the land use and demand data used in this 2009 WRMP Update.

Figure 2-2. Land Use/Demand Database Source Information



(1) Per OWD GIS data received December 2007
(2) Latest SANDAG data as of January 1, 2007

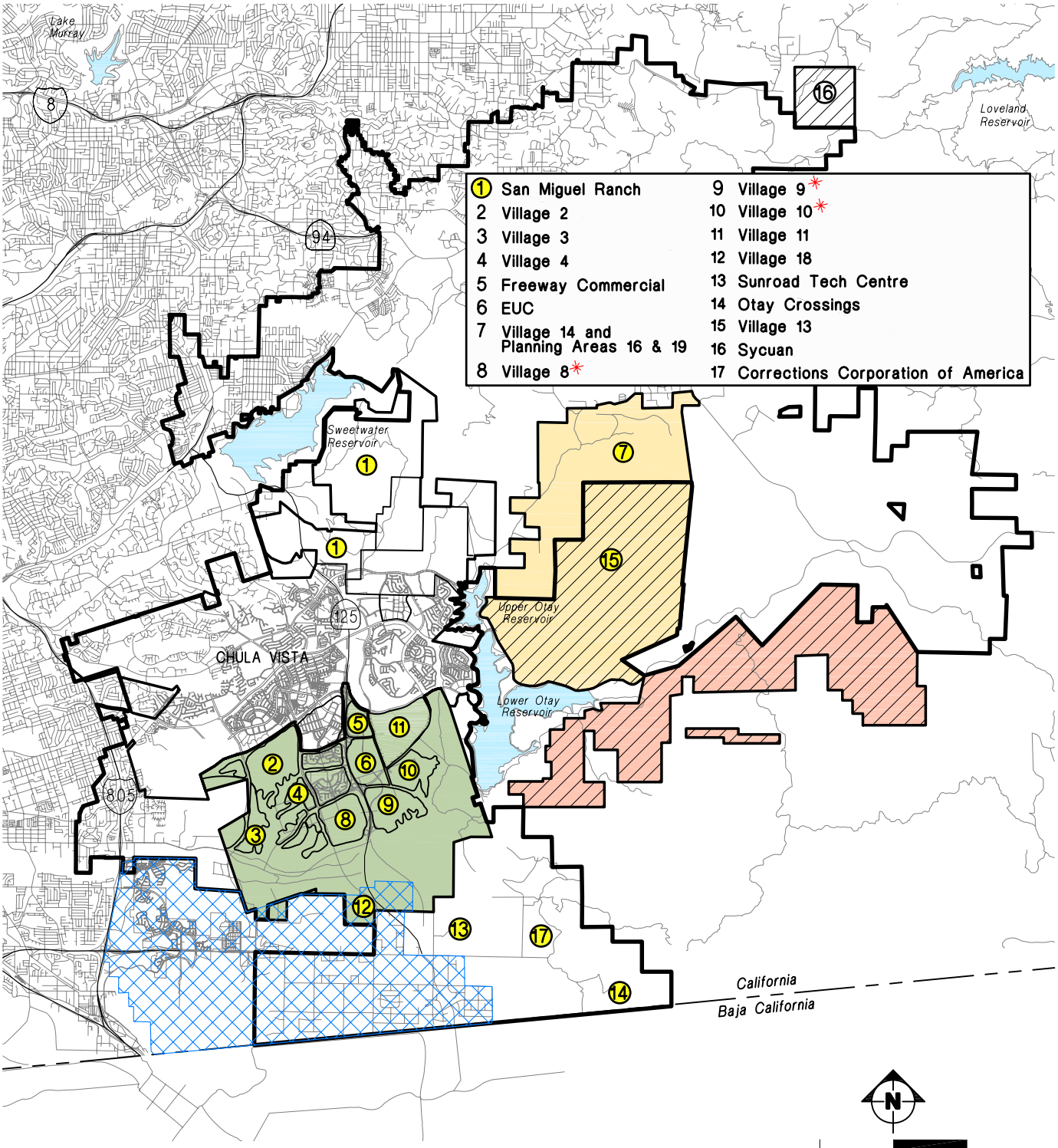
Table 2-2. Typical Land Use/Demand Database

APN	PARCELID	OWN_NAME1	PROP_ADDRESS	LEGLDESC
505-230-16-00	672368	OTAY WATER DISTRICT	2500 SWEETWATER SPRINGS BLVD	LOT 40*2.68 AC M/L IN LOTS 39&\

2007_LUC	LU_Description	Area_ac	No_Units	Exist_Demand	2030_LUC
C	Communications & Utilities	2.68	0	238.4	C

ACREAGE	X_COORD	Y_COORD	ZIP
2.68	6340965.577	1843968.614	91978

2030_LU_Description	Unit_Demand	2030_Demand	Trib_Node
Communications & Utilities		238.4	5638



MAJOR PLANNED DEVELOPMENTS WITHIN OTAY WATER DISTRICT

FIGURE 2-3

H:\Waterres\100OtayWD\OtayWRMP\Report\2008WRMP\graphics\0491298-MP-PlannedDevels.dwg 09/01/2009

Table 2-3. Project Development Status

Water System Planned Development Project	Residential Dwellings				Commercial Development (ac)	Industrial Development (ac)	Community Purpose Facility (ac)	Park Land (ac)	School Property (ac)[1]	Resort Area (ac)	Open Space (ac)	Roadway (ac)	Gross Area (ac)
	SF (DU)	MF (DU)	Total (DU)	Area (ac)									
Hillsdale System													
Hillsdale Ranch											85.5		85.5
Total	**0**	**0**	**0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**85.5**	**0.0**	**85.5**
Regulatory													
Hidden Valley Estates											1,460.0		1,460.0
Simpson Farm	98		98	122.7	12.5						7.3	15.2	157.7
Honey Springs Ranch											2,022.0		2,022.0
Rancho Jamul Estates	151		151	621.2			3.6				163.4		788.2
Rancho Jamul Gande	23		23	80.7							44.7	4.6	130.0
Planning Area 17	296		296	816.7							2,366.5		3,183.2
Total	**568**	**0**	**568**	**1,641.3**	**12.5**	**0.0**	**3.6**	**0.0**	**0.0**	**0.0**	**6,063.9**	**19.8**	**7,741.1**
Central Area System													
Vista Mother Miguel	41		41	10.0									10.0
Bella Lago	143		143	90.6							89.0		179.6
Bonita Meadows	496		496	53.5			1.6				177.5	31.3	263.9
Villages 2-4	549	2,237	2,786	331.7	15.3	87.9	6.1	75.0	10.3		200.3	32.7	759.3
Village 8	565	1,017	1,582	193.7	4.0		6.3	20.5	35.0		22.4	14.2	496.1
Village 9	365	4,118	4,483	291.1	5.0		13.8	29.8	60.6		38.5	27.7	466.5
Village 10			0						440.0				440.0
Village 13	1,843	277	2,120	522.1			2.5	19.6	12.6	48.2	1,252.4	43.0	1,900.4
Village 14	1,563	150	1,713	773.8	2.9		7.5	10.0	10.0		1,699.1	23.7	2,527.0
Village 15											2,371.9		2,371.9
Planning Area 12 (EUC)		2,500	2,500	70.1	261.2		8.9	45.0	10.0		20.0	24.2	439.4
Planning Area 16	390		390	716.9			1.7	2.5			2,119.8	25.4	2,866.3
Planning Area 18b			0			69.7							69.7
Planning Area 19	20		20	20.0									20.0
Total	**5,975**	**10,299**	**16,274**	**3,073.5**	**288.4**	**157.6**	**48.4**	**202.4**	**578.5**	**48.2**	**7,990.9**	**222.2**	**12,810.1**
Otay Mesa System													
Planning Area 18a						215.8							215.8
Other Developments	582		582	710.0	784.4	6,712.4	1,299.2	5.0			1,343.5	264.7	11,119.2
Total	**582**	**0**	**582**	**710.0**	**784.4**	**6,928.2**	**1,299.2**	**5.0**	**0.0**	**0.0**	**1,343.5**	**264.7**	**11,335.0**
TOTAL	**7,125**	**10,299**	**17,424**	**5,425**	**1,085**	**7,086**	**1,351**	**207**	**579**	**48**	**15,484**	**507**	**31,972**

[1] Village 9 includes 50.6 acres for the University Campus. Village 10 is planned for the remaining 440 acres for the University Campus site.

2.3 Major Development Project Overview

Since the development of the 2002 WRMP, the District has experienced remarkable growth, particularly in the South District service area. This growth has resulted in the build-out or near build-out of large master planned land development projects. As part of water facility planning efforts, major development projects typically complete SAMP and/or SPA planning documents. Both SAMP and SPA documents provide detailed land use data. As part of the 2009 WRMP Update, SAMPs and SPAs for the undeveloped and planned projects described in the 2002 WRMP were reviewed and their current status is reported in the following paragraphs. A number of developments have been completed since 2002. The locations of the major development projects that have not yet been completed are shown on Figure 2-3. A summary of the major planned developments at ultimate development is shown in Table 2-3.

2.3.1 Major Developments Constructed (2002-2007)

Major development projects completed since the 2002 WRMP have been incorporated into the new existing water system model. These developments are located in the city of Chula Vista and San Diego County, as described below.

City of Chula Vista

It is estimated that since 2002, nearly 11,500 new residential units have been constructed in eastern Chula Vista, most of which are included in the following specific development areas.

- Otay Ranch Village 5
- Otay Ranch Village 6
- Otay Ranch Village 7 (substantially complete)
- Otay Ranch Village 11 (partially complete)
- EastLake Trails
- EastLake III
- EastLake Business Center
- Sunbow II
- Freeway Commercial (substantially complete)
- Rolling Hills Ranch (substantially complete)

County of San Diego

The following San Diego County developments are complete or substantially complete.

- Highlands Ranch/The Pointe (substantially complete)
- Hillsdale Ranch
- San Miguel Ranch (substantially complete)

Developments Re-Zoned to Open Space

There were several important planned developments and developable areas that are no longer planned for development and have become permanent open space based on discussions with the District, local land use attorneys and the City of Chula Vista.

- Otay Ranch Village 15
- Honey Springs Ranch
- Hidden Valley Estates (pending)

2.3.2 Otay Ranch General Development Plan (GDP)

The Otay Ranch GDP represents one of the largest land plan areas, and will continue to be the largest growth area, within the District. The Otay Ranch GDP consists of nearly 23,000 gross acres in the central portion of the District. The Otay Ranch GDP is grouped geographically to form the three distinct parcels (i.e., Otay Valley, Proctor Valley, and San Ysidro Mountains). There are numerous property owners within the Otay Ranch GDP. At buildout the plan will contain eleven urban villages with approximately 37,000 dwelling units and support commercial and community facilities. The following section describes the three major parcels and major undeveloped villages.

Otay Valley Parcel

The Otay Valley Parcel is the largest parcel of the Otay Ranch GDP containing approximately 9,449 acres. The Otay Valley Parcel is generally bounded by Telegraph Canyon and Otay Lakes Roads on the north, the Otay Landfill on the west, Brown Field on the south, and the Lower Otay Reservoir on the east. The Otay River traverses the southern portion of the parcel and topographically separates most of the parcel from Otay Mesa.

The Otay Valley Parcel includes the eleven urban villages with village cores and three planning areas which include mixed use areas, parks, schools, community purpose facilities, single-family and multi-family dwellings, industrial, open space, transportation, and commercial land uses. The land areas included within the Otay Valley Parcel are known as Village 1, Village 2, Village 3, Village 4, Village 5, Village 6, Village 7, Village 8, Village 9, Village 10, Village 11, Planning Area 12, Planning Area 18a, and Planning Area 18b. The Otay Ranch GDP Planning Area 18a is located south of Otay River on Otay Mesa.

The Otay Valley Parcel will ultimately include over 9,000 single-family dwelling units, over 22,000 multi-family dwelling units, 400 acres of parks, 600 acres of schools (potentially for a University Campus to be located in the southeastern portion of the parcel), 170 acres of commercial property, 4,000 acres of open space.

The major remaining planned developments within the Otay Ranch Parcel include:

- **Eastern Urban Center.** The Eastern Urban Center (EUC) Project, also referred to as a portion of Planning Area 12, is located in the City of Chula Vista within the Otay Ranch General Development Plan (GDP) Planning Area. The site is bound by Birch Road to the north, SR-125 to the west, EastLake Parkway to the east, and the future extension of Hunte Parkway to the south. The 228.2-acre EUC SPA project consists mostly of commercial/retail (non-residential) and high density residential land uses, as well as several parks, a hotel, and a fire station. A technical water study for this project was approved by the District in January 2008. The project is expected to be completed by 2020.

- **Villages 2 through 4.** Villages 2 through 4, shown on Figure 2-3, consist of approximately 759 acres located along the western edge of the Otay Valley Parcel, south of Olympic Parkway, west of the extension of La Media Road, and north of the Otay River Valley. According to the approved SAMP for Villages 2 through 4, this project will include 549 single family dwelling units, 2,237 multi-family residential dwelling units, 6.1 acres of community purpose facilities, 15.3 acres of commercial, 87.9 acres of industrial, a 10.3-acre school, a 75-acre park, and 233 acres of open space and roadways.

- **Village 8.** Village 8 is comprised of approximately 496 acres located in the southern portion of the Otay Valley Parcel, west of the proposed SR-125 corridor. The site is located north of the Otay River Valley. This project will include 565 single family dwelling units, 1,017 multi-family dwelling units, 6.3 acres of community purpose facilities, 4.0 acres of commercial, 20.5 acres of parks, a 35.0 acre school, and 22.4 acres of open space.

- **Village 9.** Village 9 is comprised of a Town Center and surrounding residential village of approximately 467 acres located in the southern portion of the Otay Valley Parcel, northeast of the proposed interchange of SR-125 and Otay Valley Road. The site is north of the Otay Valley and will include 50.6 acres for the University Campus, along with 365 single family dwelling units, 4,118 multi-family dwelling units, 29.8 acres of parks, 13.8 acres of community purpose facility, 10.0 acres for schools, 5.0 acres for commercial, and 38.5 acres of open space.

- **Village 10 (University Campus).** The University Campus is approximately 440.0 acres located in the eastern portion of the Otay Valley Parcel, between the Eastern Urban Center and Salt Creek. The site is characterized as a broad mesa with slopes along the eastern boundary leading down to Salt Creek.

The 2005 Chula Vista General Plan deferred the final land use decisions for the Otay Ranch Villages 8, 9, and 10 and portions of Villages 4 and 7. The City of Chula Vista is currently preparing a General Plan Amendment for this area based on land offer agreements.

Proctor Valley Parcel

The Proctor Valley Parcel consists of approximately 7,895 acres of which approximately 70 percent is proposed as open space. This parcel lies to the northeast of the Otay Valley Parcel and is generally bounded by Otay Lakes Road and Lower Otay Reservoir to the south, the Upper Otay Reservoir and San Miguel Mountains to the west, the community of Jamul to the north, and vacant undeveloped land to the east. Approximately 2,962 acres of the Proctor Valley Parcel lie within the District's boundary, and about 4,933 acres of the parcel lie outside the District's boundary and within the District's recommended Area of Influence.

The Proctor Valley Parcel includes two urban villages and two planning areas which incorporate parks, schools, community purpose facilities, single-family and multi-family dwellings, commercial, open space, resort, and transportation land uses. The land areas included within the Proctor Valley Parcel are known as Village 13, Village 14, Planning Area 16, and Planning Area 19.

Development will include approximately 3,003 single-family dwelling units, 1,558 multi-family dwelling units, 13 acres of parks, 19 acres of community purpose facilities, 10 acres of schools, 3 acres of commercial property, 5,517 acres of open space, and 561 acres of transportation uses. Village 13 includes a resort village containing a golf course, resort center, commercial, parks, conference center, low and medium-density residential areas.

The portion of the Proctor Valley Parcel within the District's boundary includes Village 14 and Planning Areas 16 and 19 with approximately 1,773 single-family residential units, 150 multi-family residential units, an elementary school, and a neighborhood park.

The portion of the Proctor Valley Parcel outside the District's boundary is known as the Resort Parcel, or Village 13. The land use mix will include approximately 1,230 single-family residential dwelling units, 1,408 multi-family dwelling units, a hotel, a recreation/visitor center, commercial areas, and neighborhood parks. Village 13 is anticipated to be annexed into the District to receive water service.

San Ysidro Mountain Parcel

The land areas included within the 5,555-acre San Ysidro Mountains Parcel are known as Village 15 and Planning Area 17. Since the 2002 WRMP, Village 15 has been recorded as open space preserve. Planning Area 17 is located within the Regulatory System, and is planned to include 296 single-family units over 800 acres. Over 85 percent of the parcel is designated as open space. The entire parcel lies outside of the District's boundaries but within the Area of Influence.

2.3.3 City of San Diego – Otay Mesa Community Plan

The Otay Mesa Community Planning Area (OMCPA) is a dynamic and rapidly developing area within the City of San Diego. The 9,300 acre area is bounded by the Otay River Valley and the City of Chula Vista on the north, the International Border on the south, Interstate 805 on the west, and the County of San Diego on the east. The District's service area encompasses the eastern portion of the OMPCA and a small notch on the north side of the OMCPA.

It is envisioned that Otay Mesa will be a major employment center and home to a future population of 32,000 residents. The City is currently updating the Otay Mesa Community Plan, originally adopted in 1984. The intent of the update is to establish a framework for future development that will raise the standard of expectations for Otay Mesa and meet the housing demand projected for the City of San Diego. The currently adopted Community Plan is largely comprised of industrial and park/open space land uses. The City's proposed OMPCA Update alternatives reduce the amount of proposed industrial development and increase the percentage of residential development, including the addition of a mixed use Village Center development concept. Three alternative land use proposals have been presented to the community and developers are proceeding with planning elements based on one or more of these alternatives. The City is not anticipated to adopt a new Community Plan until 2010.

2.3.4 County of San Diego – South District

The County of San Diego's East Otay Mesa Specific Plan covers a land area on the Otay Mesa. It is bordered on the west by the City of San Diego, on the south by the border with Mexico and the City of Tijuana, and on the east by the San Ysidro Mountains. To the immediate north are the existing 773.5 acre site of the Richard J. Donovan State Correctional Facility and the 519 acre site of the County's George F. Bailey and East Mesa Detention Facilities.

The East Otay Mesa SPA encompasses approximately 3,300 gross acres and designates approximately 1,418 acres, 43 percent of the SPA, as industrial land use. The planned mixed industrial land uses are intended primarily for accommodating wholesale storage and distribution, warehousing, research services, and general industrial uses. Land use includes approximately 495 acres of very low-density rural residential development in the hillside areas, 74 acres for a third border crossing facility, 292 acres of conservation and open space, and 987 acres for commercial purposes.

There are several development projects being planned within the East Otay Mesa Plan and are described below.

Sunroad Technical Centre

The Sunroad Technical Centre project includes over 190 acres of proposed industrial development by Sunroad. The project is located north of Otay Mesa Road and just east of the SR-125 Toll Road.

Otay Crossings Commerce Park

The proposed development concept for the approximately 311.5 acre Otay Crossings project is planned as a mixed industrial project. The project consists of the future SR-11 to provide accessibility to the planned future border crossing facility, 31 mixed use industrial lots, circulation elements, and open space. The U.S. Department of Homeland Security has requested 40 to 80 acres of the Otay Crossings project site for construction of the future third border crossing facility. Of the total 212 acres for mixed industrial use, 51 acres would be for the SR-11 future right-of-way, and 21 acres is proposed as natural open space. The Otay Crossings project is currently planned to be constructed in two phases over several years.

Expansion of the State and County Prison Facilities

There are currently two prison sites in San Diego County's East Otay Mesa area: the Donovan State Correctional Facility and the County's George F. Bailey Detention Center.

- Corrections Corporation of America (CCA) currently leases facilities at the County Detention Center but is proposing to build and operate a new 2,112-bed Correctional Center on an undeveloped 37-acre site located along Alta Road. Current land use planned for these parcels is Industrial. The site will consist of approximately 389,000 square feet of building space, developed in two separate phases. The potential demands for this facility are expected to exceed those estimated for the current land use. CCA is

currently preparing a SAMP for District review, which discusses alternatives water conservation and onsite recycling in order to reduce the total water demand for the site.

- The Donovan State Prison is planning to expand its facilities to include a new medical facility, which will house approximately 3,000 inmates and 1,500 staff.

It is anticipated that these facilities may be completed within the next 2 to 5 years. SAMPs will be required for these projects as the District has not previously planned for major expansion at the Prison sites.

2.3.5 County of San Diego

In addition to the East Otay Mesa area, the County of San Diego includes a majority of the North District and includes the Spring Valley Community Plan, Crest-Dehesa Community Plan, Valle de Oro Community Plan, Jamul-Dulzura Community Plan, and Sweetwater Community Plan. In addition, the South District includes County areas, immediately north of the city of Chula Vista, along the SR-125 corridor. Major planned developments, not shown on Figure 2-3, are described below.

Bonita Meadows

The Bonita Meadows development project is located in the Central Area System, and is generally bounded by Proctor Valley Road and San Miguel Ranch on the east, and the Sweetwater Reservoir on the north, and existing development on the west and south. The Bonita Meadows project is comprised of approximately 264 gross acres and will include 496 single-family dwelling units and about 2 acres of land for community purpose facility uses. About 209 acres is intended for open space and roadway purposes.

Simpson Farm

The Simpson Farm Development project is generally located north of Campo Road, east of Jefferson Road, south of Olive Vista Drive, and is within the Regulatory System. The Simpson Farm development consists of approximately 158 gross acres and includes 98 low-density single-family residential dwelling units on 123 acres, a 13-acre commercial site, and 15 acres for roadways. A small portion of the total area, 7 acres, will not be developed and is planned as open space. This project is anticipated to be built out before the 2016 planning horizon.

Rancho Jamul Estates

The Rancho Jamul Estates Development project is generally located north of Campo Road and is within the Regulatory System. The Rancho Jamul Estates development consists of approximately 788 gross acres and will include 151 very low-density single-family residential dwelling units. About 163 acres of the total area will not be developed and is planned for open space. This project is anticipated to be built out before the 2016 planning horizon. According to the District staff, two of the three units planned for this development are complete.

Rancho Jamul Grande

The Rancho Jamul Grande Development project is generally located north of Campo Road within the Regulatory System and surrounded by the Rancho Jamul Estates Development project. The Rancho Jamul Grande development consists of approximately 130 gross acres and will include 23 very low-density single-family residential dwelling units. About 45 acres of the total area will not be developed and is planned for open space. This project is anticipated to be built out before the 2016 planning horizon.

2.4 Growth Forecasts and Population Projections

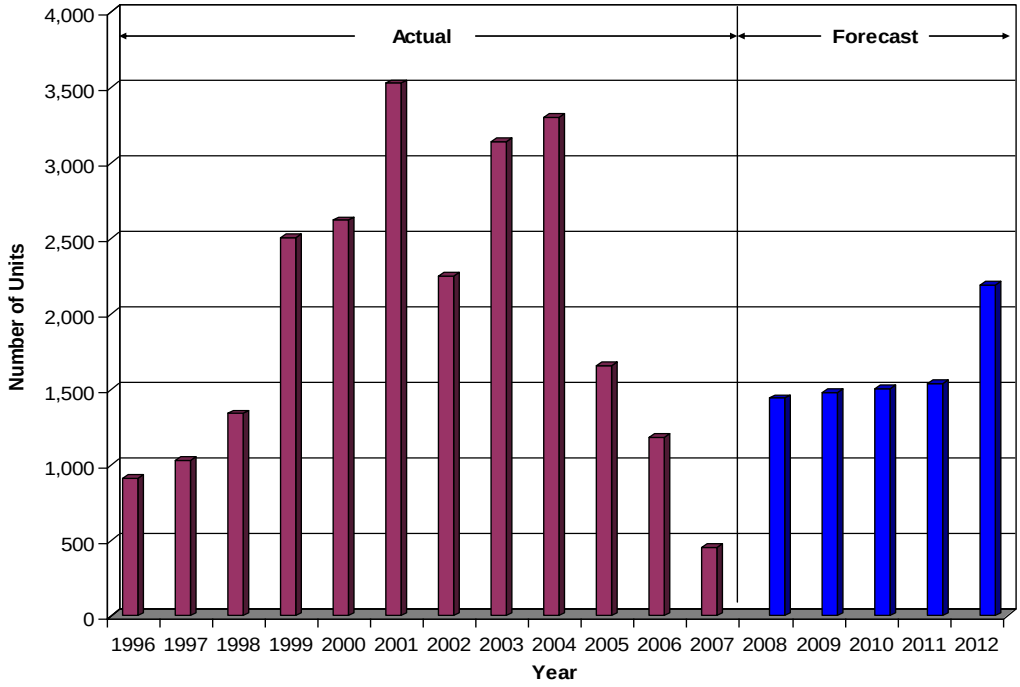
Data on the future rate of growth was obtained from SANDAG, the City of Chula Vista, and recent forecasts developed by the District (used primarily for revenue projections). The assumed growth rates play a critical role in determining the timing and phasing of water improvement projects. The recent volatility and downturn of the housing market in Southern California has made this an important consideration of the 2009 WRMP Update.

In its 2007 Annual Growth Management Review, the City of Chula Vista Planning and Building Department reported a significant slowdown in residential growth over the prior 3 years and predicted a slow recovery through 2011, as shown in Figure 2-4. The forecast from November 2007 through December 2012 indicated an additional 8,146 residential units could be permitted for construction in the City, (6,845 in the east and 1,301 units in the west) for an annual average of 1,369 in the east and 260 units in the west, or just over 1,629 housing units permitted per year on average, citywide. In 2008, the projected number of units permitted per year on average, citywide, was down by 333 units from the 2007 forecast.

In October 2008, the City of Chula Vista made the following statement regarding its annual growth projections: *The housing market is influenced by a variety of factors outside the City's control. The City's residential growth fell grossly short of last year's 12- to 18-month forecast; however, given the unprecedented year of economical events at the local and national levels, this was not surprising. While the economy is in recovery mode, it is quite possible that growth may continue to fall short of projections for some time. A return to equilibrium in residential construction is anticipated in the future, but it is difficult to predict exactly how far out. Current estimates are for at least two years.*

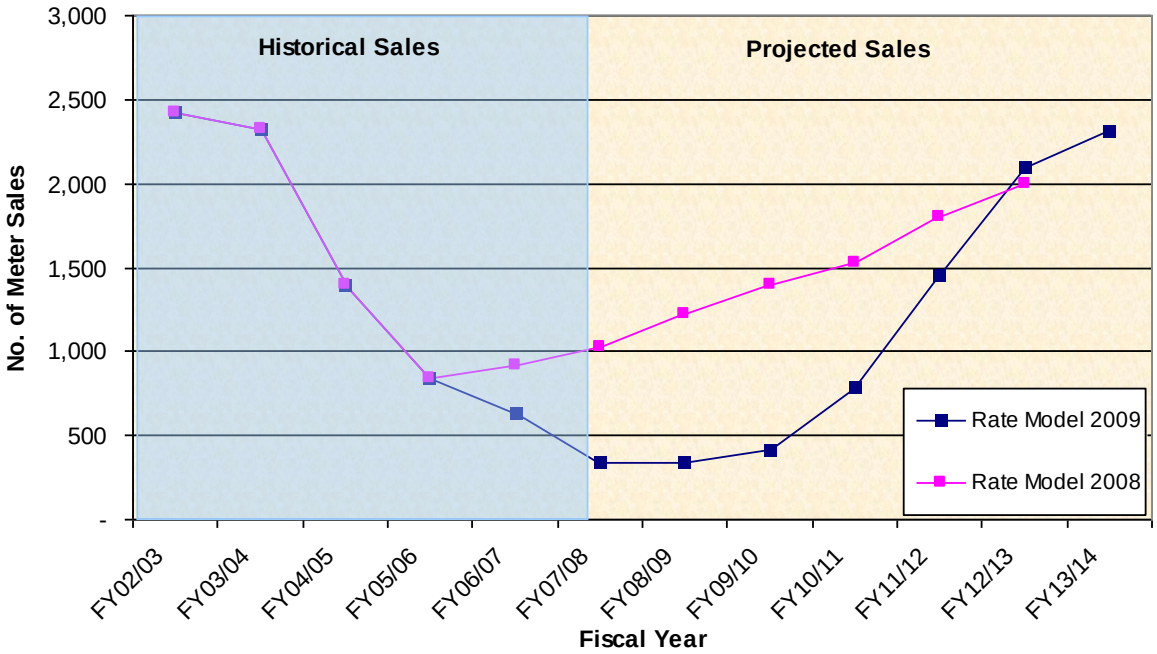
Although Chula Vista represents about a third of the area served by the District, the District revised its 2008 projections in 2009 to reflect a significant slowdown in meter sales, and projected less than 1,000 meters per year through 2011, as shown in Figure 2-5. This data will play a significant role in developing a phasing plan for the District's capital improvement program.

Figure 2-4. City of Chula Vista Residential Growth Forecast



Source: City of Chula Vista 2007 Annual Growth Management Review Cycle (December 12, 2007)

Figure 2-5. Otay Water District Meter Sales Forecast



Source: Otay Water District, Jim Peasley, personal communication, July 30, 2008

Utilizing the ultimate land use database developed for the 2009 WRMP Update, estimates of the ultimate number of dwelling units and population for the planning area were developed based on dwelling unit densities per acre and persons per dwelling unit for residential land uses. Values for dwelling unit per acre were based on actual development plans per SAMPs, SPAs, and the Otay Ranch GDP. All areas outside SAMPs, SPAs, and the Otay Ranch GDP were assigned appropriate dwelling unit per acre values and based on values consistent with Community, City, County, and SANDAG planning guidelines. Persons per dwelling unit values were assigned to each residential category. The highest values of people per dwelling unit are for very low and low-density single-family residential areas and the lowest values are for multi-family residential development.

Table 2-4 shows the dwelling unit densities and persons per dwelling unit criteria for the residential land uses utilized for this WRMP. These are the same values assigned in the 1991, 1995, and 2002 Master Plans for dwelling unit projections. The values used for the population projections were determined based on current SANDAG data. As previously mentioned, actual dwelling unit densities were based on the SAMPs, SPAs, and Otay Ranch GDP.

Table 2-4. Dwelling Unit and Population Projection Criteria

Land Use Code	Land Use Designation	Dwelling Units Per Acre	Persons Per Dwelling Unit
VL	Very Low Density Residential Dwellings	0.0 to 1.0	4.0
L	Low Density Residential Dwellings	1.01 to 3.0	3.8
M	Medium Density Residential Dwellings	3.01 to 8.0	3.5
HD	High Density Residential Dwellings	> 8.0	1.8

Ultimate water demand forecasts are based on land use, and are developed and presented in Chapter 4. Population and development forecasts by the District and Chula Vista were analyzed to develop a target 2016 water demand and corresponding CIP. Over the next 5 years, the District should continue to carefully monitor the growth in light of the housing downturn and consider adjusting the timing of CIPs accordingly.

This page intentionally left blank.

Chapter 3
Potable Water Supply Sources

This chapter of the 2009 WRMP Update describes the District's present portfolio of potable water supply sources, and its adopted strategies now being implemented to further diversify its sources to enhance reliability and flexibility. Recycled water supply sources are discussed in Chapter 5.

The District's dependence on imported water as the main source of supply potentially poses challenges to meet water demands reliably and cost-effectively over time, especially in protracted dry-weather periods. In 2007, the District completed an Integrated Water Resources Plan (IRP) which examines potential, future supply options and their performance with regard to long-term, comprehensive water resource objectives. The 2007 IRP provides a comprehensive and defensible implementation strategy to meet the District's water supply objectives, while allowing flexibility in adapting to anticipated changes in the water industry, market and regulatory conditions. This chapter provides a brief summary of the District's water supply sources and the recommendations of the 2007 IRP. Regional water supply challenges and potential local water supply offset projects are also addressed.

3.1 Present Portfolio of Potable Water Sources

Existing potable water supply sources for the District include the San Diego County Water Authority (SDCWA), Helix Water District (Helix WD), and the City of San Diego. The facilities associated with delivering water to the District from these agencies are described below.

3.1.1 San Diego County Water Authority

The District receives potable water from Pipeline Number 4 (Pipeline No. 4) of the Second San Diego County Aqueduct (Second SD Aqueduct) and the La Mesa-Sweetwater Extension (LMSE). Both of these conveyance facilities are owned and operated by the SDCWA. These facilities are shown schematically in Figure 3-1.

Pipeline No. 4 delivers potable water treated at the Metropolitan Water District of Southern California (MWD) Skinner Water Treatment Plant (WTP) located in Riverside County. Pipeline No. 4 is the District's primary supply system. SDCWA has multiple flow control facilities (FCFs) or connections to Pipeline No. 4 that feed into the District's water system.

Raw water is delivered to the Levy WTP via SDCWA's First San Diego County Aqueduct (First SD Aqueduct). The LMSE conveys potable water from the R.M. Levy WTP (Levy WTP), located at Lake Jennings in the community of Lakeside, owned and operated by the Helix WD. Two connections on the LMSE, known as Otay 8 FCF and Otay 14 FCF, supply the District's Regulatory System.

The SDCWA does not have contractual agreements with its member agencies to guarantee flow rates or hydraulic gradients at their various FCF connections. Generally, if SDCWA cannot obtain sufficient treated and/or raw water, or has delivery limitations for the water requests of its

24 member agencies, they will attempt to allocate the water delivery shortfall to its member agencies on a proportional basis.

The SDCWA discourages direct service from their transmission systems, since it reduces operational flexibility, allows for the possibility of peaking on the system, and can potentially create hydraulic transients. SDCWA has an Operational Surcharge Ordinance for the purpose of maximizing pipeline capacity and reducing potential surge pressures in their pipelines. The intent of the ordinance is to encourage member agencies to withdraw water from SDCWA pipelines at constant rates throughout the day until a revised order is placed with operations personnel. Surcharges may be imposed for delivered flows that vary by more than 10 percent of the daily flows requested at each FCF.

Table 3-1 lists the District's current FCF connections to SDCWA Pipeline No. 4, their rated capacities in cubic feet per second (cfs), and the District systems served. The location of the FCFs is shown schematically in Figure 3-1. The FCFs generally have a turn-down ratio of 10:1, meaning that the minimum non-zero flow through the facility is one-tenth; or 10 percent of the rated capacity.

Table 3-1. SDCWA Pipeline No. 4 FCF District Connections

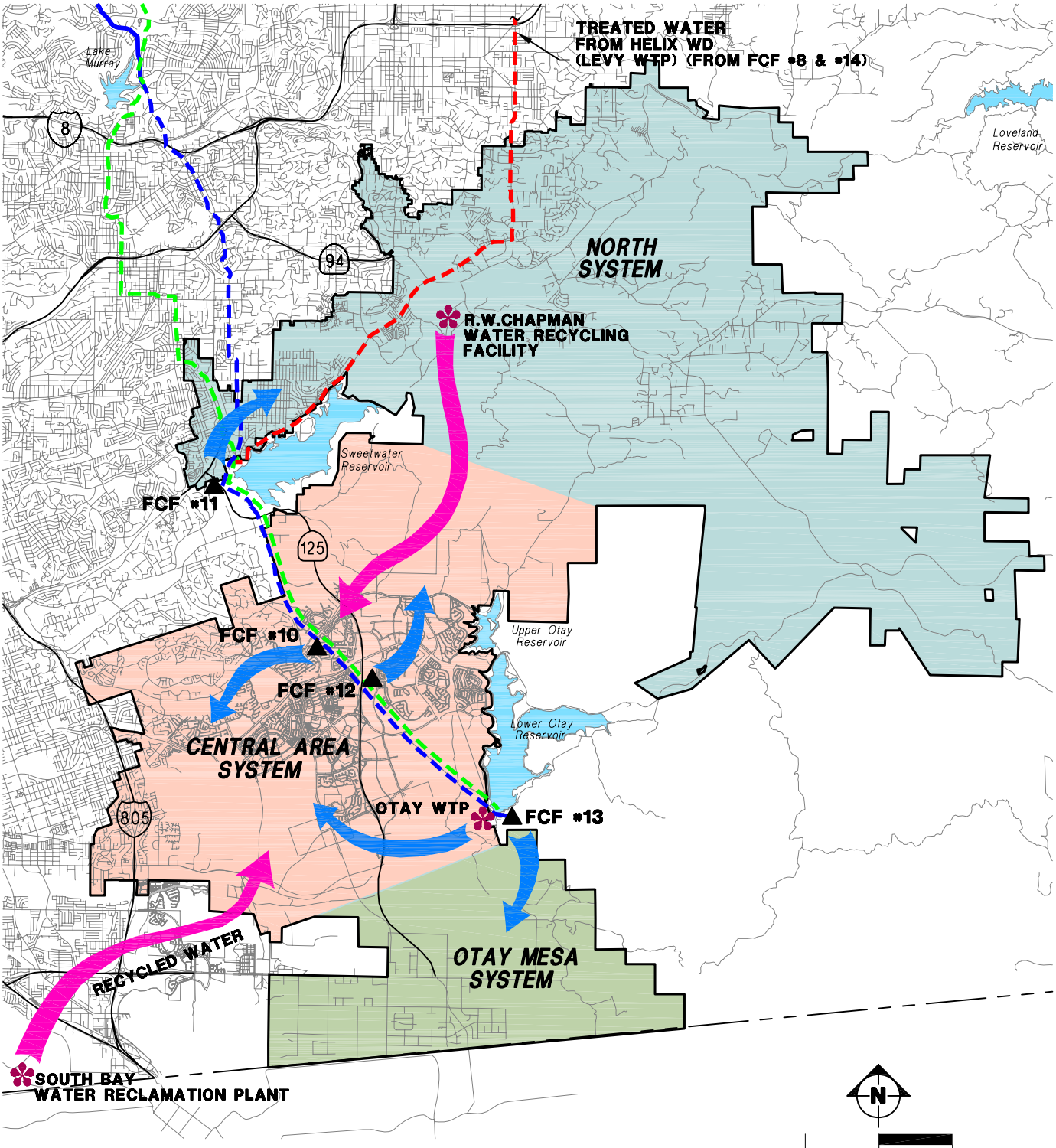
FCF Connection No.	Rated Capacity		Minimum Delivery		Otay Water District Water System(s) Served
	cfs	mgd	cfs	mgd	
10	28.0	18.10	2.8	1.81	Central Area (624-2 Reservoir)
11	60.0	38.78	13.8	8.93	La Presa, Hillsdale, & Regulatory (520 Reservoirs)
12	60.0	38.78	6.0	3.88	Central Area (624-1 & 624-3 Reservoirs)
13	40.0	25.85	4.0	2.59	Otay Mesa (571-1 Reservoir)

The FCFs are further described below:

- **Otay 11 FCF.** This facility is located near the southwest quadrant of SR-125 and Paradise Valley Road, and is the primary supply for the La Presa, Regulatory, and Hillsdale systems. Water is conveyed through 42-inch and 36-inch diameter transmission mains from Otay 11 FCF to the Regulatory Site and placed into storage by gravity at a high water elevation of 520 feet. Otay 11 FCF also currently provides direct supply for a majority of the La Presa System, known as the Aqueduct Pressure Zone, off the hydraulic gradient available from SDCWA Pipeline No. 4.

- **Otay 10 FCF and Otay 12 FCF.** These are the primary sources of supply to the Central Area System. Otay 10 FCF is located in the EastLake area north of Otay Lakes Road near the intersection of Gotham Street and Lehigh Avenue. Water is fed by gravity into the 624-2 Reservoir. Otay 12 FCF is located in the EastLake area south of Otay Lakes Road and feeds the 624-1 and 624-3 reservoirs by gravity.

- **Otay 13 FCF.** This facility is located near the termination of SDCWA Pipeline No. 4 at the Lower Otay Reservoir, and provides supply to the Otay Mesa System. Supply from Otay 13 FCF is conveyed by gravity to the 571-1 Reservoir.



OTAY WATER DISTRICT WATER SUPPLY SOURCES

FIGURE 3-1

H:\Waterres\100OtayWD\OtayWRMP\Report\2008WRMP\graphics\
0491298-MP-OWD Supply.dwg 10/17/08

When SDCWA completed construction and placed Pipeline No. 4 into operation in 1996, the existing parallel Pipeline No. 3 was converted from potable water to a raw water delivery system. Pipeline No. 3 provides an imported raw water supply to the Sweetwater Authority Perdue WTP, Sweetwater Reservoir, City of San Diego Otay WTP, and Lower Otay Reservoir.

3.1.2 Helix Water District

By agreement with the Helix Water District and SDCWA, the District has capacity rights to treated water from the Levy WTP. This water is conveyed to the District's North Area System via the SDCWA's LMSE pipeline. The District's recently negotiated agreement provides for a water supply delivery of 12 mgd on-peak, and 16 mgd off-peak. The Levy WTP has a rated capacity of 106 mgd.

In order to maximize flow from this source, a new 36-inch water transmission main, with a conveyance capacity of 16 mgd, is under design. The design also includes an upgrade at Otay Otay 14 FCF to 16 mgd. Once the new pipeline is operational, the LMSE pipeline and Otay 8 FCF are expected to be abandoned or converted to raw water service by SDCWA. The new 36-inch pipeline should be operational by spring 2010.

Historically, the District has considered its supply of water from the Levy WTP to be an alternative source for use when the SDCWA Pipeline No. 4 is out of service. However, the District now anticipates transitioning its use of the Levy WTP supply to more of a baseload use at delivery rates of up to its 16 mgd off-peak entitlements. The District will reduce its use of the SDCWA Pipeline No. 4 FCF connection (Otay 11 FCF), while maintaining full redundant capacity in these connections.

Table 3-2. Helix LSME FCF District Connects

FCF Connection No.	Rated Capacity		Minimum Delivery		Otay Water District Water System(s) Served
	cfs	mgd	cfs	mgd	
8[(1)]	6.2	4.0	0.6	0.4	La Presa & Regulatory
14[(2)]	24.8	16.0	-	12.0[(3)]	La Presa & Regulatory

(1) Hydraulic limitations allow only 3.4 mgd currently, but connection is rated at 4 mgd. To be abandoned or converted once the new 36-inch pipeline is complete.
(2) Currently Otay 14 FCF is not operational. Facility will resume operations once the new 36-inch main is complete.
(3) The District desires to baseload Otay 14 FCF at a minimum flow of 12 mgd.

3.1.3 City of San Diego

Through a 1999 agreement with the City of San Diego, the District may obtain up to 10 mgd of supply from the City's Otay WTP. The Otay WTP's existing rated capacity is 40 mgd, with an actual effective capacity of approximately 34 mgd. The City of San Diego's typical demand for treated water from the Otay WTP is approximately 20 mgd. Under the terms of the agreement, the City's obligation to supply treated water to the District is contingent upon its surplus treatment capacity, beyond what the City needs for its own area system.

The agreement also provides the District with the option of funding an expansion of the Otay WTP in return for additional capacity rights. Although in the past the City has planned for expansion of the plant to a capacity of 60 mgd, the City currently has no committed plans or budget for expansion of the plant.

The District does not currently have permanent facilities in place to take delivery of water from the Otay WTP; instead a temporary "Lower Otay PS" conveys flows to an Otay Interconnect. The District has completed the design of a permanent Lower Otay PS (LOPS), but has yet to start construction of the facility.

The District considers the supply of water from the Otay WTP to be an alternative source for use in the South District area system when the SDCWA Pipeline No. 4 is out of service. Use of this water in the North District would be dependent on the District completing the construction of the remaining portion of the planned South-to-North interconnection and transmission facilities.

3.1.4 Emergency Supplies

The District has established a goal to sustain a 10-day outage of supply from SDCWA Pipeline No. 4 at any time of the year without a reduction in service level. The District seeks to obtain this level of supply reliability through the development of alternative water supplies, through agreements with neighboring water districts, and through treated water storage.

For emergency events longer than the 10-day aqueduct shutdowns noted previously, the District will utilize emergency supplies developed by SDCWA's Emergency Storage Project (ESP). The ESP is designed to provide treated water service to all SDCWA member agencies during a two-month interruption in service of imported water deliveries into San Diego County. The ESP is sized to deliver up to 75 percent of each agency's peak two-month summer demand. The key facilities of the ESP include the Olivenhain Dam and Conveyance System, the Lake Hodges Interconnect, the San Vicente-Miramar Pipeline, and the expansion of San Vicente Reservoir.

3.2 Future Water Supply Portfolio Options

The District evaluated a comprehensive range of water supply source options as part of its 2007 IRP. The following paragraphs summarize these new supply options, with a focus on how these projects may influence the master planning of the District's potable water facilities.

3.2.1 Overview of 2007 IRP

In developing the 2007 IRP, the District placed great emphasis on the need for flexibility to adapt and react to future water supply opportunities and changes. The IRP proposes a phased implementation of projects from now to 2030 to meet growing future water demands, while making adjustments as necessary to respond to changing technology, supply levels, regulations, market conditions, costs, and partnership opportunities.

The overall implementation strategy developed in the IRP is intended to assist the District in addressing uncertainties surrounding future water supply, by reducing dependence on imported sources. The IRP concludes that implementation of the plan will support the District in attaining

its multiple objectives of achieving reliability, maintaining affordability, increasing flexibility, increasing diversity, and addressing environmental and institutional constraints.

The IRP identified eight supply options, including water conservation, groundwater development, desalination, recycled water, additional imported water alternatives, and regional water banking and transfers. Within these eight source categories, the IRP assessed 27 individual water supply project options in terms of costs and non-monetary factors. Upon screening for feasibility, the IRP reduced the number of options from 27 to 23. These options were integrated into a set of eight alternative water supply strategies, termed portfolios, addressing established District objectives by considering various arrangements and timing. The District then selected from these portfolios to identify an implementation path or roadmap to keep the District on track in accomplishing long-term goals, while strategically making investments only if and when necessary.

The IRP recommended the following short-term and long-range projects for implementation. The short-term actions are intended to serve as a foundation for possible implementation of one or more of the recommended long-range projects.

Short-Term (2008-2010)

- Additional conservation measures
- SD17 agreement with City of San Diego to treat raw water at Alvarado WTP
- Additional purchases from recycled water from the City of San Diego's South Bay Water Reclamation Plant (SBWRP)
- North District Recycled Water Concept
- Water banking agreements

Long-Range (2010-2030)

- Central Valley and Land Fallowing Transfers
- Groundwater projects (Demineralization and Conjunctive Use)
- Ocean Desalination (Poseidon, Sweetwater/SD South Bay, Rosarito, Mexico, or other projects)
- Stripping (Scalping) Plant along the County of San Diego's Spring Valley Trunk Sewer
- North of Delta Transfers

3.2.2 IRP Recommended Projects / Implications to Master Plan

The IRP's recommended short-term and long-range measures are summarized in Tables 3-3 and 3-4, along with the potential implications of each measure to this 2009 WRMP Update. An analysis of water supply projects that impact facilities addressed in the WRMP Update, including CIP recommendations, is addressed in Chapter 6 of this report.

Table 3-3. IRP Short-Term Measures and Implications to 2009 WRMP Update

IRP Measure	Description	Implications to 2009 WRMP Update
Additional Conservation Measures	The District will implement additional water conservation measures targeting all uses, including residential indoor, landscape irrigation, and commercial and industrial uses	• reduces water demands. • may reduce the need for new transmission and storage facilities • may reduce the need for new water supplies.
SD17 Agreement with City of San Diego	The District is negotiating with the City of San Diego to obtain capacity rights in the City's SD17 FCF and pumping facility. The District would be able to receive treated water from the City's Alvarado WTP, delivered via SDCWA Pipeline No. 4.	• increases supply reliability, although the measure still relies on SDCWA Pipeline No. 4 being operational south of the Alvarado WTP • may reduce the need for other water supply reliability measures.
Additional purchases from recycled water from SBWRP	The District currently purchases 6 mgd of recycled water from the City of San Diego's South Bay Water Reclamation Facility, under an agreement with the City. This measure would expand the City's purchase agreement.	• reduces potable demands in the South District Area System • enhances supply reliability in the South District Area System • Provides for potable water off sets.
North District Recycled Water Concept	The District currently delivers recycled water from its Chapman WRF to distant customers in eastern Chula Vista. This project would reroute those deliveries to customers closer to the Chapman facility. The existing customers would be supplied with additional purchases from the City of San Diego's South Bay WRF, per the above measure.	• reduces North District potable water demands by up to 1.1 mgd. • may reduce the need for new transmission and storage facilities • may reduce the need for new water supplies. • Provides for potable water off sets.
Water banking agreements	The District would participate in out-of-county water banking agreements to supplement supplies from SDCWA during dry-year shortage situations.	• enhances dry-year supply reliability • may reduce the need for other water supply reliability measures

Table 3-4. IRP Long-Range Measures and Implications to Master Plan

IRP Measure	Description	Implications to 2009 WRMP Update
Local Groundwater Projects (Demineralization and Conjunctive Use)	The District would lead or participate in one or more groundwater demineralization and/or conjunctive use projects in the Middle or Lower Sweetwater River Basin, the Santee-El Monte Basin, the Tijuana River Basin, or the San Diego Formation,	• increases supply reliability • may reduce the need for other new water supplies.
Seawater Desalination	The District would develop 5,000 AF/yr of supply from seawater desalination as part of a possible Southern California Partnership project at the South Bay Power Plant site, or through participation in other projects, such as Rosarito, Mexico.	• enhances supply reliability, especially in the South District Area System • may reduce the need for other new water supply reliability measures.
Stripping (Scalping) Plant along Spring Valley Trunk Sewer	The District would construct a 5 mgd WRP in the Sweetwater Valley area to treat wastewater obtained from the County's Spring Valley Trunk Sewer. The recycled water produced by the plant would supply additional recycled water uses in the South District.	• reduces South District potable water demands by up to 5 mgd. • may reduce the need for new potable transmission and storage facilities • may reduce the need for other new water supplies. • Provides for potable water off sets.

IRP Measure	Description	Implications to 2009 WRMP Update
Central Valley Transfers	The District would participate in agreements to transfer South of Delta Central Valley water to supplement supplies from SDCWA during dry-year shortage situations.	• enhances dry-year supply reliability • may reduce the need for other new water supply reliability measures
North of Delta Water Transfers	Same as above, but transfers would come from North of the Delta, where supplies may be more available but where the transfer must address the complications of moving water through the Sacramental-San Joaquin Delta	• enhances dry-year supply reliability • may reduce the need for other new water supply reliability measures

3.3 Regional Water Supply Conditions

Good planning is the key to meeting the future water needs of a growing community and the District's mission is to reliably deliver safe water to its growing region. Given the current drought conditions and court-ordered restrictions on imported water, the District has been challenged to develop new ways to reliably deliver water to its customers.

The need to free up potable water supplies has become significantly more important over the past year. In addition to extended drought conditions in the area, court rulings limiting imported water supplies to Southern California have caused concern among local water districts. The August 2007 court ruling in the case of NRDC v. Kempthorne to restrict pumps that supply water from the Sacramento-San Joaquin River Delta to 25 million Californians, including 3 million residents in San Diego County, along with on-going drought conditions in the western United States, has caused and will continue to cause water supply shortages.

The SDCWA is imposing short term drought management actions and implementing a long term planned and measured response to these recent developments. The SDCWA intends to update its Urban Water Management Plan to include these measures. While individual retail water purveyors cannot be expected to be able to substantially alter or influence the Southern California water picture, it is becoming increasingly clear that regional water agencies are not going to be able to assure the long term availability of imported water supplies. Although the regional water agencies involved in importing water to the District are intent, and in fact mandated, to devote their resources and supplies to maintaining a reliable supply to customers within their area systems, it is prudent that the District pursue opportunities to preserve potable water supplies and seek alternative sources of water.

At this time, the District is unable to approve new development projects that require more water than has been planned for in its 2005 Urban Water Management Plan unless significant mitigation measures are approved. To get project approvals, developers are increasingly proactive in seeking ways to conserve water or develop "new water" for their projects. Otay WD is looking into alternatives for "offsetting" increased potable water use with water conservation and recycled water development projects. This is new territory for a region that is experiencing unprecedented water shortages. The District is also pursuing the recommended alternatives in the 2007 IRP in seeking new local water supply.

3.4 Potential Water Supply Offset Projects

In evaluating the availability of sufficient water supply, new development project proponents who anticipate a water demand that exceeds what was planned for that area are required to acquire a water supply source and/or participate in the development of alternative water supply projects to offset the anticipated additional demand. The District has begun planning for a number of local or regional water supply development projects that developers may participate in. These new water supply projects are in response to the regional water supply issues related to the Sacramento-San Joaquin Delta and the current ongoing western states drought conditions. They are in various states of the planning process and are intended to increase water supplies to serve new development project water supply needs. It is anticipated that future Water Management Plans prepared by the District, SDCWA and MWD will capture any increases in water demand associated with adopted changes in land use, as well as any new local water supply resources, and will provide the planning tools necessary to ensure a water supply plan to meet the needs of future planned development. However, until those plans are adopted, it is necessary to address the current regional water supply shortage by offsetting projected increases in water demands with local water supply offset projects. The following water supply offset projects, listed in Table 3-5, below, have been proposed and their current status is described in the paragraphs below. The approximate locations of these projects are shown in Figure 3-2.

Table 3-5. Potential Water Supply Offset Projects

Project Name	Estimated Total Cost	Anticipated Yield (AFY)
Middle Sweetwater River Basin Groundwater Well	$8 to 10 million	1,000
Rosarito Seawater Desalination Facility	No Cost listed(1)	11,200
Otay River Groundwater Desalination Facility	$8 to 10 million	4,500
North District Recycled Water Project	$14 to 15 million	800
Otay Mesa RW System Link	$16.4 million	300 to 1,658 (ultimate)
Potable Water Meter to Recycled Water Conversions	$1 to 2 million	100 to 200
Rancho Del Rey Groundwater Well	$5 to 8 million	300 to 500
Otay Mesa Lot 7 Groundwater Well	$5 to 8 million	300 to 500
City of Chula Vista MBR Reclamation Plant	$47 million	2,240 to 6,720

(1) Cost would include participation in Mexican RW treatment facility, conveyance to Border, then possible full treatment at Border and conveyance into US.

3.4.1 Middle Sweetwater River Basin Groundwater Well Project

The Middle Sweetwater River Basin Groundwater Well is a new additional water supply project had been thoroughly studied and documented in the 1990's. The Middle Sweetwater River Basin is located within the Sweetwater River watershed and is that reach of the river from Sweetwater Reservoir to the upstream Loveland Reservoir. The next step in development of the Middle Sweetwater River Basin Groundwater Well is the implementation of a pilot well project. The ultimate objective of the District is to develop a groundwater well production system

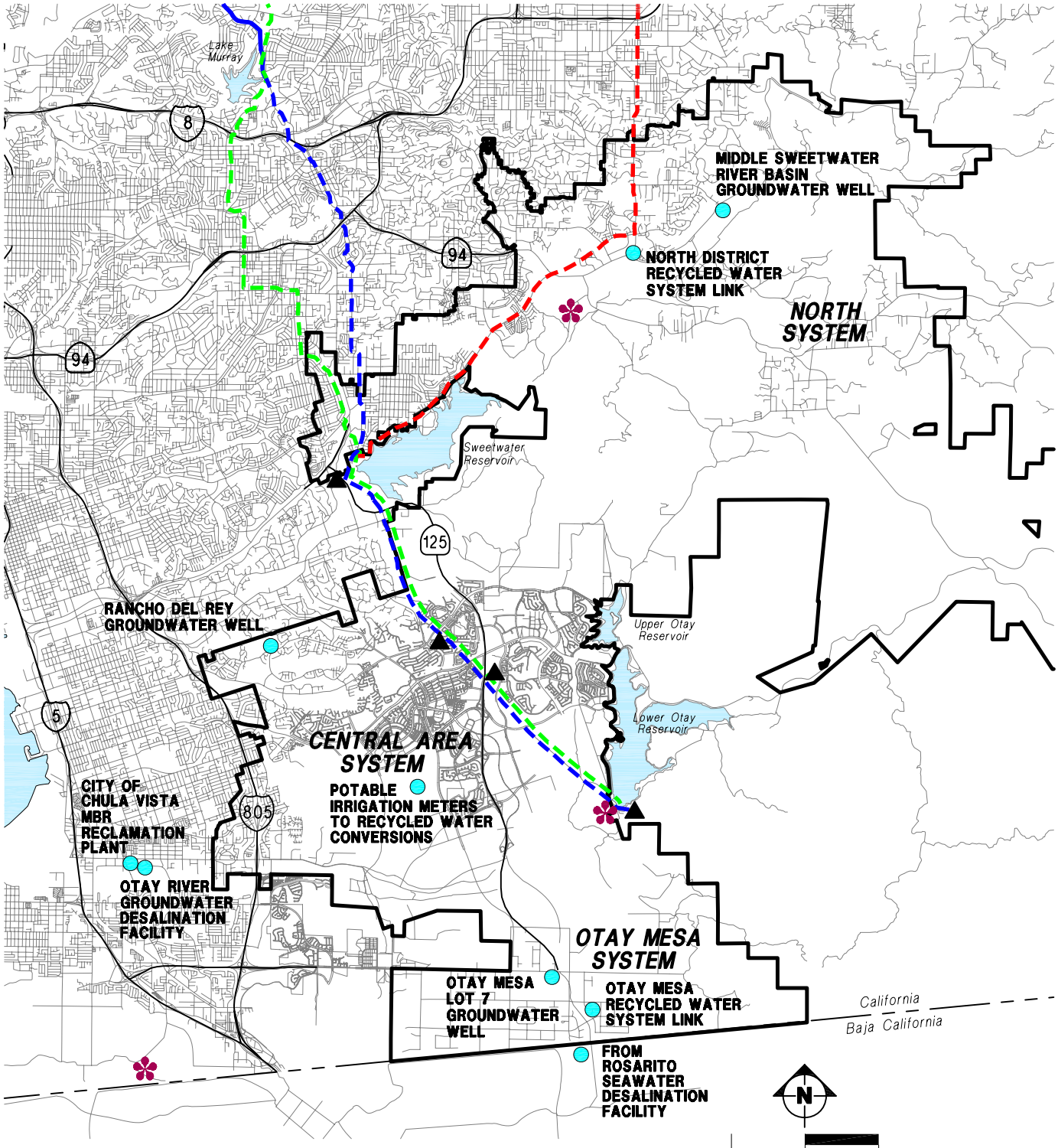
within the Middle Sweetwater River Basin capable of producing a sustainable yield of potable water as a local supply.

The purpose of the Middle Sweetwater River Basin Groundwater Well Pilot project is to identify the feasibility of developing a groundwater resource production system and to determine and assess any limitations or constraints that may arise. The Middle Sweetwater River Basin Groundwater Well Pilot Project will accomplish six primary goals:

- Update project setting
- Update applicable project alternatives analysis
- Prepare groundwater well pilot project implementation plan
- Construct and test pilot monitoring and extraction wells
- Provide recommendations regarding costs and feasibility to develop a groundwater well production system within the Middle Sweetwater River Basin capable of producing a sustainable yield of potable water
- Prepare groundwater well production project implementation plan and scope of work

The groundwater conjunctive use concept planned to be developed is described as the extraction of the quantity of water from the groundwater basin that was placed there by customers of the Otay WD, Helix WD, and Padre Dam MWD by means of their use of imported treated water that contributed to the overall volume of groundwater within the basin. An estimated quantity had developed to be on the order of 12.5 percent of the total consumption of the Otay WD customers within that basin as measured by their water meters. In the 1994/1995 time frame, quantity of water that was placed into the groundwater basin by Otay WD customers was estimated to be 810 AFY. Currently, that 12.5 percent quantity could be on the order of 1,000 AFY. The scope of work addresses this concept while further development of the groundwater basin as an additional supply resource is appropriately considered. It is anticipated that the consultant fee for the entire scope of work, will cost up to $2 million and may take up to two years to complete. If it is deemed that a Middle Sweetwater River Basin Groundwater Well Production Project is viable then the consultant will develop and provide a groundwater well production project implementation plan, cost estimate, and related scope of work. The total cost of a fully functional groundwater well recharge and production facility is roughly estimated to cost $8 to $10 million.

Further development of the groundwater basin to enhance the total groundwater production could be accomplished by the District by means of additional extraction of water from the basin that is placed there by means of either injection and/or spreading basins using imported untreated water as the resource supply. The existing La Mesa Sweetwater Extension Pipeline, owned by SDCWA, once converted to an untreated water delivery system, could be the conveyance system to transport untreated water for groundwater recharge in support of this conjunctive use concept. These two distinct water resource supply conjunctive use concepts will be addressed so they may coexist and to allow for their development as separate phases.



LA MESA SWEETWATER EXTENSION (LMSE)

SDCWA PIPELINE No 3 (RAW)

SDCWA PIPELINE No 4 (FILTERED)

▲ FLOW CONTROL FACILITY (FCF)

✽ TREATMENT FACILITY

○ POTENTIAL PROJECT LOCATION

H:\Waterres\100OtayWD\OtayWRMP\Report\2008WRMP\graphics\0491298-MP-OWD PotableOffset.dwg 08/31/2009

OTAY WATER DISTRICT POTENTIAL POTABLE WATER OFFSET PROJECTS

FIGURE 3-2

3.4.2 Rosarito Seawater Desalination Facility

The District is currently investigating the feasibility of purchasing desalinated water from a seawater reverse osmosis plant that is planned to be located in Rosarito, Mexico, known as the Rosarito Seawater Desalination Facility (Rosarito) project. The treatment facility is intended to be designed, constructed, and operated in Mexico by a third party. The District's draft Binational Ocean Rosarito Desalination Feasibility Study, prepared in 2008, discusses the likely issues to be considered in terms of water treatment and monitoring, potential conveyance options within the United States from the international border to potential delivery points, and environmental, institutional, and permitting considerations for the District to import the Rosarito project product water as a new local water supply resource.

While the treatment facility for the Rosarito project will likely not be designed or operated by the Otay WD as the lead agency, it is important that the District maintain involvement with the planning, design, and construction of the facility to ensure that the implemented processes provide a product water of acceptable quality for distribution and use within the Otay WD's system as well as in other regional agencies' systems that may use the product water, e.g. City of San Diego, SDCWA, etc. A seawater reverse osmosis treatment plant removes constituents of concern from the seawater, producing a water quality that far exceeds established United States and California drinking water regulations for most parameters, however, a two-pass treatment system may be required to meet acceptable concentrations of boron and chlorides, similar to the levels seen within the existing District supply sources. The Binational Ocean Rosarito Desalination Feasibility Study addresses product water quality that is considered acceptable for public health and distribution.

The District, or any other potential participating agencies, will be required to get approval from the CDPH in order to use the desalinated seawater as a water source. Three alternatives approaches are identified for getting this approval: 1) Certification of the Rosarito project in Mexico by CDPH; 2) Disinfection treatment only in the United States, receiving a waiver of specific filtration requirements through CDPH; or 3) Full filtration and disinfection treatment of water entering the United States with waiver of certain typical Watershed Sanitary Survey requirements. These alternatives vary in their cost and their likelihood of meeting CDPH approval.

The Binational Ocean Rosarito Desalination Feasibility Study addresses two supply targets for the desalinated water (i.e. local and regional). The local alternative assumes that only Otay WD would participate and receive desalinated water, while the regional alternative assumes that other regional and/or local agencies would also participate in the project. For the local alternative, the supply target is assumed to be 10 mgd or 11,200 AFY. This is based on the Otay WD 2007 IRP, which identified a 5 to 10 mgd of seawater desalination as part of Otay WD's preferred supply strategy.

The regional alternative assumes a total supply target of 25 mgd or 28,000 AFY based upon the projected maximum available desalinated water supply from the Rosarito project. Of the 25 mgd, Otay WD could receive 10 mgd. The remainder would go to other partnering regional and/or local agencies within the United States. Potential partners include the City of San Diego, SDCWA, Helix WD, Padre Dam Municipal WD, and/or Sweetwater Authority. It is expected

there will be a need for these agencies to develop local water supply options and that supply requirements for these agencies will exceed 15 mgd.

The District is proceeding with negotiations among the parties to establish water supply resource acquisition terms through development of a Principles of Understanding document.

3.4.3 Otay River Groundwater Desalination Facility

Many local entities in San Diego County have studied the San Diego Formation and are interested in its potable water supply potential. These include the Sweetwater Authority, the Water Authority, City of San Diego, Otay WD, and the United Stated Geological Service. The San Diego Formation extends from the California-Mexico border to near Mission Bay in San Diego County, a distance of approximately 16 miles and from the coast to approximately six miles inland.

The geology of the San Diego Formation is complex and at present, only partly understood. The heterogeneity of the aquifer makes it extremely difficult to accurately predict groundwater flow or well performance. Few, if any, investigations have been performed on the San Diego Formation in the Otay River Valley. Most of the knowledge is based in the Sweetwater River Valley and the Tijuana River Valley. Therefore, the Otay River Groundwater Desalination Facility project would produce valuable and useful data to aid in characterizing the San Diego Formation that could ultimately lead to the production of potable water.

The objective of Otay WD and Sweetwater Authority is to plan, and potentially permit, design, and construct an Otay River project within the Lower Otay River Basin capable of producing a sustainable yield of potable water as a local supply. The Lower Otay River Basin is located within the Otay River watershed, below the Lower Otay Reservoir. The San Diego Formation is the principal aquifer in the South San Diego Bay area and underlies the Otay River Basin and other river basins. This project would increase the quantity of local water supply within the South San Diego Bay region by development of a brackish groundwater well and desalination production system to extract, to the maximum extent practical, groundwater from the San Diego Formation.

The Otay River Groundwater Desalination Project is currently being accomplished in two phases. Phase I, which is underway, is envisioned as the planning and feasibility aspects of the project intended to determine the viability of extracting brackish groundwater from the San Diego Formation with the purpose to eventually construct brackish groundwater desalination treatment and transport facilities. Phase II is envisioned as proceeding with a pilot project, environmental compliance, permitting, design, construction, operation, maintenance, and other requirements of the Otay River project production and transport facilities to treat the groundwater and deliver the produced potable water to customers of both Sweetwater Authority and Otay WD. Proceeding with Phase II is dependent upon the outcomes of the Phase I efforts.

In 2006, Sweetwater Authority, in partnership with Otay WD received notification from the California Department of Water Resources (DWR) that Sweetwater Authority had been selected to receive a matching grant for the Otay River Basin Brackish Groundwater Desalination Study. The grant amount from DWR is $242,000. The combined Sweetwater Authority and Otay WD contribution is $357,000, for a total of $599,000 to accomplish the DWR grant study. Through

the Otay River Basin Brackish Groundwater Desalination Study, Sweetwater Authority and Otay WD will determine the feasibility of extracting brackish groundwater from the San Diego Formation. A portion of the work involves the United States Geological Society (USGS) services to construct multi-depth monitoring wells near the Otay River. The monitoring wells have been constructed.

In 2007, Sweetwater Authority, in partnership with Otay WD, was selected to receive a $1.5 million matching grant from the SDCWA Local Investigations and Studies Assistance (LISA) grant funding program for the $3 million USGS Study of the San Diego Formation for Potential In-lieu Conjunctive Use concept. The USGS Study of the San Diego Formation for Potential In-lieu Conjunctive Use effort has two primary objectives:

- Develop an integrated, comprehensive understanding of the geology and hydrology of the San Diego Formation and the overlying alluvial deposits. With this understanding, the sustainable yield of the San Diego Formation can be determined founded upon good science.
- Use this understanding to evaluate use of the alluvial deposits and the San Diego Formation for an in-lieu conjunctive use project for expanded extraction.

The study phase, Phase I, of the project is to collect necessary geologic, groundwater, and water quality data that can be used to determine the safe yield from the aquifer and to develop a solidified plan for completing a project that could potentially yield at least 4,500 AFY of desalinated potable water.

The Otay WD and Sweetwater Authority are diligently pursuing this opportunity with due consideration of the recommendations of the existing reports and plans. This project and resulting water supply is intended to be equally shared between the two agencies. The total cost of a fully functional groundwater well production facility is roughly estimated to range from $8 to 10 million. The Otay River project will allow the partnering each agency to complete a significant step towards developing a new potable water source from brackish groundwater that is currently not used.

3.4.4 North District Recycled Water Concept Project

The District continues the quest to investigate all viable opportunities to expand the successful recycled water program into areas that are not currently served. One of these areas is in the portion of the service area designated as the North District, located within the Middle Sweetwater River Basin watershed upstream of the Sweetwater River. The close proximity of the recycled water markets in the North District to the District's water reclamation facility means that the distribution system to serve this area could be constructed relatively cost effectively. This makes the North District a logical location for the expansion of the recycled water system and market area.

The Phase I study components of the North District Recycled Water Concept encompassed the preparation of six technical memorandums including the project definition, a discussion of the regulatory process, a discussion of the protection of the watershed that would be affected by recycled water use in the North District, identification of stakeholders, public outreach, and an implementation plan.

Implementation of the North District recycled water project would result in a reduction of 800 AFY of demand on the potable water system and maximizing recycled water resources which in turn minimizes treated wastewater discharges to the local ocean outfall. Other opportunities are a possible partnership with Sweetwater Authority to monitor any benefits and impacts of increased recycled water use in the watershed and stakeholder outreach to resolve any water quality concerns and to retain consumer confidence. Two major constraints associated with the North District Recycled Water System Development Project include: 1) water quality objectives for the Middle Sweetwater Basin that will affect the effluent limitations for the recycled water produced at the water reclamation facility and 2) the cost of the infrastructure needed to convey and store recycled water in the North District. These costs are estimated to be in the range of $14 to $15 million dollars.

There are two additional phases proposed for the North District Recycled Water System Development Project. Phase II would include further investigation of the issues identified in Phase I as requiring further study. These include stakeholder outreach, regulatory issues, and facility planning. The third phase of the effort would include the facility planning, permitting, environmental compliance, design, and construction of the improvements necessary for delivery of recycled water to the North District markets.

3.4.5 Otay Mesa Recycled Water System Link

This project is intended to plan, design, and construct the conveyance, distribution, and storage facilities to link the District's two recycled water supply sources to the existing and future customers on Otay Mesa. The total cost to link the systems and connect the distribution system within Otay Mesa is estimated at $16.4 million. Projected ultimate annual average demand for recycled water on Otay Mesa is 1,658 AFY and the existing demand (i.e. 2008) for recycled water is about 300 AFY. The 300 AFY is currently being supplied with imported treated water.

3.4.6 Potable Irrigation Meters to Recycled Water Conversions

The existing multi-family, commercial, and industrial development customer accounts are good candidates to separate outside landscape irrigation uses from their indoor uses. A project has been developed to proceed with implementation of the concept. The irrigation system retrofits will require Board approval of a capital improvement program project budget, customer outreach, research of existing onsite irrigation system configuration, irrigation system supply redesign, CDPH approval, service lateral and meter installation, inspection, testing, and customer billing account modification.

The District's existing Code of Ordinances requires outside or landscape irrigation systems for multi-family, commercial, and industrial development projects to have a separate service and water meter under specific conditions, as noted below:

1. Commercial Parcels - 5,000 square feet or Larger Irrigated Landscape - When a customer requests water service on a parcel of land with irrigated landscape equal to 5,000 square feet or more, a separate meter will be required for irrigation purposes on the site.

2. Reclaimed Water Service Areas - In areas designated as reclaimed water service areas, the customer shall be required to install a separate reclaimed water service lateral and meter to supply irrigation to the parcel.

The District is continuing to pursue the potable water to recycled water conversion opportunity to save 100 to 200 AFY. The total cost is roughly estimated to range from $1 to $2 million.

3.4.7 Rancho del Rey Groundwater Well

In 1991, the McMillin Development Company drilled the Rancho del Rey Groundwater Well to augment grading water supplies for their Rancho del Rey development projects. Although the well was considered a "good producer," little was known regarding its water quality and sustainable yield because the water was used solely for earthwork (i.e. dust control and soil compaction). The well was drilled to 865 feet, with a finished depth of 830 feet and produced approximately 400 AFY of low quality water for four years until its use was discontinued in April 1995 when the well was no longer needed. McMillin notified the Otay WD of its intent to sell off the groundwater well asset.

To determine if purchasing this asset would be beneficial to the District, they retained Quality Assurance Laboratories to conduct water quality testing in February 1995. It was established that the water from the well had a high total dissolved solids levels that exceeded 2,000 milligrams per liter. The Otay WD also retained engineering and well drilling firms to perform pump draw down tests, which established the well's long term yield to be about 629 AFY. A feasibility study was then prepared to compare alternatives for treating and using the groundwater and to provide a benefit/cost analysis. The September 1996 "Groundwater Treatment Feasibility Study Ranch del Ray Well Site," report concluded that a Rancho del Rey Groundwater Well project could be feasible. It was established that both capital and operation and maintenance costs would require the well to produce at least 700 AFY for a minimum of ten years to make the project economically viable. In October 1997 the Otay WD purchased the property and well.

In May 1997 the Otay WD submitted to CDPH an Application for an Amended Operating Permit to add the Rancho del Rey Groundwater Well as a source water supply. The CDPH established that it would not issue an amended permit for the operation of the Rancho del Rey Groundwater Well and any related treatment facilities until the system design and specifications were reviewed and approved and the facilities passed field inspection following construction. In April 1998 the Otay WD received four proposals from consultants interested in designing the project. These proposals came in at almost double the estimated cost and in March 2000 the Otay WD decided to suspend further work on the developing the Rancho del Rey Groundwater Well until the project becomes economically viable or other circumstance would make it desirable to pursue development of the well.

The District is continuing to pursue the Rancho del Rey groundwater well opportunity with due consideration of the recommendations of the existing reports and plans to develop a groundwater well production facility to extract perhaps between 300 to 500 AFY. The total cost of a fully functional groundwater well production facility is roughly estimated to range from $5 to 8 million. In 2008 the Otay WD decided to reestablish the pursuit of the Rancho del Rey Groundwater Well project based upon the current water supply and water pricing conditions.

3.4.8 Otay Mesa Lot 7 Groundwater Well

In early 2001 Otay WD was approached by a landowner representative about possible interest in purchasing an existing well or alternatively, acquiring groundwater supplied from the well located on Otay Mesa. The then landowner, National Enterprises, Inc., reportedly stated that the well could produce 3,200 AFY with little or no treatment required prior to introducing the water into the Otay WD potable water system or alternatively, the recycled water system. In March 2001 authorization to proceed with testing of the Otay Mesa Lot 7 Groundwater Well was obtained and the District proceeded with the investigation of this potential groundwater supply opportunity.

The May 2001 an investigation was conducted to assess the Otay Mesa Lot 7 Well. The scope of work included a geohydrologic evaluation of the well, analyses of the water quality samples, management and review of the well video log, and documentation of well pump testing. The primary findings, as documented in the "Otay Mesa Lot 7 Well Investigation" report, formed the basis of the following recommendations:

- For the existing well to be use as a potable water supply resource, a sanitary seal must be installed in accordance with the CDPH guidelines.
- Drawdown in the well must be limited to avoid the possibility of collapsing the casing.
- Recovery from pumping drawdown is slow and extraction would need to be terminated for up to 2 days to allow for groundwater level recovery.
- The well water would need to be treated and/or blended with potable water prior to introduction into the potable water distribution system.

The existing Otay Mesa Lot 7 Well, based upon the above findings, was determined not to be a reliable municipal supply of potable water and that better water quality and quantity perhaps could be discovered deeper or at an alternative location within the San Diego Formation.

The District is continuing to pursue the Otay Mesa groundwater well opportunity with due consideration of the recommendations of the existing report and plans to develop a groundwater well production facility to extract perhaps between 300 to 500 AFY. The total cost of a fully functional groundwater well production facility is roughly estimated to range from $5 to 8 million.

3.4.9 City of Chula Vista MBR Reclamation Plant

The City of Chula Vista Membrane Bio Reactor (MBR) Reclamation Plant proposal is driven by the City's need for sewer disposal capacity for planned growth. The MBR Plant is conceived as being constructed in three phases. Initial capacity is planned as 2 mgd (2,240 AFY) with an expansion to 4 mgd (4,480 AFY) and then an expansion to 6 mgd (6,720 AFY) as the City of Chula Vista needs sewer disposal capacity. The District would purchase the produced recycled water from the City of Chula Vista, which would offset potable water uses within the District. Total cost is estimated at $47 million. The MBR Plant may or may not be implemented by the City of Chula Vista as they may acquire sewer disposal capacity by other means such as purchasing capacity in the City of San Diego Metro System. The District does not plan to construct the MBR Plant if the City of Chula Vista chooses not to and/or acquires alternative sewer disposal capacity.

This page intentionally left blank.

Chapter 4
Potable Water System Evaluation

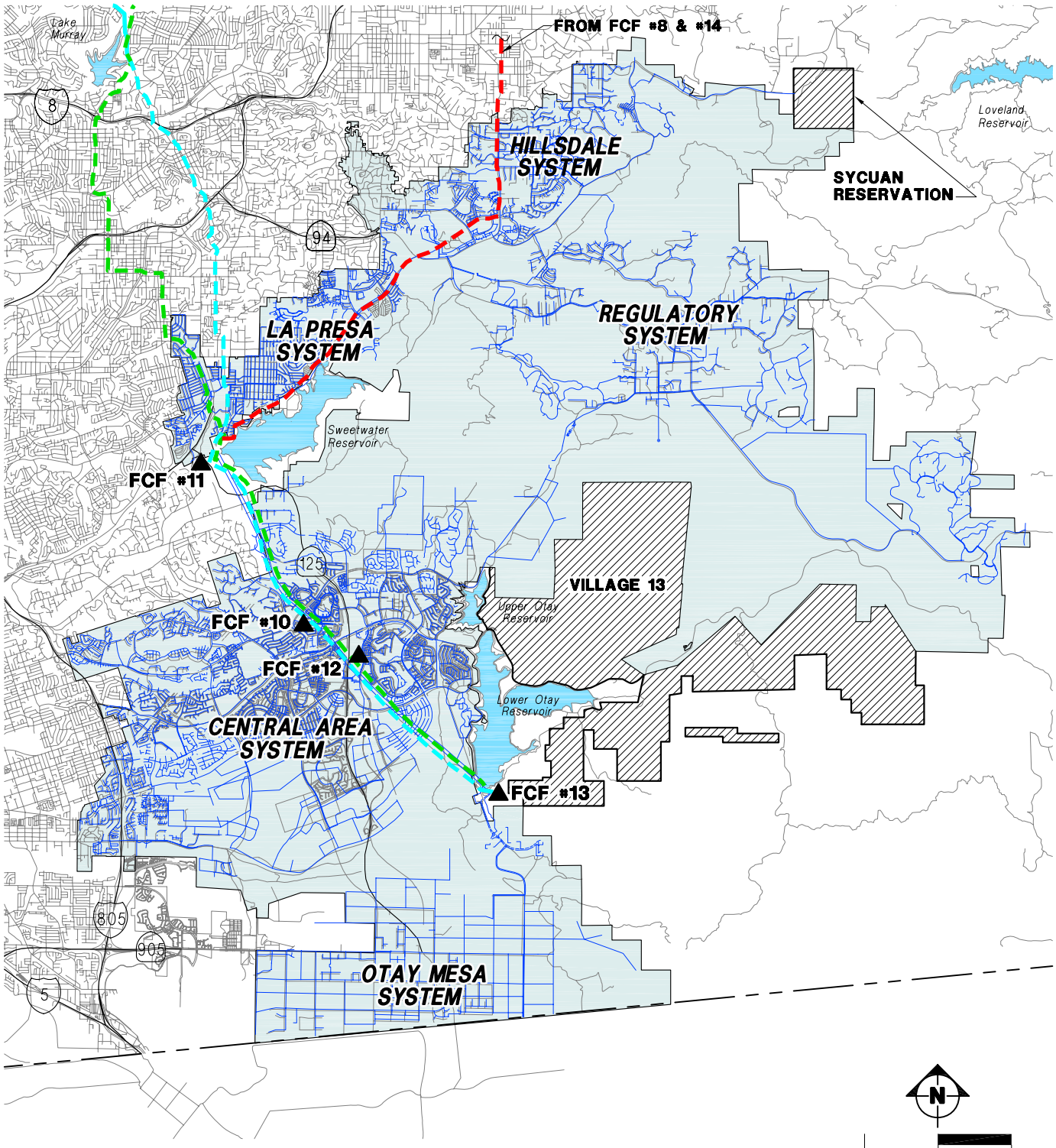
This chapter provides a description of the District's existing water distribution system, major improvements since the 2002 WRMP and the planning criteria used to evaluate the existing and future potable water system. In addition, this chapter updates existing water demand by service area and pressure zone and develops a water demand forecast based on the land use projections provided in Chapter 2. A new InfoWater hydraulic model of the District's system has been developed to evaluate the performance of the existing distribution system and to analyze infrastructure required to serve future demands. A summary of recommended improvements is provided at the end of this chapter.

4.1 Existing Water System Description

The District's potable water infrastructure consists of five primary operating systems, defined by geographic location as shown in Figure 4-1. These systems are known as La Presa, Hillsdale, Regulatory, Central Area and Otay Mesa. The La Presa, Hillsdale and Regulatory Systems are located in the North District. The Central Area and Otay Mesa Systems are located in the South District. The North, Central and Otay Mesa systems are geographically separated and operationally distinct. As discussed in Chapter 3, each system receives imported water from one or more flow control facilities (FCFs) on the SDCWA Aqueduct. Each system has its own storage and pumping facilities and its own demands to serve. The existing reservoirs, pump stations and piping networks are shown on Exhibits I through V for the La Presa, Hillsdale, Regulatory, Central Area, and Otay Mesa systems, respectively. A hydraulic schematic showing how these systems are inter-related is provided in Exhibit VI.

There are multiple pressure zones within four of the five systems, the exception being the Otay Mesa System. The established primary pressure zones are named based on the high water level elevation of the reservoir(s) that provides operational storage for the zone or the setting of the pressure reducing station(s) (PRS) serving that area. Each reservoir is identified by its high water level (HWL) followed by a number representing the sequence of reservoir construction. Secondary pressure zones do not have operational storage reservoirs within the zone and are named based on the upstream and downstream hydraulic grade elevation established by the PRS that serves the zone. A specifically named hydropneumatic pump station can also serve a secondary pressure zone. A pump station is identified by the pressure zone it lifts water to, followed by a number representing the sequence of pump station construction.

A description of the existing facilities in each of the five systems is provided in the following paragraphs, including the major water facility improvements that have been completed since the 2002 WRMP.



EXISTING POTABLE WATER SYSTEMS

FIGURE 4-1

H:\Waterres\100OtayWD\OtayWRMP\Report\2008WRMP\graphics\
0491298-MP-PotableWaterSystems.dwg 11/7/08

4.1.1 La Presa System

As shown on Exhibit I, the La Presa System serves the northwestern part of the District's North District near Sweetwater Reservoir. Since the 2002 WRMP, major system changes within the La Presa System include: a new water system to serve the Pointe Development, abandonment of Dorchester Hydropneumatic PS and the demolition of the 451-1 Reservoir. The La Presa System also directly benefits from the SDCWA and Helix Water District expanded water supply agreement, as discussed in Chapter 3.

Under current operating conditions water supplies for the La Presa System are obtained from Otay 11 FCF on SDCWA Pipeline No. 4. This water supply is conveyed by gravity from Otay 11 FCF through 42-inch and 36-inch transmission mains to two 520-foot elevation HWL storage reservoirs (Regulatory Reservoirs) in the Regulatory System. The hydraulic grade line (HGL) provided by Otay 11 FCF is established based on the flow rate and is sufficient to serve the vast majority of the La Presa System customers directly.

An alternative supply from the Helix Water District R.M. Levy Water Treatment Plant (Levy WTP), delivered via the La Mesa/Sweetwater Extension (LMSE), is obtained through the SDCWA Otay 8 FCF. This alternative supply source is available to each of the three systems in the North District, but the water is stored in the Regulatory System 520 Reservoirs. The effective capacity of the LMSE is hydraulically limited to 3.4 mgd. In 2007, the District took an average of 1.7 mgd from this source.

In 2007, the District executed an agreement with SDCWA and Helix Water District to significantly increase its supply from the Levy WTP to take advantage of available WTP capacity and increase reliability. Under this agreement, the District is obligated to take 10,000 acre-feet per year (AFY) from the Levy WTP (up to 12 mgd during peak demand periods, 16 mgd off-peak) beginning in March 2010. In order to maximize flow from the source, a new 36-inch water transmission main with a conveyance capacity of 16 mgd is planned to be constructed. In addition, Otay 14 FCF will be upgraded to accommodate the 16 mgd capacity required to convey water from the Levy WTP to the new pipeline for delivery to the District. Once the new 36-inch pipeline and Otay 14 FCF are operational, the existing LMSE pipeline and Otay 8 FCF are expected to be abandoned or converted to a non-potable service by SDCWA. The new 36-inch pipeline project is currently under design and is anticipated to be in service by spring 2010. As a result of this improvement the District will significantly improve reliable supply to the North District. The evaluation of the District's facilities in this 2009 WRMP Update incorporates this new supply agreement.

Pressure Zones

Within the La Presa System there are currently four primary pressure zones and several small secondary pressure zones. Two zones are served by pressure reducing stations and one is served by a hydropneumatic pump station.

- The Dorchester Hydropneumatic PZ, previously supplied by the 451-1 Reservoir, forebay and discharged at a hydraulic grade line (HGL) of approximately 850, has been abandoned and that service area is now served by the Aqueduct PZ at a grade of

approximately 550 feet. Once the new 36-inch pipeline and upgrade to Otay 14 FCF are complete, this area will be served by the new 640 PZ.

- A small 493 PZ is served via a PRS from the 657 PZ.
- The Aqueduct (657) PZ is currently served directly from the downstream gradient of Otay 11 FCF. There is no storage for this part of the system. Ultimately this part of the system will be served by the 640 PZ.
- A large portion of the La Presa System is currently supplied directly from the downstream gradient of Otay 11 FCF defined as the 657 PZ. The 657 PZ can also be supplied by pumping from a forebay fed via a pressure reducing station from the 36-inch transmission main supplied by Otay 11 FCF to the two 657 storage reservoirs.
- The 850 PZ is supplied by pumping from the 36-inch transmission main supplied by Otay 11 FCF at the La Presa PS and by pumping from the Regulatory Reservoirs via the 850-2 PS.
- The 1004 PZ is supplied by pumping from the Aqueduct PZ. The Aqueduct PZ supplies water via four pressure reducing stations to the 657/493 PZ. The 1004 PZ supplies water via a pressure reducing station to the 1004/850 PZ.
- The new Pointe Hydropneumatic Pump Station has a discharge HGL of approximately 1050 and takes suction from the 850-1 Reservoir.

A summary of existing pressure zones within the La Presa System is provided in Table 4-1.

Table 4-1. Existing La Presa System Pressure Zones[1]

Pressure Zone	Service Elevation (ft)[2]		Source	Storage Reservoir(s)
	Minimum	Maximum		
Aqueduct	195	507	Otay 11 FCF, 850/657 PRS	n/a
657	195	507	SDCWA Otay 11 FCF, 850/657 PRS	657-1, 657-2
850	388	700	850-1 PS, 850-2 PS, 1004/850 PRS	850-2, 850-3
1004	542	854	1004-1 Pump Station	1004-2
The Pointe (1050)	588	900	The Pointe Hydro Pump Station[3]	n/a
1200 Hydro	738	1,050	1200 Hydro Pump Station	n/a

(1) Facilities as of September 2007.
(2) Maximum elevation based on 65 psi static pressure. Minimum elevation based on 200 psi static pressure.
(3) Service elevations established by the hydropneumatic system pressure settings.

Pump Stations

There are five pump stations serving the La Presa System. The facility known as the La Presa Pump Station (PS) houses two pump stations: the 850-1 PS and the 657-1 PS.

- The 850-1 PS normally takes suction from the 36-inch transmission main supplied from Otay 11 FCF and discharges to the 850-1 and 850-2 Reservoirs, which serve the 850 PZ. When Otay 11 FCF is out of service, the forebay located at the La Presa PS is used to supply the suction side of the 850-1 PS. A booster pump is used to increase the suction pressure to what normally is provided by Otay 11 FCF.

- The 657-1 PS is used to supply the 657-1 and 657-2 Reservoirs and is used when SDCWA Pipeline No. 4 at Otay 11 FCF is out of service. The forebay provides supply to the 657-1 PS without the need for additional suction pressure. The 657-1 and 657-2 Reservoirs can also be supplied from the 36-inch transmission main by manually opening a normally closed valve connected between the Aqueduct PZ and the 657 PZ systems. When Otay 11 FCF is out of service, the 657-1 and 850-1 PSs can be supplied via the 36-inch transmission main by back feeding the forebay from the 520 Regulatory Reservoirs and/or directly filling the forebay via the LMSE.

- The 850-2 PS takes suction from the 520 Regulatory Reservoirs and discharges to the 850-1, 850-2, and 850-3 Reservoirs. Once the 36-inch Pipeline is complete, the 850-2 PS will take suction from the 640 reservoirs, thus improving operational efficiency at the station.

- The Pointe Hydropneumatic PS takes suction from the 850-1 Reservoir and serves the Pointe PZ at an approximate HGL of 1050.

- The 1004-1 PS takes suction from the Aqueduct PZ and discharges into the 1004-2 Reservoir, which serves the 1004 PZ.

The La Presa System Pump Station data is summarized in Table 4-2.

Storage Reservoirs

The 657-1 and 657-2 Reservoirs provide operational storage and supply water by gravity to serve the 657 PZ. The Aqueduct PZ water system floats on the downstream gradient provided by Otay 11 FCF. The 850-1, 850-2, and 850-3 Reservoirs provide operational storage and supply water by gravity to the 850 PZ. The 1004-2 Reservoir provides operational storage and supplies water by gravity to serve the 1004 PZ. A summary of existing La Presa System storage facilities and their capacities is provided in Table 4-3.

Table 4-2. Existing La Presa System Pump Stations[1]

La Presa System Pump Station	Pump Unit No.	Pumping Unit Rated Capacity		Pump Station Capacity			
				Total Capacity		Firm Capacity	
		gpm	mgd	gpm	mgd	gpm	mgd
657-1[2]	1	600	0.86	1,450	2.09	600	0.86
	2	850	1.22				
850-1[2]	1	800	1.15	3,200	4.61	2,400	3.46
	2	800	1.15				
	3	800	1.15				
	4	800	1.15				
	5[3]	3,200	4.61				
850-2 (Copps Lane Pump Station)	1	2,000	2.88	8,000	11.52	6,000	8.64
	2	2,000	2.88				
	3	2,000	2.88				
	4	2,000	2.88				
	5[5]	--	--				
1004-2	1	500	0.72	1,500	2.16	1,000	1.44
	2	500	0.72				
	3	500	0.72				
The Pointe Hydro (1050)	1	240	0.35	480	0.69	240	0.35
	2	240	0.35				
	3[4]	1,500	2.16				

(1) Facilities as of September 2007.
(2) The La Presa Pump Station is planned to be demolished.
(3) The fifth pump is a booster pump that provides suction pressure during an Otay 11 FCF outage.
(4) Pump provided for fire service only.
(5) Space provided for additional pump.

Table 4-3. Existing La Presa System Storage Reservoirs[1]

Reservoir ID	Capacity (mg)	Overflow Elevation (ft)
657 Pressure Zone		
657-1	1.00	657
657-2	0.84	657
Total	**1.84**	
850 Pressure Zone		
850-1	1.12	851
850-2	3.10	850
850-3	3.10	851
850-4[2]	2.20	851
Total[3]	**7.32**	
1004 Pressure Zone		
1004-2 (Dictionary Hill)	1.40	1004
Total	**1.40**	
Total La Presa System[3]	**10.56**	

(1) Facilities as of September 2007.
(2) The 850-4 Reservoir is currently under construction.
(3) The total storage does not include the 850-4 Reservoir.

4.1.2 Hillsdale System

As shown on Exhibit II, the Hillsdale System serves the northernmost part of the District's North District. Since the 2002 WRMP, the Hillsdale System has seen minor growth, and the construction of a new 5.76 mg Reservoir (803-4) to replace the old 803-1 Reservoir. Under current operating conditions, water supply for the Hillsdale System is obtained from Otay 11 FCF on SDCWA Pipeline No. 4. The water supply is conveyed by gravity from Otay 11 FCF through a 42-inch and 36-inch transmission main to three Regulatory Reservoirs and pumped to the Hillsdale System via the 803-1 PS. As noted earlier, by spring 2010 the majority of supply to the North District will come from the Levy WTP through the 36-inch Pipeline. In addition, new Regulatory Reservoirs will be constructed at a higher water level (640 feet), which will enhance pump station operations and efficiency.

Pressure Zones

There are currently three primary pressure zones and one relatively small secondary pressure zone served by a hydropneumatic pump station within the Hillsdale System. The 803, 978, and 1200 PZs are supplied by pumping from the 520, 803, and 978 PZs, respectively. The Cottonwood Hydropneumatic PZ is supplied by the 803 PZ distribution system and discharges at an approximate HGL of 860 feet. A summary of existing pressure zones within the Hillsdale System is provided in Table 4-4.

Table 4-4. Existing Hillsdale System Pressure Zones[1]

Pressure Zone	Service Elevation (ft)[2]		Source	Storage Reservoir(s)
	Minimum	Maximum		
803	341	653	803-1 Pump Station	803-2, 803-3, 803-4
978	516	828	978-1 Pump Station	978-1, 978-2
1200	738	1,050	1200-1 Pump Station	1200-1
Cottonwood (860)	398	710	Cottonwood Hydro Pump Station[3]	n/a

(1) Facilities as of September 2007.
(2) Maximum elevation based on 65 psi static pressure. Minimum elevation based on 200 psi static pressure.
(3) Service elevations established by the hydropneumatic system pressure settings.

Pump Stations

There are four pump stations serving the Hillsdale System.

- The 803-1 PS (Hillsdale PS) currently takes suction from the adjacent 520-2, and/or 520-3 Reservoirs within the Regulatory System and discharges to the reservoirs in the 803 PZ. Once the 36-inch Pipeline is complete, the 803-1 PS will take suction from the 640 reservoirs, thus improving operational efficiency at the station.

- The Cottonwood Hydropneumatic PS takes suction from the 803 PZ distribution system and discharges at an approximate HGL of 860 feet.

- The 978-1 PS takes suction from the adjacent 803-1 Reservoir and discharges to the 978-1 and 978-2 Reservoirs, which serve the 978 PZ.

- The 1200-1 PS takes suction from the adjacent 978-1 Reservoir and discharges to the 1200-1 Reservoir that serves the 1200 PZ.

The Hillsdale System Pump Station data are summarized in Table 4-5.

Table 4-5. Existing Hillsdale System Pump Stations[(1)]

Hillsdale System Pump Station	Pump Unit No.	Pumping Unit Rated Capacity		Pump Station Capacity			
				Total Capacity		Firm Capacity	
		gpm	mgd	gpm	mgd	gpm	mgd
803-1	1	2,600	3.74	13,000	18.72	10,400	14.98
	2	2,600	3.74				
	3	2,600	3.74				
	4	2,600	3.74				
	5	2,600	3.74				
	6[(2)]	--	--				
978-1	1	850	1.22	3,100	4.46	2,250	3.24
	2	850	1.22				
	3	700	1.01				
	4	700	1.01				
1200-1	1	500	0.72	1,500	2.16	1,000	1.44
	2	500	0.72				
	3	500	0.72				
Cottonwood Hydro (860)	1	100	0.14	200	0.29	100	0.14
	2	100	0.14				

(1) Facilities as of September 2007.
(2) Space is available to add a sixth pump in the future.

Storage Reservoirs

Three reservoirs provide operational storage and supply water by gravity to the 803 PZ (803-2, 803-3 and 803-4). In 2007, the District demolished the former 803-1 Reservoir and constructed the new 803-4 Reservoir on the same site. The 978-1 and 978-2 Reservoirs provide operational storage and supply water by gravity to the 978 PZ. The 1200-1 Reservoir provides operational storage and supplies water by gravity to the 1200 PZ. A summary of existing Hillsdale System storage facilities and their capacities is provided in Table 4-6.

Table 4-6. Existing Hillsdale System Storage Reservoirs[(1)]

Reservoir ID	Capacity (mg)	Overflow Elevation (ft)
803 Pressure Zone		
803-2	2.00	803
803-3 (Singing Hills Reservoir)	2.15	804
803-4 (Vista Grande Reservoir)	5.76	803
Total	**9.91**	
978 Pressure Zone		
978-1	0.53	978
978-2 (Filiponi Reservoir)	2.50	978
Total	**3.03**	
1200 Pressure Zone		
1200-1 (Grant Reservoir)	1.00	1200
Total	**1.00**	
Total Hillsdale System	**13.94**	

(1) Facilities as of September 2007.

4.1.3 Regulatory System

As shown on Exhibit III, the Regulatory System serves the sparsely developed eastern portion of the District's North District. Under current operating conditions water supply for the Regulatory System is obtained from SDCWA Otay 11 FCF on SDCWA Pipeline No. 4. The water supply is conveyed by gravity from Otay 11 FCF through a 42-inch and 36-inch transmission main to the Regulatory Reservoirs.

The Regulatory System has seen minimal change since the 2002 WRMP as water demands have not significantly increased. No major system improvements have been required in the past few years.

Pressure Zones

There are currently six primary pressure zones and two relatively small secondary pressure zones served by hydropneumatic pump stations within the Regulatory System. The primary pressure zones are conceptually stair-stepped to serve a wide range of ground elevations that generally increase from west to east. The higher elevation pressure zones receive water by progressively pumping water through a series of lower elevation pressure zones.

The 520 PZ is supplied by gravity from the 520-2, and 520-3 Reservoirs. The 832, 944, 1090, 1296, and 1485 PZs are supplied by pumping from the 520, 832, 832, 944, and 1296 PZs, respectively. The 1530 Vista Diego and 1655 Rancho Jamul Hydropneumatic PZs are supplied by the 1296 PZ transmission system. A summary of existing Regulatory System pressure zones is provided in Table 4-7.

Table 4-7. Existing Regulatory System Pressure Zones[1]

Pressure Zone	Service Elevation (ft)[2]		Source	Storage Reservoir(s)
	Minimum	Maximum		
832	370	682	832-1 Pump Station	832-1, 832-2
944	482	794	944-1 Pump Station	944-1, 944-2
1090	628	940	1090-1 Pump Station	1090-1
1296	834	1,146	1296-1 Pump Station	1296-1, 1296-2
Vista Diego (1530)	1,068	1,380	Vista Diego Hydro Pump Station[3]	n/a
Rancho Jamul (1655)	1,193	1,505	Rancho Jamul Hydro Pump Station[3]	n/a
1485	1,023	1,335	1485-1 Pump Station	1485-1, 1485-2

(1) Facilities as of September 2007.
(2) Maximum elevation based on 65 psi static pressure. Minimum elevation based on 200 psi static pressure.
(3) Service elevations established by the hydropneumatic system pressure settings.

Pump Stations

There are six pump stations serving the Regulatory System. The 520 PZ is supplied by gravity from two reservoirs and therefore requires no pump stations.

- The 832-1 PS takes suction from a 520 PZ transmission main supplied by the 520 Reservoirs and discharges to the 832-1 and 832-2 Reservoirs, which serve the 832 PZ.
- The 944-1 PS takes suction from an 832 PZ transmission main and discharges to the 944-1 and 944-2 Reservoirs, which serve the 944 PZ.
- The 1090-1 PS suction from an 832 PZ transmission main and discharges to the 1090-1 Reservoir that serves the 1090 PZ.
- The 1296-1 PS takes suction from the adjacent 944-1and 944-2 Reservoirs and discharges to the 1296-1 and the 1296-2 Reservoirs, which serve the 1296 PZ.
- The 1530 Vista Diego and 1655 Rancho Jamul Hydropneumatic PSs take suction from the 1296 PZ transmission system.
- The 1485-1 PS takes suction from a 1296 PZ transmission main and discharges to the 1485-1 and 1485-2 Reservoirs, which serves the 1485 PZ.

The Regulatory System Pump Station data are summarized in Table 4-8.

Table 4-8. Existing Regulatory System Pump Stations[1]

Regulatory System Pump Station	Pump Unit No.	Pumping Unit Rated Capacity		Pump Station Capacity			
				Total Capacity		Firm Capacity	
		gpm	mgd	gpm	mgd	gpm	mgd
832-1	1	2,600	3.74	7,800	11.23	5,200	7.49
	2	2,600	3.74				
	3[2]	--	--				
	4[2]	--	--				
	5[2]	--	--				
	6	2,600	3.74				
1090-1	1	280	0.40	560	0.81	280	0.40
	2	280	0.40				
944-1	1	770	1.11	5,540	7.98	3,540	5.10
	2	770	1.11				
	3	2,000	2.88				
	4	2,000	2.88				
1485-1	1	430	0.62	1,290	1.86	860	1.24
	2	430	0.62				
	3	430	0.62				
Rancho Jamul Hydro	1	350	0.50	970	1.40	620	0.89
	2	350	0.50				
	3	230	0.33				
	4	40	0.06				
Vista Diego Hydro	1	260	0.37	520	0.75	260	0.37
	2	260	0.37				
	3[3]	1,100	1.58				

(1) Facilities as of September 2007.
(2) Space provided for future additional pump.
(3) Pump provided for fire service only.

Storage Reservoirs

The 520-2 and 520-3 Reservoirs primarily provide emergency storage for the entire North District (Hillsdale, Regulatory, and La Presa Systems). These reservoirs also provide operational storage and supply water by gravity to the 520 PZ.

The 832-1 and 832-2 Reservoirs provide operational storage and supply water by gravity to the 832 PZ. The 944-1 and 944-2 Reservoirs provide operational storage and supply water by gravity to the 944 PZ. The 1296-1 and 1296-2 Reservoirs provide operational storage and supply water by gravity to the 1296 PZ. The 1485-1 Reservoir provides operational storage and supply water by gravity to the 1485 PZ. A summary of existing Regulatory System storage facilities and their capacities is provided in Table 4-9.

Table 4-9. Existing Regulatory System Storage Reservoirs[1]

Reservoir ID	Capacity (mg)	Overflow Elevation (ft)
520 Pressure Zone		
520-2 (Regulatory Reservoir)	5.10	520
520-3 (Regulatory Reservoir)	20.00	520
Total	**25.10**	
832 Pressure Zone		
832-1[2]	0.87	833
832-2	1.96	832
Total	**2.83**	
944 Pressure Zone		
944-1	0.31	944
944-2	3.08	944
Total	**3.39**	
1090 Pressure Zone		
1090-1	0.47	1090
Total	**0.47**	
1296 Pressure Zone		
1296-1	1.02	1296
1296-2	2.01	1296
Total	**3.03**	
1485 Pressure Zone		
1485-1	0.31	1485
1485-2	1.30	1485
Total	**1.61**	
Total Regulatory System	**36.43**	

(1) Facilities as of September 2007.
(2) The 832-1 Reservoir has been identified for potential conversion to the future recycled water system extension into the North District.

4.1.4 Central Area System

As shown in Exhibit IV, the Central Area System serves the major growth area of Eastern Chula Vista. Water supply for the Central Area System is obtained from the Otay 10 FCF and Otay 12 FCF on SDCWA Pipeline No. 4. Water supply is conveyed by gravity from Otay 10 FCF through a 36-inch transmission main to the 624-2 Reservoir. Water supply is conveyed by gravity from Otay 12 FCF through 42-inch and 30-inch transmission mains to the 624-1 Reservoir and through a 42-inch transmission main to the 624-3 Reservoir. Water is subsequently delivered from the 624-1, 624-2, and 624-3 Reservoirs, by gravity and through pumping, to serve the various pressure zones in the Central Area System.

Supply to the Central Area System is also available through the District's connection to the City of San Diego's Otay WTP. The District has an agreement with the City of San Diego to treat 10 mgd of raw water (purchased from the SDCWA) at the Otay WTP, if surplus treatment capacity is available. Typically the District can receive only 8 mgd during the summer months from this supply source.

The Central Area System has experienced unprecedented growth since the 2002 WRMP, with more than a 50 percent increase in water demand. In order to keep pace with growth, the District constructed a major water pump station (980-2 PS) at the 624 Reservoir site to directly supply the 980 PZ. The Rolling Hills Ranch Hydropneumatic PS was also constructed to serve development in the higher elevation areas.

In order to further enhance reliability to the rapidly growing area, the District completed the construction of the 36-inch Otay Interconnect Pipeline, which allows the transfer of treated water between the Otay Mesa System and the Central Area System 624-1 and 624-3 Reservoirs. Water can be pumped from the south or conveyed by gravity from the north.

Pressure Zones

There are currently five primary pressure zones and three secondary pressure zones served by pressure reducing stations within the Central Area System.

- The 624 PZ is supplied by gravity from the 624-1, 624-2, and 624-3 Reservoirs. There are also three 711/624 Pressure Reducing Stations that can provide a portion of supply to the 624 PZ but are normally closed.

- The 485 PZ is normally supplied by gravity from the 624-2 Reservoir through two pressure reducing stations on the 624 PZ transmission system. The 485 PZ can also be supplied by gravity from the 711 PZ through one pressure reducing station.

- The 458 and 340 PZs are supplied by gravity from the 624-1 Reservoir through two pressure reducing stations on the 624 PZ transmission system. The 458 PZ supplies water via three pressure reducing stations to the 340 PZ.

- The 711 and 980 PZs are primarily supplied by pumping from the 624-3 Reservoir. The 980 PZ can also be supplied directly by pumping from the 711 PZ via the 980-1 PS. The 711 PZ supplies water via a pressure reducing station to the 711/580 PZ. The 980 PZ can supply water via two pressure reducing stations to the 711 PZ but are normally closed. The 980 PZ can supply water via a pressure reducing station to the 624 PZ but it is normally closed. A summary of existing Central Area System pressure zones is provided in Table 4-10.

Table 4-10. Existing Central Area System Pressure Zones[1]

Pressure Zone	Service Elevation (ft)[2]		Source	Storage Reservoir(s)
	Minimum	Maximum		
340	0	190	458/340 PRS[3]	n/a
458	0	308	624/458 PRS[3]	458-1, 458-2
485	21	335	624/485 PRS[3]	485-1
580	116	430	711/580 PRS[3]	n/a
624	160	474	SDCWA Otay 10 FCF & Otay 12 FCF	624-1, 624-2, 624-3
711	247	561	980/711 PRS[3]	n/a
711	247	561	711-1 Pump Station	711-1, 711-2, 711-3
980	516	830	980-1 Pump Station (stand-by) 980-2 Pump Station	980-1, 980-2
Rolling Hills Ranch (1100)	638	950	1100 Hydro Pump Station[4]	n/a

(1) Facilities as of September 2007.
(2) Maximum elevation based on 65 psi static pressure. Minimum elevation based on 200 psi static pressure.
(3) Service elevations established by the pressure reducing station pressure settings.
(4) Service elevations established by the hydropneumatic system pressure settings.

Pump Stations

The 711-1 PS (shown at right) takes suction from the adjacent 624-1 and the 624-3 Reservoirs and discharges to the 711-1 (22-1 Reservoir), 711-2 (22-1A Reservoir), and 711-3 Reservoir (22-1B Reservoirs), which serve the 711 PZ.

The 980-2 PS also takes suction from the 624 Reservoirs and discharges to the 980-1 and 980-2 Reservoirs, which serve the 980 PZ. The 980-1 PS (EastLake PS) serves as a redundant pump station and takes suction from the 711 PZ transmission main and discharges to the 980 PZ.

The Rolling Hills Hydropneumatic PS takes suction from the 980 PZ and serves the highest elevation not serviceable by the 980 PZ.

Central Area System pump station data is summarized in Table 4-11.

Table 4-11. Existing Central Area System Pump Stations[1]

Central System Pump Station	Pump Unit No.	Pumping Unit Rated Capacity		Pump Station Capacity			
				Total Capacity		Firm Capacity	
		gpm	mgd	gpm	mgd	gpm	mgd
711-1	1	4,000	5.76	20,000	28.80	16,000	23.04
	2	4,000	5.76				
	3	4,000	5.76				
	4	4,000	5.76				
	5	4,000	5.76				
980-1 (Stand-by)	1	4,000	5.76	12,000	17.28	8,000	11.52
	2	4,000	5.76				
	3	4,000	5.76				
980-2	1	5,700	8.21	28,500	41.04	22,800	32.83
	2	5,700	8.21				
	3	5,700	8.21				
	4	5,700	8.21				
	5	5,700	8.21				
Rolling Hills Ranch Hydro	1	250	0.36	2,850	4.104	1,100	1.58
	2	850	1.22				
	3[2]	1,750	2.52				
Temporary LOPS	1	13,900	20.02	13,900	20.02	13,900	20.02

(1) Facilities as of September 2007.
(2) Pump provided for fire service only.

Storage Reservoirs

There are eleven storage reservoirs that serve the Central Area System.

- The 624-1, 624-2, and 624-3 Reservoirs provide operational storage and supply water by gravity to the 624 PZ. The 624 PZ then supplies water by gravity through pressure reducing stations to the 340, 458, and 485 PZs. The three 624 reservoirs also provide emergency storage supply for the Central Area System.

- The 711-1, 711-2, and 711-3 Reservoirs provide operational storage and supply water by gravity to the 711 PZ. The 711-3 Reservoir is about five times larger than the 711-1 and 711-2 reservoirs and experiences limited turnover. (The 711-1 and 711-2 Reservoirs are pictured at right.)

- The 980-1 and 980-2 Reservoirs provide operational storage and supply water by gravity to the 980 PZ.

- The 485 PZ includes the 485-1 Reservoir (22-2 Reservoir) that provides operational storage and supply water by gravity to the 485 PZ.
- The 458 PZ includes the 458-1 (10-1 Reservoir) and 458-2 (10-2 Reservoir) Reservoirs that provide operational storage and supply water by gravity to the 458 PZ.
- The 340 PZ contains no operational storage reservoirs and receives flow by gravity via three pressure reducing stations from the 458 PZ.

A summary of existing Central Area System storage facilities and their capacities are provided in Table 4-12.

Table 4-12. Existing Central Area System Storage Reservoirs[(1)]

Reservoir ID	Capacity (mg)	Overflow Elevation (ft)
458 Pressure Zone		
458-1 (10-1 Reservoir)	0.82	458
458-2 (10-2 Reservoir)	1.75	458
Total	**2.57**	
485 Pressure Zone		
485-1 (22-2 Reservoir)	1.00	485
Total	**1.00**	
624 Pressure Zone		
624-1 (Patzig Reservoir)	12.40	624
624-2 (22-3 Reservoir)	8.13	624
624-3 (EastLake Greens Reservoir)	30.00	624
Total	**50.53**	
711 Pressure Zone		
711-1 (22-1 Reservoir)	3.10	711
711-2 (22-1A Reservoir)	2.30	711
711-3 (22-1B Reservoir)	16.00	711
Total	**21.40**	
980 Pressure Zone		
980-1 (22-4 Reservoir)	5.02	979
980-2 (22-5 Reservoir)	5.02	979
Total	**10.04**	
Total Central System	**85.54**	

(1) Facilities as of September 2007.

4.1.5 Otay Mesa System

As shown on Exhibit V, the Otay Mesa System serves the predominately industrial zoned lands in the City and County of San Diego. All water supply for the Otay Mesa System is obtained from SDCWA Otay 13 FCF on SDCWA Pipeline No. 4. The water supply is conveyed by gravity from Otay 13 FCF through a 30-inch transmission main to the 571-1 Reservoir (Roll Reservoir).

There continues to be slow absorption of industrial land on Otay Mesa in the City and County of San Diego. Only a few new water facilities have been constructed since the 2002 WRMP. The transmission and distribution system is fairly robust, in that many of the pipelines were originally constructed to serve large agriculture demands.

The new Otay Interconnect Pipeline can also be supplied by a temporary water pump station located near the City of San Diego's Otay WTP. Since the 2002 WRMP, the District has secured 10 mgd of water supply (when available) from the City of San Diego. This water is taken directly into the Otay Mesa system or pumped into the Otay Interconnect Pipeline.

Pressure Zones

Otay Mesa is relatively flat, as contrasted with each of the other systems. This allows the entire Otay Mesa System to be served by a single pressure zone (i.e., 870 PZ). The 571-1 Reservoir does not serve customers directly by gravity, it is strictly used as forebay for the 571-1 Pump Station. Otay Mesa System pressure zone data is summarized in Table 4-13.

Table 4-13. Existing Otay Mesa System Pressure Zones[(1)]

Pressure Zone	Service Elevation (ft)[(2)]		Source	Storage Reservoir(s)
	Minimum	Maximum		
571	109	421	SDCWA Otay 13 FCF	571-1
870	408	720	Low Head & 870-1 Pump Stations	870-1

(1) Facilities as of September 2007.
(2) Maximum elevation based on 65 psi static pressure. Minimum elevation based on 200 psi static pressure. Service elevations established by the hydropneumatic system pressure settings.

Pump Stations

Three pump stations serve the Otay Mesa System.

- The 571-1 (Low Head) PS is supplied by the 571-1 Reservoir or Otay 13 FCF and provides suction pressure to the 870-1 (High Head) Pump Station (i.e., they operate in series) to serve the 870 PZ.

- The 870-1 PS discharges to the 870-1 Reservoir (Upper Reservoir) and Otay Mesa service area via 30-inch transmission mains.

- A temporary pump station has been constructed near the Otay WTP to convey purchased City of San Diego water to the Otay Mesa water system. A permanent "Lower Otay Pump Station" (LOPS) has been designed, but has yet to be constructed.

Otay Mesa pump station data is summarized in Table 4-14.

Table 4-14. Existing Otay Mesa System Pump Stations[1]

Otay Mesa System Pump Station	Pump Unit No.	Pumping Unit Rated Capacity		Pump Station Capacity			
				Total Capacity		Firm Capacity	
		gpm	mgd	gpm	mgd	gpm	mgd
Temporary LOPS[2]	1	13,900	20.02	13,900	20.02	13,900	20.02
571-1 (Low Head Pump Station)[3]	1	6,850	9.86	20,550	29.59	13,700	19.73
	2	6,850	9.86				
	3	6,850	9.86				
870-1 (High Head Pump Station)[3]	1	2,300	3.31	17,800	25.63	13,400	19.30
	2	2,300	3.31				
	3	4,400	6.34				
	4	4,400	6.34				
	5	4,400	6.34				

(1) Facilities as of September 2007.
(2) The Temporary Lower Otay PS is planned to be replaced with a permanent station in the future.
(3) The Low Head and High Head Pump Stations are planned to be replaced by the future 870-2 Pump Station.

Storage Reservoirs

The 571-1 Reservoir is the emergency storage facility for the Central and Otay Mesa Systems. The 870-1 Reservoir provides operational storage and supplies water by gravity to serve the 870 PZ. A summary of existing Otay Mesa System storage facilities and their capacities is provided in Table 4-15.

Table 4-15. Existing Otay Mesa System Storage Reservoirs[1]

Reservoir ID	Capacity (mg)	Overflow Elevation (ft)
571-1 (Roll Reservoir)	36.72	571
870-1 (Upper Reservoir)	10.98	870
Total Otay Mesa System	**47.70**	

(1) Facilities as of September 2007.

4.2 Potable Water System Criteria

The District's potable water system planning criteria are presented in Table 4-16. These criteria have been updated based on the following:

- August 2002 Otay Water District Water Resources Master Plan (Chapter 7 Potable Water System Evaluation)
- November 2006 Water Agency Standards – Design Guidelines for Water and Sewer Facilities, Section 4.1 Water Planning (revised 09/07/04)
- Comparison to other local water purveyor criteria
- Meetings and discussions with District engineering and operations staff

The District's potable water system capital improvement facilities consist of pump stations, storage reservoirs, and transmission mains. The primary facilities are planned, funded and constructed by the District, whereas distribution pipelines and laterals typically 12-inch diameter or smaller are typically planned, financed and constructed by the project proponents as part of each development project.

The District's potable water Capital Improvement Program (CIP) facilities are planned and sized based on the set of system planning criteria presented in this chapter. The important planning criteria include system pressure goals/limits, pump station capacity, operational reservoir storage capacity, transmission and distribution pipeline sizing based on velocity, and emergency water supply requirements. See Chapter 5 for a discussion of recycled water system criteria.

4.2.1 System Pressures

It is desirable to limit the number of potable water system pressure zones. This reduces the number of pump stations, storage reservoirs and pressure reducing stations. Fewer pressure zones increases reliability, improves flexibility, enhances water quality control and decreases both capital and operational costs. A minimum static system pressure of 65 pounds per square inch (psi) and a maximum static pressure of up to 200 psi are recommended to provide consistency to the level of service provided by the District's existing systems.

The pressure criteria have been reviewed to include a set of improved guidelines for new development. A minimum static pressure of 65 psi continues to be recommended and a 'desirable' maximum static pressure of 120 psi has been listed to promote lower system pressure at the lower elevations within each pressure zone. System planning should also take into consideration pump operations such that new development services do not exceed 150 psi. However, it is realized that existing pressure zones may require service pressures exceeding 150 psi but below the 200 psi limit.

Service connections must have a pressure regulator installed to maintain a maximum service pressure of 80 psi to protect typical household plumbing. The pressure regulator must also comply with the criteria established in the Uniform Plumbing Code (UBC) and the District's detailed design requirements.

Table 4-16. Otay Water District Potable Water System Criteria

Criterion	Value
Determination of Demand	Population
Very Low Single Family Residential (VL)	3.0 inhabitants/DU
Low-Density Single Family Residential (L)	3.0 inhabitants/DU
Medium-Density Multi-Family Residential	2.5 inhabitants/DU
High-Density Multi-Family Residential	2.5 inhabitants/DU
General Land Use Categories[1]	gpd/(net acre, SF or EDU)
Peaking Factors	
Minimum Day/Average Day Ratio	0.85
Maximum Day/Average Day Ratio	Per Fig. 4-2
Peak Hour/Average Day Ratio	Per Fig. 4-3
Required Fire Flows	
Single Family Residential	1,500 gpm - 2 hours min.
Multi-Family Residential	2,500 gpm - 2 hours min.
Commercial/Business	3,500 gpm - 3 hours min.
Industrial	3,500 gpm - 4 hours
Schools/Hospitals/Resorts/Hotels	5,000 gpm - 4 hours
Storage	
Operating Storage	0.30 MDD[2]
Fire Storage	(FF x duration)
Emergency Reserve Component	1.0 MDD
Pressure Criteria	
Maximum Desirable	120 psi
Maximum Static (no demand)	200 psi
Minimum Static (no demand)	65 psi
Min. Residual Pressure (Peak Hour)	40 psi
Min. Residual Pressure (Max. Day + Fire Flow)	20 psi
Pumping Station Criteria	
Pumping Period[3]	24 hours
Pumping Capacity[4]	MDD + 3-day FF recharge
Redundancy	1 of largest pump
Standby Power	Portable or permanent generator
Pipe Criteria	
Maximum Velocity – Max. Day	N/A
Max. Velocity - Distribution (Peak Hour)	6 fps
Max. Velocity - Transmission (Peak Hour)	6 fps
Max. Velocity (Max. Day + Fire Flow)	10 fps
Max. Headloss per thousand feet	10 ft
Minimum Diameter	8 inch
Hazen-Williams “c” factor (12-inch diameter or less)	120
Hazen-Williams “c” factor (>12-inch diameter)	130

(1) Water Duty factors by land use categories are provided in Table 4-27
(2) Maximum day demand
(3) Pumping to occur during non-peak energy hours whenever possible.
(4) For closed systems, pump capacity equals peak hour demand or max day plus fire flow, whichever is greater.

4.2.2 Fire Protection

Various fire flow requirements have been defined by the fire protection agencies operating within the District's boundaries. Fire Districts to the north include Spring Valley and Jamul-Delzura, those to the south include the City of Chula Vista, City of San Diego and County of San Diego. CalFire operations are as needed throughout the District. Fire flow requirements are based upon building construction, floor space and/or land use acreage and, in some instances, a combination of these parameters. The distribution system is analyzed on the basis of delivering the required fire flow for a specified amount of time on the maximum demand day (MDD) of the year. This condition is typically used to determine the size of most distribution mains comprising the system. MDD plus fire flow rates commonly impose crucial hydraulic conditions resulting in very low residual distribution system pressures and high velocities.

Fire flow quantities and durations (length of the fire event) for master planning purposes are determined based on the type of land use served. This Master Plan establishes uniform fire flow criteria for various land uses throughout the District. These requirements are for new construction and apply to structures with or without fire sprinklers. Fire flows requirements used for existing developments will not be changed. Minimum fire flows range from 1,500 gpm for 2 hours for residential areas to 5,000 gpm for 4 hours for large industrial areas such as hospitals and resorts. Local fire agencies may require higher fire flows under certain circumstances, such as developments adjacent to open space areas susceptible to wild fires or certain industrial structures, or possibly allow flow reductions due to use of sprinklers in buildings.

Where specific building plans are provided, Insurance Services Office (ISO) criteria can be used to refine fire flow requirements. ISO standards are specific to a particular building and based on a number of considerations, such as type of occupancy, type of construction and construction materials, square footage, distance from other structures, and other factors. In general, this information is not available at the development planning stage.

The District should continue to work with and coordinate any new fire protection requirements with the local fire agencies. The use of fire sprinklers systems and static pressure requirements should also be considered especially along pressure zone boundaries where higher static pressures may be desired.

4.2.3 Transmission and Distribution Pipelines

Pipeline sizing criteria aim to minimize wear on valves and scouring of interior coatings and to limit distribution system head loss. The design criteria allow a peak hour (PH) pipeline velocity of 6 fps for distribution and transmission mains. In general, transmission mains are designed to provide for PH, while distribution piping is sized for providing MDD plus fire flow. Under MDD plus fire flow, pipelines are sized so that maximum velocities do not exceed 10 fps while maintaining minimum residual dynamic pressure of 20 psi. Under PH conditions maximum velocities of 6 fps require maintaining a minimum residual pressure of 40 psi. In special circumstances, piping facilities may operate outside maximum velocity ranges if minimum residual pressures are met and conditional approval is obtained from the District.

A Hazen-Williams C-factor of 130 is to be used for pipelines larger than 12-inch diameter and 120 for pipelines of 12-inch diameter or smaller for planning studies. The existing calibrated hydraulic model may adjust system C-factors to achieve calibration goals. Surge pressure analyses will be required during facility design and adequate surge protection methods or devices provided as necessary to protect distribution system facilities from excessive pressure conditions. Appropriate pipeline pressure classes within the influence of increased pressure during normal pumping station operations must be provided as well.

4.2.4 Pump Stations

Pump station criteria were developed to provide the District with design requirements for operational needs. In particular, the number of pumps, redundancy requirements, backup generators, and piping design are listed in Table 4-16. The capacity and head requirements for each station will depend on the area to be served and are evaluated on a project-by-project basis.

The District's potable water pump station facilities are sized to provide an installed capacity, defined as firm capacity, equal to the cumulative MDD of all pressure zones supplied, including higher zones. This equates to summing annual ADDs for all pressure zones served, then multiplying by the cumulative maximum day peaking factor as expressed in Figure 4-2. PH and fire flow demands in excess of MDD are to be met from water stored within the operational reservoirs within each pressure zone. Standby pumping units with capacity equal to the largest unit in a pump station and emergency power supplies are recommended for each station.

For closed pressure systems (e.g., hydro-pneumatic pressure zones), the pumping station facilities are sized to provide installed (firm) capacity equal to PH demand or maximum day plus fire flow, whichever is greater, of the zone served. This equates to summing annual ADD for the pressure zone served then multiplying by the PH peaking factor (expressed in Figure 4-3) or MDD plus largest fire flow. A standby pumping unit with capacity equal to the largest station unit and emergency power supplies are recommended for each hydro-pneumatic pump station. Also, a pumping unit with a capacity estimated to represent nighttime demand (i.e., 30 percent of annual ADD) should be provided to prevent cycling of the larger units under repeated small demand conditions.

In order to accommodate pumping needs and operate the stations in off-peak electrical energy consumption time periods, consideration of alternative energy sources should be investigated and provided where feasible as part of the design process for each facility. The on-peak electrical energy consumption time period in the summer months (i.e., May 1 through September 30) is from 11:00 a.m. to 6:00 p.m. weekdays only. The on-peak electrical energy consumption time period in the winter months (i.e., October 1 through April 30) is from 5:00 p.m. to 8:00 p.m. weekdays only. The off-peak electrical energy consumption time period in the summer and winter months is 10:00 p.m. to 6:00 a.m. weekdays and all day weekends. Semi-peak electrical energy consumption periods for summer and winter months are the remaining times. These time periods are presented in Table 4-17.

Figure 4-2. MDD Peaking Factor Curve

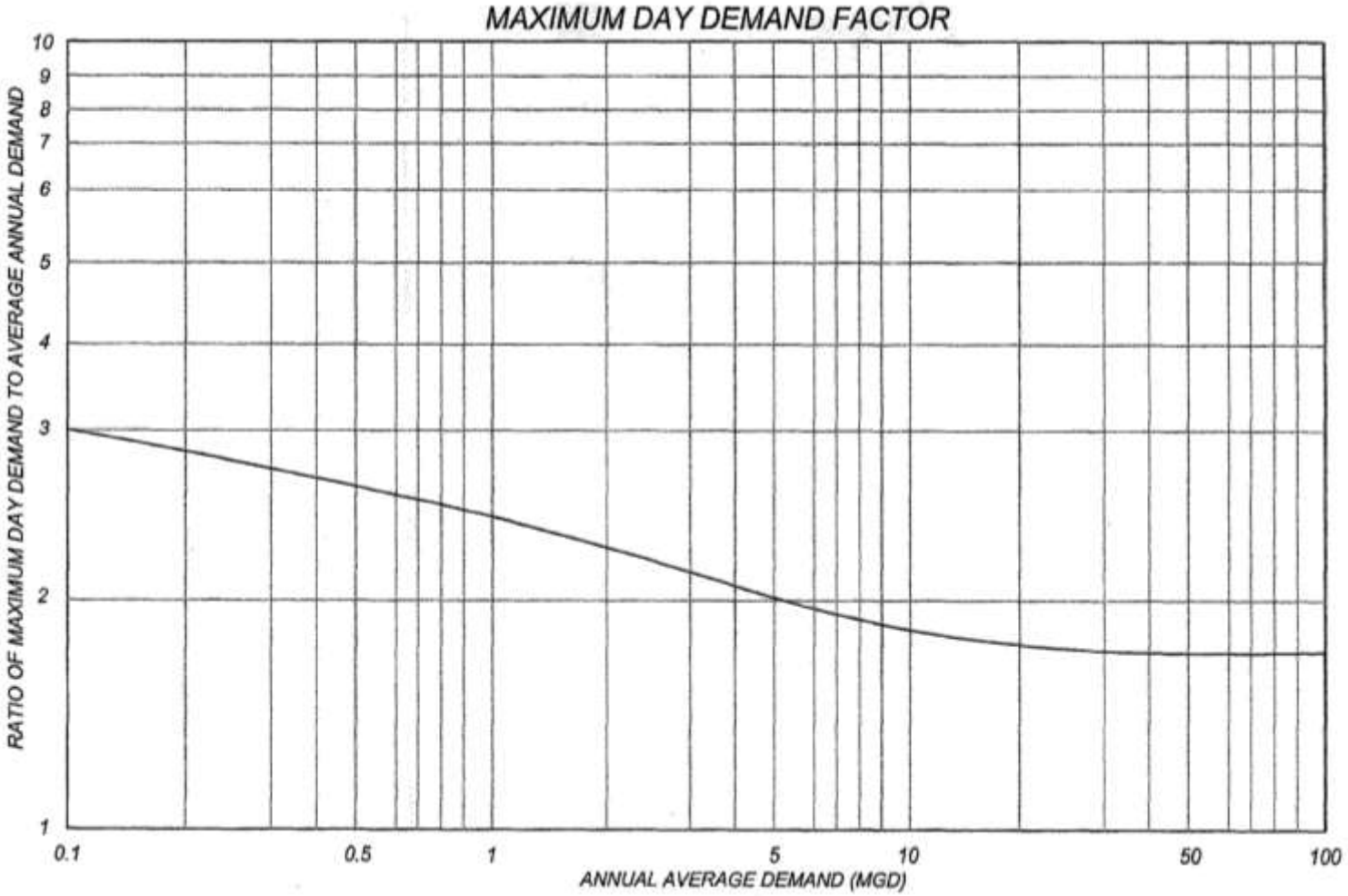


Figure 4-3. Peak Hour Peaking Curve

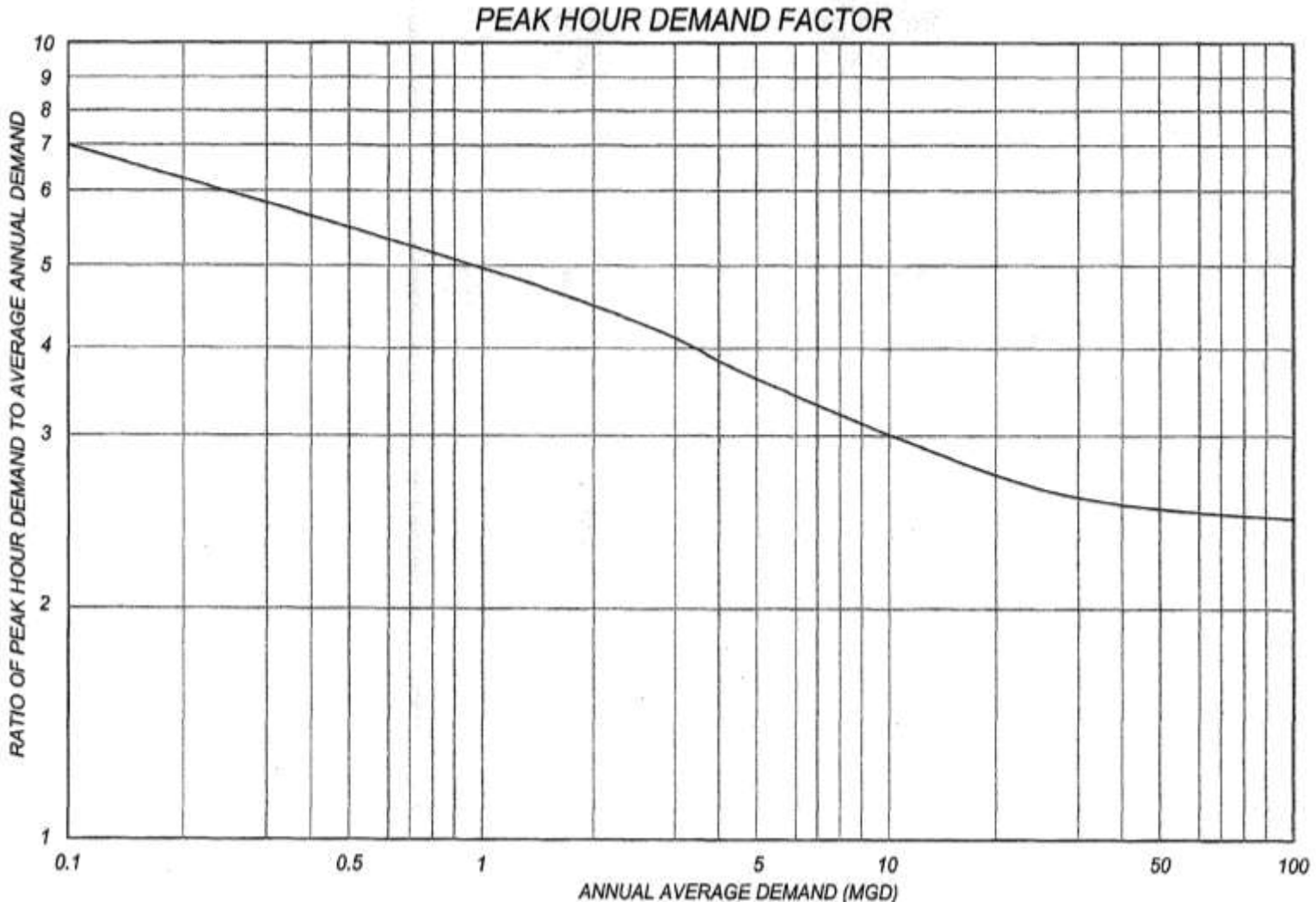


Table 4-17. Otay Water District Energy Time Periods

Time of Year	Off-Peak Energy Times[(1)]	On-Peak Energy Times[(2)]
May 1 through September 30	10:00 p.m. to 6:00 a.m.	11:00 a.m. to 6:00 p.m.
October 1 through April 30	10:00 p.m. to 6:00 a.m.	5:00 p.m. to 8:00 p.m.

(1) Off-Peak Energy Times are for weekdays and weekends
(2) On-Peak Energy Times are for weekdays only

4.2.5 Treated Water Storage

Treated water storage serves the potable water system needs shown in Table 4-18. The District sizes and locates treated water reservoirs for each pressure zone for the total of each storage component listed above. If storage cannot be provided within the zone, then storage may be located in the next higher pressure zone that is connected via a PRS. In this case, the PRS must then be sized to pass the MDD plus fire flow to the lower zone.

Table 4-18. Treated Water Storage Needs and District Criteria

Storage Need	Description	District Criteria
Operational	Balances short-term variations in demand throughout the day with a relatively constant incoming supply to the water system; also, provides the ability to serve peak demands that exceed the maximum-day supply capacity of the transmission pipelines	By Pressure Zone: 30% MDD
Fire Flow	Provides the capability to serve fire flow requirements that exceed the maximum-day supply capacity of the transmission pipelines;	By Pressure Zone: Sized to meet largest fire flow rate and duration required for zone
Emergency	Provides treated water storage for use during an emergency situation, supply (such as a facility outage)	By Pressure Zone: 100% MDD District-wide: Up to 5 days of average day demand during a maximum month
Total		By Pressure Zone: 130% MDD + Fire Flow District-wide: Total storage for each pressure zone, plus up to 5 days of average day demand during a maximum month

Providing adequate reservoir storage is critical to effective potable water system operations. Operational storage reservoirs typically serve a particular pressure zone. Operational storage provides a sufficient volume of water to accommodate hourly fluctuations in water demand while being supplied by pumping facilities. Operational storage allows pump stations and associated transmission mains in each pressure zone to operate at a relatively uniform rate, equivalent to the MDD condition. When a PH demand occurs, the flow is supplied from operational storage within the reservoirs because daily operational and fire storage are contained within the

operational storage component. Fire flow rate and duration are stipulated by the local fire agency, and such volume is supplied from the fire storage component in each reservoir. These operational reservoirs also contain an emergency reserve volume component to allow each pressure zone in the District to weather such events as power outages, mechanical system failures, SDCWA supply interruptions, etc. Operational storage reservoirs fill during low or no demand periods and drain during high demand periods.

As noted in Table 4-16, District policy is to size operational storage reservoirs in each pressure zone based on the sum of: (a) daily operational capacity equal to 30 percent of MDD, (b) emergency reserve capacity equal to one MDD, and (c) the maximum fire flow volume, resulting in:

Storage by Pressure Zone = Fire Volume + 1.3 MDD

4.2.6 Water Supply Reliability

As discussed in Chapter 3, the District is reliant on imported water for all of its supply. The District recognizes that its supply of imported water may be subject to reductions during droughts or other shortage situations. Also, the District recognizes that the facilities that deliver imported water into San Diego County and to the District's service area are subject to scheduled maintenance shutdowns, as well as to unscheduled service outages due to pipe failures or other emergency events.

SDCWA reserves the right to shut-down its aqueduct facilities for scheduled and unscheduled maintenance, and advises its member agencies to have the ability to operate independently of SDCWA supplies for up to 10 continuous days anytime of the year. SDCWA schedules routine maintenance shutdowns of its facilities during the winter months when demands are low. Many agencies therefore target their planning efforts to being able to sustain a 10-wintertime-day interruption of SDCWA deliveries. Should an unscheduled outage occur during the peak demand summer months, these agencies may need to impose water use restrictions during the outage period.

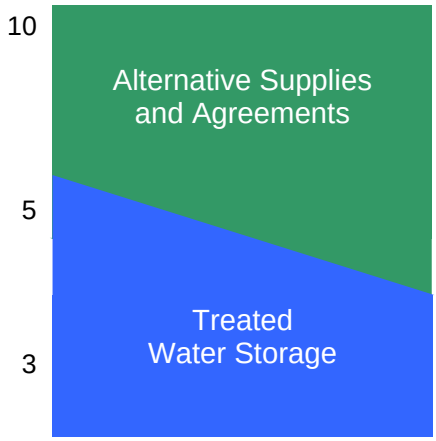
Scheduled aqueduct shut-downs are unusual to individual pipelines, such that agencies with access to more than one aqueduct pipeline may be able to sustain a 10-day outage of one pipeline by simply drawing on another. Also, scheduled shutdowns are typically scheduled for the winter months, when demands are low. The overall probability of an aqueduct pipeline being out of service, including scheduled and unscheduled events, is therefore higher in the winter months and lower in the summer months.

In the case of the District, the critical aqueduct supply pipeline is SDCWA Pipeline No. 4, which supplies treated water. During an outage of SDCWA Pipeline No. 4, the District would draw on water from the LMSE pipeline via its agreement with the Helix Water District and SDCWA for the North District, from the City of San Diego's Otay WTP under the District's agreement with the City for the South District, and from the District's emergency treated water storage component.

District Supply Reliability Goal

The District's goal is to be able to sustain a 10-day outage of supply from SDCWA Pipeline No. 4 at any time of the year without a reduction in service level. The District seeks to obtain this level of supply reliability through the development of alternative water supplies, through agreements with neighboring water districts, and through treated water storage. Treated water storage is to contribute no more than five days of the reliability goal, with the balance coming from other sources. Over time, the District seeks to decrease its reliability on treated water storage and rely more on alternative water supplies and agreements, as shown in the graph to the right.

10-Day Supply Reliability



The District's goal is to be able to operate independent of supply from SDCWA Pipeline No. 4 for 10 days, through a combination of treated water storage and alternative supply arrangements. The graph shows treated water storage making up between three and five days of the total reserve. Based on existing and District storage and planned storage projects, treated water storage will make up approx-imately three days of the reserve at buildout conditions, with the balance coming from other supply sources.

Table 4-19 provides summary statistics of the current status, based on existing 2007 water demands, of the District's supply reliability, relative to its goal of 10 days of SDCWA Pipeline No. 4 independence. The table shows demands by month for the North and South District service areas, the available supply from sources independent of SDCWA Pipeline No. 4, and the available supply from storage. The right hand column shows the resulting Level of Service for that month over the 10-day period. Level of Service is expressed as the number of days the District could expect to maintain full uninterrupted water service.

This table assumes that there is no supply from SDCWA Pipeline No. 4, that no water conservation measures are in place, and that the shutdowns are unexpected (reservoirs are not necessarily full at the beginning of the shutdown). SDCWA Pipeline No. 3, the raw water line that serves the Otay WTP, and the LMSE are assumed to remain in service. The available storage shown is the emergency component of the available treated water storage, exclusive of operating and fire storage volumes.

The table shows that the District is currently well along toward meeting its supply reliability goal. The North District currently has at least 10 days of emergency water storage from December through April, while the South District only meets the 10-day goal in February. Table 4-20 presents the water supply expansion scenario for 12 mgd from the Helix WTP. In the North District service area, the expansion of the District's capacity availability from the Helix Water District's Levy WTP from 6.2 mgd to at least 12 mgd, combined with existing treated water storage, provides a Level of Service of 100 percent in all months.

Table 4-19. Supply Reliability – Level of Service During 10-Day Outage of SDCWA Pipeline No. 4 (2007 Conditions)[8]

Month	Average Demand (mgd)[1]	Interconnection Supply (mgd)[2]	Required Demand from Storage (mgd)[3]	Estimated Operating Reservoir Volume[4]	Fire Storage Reserve (mg)[5]	Available Storage (mg)[6]	Potential Net Days of Available Storage[7]
North District (Total Storage Capacity = 80.8 mg)							
January	9.63	6.20	3.43	68%	10.17	48.0	>10
February	7.72	6.20	1.52	70%	10.17	49.5	>10
March	9.53	6.20	3.33	72%	10.17	50.9	>10
April	11.42	6.20	5.22	74%	10.17	52.3	>10
May	14.47	6.20	8.27	76%	10.17	53.7	6
June	14.55	6.20	8.35	80%	10.17	56.5	7
July	17.42	6.20	11.22	85%	10.17	60.1	5
August	15.89	6.20	9.69	90%	10.17	63.6	7
September	16.06	6.20	9.86	80%	10.17	56.5	6
October	12.93	6.20	6.73	76%	10.17	53.7	8
November	11.76	6.20	5.56	72%	10.17	50.9	9
December	9.34	6.20	3.14	68%	10.17	48.0	>10
South District (Total Storage Capacity = 133.2 mg)							
January	20.98	10.00	10.98	68%	9.00	84.5	8
February	16.97	10.00	6.97	70%	9.00	87.0	>10
March	20.92	10.00	10.92	72%	9.00	89.5	8
April	22.03	10.00	12.03	74%	9.00	91.9	8
May	25.74	10.00	15.74	76%	9.00	94.4	6
June	26.25	10.00	16.25	80%	9.00	99.4	6
July	33.87	10.00	23.87	85%	9.00	105.6	4
August	32.16	10.00	22.16	90%	9.00	111.8	5
September	32.12	10.00	22.12	80%	9.00	99.4	4
October	27.23	10.00	17.23	76%	9.00	94.4	5
November	24.74	10.00	14.74	72%	9.00	89.5	6
December	20.05	10.00	10.05	68%	9.00	84.5	8

(1) Monthly demands for 2007 per OWD Operations records.
(2) The North District is currently entitled to a maximum of 6.2 mgd from the Helix WD Levy WTP. The South District is entitled to a maximum of 10.0 mgd from the City of San Diego's Otay WTP.
(3) Required demand is the average demand less the required interconnection supply.
(4) Estimated operating volumes based on historic seasonal variations in tank volume to promote optimum water quality and system operations. Values are typical and can vary year to year. Values received from OWD Operations staff.
(5) Fire storage reserve is the amount of storage provided for each zone to supply a fire event. This storage is not included for emergency outage conditions.
(6) The available storage is the total storage less the fire storage reserve times the estimated operating volume.
(7) Potential net days are the number of days that could be supplied by the available storage (available storage divided by the average demand).
(8) Facilities as of September 2007.

Table 4-20. Supply Reliability – North District Level of Service During 10-Day Outage of SDCWA Pipeline No. 4 with 12 mgd from Levy WTP

Month	Average Demand (mgd)[1]	Interconnection Supply (mgd)[2]	Required Demand from Storage (mgd)[3]	Estimated Operating Reservoir Volume[4]	Fire Storage Reserve (mg)[5]	Available Storage (mg)[6]	Potential Net Days of Available Storage[7]
North District (Total Storage Capacity = 80.8 mg)							
January	9.63	9.63	0.00	68%	10.17	48.0	>10
February	7.72	7.72	0.00	70%	10.17	49.5	>10
March	9.53	9.53	0.00	72%	10.17	50.9	>10
April	11.42	11.42	0.00	74%	10.17	52.3	>10
May	14.47	12.00	2.47	76%	10.17	53.7	>10
June	14.55	12.00	2.55	80%	10.17	56.5	>10
July	17.42	12.00	5.42	85%	10.17	60.1	>10
August	15.89	12.00	3.89	90%	10.17	63.6	>10
September	16.06	12.00	4.06	80%	10.17	56.5	>10
October	12.93	12.00	0.93	76%	10.17	53.7	>10
November	11.76	11.76	0.00	72%	10.17	50.9	>10
December	9.34	9.34	0.00	68%	10.17	48.0	>10

(1) Monthly demands for 2007 per OWD Operations records.
(2) A maximum of 12.0 mgd from the Helix WD Levy WTP will be available beginning in 2010.
(3) Required demand is the average demand less the required interconnection supply.
(4) Estimated operating volumes based on historic seasonal variations in tank volume to promote optimum water quality and system operations. Values are typical and can vary year to year. Values received from OWD Operations staff.
(5) Fire storage reserve is the amount of storage provided for each zone to supply a fire event. This storage is not included for emergency outage conditions.
(6) The available storage is the total storage less the fire storage reserve times the estimated operating volume.
(7) Potential net days are the number of days that could be supplied by the available storage (available storage divided by the average demand).

The District could increase the South District Level of Service through any of several measures identified in its 2007 Integrated Resources Plan. For example, one the IRP's recommended measures are the implementation by the District of 5,000 AFY (approximately 4.5 mgd) of seawater desalination capacity. The increase in supply could greatly improve the number of days available for emergency water use and even reach the District's 10-day goal during months of lower demands (December through April).

Emergency Interconnections

There are several existing minor interconnections with neighboring agency systems that can provide relatively small quantities of water to benefit the District, the other agency or both. The locations of the interconnections are shown on Exhibits I through V. These connections are typically used when performing shutdowns within specific localized pressure zones for planned operational circumstances or in the event of an emergency within an agency unrelated to SDCWA system operations. However, most of these interconnections are capable of supplying water during SDCWA outages. The small flow rates that can be transferred between the

agencies typically have a minor affect on meeting SDCWA Pipeline No. 4 emergency outage conditions because an outage to Pipeline No. 4 places the supplier in a less reliable situation with reduced overall resources.

The District has six existing minor interconnections with the Helix WD, four of which are capable of supplying the District with water. Table 4-21 provides a summary of these connections and they are described as follows:

- South Barcelona and Ivy Street interconnection (South Barcelona Connection) within the La Presa System 850 PZ requiring a portable pumping unit capable of approximately 400 gpm serving the District or Helix WD.
- Blossom Lane and Walbollen Street interconnection (Blossom Lane Connection) within the La Presa System Aqueduct PZ capable of approximately 800 gpm serving the District.
- Grand Avenue and Eucalyptus Street interconnection (Grand Avenue Connection) within the La Presa System 850 PZ capable of approximately 800 gpm serving Helix WD.
- Vista Grande Road and Canta Lomas interconnection (Vista Grande Connection) within the Hillsdale System 978 PZ capable of approximately 1,000 gpm serving the District or Helix WD.
- Sir Francis Drake Drive and Explorer Road interconnection (Francis Drake Connection) within the La Presa System 850 PZ capable of approximately 800 gpm serving the District.
- Sweetwater Springs Interconnection within the 850 PZ capable of approximately 725 gpm serving the District or Helix WD.

Table 4-21. Minor Emergency Interconnections with Helix WD

Otay Connection Identification	Agency Served	Otay Water System and Pressure Zone Supply	Flow Rate (gpm)	Service Condition[(1)]
South Barcelona	Helix WD/ District	La Presa (850 PZ)	400	Agency Option
Blossom Lane	Otay WD	La Presa (Aqueduct PZ)	800	Helix WD Option
Grand Avenue	Helix WD	La Presa (850 PZ)	800	District Option
Vista Grande	Helix WD/ District	Hillsdale (978 PZ)	1,000	Agency Option
Francis Drake	District	La Presa (850 PZ)	800	Helix WD Option
Sweetwater Springs	Helix WD	La Presa (850 PZ)	725	Agency Option

(1) Service condition defined as agency with the option of providing emergency water service to the requesting agency depending upon their ability to serve.

Two additional interconnections with Helix WD are proposed: one at the intersection of Del Rio Road and the Helix/Otay Boundary and one at the intersection of Gillespie Drive and Orville Street.

The District has six existing minor interconnection with Sweetwater Authority, three of which are capable of supplying the District with water. A seventh connector is awaiting construction. Table 4-22 provides a summary of these connections and they are described as follows:

- Proctor Valley Road and Jonel Way interconnection (Proctor Valley Connection) within the Central Area System 580 PZ requiring a portable pumping unit capable of approximately 140 gpm serving the District.
- Paseo Del Rey and Douglas Street interconnection (Douglas Street Connection) within the Central Area System 711 PZ capable of approximately 350 gpm serving Sweetwater Authority.
- Oleander Avenue and East Naples Street interconnection (East Naples Connection) within the Central Area System 624 PZ capable of approximately 2,000 gpm serving Sweetwater Authority.
- Nacion Avenue and East Oxford Street interconnection (Nacion Avenue Connection) within the Central Area System 458 PZ capable of approximately 1,000 gpm serving the District or Sweetwater Authority.
- Cherry Hills Lane interconnection (Cherry Hills Connection) within the Central Area System 624 PZ capable of approximately 1,000 gpm serving Sweetwater Authority or via portable pumping unit serving the District.
- Lynwood Drive and Bay Leaf Drive interconnect with the 485 PZ capable of approximately 800 gpm serving Sweetwater Authority.
- Camino Elevado interconnect with the 624 PZ capable of 800 gpm serving Sweetwater Authority.

Table 4-22. Minor Emergency Interconnections with Sweetwater Authority

OWD Connection Identification	Agency Served	OWD Water System and Pressure Zone Supply	Flow Rate (gpm)	Service Condition[(1)]
Proctor Valley	District	Central Area (580 PZ)	140	SWA Option
Douglas Street	SWA	Central Area (711 PZ)	350	District Option
East Naples	SWA	Central Area (624 PZ)	2,000	District Option
Nacion Avenue	SWA/ District	Central Area (458 PZ)	1,000	Agency Option
Cherry Hills	SWA/ District	Central Area (624 PZ)	1,000	Agency Option
Lynwood Drive & Bay Leaf	SWA	Central Area (485 PZ)	800	District Option
Camino Elevado	SWA	Central Area (624 PZ)	800	District Option

(1) Service condition defined as an agency with the option of providing emergency water service to the requesting agency depending upon their ability to serve.

The District has six existing minor interconnections with the City of San Diego, four of which are capable of supplying the District with water. Table 4-23 provides a summary of these connections, described as follows:

- East H Street and Kemel Place interconnection (East H Street Connection) within the Central Area System 485 PZ capable of approximately 1,500 gpm to the District.
- Otay Valley Road and Oleander Avenue interconnection (Palm Avenue Connection) within the Central Area System 340 PZ capable of approximately 2,500 gpm to the District.
- Entertainment Circle interconnection (Otay Rio Connection) within the Central Area System 340 PZ capable of approximately 5,000 gpm to the District.
- Otay Mesa Road and Heritage Road interconnection (Heritage Road Connection) within the Otay Mesa System 870 PZ capable of approximately 5,000 gpm to the City of San Diego or, via portable pumping units, to the District.
- Otay Mesa Road and Cactus Road interconnection (Brown Field Connection) within the Otay Mesa System 870 PZ capable of approximately 5,000 gpm to the City of San Diego Brown Field Municipal Airport.
- Telegraph Canyon Road interconnect with the 624 PZ and 811 PZ is capable of supplying 2,000 gpm to each PZ to serve the District.

Table 4-23. Minor Emergency Interconnections with City of San Diego

OWD Connection Identification	Agency Served	OWD Water System and Pressure Zone Supply	Flow Rate (gpm)	Service Condition[(1)]
East H Street	District	Central Area (485 PZ)	1,500	City Option
Palm Avenue	District	Central Area (340 PZ)	2,500	Not in service
Otay Rio	District	Central Area (340 PZ)	5,000	On Demand
Heritage Road	City of SD/ District	Otay Mesa (870 PZ)	5,000	Agency Option
Brown Field	City of San Diego	Otay Mesa (870 PZ)	5,000	On Demand
Telegraph Canyon Rd	District	Central Area (624 & 711 PZ)	2,000	City Option

(1) Service condition defined as an agency with the option of providing emergency water service to the requesting agency depending upon their ability to serve.

The Palm Avenue Connection is no longer required, as the Otay Rio Connection has superseded it in functionality. With exception of the Brown Field Connection, the Otay WTP supplies all of the City of San Diego interconnections.

The District has one existing minor interconnection with Cal-American (Cal-Am) that is capable of supplying this private water company with water. The Cal-Am Connection is located at Otay Valley Road and Rios Avenue within the Central Area System 340 PZ and has a capacity of approximately 1,000 gpm.

The District has one existing interconnection with Mexico (Mexico Connection) that is capable of supplying the City of Tijuana with water. The Mexico Connection is located near the international border east of the Second Border crossing within the Otay Mesa System 870 Pressure Zone and has a capacity of approximately 20.0 cfs (8,976 gpm or 12.9 mgd).

4.3 Potable Water Demands

This section presents the District's historical water deliveries, existing water demands, unit water demands and future demand projections.

4.3.1 Historical Water Deliveries

The District orders potable water through SDCWA up to three times a day, depending on system demands and reservoir levels. The deliveries from SDCWA are recorded at the each of the five FCFs that connect to the District's potable water transmission system. The District's historical annual average day water deliveries, expressed in million gallons per day (mgd) during the calendar years 1980 to 2007 are presented in Table 4-24.

Annual water use increased rapidly in the 1980's due to development but decreased slightly in the early nineties, primarily due to water conservation measures and actions successfully implemented during the California drought. The deliveries from 2000 to 2005 were characterized by tremendous growth throughout the service area, in particular the Central Area. Overall, the District has tripled its water deliveries over the last 25 years. The District currently represents the fastest growing SDCWA member agency and is now second to the City of San Diego in gross water sales.

The District's average annual day and maximum monthly potable water deliveries from 1980 through 2007 are shown in Table 4-24 and graphically represented in Figure 4-4. The average annual increase in potable water deliveries over this 28-year period is 926 AFY.

The District's historic maximum day peaking factors are presented in Figure 4-5. Over the 28-year period, the maximum month average day to annual average day ratio has ranged from a high of 1.7 to a low of 1.3. As shown in Figure 4-5, the value has trended steadily toward 1.4 since 2000. This significant drop in 2007 may be associated with the recycled water connection to the SBWRP which likely decreased potable water delivery during the maximum month period.

4.3.2 Existing Service Area Water Demands

Current water use in the District's five water systems has been evaluated by examining the three years of monthly meter records for each pressure zone; from January 2004 through October 2007. A total of 49,145 water meters were identified within the database. In some instances where only partial year readings are available, assumptions were made to annualize usage based on the number of months available.

Table 4-25 presents average annual consumption by major water system and individual pressure zone. The values exclude water consumption through all non-permanent use meters and other end-delivery facilities such as:

- Temporary construction water meters (representing a fairly high demand on the system during this period)
- Interim or temporary service for a customer or outside agency
- Filling of water tank trucks for construction, dust control, etc.
- Fire hydrant testing or system flushing
- Unmetered or other unbilled water losses.

Table 4-24. Historic SDCWA Water Deliveries[1]

Year	Annual Average Day Delivery (mgd)	Maximum Month Delivery (mgd)	Maximum Month to Average Day Ratio	Annual Increase, %
1980	11.21	17.63	1.57	
1981	12.28	19.18	1.56	10%
1982	10.84	18.45	1.70	-12%
1983	10.19	16.48	1.62	-6%
1984	12.47	17.68	1.42	22%
1985	12.97	19.23	1.48	4%
1986	13.99	20.61	1.47	8%
1987	14.68	20.69	1.41	5%
1988	17.05	23.64	1.39	16%
1989	20.06	27.69	1.38	18%
1990	20.71	27.31	1.32	3%
1991	18.22	23.89	1.31	-12%
1992	19.09	24.81	1.30	5%
1993	19.85	26.79	1.35	4%
1994	20.33	30.29	1.49	2%
1995	18.68	26.70	1.43	-8%
1996	19.42	25.81	1.33	4%
1997	20.01	26.40	1.32	3%
1998	20.70	29.26	1.41	3%
1999	23.70	31.94	1.35	14%
2000	27.63	37.40	1.35	17%
2001	28.23	40.04	1.42	2%
2002	29.51	41.61	1.41	10%
2003	32.61	44.66	1.37	10%
2004	35.73	52.82	1.48	10%
2005	35.32	49.52	1.40	-1%
2006	36.51	51.28	1.40	3%
2007	34.75	45.12	1.26	-2%
28-yr Average			**1.42**	**5%**
1980s			**1.49**	**7%**
1990s			**1.36**	**3%**
(2001-2007)			**1.39**	**5%**

[1] All data based on SDCWA Delivery Log Sheets recorded by OWD staff with the exception of 2002. The data for 2002 was taken from SDCWA Annual Reports.

Figure 4-4. Historic Annual Potable Water Deliveries

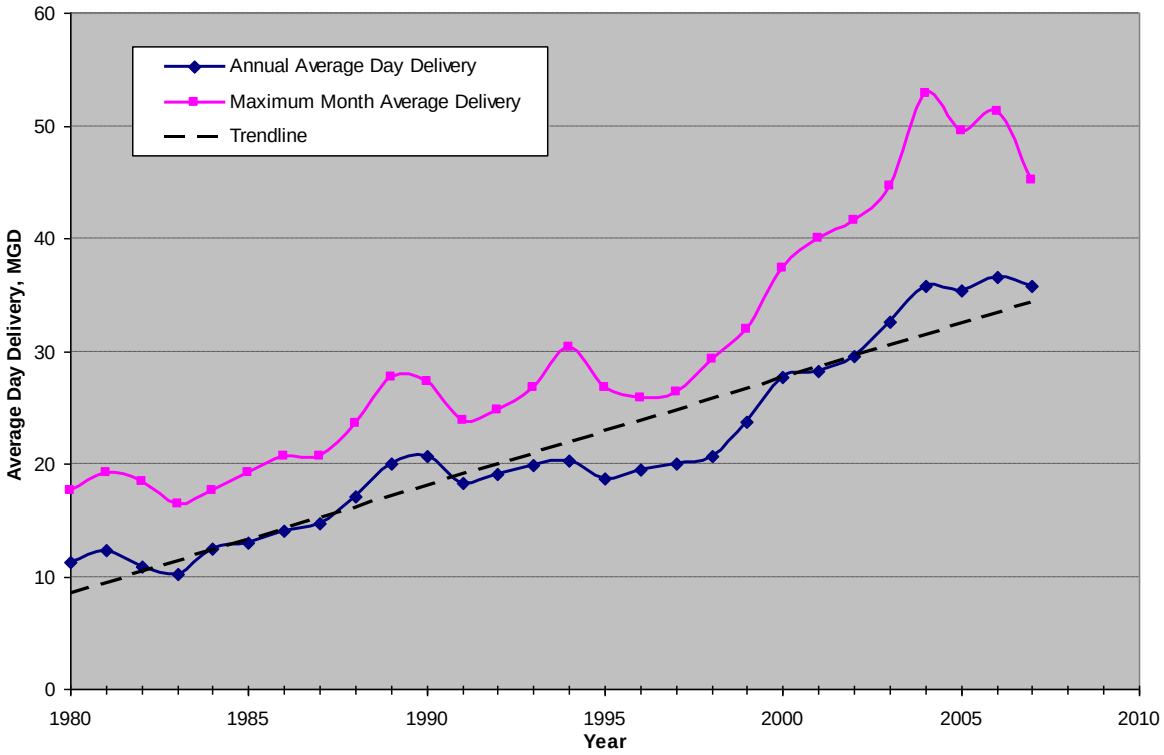


Figure 4-5. Historic Maximum Month Average Day Peaking Factor

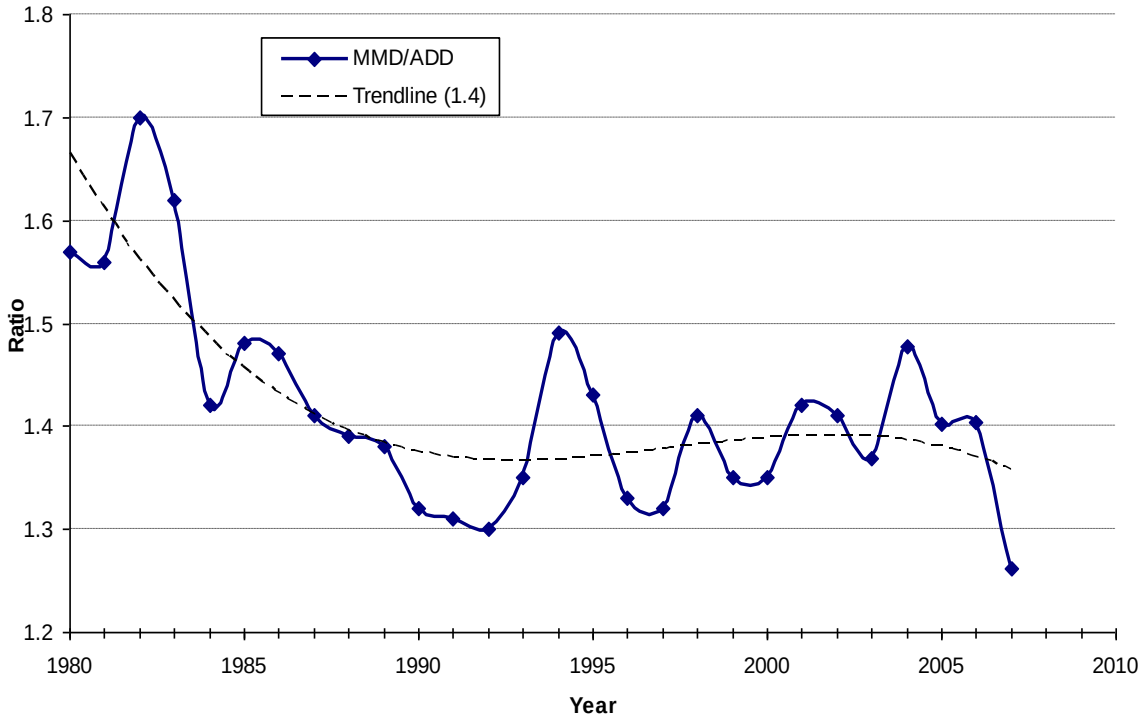


Table 4-25. OWD Potable Water Use by System and Pressure Zone

Water System	Pressure Zone	2002 MP Potable Water Use (mgd)[2]	Average Day Demand (mgd)[1]				% Increase from 2002 MP to 2007 Data
			2004	2005	2006	2007	
North District							
La Presa	451	NA[3]	0.11	0.11	0.10	--	
	640	NA[3]	1.69	1.58	1.65	1.78	
	657	2.22	0.64	0.59	0.62	0.62	
	850	2.40	2.84	2.72	2.84	2.89	
	1004	0.16	0.07	0.07	0.08	0.09	
	1050	NA[3]	0.08	0.06	0.06	0.06	
	Total La Presa System	**4.80**	**5.43**	**5.13**	**5.35**	**5.43**	**13%**
Hillsdale	803	2.32	3.33	2.72	2.70	3.08	
	860	0.03	0.02	0.02	0.02	0.03	
	978	0.91	1.06	1.00	1.13	1.12	
	1200	0.03	0.19	0.17	0.21	0.22	
	Total Hillsdale System	**3.30**	**4.60**	**3.92**	**4.06**	**4.45**	**35%**
Regulatory	520	0.29	0.17	0.16	0.18	0.19	
	832	0.39	0.39	0.36	0.38	0.38	
	944	0.00	0.01	0.01	0.00	0.01	
	1090	0.02	0.02	0.02	0.02	0.02	
	1296	0.57	0.72	0.65	0.70	0.73	
	1485	0.02	0.30	0.28	0.30	0.30	
	1530	0.00	0.03	0.03	0.03	0.03	
	1655	0.25	0.02	0.01	0.02	0.02	
	Total Regulatory System	**1.54**	**1.65**	**1.52**	**1.63**	**1.68**	**9%**
	Total North District	**9.64**	**11.68**	**10.56**	**11.03**	**11.55**	**20%**
South District							
Central Area	340	NA[3]	0.51	0.52	0.53	0.55	
	458	1.52	1.04	1.04	1.12	1.15	
	485	0.58	0.52	0.49	0.51	0.55	
	580	NA[3]	0.05	0.05	0.06	0.10	
	624	3.44	3.32	3.21	3.23	3.25	
	711	3.37	6.39	6.76	7.07	7.37	
	980	2.04	4.29	4.69	6.01	6.01	
	1100	NA[3]	0.00	0.01	0.05	0.07	
	Total Central Area System	**10.95**	**16.12**	**16.78**	**18.59**	**19.06**	**74%**
Otay Mesa	570	0	0.00	0.00	0.00	0.00	
	870	1.86	2.32	2.38	2.56	2.65	
	Total Otay Mesa System	**1.86**	**2.32**	**2.38**	**2.56**	**2.65**	**43%**
	Total South District	**12.80**	**18.44**	**19.16**	**21.15**	**21.70**	**70%**
	OWD TOTAL	**22.44**	**30.12**	**29.72**	**32.19**	**33.26**	**48%**

(1) Average Annual Demands based on OWD billing data. 2007 data based on October 2006 through September 2007.
(2) Meter billing data from June 2000 through May 2001 per 2002 Water Resources Master Plan.
(3) Demands for these individual zones were Not Available (NA) but were included in higher zones in the 2002 Master Plan.

It is estimated that unbilled water amounts to a relatively small percentage of the total system demand. Unbilled water is the total difference between the total CWA delivered water and the total amount billed by the District. Generally unbilled water is associated with leaks, pipeline breaks, illegal connections, and unmetered fires, to name a few. Annual unbilled water loss is presented in Table 4-26. Average unbilled water since 2004 has ranged from about 4 to 10 percent, which is consistent with industry standards.

Table 4-26. Historic Unbilled for Water

Year	CWA Avg Annual Delivery (mgd)[1]	Total Avg Annual Consumption (mgd)	Recycled Water Supplement (mgd)[3]	Unaccounted for Water (mgd)	% Unaccounted For
2004	35.73	30.12	2.17	3.44	10%
2005	35.32	29.72	2.49	3.10	9%
2006	36.51	32.19	2.81	1.52	4%
2007[2]	35.75	33.26	0[4]	2.49	7%

(1) Average annual delivery to OWD and recycled water supplement are taken from daily log sheets recorded by OWD staff.
(2) Total average annual consumption for 2007 was calculated from October 2006 through September 2007.
(3) Recycled water data per production records for the RWCWRF.
(4) Recycled water supplement was not required in 2007.

In May 2007, the District started receiving recycled water from the City of San Diego's South Bay Plant. As a result, the District has not needed to supplement potable water during the summer months to the recycled system. Accordingly, the CWA Average Annual Delivery in 2007 water supply is less than previous years.

4.3.3 Unit Demand Factor Verification

The 2004 to 2007 water meter data was valuable in validating unit water demands by land use and forecasting ultimate water use in the District. Representative sample areas of billing records were reviewed for residential, commercial, industrial and school uses. Based on known dwelling units and land areas, unit water demands were calculated for each category and compared to the 2002 WRMP unit demands. The primary goal of this exercise was to:

- Note any major trends or changes in water use patterns
- Validate the reasonableness of the 2002 WRMP unit demands
- Recommend, if any, changes to the unit water demands

The results of the unit water demand sampling and recommended water duty factors are presented in Table 4-27. The sampled unit water demand included an allowance for recycled water use. It was noted that industrial demands continue to remain lower than the recommended unit demand because of low water use type industrial development (distribution, warehouse, and truck parking). However, it is recommended that the unit demand remain 893 gpd/ac in anticipation of increased development activity on Otay Mesa where truck parking may be replaced with industrial buildings. School sites were found to be highly variable but the unit demands were left unchanged from 2002 WRMP since they make up a small percent of the total demand. Residential use was very consistent when compared to the 2002 WRMP unit

demands. As a result of the analysis it was recommended that similar unit water demands be used to develop the 2009 WRMP Update water demand forecast.

Table 4-27. Water Unit Duty Factors

Land Use Code	Land Use Type	2002 WRMP Unit Demand	Average 2007 Sample Billing Data	Recommended 2009 WRMP Update Unit Demand	Reduction Factor	Adjusted Unit Demand
VL	Very Low Residential (<1 DU/ac)	1,050 gpd/DU	975 gpd/DU	1,050 gpd/DU	1.00	1,050 gpd/DU
L	Low Density Residential (1-3 DU/ac)	850 gpd/DU	475 gpd/DU	850 gpd/DU	1.00	850 gpd/DU
M	Medium-Density Residential (3-8 DU/ac)	500 gpd/DU	453 gpd/DU	500 gpd/DU	0.85	425 gpd/DU
HD	High-Density Residential (>8 DU/ac)	300 gpd/DU	118 gpd/DU	300 gpd/DU	0.85	255 gpd/DU
E	School/Education	1,785 gpd/ac	238 gpd/ac	1,785 gpd/ac	0.80	1,428 gpd/ac
R	Church/Religious Facility	1,785 gpd/ac	495 gpd/ac	1,785 gpd/ac	0.80	1,428 gpd/ac
IRR	Landscaped Areas	2,155 gpd/ac	NA	2,155 gpd/ac	1.00	2,155 gpd/ac
CPF	Community Purpose Facility	893 gpd/ac	602 gpd/ac	893 gpd/ac	0.80	714 gpd/ac
C	Commercial	1,785 gpd/ac	1,197 gpd/ac	1,785 gpd/ac	0.90	1,607 gpd/ac
HP	Hospital/Medical Facility	3,035 gpd/ac	1,507 gpd/ac	3,035 gpd/ac	0.80	2,428 gpd/ac
I	Industrial	893 gpd/ac	611 gpd/ac	893 gpd/ac	0.95	848 gpd/ac

The 2002 WRMP recommended the reduction of potable water demands for certain land use types to account for the use of recycled water for irrigation. Factors, established 2002 WRMP, can be applied to the recommended unit demand factor for each land use to determine a reduced potable water usage. The application of these factors should only be used for areas where recycled water will be used. These factors are also listed in Table 5-9.

4.3.4 Potable Water Demand Projection Methodology

The water demand projection methodology utilizes a component approach. In order to determine future sizes and capacities of water mains, pump stations, reservoirs, and other water system facilities, it is first necessary to determine ultimate water demands. This is most commonly done by applying representative values of water usage to each future land use type based upon the adopted land uses for the area to be served. Future demands were estimated for each of the land use types and then summed to obtain the total demand for the defined pressure zones, culminating in a total demand for the entire planning area. (Creation of a land use and water demand database was performed using the spatial analysis capabilities of ARC/VIEW software as described in Chapter 2.) This particular approach is called the water duty method, the amount of water used in gallons per day per acre (gpd/ac). This approach was used for all future land use types except residential development where a demand per dwelling unit was applied. All other water users including golf courses, schools, jails, prisons, and hospitals have been identified and specific water duty factors were allocated.

Residential water demands are estimated on a per dwelling unit basis to ensure that demand criteria used adequately represent each pressure zone based on actual data for each of the four residential land use categories (very low, low, medium, and high). This method has been chosen because residential land uses represent a substantial percentage of the total service area.

The projected water demand for the planning area at ultimate (2030) development was determined by applying the established water duty factors to proposed land uses. ArcView was used to determine areas for each land use where SAMPs or District projections are not available. These areas were then multiplied by a water duty factor corresponding to the land use type in order to determine 2030 water demands by system and pressure zone. For the intermediate year 2016, any development with a current SAMP was considered substantially complete and a 2 percent increase in demand in the Regulatory System was used for the year 2016 planning horizon.

4.3.5 Summary of Future Water Demands

Table 4-28 presents updated water demand projections for the District at ultimate (assumed year 2030) and for an interim year 2016 condition. The ultimate water demand serves as the basis for pump station and storage sizing. The hydraulic model uses the ultimate demands to size critical transmission facilities. The 2016 water demand estimates are utilized as the basis for the 6-year CIP. Phases have been developed to define specific periods to forecast, plan and budget for anticipated growth within the District. The existing system is defined as Phase I and includes CIP projects currently under construction. Phase II includes anticipated growth through 2016, and Phase III is the ultimate buildout for the District, assumed to occur by year 2030.

A comparison between the 2009 WRMP Update and 2002 WRMP estimates is also included in Table 4-28. The new ultimate water demand projection for the District is approximately 54.35 mgd which is slightly lower than the 55.7 predicted in the 2002 WRMP. Forecasted water demand in portions of the Regulatory System was significantly reduced due to land use changes to open space and serviceability of rural and remote areas. The Sycuan Indian Reservation has been included in the new forecast as they have been incorporated into the District's Area of Influence. The Central Area will continue to have the largest increase in water demand and its update forecast is slightly higher compared to the 2002 WRMP.

4.3.6 Otay Mesa Community Plan Update

The Otay Mesa Community Planning Area (OMCPA) is an area within the City of San Diego encompassing nearly 18,000 acres of partially developed land, a portion of which lies within Otay Water District. The City is currently updating the 1981 Otay Mesa Community Plan and has proposed a number of land use alternatives. These alternatives range in land use from mostly industrial to mixed-use residential and urban center core neighborhoods. The base land use plan for comparison is called the No Project alternative, which is based on the current approved and adopted plan for this area. The *Otay Mesa Community Plan Update Technical Infrastructure Study* was prepared by PBS&J in January 2007 to evaluate the base and proposed land use alternatives and potential impacts to infrastructure serving the plan area.

The OMCPA includes approximately 7,900 acres within the District. However, because the OMCPA lies entirely within the City of San Diego, which is also the land use agency for this area, the City requested that the potable water demands be estimated using the City's *Design Standards*. For the portion of the OMCPA within the District, water demands ranged from 5.0 mgd for the No Project to a maximum of 17.7 mgd for the maximum buildout condition. This 2009 WRMP Update projected ultimate demands for the entire Otay Mesa System (870 PZ) at 8.3 mgd per Table 4-28.

Table 4-28. Water Demand Projections

Water System	Pressure Zone	Existing 2007 ADD (mgd)[1]	Projected 2016 ADD (mgd)		% Growth for Phase II (2016)	Projected Ultimate ADD (mgd)		% Growth for Ultimate
			2002 WRMP	2009 WRMP		2002 WRMP	2009 WRMP	
North District								
La Presa	451[2]	--	--	--		--	--	
	493[3]	--	--	--		--	--	
	640	1.78	2.58	1.78		2.83	2.34	
	657	0.62	0.46	1.27		0.46	0.41	
	850	2.89	2.70	2.89		3.01	3.01	
	1004	0.08	0.42	0.28		0.44	0.45	
	The Pointe Hydro	0.06	0.13	0.13		0.13	0.13	
	Total La Presa System	**5.42**	**6.29**	**6.35**	**17.0%**	**6.87**	**6.35**	**17.0%**
Hillsdale	803	3.08	2.72	3.69		2.82	4.02	
	860	0.03	0.03	0.03		0.03	0.03	
	978	1.12	1.02	1.12		1.04	1.16	
	1200	0.22	0.16	0.22		0.19	0.24	
	Total Hillsdale System	**4.45**	**3.93**	**5.05**	**13.7%**	**4.08**	**5.45**	**22.6%**
Regulatory[4]	520	0.19	0.00	0.19		0.00	0.36	
	832	0.38	0.56	0.39		0.73	0.43	
	944	0.01	0.03	0.01		0.04	0.01	
	1090	0.02	0.12	0.02		0.18	0.04	
	1296	0.73	3.70	0.75		5.26	1.50	
	1485	0.30	0.27	0.30		0.30	0.41	
	1530	0.03	0.04	0.03		0.05	0.04	
	1595	--	--	--		0.60	--	
	1655	0.02	0.04	0.02		0.07	0.09	
	1920	--	--	--		0.19	--	
	Honey Springs	--	--	--		0.07	--	
	Total Regulatory System	**1.68**	**4.76**	**1.71**	**2.0%**	**7.49**	**2.87**	**71.5%**
	Total North District	**11.54**	**14.98**	**13.11**	**13.6%**	**18.44**	**14.67**	**27.1%**
South District								
Central Area	340[5]	--	--	--		--	--	
	458[5]	1.70	1.85	1.70		1.96	2.27	
	485	0.55	0.58	0.55		0.58	0.60	
	580	0.10	--	0.35		--	0.67	
	624	3.25	4.50	3.38		5.33	4.48	
	711	7.37	7.52	9.31		9.92	11.32	
	980	6.01	7.18	7.07		11.27	11.92	
	1100	0.07	0.26	0.13		0.34	0.17	
	Total Central Area System	**19.06**	**21.89**	**22.50**	**18.1%**	**29.40**	**31.42**	**64.9%**
Otay Mesa	570	0.00	0.00	0.00		0.00	--	
	870	2.65	3.42	2.73		7.83	8.26	
	Total Otay Mesa System	**2.65**	**3.42**	**2.73**	**3.0%**	**7.83**	**8.26**	**211.8%**
	Total South District	**21.70**	**25.31**	**25.23**	**16.2%**	**37.23**	**39.68**	**82.5%**
	OWD TOTAL	**33.25**	**40.29**	**38.34**	**15.3%**	**55.67**	**54.35**	**63.5%**

(1) Existing 2007 demands are based on OWD billing data (October 2006 through September 2007).
(2) The 451PZ has been converted to the 640PZ.
(3) The 493PZ demands are included in the 640PZ.
(4) 2016 demand projections for the Regulatory System were assumed using an anticipated growth rate of 2% based on meter sales projections from OWD.
(5) The 340 PZ demands are included in the 458 PZ.

For purposes of this Master Plan, the approved and adopted land uses were primarily used to evaluate the District's existing and proposed infrastructure. Anticipated demand for Otay Crossings Commerce Park, 3rd Border Crossing, and Corrections Corporation of America were also incorporated based on Draft SAMPs submitted to the District. Based on the findings in the January 2007 report, no new major facilities would be required to serve the additional demands projected by the different land use alternatives. Further analysis will be required for this area once a land use alternative is adopted by the City of San Diego. The City intends to have a new adopted Community Plan sometime in late 2009 or early 2010.

4.4 Hydraulic Model Development and Analysis

The purpose of this section is to describe the development of a new GIS-based hydraulic model of the District's existing and future water systems. The new InfoWATER Model (by MWHSoft) was used to evaluate the existing water system and determine CIP projects throughout the service area based on planning criteria and growth forecasts.

4.4.1 2002 WRMP Hydraulic Models

All hydraulic models used in the 2002 WRMP were created using the software H_2OMAP (by MWHSoft). Each of the District's three potable water system models (North, Central, and South) was created separately, as well as one for the entire recycled water system. Also, separate models were created for the existing and ultimate conditions for each system, resulting in numerous models to manage. With the new InfoWATER modeling software, managing these scenarios is more easily streamlined. For the 2009 WRMP Update, one model was created for the potable water system and a second for the recycled water system. Each model contains existing and future analyses. The 2002 WRMP models were reviewed and the following was noted: 1) the models had not been updated for a number of years, 2) the models were not created using the District's GIS data, and 3) the models were not necessarily accurate representations of the District's systems. However, the 2002 WRMP models were used to obtain and review set points for pumps and control valves and other operational settings, as well as pump curves and diurnal patterns. The old models also helped answer connectivity questions and identify pressure zone boundaries and closed valves.

4.4.2 2009 WRMP Update Hydraulic Model Development

New hydraulic models for the potable and recycled water systems were developed using the District's GIS database as the source information for pipes, junctions, valves, pumps and tanks using the modeling software InfoWATER. Relevant information such as diameter, length, material, installation year, pressure zone, and reference drawing number was included in the model and entered by hand where necessary for all facilities. Node elevations were obtained from GIS topography using contours provided by the District. Storage tanks were annotated with capacity, high water level (HWL), diameter, and height. Pressure reducing valve set points, pump station controls, and other operational settings were obtained from District engineering and operations staff through workshops, existing hydraulic models and detail review of computerized system operational data information. Locations of closed valves were confirmed using the District's as-built drawing information and meetings with District operations staff.

Detailed hydraulic computer models are required to analyze the complex operation of the District's water systems. The steps of model formulation include obtaining the system's physical data, translating the physical data into a network of nodes and links, determining pressure zone boundaries, inputting accurate water demands, and calibrating the model to match the District's operational field data.

The computer model includes all the major transmission and distribution mains 8-inches in diameter and larger and 6-inch mains where they complete a loop. The District's GIS data also notes those pipes and facilities that are existing and future. The model was developed such that these facilities are identified; future facilities will not be modeled with the existing system.

The hydraulic software InfoWATER was utilized throughout the model development, calibration, and analysis of the District's systems. This software has the capability to read directly from GIS data in order to create the necessary facilities for the model. All relevant information was pulled directly from the GIS, rather than having to digitize and input by hand. In addition, this software allows for more efficient future model updates from GIS data as the District continues to build out. One critical aspect is that the GIS and model must maintain a "one-to-one" relationship with any features used to build the model. Training of District personnel is essential to maintaining the GIS and hydraulic models.

Once the network and facility data were validated, the hydraulic models were populated with existing and future average demands for each parcel within the District's water service area.

Existing System Model Basis

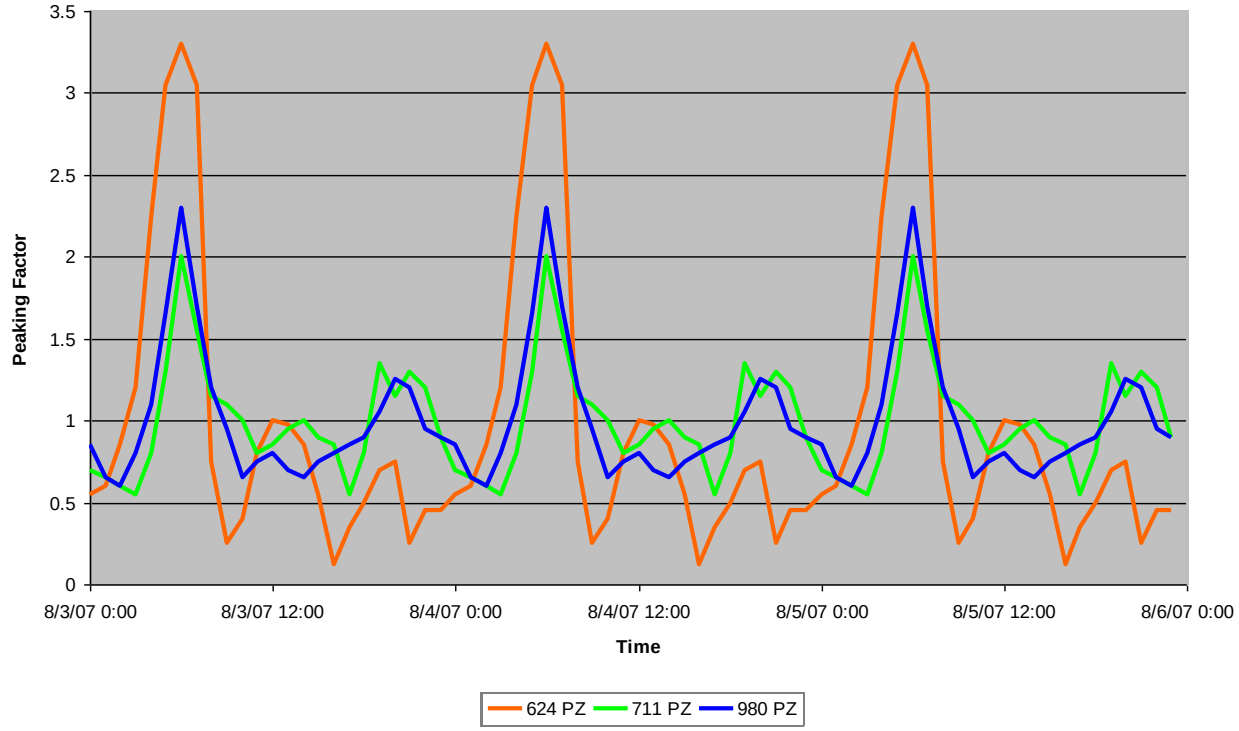
The existing potable water hydraulic model is based on the District's GIS updates as of September 1, 2007. This GIS data was further updated as part of the 2009 WRMP Update to adequately document normally closed valves, pressure zone boundaries, and pump station and reservoir piping. The updates were closely coordinated with the District's GIS department, as each facility update will become a part of the District's updated GIS database.

Model Calibration

Once the hydraulic model was developed, a "macro" calibration approach was performed, which compares field data over an extended period of time to the model. The first stage to developing a macro-calibrated model is to obtain current Supervisory Control and Data Acquisition (SCADA) information from the District. This real-time field data, such as reservoir trends, SDCWA water deliveries, and pump station flows, was collected over a 3-day period from August 3 through August 5, 2007. This period included the peak day on the maximum demand month for the 2007 calendar year. Reservoir levels and pump station operations were analyzed to determine the diurnal demand patterns for several areas within the District's system. Each individual pressure zone was analyzed at hourly increments to determine net changes in storage and pumped flows to estimate change in water demand. The diurnal patterns that were produced from this effort were then compared against those used in the 2002 WRMP. Figure 4-6 is an example of diurnal patterns developed for the three major pressure zones within the Central Service Area. These particular patterns show that the minimum daily flow is approximately 50 to 60 percent of the average daily demand, while the peak for the 980 PZ is nearly 2.4 times the average day demand for that specific day. Assuming a maximum day

peaking factor of about 1.7, this would equate to a peak hour factor of about 4.1. Diurnal patterns for other pressure zones are included in Appendix B-1.

Figure 4-6. Time of Day Diurnal Pattern



Diurnal demand patterns, initial tank levels, and pump operations were then input into the hydraulic model to determine an analytical baseline. During macro calibration it is possible to find areas that require further analysis, in which case special equipment can be set up in the field to test flows and pressures at different times. This process can often identify problem areas in the field, such as partially closed valves, leaking pipes, or other areas of concern. The more the model can reasonably simulate actual field conditions, the more accurate the results are. For this 2009 WRMP Update, no field analysis was required. The availability of SCADA data and knowledge of Operations staff was sufficient to macro-calibrate the model to a reasonable level of confidence. A matrix was developed to summarize the level of confidence in the model's ability to simulate actual conditions. Table 4-29 presents the level of confidence for each modeled pressure zone based on a range from low (1.0) to high (3.0). Additional model calibration information, such as tank levels and pump station operations, is included in Appendix B-2.

As noted in Table 4-29, many areas within the model produced excellent results, matching the SCADA data observed for those days. Figures 4-7 and 4-8 show the calibrated model results for the 980 reservoirs and 980-2 PS, respectively, which closely matched the SCADA field data. Lower levels of confidence were observed in the 803 and 1485 PZs and these areas are recommended for further study and field testing.

Table 4-29. Potable Water Model Level of Confidence[1]

Pressure Zone	Facility	Reservoir/Tank[2]		Pumping[3]		Level of Confidence[4]
		Model Trend	SCADA Match	Flow	Time	
340[5]	NA	NA	NA	NA	NA	NA
451	NA	NA	NA	NA	NA	NA
458	458-1 Res	3	1.5	NA	NA	2.25
	458-2 Res	3	1.5	NA	NA	Moderately High
485	485-1 Res	1	1	NA	NA	1
520	520-2 Res	2	2	NA	NA	2.00
	520-3 Res	2	2	NA	NA	Moderate
570	570-1 Res	3	3	NA	NA	3
624	624-1 Res	2	1.5	NA	NA	1.83
	624-2 Res	2	2	NA	NA	
	624-3 Res	1.5	2	NA	NA	Low-Moderate
657	657-1 Res	3	2	NA	NA	2.5
	657-2 Res	3	2	NA	NA	
	657-1 PS[5]	NA	NA	--	--	High
711	711-1 Res	3	3	NA	NA	2.75
	711-2 Res	3	3	NA	NA	
	711-3 Res	3	3	NA	NA	
	711-1 PS	NA	NA	2	2	High
803	803-2 Res	1.5	1.5	NA	NA	1.63
	803-3 Res	2	2	NA	NA	
	803-4 Res	1	1	NA	NA	
	803-1 PS	NA	NA	2	2	Low
832	832-1 Res	2.5	2	NA	NA	2.25
	832-2 Res	2.5	2	NA	NA	
	832-1 PS	NA	NA	2.5	2	Moderately High
850	850-2 Res	3	2.5	NA	NA	2.7
	850-3 Res	3	2.5	NA	NA	
	850-4 Res	3	2.5	NA	NA	
	850-1 PS[5]	NA	NA	NA	NA	High
	850-2 PS	NA	NA	2	3	
860	860-1 PS					
870	870-1 Res	3	3	NA	NA	3
	870-1 PS[5]	NA	NA	NA	NA	
944	944-1 Res	3	3	NA	NA	2.83
	944-2 Res	3	3	NA	NA	
	944-1 PS	NA	NA	2.5	2.5	High
978	978-1 Res	3	2	NA	NA	2.4
	978-2 Res	3	2	NA	NA	
	978-1 PS	NA	NA	2.5	2	Moderately High
980	980-1 Res	3	3	NA	NA	3
	980-2 Res	3	3	NA	NA	
	980-1 PS	NA	NA	NA	NA	
	980-2 PS	NA	NA	3	3	
1004	1004-1 Res	3	3	NA	NA	3
	1004-1 PS	NA	NA	3	3	

Pressure Zone	Facility	Reservoir/Tank[2]		Pumping[3]		Level of Confidence[4]
		Model Trend	SCADA Match	Flow	Time	
1050	1050-1 PS[6]					
1090[5]	1090-1 Res	--	--	NA	NA	
	1090-1 PS	NA	NA	--	--	
1200	1200-1 Res	3	3	NA	NA	2.875
	1200-1 PS	NA	NA	2.5	3	High
1296	1296-1 Res	3	3	NA	NA	3
	1296-2 Res	3	3	NA	NA	
	1296-1 PS	NA	NA	3	3	
1485	1485-1 Res	2	2	NA	NA	1.67
	1485-2 Res	2	2	NA	NA	
	1485-1 PS	NA	NA	1	1	Low
1530	1530-1 PS[6]					
1655	1655-1 PS[6]					

(1) Facilities as of September 2007.
(2) Tanks must show a repeating trend over the course of the calibration period. That trend was then rated on how well it matched the SCADA information.
(3) Rates how well the total flow and duration of pumping matched the SCADA information.
(4) Rated Level of Confidence in that system = < 1.75 : Low ; 1.75 to 2.4 Moderate ; > 2.4 High
(5) SCADA information was not available.
(6) Hydropneumatic zones were not modeled. Demands were included in the lower zone.

Existing System Model Results

The calibrated model, since it reflected maximum day, was used to analyze the District's existing system to determine areas of deficiencies based on District planning criteria. The results of the model show that the District's system has sufficient transmission and pumping capacity to serve existing demands. Existing storage deficiencies could also be credited to other pressure zones until new reservoirs can be constructed.

District Operations staff had noted that during peak morning demands when the 980-2 PS is off, the 980 PZ experiences large pressure drops. The calibrated existing hydraulic model was used to accurately simulate this condition due to the high level of confidence in the model accuracy for this area. The drop in pressure was then attributed to the outlet piping constraint at the 980 Reservoir site and the cycle status of the tanks. There is currently only a single 30-inch line feeding the 980 PZ from these tanks, where originally there was a parallel 20-inch. The 20-inch line has since been converted to the recycled water system and is no longer of benefit to the 980 PZ.

Ultimate Model Results

The ultimate model of the District was based on the calibrated existing system, demands projected in Section 4.3.5, projects currently in various levels of design and construction, and the completion of CIP Projects as provided by the District. The need for these CIP projects and their timing were verified using the hydraulic model, input from District staff, and knowledge of planned development timing as discussed in Section 4.3.5. Overall, the model shows that the District will have sufficient storage, pumping, and transmission capacity to serve its customers at ultimate buildout conditions based on the planned CIP projects.

Figure 4-7. 980 Reservoir Model Trending Results v. SCADA

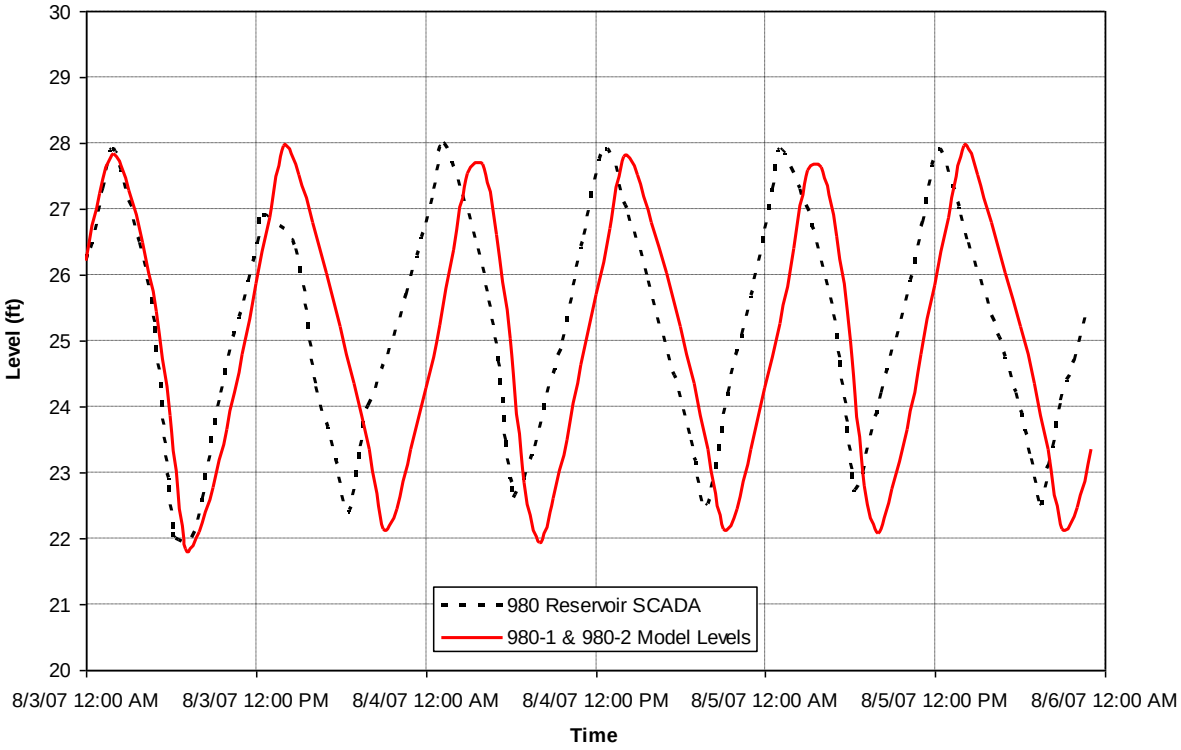
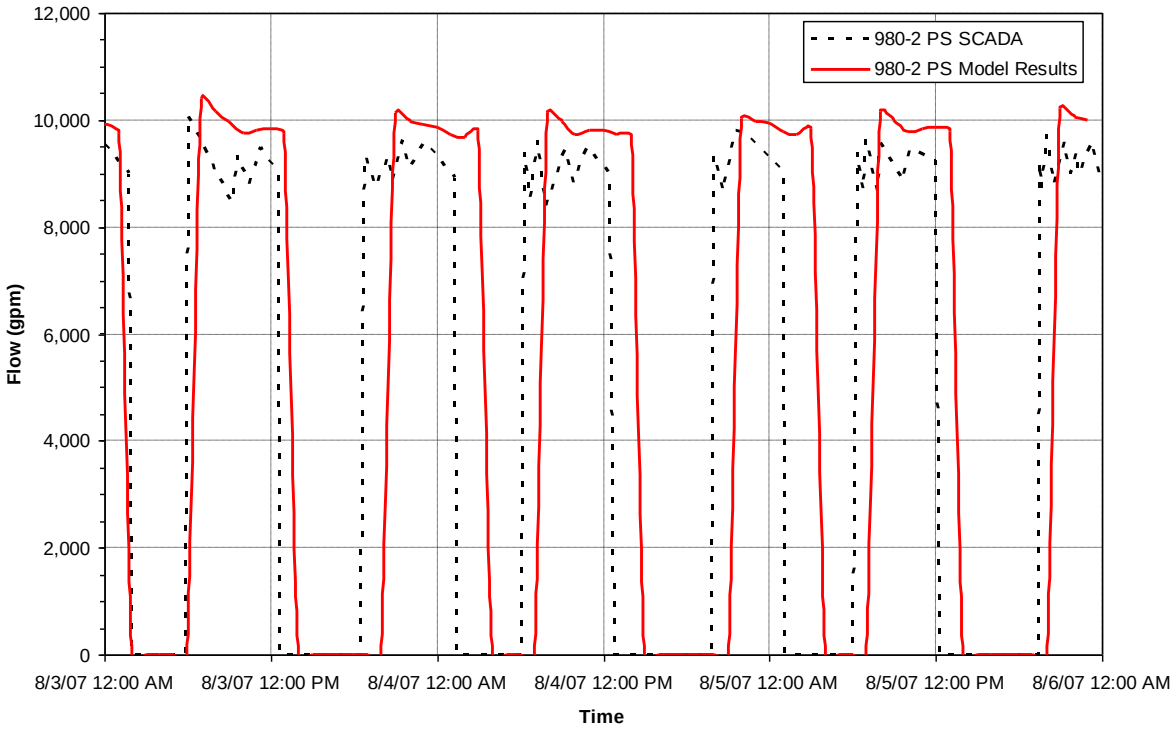


Figure 4-8. 980-2 Pump Station Model Results v. SCADA



4.5 Storage and Pumping Analysis

This section presents the potable water system capacity analysis and identifies any deficiencies in the existing water storage and pumping systems. In addition, future analyses were conducted to identify phased CIP projects. Specific phases have been developed to be able to forecast, plan and budget for anticipated growth within the District. The existing system is defined as Phase I. Phase II includes growth through 2016, and Phase III is the ultimate buildout for the District.

4.5.1 Existing Water System (Phase I)

Total operational storage and pumping requirements are calculated based on the planning criteria outlined in Section 4.2.5 and Table 4-18.

Storage Analysis

The storage calculations for supplying primary pressure zones include the secondary pressure zone demands served by pressure reducing stations and hydropneumatic pump stations. Tables 4-30 and 4-31 present the reservoir storage balance calculations for the operational storage required for existing capacity for each system for the North and South District, respectively.

The storage analysis shows that several pressure zones have storage deficiencies. However, the District will allow deficiencies to be mitigated by excess storage in a neighboring zone. As shown in Table 4-30, the North District, overall, has a surplus storage of 23.3 mg. It should be noted that at the time of the model calibration and analysis, the 640-1 and 640-2 reservoirs were in construction and not included in the operational and emergency storage calculations for the North District. The La Presa 657 and 1004 PZs both show deficiencies that can be mitigated by the available 520 Regulatory storage. These reservoirs also mitigate the deficient storage for the 1090 and 1296 PZs within the Regulatory System.

As shown in Table 4-31, the South District, overall, has a surplus storage of 68 mg. However, the South District also has several zones that are deficient under existing demands. Currently this storage deficit could be made up by the 624 Reservoirs, but requires the use of a portion of the emergency volume in the 624-3 Reservoir.

The largest deficiency currently exists in the 980 PZ. Since this is one of the highest growth areas in the District, it is recommended that new storage be immediately planned to correct this deficiency. A new 980-3 Reservoir is proposed on the same site as the existing 980-1 and 980-2 Reservoirs. Further discussion is provided in Section 4.6.1.

Pump Station Capacity Analysis

The pumping calculations for supplying primary pressure zones are cumulative and include demands for the direct pumped zone and all zones above. Capacity requirements are based on the planning criteria in Table 4-18. Table 4-32 and 4-33 present the pump station capacity analysis for the existing system for the North and South Districts, respectively.

Table 4-30. Existing Storage Balance – North District

Pressure Zone	Facility ID (Name)	Year Built	Material	Existing Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[11]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
La Presa System															
451	451-1 (1-2 Res.)[1]	1959	Steel	--	--	--	--	--	0.0 mg	--	--	--	0.00 mg	0.00 mg	0.00 mg
640[6]	640-1	2008	Concrete	1,237	1.78	2.25	2,473	4.01	10.0 mg	1.20 mg	1.50 mg	4.01 mg	6.71 mg	0.00 mg	0.00 mg
	640-2	2008	Concrete						10.0 mg						
657	657-1 (1-1 Res.)[2]	1957	Steel	429	0.62	2.51	859	1.55	1.0 mg	0.47 mg	0.18 mg	1.55 mg	2.20 mg	(0.36) mg	0.00 mg
	657-2 (1-1A Res.)	1990	Steel						0.8 mg						
850[3,7]	850-1 (1-5 Res.)	1959	Steel	2,046	2.95	2.14	4,091	6.30	1.1 mg	1.89 mg	0.63 mg	6.30 mg	8.83 mg	(1.61) mg	0.00 mg
	850-2 (20-1 Res.)	1976	Steel						3.1 mg						
	850-3 (20-2 Res.)	1984	Steel						3.0 mg						
	850-4 (in construction)	2008	Steel						--						
1004	1004-1 (1-4 Res.)[2]	1959	Steel	54	0.08	3.00	109	0.23	0.0 mg	0.07 mg	0.30 mg	0.23 mg	0.60 mg	0.80 mg	0.00 mg
	1004-2 (Dictionary Hill Res.)	2004	Steel						1.4 mg						
Total La Presa				**3,766**	**5.4**				**30.5 mgd**	**3.63 mg**	**2.61 mg**	**12.10 mg**	**18.3 mgd**	**(1.17) mg**	**0.00 mg**
Hillsdale System															
803[4,8]	803-1 (Vista Granda Res.)[2]	1959	Steel	2,155	3.10	2.11	4,310	6.5	0.0 mg	1.96 mg	1.50 mg	6.55 mg	10.01 mg	(0.10) mg	0.00 mg
	803-2 (20-3 Res.)	1979	Steel						2.0 mg						
	803-3 (Singing Hills Res.)	1986	Steel						2.2 mg						
	803-4 (Vista Grande Res.)	2006	Steel						5.8 mg						
978[8]	978-1 (3-2 Res.)	1959	Steel	778	1.12	2.33	1,555	2.61	0.5 mg	0.78 mg	0.24 mg	2.61 mg	3.63 mg	(0.60) mg	0.00 mg
	978-2 (Filiponi Res.)	1992	Rec. Conc.						2.5 mg						
1200[8]	1200-1 (Grant Res.)	1996	Steel	154	0.22	2.76	308	0.61	1.0 mg	0.18 mg	0.24 mg	0.61 mg	1.04 mg	(0.04) mg	0.00 mg
Total Hillsdale System				**3,087**	**4.4**				**13.9 mgd**	**2.93 mg**	**1.98 mg**	**9.77 mg**	**14.7 mgd**	**(0.74) mg**	**0.00 mg**

Pressure Zone	Facility ID (Name)	Year Built	Material	Existing Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[11]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
Regulatory System															
520[7,8]	520-1 (Regulatory Res.)[2]	1962	Concrete	130	0.19	2.78	261	0.52	0.0 mg	0.16 mg	1.50 mg	0.52 mg	2.18 mg	22.92 mg	20.02 mg
	520-2 (Regulatory Res.)	1983	Steel						5.1 mg						
	520-3 (Regulatory Res.)	1992	Rec. Conc.						20.0 mg						
832[9]	832-1 (2-1 Res.)	1962	Concrete	264	0.38	2.58	529	0.98	0.9 mg	0.29 mg	0.90 mg	0.98 mg	2.18 mg	0.65 mg	0.44 mg
	832-2 (2-1A Res.)	1991	Steel						2.0 mg						
944[10]	944-1 (9-1 Res.)	1962	Steel	4	0.01	3.00	9	0.02	0.3 mg	0.01 mg	0.90 mg	0.02 mg	0.93 mg	2.46 mg	2.46 mg
	944-2 (9-1A Res.)	1992	Steel						3.1 mg						
1090[9]	1090-1 (2-2 Res.)	1962	Concrete	15	0.02	3.00	30	0.07	0.5 mg	0.02 mg	0.60 mg	0.07 mg	0.69 mg	(0.22) mg	0.00 mg
1296[5,10]	1296-1 (9-2 Res.)	1962	Steel	542	0.78	2.49	1,084	1.94	1.0 mg	0.58 mg	1.50 mg	1.94 mg	4.03 mg	(1.00) mg	0.00 mg
	1296-2 (9-2A Res.)	1991	Steel						2.0 mg						
1485	1485-1 (9-3 Res.)	1962	Steel	207	0.30	2.63	414	0.78	0.3 mg	0.24 mg	0.18 mg	0.78 mg	1.20 mg	0.41 mg	0.41 mg
	1485-2 (9-3A Res.)	2006	Steel						1.3 mg						
Total Regulatory System				**1,163**	**1.7**				**36.4 mgd**	**1.29 mg**	**5.58 mg**	**4.32 mg**	**11.2 mgd**	**25.24 mg**	**23.33 mg**
Total North District				**8,016**	**11.5**				**80.8 mgd**	**7.9 mg**	**10.2 mg**	**26.2 mg**	**44.2 mgd**	**23.33 mg**	**23.33 mg**

(1) Demolished. Storage for this system is included in the 640 Pressure Zone.
(2) Demolished.
(3) Includes demands for the 1050 The Pointe hydro system.
(4) Includes demands for the 860 Cottonwood hydro system.
(5) Includes demands for the 1530 Vista Diego and 1655 Rancho Jamul hydro systems.
(6) 640 reservoirs are currently in construction. Demands for the 640 PZ, which includes the reduced 493 PZ, are currently served directly by the CWA system. Not in service during system calibration.
(7) Storage deficit for the 850 PZ included in the 520 reservoirs.
(8) Storage deficit for the Hillsdale System included in the 520 reservoirs.
(9) Storage deficit for the 1090 PZ included in the 832 reservoirs.
(10) Storage deficit for the 1296 PZ included in the 944 reservoirs.
(11) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.

Table 4-31. Existing Storage Balance – South District

Pressure Zone	Facility ID (Name)	Year Built	Material	Existing Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[1]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
Central System															
458[2,5]	458-1 (10-1 Res.)	1964	Steel	1,181	1.70	2.27	2,361	3.86	0.8 mg	1.16 mg	1.50 mg	3.86 mg	6.52 mg	(3.95) mg	0.00 mg
	458-2 (10-2 Res.)	1967	Steel						1.8 mg						
485[6]	485-1 (22-2 Res.)	1983	Steel	384	0.55	2.52	768	1.39	1.0 mg	0.42 mg	1.50 mg	1.39 mg	3.31 mg	(2.31) mg	0.00 mg
624[5,6,7]	624-1 (Patzig Res.)	1999	Earth. Emb.	2,260	3.25	1.85	4,520	6.02	12.4 mg	1.81 mg	1.50 mg	6.02 mg	9.33 mg	41.20 mg	28.00 mg
	624-2 (22-3 Res.)	1988	Steel						8.1 mg						
	624-3 (EastLake Res.)	1997	Rec. Conc.						30.0 mg						
711[3,7]	711-1 (22-1 Res.)	1976	Steel	5,187	7.47	1.90	10,375	14.19	3.1 mg	4.26 mg	1.50 mg	14.19 mg	19.95 mg	1.45 mg	1.45 mg
	711-2 (22-1A Res.)	1993	Steel						2.3 mg						
	711-3 (22-1B Res.)	2002	Earth. Emb.						16.0 mg						
980[4,7]	980-1 (22-4 Res.)	1985	Steel	4,221	6.08	1.96	8,441	11.91	5.0 mg	3.57 mg	1.50 mg	11.91 mg	16.99 mg	(6.95) mg	0.00 mg
	980-2 (22-5 Res.)	1989	Steel						5.0 mg						
Total Central System				**13,233**	**19.06**				**85.5 mg**	**11.21 mg**	**7.50 mg**	**37.38 mg**	**56.09 mg**	**29.45 mg**	**29.45 mg**
Otay Mesa System															
571	571-1 (Roll Res.)	1993	Earth. Emb.	0	0.00	3.00	0	0.00	36.7 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg	36.72 mg	36.72 mg
870	870-1 (Upper Res.)	1993	Earth. Emb.	1,839	2.65	2.20	3,678	5.83	11.0 mg	1.75 mg	1.50 mg	5.83 mg	9.07 mg	1.91 mg	1.91 mg
Total Otay Mesa System				**1,839**	**2.65**				**47.70 mg**	**1.75 mgd**	**1.50 mgd**	**5.83 mgd**	**9.07 mgd**	**38.63 mgd**	**38.63 mgd**
Total South District				**15,072**	**21.7**				**133.24 mg**	**12.96 mgd**	**9.00 mgd**	**43.21 mgd**	**65.17 mgd**	**68.07 mgd**	**68.07 mgd**

(1) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.
(2) Includes demands for the 340 reduced system.
(3) Includes demands for the 580 reduced system.
(4) Includes demands for the 1100 hydro system.
(5) Storage deficit for 458 PZ included in the 624-1 reservoir.
(6) Storage deficit for 485 PZ included in the 624-2 reservoir.
(7) Storage deficit for 711 and 980 PZs included in the 624-3 reservoir.

Table 4-32. Existing Pump Station Capacity Analysis – North District[1]

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		Zone Average Annual Demand	Max Day Demand[5]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
La Presa System								
657-1[2]	1	600	0.86	600	0.86	429	1,078	(478)
	2	850	1.22					
850-1[2]	1	800	1.15	2,400	3.46	2,046	4,378	1,622
	2	800	1.15					
	3	800	1.15					
	4	800	1.15					
850-1 Booster[2]	1	3,200	4.61	--	--			
850-2	1	2,000	2.88	6,000	8.64			
	2	2,000	2.88					
	3	2,000	2.88					
	4	2,000	2.88					
	5[3]	--	--					
1004-2	1	500	0.72	1,000	1.44	54	163	837
	2	500	0.72					
	3	500	0.72					
1050 - Pointe Hydro	1	240	0.35	240	0.35	41	122	118
	2	240	0.35					
	3[4]	1,500	2.16					
Hillsdale System								
803-1	1	2,600	3.74	10,400	14.98	3,087	6,328	4,072
	2	2,600	3.74					
	3	2,600	3.74					
	4	2,600	3.74					
	5	2,600	3.74					
	6[3]	--						
978-1	1	850	1.22	2,250	3.24	932	1,221	1,029
	2	850	1.22					
	3	700	1.01					
	4	700	1.01					
1200-1	1	500	0.72	1,000	1.44	154	425	575
	2	500	0.72					
	3	500	0.72					
Cottonwood Hydro (860)	1	100	0.14	100	0.14	17	52	48
	2	100	0.14					
Regulatory System								
832-1	1	2,600	3.74	5,200	7.49	1,033	2,366	2,834
	2	2,600	3.74					
	3[3]	--	--					
	4[3]	--	--					
	5[3]	--	--					
	6	2,600	3.74					

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		Zone Average Annual Demand	Max Day Demand[5]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
1090-1	1	280	0.40	280	0.40	15	45	235
	2	280	0.40					
944-1	1	770	1.11	3,540	5.10	754	1,794	1,746
	2	770	1.11					
	3	2,000	2.88					
	4	2,000	2.88					
1296-1	1	2,000	2.88	3,300	4.75	749	1,783	1,517
	2	650	0.94					
	3	650	0.94					
	4[3]	--	--					
	5	2,000	2.88					
1485-1	1	430	0.62	860	1.24	207	544	316
	2	430	0.62					
	3	430	0.62					
Rancho Jamul Hydro (1655)	1	350	0.50	620	0.89	13	39	581
	2	350	0.50					
	3	230	0.33					
	4	40	0.06					
Vista Diego Hydro (1530)	1	260	0.37	260	0.37	21	62	198
	2	260	0.37					
	3	1,100	1.58					

(1) Facilities as of September 2007.
(2) The La Presa PS is to be demolished. The existing 657 PZ partially served via connections to 36-inch from Otay 11 FCF.
(3) Space provided for an additional pump if needed.
(4) Fire service pump only.
(5) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

Table 4-33. Existing Pump Station Capacity Analysis – South District[1]

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		Zone Average Annual Demand	Max Day Demand[5]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
Central Area								
711-1	1	4,000	5.76	16,000	23.04	5,187	9,856	6,144
	2	4,000	5.76					
	3	4,000	5.76					
	4	4,000	5.76					
	5	4,000	5.76					
980-1[2]	1	4,000	5.76	8,000	11.52	4,221	8,273	14,527
	2	4,000	5.76					
	3	4,000	5.76					
980-2	1	5,700	8.21	22,800	10.032			
	2	5,700	8.21					
	3	5,700	8.21					
	4	5,700	8.21					
	5	5,700	8.21					
Rolling Hills Ranch Hydro (1100)	1	250	0.36	1,100	1.58	47	142	958
	2	850	1.22					
	3[3]	1,750	2.52					
Otay Mesa								
870-1	1	2,300	3.31	13,400	19.30	1,839	4,046	9,354
	2	2,300	3.31					
	3	4,400	6.34					
	4	4,400	6.34					
	5	4,400	6.34					
571-1	1	6,850	9.86	13,700	19.73	1,839	4,046	9,654
	2	6,850	9.86					
	3	6,850	9.86					
Temporary LOPS[4]	1	13,900	20.02	13,900	9.65	--	--	--

(1) Facilities as of September 2007.
(2) 980-1 PS for emergency only. Used as a backup to the 980-2 PS. No 980 PZ pumping capacity is included in the 711-1 PS.
(3) Pump provided for fire service only.
(4) Temporary Lower Otay PS to be replaced with a permanent station in the future.
(5) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

As shown in Tables 4-32 and 4-33, the existing pumping systems have adequate capacity to meet existing system conditions. The District has been prudent in designing and constructing pump stations with sufficient capacity to accommodate growth.

4.5.2 Phase II (2016) Water System Analysis

The Phase II water system was developed and analyzed based on projected water demands for 2016, presented in Table 4-28, and their locations within the District. These demands were used to analyze the storage and pumping facilities within the District. Tables 4-34 and 4-35 present the Phase II water storage balance for the North and South Districts, respectively.

Storage Analysis

The storage analysis for the North District shows that the 657, 803, 978, 1200 and 1655 PZs have storage deficiencies per the District's planning criteria. The storage deficiency for the 657 reservoirs will be mitigated through additional interconnects to the District's 36-inch pipeline from the Otay 11 FCF. The Hillsdale System (803, 978, and 1200 PZs) is deficient by nearly 2.7 mg, which has assumed credit in the 520 reservoirs. Phase II includes the storage for the 10.0-mg 640-1 operational reservoir, which will serve a large portion of the La Presa System, thus reducing the operational storage requirements for the 520 reservoirs. The 10.0-mg 640-2 reservoir is considered emergency storage and is not considered in the total surplus for the North District. In addition, during Phase II the 20.0-mg 520-3 Reservoir will primarily be used for emergency and pump storage and will not contribute to the total storage volume for the North District. With the credit adjustments and completion of the 850-4 reservoir, the North District overall has a storage surplus of 6.9 mg for the Phase II condition.

The South District has several zones that are deficient under the District's planning criteria. The proposed 13.0-mg 980-3 reservoir will primarily mitigate the operational storage requirement for the 980 PZ and allow the entire storage of the 624-3 reservoir to be used for emergency storage while still meeting the required storage for the South District. By increasing storage in the 980 PZ, the Central System will maintain a storage surplus through Phase II.

Pump Station Capacity Analysis

The pump station capacity analysis was conducted for the Phase II demand condition. Since the existing (Phase I) system had numerous pump stations with excess capacity, no major upgrades are anticipated for Phase II. Table 4-36 and 4-37 present the pumping conditions for the Phase II (2016) system. As expected, the Phase II demands can be met with the existing pumping system. The temporary Lower Otay PS (LOPS) is currently planned to be replaced with a permanent station with an initial firm capacity of 9,000 gpm. This improvement is discussed further in Section 4.6.2.

The 2002 WRMP included several pump station upgrades that were proposed for the North District during Phase II. However, based on the revised land uses and demands for this area, these upgrades are no longer necessary. These projects are discussed further in Section 4.6.2 and in Chapter 6.

Table 4-34. Phase II (2016) Storage Balance – North District

Pressure Zone	Facility ID (Name)	Year Built	Material	2016 Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[10]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
La Presa System															
640[2,7]	640-1 (operational)	2008	Concrete	1,237	1.78	2.26	2,473	4.02	10.0 mg	1.21 mg	1.50 mg	4.02 mg	6.73 mg	3.27 mg	3.27 mg
	640-2 (emergency)	2008	Concrete						10.0 mg						
657	657-1 (1-1 Res.)	1957	Steel	884	1.27	2.31	1,769	2.94	1.0 mg	0.88 mg	0.18 mg	2.94 mg	4.00 mg	(2.16) mg	(2.16) mg
	657-2 (1-1A Res.)	1990	Steel						0.8 mg						
850[3,7]	850-1 (1-5 Res.)	1959	Steel	2,098	3.02	2.14	4,196	6.46	1.1 mg	1.94 mg	0.63 mg	6.46 mg	9.03 mg	0.39 mg	0.39 mg
	850-2 (20-1 Res.)	1976	Steel						3.1 mg						
	850-3 (20-2 Res.)	1984	Steel						3.0 mg						
	850-4	2008	Steel						2.2 mg						
1004[2]	1004-2 (Dictionary Hill Res.)	2004	Steel	191	0.28	2.68	382	0.74	1.4 mg	0.22 mg	0.30 mg	0.74 mg	1.26 mg	0.14 mg	0.14 mg
Total La Presa				**4,410**	**6.4**				**32.7 mgd**	**4.25 mg**	**2.61 mg**	**14.17 mg**	**21.0 mgd**	**1.63 mg**	**1.63 mg**
Hillsdale System															
803[4,8,9]	803-1 (Vista Granda Res.)[2]	1959	Steel	2,560	3.69	2.18	5,119	8.0	0.0 mg	2.41 mg	1.50 mg	8.03 mg	11.95 mg	(2.04) mg	0.00 mg
	803-2 (20-3 Res.)	1979	Steel						2.0 mg						
	803-3 (Singing Hills Res.)	1986	Steel						2.2 mg						
	803-4 (Vista Grande Res.)	2006	Steel						5.8 mg						
978[8]	978-1 (3-2 Res.)	1959	Steel	778	1.12	2.35	1,555	2.63	0.5 mg	0.79 mg	0.24 mg	2.63 mg	3.66 mg	(0.63) mg	0.00 mg
	978-2 (Filiponi Res.)	1992	Rec. Conc.						2.5 mg						
1200[8]	1200-1 (Grant Res.)	1996	Steel	154	0.22	2.72	308	0.60	1.0 mg	0.18 mg	0.24 mg	0.60 mg	1.02 mg	(0.02) mg	0.00 mg
Total Hillsdale System				**3,491**	**5.0**				**13.9 mgd**	**3.38 mg**	**1.98 mg**	**11.27 mg**	**16.6 mgd**	**(2.69) mg**	**0.00 mg**

Pressure Zone	Facility ID (Name)	Year Built	Material	2016 Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[10]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
Regulatory System															
520[8,11]	520-2 (Regulatory Res.)	1983	Steel	133	0.19	2.79	266	0.53	5.1 mg	0.16 mg	1.50 mg	0.53 mg	2.19 mg	2.91 mg	0.22 mg
	520-3 (Emergency)	1992	Rec. Conc.						20.0 mg						
832	832-1 (2-1 Res.)	1962	Concrete	270	0.39	2.59	539	1.01	0.9 mg	0.30 mg	0.90 mg	1.01 mg	2.21 mg	0.62 mg	0.62 mg
	832-2 (2-1A Res.)	1991	Steel						2.0 mg						
944	944-1 (9-1 Res.)	1962	Steel	5	0.01	3.00	9	0.02	0.3 mg	0.01 mg	0.90 mg	0.02 mg	0.93 mg	2.46 mg	2.46 mg
	944-2 (9-1A Res.)	1992	Steel						3.1 mg						
1090	1090-1 (2-2 Res.)	1962	Concrete	15	0.02	3.00	31	0.07	0.5 mg	0.02 mg	0.60 mg	0.07 mg	0.69 mg	0.78 mg	0.78 mg
	1090-2	Phase II	--						1.0 mg						
1296[5]	1296-1 (9-2 Res.)	1962	Steel	540	0.78	2.48	1,079	1.93	1.0 mg	0.58 mg	1.50 mg	1.93 mg	4.01 mg	1.01 mg	0.84 mg
	1296-2 (9-2A Res.)	1991	Steel						2.0 mg						
	1296-3	Phase II	--						2.0 mg						
1485	1485-1 (9-3 Res.)	1962	Steel	211	0.30	2.67	422	0.81	0.3 mg	0.24 mg	0.18 mg	0.81 mg	1.24 mg	0.37 mg	0.37 mg
	1485-2 (9-3A Res.)	2006	Steel						1.3 mg						
1655[6]	1655-1	Phase II	--	13	0.02	3.00	27	0.06	0.5 mg	0.02 mg	0.60 mg	0.06 mg	0.67 mg	(0.17) mg	0.00 mg
Total Regulatory System				**1,187**	**1.7**				**39.92 mg**	**1.33 mg**	**6.18 mg**	**4.42 mg**	**11.9 mgd**	**7.99 mg**	**5.30 mg**
Total North District				**9,088**	**13.1**				**86.5 mgd**	**9.0 mg**	**10.8 mg**	**29.9 mg**	**49.6 mgd**	**6.93 mg**	**6.93 mg**

(1) Demolished. Storage for this system is included in the 640 Pressure Zone.
(2) Storage deficit for the 1004 PZ includes in the 640 reservoirs.
(3) Includes demands for the 1050 The Pointe hydro system.
(4) Includes demands for the 860 Cottonwood hydro system.
(5) Includes demands for the 1530 Vista Diego hydro system.
(6) Storage deficit for the 1655 PZ included in the 1296 reservoirs.
(7) Storage deficit for the 850 PZ included in the 640 reservoirs.
(8) Storage deficit for the Hillsdale System included in the 520 reservoirs.
(9) Storage not provided for the proposed Sycuan Annexation. This property will require onsite pumping and storage.
(10) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.
(11) Emergency Reservoirs not included in the total surplus/deficit for that zone or system.

Table 4-35. Phase II (2016) Storage Balance – South District

Pressure Zone	Facility ID (Name)	Year Built	Material	2016 Average Annual Demand gpm	2016 Average Annual Demand mgd	Max/ Avg PF	Max Day Demand (ADD x PF) gpm	Max Day Demand (ADD x PF) mgd	Capacity	Required Storage per Design Criteria: Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total	Surplus/ (Deficit)	Net Surplus[1]
Central System															
458[2,5]	458-1 (10-1 Res.)	1964	Steel	1,181	1.70	2.28	2,361	3.88	0.8 mg	1.16 mg	1.50 mg	3.88 mg	6.54 mg	(3.97) mg	0.00 mg
	458-2 (10-2 Res.)	1967	Steel						1.8 mg						
485[6]	485-1 (22-2 Res.)	1983	Steel	384	0.55	2.55	768	1.41	1.0 mg	0.42 mg	1.50 mg	1.41 mg	3.33 mg	(2.33) mg	0.00 mg
624[5,6,7]	624-1 (Patzig Res.)	1999	Earth. Emb.	2,347	3.38	2.10	4,695	7.10	12.4 mg	2.13 mg	1.50 mg	7.10 mg	10.73 mg	9.80 mg	2.05 mg
	624-2 (22-3 Reservoir)	1988	Steel						8.1 mg						
	624-3 (EastLake Res. – Emergency)	1997	Rec. Conc.						30.0 mg						
711[3,7]	711-1 (22-1 Res.)	1976	Steel	6,708	9.66	1.70	13,416	16.42	3.1 mg	4.93 mg	1.50 mg	16.42 mg	22.85 mg	(1.45) mg	0.00 mg
	711-2 (22-1A Res.)	1993	Steel						2.3 mg						
	711-3 (22-1B Res.)	2002	Earth. Emb.						16.0 mg						
980[4,6,7]	980-1 (22-4 Res.)	1985	Steel	5,004	7.21	1.81	10,008	13.04	5.0 mg	3.91 mg	1.50 mg	13.04 mg	18.45 mg	4.57 mg	4.57 mg
	980-2 (22-5 Res.)	1989	Steel						5.0 mg						
	980-3	--	--						13.0 mg						
Total Central System				**15,624**	**22.5**				**98.5 mgd**	**12.55 mg**	**7.50 mg**	**41.85 mg**	**61.9 mgd**	**6.62 mg**	**6.62 mg**
Otay Mesa System															
571	571-1 (Roll Res.)	1993	Earth. Emb.	0	0.00	3.00	0	0.00	36.7 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg
870	870-1 (Upper Res.)	1993	Earth. Emb.	1,894	2.73	2.17	4,110	5.92	11.0 mg	1.78 mg	1.50 mg	5.92 mg	9.19 mg	1.79 mg	1.79 mg
Total Otay Mesa System				**1,894**	**2.7**				**47.7 mgd**	**1.78 mg**	**1.50 mg**	**5.92 mg**	**9.2 mgd**	**1.79 mg**	**1.79 mg**
Total South District				**33,143**	**47.7**				**244.7 mgd**	**26.89 mg**	**16.50 mg**	**89.62 mg**	**133.0 mgd**	**15.02 mg**	**15.02 mg**

(1) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.
(2) Includes demands for the 340 reduced system.
(3) Includes demands for the 580 reduced system.
(4) Includes demands for the 1100 hydro system.
(5) Storage deficit for 458 PZ included in the 624-1 reservoir.
(6) Storage deficit for 485 PZ included in the 624-2 reservoir.
(7) Storage deficit for 711 and 980 PZs included in the 624-3 reservoir.

Table 4-36. Phase II (2016) Pump Station Capacity Analysis – North District

Pump Station	Pump Unit	Rated Capacity		Firm Capacity[4]		Zone Average Annual Demand	Max Day Demand[7]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
La Presa System								
657-1[1]	--	--	--	--	--	--	--	--
850-1[1]	--	--	--	--	--	--	--	--
850-2	1	2,000	2.88	6,000	8.64	2,405	5,099	901
	2	2,000	2.88					
	3	2,000	2.88					
	4	2,000	2.88					
	5[3]	--	--					
1004-2	1	500	0.72	1,000	1.44	191	487	513
	2	500	0.72					
	3	500	0.72					
1050 - Pointe Hydro	1	400	0.58	400	0.58	93	268	132
	2	240	0.35					
	3[2]	1,500	2.16					
Hillsdale System								
803-1	1	2,600	3.74	10,400	14.98	3,509	6,982	3,418
	2	2,600	3.74					
	3	2,600	3.74					
	4	2,600	3.74					
	5	2,600	3.74					
	6[3]	--	--					
978-1	1	850	1.22	2,250	3.24	932	2,162	88
	2	850	1.22					
	3	700	1.01					
	4	700	1.01					
978-2	1	750	1.08	1,500	2.16			
	2	750	1.08					
	3	2,000	2.88					
1200-1	1	500	0.72	1,000	1.44	154	400	600
	2	500	0.72					
	3	500	0.72					
Cottonwood Hydro (860)	1	100	0.14	100	0.14	17	52	48
	2	100	0.14					
Regulatory System								
832-1	1	2,600	3.74	5,200	7.49	1,054	2,329	2,871
	2	2,600	3.74					
	3[3]	--	--					
	4[3]	--	--					
	5[3]	--	--					
	6	2,600	3.74					

Pump Station	Pump Unit	Rated Capacity		Firm Capacity[4]		Zone Average Annual Demand	Max Day Demand[7]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
1090-1	1	280	0.40	280	0.40	15	46	234
	2	280	0.40					
944-1	1	700	1.01	3,400	4.90	769	1,721	1,679
	2	700	1.01					
	3	2,000	2.88					
	4	2,000	2.88					
1296-1	1	2,000	2.88	3,300	4.75	764	1,712	1,588
	2	650	0.94					
	3	650	0.94					
	4	--	--					
	5	2,000	2.88					
1296-2 (Proctor Valley PS)[5]	1	3,500	5.04	10,000	14.40			
	2	3,500	5.04					
	3	3,000	4.32					
	4[3]	--	--					
1485-1	1	430	0.62	860	1.24	211	547	313
	2	430	0.62					
	3[3]	--	--					
	4	430	0.62					
Rancho Jamul (1655)[6]	1	350	0.50	620	0.89	13	40	580
	2	350	0.50					
	3	230	0.33					
	4	40	0.06					
Vista Diego Hydro (1530)	1	260	0.37	260	0.37	21	63	197
	2	260	0.37					
	3	1,100	1.58					

(1) Demolished or otherwise out of service.
(2) Fire pump and not included in total station capacity.
(3) Space available for an additional pump unit.
(4) Firm Capacity does not include the capacity of one of the largest pumps.
(5) 1296-2 PS is for emergency situations only and is not included in the total pumping capacity for this zone.
(6) The 1655 PS is planned to be converted from a hydropneumatic station to an open reservoir system during Phase II.
(7) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

Table 4-37. Phase II (2016) Pump Station Capacity Analysis – South District

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		Zone Average Annual Demand	Max Day Demand[4]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
Central Area								
711-1	1	4,000	5.76	16,000	23.04	6,708	11,404	4,596
	2	4,000	5.76					
	3	4,000	5.76					
	4	4,000	5.76					
	5	4,000	5.76					
980-1[1]	1	4,000	5.76	8,000	11.52	5,004	9,057	13,743
	2	4,000	5.76					
	3	4,000	5.76					
980-2	1	5,700	8.21	22,800	10.032			
	2	5,700	8.21					
	3	5,700	8.21					
	4	5,700	8.21					
	5	5,700	8.21					
Rolling Hills Ranch Hydro (1100)	1	250	0.36	1,100	1.58	93	261	839
	2	850	1.22					
	3[2]	1,750	2.52					
Otay Mesa								
870-2	1	2,750	3.96	11,000	15.84	1,839	4,110	6,890
	2	2,750	3.96					
	3	2,750	3.96					
	4	2,750	3.96					
	5	2,750	3.96					
Permanent LOPS[3]	1	4,500	6.48	9,000	3.96	--	--	--
	2	4,500	6.48					
	3	--	--					
	4	--	--					
	5	4,500	6.48					

(1) 980-1 PS for emergency only. Used as a backup to the 980-2 PS.
(2) Pump provided for fire service only.
(3) Initial phase of construction for the Permanent LOPS will bring the firm capacity up to 9,000 gpm.
(4) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

4.5.3 Ultimate (Phase III) Water System Analysis

The Phase III ultimate water system was analyzed based on projected demands for the District at build-out. These demands were used to analyze the storage and pumping facilities within the District. Tables 4-38 and 4-39 present the Phase III storage balance.

The storage analysis for the North District shows that several pressure zones have storage deficiencies. The Hillsdale System is deficient by nearly 3.4 mg. However, this storage can be credited in the 520 reservoirs. Additional storage will be required to meet the ultimate demand for this system. The North District overall will have a storage surplus of 13.9 mg for the Phase III condition. Storage project required for Phase III are discussed in Section 4.6.1.

The South District will also have several zones that are deficient under the Phase III demands. Additional storage will be required to meet the ultimate demand for this system. The South District will have a storage surplus of 0.8 mg for the Phase III condition. Storage projects required for Phase III are discussed in Section 4.6.1.

The pump station capacity analysis was applied to the Phase III demand condition. Table 4-40 and 4-41 present the pumping conditions for the Phase III ultimate system. The Phase III demands and pumping requirements can be met with the existing pumping system. The Lower Otay PS (LOPS) is planned to be upgraded to a firm capacity of 18,000 gpm during Phase III to increase system reliability and operational flexibility. This improvement is discussed further in Section 4.6.2.

Table 4-38. Phase III (Ultimate) Storage Balance – North District

Pressure Zone	Facility ID (Name)	Year Built	Material	Ultimate Average Annual Demand		Max/ Avg PF	Max Day Demand (ADD x PF)		Capacity	Required Storage per Design Criteria				Surplus/ (Deficit)	Net Surplus[11]
				gpm	mgd		gpm	mgd		Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total		
La Presa System															
640[6]	640-1 (Operational)	2008	Concrete	1,627	2.34	2.23	3,254	5.23	10.0 mg	1.57 mg	1.50 mg	5.23 mg	8.29 mg	1.71 mg	1.31 mg
	640-2 (Emergency)	2008	Concrete						10.0 mg						
	640-3 (Emergency)	--	--						10.0 mg						
657	657-1 (1-1 Res.)[2]	1957	Steel	287	0.41	2.59	574	1.07	1.0 mg	0.32 mg	0.18 mg	1.07 mg	1.57 mg	0.27 mg	0.27 mg
	657-2 (1-1A Res.)	1990	Steel						0.8 mg						
850[3,7]	850-1 (1-5 Res.)	1959	Steel	2,183	3.14	2.12	4,366	6.66	1.1 mg	2.00 mg	0.63 mg	6.66 mg	9.29 mg	0.13 mg	0.13 mg
	850-2 (20-1 Res.)	1976	Steel						3.1 mg						
	850-3 (20-2 Res.)	1984	Steel						3.0 mg						
	850-4	1984	Steel						2.2 mg						
1004[2]	1004-2 (Dictionary Hill Res.)	2004	Steel	310	0.45	2.58	620	1.15	1.4 mg	0.35 mg	0.30 mg	1.15 mg	1.80 mg	(0.40) mg	0.00 mg
	Total La Presa System			**4,407**	**6.3**				**42.7 mgd**	**4.23 mg**	**2.61 mg**	**14.11 mg**	**21.0 mgd**	**1.71 mg**	**1.71 mg**
Hillsdale System															
803[4,8,9]	803-2 (20-3 Res.)	1979	Steel	2,811	4.05	2.08	5,622	8.4	2.0 mg	2.53 mg	1.50 mg	8.42 mg	12.44 mg	(2.53) mg	0.00 mg
	803-3 (Singing Hills Res.)	1986	Steel						2.2 mg						
	803-4 (Vista Grande Res.)	2006	Steel						5.8 mg						
978[8]	978-1 (3-2 Res.)	1959	Steel	806	1.16	2.36	1,612	2.74	0.5 mg	0.82 mg	0.24 mg	2.74 mg	3.80 mg	(0.77) mg	0.00 mg
	978-2 (Filiponi Res.)	1992	Rec. Conc.						2.5 mg						
1200[8]	1200-1 (Grant Res.)	1996	Steel	168	0.24	2.69	337	0.65	1.0 mg	0.20 mg	0.24 mg	0.65 mg	1.09 mg	(0.09) mg	0.00 mg
	Total Hillsdale System			**3,785**	**5.5**				**13.9 mgd**	**3.54 mg**	**1.98 mg**	**11.81 mg**	**17.3 mgd**	**(3.39) mg**	**0.00 mg**

Pressure Zone	Facility ID (Name)	Year Built	Material	Ultimate Average Annual Demand gpm	Ultimate Average Annual Demand mgd	Max/ Avg PF	Max Day Demand (ADD x PF) gpm	Max Day Demand (ADD x PF) mgd	Capacity	Required Storage per Design Criteria: Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total	Surplus/ (Deficit)	Net Surplus[11]
Regulatory System															
520[12]	520-2 (Regulatory Res.)	1983	Steel	247	0.36	2.60	494	0.92	5.1 mg	0.28 mg	1.50 mg	0.92 mg	2.70 mg	3.40 mg	0.00 mg
	520-3 (Emergency)	1992	Rec. Conc.						20.0 mg						
832	832-1 (2-1 Res.)	1962	Concrete	298	0.43	2.58	596	1.11	0.9 mg	0.33 mg	0.90 mg	1.11 mg	2.34 mg	0.49 mg	0.49 mg
	832-2 (2-1A Res.)	1991	Steel						2.0 mg						
944	944-1 (9-1 Res.)	1962	Steel	6	0.01	3.00	11	0.02	0.3 mg	0.01 mg	0.90 mg	0.02 mg	0.93 mg	2.46 mg	2.46 mg
	944-2 (9-1A Res.)	1992	Steel						3.1 mg						
1090	1090-1 (2-2 Res.)	1962	Concrete	28	0.04	3.00	56	0.12	0.5 mg	0.04 mg	0.60 mg	0.12 mg	0.76 mg	0.71 mg	0.71 mg
	1090-2	--	--						1.0 mg						
1296[5,10]	1296-1 (9-2 Res.)	1962	Steel	1,068	1.54	2.28	2,137	3.51	1.0 mg	1.05 mg	1.50 mg	3.51 mg	6.06 mg	8.97 mg	8.51 mg
	1296-2 (9-2A Res.)	1991	Steel						2.0 mg						
	1296-3	--	--						2.0 mg						
	1296-4	--	--						10.0 mg						
1485	1485-1 (9-3 Res.)	1962	Steel	284	0.41	2.59	568	1.06	0.3 mg	0.32 mg	0.18 mg	1.06 mg	1.56 mg	0.05 mg	0.05 mg
	1485-2 (9-3A Res.)	2006	Steel						1.3 mg						
1655	1655-1	--	--	64	0.09	3.00	128	0.28	0.5 mg	0.08 mg	0.60 mg	0.28 mg	0.96 mg	(0.46) mg	0.00 mg
Total Regulatory System				**1,996**	**2.9**				**49.93 mg**	**2.11 mg**	**6.18 mg**	**7.02 mg**	**15.3 mgd**	**15.62 mg**	**12.22 mg**
Total North District				**10,188**	**14.7**				**106.5 mgd**	**9.9 mg**	**10.8 mg**	**32.9 mg**	**53.6 mgd**	**13.93 mg**	**13.93 mg**

(1) Demolished. Storage for this system is included in the 640 Pressure Zone.
(2) Storage deficit for the 1004 PZ includes in the 640 reservoirs.
(3) Includes demands for the 1050 The Pointe hydro system.
(4) Includes demands for the 860 Cottonwood hydro system.
(5) Includes demands for the 1530 Vista Diego and 1655 Rancho Jamul hydro systems.
(6) Only the 640-1 reservoir is included in the operational storage volume.
(7) Storage deficit for the 850 PZ included in the 640 reservoirs.
(8) Storage deficit for the Hillsdale System included in the 520 reservoir.
(9) Storage not provided for the Sycuan Annexation. This property will require pumping and on-site storage.
(10) Storage deficit for the 1296 PZ included in the 944 reservoirs.
(11) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.
(12) Emergency reservoir volume is not included in the operational storage.

Table 4-39. Phase III (Ultimate) Storage Balance – South District

Pressure Zone	Facility ID (Name)	Year Built	Material	Ultimate Average Annual Demand gpm	Ultimate Average Annual Demand mgd	Max/ Avg PF	Max Day Demand (ADD x PF) gpm	Max Day Demand (ADD x PF) mgd	Capacity	Required Storage per Design Criteria: Operational (0.30 x MDD)	Fire	Emergency (1.0 x MDD)	Total	Surplus/ (Deficit)	Net Surplus[1]
Central System															
458[2,5]	458-1 (10-1 Res.)	1964	Steel	1,576	2.27	2.22	3,499	5.04	0.8 mg	1.51 mg	1.50 mg	5.04 mg	8.05 mg	(5.48) mg	0.00 mg
	458-2 (10-2 Res.)	1967	Steel						1.8 mg						
485[6]	485-1 (22-2 Res.)	1983	Steel	415	0.60	2.51	1,041	1.50	1.0 mg	0.45 mg	1.50 mg	1.50 mg	3.45 mg	(2.45) mg	0.00 mg
624[5,6,7,8]	624-1 (Patzig Res.)	1999	Earth. Emb.	3,110	4.48	2.05	6,376	9.18	12.4 mg	2.75 mg	1.50 mg	9.18 mg	13.44 mg	14.21 mg	0.00 mg
	624-2 (22-3 Res.)	1988	Steel						8.1 mg						
	624-3 (EastLake Res. - Emergency)	1997	Rec. Conc.						30.0 mg						
	624-4 (Emergency - Future)	Phase III	--						30.0 mg						
711[6]	711-1 (22-1 Res.)	1976	Steel	8,326	11.99	1.68	13,987	20.14	3.1 mg	6.04 mg	1.50 mg	20.14 mg	27.68 mg	(6.28) mg	0.00 mg
	711-2 (22-1A Res.)	1993	Steel						2.3 mg						
	711-3 (22-1B Res.)	2002	Earth. Emb.						16.0 mg						
980[4,6]	980-1 (22-4 Res.)	1985	Steel	8,396	12.09	1.67	14,021	20.19	5.0 mg	6.06 mg	1.50 mg	20.19 mg	27.75 mg	0.27 mg	0.27 mg
	980-2 (22-5 Res.)	1989	Steel						5.0 mg						
	980-3	Phase II	--						13.0 mg						
	980-4 (Future)	Phase III	--						5.0 mg						
Total Central System				**21,823**	**31.4**				**133.5 mgd**	**16.82 mg**	**7.50 mg**	**56.05 mg**	**80.4 mgd**	**0.27 mg**	**0.27 mg**
Otay Mesa System															
571	571-1 (Roll Res.- Emergency)	1993	Earth. Emb.	0.0	0.00	3.00	0	0.00	36.7 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg	0.00 mg
870	870-1 (Upper Res.)	1993	Earth. Emb.	5,734	8.26	1.78	10,206	14.70	11.0 mg	4.41 mg	1.50 mg	14.70 mg	20.61 mg	0.37 mg	0.37 mg
	870-2 (Future)	Phase III	--						10.0 mg						
Total Otay Mesa System				**5,734**	**8.3**				**57.7 mgd**	**4.41 mg**	**1.50 mg**	**14.70 mg**	**20.6 mgd**	**0.37 mg**	**0.37 mg**
Total South District				**49,379**	**71.1**				**191.2 mgd**	**21.2 mgd**	**9.0 mgd**	**70.7 mgd**	**101.0 mgd**	**0.6 mgd**	**0.6 mgd**

(1) Net Surplus takes into account upper zone deficit storage within lower zone reservoirs.
(2) Includes demands for the 340 reduced system.
(3) Includes demands for the 580 reduced system.
(4) Includes demands for the 1100 hydro system.
(5) Storage deficit for 458 PZ included in the 624-1 reservoir.
(6) Storage deficit for 485 PZ included in the 624-2 reservoir.
(7) Storage deficit for 711 and 980 PZs included in the 624-3 reservoir.
(8) Due to deficit storage in the Central system, a portion of the 624-3 emergency storage is considered for operational storage.

Table 4-40. Phase III (Ultimate) Pump Station Capacity Analysis – North District

Pump Station	Pump Unit	Rated Capacity		Firm Capacity[4]		Zone Average Annual Demand	Max Day Demand[7]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
La Presa System								
657-1[1]	--	--	--	--	--	--	--	--
850-1[1]	--	--	--	--	--	--	--	--
850-2	1	2,000	2.88	6,000	8.64	2,183	4,628	1,372
	2	2,000	2.88					
	3	2,000	2.88					
	4	2,000	2.88					
	5[3]	--	--					
1004-2	1	500	0.72	1,000	1.44	310	790	210
	2	500	0.72					
	3	500	0.72					
1050 – Pointe Hydro	1[5]	400	0.58	400	0.58	93	268	132
	2	240	0.35					
	3[2]	1,500	2.16					
Hillsdale System								
803-1	1	2,600	3.74	10,400	14.98	3,782	7,526	2,874
	2	2,600	3.74					
	3	2,600	3.74					
	4	2,600	3.74					
	5	2,600	3.74					
	6[3]	--	--					
978-1	1	850	1.22	2,250	3.24	975	2,261	(11)
	2	850	1.22					
	3	700	1.01					
	4	700	1.01					
978-2	1	750	1.08	1,500	2.16			
	2	750	1.08					
	3	2,000	2.88					
1200-1	1	500	0.72	1,000	1.44	168	438	562
	2	500	0.72					
	3	500	0.72					
Cottonwood Hydro (860)	1	100	0.14	100	0.14	17	52	48
	2	100	0.14					
Regulatory System								
832-1	1	2,600	3.74	5,200	7.49	1,748	3,864	1,336
	2	2,600	3.74					
	3[3]	--	--					
	4[3]	--	--					
	5	--	--					
	6	2,600	3.74					
1090-1	1	280	0.40	280	0.40	28	85	195
	2	280	0.40					

Pump Station	Pump Unit	Rated Capacity		Firm Capacity[4]		Zone Average Annual Demand	Max Day Demand[7]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
944-1	1	700	1.01	3,400	4.90	1,422	3,183	217
	2	700	1.01					
	3	2,000	2.88					
	4	2,000	2.88					
1296-1	1	2,000	2.88	3,300	4.75	1,416	3,173	127
	2	650	0.94					
	3	650	0.94					
	4[3]	--	--					
	5	2,000	2.88					
1296-2 (Proctor Valley PS)[5]	1	3,500	5.04	10,000	14.40			
	2	3,500	5.04					
	3	3,000	4.32					
	4[3]	--	--					
1485-1	1	430	0.62	860	1.24	284	736	124
	2	430	0.62					
	3[3]	--	--					
	4	430	0.62					
Rancho Jamul (1655)[6]	1	350	0.50	620	0.89	64	192	428
	2	350	0.50					
	3	230	0.33					
	4	40	0.06					
Vista Diego Hydro (1530)	1	260	0.37	260	0.37	25	76	184
	2	260	0.37					
	3	1,100	1.58					

(1) Demolished or otherwise out of service.
(2) Fire pump and not included in total station capacity.
(3) Space available for an additional pump unit.
(4) Firm Capacity does not include the capacity of one of the largest pumps.
(5) 1296-2 PS is for emergency situations only and is not included in the total pumping capacity for this zone.
(6) The 1655 PS is planned to be converted from a hydropneumatic station to an open reservoir system during Phase II.
(7) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

Table 4-41. Phase III (Ultimate) Pump Station Capacity Analysis – South District

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		Zone Average Annual Demand	Max Day Demand[4]	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm
Central Area								
711-1	1	4,000	5.76	16,000	23.04	8,326	13,987	2,013
	2	4,000	5.76					
	3	4,000	5.76					
	4	4,000	5.76					
	5	4,000	5.76					
980-1[2]	1	4,000	5.76	8,000	11.52	8,396	14,021	8,779
	2	4,000	5.76					
	3	4,000	5.76					
980-2	1	5,700	8.21	22,800	10.032			
	2	5,700	8.21					
	3	5,700	8.21					
	4	5,700	8.21					
	5	5,700	8.21					
Rolling Hills Ranch Hydro (1100)	1	250	0.36	1,100	1.58	120	336	764
	2	850	1.22					
	3[1]	1,750	2.52					
Otay Mesa								
870-2	1	2,750	3.96	11,000	15.84	5,734	10,206	794
	2	2,750	3.96					
	3	2,750	3.96					
	4	2,750	3.96					
	5	2,750	3.96					
Permanent LOPS[3]	1	4,500	6.48	18,000	25.92	--	--	--
	2	4,500	6.48					
	3	4,500	6.48					
	4	4,500	6.48					
	5	4,500	6.48					

(1) Pump provided for fire service only.
(2) 980-1 PS for emergency only. Used as a backup to the 980-2 PS.
(3) Final phase of construction for the Permanent LOPS will bring the firm capacity up to 18,000 gpm.
(4) The required pumping capacity for hydropneumatic stations is either maximum day plus fire or peak hour, whichever is greater.

4.6 Recommended Potable Water System Improvements

This section provides a recommended Capital Improvement Program (CIP) project plan for the required operational reservoirs, pump stations, and transmission mains to serve the five District systems at 2016 (Phase II) and at ultimate development (Phase III). The recommended system improvements are shown on Exhibits I through V for the La Presa, Hillsdale, Regulatory, Central Area, and Otay Mesa Systems, respectively. These exhibits show the location of the proposed CIP facilities and the primary existing potable water system facilities within the five systems. The future distribution pipelines are generally not shown on the plates. The facilities shown with CIP project numbers are the primary reservoirs, pump stations, and transmission mains that will be planned, funded, and constructed by the District. Additional distribution pipelines and laterals will be required to serve specific customers, but will be the responsibility of the individual customers. The distribution pipelines and laterals are "exaction" projects (i.e., developer projects) and thus are the development project proponent's responsibility to plan, fund, and construct. These pipelines will typically be 12-inch and smaller in diameter. It should be noted that some of the proposed transmission main alignments may change as development plans are revised and/or refined in the future. The intent is to align all the transmission mains within the currently planned roadways as much as possible. As development projects are proposed the project proponents will be required to prepare a SAMP that will at a minimum define the distribution pipelines required to serve the development and include the necessary regional CIP facilities.

Recommended CIP projects are divided into three construction phases or increments of development: Phase I (2008 - 2009), Phase II (2010 - 2016), and Phase III (2017 - Ultimate). Phase I includes those projects currently under construction. CIP project phasing is based on land development improvement project phasing contained within the various existing SAMPs that are discussed in Chapter 2, and meeting the projected water demands discussed in section 4.3.5. Phasing for the recommended CIP projects may be accelerated or deferred as required to account for changes in development project schedules, availability of land or right-of-way for construction, project funding limitations, environmental concerns, and other considerations. Chapter 6 provides a compilation of recommended CIP projects and costs.

4.6.1 Storage Projects

La Presa System

The La Presa System is undergoing the most significant changes as primary supply will shift from Otay 11 FCF to the 640 Reservoirs via the new 36-inch pipeline from Otay 14 FCF. Storage projects required for the La Presa System are described below and presented in Table 4-42.

640 Pressure Zone. The 640 PZ will be expanded and includes areas currently served the 657 Reservoirs, and will be supplied by the recently-constructed 640-1 and 640-2 Reservoirs located at the Regulatory Site through the existing 42-inch and 36-inch diameter transmission mains. The 640 Reservoirs will be supplied directly from Otay 14 FCF. The 640 Reservoirs will be interconnected with the existing 520-foot elevation reservoirs so that water can be transferred to or from either the 520 or 640-foot elevation storage depending upon the relative demands imposed on each and the available HGL downstream of Otay 11 FCF. The constructed

capacity of the 640-1 and 640-2 reservoirs is 10.00 mg each. The District has recently constructed the 640-1 and 640-2 reservoirs and is in the preliminary engineering phase for the additional 10.0 mg of storage planned at the 640-foot elevation (640-3 Reservoir). The 640-1 Reservoir volume includes the 520 PZ ultimate reservoir requirement as the 520 PZ is also anticipated to be converted over to 640 in the future.

Table 4-42. Recommended La Presa System Reservoirs

Reservoir Project Title	Capacity (mg)	Pressure Zone	Phase Needed
Res-640-1[(1)] Reservoir 100 MG	10.0	640	I
Res-640-2 Emergency[(1)] Reservoir 10.0 MG	10.0	640	I
Res-640-3 Emergency Reservoir 10.0 MG	10.0	640	III
La Presa System Total	**30.0**		

(1) Reservoirs 640-1 and 640-2 have been constructed, but at the time of this Master Plan had not been placed into service.

657 Pressure Zone. Existing operational storage for the current 657 PZ includes the 1.00-mg 657-1 Reservoir and the 0.84-mg 657-2 Reservoir, for a total capacity of 1.84 mg. There is no storage for the Aqueduct (657) PZ. The ultimate 657 PZ demands will require 1.57 mg of storage. The 657 PZ can also be served by three 850/657 PRVs. Once the 640-1 Reservoir is constructed, the 657 Aqueduct PZ will be served by the 640-1 Reservoir. This change will provide increased flexibility and reliability to the La Presa System and mitigate the existing storage deficiency within the system.

850 Pressure Zone. Existing operational storage for the 850 PZ includes the 1.12-mg 850-1 Reservoir, the 3.10-mg 850-2 Reservoir, and the 3.02-mg 850-3 Reservoir, for a total capacity of 7.24 mg. Ultimate demands for the 850 PZ will require a storage volume of 9.29 mg. The existing reservoirs currently do not provide adequate storage to meet existing demands, with a deficit of 1.61 mg. A 2.20-mg 850-4 Reservoir is currently in construction and will satisfy projected storage requirements through build out.

The Pointe Hydropneumatic Pressure Zone. An operational storage reservoir for the existing Pointe Hydropneumatic PZ is not practical given the relatively small demand of this zone and the lack of viable reservoir sites. This pressure zone is therefore to remain served by the hydropneumatic pump station. The 850 PZ reservoir sizing computations include the hydropneumatic system demand.

1004 Pressure Zone. The existing operational storage for the 1004 PZ includes the 1.40-mg 1004-2 Reservoir. This reservoir does not satisfy ultimate storage requirements of 1.80 mg for the 1004 PZ, with a deficit of 0.40 mg. This deficit has been credited to the 850 and future 640 PZ storage, and no new storage is recommended for this zone.

Hillsdale System

803 Pressure Zone. Existing operational storage for the 803 PZ includes the 2.00-mg 803-2 Reservoir, and the 2.15-mg 803-3 Reservoir, and the 5.76-mg 803-4 Reservoir for a total of 9.90 mg. The ultimate storage needs for this system total 12.44 mg. The 2.53-mg deficit has been credited in the 520 reservoirs. No new reservoirs are proposed for the 803 PZ.

Cottonwood Hydropneumatic Pressure Zone. An operational storage reservoir for the existing Cottonwood Hydropneumatic PZ is not practical given the very small demand for this built out pressure zone and the lack of viable reservoir sites. This pressure zone is therefore to remain served by the hydropneumatic pump station. The 803 PZ reservoir sizing computations include the hydropneumatic system demand.

978 Pressure Zone. Existing operational storage for the 978 PZ includes the 0.53-mg 978-1 Reservoir and the 2.50-mg 978-2 Reservoir. The existing 3.03 mg of total storage is adequate to meet existing requirements, but cannot meet the 3.80 mg ultimate storage needs. The deficit by 0.77 mg has been credited in the 520 storage volume. No new storage is recommended for this PZ as there are no remaining viable 978-foot elevation reservoir sites.

1200 Pressure Zone. Existing operational storage for the 1200 PZ is the 1.00-mg 1200-1 Reservoir. Ultimate storage needs show a 0.09-mg deficit at ultimate development which is credited to the 520 Reservoirs. No additional storage is required for this PZ.

Regulatory System

The recommended Regulatory System storage projects are described below and summarized in Table 4-43.

Table 4-43. Recommended Regulatory System Reservoirs

Reservoir Project Title	Capacity (mg)	Pressure Zone	Phase Needed
Res-1090-2 Reservoir 1.0 MG	1.0	1090	III
Res-1296-3 Reservoir 2.0 MG	2.0	1296	II
Res-1296-4 Reservoir 10.0 MG	10.0	1296	III
Res-1655-1 Reservoir 0.5 MG	0.5	1655	II
Regulatory System Total	**13.5**		

520 Pressure Zone. The 520 PZ is currently served by gravity from the 520-foot elevation Regulatory Reservoirs, which have a total existing capacity of 25.10 mg. It is ultimately planned that this zone be converted to the 640 PZ, which will provide significant electrical energy savings from operation of the 832-1 PS because suction pressure will be increased from the 520-foot elevation to the 640-foot elevation. The 640-1 Reservoir volume includes the ultimate projected 520 PZ storage requirement for 2.70 mg. The existing Regulatory Reservoirs provide a portion of the emergency storage requirement for the North District. No additional 520-foot elevation storage is recommended.

832 Pressure Zone. Existing storage for the 832 PZ consists of the 0.87-mg 832-1 Reservoir and the 1.96-mg 832-2 Reservoir, which total 2.83 mg. The ultimate operational storage required for the 832 PZ totals 2.34 mg, a surplus of 0.49 mg. Therefore, additional storage for the 832 PZ is not recommended.

944 Pressure Zone. Existing storage for the 944 Pressure Zone includes the 0.31 mg 944-1 Reservoir and the 3.08 mg 944-2 Reservoir, which total 3.39 mg. The existing total volume is adequate for the ultimate projected storage volume of 0.93 mg. Therefore, additional storage capacity for the 944 PZ is not recommended.

1090 Pressure Zone. Existing storage for the 1090 PZ is provided by the 0.47-mg 1090-1 Reservoir, which is adequate for the existing operational storage requirement. The existing storage for the 1090 PZ does not fully meet the storage required, and ultimately cannot meet the need for 0.76 mg of storage. A 1.0 mg 1090-2 Reservoir should be constructed to provide ultimate projected storage requirements for the 1090 PZ. The proposed site for this new reservoir is adjacent to the existing 1090-1 Reservoir and is anticipated in Phase III.

1296 Pressure Zone. Existing operational storage for the 1296 PZ includes the 1.02-mg 1296-1 Reservoir and the 2.01-mg 1296-2 Reservoir. The existing storage of 3.03 mg is 1.00 mg deficient based on existing demands. An additional 3.03 mg will be required to meet the ultimate projected storage requirement of 6.06 mg. A 2.00 mg 1296-3 Reservoir should be constructed on existing District property at the end of Bear Mountain Way adjacent to the existing reservoirs during the Phase II period. A 10.00 mg 1296-4 Reservoir for emergency storage supply should be provided in the 1296 PZ during Phase III. The 1296-4 Reservoir will provide storage for the water to be supplied from the Central Area System via the proposed Proctor Valley 1296-2 PS when the Regulatory System has planned or emergency operational interruptions or when the SDCWA Pipeline No. 4 is out of service.

Vista Diego 1530 Hydropneumatic Pressure Zone. An operational storage reservoir for the existing Vista Diego Hydropneumatic PZ is not practical given the small demand for this zone and the lack of viable reservoir sites. This pressure zone is therefore to remain served by the hydropneumatic pump station. The 1296 PZ reservoir sizing computations include the hydropneumatic system demand.

Hidden Valley Hydropneumatic Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

1485 Pressure Zone. Existing operational storage for the 1485 PZ includes the 0.31-mg 1485-1 and 1.3-mg 1485-2 Reservoirs for a total of 1.61 mg. Ultimate storage needs for this PZ total 1.56 mg. Therefore, no additional storage is required for this system. The existing reservoir may ultimately need to be abandoned because it has severe corrosion damage to the extent that it is likely not practical or cost effective to rehabilitate.

1595 Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

1655 Pressure Zone. The 1655 PZ, which is currently served by the Rancho Jamul Hydropneumatic PS, has no existing operational storage to provide adequate fire protection or system reliability. A 0.50 mg 1655-1 Reservoir should be constructed during the Phase II period in order to abandon the existing hydropneumatic tank. The proposed location is north of the Rancho Jamul Hydropneumatic PS on an existing District-owned site. Ultimate storage needs of 0.96 mg will create a deficit of 0.46 mg, which has been credited in the 1296 PZ storage.

1920 Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

South District

The recommended South District storage projects are described below and summarized in Table 4-44.

Table 4-44. Recommended South District Reservoirs

Reservoir Project Title	Capacity (mg)	Pressure Zone	Phase Needed
Res 624-4 Emergency Reservoir 30.0 MG	30.0	624	III
Res 980-3 Reservoir 13.0 MG	13.0	980	II
Res 980-4 Reservoir 5.0 MG	5.0	980	III
Res 870-2 Reservoir 10.0 MG	10.0	870	III
South District Total	**58.0**		

458 Pressure Zone. Unlike typical pressure zones in the District's water systems, the 458 PZ is a gravity-fed system from the 624 PZ. It also feeds the 340 PZ through three pressure reducing stations. Existing operational storage for the combined pressure zones is provided by the 0.82-mg 458-1 and 1.75-mg 458-2 Reservoirs, which have a total volume of 2.57 mg. The projected operational storage volume for the combined 340 and 458 PZs is 8.05 mg, creating a deficit of 5.48 mg. Since the three 624-foot elevation reservoirs feed the 458 PZ by gravity, the 340 and 458 PZ total storage needs for ultimate demand conditions can be met with the storage volume in the 624-foot elevation reservoirs. Therefore, a new reservoir at the 458-foot elevation is not recommended and the required storage is provided in the volume stored in the 624 reservoirs.

485 Pressure Zone. Like the 458 PZ, the 485 PZ is also a gravity-fed system from the 624 PZ. The projected operational storage volume is provided by the 1.0-mg 485-1 Reservoir. This reservoir does not meet the existing or ultimate storage needs for this zone with an ultimate storage deficit of 2.45 mg. Since the three 624-foot elevation reservoirs feed the 485 PZ by gravity, the 485 PZ total storage needs for ultimate demand conditions can be met with the storage volume in the 624 reservoirs. Therefore, a new reservoir at the 485-foot elevation is not recommended and the required storage can be provided in the volume stored at the 624-foot elevation.

624 Pressure Zone. Storage for the 624 PZ currently includes the 12.40-mg 624-1, 8.13-mg 624-2, and 30.00-mg 624-3 Reservoirs for a total of 50.53 mg. A significant portion of the 624 PZ reservoirs provides emergency storage for the Central Area System. The 340, 458, and 485 PZ ultimate storage deficiencies are included in the ultimate projected 624 storage volume requirement. Ultimate storage needs for the 624 PZ totals 13.44 mg, with a surplus of 14.21 mg. The remaining 624-foot elevation volume is credited toward emergency water supply storage and deficit transfers from other zones. Therefore, a new operational reservoir at the 624-foot elevation is not recommended. As discussed in Chapter 3, a new 30-mg 624-4 Reservoir is recommended in Phase III in order to meet the emergency supply criteria.

711 Pressure Zone. The 3.10-mg 711-1 Reservoir, 2.30-mg 711-2 Reservoir, and 16-mg 711-3 Reservoir provide a total existing operational storage capacity of 21.40 mg for the 711 PZ. These existing reservoirs do not satisfy the ultimate projected storage requirement of 27.68 mg, a deficit of 6.28 mg. Similar to other pumped zones, by crediting the additional storage within the 624 PZ the District can achieve the projected storage deficiency. Therefore, a new reservoir at the 711-foot elevation is not recommended.

980 Pressure Zone. The 5.02-mg 980-1 Reservoir and 5.02-mg 980-2 Reservoir provide a total existing operational storage capacity of 10.04 mg for the 980 PZ. The 980 PZ is currently deficient by 6.95 mg due to extensive development since the 2002 WRMP. A 13-mg 980-3 Reservoir should be constructed early in Phase II. The recommended site for this reservoir is adjacent to the existing 980-1 and 980-2 Reservoirs within the District's Use Area. A 5-mg 980-4 Reservoir should be constructed in conjunction with the development of Village 13 of the Otay Ranch GDP. The proposed site for this reservoir is on property north of Otay Lakes Road and east of Upper Otay Reservoir. The 980-4 Reservoir is projected to be required in Phase III.

Rolling Hills Hydropneumatic Pressure Zone. An operational storage reservoir for the Rolling Hills Hydropneumatic PZ is not recommended due to the very small demand expected at ultimate conditions. This pressure zone will continue to be served by a hydropneumatic pump station.

870 Pressure Zone. Existing operational storage for the 870 PZ is provided by the 10.98-mg 870-1 Reservoir. The ultimate projected storage requirement for the 870 PZ is 20.61 mg. The existing storage is adequate to supply projected demands through year 2016. A 10.00-mg 870-2 Reservoir is recommended to be constructed during the Phase III period and will provide capacity to satisfy projected ultimate storage requirements. The proposed site for the 870-2 Reservoir is adjacent to the existing 870-1 Reservoir.

An area in the Otay Mesa system to the east of Alta Road lies at higher elevations that cannot be served by the 870 PZ. However, current land planning includes very low-density residential and is not anticipated for a number of years. Should this area develop in the future it will be the responsibility of the developer to evaluate and provide adequate service pressure to the customers and could require the construction of a pump station and reservoir.

4.6.2 Pump Stations

La Presa System

The recommended La Presa System pump station projects are described below and summarized in Table 4-45.

Table 4-45. Recommended La Presa System Pump Stations

Pump Station Name	Capacity (gpm)	Pressure Zone	Phase Needed
Perdue WTP PS	3,500	640	II
PS - 657-1/850-1 PS Demolition	N/A	657, 850	II
PS - Pointe Hydro Expansion	400	1050	III

640 Pressure Zone. The Perdue WTP Pump Station is a proposed pump station that will convey water from the Sweetwater Authority's Perdue WTP to the 640 PZ of the La Presa System at a firm capacity of 3,500 gpm. This Phase II project would add reliability through access to local potable water from the Perdue WTP.

657 Pressure Zone. The 657-1 PS, which has existing firm capacity of approximately 600 gpm, currently serves as the backup supply to the 657 PZ when the SDCWA Pipeline No. 4 or Otay 11 FCF is out of service and is typically used to supply the 657 storage reservoirs. The planned elimination of the Aqueduct PZ service area with construction of the 640-1 Reservoir and supplying the 657 reservoirs from the 850 PZ negates the need for the 657-1 PS. The 657 PZ will be supplied by the 850 PZ through three pressure reducing stations with a total capacity of 1,000 gpm, which is projected to be adequate to supply the ultimate demands for the 657 PZ. The 657-1 PS will then not be required and can be removed from service. It is recommended to have the 640-1 Reservoir in service prior to removing the 657-1 PS from the operating system. It is estimated that the pump station can be demolished in the early years of Phase II. The 850-2 PZ will supply the 640 and 657 Pressure Zones through PRVs when the SDCWA Pipeline No. 4 is out of service.

850 Pressure Zone. The 850 PZ can currently be supplied by two pumping facilities, the 850-1 and 850-2 PSs. The 850-2 PS, which has a firm capacity of approximately 6,000 gpm, is capable of serving the entire 657 and 850 PZ. The required pumping capacity for the 850-2 PS is projected to be 4,628 gpm for ultimate demand conditions. Hence, the pump station will have adequate pumping capacity to meet ultimate demands. The redundancy provided by the 850-1 PS will then not be required and the station can be removed from service. It is recommended to have the 640-1 Reservoir in service prior to removing the 850-1 PS from the operating system. It is estimated that the 850-1 PS can be demolished in the early years of Phase II.

The Pointe Hydropneumatic Pressure Zone. The existing Pointe Hydropneumatic PS has a firm pumping capacity of approximately 240 gpm with a dedicated 1,500-gpm fire pump. The ultimate projected Pointe Hydropneumatic PZ pumping capacity is 268 gpm. The projected demands could require the pumping capacity to be expanded. It is estimated that the Pointe Hydropneumatic PS upgrade would be required in Phase III depending upon actual demands.

1004 Pressure Zone. The existing 1004-2 PS has a firm pumping capacity of approximately 1,000 gpm, which is adequate capacity to satisfy projected ultimate demand conditions for the 1004 PZ.

Hillsdale System

The recommended Hillsdale System pump station projects are described below and summarized in Table 4-46.

Table 4-46. Recommended Hillsdale System Pump Stations

Pump Station Name	Capacity (gpm)	Pressure Zone	Phase Needed
PS-978-2 Pump Station (1,500 gpm)	1,500	978	III

803 Pressure Zone. The 803-1 PS is located on a site adjacent to the Regulatory Reservoirs. This pump station supplies the 803 PZ and must also have capacity for the Cottonwood Hydropneumatic (860), 978, and 1200 PZs. The required firm pumping capacity for the 803-1 PS is 7,526 gpm for ultimate projected demand conditions. The 803-1 PS has a current firm pumping capacity of approximately 10,400 gpm. It has space for one additional pump to bring firm capacity to approximately 13,000 gpm. The pump station has adequate existing pumping capacity to meet ultimate demands for the Hillsdale System.

Cottonwood Hydropneumatic Pressure Zone. The existing Cottonwood Hydropneumatic PS capacity is approximately 100 gpm. The existing and ultimate projected Cottonwood Hydropneumatic PZ pumping capacity is 140 gpm. The pump station has been operating adequately with this 40 gpm deficiency therefore no expansion is recommended to meet ultimate demand conditions.

978 Pressure Zone. The 978-1 PS supplies the 978 PZ and must also have capacity for the 1200 PZ, which is supplied via the 978 PZ. The ultimate annual average day demand for the 978 and 1200 PZs is estimated to be 975 gpm (1.4 mgd). The required firm pumping capacity for 978-1 PS is 2,250 gpm for ultimate projected demand conditions. The existing firm capacity of the 978-1 PS is approximately 2,250 gpm, which is adequate to meet projected ultimate demands. Hence, no capacity increase is required.

It is recommended to complete the construction of the planned 978-2 PS located at the existing 803-3 Reservoir site to enhance system reliability. This pump station will provide a second source of supply to the 978 and 1200 PZs. The recommended capacity is 1,500 gpm and the pump station is anticipated in Phase III.

1200 Pressure Zone. The 1200-1 PS is the sole supply source for the 1200 PZ. The existing firm pumping capacity of this station is approximately 1,000 gpm, which is adequate to meet the projected ultimate pumping requirement of 438 gpm. Hence no capacity increase is required.

Regulatory System

The recommended Regulatory System pump station projects are described below and summarized in Table 4-47.

Table 4-47. Recommended Regulatory System Pump Stations

Pump Station Name	Capacity (gpm)	Pressure Zone	Phase Needed
PS-1485-1 Pump Station Replacement	860	1485	I
PS-1090-1 Pump Station Replacement	280	1090	III
PS-Proctor Valley Pump Station 910,000 gpm)	10,000	1296	III

832 Pressure Zone. The 832-1 PS has a current firm pumping capacity of approximately 5,200 gpm. There are three existing open pump can positions for 2,600 gpm vertical turbine units to be installed in the future when needed to increase firm pumping capacity. No additional pump stations are proposed for the 832 PZ. Therefore, the 832-1 PS capacity must be increased to satisfy ultimate projected 832 PZ demands, plus the flows transferred through the 832 PZ to supply higher pressure zones within the Regulatory System. Based on revised land uses within the eastern areas of the Regulatory System and the reduction of potential demand in that area, the need for increased capacity at this station no longer exists. The current configuration of this pump station should continue to meet existing demands as well as the ultimate conditions. No increase in capacity is recommended for this PZ.

944 Pressure Zone. The 944-1 PS is the sole supply source for the 944 PZ and has an existing firm capacity of 3,400 gpm. The existing capacity is adequate to meet present demands. However, additional capacity may be needed to meet projected demands as the pump station will be operating at 90 percent capacity. The District should continue to monitor demands in this service area. The 944-1 PS primarily serves as a booster pumping facility to convey water to the two 944-foot elevation reservoirs for re-pumping to the 1296 PZ via the 1296-1 PS. The 944-1 PS must have adequate capacity to supply the ultimate 944 PZ demand, plus ultimate needs for the 1296, 1530 Vista Diego Hydropneumatic, 1485, and 1655. If necessary to meet ultimate demands it is suggested that the two pumps rated at 770 gpm be replaced with 1,000 gpm vertical turbine units to increase the firm pumping capacity. The 944-1 PS is assumed to be upgraded during Phase III.

1090 Pressure Zone. The 1090-1 PS is the sole supply source for the 1090 PZ and has an existing firm capacity of approximately 280 gpm. The ultimate projected firm pumping capacity of the 1090-1 PS is 400 gpm. The useful life of the 1090-1 PS has been consumed. It is recommended that the 1090-1 PS be replaced with a new facility and constructed during Phase III.

1296 Pressure Zone. The projected ultimate maximum day demand for the pressure zones to be served by the1296-1 PS totals 3,173 gpm and it is planned that this demand will be met by expansion of the existing 1296-1 PS. The firm pumping capacity of the existing 1296-1 PS is 3,300 gpm and is adequate to meet the ultimate needs for this area. In order to increase reliability to this area, a second 1296 PS is recommended on Proctor Valley Road which will lift

water from the Central System 980 PZ into the Regulatory System. This station is recommended to have an ultimate firm capacity of 10,000 gpm and is recommended during Phase III.

1485 Pressure Zone. The ultimate maximum day demand for the 1485 PZ is projected to be 736 gpm. The existing 1485-1 PS has a firm capacity of approximately 860 gpm, which is adequate to meet ultimate demands. It is recommended that the 1485-1 PS be upgraded to replace the existing 1485-1 PS and increase the firm pumping capacity to 1,000 gpm during the Phase II period. The useful life of many of the existing components at the 1485-1 PS has been consumed.

Vista Diego 1530 Hydropneumatic Pressure Zone. The existing Vista Diego Hydropneumatic PS capacity is approximately 260 gpm. The ultimate projected Vista Diego Hydropneumatic PZ pumping capacity is 243 gpm. The hydropneumatic pump station has adequate pumping capacity to meet ultimate demands.

1595 Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

1655 Pressure Zone. The projected ultimate demand of the 1655-1 PZ is less than the existing Rancho Jamul Hydropneumatic PS firm capacity of approximately 620 gpm as the plan is to convert the station from a closed system to an open system, requiring less pumping capacity. Therefore, expansion of this station is not anticipated. However, this PZ is recommended for conversion from a hydropneumatic system to an open system during Phase II with the construction of the 0.50-mg 1655-1 Reservoir.

1920 Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

Honey Springs Hydropneumatic Pressure Zone. Since the 2002 WRMP, land use changes have eliminated the need for this system.

South District

The recommended South District pump station projects are described below and summarized in Table 4-48.

Lower Otay Pump Station. The planned Lower Otay PS will be used to transfer flow from the City of San Diego's Otay WTP to the Central Area and Otay Mesa Systems and will replace the existing trailer-mounted single diesel pump (Temporary LOPS). As the Otay WTP operates at a hydraulic gradient of approximately 510 feet at the plant and 490 feet at South San Diego Reservoir, which is lower than the Central Area and Otay Mesa Systems, it will be necessary to construct a pump station to utilize this supply source. The Lower Otay PS is to be constructed on a site the District acquired adjacent to the plant site. The suction system for the pump station should be provided within the City of San Diego's clear wells within the plant site. The pump station discharge pipeline will be required to connect into the existing Central Area-Otay Mesa Interconnection Pipeline. The transmission main design capacity of the Central Area-Otay Mesa Interconnection Pipeline is equal to 31 cfs (20 mgd) or approximately 13,900 gpm.

Table 4-48. Recommended South District Pump Stations

Pump Station Name	Capacity (gpm)	Pressure Zone	Phase Needed
PS-870-2 Pump Station (11,000 gpm)	11,000	870	III
PS-Lower Otay Pump Station	9,000	624/570	II
PS-Lower Otay Pump Station Expansion (9,000 gpm)	9,000	624/570	III

The minimum capacity of this pump station should not be less than the current contractual agreement with the City of San Diego, which is for 10 mgd now and 20 mgd in the future. However, based on the potential availability of up to 26 mgd from the City of San Diego's Lower Otay WTP, it is recommended that a 40 cfs (26 mgd) pumping capability be provided and designed into the facility with the potential capability assured for future construction. This 9 cfs increase above 31 cfs provides additional capacity for the District to meet expected demands in Mexico that are planned to be served through an existing connection per terms of an agreement with the SDCWA and provide capacity for flow transfer to the North District systems. This pump station is recommended as part of the overall emergency water supply strategy and is recommended in Phase II with an initial capacity of at least 9,000 gpm. Design for this facility has been completed, however the first phase of construction is not anticipated until Phase II. Expansion of the pumping rate to 18,000 gpm is recommended in Phase III.

711 Pressure Zone. Since the recently-constructed 980-2 PS takes suction from the 624-3 Reservoir, the 711-1 PS needs to only supply the 711 PZ ultimate pumping requirement of 13,571 gpm. The 711-1 PS has an existing firm pumping capacity of approximately 16,000 gpm, which is adequate to meet ultimate projected demands. In instances where the 980 PZ must be supplemented by the 980-1 PS, the 711-1 PS may exceed its maximum pumping capacity. No additional pump stations or upgrades are recommended at this time for the 711 PZ.

980 Pressure Zone. The existing firm capacity of the 980-2 PS is 22,800 gpm and supplies the 980 PZ and the planned Rolling Hills Hydropneumatic PZ plus the 10,000 gpm flow transfer to the Regulatory System. The current required pumping capacity for the 980 PZ is 8,156 gpm. Ultimate pumping requirement for the 980 PZ is 13,685 gpm. The existing 980-1 PS has a firm pumping capacity of 8,000 gpm and takes suction pressure directly from the 711 PZ transmission system. The 980-1 PS serves as a backup facility for the 980-2 PS. Therefore, a standby or emergency unit would not be required in the 980-2 PS. No additional pump stations or upgrades are recommended at this time for the 980 PZ.

Proctor Valley Pump Station. The Proctor Valley 1296-2 PS will be located along Proctor Valley Road between the boundary of the Central Area and Regulatory Systems and will transfer flow from the 980 PZ to the 1296 PZ of the Regulatory System during planned or emergency supply outages or system failures. It is recommended that the Proctor Valley 1296-2 PS be constructed with a firm capacity of 10,000 gpm. It is anticipated that this pumping rate would typically not coincide with maximum day demands. This pump station will likely be constructed during Phase III corresponding to development activities of the Proctor Valley Parcel of the Otay Ranch GDP.

Rolling Hills Hydropneumatic Pressure Zone. The Rolling Hills Hydropneumatic PS has been designed to serve the Rolling Hills Hydropneumatic PZ ultimate demands. The intent is to provide about 60 psi of pressure to the lot with the highest elevation within the planned Rolling Hills Hydropneumatic PZ. The Rolling Hills Hydropneumatic PS capacity is about 1,100 gpm to serve an ultimate demand of 336 gpm during max day. A separate fire pump is included at this station with a capacity of 1,750 gpm.

870 Pressure Zone. The existing firm capacity of the 870-1 PS facility is approximately 13,400 gpm. The existing facilities provide adequate capacity to satisfy ultimate projected demands. However, the District is currently planning to replace the existing 870-1 PS, with a new facility located on the south side of the 571-1 Reservoir, near the existing available 42-inch outlet pipeline. This will eliminate the need for the existing Low Head PS and will improve water quality within the 571-1 Reservoir. The new 870-2 PS will have a minimum firm capacity of 11,000 gpm and is assigned to Phase III. The existing pumps and natural gas engines at the 870-1 PS should be removed and installed within the new 870-2 PS facility. The useful life of many of the existing components at the 870-1 PS has been consumed.

4.6.3 Pipeline Projects

Based on a review of the District current 2008-2009 CIP, current development plans and the ultimate system analysis, the following transmission pipeline improvement projects were identified.

Phase II

- **P2009:** Approximately 25,500 LF of 36-inch pipeline is proposed from the existing FCF No. 14 to the Regulatory Site. This project will provide water directly to the 640 Reservoirs and allow greater flexibility in the North District. This project is to be completed by March 1, 2010 based on the terms of the East County Regional Treated Water Improvement Program Agreements between the District and SDCWA.

- **P2010**: Approximately 4,700 LF of 24-inch main is proposed in Lakewood Avenue from the Sweetwater Authority Perdue WTP to the 36-inch main in Akard Street. The project allows the District access to local potable water from Sweetwater Authority.

- **P2038:** 8,600LF of 12-inch main in Hidden Mesa Road.

- **P2058:** 7,800 LF of 24-inch main is proposed from Proctor Valley Road between Melody Road and Lyons Valley Road and will parallel the existing 12-inch and 16-inch lines. This project will increase capacity from the 1296-1 PS and the future 1296-4 Reservoir in order to supply water to the Regulatory PZs during a CWA outage. This project is anticipated during Phase II.

- **P2066:** Approximately 4,100 LF of 30-inch main is proposed in Alta Road from Otay Mesa Road north to the Donovan State Prison access road, then west to connect to an existing 30-inch main. This project is necessary to increase capacity to the Otay Mesa 870 PZ. This project originally included 24-inch and 30-inch parallel lines. However, it has been determined that the capacity of the 24-inch is no longer needed and that a 30-inch line

would be sufficient to meet ultimate demands. This project, although originally planned for Phase III, has been accelerated into Phase II due to the expansion of the prison and the need to relocate the existing 24-inch line.

- **P2104:** Approximately 4,900 LF of 12-inch line is proposed in La Media Road between Birch Road and Rock Mountain Road. This line will serve future development within Otay Ranch and is anticipated in Phase II.

- **P2107:** Approximately 4,000 LF of 12-inch line is proposed in the future Rock Mountain road between La Media Road and Sr-125. This line will serve future development within Otay Ranch and is anticipated in Phase II.

- **P2135:** Approximately 3,200 LF of 12-inch line in Otay Lakes Road. This pipeline is planned for Phase II.

- **P2171:** Approximately 2,100 LF of 30-inch line is proposed in Proctor Valley Road from Pioneer Road to the intersection of Proctor Valley Road and Melody Road. This line will provide redundancy from the 1296-2 PS to the 1296-4 Reservoir and the rest of the 1296 PZ during an emergency CWA outage. This pipeline is planned for Phase II.

- **P2181:** Approximately 8,800 LF of 30-inch line is proposed from the 1296-2 Proctor Valley PS in Proctor Valley Road north to Coyote Road. This line will serve the Regulatory System from the 1296-2 Emergency PS in the event of a CWA outage and is planned for Phase II.

- **P2190:** Approximately 1,300 LF of 10-inch line is proposed in Jamul Highlands Road south to Presilla Drive. This line will provide redundancy and additional fire protection for the 1296 and 1655 PZ and is anticipated in Phase II.

- **P2203:** Approximately 4,000 LF of 30-inch line is proposed in Proctor Valley Road in Phase II.

- **P2318:** Construction of a 20-inch pipeline between the two existing 18-inch mains to allow for bypass of the existing 36-inch transmission main near the old SDCWA Otay FCF No. 5 that was on Pipeline No. 3. Also includes several 6-inch system connections to the existing 36-inch transmission main in the La Presa System.

- **P2325:** Approximately 2,300 LF of 12-inch line is proposed in Coastal Hills Drive north of Vineyard Way to serve future development within the 1100 PZ. This line is anticipated in Phase II.

- **P2356:** Approximately 3,600 LF of 12-inch line is proposed in Jamul Drive in Phase II.

- **P2387:** Approximately 1,800 LF of 12-inch line is proposed in Steel Canyon Road in Phase II.

- **P2399:** Approximately 2,200 LF of 30-inch line is proposed in Hunte Parkway north of Proctor Valley Road. This line will alleviate high headlosses experienced during the morning peak demand periods in the 980 PZ. This project is anticipated in Phase II.

- **P2402:** Approximately 5,400 LF of 12-inch line is proposed in La Media Road from Rock Mountain Road south to Otay Valley Road. This line will serve future development within Otay Valley and is anticipated in Phase II.

- **P2414:** Approximately 2,700 LF of 16-inch line is proposed in Dehesa Road from Sloane Canyon Way to the Sycuan Indian Reservation. This property will be ultimately served by the District and will require an extension of the existing services within the 803 PZ. This project is anticipated in Phase II.

- **P2430:** Approximately 12,400 LF of 30-inch in Proctor Valley Road in Phase II.

- **P2471:** A Pressure reducing station is proposed to be constructed at the existing 657-1/850-1 PS. The PRS will reduce pressure from the 850 PZ to the 657 PZ as a back-up supply and is anticipated in Phase II.

Phase III

- **P2053:** 5,800 LF of 20-inch line is proposed in Campo Road to parallel the existing 16-inch main from the 944-1 PS out to the existing 944 Reservoirs. This line is needed to increase capacity and lower headloss in the existing 16-inch line due to increased demand in the upper Regulatory PZs and allow water to flow from the 1296-2 Emergency PS during a CWA outage or other water shortage. This project is planned for Phase III.

- **P2056:** Approximately 2,200 LF of 16-inch line in Jamul Drive in Phase III.

- **P2106:** Approximately 4,400 LF of 12-inch line is proposed from the future Rock Mountain Road south to the future Otay Valley Road extension. This line is necessary to serve future developments in Otay Ranch and is anticipated in Phase III.

- **P2116:** Approximately 3,000 LF of 12-inch line is proposed in the future Hunte Parkway alignment from SR-125 east to EastLake Parkway. This line is necessary to serve development east of SR-125 and south of Hunte Parkway and to provide a looped system. It is anticipated in Phase III.

- **P2122:** Approximately 2,400 LF of 20-inch line is proposed to connect the existing 24-inch line through the Olympic Training Center (OTC) south to connect to the existing 30-inch transmission main from LOPS. This will provide flexibility for the 711 PZ to be fed directly from the 624 PZ should the 711-1 PS go offline and is anticipated in Phase III.

- **P2137 and P2139:** Approximately 2,800 LF of 20-inch line is proposed to extend east in Otay Lakes Road to serve the future Village 13/Resort parcel. It is anticipated in Phase III.

- **P2138:** Approximately 2,900 LF of 20-inch line is proposed to extend north from Otay Lakes Road to the proposed 980-4 Reservoir. This line will also serve the future Village 13/Resort parcel and is anticipated in Phase III.

- **P2148:** Approximately 4,800 LF of 16-inch line is proposed in Jamacha Boulevard from Sweetwater Springs Boulevard to Trace Drive. This line will provide additional capacity to serve to 850 PZ and is anticipated in Phase III.

- **P2156:** Approximately 1,200 LF of 12-inch line is proposed in Olive Vista Drive from east of Heide Road to Kemberly Lane that will parallel an existing 10-inch line in order to increase capacity in this area and reduce headloss through the existing 12-inch and a redundant connection to the 1485 PZ. This pipeline is planned for Phase III.

- **P2177:** Approximately 4,300 LF of 30-inch line is proposed to extend south from Melody Road to serve the future 1296-4 Emergency Reservoir. This line is anticipated in Phase III.

- **P2188:** Approximately 3,400 LF of 24-inch line is proposed in Campo Road from Steele Canyon Road east to the 944-1 PS. This line will provide additional transmission capacity to the upper Regulatory zones and is anticipated in Phase III.

- **P2198:** Approximately 8,500 LF of 18-inch line is proposed from the 832 Reservoirs in Steele Canyon Road. This line will provide the flexibility for the Regulatory System to operate during a CWA outage by allowing water from the South District through the 1296-2 Emergency PS to flow through PRVs and serve the 832 PZ. This project is anticipated in Phase III.

- **P2204:** Approximately 3,100 LF of 24-inch line is proposed in Pioneer Way from Proctor Valley Road to the 1296 Reservoirs. This line will serve the reservoirs and Regulatory System from the 1296-2 Emergency PS in the event of a CWA outage and is planned for Phase III.

- **P2374:** Approximately 400 LF of 30-inch line is proposed to connect the proposed 870-2 Reservoir to the existing 870-1 Reservoir. This project is anticipated in Phase III.

- **P2401:** Approximately 17,700 LF of 12-inch line is proposed in Otay Valley Road from Heritage Road east to EastLake Parkway. This line will serve future developments in the Otay Ranch area and is anticipated in Phase III.

- **P2403:** Approximately 6,800 LF of 12-inch line is proposed in Heritage Road between Olympic Parkway and Otay Valley to serve future development in the area. This project is anticipated in Phase III.

- **P2404:** Approximately 8,000 LF of 12-inch line is proposed in the future Rock Mountain Road from La Media Road to Otay Valley Road. This line will serve future developments in the Otay Valley are and is anticipated in Phase III.

- **P2405:** Approximately 1,200 LF of 12-inch line and a new 624/340 PRS are proposed in Otay Valley Road between Heritage Road and the existing 16-inch line in Main Street. This line will provide a redundant service connection to the 340 PZ and is anticipated in Phase III.

- **P2406:** Approximately 2,400 LF of 12-inch line and a new 711/624 PRS are proposed in EastLake Parkway south of Hunte Parkway. This line will serve future development in Otay Valley and provide a backup supply to the 624 PZ. This project is anticipated in Phase III.

- **P2411:** The existing 1296/944 PRS is planned to be upgraded to replace the aging facility at the 1296-1 PS site. This project is anticipated in Phase III.

- **P2412:** The existing 944/832 PRS is planned to be upgraded to replace the aging facility at the 944-1 PS site. This project is anticipated in Phase III.

- **P2413:** The existing 1296/803 PRS is planned to be upgraded to replace the aging facility. This project is anticipated in Phase III.

- **P2427:** Approximately 4,000 LF of 20-inch line in Otay Lakes Road in Phase III.

- **P2435:** Approximately 15,700 LF of 30-inch line is proposed from Proctor Valley Road to the proposed 1296-2 Emergency PS. This line will provide flexibility in order to move water from the Central System to the Regulatory System in the North District in the event of an emergency. This project is anticipated in Phase II.

This page intentionally left blank.

Chapter 5
Recycled Water System

As noted in Chapter 3, the State of California is in the midst of a water supply crisis. Uncertainties that affect California's water resources, which in turn impact supplies to Southern California, have received widespread media coverage and public attention in recent months. The recent federal court ruling setting operational limits on Delta pumping for a portion of the year to protect endangered Delta species is expected to reduce supplies to Metropolitan Water District and the SDCWA. As a result, the District continues to prudently invest and expand its recycled water system, which has become one of the largest systems in San Diego County.

Otay Water District's existing recycled water system, constructed largely by new development, provides the District with a reliable supply of irrigation water. This chapter provides a description of the District's recycled water supply and distribution system and addresses potential areas of expansion.

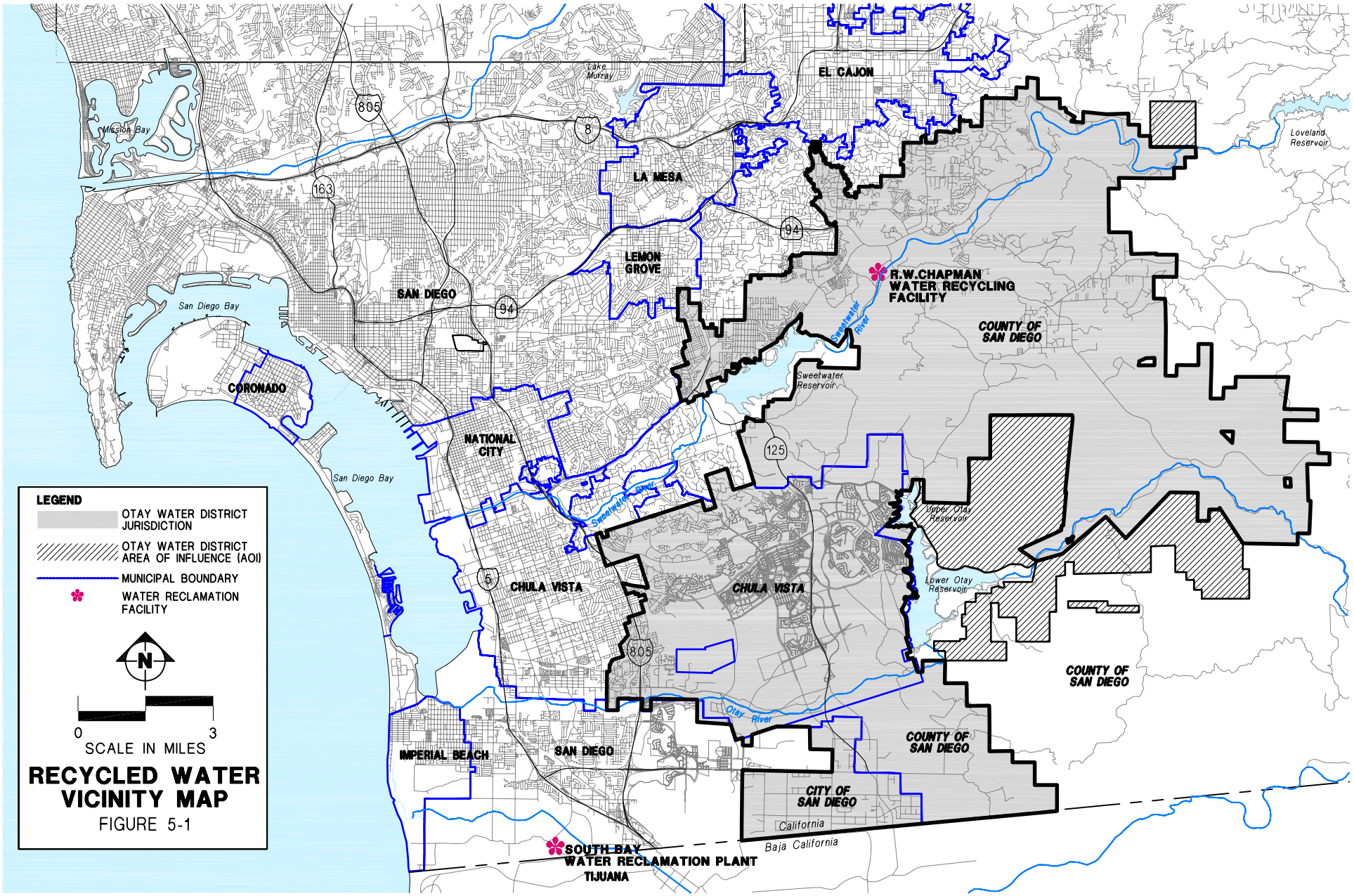
5.1 Recycled Water Supply

Otay Water District has two sources of recycled water supply: recycled water produced locally at the District's Ralph W. Chapman Water Recycling Facility (RWCWRF) and a recycled water supply produced at the City of San Diego's South Bay Water Reclamation Plant (SBWRP). These facilities are shown on the vicinity map included in Figure 5-1.

5.1.1 Local Supply

The District owns and operates the RWCWRF, formerly known as the Jamacha Basin Water Reclamation Facility. The RWCWRF is located near the intersection of Campo Road/Highway 94 and Singer Lane within the Middle Sweetwater River basin. The RWCWRF was originally constructed in 1979 and upgraded in 1990. It has a rated design capacity of 1.3 mgd.

Wastewater collection services within the Middle Sweetwater River basin, known as the Jamacha Basin, are provided by two agencies, the Otay Water District and the Spring Valley Sanitation District (SVSD), which is operated by the County of San Diego. Current wastewater collection system flows for both agencies total approximately 2.04 mgd average dry weather flow (ADWF). Approximately 1.36 mgd is collected from District customers and 0.68 mgd is collected from SVSD customers. The RWCWRF is a scalping treatment facility: wastewater that is not treated by the facility for beneficial reuse continues to flow in the Rancho San Diego Outfall Facilities to the City of San Diego Metropolitan Wastewater System. The total ultimate projected sewage generation within Jamacha Basin that could be potentially treated at the RWCWRF, if it were to be expanded, has been estimated at 3.84 mgd. This includes the land areas outside of the County of San Diego Urban Limit Line established by County Policy I-107. This estimate attributed 0.85 mgd to the SVSD customers and 2.99 mgd to District customers. The rate of growth of the sewage collection system flows is estimated to be less than 1 percent per year within the Jamacha Basin.



H:\Waterres\100 Otay WD\Otay WRMP\Report\2008WRMP\graphics\0491298-MP-RW-Vicinity.dwg 11/19/08

The RWCWRF provides tertiary treatment that meets the State of California's Title 22 requirements for reuse. Effluent from the plant is pumped to lined and covered reservoirs in the District's property known as the Use Area, located north of Proctor Valley Road adjacent to the Rolling Hills Ranch Development project.

In order to serve the District's existing demand for recycled water without supplementing with potable water, the District entered into an agreement to purchase recycled water from the City of San Diego's SBWRP.

5.1.2 South Bay Water Reclamation Plant Supply

The City of San Diego's Metropolitan Wastewater Department (MWWD) owns and operates a recycled water treatment plant known as the South Bay Water Reclamation Plant (SBWRP). The SBWRP has a rated capacity of 15 mgd and is located at Monument and Dairy Mart Roads near the international border, adjacent to the Tijuana River. The SBWRP receives wastewater flow from a pump station known as the Grove Avenue Pump Station that scalps flow from the existing interceptor system that conveys flow northward to the Point Loma Treatment Plant for treatment and ocean outfall disposal. The existing interceptor system flows are thereby reduced freeing up additional capacity for future growth in the South Bay region. The SBWRP in essence is a scalping plant and is designed for a relatively constant flow rate depending upon recycled water demands and interceptor capacity limitations.

The agreement between the District and the City of San Diego for purchase of recycled water from the SBWRP was finalized on October 20, 2003. In accordance with the agreement, the City of San Diego will provide an annual amount of up to 6 mgd of recycled water to District. The term of the agreement is 20 years from January 1, 2007. The City has agreed to meet all applicable federal, state and local health and water quality requirements for recycled water produced at the SBWRP to the point of delivery. The recycled water total dissolved solids (TDS) are not to exceed 1,000 mg/l. From the point of delivery, District is responsible for all water handling facilities that it owns and operates and for the quality of the recycled water from that point.

The point of delivery is located at the intersection of Dairy Mart Road and Camino de la Plaza, as shown in Figure 5-1. As part of the agreement, the District has constructed a 30-inch transmission main to deliver the recycled water from the point of delivery to the District. The City of San Diego has retained 1 mgd of capacity in this transmission pipeline that runs through the City's system.

The new Master Reclamation Permit (Order R9-2007-0038) that allows the District to distribute the blended recycled water supply from the RWCWRF and the SBWRP restricts the areas where recycled water can be used within the District based on the local surface and groundwater beneficial uses and water quality objectives of the hydrologic areas that overlay the District's boundaries. These hydrologic areas are shown in Figure 5-2. The current permit allows recycled water use at sites located in the following Hydrographic Areas (HA) and Subareas (HSA): Telegraph HSA, La Nacion/Sweetwater River HSA, the Salt Creek portion of Otay Valley HA, and Tijuana Valley HA.

5.1.3 Future Sources of Supply

The City of Chula Vista is currently evaluating the feasibility of constructing a 5 to 6 mgd reclamation facility to meet its local wastewater treatment needs. Critical to the project success, is the ability to market and sell the recycled water to areas with a need for and a distribution system in place. The District has been working closely with the City of Chula Vista to evaluate the feasibility of the proposed project and the benefits of increasing the region's recycled water supply.

5.2 Recycled Water Facilities

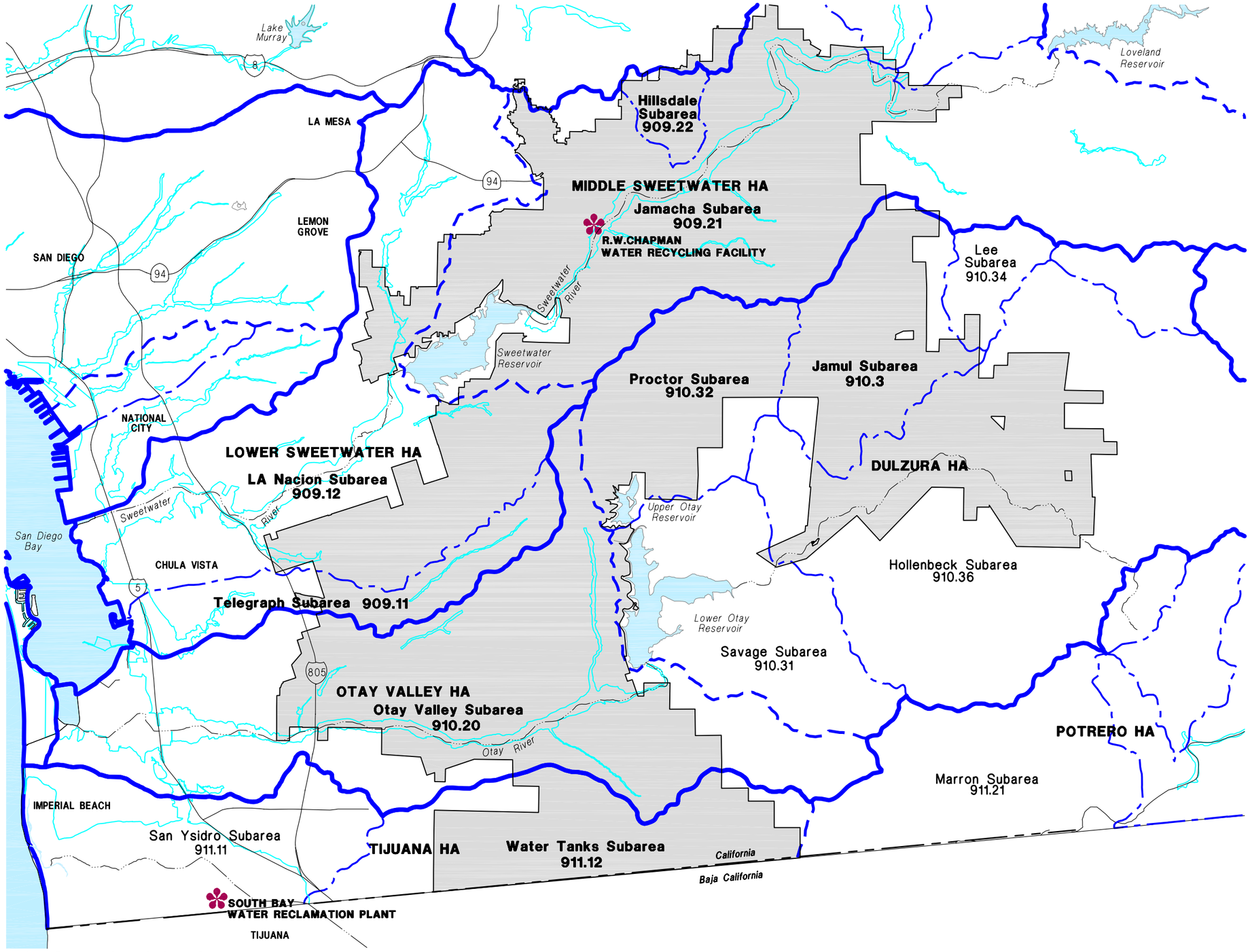
The District operates and maintains over 77 miles of recycled water transmission and distribution pipelines, pump stations and reservoirs, making it one of the largest recycled water systems in the Southern California. The District currently serves recycled water to customers within its Central Area System, south of the Sweetwater Reservoir and west of the Otay Lakes Reservoirs. New facilities were recently constructed to link the District's system with the City of San Diego's SBWRP. A schematic of the system's hydraulic profile is provided in Figure 5-3. The following paragraphs describe the District's existing recycled water distribution system, as well as the facilities planned in the near future.

5.2.1 Existing Distribution System

To serve the District's recycled water customers, Title 22 effluent from the RWCWRF is pumped 3.4 miles to two lined and covered reservoirs, the 12-mg 927-1 (Pond No. 1) and the 16.3-mg 927-2 (Pond No. 4). Because these storage facilities are lined and covered, there are no odor control or vector control issues associated with these facilities, nor is there any percolation of recycled water from these facilities into the groundwater basin. The recycled water pump station at the RWCWRF consists of 5 pumps and has a total capacity of 3,500 gpm with a firm capacity of 2,600 gpm. Firm capacity is defined as the total capacity less the capacity of the largest pump in the pump station. The largest pump is designated as a standby unit that is used as the backup pump unit in the event that any other units out of service. The 3.4-mile, 14-inch diameter force main to the reservoirs serves as a vessel to fulfill the Title 22 requirement of 450 milligram-minutes per liter of chlorine contact time before the recycled water can be used.

The 927-1 and 927-2 reservoirs have high water elevations of 944 and 927, respectively, and provide forebay storage for the District's recycled water system.

The District is in the process of hydraulically connecting the reservoirs via a PRV interconnection whereby the distribution system will "float" off of the 927 pressure zone. An emergency disposal pipeline connects these reservoirs to the SVSD Frisbee Trunk Sewer in the event that the recycled water needs to be diverted prior to reaching the recycled water customers.

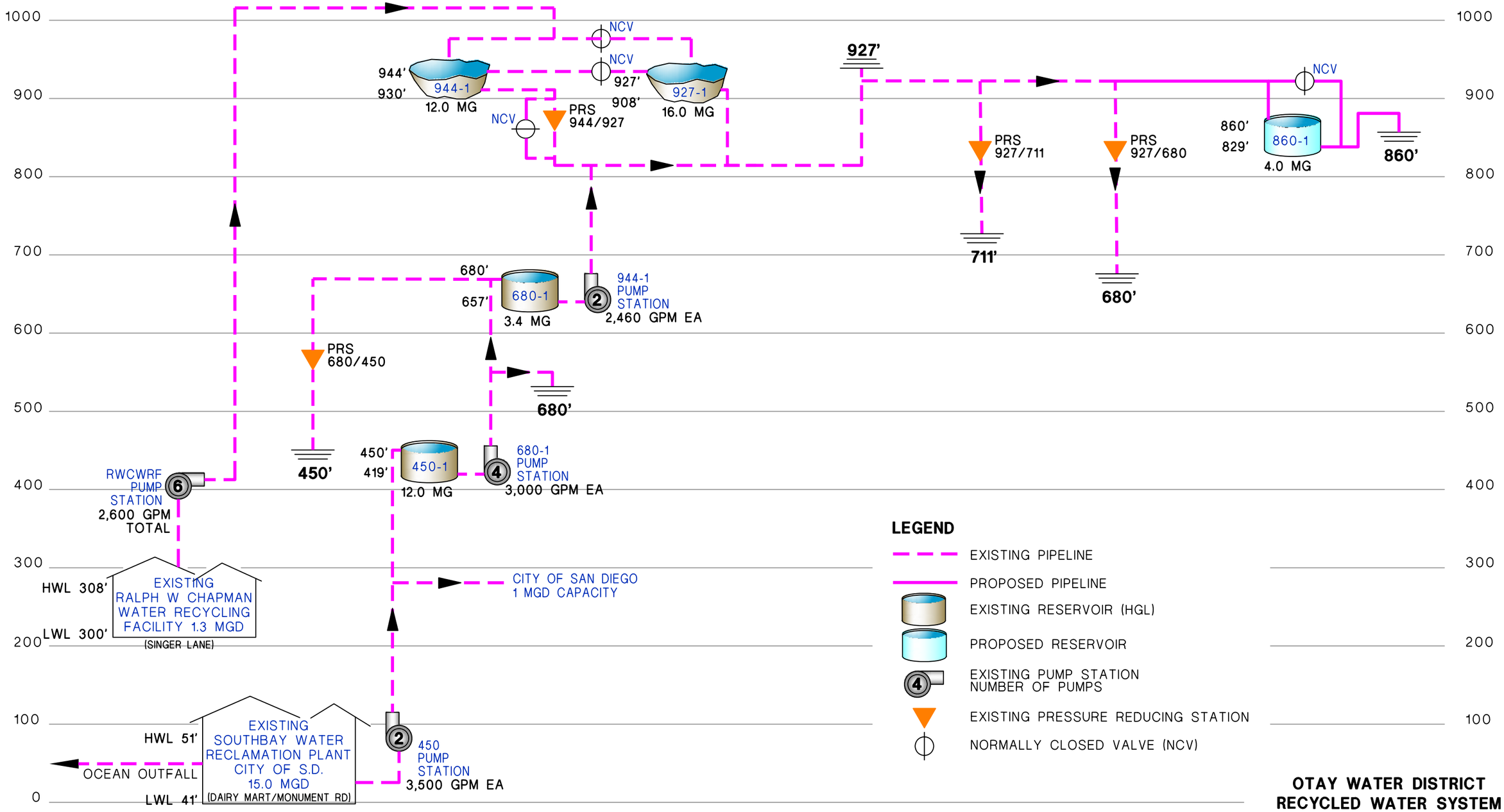


H:\WaterRes\100 OtayWD\OtayWRMP\Report\2008 WRMP\Graphics\491298-HYDRLareasMP.dwg 09/01/2009

HYDROLOGIC SUBAREAS

FIGURE 5-2

This page is intentionally left blank.



OTAY WATER DISTRICT
RECYCLED WATER SYSTEM
HYDRAULIC PROFILE SCHEMATIC

FIGURE 5-3

SOURCE: OTAY WATER DISTRICT AUGUST 2006

H:\Waterres\100Otay\OtayWD\OtayWRMP\Report\2008WRMP\Graphics\0491298-MP-RW-SystemSchematic.dwg 09/01/2009

This page is intentionally left blank.

A 20-inch recycled transmission main extends south from the two reservoirs approximately 13,000 feet to Otay Lakes Road. This 20-inch main supplies the recycled water to all the existing recycled water meters connected to the recycled water system. Additional transmission mains exist in Otay Lakes Road, Telegraph Canyon Road, EastLake Parkway, Hunte Parkway, East H Street and Olympic Parkway. Figure 5-4 shows all the existing recycled water facilities within the Central Area.

In spring 2007, the District completed a major transmission project that allows recycled water produced at the City of San Diego's SBWRP to be conveyed to and distributed within the District. These new facilities are also shown on Figure 5-4. The effluent pump station at the SBWRP pumps recycled water via a 30-inch transmission main to the 12-mg 450-1 Reservoir. This reservoir functions primarily as a supply regulating reservoir and pump station forebay for the 680-1 Pump Station, which now provides recycled water to the 680 and 927 Pressure Zones within the Central Area. The 16.5-mgd 680-1 pump station is located at the 450-1 Reservoir site and pumps recycled water via a 16-inch transmission main to the 680-1 Reservoir. The 3.4-mg 680-1 Reservoir was constructed as a dual purpose land use effort and is located beneath the basketball courts at Sunset View Park in Chula Vista. The 927-1 Pump Station, with a capacity of 10.55 mgd conveys water from the 680 PZ to the 927 PZ, via a 16-inch transmission main.

5.2.2 Future Distribution System

The District's Central Area continues to be a growing area, characterized by large master planned developments. The District will continue to require developers to connect to the District's recycled water systems to serve irrigation demands. The uncertainty of water supply in San Diego County and the recent drought conditions make recycled water a viable and critical reliable supply to meet future growth needs.

Otay Mesa is also a growing part of the District with significant planned industrial development, including a third Border Crossing by the Federal Government. As part of their planning, developers in Otay Mesa have anticipated that recycled water would become available and have been constructing dual distribution pipelines within the systems for over twenty years. It is the intent of the District to continue to construct the system of reservoirs, pump stations, and transmission mains that will incorporate these distribution pipelines into a complete delivery system. The District anticipates a future connection to the Otay Mesa Area to parallel Alta Road near the District's eastern boundary. A new 4-mg 860-1 Reservoir would be located adjacent to the County's East Mesa Detention Center. These facilities are currently included in the District's 2009 Capital Improvement Program. Figure 5-5 illustrates the District's current plans for the recycled water system at ultimate buildout.

5.3 Recycled Water Customers

For many years it has been the District Board's fundamental belief that by developing and utilizing recycled water, the need for imported potable water within the District can be reduced. In Section 26 of the District's Code of Ordinances, the District states its policy that "reclaimed water shall be used within the jurisdiction wherever its use is financially and technically feasible, and consistent with legal requirements, preservation of public health, safety and welfare, and the environment." The implementation of this policy provides the District the opportunity to plan, fund, and construct facilities to meet projected recycled water market demands. To date, the

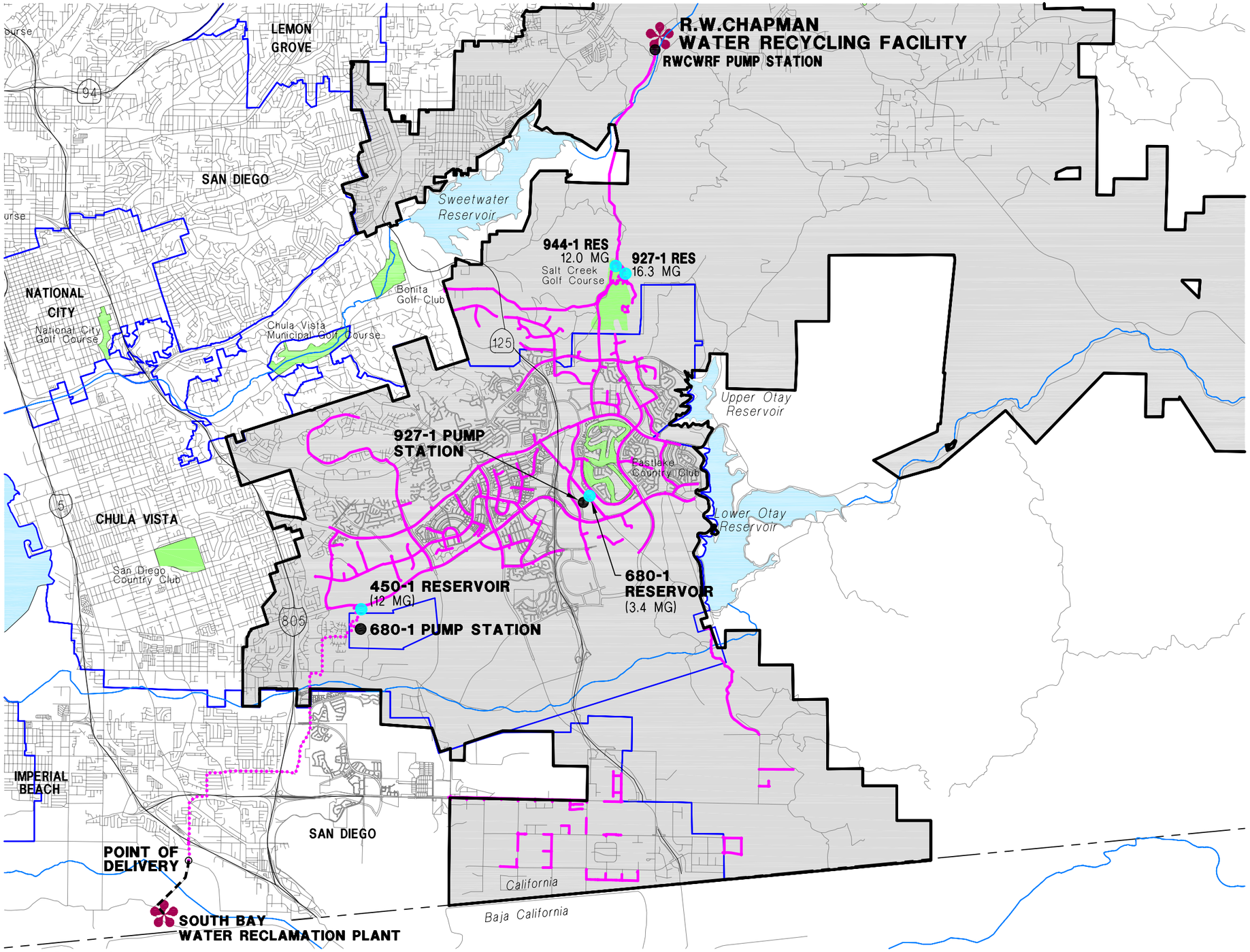
District has constructed and expanded its recycled water customer base to over 600 existing customer sites. Implementing the recycled water purchase agreement with the City of San Diego, the District has increased its available recycled water supply and continues to look for additional recycled water customers.

5.3.1 Existing Recycled Water Customers

The majority of the existing uses of recycled water within the District are landscape and golf course irrigation. Figure 5-6 illustrates the locations of existing recycled water metered connections currently served by the District. The District's largest customers and their average demand for 2007 are listed in Table 5-1. In 2007, the District's average annual recycled water demand was approximately 5,350 AFY (4.77 mgd). With an average demand over the same period of 3,670 AFY, these 41 customers account for over 68 percent of the District's annual recycled water demand. Appendix C-1 provides a complete list of the District's existing recycled water customer accounts.

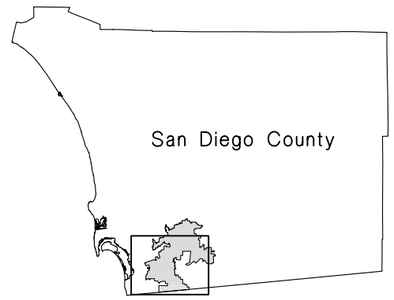
A summary of the District's historic monthly recycled water demands are provided in Figure 5-7. This data is based on the District's billing data for non-potable irrigation meters from 2004 through 2007. As shown, peak use of recycled water in the District occurs during the warm, dry season, from June through September, and has increased over the past four years as the District has expanded its distribution system. In 2002 and 2003, the District's recycled water customers used just under 1,000 million gallons annually. Over 1,200 million gallons was used annually in 2004 and 2005 and approximately 1,350 million gallons in 2006. As the District's recycled water supply from the RWCWRF is just less than 500 million gallons per year, the remaining demand was supplemented with potable water. By May 2007, however, the District was able to deliver recycled water from the City of San Diego's SBWRP and virtually eliminated the need to supplement the system with potable water. Demands in 2007 increased compared to prior years, to over 1,740 million gallons (5,350 AFY), serving approximately 600 customer sites.

Recycled water is typically used for irrigation and this type of use varies seasonally depending on the local climate variations. A standard curve, developed by the City of San Diego Clean Water Program *Water Reclamation and Reuse Master Plan* in 1989 to reflect San Diego's climate, is often used to project seasonal use of recycled water. The curve is depicted as the monthly percentage of the annual demand, with peak use occurring in July and August. In the District's case, adequate meter data is available to chart the District's historic seasonal use. As shown in Figure 5-8, the District's historic seasonal use, mirrored closely by the District's 2007 data, falls below the peak use projected by the San Diego standard curve. In the standard curve, the peak monthly demand is approximately twice the average demand. However, the District's historic data indicates that the District's peak monthly demand is 1.58 times the average demand.



LEGEND

- MUNICIPAL BOUNDARY
- OTAY WATER DISTRICT
- EXISTING 30" RW PIPELINE
- EXISTING RW SYSTEM
- CITY OF SAN DIEGO PIPELINE



N

0 8000

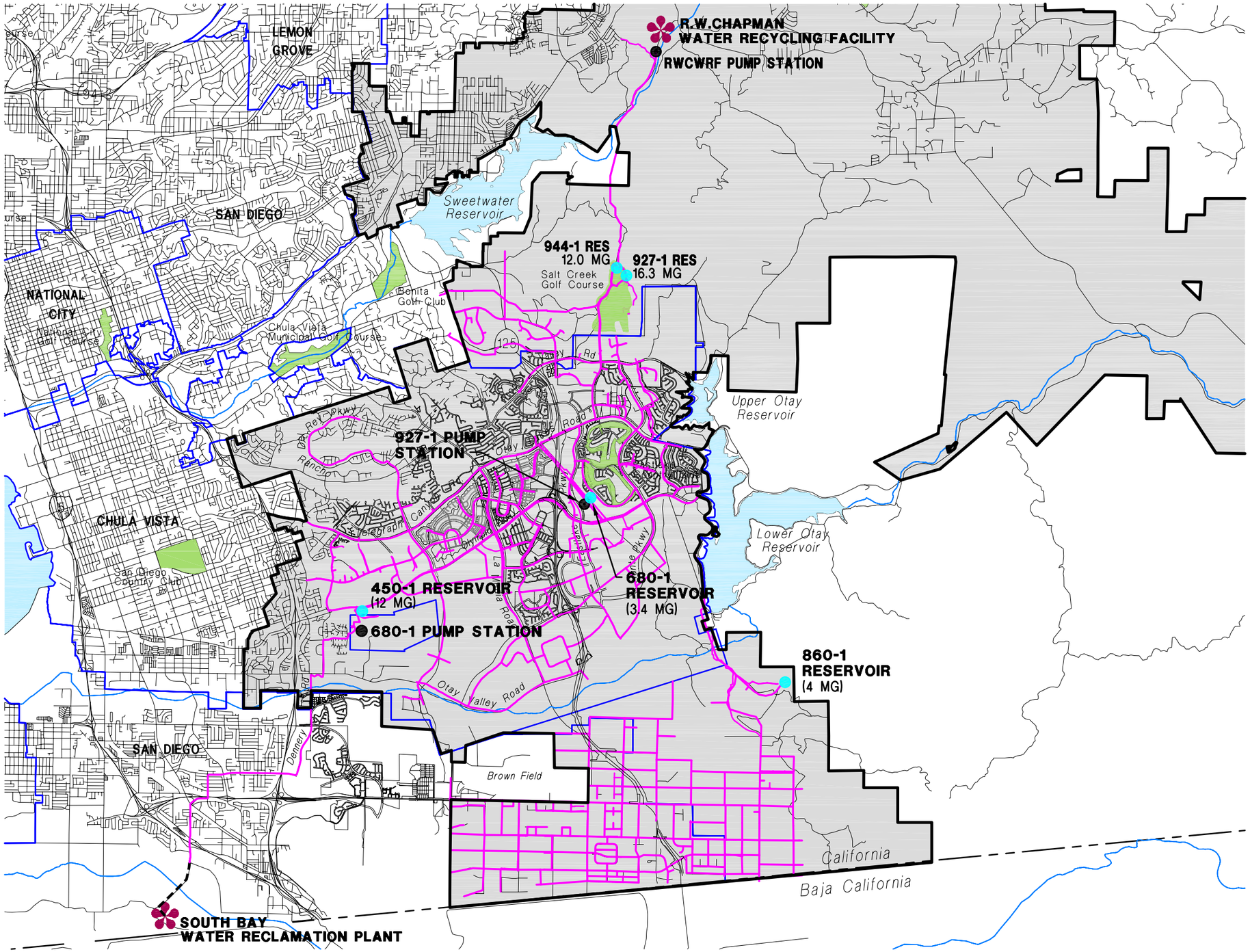
SCALE IN FEET

OTAY WATER DISTRICT
EXISTING RECYCLED WATER SYSTEM

FIGURE 5-4

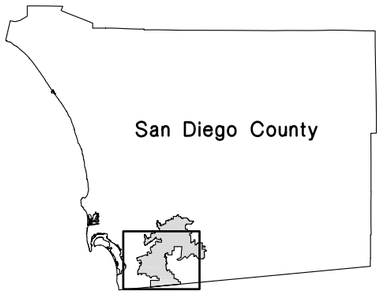
H:\WaterRes\100 OtayWD\OtayWRMP\Report\2008WRMP\Graphics\491298-RWsystem-ExistMP.dwg 09/02/2009

This page is intentionally left blank.



LEGEND

- MUNICIPAL BOUNDARY
- OTAY WATER DISTRICT
- ULTIMATE RW SYSTEM
- CITY OF SAN DIEGO PIPELINE



N

0 8000

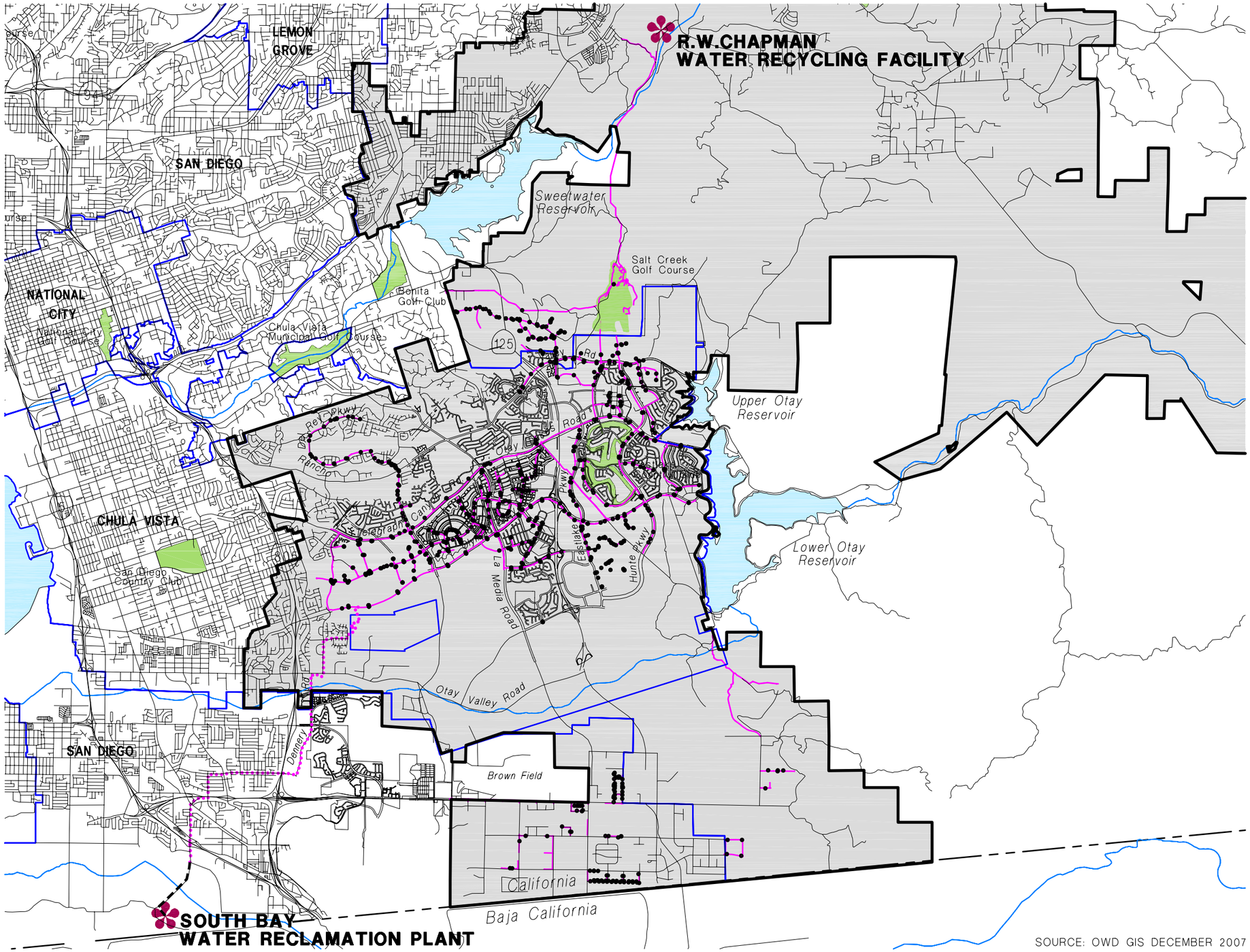
SCALE IN FEET

OTAY WATER DISTRICT
ULTIMATE
RECYCLED WATER SYSTEM

FIGURE 5-5

H:\Waterres\100OtayWD\OtayWRMP\Report\2008WRMP\Graphics\491298-RWfutureMP.dwg 09/02/2009

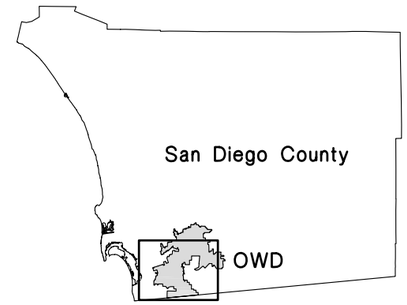
This page is intentionally left blank.



LEGEND

- MUNICIPAL BOUNDARY
- OTAY WATER DISTRICT
- EXISTING 30" RW PIPELINE
- EXISTING RW SYSTEM
- CITY OF SAN DIEGO PIPELINE
- EXISTING RW METER (2007 METER DATA)

NOTE: OTAY MESA SYSTEM EXISTING RECYCLED FACILITIES CURRENTLY SERVED BY POTABLE WATER.



N

0 8000
SCALE IN FEET

SOURCE: OWD GIS DECEMBER 2007

OTAY WATER DISTRICT RECYCLED WATER USERS

FIGURE 5-6

H:\WaterRes\100OtayWD\OtayWRMP\Report\2008WRMP\Graphics\491298-RWusersMP.dwg 10/8/08

This page is intentionally left blank.

Table 5-1. District Recycled Water Customers Using More than 10 AFY

Recycled Water Customer	2007 Average Demand	
	AFY	mgd
City of Chula Vista	1,025.99	0.92
EastLake Country Club Partners	512.16	0.46
Salt Creek Golf LLC	458.46	0.41
EastLake III Community Association	262.04	0.23
United States Olympic Committee	196.91	0.18
Chula Vista Elementary School	127.35	0.11
McMillin Lomas Verdes	105.17	0.09
Sweetwater Union High School District	95.64	0.09
EastLake II Community Association	88.43	0.08
Windingwalk Master Association	63.57	0.06
Otay Ranch One Community Association	59.82	0.05
McMillin	52.13	0.05
Rolling Hills Ranch HOA	50.89	0.05
State of California	48.58	0.04
EastLake Company LLC	37.57	0.03
San Miguel Ranch Master Association	33.74	0.03
Otay Ranch III	30.34	0.03
Rolling Hills Ranch Community	28.79	0.03
EastLake Business Associates HOA	26.87	0.02
Summit at EastLake Comm Association	26.21	0.02
Roman Catholic Bishop of San Diego	26.04	0.02
Brookfield Otay LR-7/10 LLC	24.22	0.02
Rolling Hills Ranch Master	23.62	0.02
Sweetwater School District	23.16	0.02
EastLake Center Assoc Phase II	20.71	0.02
San Miguel Ranch HOA	20.12	0.02
Otay Project LP	18.98	0.02
Otay Ranch Five Community Association	17.69	0.02
Western Pacific Housing	16.33	0.01
Otay Lakes Road LP	14.93	0.01
NNP San Miguel Ranch	14.69	0.01
Alicante San Miguel Ranch HOA	13.70	0.01
McMillin Land Development Inc.	13.31	0.01
EQR - Missions At Sunbow LLC	13.12	0.01
EastLake Village	11.92	0.01
Sevilla Apartments LP	11.79	0.01
EastLake Company	11.60	0.01
Eagle Lomas Verdes LP	11.44	0.01
Camden Sierra	11.36	0.01
Levine Investments Limited Partners	10.83	0.01
Bre Properties Inc	10.68	0.01
Total	**3,671**	**3.28**

Figure 5-7. Historic Seasonal Use of Recycled Water in Otay Water District

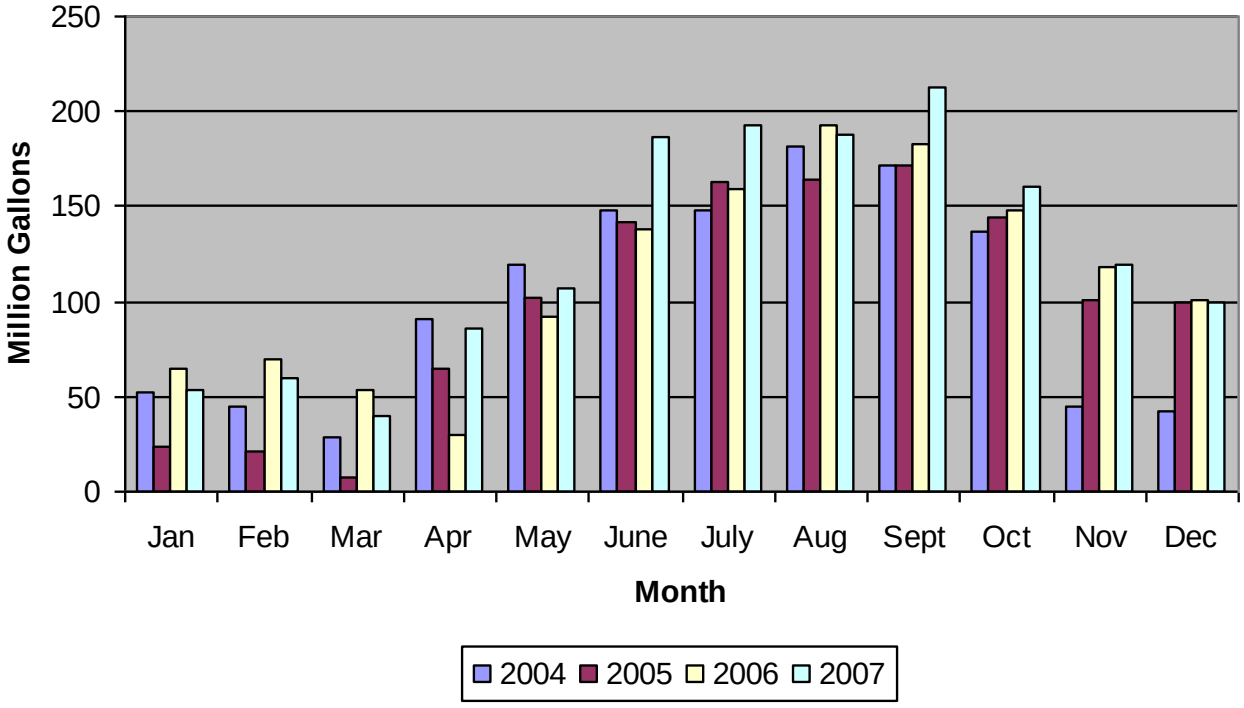
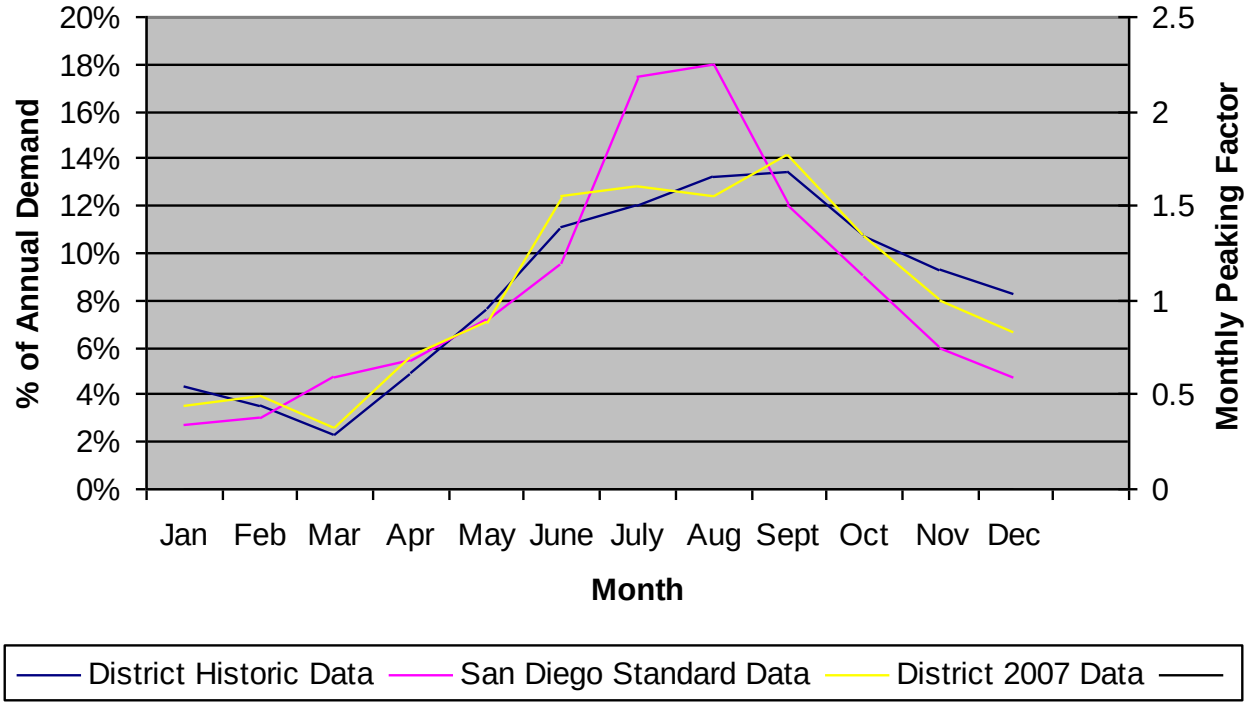


Figure 5-8. Seasonal Variation of Recycled Water Use in Otay Water District



5.3.2 Future Recycled Water Markets

Expansion of the District's recycled water system is critical to reducing demands on imported water. Areas with the greatest potential for expansion include the existing Central Area, the Otay Mesa area, and the North District area. The District anticipates maximizing the use of recycled water by converting large potable irrigation users to recycled water and continuing to require new developments within the District to use recycled water, wherever feasible.

To estimate future recycled water demands in the District, approved SAMPs or water studies were reviewed. It was assumed that areas with development plans would be in place by 2016. For areas without development plans, the projected water demand for the District at ultimate development was determined by applying irrigated area percentages and recycled water irrigation duty factors, described in Table 5-9, to land uses in the 2007 District land use database. These areas were then multiplied by an irrigated area factor and recycled water duty factor corresponding to the land use type in order to determine future recycled water demands.

Due to regulatory or financial constraints, there are a number of potential uses of recycled water that were not considered in this 2009 WRMP Update. The 2002 WRMP concluded that the use of recycled water for irrigation of single-family dwelling landscapes was not considered as a viable, cost effective recycled water market, and although this use is allowed in other parts of California, the local health departments have expressed concerns regarding public health and safety of individual homeowners operating their own irrigation systems. Therefore, irrigation of single family lots with recycled water has not been included in this Update. While groundwater recharge of recycled water to supplement local water supply is considered as a long term potential use, it is not currently planned by the District and is also not included in this report. The District also does not plan to discharge recycled water to any surface waters, including the Sweetwater River and Otay River or their tributaries.

Central Area

The Central Area System includes a number of major master-planned developments such as Rancho del Rey, EastLake, Sunbow, Rancho San Miguel, Rolling Hills Ranch, Olympic Training Center (OTC), and Otay Ranch Villages. Most of these developments are now built out; however, some recycled water meters that have been installed are not yet connected to the recycled water system. The District provided a list of 168 existing potable irrigation meters that they anticipate converting to recycled water in the future. Twelve of these customers are located in the Central Area and currently use approximately 73 AFY of potable water for irrigation.

The entire Central Area is approximately 60 percent built out and the undeveloped areas will continue to be developed with master planned type communities similar to those that have been developed to date. Since the 2002 WRMP, a number of developments have been constructed, or are under construction. Many more of these areas are currently in planning and entitlement phases. The status of these developments and the projected recycled water demands for these new developments have been estimated in Table 5-2. Some of the developments listed in Table 5-2 are located within the Otay Lakes watershed. Development projects that are tributary to the Otay Lakes are currently not allowed to use recycled water, per the District's Master Reclamation Permit. An amendment to the permit would be required because Otay Lakes is

used as a source of municipal water supply. The District is currently studying the feasibility of amending their permit to allow recycled water use in areas tributary to Sweetwater Reservoir. It is possible that in the future, recycled water may be permitted for use within the Otay Lakes watershed. Table 5-2 includes projected recycled water demands for planned projects within the Otay Lakes watershed in the event such use is allowed when these projects move forward.

The Otay Ranch GDP describes the primary land use for Villages 9 and 10 to be a University of California (UC) campus site and the secondary land use as residential development. In this 2009 WRMP Update, the projected recycled water demands for Villages 9 and 10 were revised to consider the proposed UC campus land use. The proposed future Otay River Park is assumed to develop primarily as a natural park and thus will not have a significant recycled water demand. However, if these assumptions change then an additional demand in the 680 PZ of the Central Area System could result.

Table 5-2. Central Area Projected Recycled Water Demands

No.	Project Name	2002 WRMP Projected Recycled Use (gpd)	Updated Projected Recycled Use (gpd)	Source
1	Otay Valley Village 2	291,076	135,255	Approved SAMP 1/2008
2	Otay Valley Village 3	69,908	24,559	
3	Otay Valley Village 4	113,364	87,779	
4	Otay Valley Village 7	183,843	176,286	Approved SAMP 12/2004
5	Otay Valley Village 8	137,608	118,647	
6	Otay Valley Village 9	185,348	155,866	Possible UC Campus Site
7	Otay Valley Village 10	176,135	148,119	Possible UC Campus Site
8	Otay Valley Village 11	221,178	161,740	Approved SAMP 1/2002
9	Otay Valley Village 12 (EUC)	256,398	67,947	Per Water Tech Study 1/2008
10	*Proctor Valley Village 13 (Resort)*(2)	*0*	*378,860*	*Land Use Irrigation Demand* (1)
11	*Proctor Valley Village 14* (2)	*0*	*32,950*	*Land Use Irrigation Demand* (1)
12	*San Ysidro Mountain Village 15* (2)	*0*	*0*	*Project now Open Space Preserve*
13	*San Ysidro Mountain Village 16* (2)	*0*	*787*	*Land Use Irrigation Demand* (1)
14	*San Ysidro Mountain Village 17* (2)	*0*	*N/A*	*Land Use Irrigation Demand* (1)
15	Otay Valley Village 18b	7,510	7,510	Anticipated SAMP 2008/2009
16	San Miguel Ranch	272,370	178,718	Approved SAMP 6/2000
17	680/450 Zone	222,181	65,165	
18	Hidden Valley Estates	0	0	Project now Open Space Preserve.
19	Salt Creek Ranch	0	212,328	Amended SAMP 10/2001
20	Honey Springs Ranch	0	0	Project now Open Space Preserve.
21	Central SR-125	681,056	457,650	
	Total	**2,817,975**	**2,410,166**	

(1) Land Use Irrigation Demand indicates that demands were calculated using irrigated acreage and the recycled water duty factor described in Table 5-9 for the proposed land use.
(2) Italicized projects are located within the Otay Lakes Watershed
(3) Future Infill Demand of 73 AFY based on potable irrigation meter conversions

Otay Mesa

In the near future, the District plans to expand its recycled water system into the Otay Mesa area by constructing a 24-inch pipeline along Alta Road and a 4-mg 850-1 Reservoir, connecting the Central Area system with the Otay Mesa system for the delivery of recycled water. These facilities are included in the 2009 District's Capital Improvement Program. As previously discussed, although recycled water facilities have been constructed by developers in Otay Mesa, none are currently receiving recycled water. These facilities are dual metered, meaning that recycled water meters were installed but receive only potable water at this time. Of the 168 customers the District identified that are anticipated to be converted to recycled water in the future, 156 are located in Otay Mesa and currently use approximately 338 AFY of potable water for irrigation. The complete list of recycled water meters currently using potable water is provided in Appendix C-2.

The Otay Mesa is currently developing primarily as an industrial area with minimal commercial retail and residential land uses, in accordance with the City of San Diego's adopted Otay Mesa Community Plan and the County of San Diego's East Otay Mesa Specific Plan. Limited residential development is expected in the eastern foothills of Otay Mesa. The areas near SR-125 and SR-905 interchanges will continue to develop as commercial endeavors. The City of San Diego is currently evaluating alternative land use plans for the portion of Otay Mesa that lies within the City's jurisdiction as they update the Otay Mesa Community Plan. However, none of these alternative land use plans are anticipated to change the overall demand for recycled water within the Community Plan area boundary.

Ultimate projected recycled water demands in Otay Mesa were generated using projects with a SAMP, recycled water meters currently charged with potable water, and general future land use categories. Future land uses are based on the existing Otay Mesa Community Plan and the East Otay Mesa Specific Plan. The typical land use types identified consist of parks, commercial and industrial development, freeways, street and highway corridor landscapes, multi-family residential development, public and community purpose facilities, etc. The projected recycled water demand for Otay Mesa is summarized in Table 5-3.

The near term major developments anticipated in Otay Mesa include the SR-125 and SR-905 projects, as well as the Calpine Energy Plant. In addition, the District will focus its near term efforts on connecting the existing recycled water meters that are currently charged with potable water. The existing recycled water meters will use approximately 0.30 mgd recycled water once service is provided.

In Otay Mesa is it anticipated that the District will provide recycled water service for dual plumbed facilities in addition to landscape irrigation uses. Dual plumbed facilities are facilities that have been equipped with secondary plumbing that provides recycled water service to toilets. Currently the only facility that has been equipped for indoor recycled water use in the District is the East Mesa Detention Facility, which is located in the County of San Diego. The plans for this building were approved by both the District and the County Department of Environmental Health and the facility was constructed in 1999. The East Mesa Detention Facility and the Richard J. Donovan State Correctional Facility toilet flushing and laundry demands were obtained from the *Otay Mesa Raw/Reclaimed Water Transmission Facility*

Feasibility Analysis planning report prepared by Robert Bein, William Frost & Associates, dated August 1997.

Table 5-3. Otay Mesa Projected Recycled Water Demands

No.	Project Name	2002 WRMP Projected Recycled Use (gpd)	Updated Projected Recycled Use (gpd)	Source
1	Recycled Water Meter Conversion	0	301,458	Otay Water District
2	Otay Crossings Commerce Park	0	20,580	Anticipated SAMP 2008/2009
3	3rd Border Crossing	4,310	10,279	Anticipated SAMP 2008/2009
4	Corrections Corporation of America Excess Demand		47,000	Anticipated SAMP 2008/2009
5	Energy Plant	21,550	21,550	2002 WRMP
6	Donovan State Correctional Facility	166,689	83,377	Land Use Irrigation Demand
7	East Otay Mesa Detention Facility	111,845	50,599	Land Use Irrigation Demand
8	SR-905	376,092	252,144	Land Use Irrigation Demand
9	SR-125	194,166	130,116	Land Use Irrigation Demand
10	Other	1,011,478	614,659	Land Use Irrigation Demand(1)
	Total	**1,886,130**	**1,531,763**	

(1) Land Use Irrigation Demand indicates that demands were calculated using irrigated acreage and the recycled water duty factor described in Table 5-9 for the proposed land use.

Recycled water service to the Detention Facility is not currently available and requires the construction of a pipeline. Prior to recycled water service to the Detention Facility, the District will be required to prepare a separate report, per Title 22 Section 60314, for approval by the regulatory agencies. This report will document the purpose of the dual plumbed system, the number of people served, the plans and specifications for the project and the cross connection testing protocols to be used by the District. Because there is currently insufficient information to project the future development of dual plumbed facilities, this type of recycled water use is not included in the 2009 WRMP Update recycled water demand projections.

A significant potential recycled water market may develop across the international border resulting from manufacturing or other activities in Mexico. Also, significant recycled water demands could become a possibility on Otay Mesa from pharmaceutical manufacturing or other types of industrial processes. The District may also want to consider extending their Otay Mesa recycled water service to City of San Diego customers in west Otay Mesa. The City of San Diego currently has no plans to extend their recycled water system into west Otay Mesa, however, this area will be experiencing growth and increased water demands. Recycled water service in west Otay Mesa could benefit both Otay Water District and the City of San Diego. The data presented in this 2009 WRMP Update does not include these possibilities. If these markets materialize then additional demand in the 860 PZ could result and the impact on the planned recycled water facilities and supply resources could be significant. If these markets materialize, a revision to the Otay Mesa System facility requirements may be necessary.

North District

In an effort to address potential opportunities to achieve a level of regional self-reliance, the IRP, discussed in Chapter 3, examined potential water supply options to enhance reliability and diversification of the District water resources supply portfolio. One of the outcomes of the IRP effort included the North District Recycled Water System Development Project (NDRWSDP) concept. The NDRWSDP concept is proposed as an option to help maximize recycled water use while decreasing imported water supply needs and operating costs of the District's existing recycled water system. Recycled water supply for the NDRWSDP concept could be provided by the RWCWRF.

The District has conducted a preliminary recycled water market assessment and developed alternative recycled water system concepts to convey recycled water into the North District. This was done to determine potential recycled water use opportunities within the North District to effectively utilize the entire supply resource from the RWCWRF. Approximately 795 AFY of recycled water use for landscape irrigation could offset an equivalent amount of imported water. These potential recycled water markets are located within the Middle Sweetwater River in an area commonly known as the Jamacha Basin. The Middle Sweetwater River lies between the Loveland Reservoir and the Sweetwater Reservoir, both owned and operated by Sweetwater Authority. Recycled water from the RWCWRF would be used to supply the currently identified North District recycled water markets resulting in reduced pumping requirements compared to existing conditions. The pumping lift would be reduced approximately 200 feet, thus saving substantial power costs.

There are, however, limitations on the application of recycled water to the land within the specific portions of the District's jurisdiction. The use of recycled water in geographic areas upstream of untreated water storage reservoirs that are intended and do serve as water supply resources for potable water purposes will require a significant effort to revise the current regulatory constraints, accomplish potential Basin Plan revisions, and address concerns held by neighboring water purveyor's and existing groundwater users potential sensitivity to the NDRWSDP concept. For these reasons, the use of recycled water to meet irrigation demands in the North District would be conditional upon inter-agency coordination and the permitting decision of the RWQCB and DPH.

To assist with developing inter-agency and other stakeholders' awareness and ensure full project acceptance, the proposed NDRWSDP concept has been divided into three phases. Phase I will conduct an investigation and study to identify compliance requirements involving various stakeholders, determine respective mitigation measures, and evaluate the feasibility of achieving compliance through various strategies. Phase II effort is currently envisioned as proceeding with the Phase I recommendations consisting of regulatory compliance requirements implementation, continued stakeholder participation, feasibility assessment recommendations, market assessment acceptance, refined facility planning, and capital and operational cost estimates. Phase III effort is currently envisioned as implementation of the recommended Phase II study outcomes that could include preliminary design, environmental compliance, market assurances, right-of-way acquisitions, project design, and construction of the contemplated capital improvement program project facilities.

Integrated into this 2009 WRMP Update, is a preliminary assessment of the proposed recycled water markets associated with the NDRWSDP. These potential markets currently use potable water for irrigation purposes. By evaluating the District's meter record data for potable irrigation meters in the North District, a list of potential recycled water customers was determined.

Golf courses, schools, parks, homeowner associations and commercial developments were identified as potential markets that currently use potable water for irrigation purposes. These customers are located primarily in the more developed areas on the north side of Sweetwater River, approximately 2 miles upstream from the Sweetwater Reservoir. Figure 5-9 identifies these potential customers (listed in Table 5-4) and their location within the basin. A conceptual pipeline alignment is presented to show how these customers might be served from the RWCWRF.

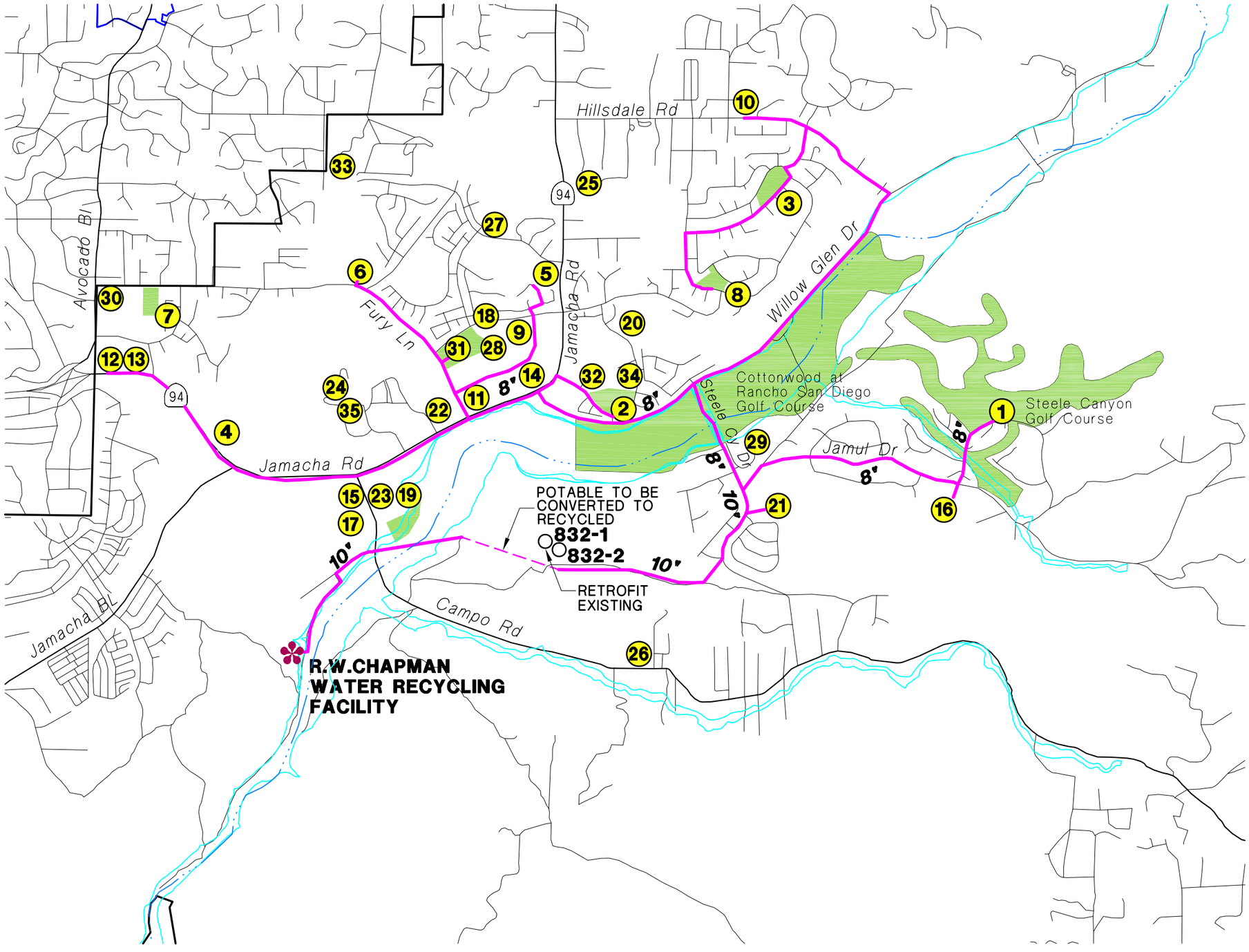
The 35 potential recycled water customers, listed in Table 5-4, represent the District's largest potable water irrigation customers in the North District including the Steele Canyon Golf Course, County of San Diego Parks, local school sites including Steele Canyon High School, Cuyamaca College and large homeowner's associations and commercial shopping centers. Together these customers use approximately 796 AFY of potable water for irrigation. On an average day, these customers would use approximately 0.7 mgd of recycled water, and on a maximum day, 1.4 mgd, just over the 1.3 mgd production capacity of the RWCWRF.

Table 5-4. Potential North District Recycled Water Customers

	Customer Name	AFY
1	Steele Canyon Golf Club	300.0
2	Con Am Partners	78.7
3	County of San Diego Woodhaven Pk	33.9
4	Skyline Wesleyan Church Inc	31.8
5	Rancho Hillside Inc	23.7
6	Mirasol Homeowners Assn	21.9
7	County of San Diego Lonnie Brewer Pk	19.7
8	County of San Diego Wind River Pk	18.2
9	S P Lavida Real	16.5
10	Roman Catholic Church	12.6
11	Collins Capital Properties	12.3
12	CA Rancho San Diego Village	11.9
13	Lanoga Corp	10.9
14	Thrifty Payless	10.5
15	Vestar California XVII	9.4
16	S Canyon Associates Del	9.0
17	Edwards Theatres Inc	8.5
18	Brabham Street	8.3

	Customer Name	AFY
19	YMCA Sports Complex	8.3
20	Garcia Alex R	7.4
21	County of San Diego Steele Canyon Pk	6.6
22	Kohls Department Stores Inc	5.1
23	Ram Centers	1.7
24	Cuyamaca College	9.7
25	Valhalla High School	9.3
26	Steele Canyon High School	53.6
27	Rancho San Diego Elementary	3.4
28	Hillsdale Middle School	0.2
29	Jamacha Elementary (LRR)	13.7
30	Avocado Elementary	1.8
31	County of San Diego Hillsdale Pk	24.7
32	County of San Diego Hilton Head Pk	3.7
33	County of San Diego Damon Lane Pk	2.7
34	County of San Diego Cottonwood Pk	6.0
35	Water Conservation Garden Cuyamaca College	4.9
	Total	**795.8**

Note: Customer number corresponds with customer location on Figure 5-9.



LEGEND

- OTAY WATER DISTRICT
- FLOODPLAIN 100 YEAR
- PROPOSED RW PIPELINE
- (23) PROPOSED RW USER
- 8" PIPELINE DIAMETER

NOTE:

SEE TABLE 5-4 FOR RECYCLED WATER USERS.

ALL PIPELINES ARE 6 INCH UNLESS OTHERWISE NOTED.

OTAY WATER DISTRICT
CONCEPTUAL NORTH DISTRICT
RECYCLED WATER SYSTEM

FIGURE 5-9

H:\Waterres\100 OtayWD\OtayWRMP\Report\2008WRMP\graphics\491298-RW-NorthMP.dwg 12/15/08

This page is intentionally left blank.

Typically, when converting customers to recycled water, not all of the identified potential sites become successful candidates for retrofits and for those that are successful candidates, retrofitting improves the water use efficiency at the site and total water use can decrease. Additional customers may need to be identified to fully utilize the daily capacity of the RWCWRF. For flexibility in the distribution system, it is assumed that pumping capacity from the RWCWRF to the Central Area System would be maintained so that excess recycled water, especially during the winter season, could be stored for use in the Central and South recycled water distribution systems.

Potential candidates that were eliminated from consideration for recycled water use in the North District include the Rancho San Diego Golf Club and Caltrans. The Rancho San Diego Golf Club (Cottonwood GC) currently uses well water for irrigation, and therefore has no current need for recycled water. Discussions with Caltrans have indicated that their highway beautification project at the east end of SR-94 has encountered limited success due to the rock found at the site and the difficulty in establishing planting and irrigation systems there. Caltrans anticipates irrigating in this vicinity only as long as it takes to establish the plantings and only occasionally after that. No demand for recycled water in this area is foreseen.

5.3.3 Summary of Recycled Water System Expansion Opportunities

The future recycled water markets for all three systems are summarized in Table 5-5. To facilitate the hydraulic analysis of the distribution system, the projected recycled water demands were allocated to the planned primary pressure zones in the Central Area and Otay Mesa Systems. These projects result in an increase in the annual average day recycled water demand by 4.61 mgd.

As discussed in Chapter 4, the proposed capital improvement projects are divided into three phases: Phase I (2008-2009), Phase II (2010 - 2016), and Phase III (2017 - Ultimate). Phase I is existing District conditions. Phase II is a five year period of time from 2010 through 2016. Phase III is considered a five year period of time from 2017 through ultimate conditions. In order to evaluate the recycled water system and recommend improvements by phase, the timing of the proposed developments is important. A summary of the projected ultimate annual average day recycled water demands by area is shown in Table 5-6. Phase I reflects the existing demand in the Central Area. Phase II assumes increased demand in the Central area as projects with existing SAMPs and Water Studies are developed, and the connection of the existing dual metered sites, future Calpine Energy Plant, and future SR-125 and SR-906 in Otay Mesa. Phase III assumes ultimate buildout of currently approved land uses in Otay Mesa and undeveloped parcels in the Central Area, as well as the expansion of recycled water facilities into the North District.

Table 5-5. Summary of Future Increase in Recycled Water Demand by Pressure Zone

Project Name	680 PZ (gpd)	944 PZ (gpd)	860 PZ (gpd)	North District (gpd)	Total (gpd)
Otay Valley Village 2	135,255	-	-	-	-
Otay Valley Village 3	24,559	-	-	-	-
Otay Valley Village 4	87,779	-	-	-	-
Otay Valley Village 7	46,422	129,864	-	-	-
Otay Valley Village 8	118,647	-	-	-	-
Otay Valley Village 9	155,866	-	-	-	-
Otay Valley Village 10	148,119	-	-	-	-
Otay Valley Village 11	-	161,740	-	-	-
Otay Valley Village 12 (EUC)	-	67,947	-	-	-
Otay Valley Village 18b	7,510	-	-	-	-
San Miguel Ranch	-	178,718	-	-	-
Salt Creek Ranch	-	212,328	-	-	-
Central SR-125	183,670	273,980	-	-	-
Other	125,138	352,624	-	-	-
Central Area Total	**1,032,965**	**1,377,201**	**-**	**-**	**2,410,166**
Otay Mesa Total	**-**	**-**	**1,531,763**	**-**	**1,531,763**
North District Total	**-**	**-**	**-**	**710,355**	**710,355**
District Total	-	-	-	-	**4,652,284**

Table 5-6. Summary of Projected Recycled Water Annual Average Day Demands

Phase	Central Area	Otay Mesa	North District	Total
Phase I (2008-2009)	4.77	0.00	0.00	**4.77**
Phase II (2010-2016)	5.73	0.71	0.00	**6.43**
Phase III (2017-Ultimate)	7.18	1.53	0.71	**9.42**

5.4 Planning Criteria for Irrigation Demands

All potential recycled water markets will be required to use recycled water to satisfy irrigation requirements. Several sources were examined to develop suitable irrigation requirements to use for planning purposes. Principle references that were used include the following:

- City of San Diego Clean Water Program, "Water Reclamation and Reuse Master Plan," James M. Montgomery, March and May 1989 Draft Reports.
- "Preliminary Reclaimed Water Use Study for EastLake Development Co.," NBS/Lowry, February 1990.

- "Otay Water District Water Reclamation Project Facilities Plan – Phase 1," John S. Murk Engineers, Inc., May 1990.
- "Water Resources Master Plan for Otay Water District," Black & Veatch, 1991 Draft.
- "Otay Water District Water Resources Master Plan," Montgomery Watson, April 1995.

5.4.1 Irrigation Demand Factors

The City of San Diego Clean Water Program report on water reclamation and reuse recommended the following general recycled water demand factors to project annual average recycled water use:

Turf Irrigation	2.5 acre-feet per acre per year
Agricultural Irrigation	2.5 acre-feet per acre per year
Freeway Landscaping	2.0 acre-feet per acre per year

A water balance calculation method performed in 1990 by NBS/Lowry in the preparation of the EastLake Development Company Preliminary Reclaimed Water Use Study, using climatological data for the City of Chula Vista, yielded a theoretical water requirement of 3.85 AFY per acre for turf irrigation.

The Draft WRMP prepared by Black & Veatch in 1991 considered the available data and recommended the use of 4.0 AFY per acre to estimate recycled water demand for turf irrigation. Black & Veatch also had personal communications with employees of the Irvine Ranch Water District (Irvine Ranch WD), whose climate may be slightly less arid than that of the District. The Irvine Ranch WD has successively planned, constructed, and operates their recycled water system using 4.0 AFY per acre water requirement for turf irrigation.

The 1995 District WRMP prepared by Montgomery Watson recommended a decrease in the landscape irrigation factor from 4.0 AFY per acre to 2.5 AFY per acre, except for golf courses where the 4.0 AFY per acre was used.

In 2002, the District developed landscape irrigation factors based on over the previous ten years recycled water use data. There was sufficient information in the District's monthly meter billing system database to compute actual recycled water consumption for landscape irrigation. Using the entire recycled water meter billing system database the actual landscape irrigation factor was computed to be 2.41 acre feet per acre per year (ac-ft/ac/yr) for landscape irrigation, except for golf courses where the 4.0 ac-ft/ac/yr value is appropriate.

Based on all the information reviewed, 2.41 ac-ft/ac/yr to estimate recycled water demand for all irrigation land use categories, except golf courses, is used. For golf courses, 4.0 ac-ft/ac/yr is used.

5.4.2 Irrigation/Land Use Coverage Factors

Another very important factor used in the projection of recycled water demand is the percentage of each land use category that would be irrigated. This percentage is applied to the gross acreages of each land use category except for the street, roadway, highways, etc. where the

actual landscape irrigation area is used. A comparison of these factors is provided in Table 5-7, along with the values recommended.

Table 5-7. Comparison of Irrigation Percentages for Various Land Use Categories

Land Use Category	Percent of Gross Land Area Irrigated by Indicated Source					
	CWP[1]	EastLake[2]	IRWD[3]	B&V[4]	MW[5]	OWD
Agriculture	100	n/a	100	100	n/a	n/a
Golf Course	100	100	100	100	100	100
Park	100	100	100	100	100	100
Street/Highway[6]	100	100	100	100	100	100
Institutional	10	50	20	20	20	20
Multi-Family	12	30	15	15	15	15
Commercial	5	30	15	10	10	10
Industrial	5	30	15	10	5	5

(1) City of San Diego Clean Water Program "Water Reclamation and Reuse Master Plan," James M. Montgomery, March and May 1989 Draft Reports.
(2) Preliminary Reclaimed Water Use Study for EastLake Development Co., NBS/Lowry, February 1990.
(3) Irvine Ranch Water District irrigation percent of use factors.
(4) "Water Resources Master Plan for Otay Water District," Black & Veatch, 1991 Draft.
(5) "Otay Water District Water Resources Master Plan," Montgomery Watson, April 1995.
(6) The pavement and shoulder areas are excluded (i.e., only the landscaped areas are considered).

The percent of irrigation factors for the various land use categories used for this 2009 WRMP Update are consistent with the values used in past master planning efforts. These values generally correspond quite well with the values within the recycled irrigation system developments that the District has reviewed and observed within the Central Area and Otay Mesa Systems.

5.4.3 Irrigation Peaking Factors

The system peaking factors that are important for determining recycled water supply requirements and for the sizing of recycled water facilities include seasonal, daily, and hourly peaking factors. Estimates of seasonal variations in recycled water demands from three separate reports were reviewed. Table 5-8 provides a summary of the monthly variations from each report. Using the first three data sets, mass diagrams were prepared by Black & Veatch as part of the Draft WRMP for the District in 1991, to estimate annual recycled water seasonal storage requirements.

Table 5-8. Comparison of Recycled Water Monthly Peaking Factors

Month	Monthly Peaking Factor By Indicated Source				
	CWP[1]	Murk[2]	EastLake[3]	OWD[4]	OWD[5]
January	0.30	0.60	0.37	0.61	0.42
February	0.36	0.72	0.50	0.19	0.42
March	0.54	0.96	0.79	0.09	0.28
April	0.66	1.08	1.31	0.64	0.59
May	0.84	1.32	1.48	1.15	0.92
June	1.20	1.32	1.55	1.41	1.34
July	2.10	.44	1.84	1.64	1.44
August	2.16	1.32	1.40	1.92	1.58
September	1.50	1.20	1.12	1.76	1.61
October	1.08	0.96	0.79	1.12	1.29
November	0.72	0.60	0.50	0.77	1.11
December	0.54	0.48	0.35	0.70	1.00

(1) City of San Diego Clean Water Program "Water Reclamation and Reuse Master Plan," James M. Montgomery, March and May 1989 Draft Reports.
(2) Otay Water District Water Reclamation Project Facilities Plan – Phase 1, John S. Murk Engineers, Inc., May 1990.
(3) Preliminary Reclaimed Water Use Study for EastLake Development Co., NBS/Lowry, February 1990.
(4) Otay Water District, Water Resources Master Plan, 2002.
(5) Otay Water District, derived from average monthly demand data 2004 – 2007.

Seasonal storage, expressed in terms of equivalent annual average days of storage, was computed as 91 day, 45 days, and 82 days. The first and third figures closely correspond with the San Diego RWQCB's typical requirement for 84 days of effluent storage at water reclamation treatment facilities that have a zero discharge limitation (i.e., wet weather effluent storage requirement of 84 days). The District's existing recycled water meter record data was also analyzed to determine the monthly peaking factors with the results shown in Table 5-8. These values correlate reasonably well with the Clean Water Program Report values. The seasonal variations for recycled water demand used in the Clean Water Program Reports are recommended for the District. This results in a projected peak summer month demand of 2.16 times the annual average demand.

The maximum day demand typically occurs during the maximum month seasonal demand period. The maximum day demand is the maximum quantity of water used on any day of the year. The maximum monthly peaking factors in Table 5-8 document a range from 1.32 to 2.16. Since May 2007, SCADA data has been available to measure recycled water demands within the District. This data indicates that the maximum day use in the summer of 2007 was 8.54 mgd (August 16, 2007), or 1.8 times the annual average day demand for 2007. A maximum day peaking factor of 2.0 is recommended and is used in this 2009 WRMP Update.

The vast majority of irrigation practices are required to be confined to the late evening and nighttime periods, in an effort to minimize public contact with recycled water spray. This irrigation period is limited to 9:00 p.m. to 6:00 a.m. each day of the week and consists of a 9-hour irrigation period. The assumption that an 8-hour irrigation period represents actual

irrigation practices, results in a diurnal peaking factor of 3.0 (i.e., 24-hour demand applied over an 8-hour period). Applying this 3.0 diurnal peaking factor to the maximum day peaking factor of 2.0, results in a peak hour peaking factor of 6.0. This peaking factor assumes that irrigation use is relatively uniform during the late evening and nighttime hours, which may not be necessarily true. It is recommended that recycled water irrigation customers be required and regulated to control their irrigation schedules to dampen peaks on the recycled water system. This effort provides the opportunity of not having to increase the size of the recycled water system facilities to meet higher peaks than planned for in this WRMP. For the recycled water irrigation systems that do not have public access or have restricted public access, such as freeways, irrigation periods are not limited to the 9:00 p.m. to 6:00 a.m. period. These types of irrigation systems should be required to use recycled water outside of the typical limited irrigation time period.

The planning criteria used to project recycled water demands are summarized in Table 5-9. The percent of irrigated area by land use category is applied to the gross acreages except for the street, roadway, highways, etc. where the actual landscape irrigation area is used. Table 5-9 also incorporates planning criteria for reservoir, pump station and pipeline facilities.

5.5 Rules and Regulations for Recycled Water Use

The District's ordinances have been assembled into a book called the Code of Ordinances. These ordinances regulate many activities within the District and its operations. Section 26 titled *Water Reclamation Plan and Implementation Procedures* includes provisions for the use of reclaimed water, definitions of reclaimed water, the general requirements and provisions for the Water Reclamation Master Plan, Procedures including the Reclaimed Water Permit Process (for reclaimed water users), and provision for the Regulation of Waste Discharge to Sewerage System intended to maintain wastewater quality for water reclamation treatment. Enforcement provisions are found in Section 26.07 including sanctions for public nuisance, injunctions, permit revocation and penalties. The Code of Ordinance Section 27 titled Requirements and Limitations for Obtaining Water Services includes section 27.01.F. requiring the installation of reclaimed water service laterals and meters to supply irrigation water to parcels in the areas designated as recycled water areas.

Recycled water quality is further protected by provisions against the brine discharge from on-site self-generating water softener units in Section 26.06.B. (in conjunction with Section 52.04 – Prohibitions Against Discharge of Objectionable Wastes), Guidelines to Determine Acceptability of Wastes (Section 52.05) and Discharge of Industrial Waste (Section 52.06).

Table 5-9. Summary of Recycled Water Demand Planning Criteria

Land Use Category	Annual Demand (ac-ft/ac)
Central Area and Otay Mesa System	
Landscape Irrigation (Parks, schools, greenbelts, freeways, etc.)	2.41
Landscape Irrigation (Golf Courses)	4.00

Land Use Category	Percent Irrigated
Parks, Golf Courses, Greenbelts	100%
Institutional (Schools, government, community purpose, etc.)	20%
Multi-Family Residential	15%
Commercial	10%
Industrial	5%
Determination of Demand[1]	Land Use
Multi-Family Residential	N/A
Single Family Residential	N/A
Other Land Use Categories	gpd/(net acre or SF)

Criterion	Value
Peaking Factors[2]	
Minimum Day/Average Day Ratio	N/A
Maximum Day/Average Day Ratio	2.0
Peak Hour/Average Day Ratio	6.0
Storage	
Operating Storage	2/3 MDD
Pressure Criteria	
Minimum Desirable	80 psi
Maximum Static (no demand)	150 psi
Minimum Static (no demand)	65 psi
Min. Residual Pressure (Peak Hour)	40 psi
Pumping Station Criteria	
Pumping Period[3]	24 hours
Pumping Capacity	MDD
Redundancy	N/A
Standby Power	N/A
Pipe Criteria	
Maximum Velocity – Max. Day	6 fps
Maximum Velocity - Distribution (Peak Hour)	8 fps
Maximum Velocity - Transmission (Peak Hour)	5 fps
Maximum Headloss per thousand feet	10 ft
Minimum Diameter	6 inch
Hazen-Williams “c” factor (12-inch diameter or less)	120
Hazen-Williams “c” factor (>12-inch diameter)	130

(1) Criteria for determining residential and non-residential (other land uses) average annual demands are presented in Table 3-1 of the OWD 2002 Water Resources Master Plan.
(2) Peaking factors to be verified through hydraulic model water system calibration.
(3) Pumping to occur during non-peak energy hours whenever possible.

5.5.1 Standard Specifications/Rules and Regulations for Recycled Water Use

Each of the District's recycled water customer sites were designed based on criteria set forth by the District. Use area design criteria for recycled water customers are specified in the District's Standard Specifications - *Rules and Regulations for Recycled Water Use.* These criteria include the following requirements:

- On-site reclamation systems shall be designed to include backflow prevention.
- Reclamation systems shall be separate and independent of potable water systems. Cross connections are prohibited.
- Annual cross connection inspections are conducted by the District or County of San Diego Department of Environmental Health.
- Hose bibs and fire hydrants on recycled water facilities are prohibited.
- Drinking fountains shall be protected from the spray of recycled water.
- Conditions causing overspray and runoff shall be limited or prevented.
- Potable and recycled water pipelines shall not be installed in the same trench.
- Recycled pipelines shall be installed below potable pipelines where running parallel to each other. Where this is not possible, the recycled water pipeline shall be sleeved.
- On-site reclamation systems shall be designed to meet the peak moisture demand of the plant material to be irrigated. The use of moisture sensors is encouraged but not mandatory.
- On-site irrigation systems shall be designed to apply irrigation water in a manner compatible with the infiltration rates of the soil types within the approved use area.
- On-site reclamation systems shall be designed to prevent discharge onto areas not under control of the use area owner. The design shall avoid spray patterns with discharge onto obstructions that tend to concentrate water resulting in ponding or runoff.
- On-site reclamation systems shall be designed to operate during periods of minimal public use of the area. The total time required to irrigate the design area shall not exceed nine (9) hours in any 24-hour period. The system shall be designed to operate between the hours of 9 p.m. to 6 a.m. An exemption from the County Department of Environmental Health was obtained by the District for service between 4 p.m. and 9 a.m. in specific use areas that have a very low probability of public contact.
- On-site reclamation system designs shall include automatic system control devises that can be easily adjusted to minimize ponding and runoff.
- On-site reclamation system design plans shall contain detailed information regarding the meter location, size, gross and net acreage of irrigated area, peak flows, estimated

annual demand, design operating pressure and material listings for each pipe, valve, backflow preventer and sprinkler device.

District Engineering staff and San Diego County Department of Environmental Health are responsible for the review and approval of the design of the recycled water facilities within the District.

5.5.2 Customer Inspections and Monitoring

Detailed inspection and monitoring procedures, rules, and regulations are found in the Standard Specifications – Rules and Regulations (Section 03000). An overview is provided below.

The District monitors and inspects the entire reclaimed distribution system, including both off-site and on-site facilities and conducts monitoring programs and maintains records as deemed necessary. The District inspects on-site facilities for compliance with these Rules and Regulations, and provides reports as requested by regulating agencies. For these purposes, the District has the right to enter the recycled water customer's premises during reasonable hours to inspect on-site reclaimed water facilities and approved use areas. Reasonable hours include hours when irrigation is occurring. The staff from the District, Water Board, and San Diego County Department of Environmental Health has the right to enter the customer's premises during reasonable hours, from time to time, to verify that the customer's irrigation practices conform with the Rules and Regulations.

Corrective actions are also specified in the Rules and Regulations and include the authority given to the Off-Site Supervisor to investigate and determine if a violation has occurred, then it is the responsibility of the User to initiate corrective action. District staff record violations on the reclaimed water service and provide a copy of the violation notice by hand delivery or US mail to the User.

A timetable for completing the corrective action can be negotiated between the District's Off-Site Supervisor and the User, with the final approval of the District. Such corrections can involve human factors, such as additional training or procedures modifications, as well as physical alterations to the system. Corrections not made in accordance with the timetable result in the termination of service by shutting off and locking the meter. If, in the opinion of the Off-Site Supervisor, the violation constitutes an immediate danger to the public health, then service is terminated immediately by shutting off the meter or service and locking it. Service is resumed only after the violation has been corrected to the satisfaction of the Off-Site Supervisor. The User is to maintain a written log of all system failures and violations, including corrective action taken. The log is reviewed by the District regularly.

A mandatory administrative review is conducted to examine User's irrigation practice if three written violations are issued within a 30-day period. The On-Site Supervisor and Owner/User or agent is required to present reasons for non-compliance with these Rules and Regulations. The Owner shall present a plan for corrective action acceptable to regulatory agencies. The accepted plan and implementation schedule must be adhered to or service may be suspended.

Cross-Connection Shutdown tests are performed by following established, written procedures which were last updated in August 2006.

5.5.3 Training and Contingency Plan

On-Site Supervisor training is provided by the San Diego County Water Authority in a program approved by the San Diego County Department of Health Services. The training program addresses on-site operation and maintenance issues associated with recycled water use and specific restrictions such as allowable time periods for irrigation, and the prevention of overspray, ponding or runoff of recycled water. A current record of designated On-Site Supervisors is included in the District's Quarterly Recycled Water Users Summary Report to the Water Board.

Reclaimed or recycled water users and the general public can also obtain information through articles published in the "Customer Pipeline" newsletter and from the District's website at http://www.otaywater.gov/owd/pages/resources/recycledwater.aspx

5.5.4 Regulatory Requirements

The San Diego Regional Water Quality Control Board (RWQCB) and the California Department of Public Health regulate the use of recycled water. The two principal regulatory documents are the "Comprehensive Water Quality Control Plan Report, San Diego Region (9)" (Basin Plan), and the "Wastewater Reclamation Criteria, an excerpt from the California Administrative Code, Title 22, Division 4, Environmental Health" (Title 22). The Basin Plan requirements vary by hydrographic subunits. Title 22 requirements are uniformly applied wastewater treatment requirements based on the intended use of the produced recycled water.

The RWCWRF and SBWRP facilities that provide the planning area with tertiary treated recycled water meet Title 22 oxidized, coagulated, filtered, and disinfected effluent requirements for non-restricted impoundments, spray irrigation of food crops, and the broadest category of landscape irrigation.

The use of recycled water within any watershed tributary to surface water storage reservoirs that provide supply for potable domestic water uses have been discouraged by the San Diego RWQCB to protect water quality in the reservoirs. These land areas include the entire North District and a portion of the South District. The three surface water storage reservoirs that restrict the size of the recycled water irrigation area are the Sweetwater Reservoir, Upper Otay Reservoir, and Lower Otay Reservoir.

The North District contains two hydrographic subunits that lie upstream of the Sweetwater Reservoir: Jamacha and Hillsdale. The District's 2007 master reclamation permit does not currently allow use of recycled water in these areas. The District is undertaking a concept study to identify the environmental and legal constraints of serving recycled water in the North District. If anti-degradation measures could be observed in the basin, District would seek to purchase more recycled water from the SBWRP to serve the South District and use recycled water from the RWCWRF in the North District, offsetting up to 1.3 mgd of potable water use in that area.

Recycled water has been historically allowed for irrigation uses in the South District hydrologic subareas (HSAs) of Telegraph Canyon (909.11), La Nacion (909.12 and known as Sweetwater River) and the Salt Creek portion of the Otay Valley (910.20). The allowable uses for recycled water from SBWRF include landscape irrigation, agricultural irrigation, industrial processes,

construction, restricted recreational impoundments, or landscape impoundments within Otay Valley Hydrographic Area (HA) (910.20) and Tijuana Valley HA (911.10). *The Engineering Report on the Production, Distribution and Use of Reclaimed Water for the South Bay Water Reclamation Plant* prepared for the Metropolitan Wastewater Department, City of San Diego (October 2001) identifies the District as a purveyor of SBWRP recycled water within District service boundaries.

The San Diego RWQCB policies, as contained in Resolution No. 90-40 (June 13,1990), permit widespread use of recycled water in the Otay River hydrographic subunit located downstream of Lower Otay Reservoir (remainder of Subunit 10.20) and the Tijuana River watershed generally located on Otay Mesa within the District. The use of recycled water for irrigation is allowed in basins down gradient of potable water supply surface storage reservoirs, if the principal potable water supply is imported water subject to the following conditions:

- Effluent limitations shall be not less than the imported water supply constituent concentrations plus incremental increases attributable to typical domestic usages.
- Recycled water effluent concentrations must be less than the groundwater quality objectives.
- Recycled water effluent concentrations must protect the beneficial uses for the basin.
- Effective source control measures for the control of salinity must be implemented.

The use of recycled water for landscape irrigation in the South District, consistent with the stated conditions, is possible on a relatively unrestricted basis downstream of the local water supply surface storage reservoirs (Upper and Lower Otay Reservoirs). Demineralization of recycled water effluent should not be necessary as long as total dissolved solid levels do not exceed current limitations.

The ordinance governing recycled water production and use within the District is found in the District's *Code of Ordinances, Division II, Section 26, Water Reclamation Plan and Implementing Procedures.*

5.5.5 Conservation

Recycled water customers are currently not subject to conservation restrictions. However, if there is a shortage in recycled water supply, the system would be supplemented with potable water. During times of severe drought, surplus potable water will not be available to serve the recycled water system and the system would consequently be shut down. To minimize the risk of a recycled water system shutdown, the District should monitor recycled water operations and ensure that usage is conducted according the regulations described in Section 5.5.1.

5.6 Recycled Water System Hydraulic Model Development

A detailed hydraulic computer model was developed to analyze the existing and future recycled water distribution system. The steps of model formulation included obtaining the system's physical data (the facilities such as pipelines, and reservoirs), translating the physical data into a

network of nodes (demand locations) and links (pipelines), determining pressure zone boundaries, importing demands, and verifying that the network matches existing data.

5.6.1 Existing System Computer Model Development

The existing recycled water system hydraulic model was developed using the District's current GIS and digitizing methodology. The computer model includes all the major transmission and distribution mains, 6-inch diameter and larger. The model includes annotation of pipeline size and material, and isolation/control valve sizes and type of valve. Node elevations were obtained from GIS topography. Reservoirs were annotated with capacity, HWL, diameter, and height. Pump stations were added with their corresponding pump curves and controls. Recycled water SCADA data, daily use logs, and existing billing records were used to check and verify the hydraulic model operation. Section 5.7 includes the existing system hydraulic analysis.

5.6.2 Ultimate System Computer Model Development

The ultimate water system was also assessed using the hydraulic computer model. Proposed transmission mains, reservoirs, and proposed pump station improvements were added to the existing system hydraulic model based on proposed developments and previous ultimate system models. Section 5.8 includes the ultimate system hydraulic analysis.

5.7 Existing Recycled Water System Analysis

The first step in the recycled water analysis was to evaluate the adequacy of the existing recycled water supply and the storage and pump station capacity for the existing recycled water system. This analysis was done to determine if any upgrades were necessary to serve existing customers.

5.7.1 Supply Capacity Analysis

The production capacity of the RWCWRF and SBWRP must be considered when evaluating the recycled water system. The RWCWRF has a design capacity of 1.3 mgd and the SBWRP provides the District with up to 6 mgd. These supplies were compared to existing recycled water demands. The supply capacity analysis is summarized in Table 5-10.

Table 5-10. Existing Supply Capacity Analysis

Pressure Zone	Average Day Demand(ADD) (mgd)	Max Day Demand (MDD = 2.0 x ADD) (mgd)	RWCWRF Supply (mgd)	SBWRP Supply (mgd)	Surplus/ (Deficit) (mgd)
All			1.3	6.0	
680	1.75	3.50			
927	3.02	6.04			
Total	**4.77**	**9.54**	**1.3**	**6.0**	**(2.2)**

The District demands currently exceed the supplies provided by the RWCWRF and SBWRP under maximum day conditions, based on a maximum day peaking factor of 2.0, as previously discussed in Section 5.4.3. Because the District has a significant amount of recycled water storage available, the maximum day supply deficit is currently met by drawing recycled water out of storage. During off-peak periods, the recycled water is pumped back into storage. Recent historic data shows that the District experiences an actual peaking factor of 1.8. As the recycled water system grows, it is expected that the peaking factor would dampen, however demand during maximum days is still anticipated to exceed available supply. Securing additional recycled water supply from SBWRP is a high priority project. The District may want to consider an agreement to purchase an additional 4 mgd supply from the City of San Diego to meet the existing supply deficit plus a 1 mgd average day demand increase when Phase II projects come online.

5.7.2 Existing Storage and Pumping Analysis

The recycled water system reservoir storage was assessed to determine if storage criteria was met under existing demands. Recycled water storage criterion was evaluated at two-thirds of a MDD based upon current District criteria in Table 5-9. Since May 2007, SCADA data has been available to measure recycled water demands within the District. This data indicates that the maximum day use in the summer of 2007 was 8.54 mgd (August 16, 2007), or 1.8 times the annual average day demand for 2007. The recommended maximum day peaking factor of 2.0 is used to evaluate storage and pump capacity. The resulting storage assessment is included in Table 5-11.

Table 5-11. Existing Recycled Water Reservoir Analysis

Pressure Zone	Facility ID (Name)	Existing Average Day Demand		Max/Avg PF	Max Day Demand (MDD = ADD x PF)		Capacity (mg)	Required Operational Storage per Design Criteria (0.67 x MDD) (mg)	Surplus/ (Deficit) (mg)
		gpm	mgd		gpm	mgd			
450	450-1	3	0.00	2.00	6	0.01	12.0	0.01	11.99
680	680-1[(1)]	1,214	1.75	2.00	2,427	3.50	3.4	2.33	1.07
927[(2)]	944-1	2,099	3.02	2.00	4,197	6.04	12.0	4.03	24.27
	927-1						16.3		
System Total		**3,316**	**4.77**			**9.55**	**43.7**	**6.37**	**37.33**

(1) Based on current operational levels, the 680 reservoir may not be fully utilized. This analysis assumes full capacity of the reservoir.
(2) Includes demands for the 680 and 710 reduced zones.

Based on a MDD of 9.55 mgd and total storage capacity in the system of 43.7 mg, there is over 37 mg in excess storage capacity in the system. The 680-1 Reservoir is currently operated at approximately 50 percent of the total capacity due to low and high water level controls. This reduces operational storage in the 680 PZ by approximately 1.5 mg. The District may want to consider evaluating and revising the current operational levels of the 680-1 Reservoir so that there is adequate storage in the 680 PZ to serve maximum day demands. However, based on current conditions, the District has adequate operational storage to meet existing maximum day demands within the pressure zones that they serve.

A recycled water pump station analysis was performed and the results are summarized in Table 5-12. The District's pump stations have adequate pumping capacity to meet existing maximum day demands within the pressure zones that they serve.

Table 5-12. Existing Recycled Water Pump Station Analysis

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		PZ ADD	Pumped ADD	Pumped MDD (PF = 2.0)		Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm	gpm	gpm
450-1[1][2]	1	3,500	5.04	10,500	15.12	3	3	6	5,731	4,769
	2	3,500	5.04				1,214	2,427		
	3	3,500	5.04				2,099	4,197		
							-900	-900		
680-1[1]	1	3,000	4.32	12,000	17.28	1,214	1,214	2,427	5,725	6,275
	2	3,000	4.32							
	3	3,000	4.32				2,099	4,179		
	4	3,000	4.32				-900	-900		
944-1[3]	1	2,460	3.54	4,920	7.08	2,099	2,099	4,197	3,297	1,623
	2	2,460	3.54							
	3[4]	--	--				-900	-900		

[1] 450 and 680 PZ demand does not include 900 gpm (1.3 mgd) supplied by RWCWRF
[2] SBWRP pump station (City of San Diego)
[3] Includes demands for the 680 and 710 reduced zones
[4] Space provided for an additional unit.

5.7.3 Existing Distribution System Analysis

The recycled water pipeline network is relatively simple and includes both transmission and distribution systems. The hydraulic computer model was utilized to assess the existing system operation and pressures. The analysis indicates that the system pressures and velocities in the existing system operate within the District's design criteria and no improvements are required.

5.8 Ultimate Recycled Water System Analysis

The future recycled water system was evaluated at ultimate demands for supply, pumping, and storage needs.

5.8.1 Supply Capacity Analysis

The production capacity of the RWCWRF and SBWRP must be considered when evaluating the recycled water system and potential expansion. The RWCWRF has a design capacity of 1.3 mgd and the SBWRP provides the District with up to 6 mgd. In Table 5-10, it was clear that the existing supply was barely able to serve the existing demands. For ultimate conditions, it was assumed that on a maximum day, the SBWRP supply could be increased to 12 mgd and that recycled water from the RWCWRF would be diverted to the North District. These supplies were compared to future recycled water demands. Should it be determined that the North District

system will not be constructed, then flow from the RWCWRF can be used to serve the Central and Otay Mesa service areas. The supply capacity analysis is summarized in Table 5-13.

Table 5-13. Ultimate Supply Capacity Analysis

Pressure Zone	Average Day Demand (ADD) (mgd)	Max Day Demand (MDD = 2.0 x ADD) (mgd)	RWCWRF Supply (mgd)	SBWRP Supply (mgd)	Surplus/ (Deficit) (mgd)
South District				12.0	
680	2.78	5.56			
860	1.53	3.06			
927	4.40	8.80			
Total	**8.71**	**17.42**		**12.0**	**(5.4)**
North District[(1)]	0.71	1.42	1.3		**(0.1)**

(1) RWCWRF assumed to serve only North District demands under ultimate conditions.

Available recycled water storage may be able provide short term relief, however, there is still a significant deficit in recycled water supply in the South District if the projected ultimate recycled water demands are to be served. Increasing SBWRP supply beyond 12 mgd would require expansion of the SBWRP and redirection of additional sewer flows from the South Bay area to the treatment facility. Therefore, the District may want to consider alternative supply options, such as expansion of the RWCWRF, partnership with Chula Vista on a regional WRF, a satellite water reclamation plant, or working with other agencies. It is recommended that the District continue to monitor its recycled water supply and demands and plan accordingly for future expansion.

5.8.2 Ultimate Storage and Pumping Analysis

The recycled water system reservoir storage was assessed to determine if storage criteria was met under ultimate demands. Recycled water storage criterion was evaluated at two-thirds of a MDD. The ultimate storage capacity includes the addition of a District planned 4-mg 860-1 Reservoir in Otay Mesa and the conversion of the 832-1 Reservoir in the North District The resulting storage assessment is included in Table 5-14.

Based on a MDD of 18.76 mgd and total storage capacity in the system of 48.6 mg, there is 36 mg in excess storage capacity in the ultimate system. The 680 PZ experiences a minor shortfall in storage during MDD, however, additional flow can be obtained through the 927 PZ, which has surplus storage. Therefore, no additional operational storage is required.

Table 5-14. Ultimate Recycled Water Reservoir Analysis

Pressure Zone	Facility ID (Name)	Ultimate Average Day Demand		Max/Avg PF	Max Day Demand (MDD = ADD x PF)		Capacity (mg)	Required Operational Storage per Design Criteria (0.67 x MDD) (mg)	Surplus/ (Deficit) (mg)
		gpm	mgd		gpm	mgd			
450	450-1	3	0.00	2.00	6	0.01	12.0	0.01	11.99
680	680-1[1]	1,931	2.78	2.00	3,862	5.56	3.4	3.71	(0.31)
North District[2]	832-1	493	0.71	2.00	987	1.42	0.9	0.95	(0.08)
860	860-1	1,064	1.53	2.00	2,127	3.06	4.0	2.04	1.96
927[3]	944-1	3,055	4.40	2.00	6,110	8.80	12.0	5.87	22.43
	927-1						16.3		
System Total		**6,546**	**9.43**			**18.85**	**48.57**	**12.58**	**35.99**

(1) Based on operational levels, the 680 reservoir may not be fully utilized. This analysis assumes full capacity of the reservoir.
(2) Proposed North District recycled water system expansion includes conversion of potable reservoir 832-1 to recycled service.
(3) Includes demands for the 680 and 710 reduced zones.

A recycled water pump station analysis was performed for ultimate demands and the results are summarized in Table 5-15. The 450-1 and 944-1 PS will require expansion to meet the maximum day demands of the ultimate system. Improvements to the 944-1 PS are included in the District's current 2008-2009 CIP and will add a third pump to the existing pump station. The currently planned 2,460 gpm pump is adequate to meet the demands in this zone if the development of recycled water in the North District is delayed or does not occur, because an additional 900 gpm would be available from the RWCWRF. However, this pump capacity would have to be increased to approximately 3400 gpm if the RWCWRF flows are redirected to the North District. Likewise, capacity improvements to the 450-1 PS are dependent on whether the North District project is implemented. Proposed future improvements at the City of San Diego's 450-1 PS range from 700 gpm to 1,600 gpm.

5.8.3 Ultimate Distribution System Analysis

The hydraulic computer model was utilized to assess the ultimate system operation and pressures. The analysis indicates that the system pressures and velocities in the existing system operate within the District's design criteria to serve ultimate demands. No improvements to existing pipelines are required; however, new pipelines are required to provide recycled water service to future developments.

Table 5-15. Ultimate Recycled Water Pump Station Analysis(5)

Pump Station	Pump Unit	Rated Capacity		Firm Capacity		PZ ADD [1]	Pumped ADD	Pumped MDD (PF = 2.0)	Max Day Demand (PF = 2.0)	Surplus / (Deficit)
		gpm	mgd	gpm	mgd	gpm	gpm	gpm	gpm	gpm
450-1 [2]	1	3,500	5.04	10,500	15.12	3	3	6	12,106	(1,606)
	2	3,500	5.04				1,931	3,862		
	3	3,500	5.04				3,055	6,110		
							1,064	2,127		
680-1	1	3,000	4.32	15,000	21.60	1,931	1,931	3,862	12,099	2,901
	2	3,000	4.32				3,055	6,110		
	3	3,000	4.32				1,064	2,127		
	4	3,000	4.32							
	5	**3,000**	4.32							
944-1 [3]	1	2,460	3.54	7,380	10.63	3,055	3,055	6,110	8,237	(857)
	2	2,460	3.54							
	3	**2,460**	3.54							
860 PZ (no PS)						1,064	1,064	2,127		
RWCWRF [4,5]	1	550	0.79	1,100	1.30	493	493	987	987	113
	2	550	0.79							
	3	550	0.79							
	4	550	0.79							

(1) Assumes all water supplied via South Bay Water Reclamation Plant.
(2) South Bay Water Reclamation Plant pump station (City of San Diego).
(3) Proposed North District to be served by RWC Water Recycling Facility.
(4) Includes demands for the 680 and 710 reduced zones and 860 PZ in Otay Mesa.
(5) Should the North District system be delayed or not constructed, then flows from the RWCWRF would serve the Central and Otay Mesa systems. Flows could be reduced at the 450-1, 680-1, and 927-1 Pump Stations.

5.9 Recommended Recycled Water System Improvements

This section provides a recommended list of improvement projects required to serve the District's recycled water customers at ultimate development. The recommended system improvements for the Central Area and Otay Mesa Systems are shown on Exhibit VII. The proposed North District System is not included in this figure, as the District is studying the feasibility of the North District under a separate study. Exhibit VII shows the primary existing recycled water system facilities and the location of the proposed CIP facilities. The facilities are shown with CIP project numbers (Rxxx) and include the reservoirs, pump stations and transmission mains for the District. Most distribution pipelines and laterals are assumed to be developer projects and will be developer's responsibility to plan, fund and construct. These pipelines will typically be 12-inch and smaller in diameter. It should be noted that some of the proposed transmission main alignments shown on Exhibit VII may change as development plans are revised or refined in the future. The proposed CIP transmission mains were located within the currently planned roadways, based on current knowledge of development plans. Developers will be required to prepare a SAMP that will, at a minimum, define the distribution pipelines required to serve the development and either confirm or revise the size and locations of the necessary regional CIP facilities.

Recommended CIP projects are divided into three construction phases or increments of development: Phase I (2008-2009), Phase II (2010 - 2016), and Phase III (2017 - Ultimate). Phasing for the recommended CIP projects may be accelerated or deferred as required to account for changes in development project schedules, availability of land or right-of-way for construction, project funding limitations, environmental concerns, and other considerations.

5.9.1 Storage and Pumping Improvements

680 Pressure Zone

Existing operational storage for the 680 PZ includes the 3.4-mg 680-1 Reservoir. The ultimate storage needs for this zone will be 3.78 mg. The 0.31-mg deficit can be supplied by the 927-1 Reservoir so that no new reservoirs are proposed for the 680 PZ. The District should consider evaluating operational efficiency of the 680-1 Reservoir, as it is currently operated at a 50 percent level which reduces available operational storage.

The 680-1 PS is located adjacent to the 450-1 Reservoir. This pump station supplies the 680 PZ and must also have capacity for the 927 PZ and Otay Mesa 860 PZ. The required pumping capacity for the 680-1 PS is 12,000 gpm for ultimate projected MDD demand conditions. The 680-1 PS has a firm pumping capacity of approximately 15,000 gpm. The pump station will have adequate pumping capacity to meet ultimate demands for the 680 PZ.

The 680 PZ is expected to have significant growth in its recycled water system. To meet ultimate buildout, various new transmission mains have been identified to serve future developments.

927 Pressure Zone

Existing operational storage for the 927 PZ includes the 16.3-mg 927-1 Reservoir. The ultimate operational storage required for the 927 PZ totals 5.96 mg, so there is a surplus of 10.34 mg. No additional storage for the 927 PZ is required.

The 944-1 PS is located adjacent to the 680-1 Reservoir. This pump station supplies the 927 PZ, as well as the small reduced 680 and 710 PZs and ultimately the 860 PZ in Otay Mesa. This station requires a firm pumping capacity of 8,237 gpm for ultimate projected maximum day demand conditions. The 944-1 PS has a current firm pumping capacity of approximately 4,920 gpm and has space for one additional pump unit. However, adding an identical 2,460 gpm unit to the station would only increase the total firm capacity to 7,380 gpm, which would create a pumping deficit of 900 gpm at ultimate conditions. In addition, the existing pumps are operating inefficiently and their replacement has been proposed. It is therefore recommended that the total firm capacity of the station be increased to 8,200 gpm supplied by three new 2,750 gpm pumps. This facility improvement (R2091) is anticipated for Phase II.

The 927 PZ is expected to have significant growth in its recycled water system. To meet ultimate buildout, various new transmission mains have been identified to serve future developments.

860 Pressure Zone

The planned 860 PZ will be ultimately supplied from a new 860-1 Reservoir located near the County Prison through planned 30-inch diameter transmission mains. These new facilities are anticipated for Phase II construction and are included in the CIP project list. The new 860-1 Reservoir is recommended to serve the 860 PZ and will be supplied directly through the 927 PZ. The District's current CIP includes the 4-mg 860-1 Reservoir. Although the analysis in this 2009 WRMP Update notes a need for approximately 2 mg, an ultimate capacity of the 860-1 Reservoir of 4 mg (R2034) is recommended due to the potential variability of recycled water use in Otay Mesa. Recycled water use has been assumed for outdoor irrigation in this 2009 WRMP Update, however, industrial users could potentially increase recycled water demand in this PZ with indoor, dual plumbed facilities. The District may also decide to extend their recycled water service to users outside the current District boundary. Surplus storage also provides operational flexibility and a storage buffer for short-term outages from the 927 PZ supply source.

It is possible to temporarily operate the 860 PZ off the 927 PZ without use of the 860-1 Reservoir until demands in Otay Mesa increase and funding can be secured for the tank. Additional analysis may be required to determine the exact timing of the proposed reservoir. However, this Master Plan analysis shows that the tank is required prior to Phase III implementation.

The 860 PZ is expected to have significant growth in its recycled water system. To meet ultimate buildout, various new transmission mains and distribution pipelines have been identified to connect the isolated pieces of recycled water pipe that have been constructed and to serve future developments. These facilities are shown in Exhibit VII and described in more detail in Chapter 6.

5.9.2 Pipeline Improvements

The following pipeline projects are required in order to meet Phase II and Phase III system conditions.

Phase II

- **R2028:** Approximately 8,100 LF of 8-inch pipe is proposed within Heritage Road between Santa Victoria and Otay Valley Road. This line will serve future developments in the Village 3 area and is anticipated in Phase II.

- **R2042:** Approximately 3,430 LF of 8-inch pipe is proposed within Rock Mountain Road between EastLake Parkway and SR-125. This line will serve future developments in the Eastern Urban Center and Village 7 area and is anticipated in Phase II.

- **R2047:** Approximately 4,880 LF of 12-inch pipe is proposed within La Media Road between Birch Road and Rock Mountain Road. This line will serve future developments in the Village 7 area and is anticipated in Phase II.

- **R2048:** Approximately 300,000 LF of pipe ranging from 6-inch to 24-inch diameter is proposed to convert and connect the Otay Mesa system to recycled water service.

- **R2058:** Approximately 10,700 LF of 16-inch pipe is proposed within Airway Road between Alta Road and La Media Road. This line will serve the future Otay Mesa area and is anticipated in Phase II.

- **R2077:** Approximately 7,900 LF of 24-inch pipe is proposed within Alta Road between Alta Gate and Airway Road. This line will serve the future Otay Mesa area and is anticipated in Phase II.

- **R2082:** Approximately 3,100 LF of 24-inch pipe is proposed between Olympic Parkway and Heritage Road. This line will serve future developments in the Village 2 area and is anticipated in Phase II.

- **R2083:** Approximately of 1,280 LF of 20-inch pipe is proposed between Olympic Parkway and State Street. This line will serve future developments in the Village 2 area and is anticipated in Phase II.

- **R2084:** Approximately 5,000 LF of 20-inch pipe is proposed within State Street between Heritage Road and La Media Road. This line will serve future developments in the Village 2 area and is anticipated in Phase II.

- **R2085:** Approximately 2,740 LF of 20-inch pipe is proposed between State Street and Olympic Parkway. This line will serve future developments in the Village 2 area and is anticipated in Phase II.

- **R2087:** Approximately 13,500 LF of 20-inch pipe is proposed in Wueste Road between Olympic Parkway and a connection near the City of San Diego Otay Water Treatment Plant. This line will serve the future Otay Mesa area and is anticipated in Phase II.

- **R2088:** Approximately 4,000 LF of 20-inch pipe is proposed from a connection near the City of San Diego Otay Water Treatment Plant to the proposed 860-1 Reservoir. This line will serve the future Otay Mesa area and is anticipated in Phase II.

Phase III

- **R2037:** Approximately 4,050 LF of 8-inch pipe is proposed within La Media Road between Rock Mountain Road and Otay Valley Road. This line will serve future developments in the Village 8 area and is anticipated in Phase III.

- **R2038:** Approximately 7,300 LF of 8-inch pipe is proposed within Rock Mountain Road between La Media Road and Otay Valley Road. This line will serve future developments in the Village 4 area and is anticipated in Phase III.

- **R2043** Approximately 2,600 LF of 8-inch pipe is proposed within Rock Mountain Road between La Media Road and SR-125. This line will serve future developments in the Village 8 area and is anticipated in Phase III.

- **R2073:** Approximately 3,170 LF of 24-inch pipe is proposed within Alta Road between Airway Road and the Border. This line will serve the future Otay Mesa area and is anticipated in Phase III.

- **R2078:** Approximately 13,920 LF of 8-inch pipe is proposed within Otay Valley Road between Heritage Road and SR-125. This line will serve future developments in the Village 3 and 4 areas and is anticipated in Phase III.

- **R2079:** Approximately 1,730 LF of 6-inch pipe is proposed within Otay Valley Road between Otay Valley Road and Entertainment Circle. This line will serve future developments in the Central area and is anticipated in Phase III.

- **R2080:** Approximately 2,840 LF of 24-inch is proposed within Olympic Parkway between Heritage Road and Medical Center and will parallel the existing 16-inch line. This line will increase capacity from the 680-1 PS and is anticipated in Phase III.

- **R3015:** This project would retrofit the 832-1 potable water reservoir for recycled water use and connect the North District to the recycled water system. This project is anticipated in Phase III.

5.9.3 Recycled Water Supply Improvements

The District's recycled water demands currently exceed the supplies provided by the RWCWRF and SBWRP under maximum day conditions. Securing additional recycled water supply from SBWRP is a high priority project. The District may want to consider an agreement to purchase an additional 4 mgd supply from the City of San Diego to meet the existing supply deficit plus a 1 mgd increase with Phase II demands.

For Ultimate, it was assumed that on a maximum day, the SBWRP supply could be increased to 12 mgd and that recycled water from the RWCWRF would be diverted to the North District. However, there is still a significant deficit in recycled water supply in the South District if the projected ultimate recycled water demands are to be served. Increasing SBWRP supply beyond 12 mgd would require expansion of the SBWRP and redirection of additional sewer flows from the South Bay area to the treatment facility. Therefore, the District may want to consider alternative supply options, such as expansion of the RWCWRF, partnership with Chula Vista on a regional WRF, a satellite water reclamation plant, or working with other agencies. It is recommended that the District continue to monitor its recycled water supply and demands and plan accordingly for future expansion.

This page is intentionally left blank.

Chapter 6
Capital Improvement Projects

Since 2002, the District has continued to improve its potable water facilities to meet the water demands associated with growth. At the same time, the District has continued to improve and expand its recycled water facilities to serve irrigation demands and conserve potable water supplies. The District's Capital Improvement Program (CIP) is updated annually to reflect improvements made to date and identify future needs for budgeting purposes.

Most recently, the 2008-2009 CIP was presented to the District's Board of Directors for approval. The projects identified in this current CIP include many of the improvements that have been recommended in previous master plans, and in this 2009 WRMP Update. The projects that are currently in design or under construction (Phase I (2008 -2009) projects) to correct existing deficiencies were not carried over in this chapter. This chapter includes the recommended Phase II (2009 - 2016) and Phase III (2017 - Ultimate) potable and recycled water transmission, pumping and storage projects identified in the previous chapters. Phasing for the recommended CIP projects may be accelerated or deferred as required to account for changes in development project schedules, availability of land or right-of-way for construction, project funding limitations, environmental concerns or other considerations.

Because many of the identified projects were included in the District's 2008-2009 CIP, the project cost information is considered to be current and remains the same in this 2009 WRMP Update. For new or revised projects, estimated costs are based on planning level unit costs plus a 25 percent increase for soft costs (design, administration and construction management) and an overall 25 percent increase for contingency. Appendix D lists the District's 2008-2009 CIP, noting projects that have been completed and projects that have changed status per this current Master Plan process.

6.1 Proposed Potable Water Improvements

The recommended phased potable water improvements consist of several major pump stations, reservoirs and transmission mains that primarily will expand service throughout the District and resolve existing storage and pumping deficiencies. The recommended potable water facility improvements are shown in Exhibits I through V – one exhibit for each of the District's five water systems. The labeling on the exhibit retains the District's original naming convention, with a W or a P listed before the project identification number. The District's CIP naming convention is slightly different, with just a P in front of the project identification number. The tables provided in this section list both the CIP naming convention and the corresponding exhibit reference number.

The facilities shown with capital improvement program project numbers are the pump stations, reservoirs and transmission mains that will be planned, funded and constructed by the District. The distribution pipelines and laterals are developer projects and thus are the development project proponent's responsibility to plan, fund, and construct. These pipelines will typically be 12-inch and smaller in diameter and will be required to serve specific customers. It should be

recognized that some of the proposed CIP transmission main alignments may change as development plans are revised or refined in the future. The proposed CIP transmission mains were located within the currently planned roadways, based on current knowledge of development plans. As development projects are proposed the developers will be required to prepare a SAMP that will at a minimum define the distribution pipelines required to serve the development and either confirm or revise the size and locations of the necessary regional CIP facilities.

6.1.1 Storage Projects

The projects listed in Table 6-1 are required in order to meet the Phase II and Phase III storage needs of the potable water system.

Table 6-1. Potable Water Storage CIP Projects

Project No.	Exhibit Reference No.	Project Description	Capacity (mg)	Cost
Phase II (2010 - 2016)				
P2040	W040	Res - 1655-1 Reservoir 0.5 MG	0.5	$1,580,000
P2037	W037	Res - 980-3 Reservoir 13.0 MG	13.0	$15,200,000
P2143	W143	Res - 1296-3 Reservoir 2.0 MG	2.0	$3,379,000
		Total Phase II	**15.5**	**$20,159,000**
Phase III (2017 - Ultimate)				
P2142	W142	Res -1296-4 Reservoir 10.0 MG	10.0	$11,700,000
P2176	W2176	Res - 1090-2 Reservoir 1.0 MG	1.0	$1,235,000
P2228	W228	Res 870-2 Reservoir 10.0 MG	10.0	$11,700,000
P2233	W233	Res - 640-3 Reservoir 10.0 MG	10.0	$8,000,000
P2431	W431	Res - 980-4 Reservoir 5.0 MG	5.0	$5,900,000
		Total Phase III	**25.0**	**$38,535,000**
		Total All Phases	**40.5**	**$58,694,000**

6.1.2 Pump Station Projects

The projects listed in Table 6-2 are required in order to meet the Phase II and Phase III pumping needs of the potable water system.

6.1.3 Pipeline Projects

The projects listed in Table 6-3 are required in order to meet the Phase II and Phase III transmission pipeline needs of the potable water system. Many of these pipeline projects are assumed to be constructed concurrently with road improvement projects and therefore would not require open cut and traffic control.

Table 6-2. Potable Water Pump Station CIP Project Costs

Project No.	Exhibit Reference No.	Project Description	Capacity (gpm)	Cost
Phase II (2009 - 2016)				
P3291	W391	Perdue WTP Pump Station	3,500	$5,200,000
P2258	W258	PS - Lower Otay Pump Station[1]	9,000	$7,805,000
P2357	W357	PS - 657-1/850-1 PS Demolition	--	$300,000
			Total Phase II	**$13,305,000**
Phase III (2016 - Ultimate)				
P2083	W083	PS - 870-2 PS (11,000 gpm)[2]	11,000	$5,548,000
P2002	W002	PS - Proctor Valley PS (10,000 gpm)	10,000	$3,200,000
P2174	W174	PS - 1090-1 PS Replacement[3]	280	$820,000
P2256	W256	PS 978-2	1,500	$900,000
P2392	W392	PS - Lower Otay PS Expansion (9,000 gpm)	9,000	$450,000
			Total Phase III	**$10,918,000**
			Total All Phases	**$24,223,000**

(1) The initial phase of the lOPS PS (P2258) will build a permanent station to replace the existing temporary station and will have a capacity of 9,000 gpm. The ultimate phase of the LOPS (P2392) will increase the capacity of the station to 18,000 gpm.
(2) New Pump Station will replace the existing 571-1 PS and 870-1 PS.
(3) New Pump Station to replace existing facility.

Table 6-3. Potable Water Pipeline and PRS CIP Project Costs

Project No.	Exhibit Reference No.	Project Description	Length (ft)	Cost
Phase II (2009 - 2016)				
P2009	W009	PL - 36-in, SDCWA Otay FCF No. 14 to Regulatory Site	25,500	$18,200,000
P2010	W010	PL - 24-in, Sweetwater Reservoir Pipeline	4,720	$4,000,000
P2038	W038	PL - 12-in, 978 Zone, Jamacha, Hidden Mesa and Chase	8,600	$1,300,000
P2058	W058	PL - 24-in, 1296 Zone, Proctor Valley Rd - Pioneer/Campo	7,800	$1,200,000
P2066	W066	PL - 30-in, 870 Zone, Otay Mesa R/W - Alta/State Prison	4,100	$608,000
P2104	W104	PL - 12-in, 711 Zone, La Media Rd - Birch/Rock Mtn. Rd	4,900	$833,000
P2107	W107	PL - 12-in, 711 Zone, Rock Mtn. Rd - La Media/SR 125	4,000	$722,000
P2135	W135	PL - 20-inch, 980 Zone, Otay Lakes Rd - Wueste/Loop	3,200	$487,000
P2171	W171	PL - 30-in, 1296 Zone, Proctor Valley Rd - Pioneer/Melody	2,100	$563,000
P2181	W181	PL - 30-in, 1296 Zone, Proctor Valley Rd - Proctor Valley PS/Millar Ranch	8,800	$2,498,000
P2190	W190	PL - 10-in, 1485 Zone, Jamul Highlands Rd to Presilla Dr	1,300	$224,000
P2203	W203	PL - 30-inch, Proctor Valley Road	4,000	$1,500,000
P2318	W318	PL - 657 Zone, Summit Cross-tie & 36-in Main Connections	--	$601,000
P2325	W325	PL - 10-in to 12-in Oversize, PB Road - Rolling Hills Hydro PS/PB Bndy	2,300	$46,000
P2356	W356	PL - 12-inch Jamul Drive	3,600	$300,000
P2387	W287	PL - 12-in Steel Canyon Road	1,800	$150,000
P2399	W399	PL - 30-in, 980 Zone, 980 Reservoirs to Hunte Parkway	2,200	$2,740,000

Project No.	Exhibit Reference No.	Project Description	Length (ft)	Cost
P2402	W402	PL - 12-in, 624 Zone, La Media Rd - Village 7/Otay Valley	5,400	$444,000
P2414	W414	PL - 12-in to 16-in Oversize, 803 Zone, Dehesa Rd - Dehesa Meadow/OWD Bndy	2,700	$275,000
P2430	W430	PL - 30-inch in Proctor Valley Road	12,360	$5,200,000
P2471	W471	PRS - 850/657 PRS at La Presa PS site	--	$300,000
		Total Phase II	**62,760**	**$42,191,000**
Phase III (2016 - Ultimate)				
P2053	W053	PL - 20-in, 944 Zone, Campo Rd - 944-1 PS/944 Reservoirs	5,800	$725,000
P2056	W056	PL- 16-in Jamul Drive	2,200	$186,200
P2106	W106	PL - 12-in, 711 Zone, La Media Rd - Rock Mtn/Otay Valley	4,400	$210,000
P2116	W116	PL - 12-in, 711 Zone, Rock Mtn. Rd - SR 125/EastLake	3,000	$270,000
P2122	W122	PL - 20-in, 711 Zone, OTC to Hunte Parkway	2,400	$225,000
P2137	W137	PL - 20-inch, 980 Zone, Otay Lakes Rd - Wueste/Loop	1,600	$190,000
P2138	W138	PL - 20-in, 980 Zone, Otay Lakes Rd to 980-4 Reservoir	2,900	$345,000
P2139	W139	PL - 20-in, 980 Zone, Otay Lakes Rd - W138 Loop	1,500	$178,000
P2146	W143	PL - 20-in, 980 Zone, Otay Lakes Rd - W139 Loop	4,500	$535,000
P2148	W148	PL - 16-in, 850 Zone, Jamacha Blvd - Sweetwater Springs/Trace	4,300	$455,000
P2156	W156	PL - 12-in, 1296 Zone, Olive Vista Drive Parallel	1,200	$225,000
P2177	W177	PL - 30-in, 1296 Zone, Melody Road to 1296-4 Reservoir	4,300	$945,000
P2188	W188	PL - 24-in, 832 Zone, Campo Rd, Steele Canyon/944-1 PS	3,400	$1,485,000
P2198	W198	PL - 18-in, 832 Zone, 832 Reservoirs to Fair Oaks Drive	8,500	$810,000
P2204	W204	PL - 24-in, 1296 Zone, Pioneer Way - Proctor Valley/1296 Reservoirs	3,100	$480,000
P2374	W374	PL - 30-in, 870 Zone, 870-2 Reservoir to 870-1 Reservoir	400	$156,000
P2401	W401	PL - 12-in, 624 Zone, Otay Valley Rd - Heritage/SR 125	17,700	$1,251,000
P2404	W404	PL - 12-in, 624 Zone, Rock Mtn Rd - Village 4/Otay Valley	8,000	$252,000
P2403	W403	PL - 12-in, 624 Zone, Heritage Road - Olympic Parkway to Otay Valley	6,800	$720,000
P2405	W405	PL - 624-340 PRS, Paseo Ranchero and Otay Valley Road	1,200	$125,000
P2406	W406	PL - 711/624 PRS, EastLake Parkway and Rock Mtn Rd	2,400	$125,000
P2411	W411	PL - 1296/944 PRS Upgrade 1296-1 Pump Station Site	--	$350,000
P2412	W412	PL - 944/832 PRS Upgrade 944-1 Pump Station Site	--	$550,000
P2413	W413	PL/PRS 1296/803 PRS	--	$500,000
P2427	W142	PL - 20-in Otay Lakes Road	4,000	$4,800,000
P2435	W435	PL - 30-in 980 Zone, Proctor Valley Road to Proctor Valley PS	15,700	$6,134,000
		Total Phase III	**109,300**	**$22,227,200**
		Total All Phases		**$82,618,200**

6.1.4 Summary of Potable Water CIP Projects by Phase

Estimated probable capital costs for the phased recommended potable water CIP project improvements are summarized in Tables 6-4.

Table 6-4. Summary of Potable Water CIP Project Costs by Phase

Type of Improvement	Total Cost
Phase II (2010 - 2016)	
Storage Reservoirs	$20,159,000
Pump Stations	$13,305,000
Pipeline/PRS	$42,191,000
Total Phase II	**$35,057,000**
Phase III (2017 - Ultimate)	
Storage Reservoirs	$38,535,000
Pump Stations	$10,918,000
Pipeline/PRS	$22,227,200
Total Phase III	**$73,232,000**
Total All Phases	**$126,779,000**

6.2 Proposed Recycled Water Improvements

The recommended phased recycled water improvements consist of several major pump stations, reservoirs and transmission mains that will expand service throughout the District and resolve existing storage and pumping deficiencies. The recommended recycled water facility improvements are shown on Exhibit VII. The facilities shown with capital improvement program project numbers are the pump stations, reservoirs and transmission mains that will be planned, funded and constructed by the District. The recommended recycled water system improvements are primarily transmission main projects needed to expand and connect the existing recycled water distribution system.

The distribution pipelines and laterals are developer projects and thus are the development project proponent's responsibility to plan, fund, and construct. These pipelines will typically be 12-inch and smaller in diameter and will be required to serve specific customers. It should be recognized that some of the proposed CIP transmission main alignments may change as development plans are revised or refined in the future. The proposed CIP transmission mains were located within the currently planned roadways, based on current knowledge of development plans. As development projects are proposed the developers will be required to prepare a SAMP that will at a minimum define the distribution pipelines required to serve the development and either confirm or revise the size and locations of the necessary regional CIP facilities.

6.2.1 Storage and Pumping Projects

The projects listed in Table 6-5 are required in order to meet the Phase II and Phase III storage and pumping needs of the recycled water system. Many of these pipeline projects are assumed to be constructed concurrently with road improvement projects and therefore would not require open cut and traffic control.

Table 6-5. Recycled Water Storage and Pumping CIP Projects Costs

Project No.	Project Description	Capacity	Cost
Phase II (2010 - 2016)			
R2034	Res 860-1	4.0 mg	$3,800,000
R2091	PS 927-1 upgrade	8,250 gpm	$500,000
		Total Phase II	**$4,300,000**

6.2.2 Pipeline Projects

The projects listed in Table 6-6 are required in order to meet the Phase II and Phase III transmission pipeline needs of the recycled water system.

6.2.3 Summary of Recycled Water CIP Projects by Phase

Estimated probable capital costs for the phased recommended recycled water CIP project improvements are summarized in Tables 6-7.

6.3 Miscellaneous Improvement Projects

Included in the 2009 Capital Improvement Program are numerous miscellaneous projects that are associated with the potable water and recycled water systems. Those projects are listed in Table 6-8.

6.4 Water Supply Projects

Water supply offset projects are included in this 2009 Capital Improvement Program to support future water supply assessment documents and potable water offset requirements within the District. These projects include groundwater wells, desalination facilities and reclamation plants.

Table 6-6. Recycled Water Pipeline CIP Projects

Project No.	Project Description	Length (ft)	Cost
Phase II (2009 - 2016)			
R2028	RecPL - 8-Inch, 680 Zone, Heritage Road - Santa Victoria/Otay Valley	8,100	$600,000
R2042	RecPL - 8-Inch, 944 Zone, Rock Mountain Road - SR-125/EastLake	3,430	$141,000
R2047	RecPL - 12-Inch, 680 Zone, La Media Road - Birch/Rock Mountain	4,880	$435,000
R2048	RecPL - Otay Mesa Distribution Pipelines and Conversions	--	$2,000,000
R2058	RecPL - 16-Inch, 860 Zone, Airway Road - Otay Mesa/Alta	10,700	$2,680,000
R2077	RecPL - 24-Inch, 860 Zone, Alta Road - Alta Gate/Airway	7,900	$4,077,000
R2082	RecPL - 24-Inch, 680 Zone, Olympic Parkway - Village 2/Heritage	3,100	$1,747,000
R2083	RecPL - 20-Inch, 680 Zone, Heritage Road - Village 2/Olympic	1,280	$340,000
R2084	RecPL - 20-Inch, 680 Zone, Village 2 - Heritage/La Media	5,000	$971,000
R2085	RecPL - 20-Inch, 680 Zone, La Media - State/Olympic	2,740	$422,000
R2087	RecPL - 24-inch, 944 Zone, Wueste Road - Olympic/Otay WTP	13,500	$1,980,000
R2088	RecPL - 30-inch, 860 Zone, County Jail - Roll Reservoir/860-1 Reservoir	4,000	$1,480,000
	Total Phase II		**$16,873,000**
Phase III (2016 - Ultimate)			
R2037	RecPL - 8-Inch, 680 Zone, La Media Road - Rock Mountain/Otay Valley	4,050	$164,000
R2038	RecPL - 8-Inch, 680 Zone, Rock Mountain Road - La Media/Otay Valley	7,300	$296,000
R2043	RecPL - 8-Inch, 944 Zone, Rock Mountain Road - La Media/SR 125	2,600	$123,000
R2073	RecPL - 24-Inch, 860 Zone, Alta Road - Airway/Border	3,170	$4,750,000
R2078	RecPL - 8-Inch, 680 Zone, Otay Valley Road - SR 125/Heritage	13,920	$560,000
R2079	RecPL - 6-Inch, 450 Zone, Otay Valley Road - Otay Valley/Entertainment	1,730	$150,000
R2080	RecPL - 24-Inch, 680 Zone, Olympic Parkway - Medical Center/Heritage	2,840	$2,000,000
R3015	RecPL - North District Distribution Pipelines and Conversions	--	$14,000,000
	Total Phase III		**$22,043,000**
	Total All Phases		**$38,916,000**

Table 6-7. Summary of Recycled Water CIP Project Costs by Phase

Type of Improvement	Total Cost
Phase II (2010 - 2016)	
Storage Reservoirs	$3,800,000
Pump Stations	$500,000
Pipeline	$16,873,000
Total Phase II	**$21,173,000**
Phase III (2017 - Ultimate)	
Storage Reservoirs	$0
Pump Stations	$0
Pipeline	$22,043,000
Total Phase III	**$22,043,000**
Total All Phases	**$43,216,000**

Table 6-8. Miscellaneous CIP Projects

Project No.	Project Title	Cost
Phase II (2010-2016)		
P2267	36-Inch Main Pumpouts and Air/Vacuum Ventilation Installations	$195,000
P2370	Res - Dorchester Reservoir and Pump Station Demolition	$100,000
P2454	Vaults and Meter, Alta Road and Use Area	$465,000
	Total Phase II	**$760,000**
Phase III (2017-Ultimate)		
P2390	Siempre Viva Bridge Pipeline Crossings	$230,000
	Total Phase III	**$230,000**

Table 6-9. Water Supply Projects

Project No.	Project Name	Anticipated Yield (AFY)	Total Cost
P2481	Middle Sweetwater River Basin Groundwater Well	1,000	$8 to 10 million
P2451	Rosarito Seawater Desalination Facility	11,200	No Cost listed[1]
P2450	Otay River Groundwater Desalination Facility	4,500	$8 to 10 million
R2089[2]	North District Recycled Water Project	800	$14 to 15 million
R2048[2]	Otay Mesa RW System Link	300 to 1,658 (ultimate)	$16.4 million
R2094	Potable Water Meter to Recycled Water Conversions	100 to 200	$1 to 2 million
P2434	Rancho Del Rey Groundwater Well	300 to 500	$5 to 8 million
P2482	Otay Mesa Lot 7 Groundwater Well	300 to 500	$5 to 8 million
R2093	City of Chula Vista MBR Reclamation Plant	2,240 to 6,720	$47 million

(1) Cost would include participation in Mexican RW treatment facility, conveyance to Border, then possible full treatment at Border and conveyance into US.

(2) Also included in Table 6-6