Fallbrook Public Utility District

FACILITIES MASTER PLAN

February 2020

Fallbrook Public Utility District Master Plan (Draft)

Prepared by District Staff

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Chapter 1 – Water Supplies

1.0 Background

The Fallbrook Public Utility District (District) currently relies on approximately 95% of water supplies from imported water. Development of local potable supplies is currently a high priority for the District, with a focus on development of supplies from the Santa Margarita River. The goal of these supplies is to help provide the District some autonomy over water supply decisions and to develop lower-cost local supplies as imported water costs continue to escalate. The District holds three water right permits on the Santa Margarita River and has been able to utilize one of these water rights permits by transferring the permit to Lake Skinner, which allows for the Metropolitan Water District of Southern California (MWD) to treat runoff into Lake Skinner and wheel the water to the District. Longstanding litigation over the other Santa Margarita River water rights was resolved in 2018 and the District is working with Camp Pendleton (CPEN) to develop these remaining rights in order to provide the District with water supplies from the River. The only other source of potable supply for the District is one groundwater well near Red Mountain Reservoir.

In addition to potable supplies, the District has been producing and selling recycled water since 1991. Currently on average about 30% of wastewater treated by the District each year is sold as recycled water. The District recently added 4 additional nursery customers and the District will continue to look at expanding the number of users as identified in Chapter 2. A summary of the overall mix of District water supplies from 2005 – 2015 is shown in Figure 1-1. As shown in Figure 1-1 Imported water from SDCWA remains the primary supply.

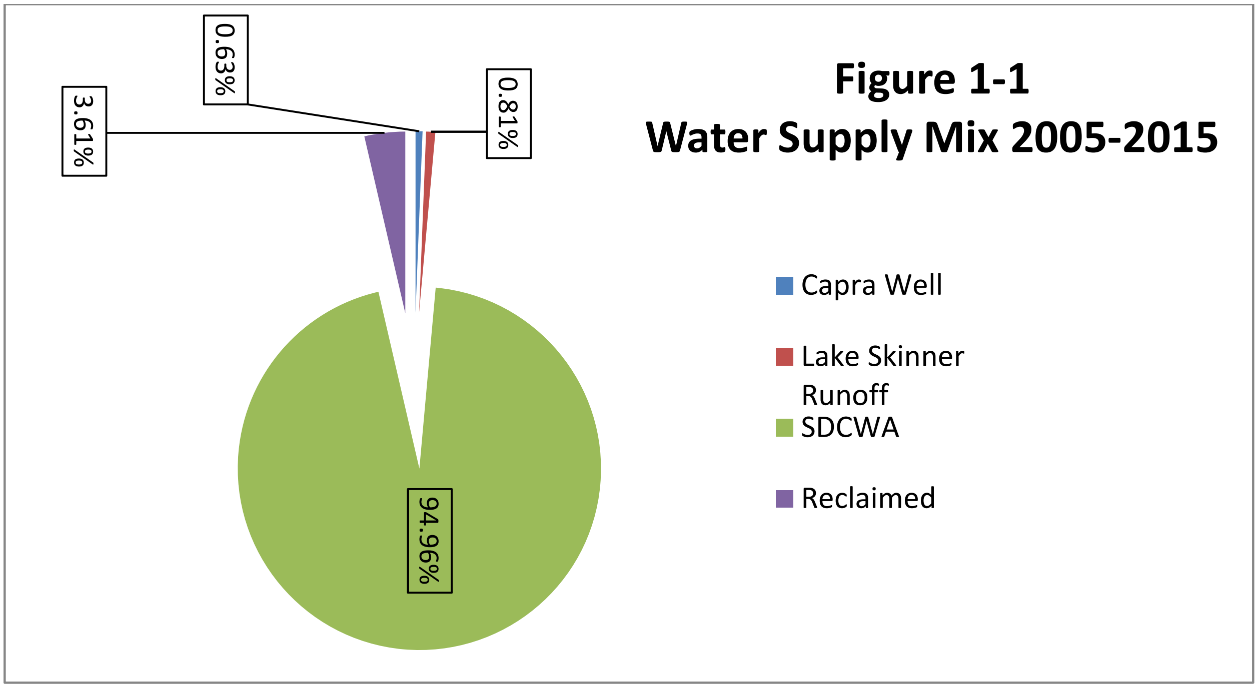

FIGURE 1-1: DISTRICT WATER SUPPLY MIX 2005-2015

1.1 Historical Water Supplies

FPUD was organized in 1922 and began supplying water in 1925. Originally the District relied 100% on water diverted from the Santa Margarita River. A small pump directly diverted water from the river. The District licensed this diversion in 1931. This diversion continued through 1970 when the pump was washed out during floods. It was never reconstructed and the license was revoked due to lack of use. The District also constructed groundwater wells outside of the District boundaries in the San Luis Rey basin in what is now part of the Rainbow MWD near Gird Road and Interstate 76. This operation continued until 1954 when imported water was made available from the San Diego County Water Authority (SDCWA) at lower cost and the operation of the wells was discontinued. No water rights were ever obtained for these wells and the District no longer owns the wells or the property. In 1990 the District took over the De Luz Water District which held a set of groundwater wells on De Luz Creek. The District operated these wells until 1995 when operations were stopped due to water quality problems. The wells are still owned by the District but have not been maintained and require significant rehabilitation. No water rights were ever obtained for these wells. In 1991 the District acquired an existing well near Red Mountain Reservoir (Capra Well). The well has been in operation by the District since 1991, except for necessary shutdowns during 2009 and 2010 during construction of the UV facility at Red Mountain Reservoir. Table 1-1 summarizes the water supply sources utilized by the District from 1925 to 2015.

Year	Santa Margarita River Diversion	San Luis Rey Groundwater Wells	Capra and De Luz Wells	Lake Skinner Runoff	SDCWA	Reclaimed	Total Production
1925	2.3						**2.3**
1926	11.3						**11.3**
1927	12.2						**12.2**
1928	15.3						**15.3**
1929	21.7						**21.7**
1930	21.3						**21.3**
1931	21.6						**21.6**
1932	24.6						**24.6**
1933	45.2						**45.2**
1934	70.5						**70.5**
1935	59.2						**59.2**
1936	84.5						**84.5**
1937	79.1						**79.1**
1938	98						**98**
1939	106.7	33.7					**140.4**
1940	140.7	298.3					**439**
1941	126.5	878.4					**1004.9**
1942	191.1	841.4					**1032.5**
1943	228.7	853.9					**1082.6**
1944	139	882.3					**1021.3**
1945	157	1186.7					**1343.7**
1946	63	372.2					**435.2**
1947	94	0					**94**
1948	58	1601.9			2330.2		**3990.1**
1949	208	2599.8			1821.4		**4629.2**
1950	343.6	1375.6			4073		**5792.2**
1951	858.2	2218.6			3467		**6543.8**
1952	856	2641			2146		**5643**
1953	1746.5	1499.6			4565		**7811.1**
1954	875	10.6			6630		**7515.6**
1955	1065				7107		**8172**
1956	999.5				7479		**8478.5**
1957	1309.6				5539		**6848.6**
1958	950				7103		**8053**
1959	861.7				9746		**10607.7**
1960	215.9				7445		**7660.9**
1961	248.7				10938		**11186.7**
1962	168.9				8938		**9106.9**

Year	Santa Margarita River Diversion	San Luis Rey Groundwater Wells	Capra and De Luz Wells	Lake Skinner Runoff	SDCWA	Reclaimed	Total Production
1963	102.7				10557		**10659.7**
1964	75.2				11193		**11268.2**
1965	242.5				9814		**10056.5**
1966	23.3				11462		**11485.3**
1967	0.2				9701		**9701.2**
1968	396.9				12118		**12514.9**
1969	129.7				9008		**9137.7**
1970					11910		**11910**
1971					11465		**11465**
1972					13356		**13356**
1973					11221.5		**11221.5**
1974					21742		**21742**
1975					11584		**11584**
1976					13477		**13477**
1977					12378		**12378**
1978					11265		**11265**
1979					12344		**12344**
1980					12895		**12895**
1981					14411		**14411**
1982					10472		**10472**
1983					9948		**9948**
1984					13060		**13060**
1985					12830		**12830**
1986					12001		**12001**
1987					11414		**11414**
1988					12465		**12465**
1989					14893		**14893**
1990					17779		**17779**
1991			158		12574	12.9	**12744.9**
1992			224.1		13374	12.4	**13610.5**
1993			268.3		12675	5.7	**12949**
1994			213.2		12825	51.4	**13089.6**
1995			170		12168.3	393	**12731.3**
1996			176		13246.2	651	**14073.2**
1997			127		14452.6	860	**15439.6**
1998			74		11859.1	620	**12553.1**
1999			147		15877.9	700	**16724.9**
2000			171		16150.3	634	**16955.3**
2001			165		14797.1	468	**15430.1**

Year	Santa Margarita River Diversion	San Luis Rey Groundwater Wells	Capra and De Luz Wells	Lake Skinner Runoff	SDCWA	Reclaimed	Total Production
2002			157		17857.1	408	**18422.1**
2003			135		16583.0	353	**17071**
2004			134		18170.6	397	**18701.6**
2005			138	1261	15202.5	365	**16966.5**
2006			178	106	18298.3	485	**19067.3**
2007			140	0	20451.9	423	**21014.9**
2008			133	16	15102.8	521	**15772.8**
2009			0	0	14617.5	675	**15292.5**
2010			0	20	11757.1	477	**12254.1**
2011			73	0	11783	595	**12451**
2012			140	0	12752	703	**13595**
2013			94	0	12671	715	**13480**
2014			77	0	12745	690	**13512**
2015			109	0	10102	589	**10800**
2016			92.6	0	9838.2	688.9	**10619.7**
2017			93.3	0	9466.1	664.9	**10224.3**
2018			73.8	0	9356.6	708.8	**10139.2**

TABLE 1-1: DISTRICT WATER SUPPLIES (1925-2018)

Since 1947, the District has been in litigation with the federal government for development of the three (3) District owned water rights on the Santa Margarita River. In 1986 on appeal, the federal judge ordered that Camp Pendleton and FPUD jointly develop a physical solution that allows equitable use of the water available in the Santa Margarita River. Both parties pursued development of a dam and water supply project with the Bureau of Reclamation, which was abandoned in 1987 due to environmental concerns. Since that time, the parties have pursued a groundwater storage project which would expand facilities on Camp Pendleton to divert river flows to subsurface storage and deliver water to FPUD. The parties completed a joint Environmental Impact Report/Statement (EIR/EIS) in conjunction with the Bureau of Reclamation in 2016. The project is anticipated to be completed by 2022.

The District initiated recycled water development in 1990 by agreeing to supply the California Department of Transportation (Caltrans) irrigation water for landscaping along Interstate 76 from the District's Ocean Outfall, which runs from the Wastewater Plant in Fallbrook to the ocean. Over the years the District added nurseries, home owner associations and athletic field customers to the system. The District currently serves 15 users from a recycled distribution system in Fallbrook.

1.2 Water Supply Development

The District continues to explore the following alternatives for water supply development:

1. Groundwater
2. Lake Skinner Runoff Water
3. Santa Margarita River Conjunctive Use Project
4. Reclaimed Water

1.2.1 Groundwater

The District peak year of groundwater production was 1949 in which 2,600 AF were produced from wells the District owned outside its service area in the San Luis Rey Basin. This was over 50% of the District's needs that year. Groundwater production capabilities were significantly limited after the District abandoned these facilities in 1954, when upstream agricultural uses resulted in poorer water quality and imported water from SDCWA was plentiful and inexpensive. Since the San Luis Rey well facilities are outside the District, and no water rights were developed, it is likely not feasible to recover this lost groundwater production. Much of the groundwater in the Santa Margarita River Basin and San Luis River Basin is subject to water rights appropriations for larger diversions as the State has determined that the surface flows and groundwater flows are connected in these basins, which gives the State jurisdiction over these flows. As these basins are fully appropriated, this makes it difficult to acquire new groundwater sources in these basins.

Within the District boundaries there are no substantial groundwater aquifers, which is why the original San Luis Rey facilities were constructed outside the District boundaries. As shown on the attached Figure 1-2, which was developed by the San Diego County Water Authority (San Diego County Water Authority, 2010), the District's Service area does not overlay any significant groundwater basins. The District overlay's geology that is primarily fractured rock, which is similar to the majority of San Diego County. Unlike traditional alluvial aquifers, fractured rock has limited pore space for water storage and is generally not suitable for large volumes of storage and diversion (California Department of Water Resources, 2011).

Currently, the District's only groundwater supply is a single well that produces up to 170 AFY of groundwater. This well is also adjacent to Red Mountain Reservoir, which has a permeable asphalt liner, so the Capra well is likely influenced by some underflow from the reservoir. The District also owns three (3) wells in De Luz, but the District stopped operation of the De Luz wells in 1995 due to water quality concerns. These wells had produced up to 100 AFY of additional groundwater supplies. As imported water costs continue to rise, it may be economical to rehabilitate these wells and install well head treatment to address the water quality issues. Since the wells pump from a small alluvium basin adjacent to the river, there are potential water rights implications of operating these wells, so the District would need to ensure that downstream users (Camp Pendleton) would not object to initiating operation of the wells. Due to the lack of alluvial aquifers' underlying of the District service area, development of groundwater would not significantly reduce imported water needs, but it continues to play a minor role in diversifying supplies. In order for the District to maximize potential groundwater supplies, the District should explore bringing the De Luz wells back into service.

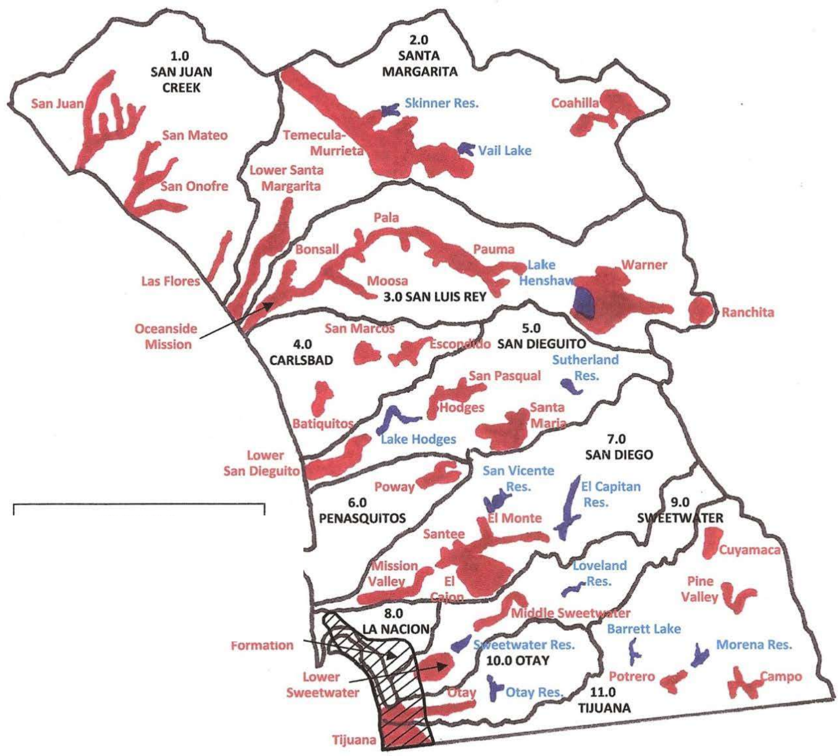

FIGURE 1-2: GROUNDWATER BASINS IN SAN DIEGO COUNTY (FROM PROPOSED GUIDELINES FOR SALINITY/NUTRIENT MANAGEMENT PLANNING IN THE SAN DIEGO REGION)

1.2.2 Lake Skinner

In 2005, the District relocated a water rights permit from the District property on the Santa Margarita River to Lake Skinner. The District had a water rights permit but no mechanism for storage and diversion; MWD had a mechanism for storage and diversion, but no water rights permit. By relocating the permit, the District could store and deliver imported water from Lake Skinner. In 2005, when the District finalized all the required approvals to receive local runoff water from Lake Skinner, it was estimated that every ten years a large wet year would produce up to 10,000 AF of runoff, so the average amount of water would be 1,000 AFY. Based on actual deliveries from MWD to the District from Lake Skinner from 2005 – 2011, the amount of water available has been much less than projected and has averaged only 241 AFY. Not all of the runoff into the lake is available to the District. There is an amount that must be released to protect downstream water rights and an amount that must be released based on environmental requirements. Based on a review of historical data, if FPUD had relocated their permit to Skinner since 1975, the annual estimated diversion would have been 733 AFY on average, with the majority of water coming in a few very wet years (See Table 1-2).

Water Year	Lake Skinner Precipitation, inches	Computed Local Runoff, acre feet	Required Release, acre feet	Projected FPUD Diversion, acre feet
1975	*9.97*	*15*	*14*	*0*
1976	*8.13*	*3*	*3*	*0*
1977	*4.08*	*3*	*3*	*0*
1978	*NR*	*NR*	*NR*	*NR*
1979	*NR*	*NR*	*NR*	*NR*
1980	*19.40*	*13,162*	*1,334*	*10,000*
1981	*8.31*	*802*	*377*	*421*
1982	*13.36*	*495*	*338*	*157*
1983	*19.50*	*1,652*	*681*	*957*
1984	*4.23*	*91*	*80*	*10*
1985	*9.17*	*145*	*119*	*19*
1986	*13.15*	*269*	*221*	*47*
1987	*7.99*	*4*	*4*	*0*
1988	*10.02*	*0*	*0*	*0*
1989	*5.83*	*0*	*0*	*0*
1990	*6.96*	*0*	*0*	*0*
1991	*14*	*938*	*133*	*805*
1992	*14*	*0*	*0*	*0*
1993	*26*	*8487*	*1339*	*7149*
1994	*13*	*1010*	*557*	*438*
1995	*20*	*3218*	*932*	*2286*
1996	*8*	*35*	*88*	*0*
1997	*10*	*4*	*4*	*0*
1998	*24*	*1746*	*487*	*1258*
1999	*6*	*6*	*6*	*0*
2000	*7*	*4*	*4*	*0*
2001	*9*	*0*	*0*	*0*
2002	*3*	*0*	*0*	*0*
2003	*15*	*0*	*0*	*0*
2004	*7*	*0*	*0*	*0*
2005	*23*	*3935*	*770*	*3166*
2006	8	398	292	106
2007	3	0	0	0
2008	14	163	132	16
2009	9	0	0	0

2010	13	176	156	20
2011	18	735	451	285
Average	**11.5**	**1071**	**243**	**775**
*Values in italics are projected based on data, values from 2006 to 2010 are actual. Diversions started part way through 2005.				

TABLE 1-2: DISTRICT LAKE SKINNER DIVERSIONS (ACTUAL AND PROJECTED)

The District in conjunction with MWD is currently working on improving the accuracy of the quantification of runoff into the Lake. In addition, the District will be exploring modifications to the required release for environmental concerns since the past adopted release criteria has been overridden by concerns over Quagga mussel control. These efforts should result in maximizing the availability of this resource which provides a lower-cost water supply.

1.2.3 Santa Margarita River Conjunctive Use Project

The Santa Margarita Conjunctive Use project will provide the “physical solution” to settle the longstanding water rights litigation between the United States Government and the District. The project expands existing diversion facilities on Camp Pendleton to capture large storm events and recharge the aquifers on Camp Pendleton. This stored groundwater will then be pumped by Camp Pendleton and delivered to the District. Figure 1-3 shows the proposed project facilities which include facilities to divert surface flows on Camp Pendleton, groundwater recharge ponds, groundwater production facilities, groundwater treatment and distribution piping and pump stations to deliver water into the District’s distribution system and ultimately to Red Mountain Reservoir. Once the water is delivered to the District’s distribution system, it will blend with other imported supplies and then be delivered to District customers. The amount of water available will be based on the amount of runoff into the river for each year type. A determination of the hydrological year will be made based on total runoff and this will set the delivery schedule of water from Camp Pendleton to the District.

The Methodology for determining the water year is presented in Table 1-3. This table also shows the projected number of each type of hydrological year based on the past 50 years of records. A monthly delivery schedule was developed based on each year type. This is the amount of water to be delivered by CPEN to the District in each month of each year type in order to settle the existing water rights litigation. The current estimated delivery schedule by hydrological year is presented in Table 1-4. Based on the delivery schedule and past hydrology it is expected that the project will deliver an average of 3,100 AFY, with the majority of water made available in wetter years.

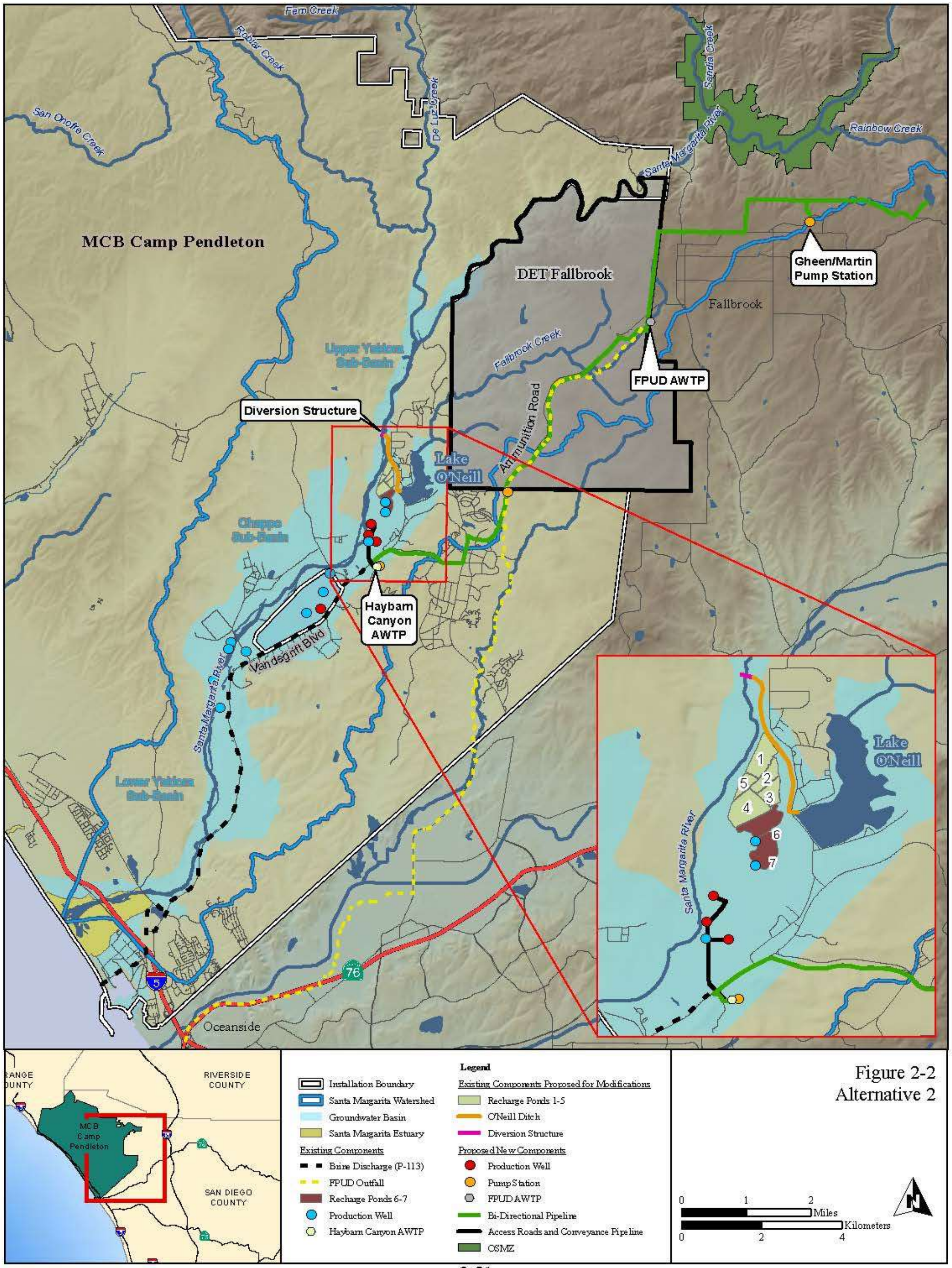

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FIGURE 1-3: PROPOSED SANTA MARGARITA CONJUNCTIVE USE FACILITIES

Range of Winter-time Streamflow (AF)	Hydrologic Condition	Number of Years Hydrologic Condition Occurs During MY 1-50
> 57,700	VW - Very Wet	9
57,699 to 14,700	AN - Above Normal	15
14,699 to 7,600	BN - Below Normal	14
< 7,599	VD - Very Dry	5
2 or more Very Dry Years in a row	ED – Extreme Drought	7

Note 1: Wintertime streamflow calculated as the total October 1 through April 30 Santa Margarita River streamflow at the point of diversion. This hydrologic condition is based on future streamflow, including corrections for diversions and augmentations.

Note 2: The "Extreme Drought" condition only occurs following the second consecutive Very Dry year. While there is a volume cutoff for VW, AN, BN, and VD, there is a antecedent condition required for the Extreme Drought condition.

TABLE 1-3: DELINEATION OF HYDROLOGIC CONDITION BASED ON FUTURE WINTERTIME STREAMFLOW FOR THE 50-YEAR MODEL PERIOD

	Water Year Type				
Month	**ED**	**VD**	**BN**	**AN**	**VW**
May	0	0	60	600	740
June	0	0	60	600	650
July	0	0	60	500	550
August	0	0	60	400	450
September	0	0	60	300	350
October	0	0	150	230	350
November	0	0	150	230	400
December	0	115	150	360	500
January	0	115	150	450	550
February	0	115	150	455	590
March	0	115	150	495	590
April	0	120	100	500	600
TOTAL	0	580	1300	5120	6320

TABLE 1-4: PROPOSED DELIVERIES TO FALLBROOK PUD BASED ON THE 50-YEAR MODEL PERIOD AND HYDROLOGICAL YEAR TYPE (ACRE-FEET PER MONTH)

1.2.4 Reclaimed Water

The District started serving reclaimed water in 1991. The recycled sales peaked in 1997 at 860 AFY and has varied from 423 AFY to 703 AFY over the last ten years. A summary of annual sales is summarized in Table 1-5. The wide fluctuations in annual recycled sales does not trend with water sales or rainfall conditions and is currently not completely understood.

Year	Recycled Sales (AFY)
1991	12.9
1992	12.4
1993	5.7
1994	51.4
1995	393
1996	651
1997	860
1998	620
1999	700
2000	634
2001	468
2002	408
2003	353
2004	397
2005	365
2006	485
2007	423
2008	521
2009	675
2010	477
2011	595
2012	703
2013	715
2014	690
2015	589

TABLE 1-5: DISTRICT RECYCLED SALES

The District recently expanded the system to serve four (4) additional large nurseries and has completed initial planning to serve additional potential recycled users as identified in Chapter 2.

1.3 Projected Water Demands and Supplies

As outlined in the District's 2015 Urban Water Management Plan (UWMP), which is based on water demand projections from the San Diego Association of Governments (SANDAG), the District expects water demands to increase from 12,320 AFY in 2010 to 18,313 in 2035 or by approximately 240 AFY annually. The District's goal is to add another 3,100 AFY of local supply through the conjunctive use project and 150 AFY of recycled supplies. A summary of the projected demand and planned water supplies based on the UWMP are outlined in Table 1-6.

Projected water supply sources	**2020**	**2025**	**2030**	**2035**
Imported Water	11,491	13,041	13,520	13,704
Groundwater supplier: Santa Margarita River	3,100	3,100	3,100	3,100
Groundwater supplier: local wells in Fallbrook	100	100	100	100
Surface diversions: rainfall into Lake Skinner	300	300	300	300
Recycled water	1,100	1,200	1,200	1,200
Total	16,091	17,741	18,220	18,404

TABLE 1-6: PLANNED SOURCES OF WATER AVAILABLE TO THE DISTRICT (AVERAGE YEAR) – AF/Y

However, as shown in Table 1-1, actual demands have declined slightly each year since 2014. If that trend continues, future demands may be lower than previously anticipated.

References

California Department of Water Resources, 2011; www.water.ca.gov/drought/docs/water_facts_1.pdf.

San Diego County Water Authority, 2010; Proposed Guidelines for Salinity/Nutrient Management Planning in the San Diego Region.

Fallbrook Public Utility District, 2015; Urban Water Management Plan.

Chapter 2 – Reclaimed Water

2.0 Background

The District started serving reclaimed water in 1991. Currently, the Water Reclamation Plant (WRP) treats all influent flows to tertiary standards. The Reclaimed sales peaked in 1997 at 860 AFY and sales have varied from 350 AFY to 675 AFY over the last few years. In 2010, two nursery customers who leased District property were required to relocate due to the construction of new District solar facilities, which resulted in reduced Reclaimed usage. The average annual usage from 2015 through 2019 was calculated as 631 AF/Year. This is the estimated average annual usage based on the current customers. The amount of Reclaimed water available, represented by the WRP Influent, varies slightly due to minor infiltration in the wet season and ranges between 130-159 AF / month, or 1694 AF / Year. The amount of Reclaimed water used by customers varies significantly from summer to winter due to irrigation needs. During the peak months of July, August and September, Reclaimed demands account for 50% to 60% of the influent flows as shown in Table 2-1.

Average Monthly Usage (2015-2019)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
WRP Influent flow (AF)	159	144	152	139	150	137	142	141	133	133	130	135	1694
Reclaimed Water Sales (AF)	25	35	39	60	52	57	73	84	73	63	41	28	631
Monthly Sales of Total Sales (%)	6%	7%	9%	9%	6%	7%	7%	8%	7%	7%	6%	5%	
Unused Reclaimed Water (AF)	133	109	112	79	98	80	69	56	59	70	89	107	1063
Reclaimed Water Usage (%)	16%	24%	26%	43%	35%	42%	51%	60%	55%	47%	32%	21%	

TABLE 2-1: MONTHLY RECLAIMED WATER USAGE AVERAGE OF 2015-2019 (ALL FIGURES IN AF)

The District recently expanded the Reclaimed distribution system to the eastern region of the district as part of a California Proposition 84 grant. The project was completed in May 2016 and now serves an additional 4 nurseries, with 77 acres of future potential growth adjacent to the reclaimed waterline extension. The District currently serves the following Reclaimed customers:

- Goodearth Nursery
- Silverthorne Nursery
- ColorSpot Nursery
  (now Altman Specialty Plants)
- DM Color Express
- Fallbrook Sports Park
- Fallbrook Youth Baseball
- Olive Hill Nursery
- Olive Hill Greenhouses
- Fallbrook High School

- Peppertree Park HOA
- Mission Road Median
- Fallbrook Airpark
- Mission Oaks HOA
- California Department of Transportation (Caltrans)
- Premier Color Nursery
- Orange Grove Energy
- Roseland Nursery
- San Diego Growers

The locations of the current District users are shown on Figure 2-1.

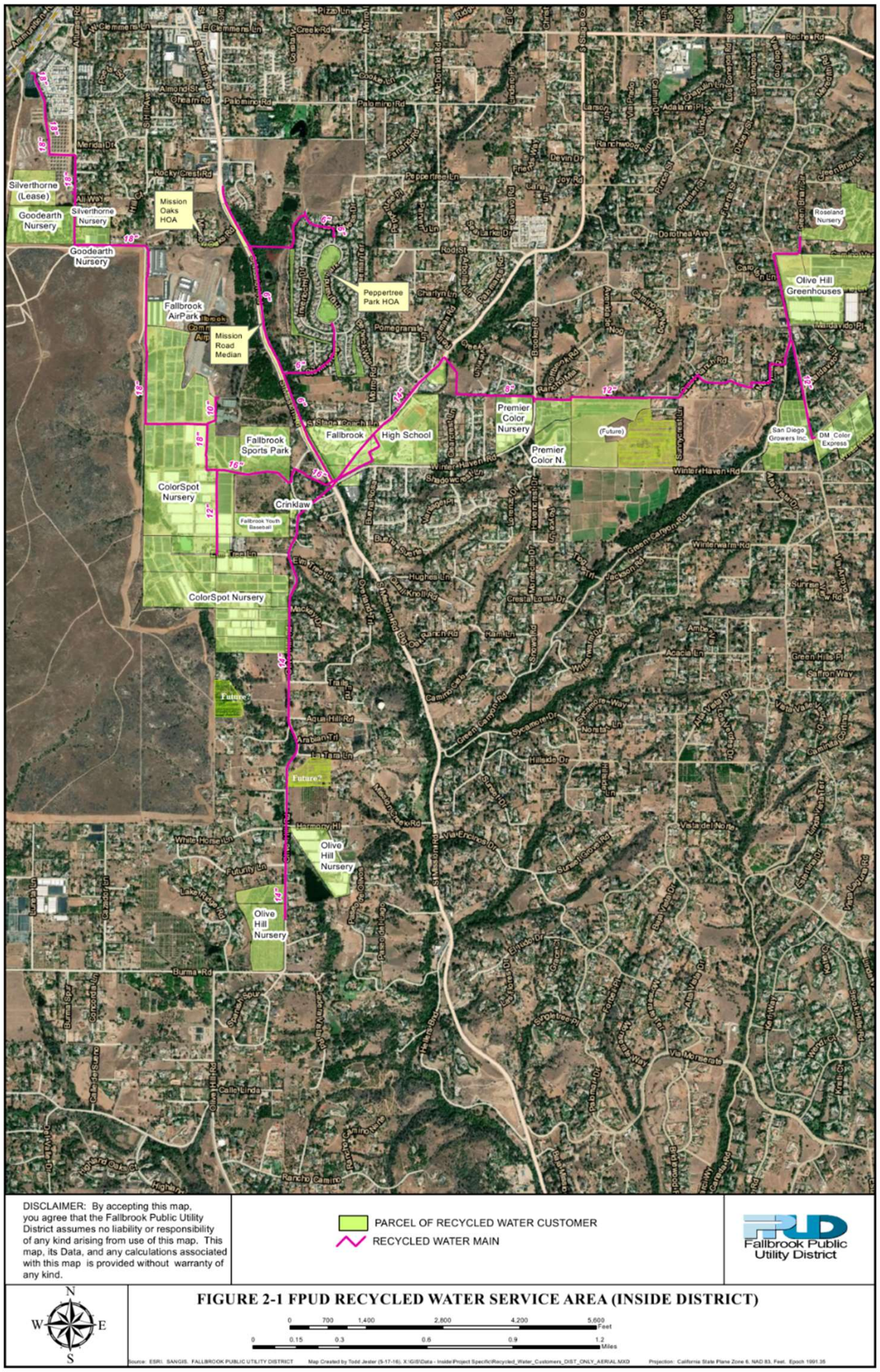

FIGURE 2-1: FPUD RECYCLED WATER CUSTOMERS

The District also serves customers which are outside the FPUD service area: Caltrans, within the City of Oceanside's service area, through the land outfall, and Orange Grove Energy, in the Rainbow MWD service area, using fill trucks and a Reclaimed fill station.

2.2 Available Reclaimed Water Supply

The District completed a $30 million dollar renovation of the Water Reclamation Plant (WRP) in 2016 which improved reliability and added storage (a 1 MG equalization reservoir, and a 1.2 MG emergency storage reservoir) for daily demands. The average influent has decreased since 2014 by an average of 224 AF/Y.

The Oceanside outfall, which provides reclaimed water to Caltrans, will be transferred to the City of Oceanside by the end of 2019 in preparation for the Santa Margarita Groundwater Treatment Plant brine discharges (see Chapter 3). Accordingly, the Caltrans service connection, which has averaged 102 AF per year and a maximum monthly consumption of 21AF, will no longer be part of the reclaimed water consumption data. For planning purposes, the Caltrans usage will be subtracted and the adjustment will be noted in the projected available Reclaimed water shown in Table 2-2.

Although a small amount of storage has been established (as noted above), the maximum Reclaimed demand would be limited to the maximum Reclaimed supply in the maximum demand month. Assuming that 95% of the supply could be utilized in the maximum month, the system has capacity to meet up to 80 percent higher demands.

Reclaim Water Availability	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
WRP Influent flow (AF)	159	144	152	139	150	137	142	141	133	133	130	135	1694
Current Reclaim Water Sales (AF)	25	35	39	60	52	57	73	84	73	63	41	28	631
Subtract Caltrans consumption (AF)	5	7	7	6	7	5	7	11	12	12	13	10	102
Adjusted Reclaim Water Sales (AF)	20	29	32	54	45	52	65	73	61	51	28	18	529
% Sales Distribution by Month	4%	5%	6%	10%	8%	10%	12%	14%	12%	10%	5%	3%	100%
Unused (Available) Reclaim Water	138	116	119	85	105	84	76	67	71	82	102	118	1165
% Projected Reclaim Water Usage	13%	20%	21%	39%	30%	38%	46%	52%	46%	38%	21%	13%	

TABLE 2-2: PROJECTED MAXIMUM MONTHLY AVAILABLE RECLAIMED WATER FOR NEW USERS (ALL FIGURES IN AF – BASED ON 2015-2019 INFLUENT FLOW AND ADJUSTED RECLAIM WATER USAGE)

2.3 Reclaimed Expansion Options

Maximum available Reclaimed water corresponds to 95 percent of the maximum influent month and respective demand month. Based on the 95 percent supply assumption, and the removal of the Caltrans connection, the available reclaimed water for additional customers is 430 AF. This could serve approximately 215 additional acres of nursery agriculture, based on a calculated average usage per acre at existing nursery customer's consumption of 2 AF per acre. Given the variable nature of the influent, the cost of building pipeline extensions, and limited interest from potential customers, the district is also looking into other beneficial uses of the treated reclaimed water. Specifically, the district is investigating additional treatment options that would allow the effluent to be discharged into Fallbrook Creek. This would allow all unused effluent to infiltrate and recharge the downstream aquifer and then subsequently used in Santa Margarita Conjunctive Use Project / Water Treatment Plant.

These options are being evaluated to better ensure the District is maximizing the economic benefits of all feasible wastewater disposal and reuse options:

1. Add new Reclaimed users and build pipeline extensions, as needed.
2. Development of a Potable Recharge Project with Aquifer Storage and Recovery
3. Development of a Direct Potable Reuse Project

2.3.1 Additional Reclaimed Users in FPUD Service Area

The district has identified 430 AF of reclaim water supply that would be available to serve additional customers. This availability has been distributed according to average monthly demands (percent Sales by Month) in such a way as to have a maximum percent projected RW usage equal to 95 percent or less. See Table 2-3.

Projected Additional Sales	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
WRP Influent flow (AF)	159	144	152	139	150	137	142	141	133	133	130	135	1694
Adjusted Reclaim Sales (projected AF)	20	29	32	54	45	52	65	73	61	51	28	18	529
% Sales by Month (total water sales)	13%	20%	21%	39%	30%	38%	46%	52%	46%	38%	21%	13%	
Maximum Additional RW Sales (AF)	17	23	26	44	36	43	53	60	50	41	23	14	430
Total Projected Sales (AF)	37	52	59	98	81	95	118	133	111	92	51	32	959
Maximum Potential Usage (Monthly Influent x 95%)	151	137	144	132	143	130	135	134	126	127	123	129	1609
Unused Reclaim Water	122	93	93	41	69	42	23	8	21	41	79	103	735
% Projected Reclaim Water Usage	81%	36%	39%	70%	54%	69%	84%	95%	84%	69%	39%	24%	

TABLE 2-3: Projected Maximum Monthly Additional Available Reclaimed Water (All figures in AF)

Analysis of the existing RW customer consumption and the respective acreage (402 acres), yields a projected consumption of 2 AF/Acre/Year (rounded up). Interest among potential customers served by the Southern RW Extension was gauged and showed that some would commit to using 50% reclaimed water and others are not yet committed. The East/South RW Extension requires less infrastructure and is assumed to have a similar projected usage. The estimated costs for pipeline extension installations was estimated at $200 / linear foot. A review of these potential customers has been addressed in Table 2-4.

Reclaimed Water Projects	Acres	Estimated Demand (AFY)	Est. Cost	[5] Cap. Unit Costs ($/AF)
Peppertree Development Phase 7		14	0[1]	0
Peppertree Development Phase 8 and 9		28	0[1]	0
Additional Future / Adjacent Nursery Sites	77	154[2]	0	0
Southern Nursery Extension (5800 Ft)	46	35-71[3] (**92**[2])	$1.16M	$641
East/South Nursery Extension (1400 Ft)	45	20[4] (**90**[2])	$280K	$155
Total Extension Projects (max.)		**182**	**$1.44M**	**$395**

[1] Costs included in the development; [2] 2 AF per acre; [3] Actual usage 50-100%; [4] Actual usage; [5]Capitalized Unit Cost (Apx A)

TABLE 2-4: ADDITIONAL RECLAIMED WATER PROJECTS

The addition of customers with significant consumption is the best way to maximize reclaimed water use and return on investment. A site with minimal investment would be the parcels adjacent to the Premier Color Nursery (PCN) which includes up to 48 acres of land (projected 96 AF/Y). There are other sites that could be developed (currently vacant) along the RW line that could yield more usage if they were developed. The total projected (future) usage for parcels adjacent to the RW waterline is 157 AF.

South of the PCN area some agriculture fields have been planted (Hemp - usage analysis, based on 5 months of growing, indicates approx. 20 AF/Y.) This East/South Nursery RW Extension is 1400 ft, south from the PCN site on Winter Haven Road, and has 45 Acres with a potential use of 90 AF.

The South Nursery Extension would provide reclaimed water to nurseries, a palm nursery and citrus grove at the southwestern corner of the district, with a pipe extension of 5800 ft. With the South Nursery Extension (Figure 2-2) the district would be able to capture up to the current usage of 71 AF (or a potential usage of 92 AF/Y).

A summary of the estimated monthly reclaimed water supply and respective projected demands based on expanding the Reclaimed system is shown in Table 2-5.

Projected New Customer Impact (AF)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
WRP Influent flow	159	144	152	139	150	137	142	141	133	133	130	135	1694
Adjusted Reclaim Sales (Current)	20	29	32	54	45	52	65	73	61	51	28	18	529
% Sales Distribution by Month	4%	5%	6%	10%	8%	10%	12%	14%	12%	10%	5%	3%	100%
Projected RW Sales (South Ext.)	4	5	6	9	8	9	11	13	11	9	5	3	92
Projected RW Sales (PCN)	6	8	9	16	13	15	19	21	18	15	8	5	154
Projected RW Sales (E/S Ext.)	3	5	6	9	8	9	11	12	10	9	5	3	90
Total Used Reclaim Water	33	47	53	88	73	86	107	120	100	83	46	29	865
% Reclaim Water Usage	21%	32%	35%	64%	49%	63%	75%	85%	76%	62%	35%	22%	
Total Remaining Reclaim Water	125	98	99	51	77	51	35	21	32	50	84	106	829

TABLE 2-5: PROJECTED MONTHLY RECLAIMED WATER USAGE WITH ADDITIONAL PRIORITY CUSTOMERS AND EXTENSIONS (ALL FIGURES IN AF)

Since the facility already produces tertiary water, the only additional capital costs are new pipeline installation. As shown in Appendix A, the gross revenue per AF for Reclaimed sold is $1896/AF. The marginal O&M costs for production and supply are limited and estimated to be $120/AF additional cost, so the annual revenue per unit sold is estimated at $1776/AF. A summary of the capital, O&M and lifecycle cost for developing additional Reclaimed pipelines based on details in Appendix A is summarized below:

Capital Cost: $1.44 million

Annual Revenue (182 AF/Y at $1896/AF): $345,072

Capitalized Unit Cost (30 years, 3%): $404/AF

Total Unit Cost = Capital + O&M = $404+ $120 = $524/AF

FIGURE 2-2: RECLAIMED NURSERY EXTENSION SOUTH

2.3.2 Development of Potable Reuse Aquifer Storage and Recovery (ASR) Project

Based on the analysis in Section 2.3.1, an additional 430 AF/Y (unused RW) can be developed within the FPUD service area to create a total annual Reclaimed water demand of 959 AF/Y. This would still result in 735 AF/Y sent to the ocean, so the District is also evaluating potential reuse alternatives such as aquifer storage and recovery to more fully utilize local water resources. Potable recharge projects that implement discharges to recharge groundwater basins have been successfully permitted and operated in California since 1962. This type of project would allow the District to more fully utilize available Reclaimed water as a water supply source. Since the District does not overlay a viable aquifer, it would require coordination with either Camp Pendleton or Oceanside, who overlay aquifers downstream of the District. The WRP is located so that disposal could be to Fallbrook Creek in the Santa Margarita Watershed or with some additional piping to Ostrich Creek in the San Luis Rey Watershed. The water would then need to be diverted and recharged to the aquifer on the lower end of the rivers, which overlay viable aquifers.

As shown in Figure 2-4, the facilities for diversion and recharge of river flows already exist on Camp Pendleton for the Santa Margarita Watershed. As part of the Santa Margarita Conjunctive Use Project, additional facilities are planned to pump groundwater and deliver to Fallbrook. The benefits and drawbacks of each option are listed in Table 2-6 below:

Option	Benefits	Drawbacks
Discharge to Fallbrook Creek	Increases Yield of Conjunctive Use Project (CUP). Facilities Planned as part of CUP to divert, store and deliver water back to FPUD. Provides potential permanent outfall capacity for Oceanside. FPUD holds water rights in Santa Margarita River.	Requires Live Stream discharge permit from Regional Water Quality Control Board (RWQCB) with potential limits of 1 mg/l as N for N and 0.1 mg/l as P for P. Annual limit but cannot be exceeded more than 10% of the time. TDS Target 750 mg/l.
Discharge to Ostrich Creek	Water Quality Discharge limits are higher for the San Luis Rey Watershed. Could provide additional yield for Oceanside's Desalters.	Requires Live Stream discharge permit from RWQCB with potential limits of 1 mg/l as N for N and 0.1 mg/l as P for P. Annual limit but cannot be exceeded more than 10% of the time. TDS Target 500 mg/l. Requires infrastructure for conveyance to Ostrich Creek. No facilities planned to improve recharge or delivery water from San Luis Rey River to Fallbrook and would require a water exchange agreement with Oceanside. FPUD holds no water rights for San Luis Rey. Water rights requirements would need to be determined.

TABLE 2-6: COMPARISON OF POTABLE REUSE ASR PROJECTS

Fallbrook Creek Potable Recharge Project

Of the two options, discharge to Fallbrook Creek has more potential as a viable reuse project. The facilities to recharge the groundwater basin and transport water back to the District from the Groundwater basin on Camp Pendleton are being constructed as part of the Santa Margarita River Conjunctive Use Project. As shown in Table 2-2, if the existing demand projections are reached with current users, there is still the opportunity for 735 AF/Y of Reclaimed water as a supply for an ASR PR project. In order to meet the surface water discharge objectives of 1 mg/l as N and 0.1 mg/l as P, it would be necessary for the plant to operate in nitrification/denitrification mode and utilize the filters as denitrification filters. Additional chemical treatment would also be required for Phosphorous Removal. Since the current Reclaimed water average TDS is 880 mg/l, a reduction in TDS of 130 mg/l would be required unless the District could demonstrate that the higher TDS would not have adverse impacts. Thus, the following modifications and additional facilities would be required:

- Additional of Recirculation Pumps in the Activated Sludge Tanks
- Replacement of Filter Media for Conversion to Denitrification Filters
- Chemical addition for P removal
- Construction of 0.5 MGD Microfiltration Facilities for P removal and RO pre-treatment.
- Addition of Methanol Feed Facilities for Denitrification Filters
- Reverse Osmosis Facilities to treat 15% of flow to meet 750 mg/l TDS target.

The brine could be disposed via the existing outfall. A summary of the general criteria for the ASR IPR project are below:

Criteria	Units
Design Capacity	Up to 0.5 MGD Discharge to Fallbrook Creek
Process Components	Modification for Denitrification/Nitrification at WRP. 0.5 MGD MF Facility. 0.08 MGD RO IPR Facility.
Estimated Footprint(1)	3000 sf
IPR Water Source(2)	Title 22 Filtered Water from Fallbrook WRP
Discharge Location	Fallbrook Creek
Recharge Location	Lake O'Neil or recharge ponds – Upper Ysidora Sub Basin
Average Retention Time in Aquifer (3)	27 years
Average Reclaimed Water Contribution(4)	5%
Maximum Reclaimed Water Contribution (4)	7.5%
Overall Estimate Percent Recovery(5)	83%
Net Additional Water Supply Produced	360 AFY

(1) Rough Estimate Based on footprint of City of San Diego 1 MGD demonstration Facility
(2) Includes initiation of nitrification/denitrification at WRP.
(3) Santa Margarita CUP aquifer includes Chappo at 27,000 and Upper Ysidora Sub-basins at 12,500. Based on location of Lake O'Neil, average retention time estimate is based on Chappo volume and average annual discharge. Minimum retention time to closest withdrawal well to be substantially less.
(4) Based on modeling projected by Stetson Engineers, after construction of SMR CUP facilities based on 50 years of hydrology, average yield will be 10,500 AFY. Minimum yield will be 5,600 AFY.

(5) Based on 15% RO treatment and 85% Bypass with 95% recovery from MF, 85% RO and additional 10% loss for evapotranspiration

TABLE 2-7: CONCEPTUAL CRITERIA FOR FALLBROOK CREEK IPR PROJECT

The treatment facilities would be located at the existing WRP site.

Projected IPR Treatment/ RW Usage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
WRP Influent flow	159	144	152	139	150	137	142	141	133	133	130	135	1694
Projected RW Sales (Max. Ad. Sales)	37	52	59	98	81	95	118	133	111	92	51	32	959
IPR Production (0.5 MGD Max=46AF/m)	46	46	46	41	46	42	23	8	21	41	46	46	452
Unused Reclaim Water (Ocean Disp.)	76	47	47	0	23	0	0	0	0	0	33	57	283
% Reclaim Water Usage	52%	68%	69%	100%	85%	100%	100%	100%	100%	100%	74%	58%	

TABLE 2-8: PROJECTED MONTHLY RECLAIMED WATER USAGE WITH NEW USERS AND 0.5 MGD WPF FACILITY (ALL FIGURES IN AF)

A summary of estimated capital and O&M costs to implement a Fallbrook Creek IPR Project based on details in Appendix A are summarized below:

Capital Cost: $7.5 million

O&M Cost for Potable Water Produced: $820 per AF

Capitalized Unit Cost (30 years, 3%): $1111/AF

Estimated SDCWA Water Cost: $1800/AF

Annual Avoided Water Cost (360 AFY at $820/AF versus $1800/AF): $350,000

Present Worth Lifecycle Costs (30 years, 3%): -$2.8 million

Total Unit Cost = Capital + O&M = $1111 + $820 = $1931/AF

Regulatory Issues:

While this project would provide recharge to the groundwater basin, the proposed discharge configuration would make it a live stream discharge project, which are widely used across California. The project would require a NPDES permit from the RWQCB as well as approval from the Department of Drinking Water (DDW). The project would likely be required to meet the following basin plan objectives by the RWQCB for nutrients and TDS for the Santa Margarita Watershed: 1 mg/l as N for total Nitrogen, 0.1 mg/l as P for Phosphorous and 750 mg/l for TDS. An exception would be if studies demonstrate that beneficial uses can be protected at higher nutrient and TDS levels. It may be subject to groundwater replenishment regulations by the DDW, although it could be argued that it is not a groundwater recharge application and less expensive capital facilities could potentially be utilized. Currently the cost assumptions are based on meeting the basin plan objectives and not providing Full Advanced Treatment (FAT). Studies are currently underway to further evaluate nutrient limits in the Santa Margarita Watershed, which may affect discharge limits for the facility. Given the volume of the aquifer and the recharge location, it is likely that the DDW retention requirements could be met if they were required by DDW, but more detailed studies are necessary based on the nearest well sites.

Direct Potable Recharge Project

In lieu of discharging advanced treated water into Fallbrook Creek, the water could be discharged directly into the distribution system as a direct potable recharge project. This project would require Full Advanced Treatment (FAT) purified water and these projects have not yet been permitted or constructed in California. This Project would require constructing a 0.5 MGD FAT Facility. Some water would be lost as brine and waste washwater through the MF and RO processes. Initial assumed overall recovery value of 80% is used for this study based on 95% recovery of MF and 85% recovery through RO, so 800 AFY of new water supply and 200 AFY of waste brine would be produced from 1000 AFY Title 22 supply. It is estimated that the FAT water purification facility at the WRP would require additional capital costs for monitoring and fail safe controls.

Criteria	Units
Design Capacity	0.5 MGD
Process Components	Microfiltration/Reverse Osmosis/UV Advance Oxidation
Estimated Footprint(1)	4000-5000 sf
FAT Facility Water Source(2)	Title 22 Filtered Water from Fallbrook WRP
Discharge Location	Distribution System
Overall Estimate Percent Recovery(3)	80%
Net Additional Water Supply Produced	350 AFY

(1) Based on footprint of City of San Diego 1 MGD demonstration Facility; may require initiation of nitrification/denitrification at WRP.

(2) Based on 95% recovery from MF and 85% recovery through RO

TABLE 2-9: DIRECT POTABLE RECHARGE ANALYSIS

A summary of estimated capital and O&M costs to implement an ASR PR Project without the rebate based on details in Appendix A is below:

Capital Cost: $13 million

O&M Cost for Potable Water Produced: $820 per AF

Capitalized Unit Cost (30 years, 3%): $2000 per AF

Estimated SDCWA Water Cost: $1800/AF

Annual Avoided Water Cost (350 AFY at $980/AF): $343,000

Present Worth Lifecycle Costs (30 years, 3%): -$13 million

Total Unit Production Cost: Capital + O&M = $2820/AF

<u>Regulatory Issues:</u>

Since the discharge of this project is to a drinking water reservoir it is not subject to RWQCB approval or permitting. The project would require extensive DDW permitting and is unlikely to be permitted at this time. Key issues would be the lack of an environmental buffer and the lack of full conventional treatment before discharge. There are no similar facilities currently operating in California. There is a small (0.1 MGD) facility potable recharge facility operating in New Mexico and one in Texas, but both are discharged to a WTP that includes filtration. Additional Facilities would need to be built and permitted in California before it would be feasible for the District to pursue permitting the project.

2.3.3 Other Potential Reclaimed Expansion through Coordination with other Agencies

FPUD is exploring opportunities to expand Reclaimed water usage with Camp Pendleton and Rainbow MWD. Camp Pendleton currently has available Reclaimed water with limited users and Rainbow does not have any Reclaimed production or usage. FPUD is exploring the following opportunities with these agencies:

Camp Pendleton - Support potential IPR projects on base to increase available water supplies in the basin.

Rainbow MWD - Explore option to more fully utilize existing WRP capacity and increase Reclaimed water supplies by diverting Wastewater from RMWD to the Fallbrook WRP.

2.4 Recommendations

Based on the economic evaluation, expansion of Reclaimed water users represents an additional revenue source for the District. Over the long term, the value of the Reclaimed water will further incentivize Reclaimed water to be used as a resource for the District. A summary of the options to expand Reclaimed water use is in Table 2-10:

Option	Capital Cost ($M)	Total Water Cost ($/AF)	Additional Water Produced (AF)
(1) South Nursery Extension	$1.16	$641	92
(1) East/South Nursery Extension	$0.28	$155	90
(2) Fallbrook Creek Discharge Project	$7.5	$1931	433
(3) Direct Potable Reuse Project	$13	$2820	433

TABLE 2-10: RECOMMENDED PROJECTS FOR INCREASING RECLAIM WATER UTILIZATION

The District should pursue the following steps for the Reclaimed water system:

1. Pursue planning and design for proposed pipeline expansions. Work with identified users to begin planning for these extensions. If development occurs along the proposed Reclaimed pipeline alignments, require developers to install the pipeline sections and install connections for future Reclaimed use.
2. Pursue grant funding opportunities for the Reclaimed waterline extension.
3. Pursue grant funding opportunities for a pilot and feasibility study of the best practices and lowest cost methods to conduct Potable Recharge / Live Stream discharge Project.

Chapter 2 – Appendix A – Reclaimed Alternatives Cost Assumptions

Option 1 - Developing Additional Reclaimed Water Demands in FPUD Service Area

Reclaimed Revenue from 2017-18 Budget

Water Sales:	$1,153,170
Service Charges	$17,956
Other Charges	$156,060
Total	$1,327,186

FY 17-18 Sales: 700 AF

Gross Revenue per AF = $1,327,186/700 AF = $1896/AF

O&M Costs for additional supply: Since Tertiary Water is already produced, marginal O&M increase is only pumping of this water. Power is $60/AF, O&M and other costs estimated at $60/AF. Total estimated at $120/AF.

Capital Construction Costs:

Capital Costs for pipeline extensions Based on $200/lf. Values derived from FPUD costs for recent Reclaimed pipeline installation.

Option 2 - Development of an Indirect Potable Recharge (IPR) Project.

Capital Construction Costs:

Additional Mixed Liquor Recirculation Facilities: $0.5 Million

Methanol and Alum Storage: $0.5 Million

Conversion of Filters: $0.5 million

0.5 MGD MF facility (Based on $2.5 Mil/MGD): $1.25 Million

0.08 MGD RO Facility: (Based on $3 Mil/MGD): $0.25 Million (Rounded Up)

Site Work/Piping $2.0 Million

Mark-up for engineering (15%), Construction Management (10%) and Contingency (25%): $2.5 million.

Total Capital Cost: $7.5 million

Construction of Facilities to Divert, Store and Distribute Groundwater back to FPUD: $0 (already included in Santa Margarita CUP).

Construction of Facilities to treat and distribute water to Red Mountain Reservoir: $0 (already included in Santa Margarita CUP).

Capitalized Unit Cost (A/P, 3%, 30 years) = 0.051 x $7.5 million = $0.4 M per year / 360 AFY = $1111 / AF

<u>O&M Costs</u>

Costs of additional WW Treatment: $120/AF ($120/AF Based on $3/gal for methanol, $300/ton alum, membrane replacement at $10,000/yr and $10,000 power with net production 433 AFY): $120/AF

For Demineralization Facilities Add $100/AF

Recharge Facilities on Camp Pendleton: $90/AF (Based on Values Developed by Stetson Engineers for SMRCUP)

Groundwater Production: $280/AF (Based on Values Developed by Stetson Engineers for SMRCUP)

Conveyance to FPUD: $230/AF (Based on Values Developed by Stetson Engineers for SMRCUP)

Total O&M Production: $820/AF

SDCWA Water Cost (Projected 2018): $1800/AF

Total Unit Cost = Capital + O&M = $1111 + $820 = $1931/AF

Option 3 - Development of a Direct Potable Recharge (DPR) Project

Capital Costs Based on City of San Diego Demonstration 1 MGD facility: $11.8 million/MG (Quicho et al., Sustaining San Diego, Water Environment and Technology, May 2012). Use 60% of costs or $7 million.

Mark-up for engineering (15%), Construction Management (10%) and Contingency (25%): $3.5 million.

Additional monitoring and controls: $1 million

<u>WRP Upgrades</u>

Additional Mixed Liquor Recirculation Facilities: $0.5 Million

Methanol and Alum Storage: $0.5 Million

Conversion of Filters: $0.5 million

Total Capital: $13 million

Capitalized Unit Cost (A/P, 3%, 30 years) = 0.051 x $13 = $0.7 M per year / 350 AFY = $2000 / AF

O&M Costs

MF/RO/UV AOP Treatment: $600/AF

Additional WW Treatment, DBP treatment and Monitoring: $200/AF

Total O&M Production: $800

SDCWA Water Cost (Projected 2018): $1800

Annual Avoided Cost (SDCWA Water Cost – Total O&M Cost): $1000/AF

Total Unit Cost – Capital + O&M = $2,000/AF + $800/AF = $2800/AF

Chapter 3 – Water Treatment and Distribution

3.0 Background

Fallbrook is located in an unincorporated area in the northernmost part of San Diego County east of Interstate 5 and between the Santa Margarita and San Luis Rey Rivers. The District is bounded on the east and south by the Rainbow Municipal Water District, on the west by Camp Pendleton Marine Base and the Fallbrook Naval Weapons Station, and on the north by the San Diego/Riverside County Line. North of the County line, the Rancho California Water District and Western Municipal Water Districts share boundaries with FPUD (See Figure 3-1 and 3-2). The District currently serves approximately 37,000 people in an area of 28,000 acres.

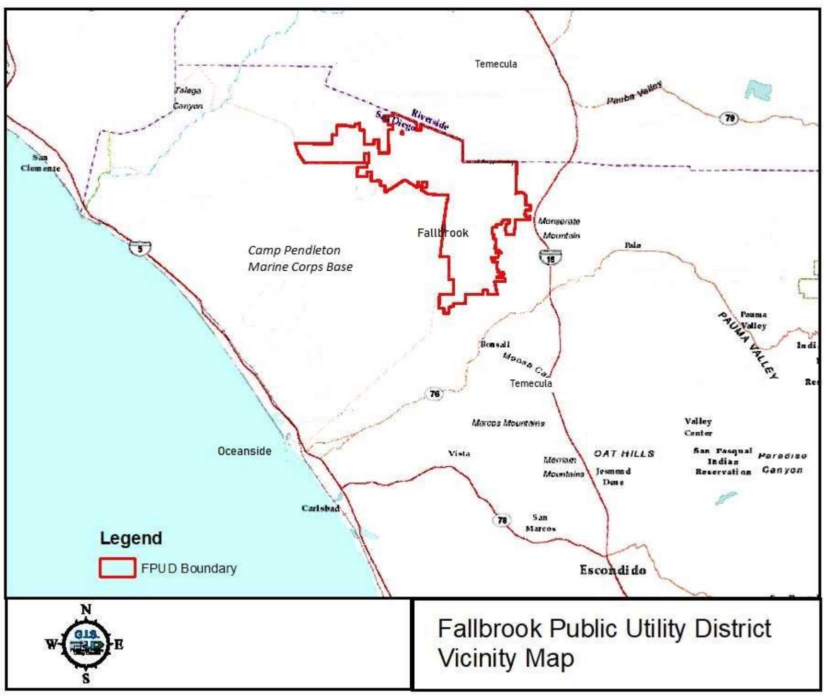

FIGURE 3-1: FPUD SERVICE AREA

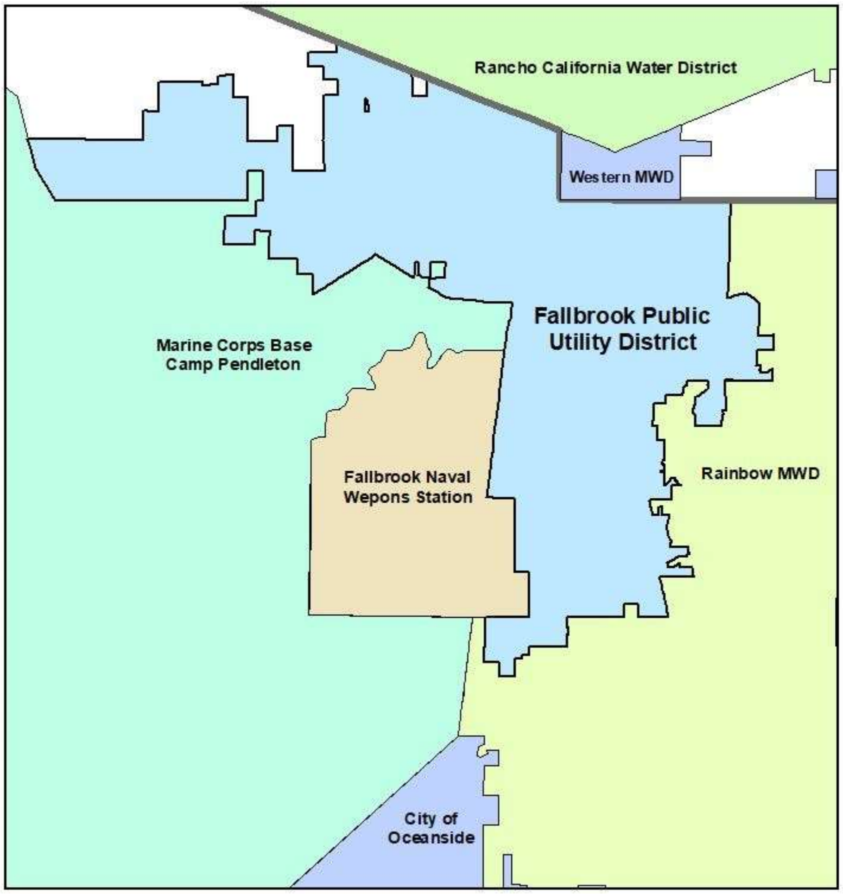

FIGURE 3-2: FALLBROOK PUBLIC UTILITY DISTRICT SERVICE AREA AND ADJACENT DISTRICTS

3.1 Distribution System

The District's water distribution system is comprised of the following:

- 270 miles of pipelines
- 6,800 valves,
- 8 steel reservoirs,
- 5 pump stations
- Ultraviolet disinfection water treatment plant
- 1,300-acre foot open treated water reservoir.

The District service area is divided into two major service areas: the Fallbrook Service Area and the De Luz Service Area. The Fallbrook Service area is roughly the areas to the South of the Santa Margarita River and the De Luz area is North of the river. The Fallbrook service area has a higher population density and less variation in topography. The De Luz area has a much lower population density and wide variations in topography over short distances. Both areas are supplied through the San Diego County Water Authority (SDCWA). SDCWA purchases water from the Metropolitan Water District of Southern California (MWD) and owns and operates the aqueducts in San Diego County. MWD does however own the aqueduct for approximately 10 miles into San Diego County and 3 of the 4 District connections are actually on MWD's pipeline. This water is still purchased through SDCWA. A summary of the connections to the aqueducts in is Table 3-1.

Fallbrook Service Area

Water is supplied to the Fallbrook Service Area via three (3) aqueduct connections, Designated Fallbrook 6 (FB-6), Fallbrook 3 (FB-3) and Fallbrook 4 (FB-4) by SDCWA. The FB-6 connection provides water to the Sachse Pressure Zone off the second aqueduct, the FB-3 connection provides water to the Red Mountain Pressure Zone off the first aqueduct and the FB-4 connection provides water to the Gheen Pressure Zone. The District has determined that FB-4 is not necessary to meet District demands and it is no longer being used. The general topography of the Fallbrook Service Area has higher elevations in the northeast sloping downward to the west and south. The aqueduct connections provide adequate pressure to service the Red Mountain and Sachse Zones and the vast majority of customers in the Fallbrook service areas are served by gravity. (See Figures 3-3 and 3-4). Water is pumped from Sachse Zone to serve a small number of residences in the Toyon Zone. The pressure is reduced as water moves from the Red Mountain Zone to feed lower pressure zones. The two main pressure reducing stations are the Kaufman and Gum Tree pressure reducing stations that reduce Red Mountain pressure to serve the Gheen Zone. The pressure is further reduced as water is fed from the Rattlesnake and Yarnell pressure stations reduce Gheen pressure to serve the Rattlesnake Zone.

De Luz Service Area

Water is supplied to the De Luz Service Area via one (1) aqueduct connection labeled De Luz 1 (DLZ-1) by SDCWA. Water from the DLZ-1 connection flows west via the De Luz East transmission main to the intersection of Rock Mountain and Mira Monte Roads where the pipe splits into the North De Luz Transmission Main and the West De Luz Transmission Main. The North Transmission Main provides De Luz Aqueduct Pressure to the northern part of the De Luz Service Area. There are no meter services on this main east of the intersection of Daily Road and Lynda Lane. Water is pumped from the North Transmission Main at the Daily Pump Station to the De Luz High Pressure Zone and the 1 Million Gallon Tank. The Bucknell pressure station reduces De Luz Aqueduct Pressure to serve the De Luz Low Pressure Zone.

The West Transmission Main provides De Luz Aqueduct Pressure to the southern part of the De Luz Service Area and fills the 8 Million Gallon Tank. Water is pumped from the West Transmission Main at the Harris and Donnil Pump Stations to the De Luz High Pressure Zone and the 2.8 Million Gallon Tank.

The Joan Lane Pump Station is a very small booster pump station that pumps water from the De Luz High Pressure Zone to serve 8 meters in the area of the pump station that are at an elevation above what can be served by De Luz High Pressure.

Name	Min cfs Order	Max cfs Order	Actual Capacity	Aqueduct Ownership	Aqueduct
De Luz 1 (DLZ-1)	2	20	13	MWD	Second (Pipeline 4)
Fallbrook 3 (FB-3)	3	30	20	MWD	First (Pipeline 1)
Fallbrook 6 (FB-6)	3	30	18	MWD	Second (Pipeline 4)
Fallbrook 4 (FB-4)	2.4	22	9	SDCWA	Second (Pipeline 4)

TABLE 3-1: SUMMARY OF AQUEDUCT CONNECTIONS

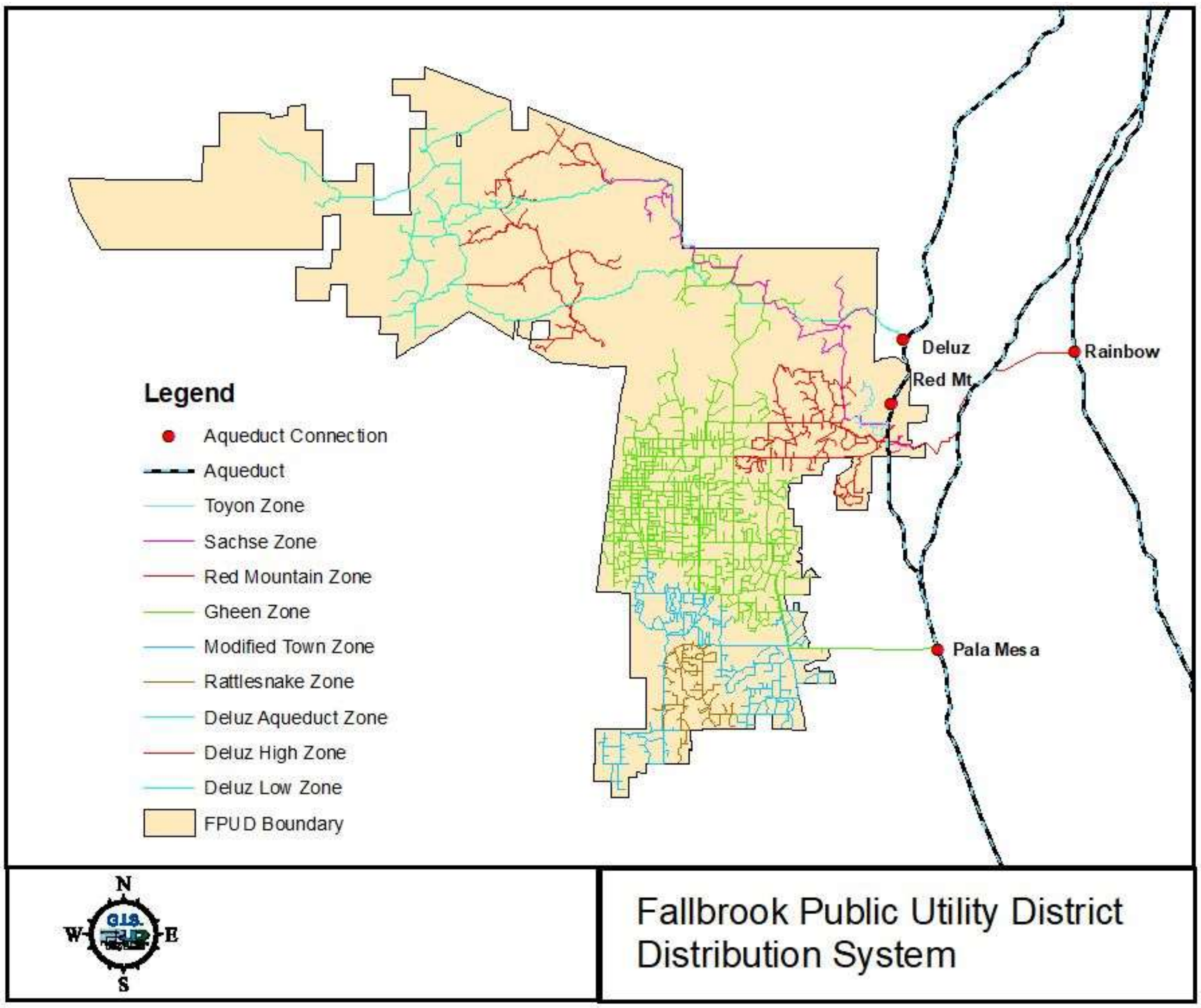

FIGURE 3-3: MAP OF PRESSURE ZONES

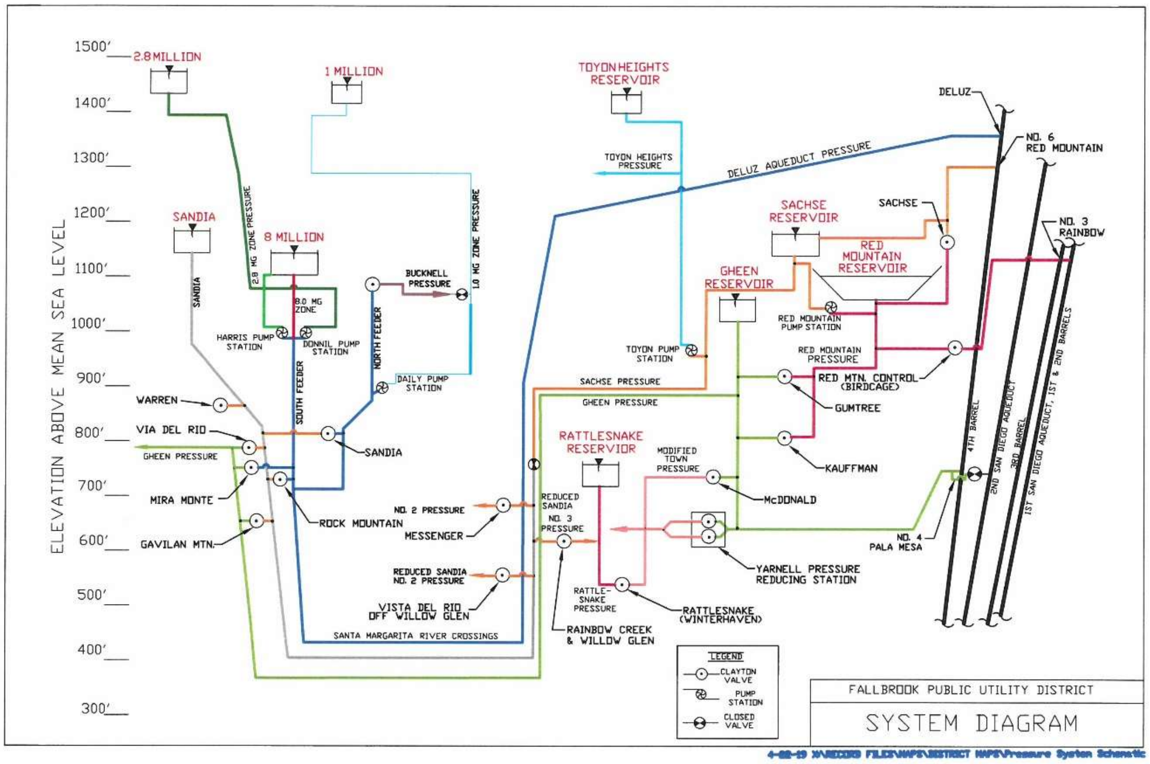

FIGURE 3-4: SCHEMATIC OF PRESSURE ZONES

3.1.1 Water Pipelines

The District's water mains are predominantly cement mortar lined and coated steel pipe (CML&C). Steel pipe was chosen because of its durability and ability to fabricate bends in the field. The distribution system has 226 miles of CML&C pipe out of a total of 270 miles of pipe. The District has approximately 20 miles of C.L.I.P. (Concrete Line in Place) water main. This pipe is tar-wrapped bare steel pipe installed prior to 1960 that was lined with a concrete coating in place during the early 1960's. Some of these pipelines were also dug up from March Air Force Base after it was closed and reinstalled in Fallbrook. The exact age of many of these lines is unknown. The District has approximately 14 miles of asbestos cement transite pipe in the De Luz service area, some smaller sections of PVC pipe and steel pipe with unknown linings and coatings (See Table 3-2). The District was formed in 1920 and some pipe from the early days of the District is still in use. Prior to 1950, there was inadequate tracking of pipe installations so the actual age of these pipelines is unknown. The majority of the District was built prior to the 1980 and the weighted average of the pipelines in the District is approximately 40 years.

PIPELINE MATERIAL	SIZE IN INCHES	LENGTH IN MILES
A-C	6	0.77
A-C	8	11.29
A-C	12	1.42
C.L.I.P.	4	0.11
C.L.I.P.	6	2.36
C.L.I.P.	8	3.02
C.L.I.P.	10	0.62
C.L.I.P.	12	9.20
C.L.I.P.	14	0.13
C.L.I.P.	16	0.82
C.L.I.P.	20	1.66
C.L.I.P.	24	0.12
C.L.I.P.	30	2.59
C.M.L.&C.	3	0.03
C.M.L.&C.	4	3.44
C.M.L.&C.	6	106.97
C.M.L.&C.	8	44.10
C.M.L.&C.	10	11.92
C.M.L.&C.	12	26.27
C.M.L.&C.	14	4.52
C.M.L.&C.	16	9.30
C.M.L.&C.	18	0.53
C.M.L.&C.	20	6.03
C.M.L.&C.	21	4.64
C.M.L.&C.	24	8.91
C.M.L.&C.	30	0.12
C.M.L.&C.	36	0.10
C.M.L.&C.	84	0.05
COPPER	2	0.07
D.I.P.	4	0.13
D.I.P.	6	0.03
P.V.C.	2	2.96
P.V.C.	3	0.39
P.V.C.	4	3.13
P.V.C.	6	0.13
P.V.C.	8	0.29
STEEL	2	0.02
STEEL	4	0.20
STEEL	6	0.21
STEEL	8	0.20
STEEL	12	0.47
TOTAL		270

TABLE 3-2: SUMMARY OF MATERIALS AND SIZE

Age of Pipe

PIPE INSTALL DECADE	NUMBER OF MILES
1950-1959	12.48
1960-1969	66.85
1970-1979	64.59
1980-1989	45.21
1990-1999	22.88
2000-2009	18.70
2010-2019	6.40
UNKNOWN*	32.16
TOTAL	270

*Unknown pipe sections are likely pre-1950.

TABLE 3-3: SUMMARY OF OVERALL PIPE AGE

3.1.2 Capital Improvement Pipeline Projects

The District has developed a long-term repair and replacement plan that drives the overall CIP for distribution projects. The District is anticipating limited development and has sufficient existing capacity to serve projected future demands. Since 2007, the District has replaced 22,620 feet of Pipeline. The priority for these pipeline replacements is based on:

1. Probability of Failure: based on the age of pipe, number of leaks on the pipe, slope and soil that houses pipe.
2. Consequence of Failure: Size of Pipe, number of Services on Pipe, nearness to critical facility (Streams, Main Streets, Schools, or Hospitals).

The capital improvement program is developed to achieve the lowest lifecycle cost to meet water supply and distribution needs and maintain system reliability for the District's customers. Projects are selected based on weighing prioritized needs versus available capital funds. The planned pipeline projects over the next five years are shown in Table 3-4. The District's target is to get to a 100-year replacement cycle for all pipelines. The projected annual replacement requirements are shown in Figure 3-3.

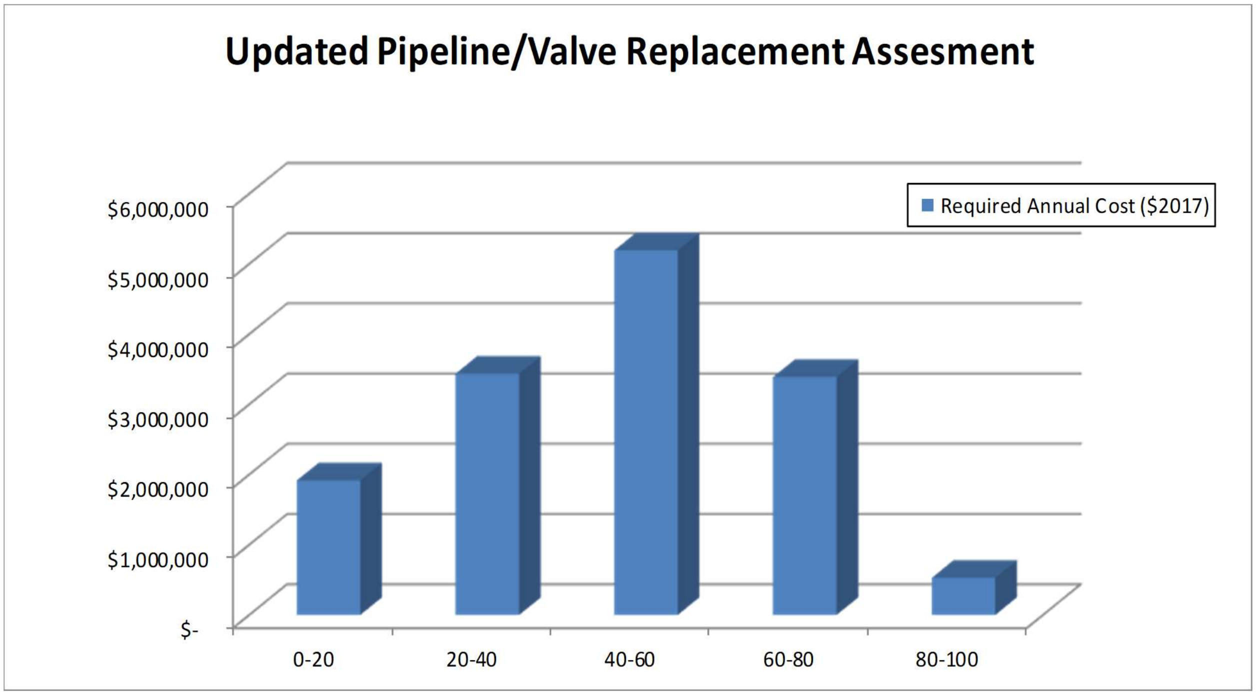

FIGURE 3-5: ANNUAL PIPELINE REPLACEMENT NEEDS

Planned Pipeline Projects Over The Next Five Years			
Location of Pipeline Project	Scheduled	Lf. of Pipe	Estimated Cost
Winterhaven, Yarnell to Rattlesnake PRV			
Phase 1- Winterhaven, Clearcrest to Havencrest 12"	2019-20	1820	$662,480
Phase 2- Lorenzo Drive 6"	2019-20	680	$176,800
Phase 3- Winterhaven, Havencrest to Sunnycrest 12"	2020-21	2650	$927,500
Phase 4- Winterhaven, Sunnycrest to Winterwarm 12"	2020-21	2930	$1,025,500
Alvarado Brandon to Brandenburg 12"	2021-22	1600	$640,000
Via Arroyo Via Rancheros to Adler Creek 12"	2021-22	1800	$720,000
Gum Tree Gum Tree Ln to Ridge 20"			
Phase 1- Gum Tree Creek Crossing Realignment 20"	2019-20	375	$370,500
Phase 2- Gum Tree Ln to Creek Crossing 20"	2021-22	1760	$1,408,000
Phase 3- 8.3 Creek Crossing to Live Oak 20"	2022-23	2085	$1,459,500
Hawthorne at Main and Ivy to Hawthorne Alley	2020-21	800	$280,000
O'Hearn S. of Almond 8"	2020-21	1000	$375,000
Hillside Drive Sunset to Portofino 12"	2023-25	5200	$2,080,000
Hughes Lane to Clearcrest 12"	2023-24	1000	$400,000
Pheasant Run 6" Replacement	2022-23	4500	$1,575,000

TABLE 3-4: PLANNED PIPELINE PROJECTS OVER THE NEXT FIVE YEARS

3.2 Water Storage

The District has eight (8) steel reservoirs and one (1) large uncovered treated water reservoir (Red Mountain Reservoir). Seven of the eight reservoirs are welded steel with one small bolted reservoir. The uncovered reservoir has an asphalt liner.

3.2.1 Red Mountain Reservoir

The District's Red Mountain Reservoir is an open treated water reservoir with a capacity of 1,300acre feet. The reservoir was formed by construction of Red Mountain Dam in 1985. The reservoir was created to provide emergency storage in the event of a failure of the imported water supply. Treated surface water purchased from the San Diego County Water Authority and ground water from the District's Capra Well are stored in the reservoir and treated at the Red Mountain Ultraviolet Treatment Facility before entering the Red Mountain Pressure Zone of distribution system.

The Red Mountain Reservoir has a maximum operating elevation of 1,142 feet and a bottom elevation of 1,050 feet. Based on operational experience, a minimum operating elevation of approximately 1,100 feet is required to provide proper pressure to the downstream pressure zones during summer peak demands.

In the future, the reservoir will also be used to store flows from the Santa Margarita Conjunctive Use Project. Excess supply from the project will be pumped in to the reservoir during periods when water production from the project is greater than the distribution system demands. There was recently a project to help seal cracks and replace sections of the Reservoir's asphalt liner. Eventually a project will be necessary in the next 10-20 years to replace the asphalt liner.

FIGURE 3-6: SACHSE TANK AND RED MOUNTAIN RESERVOIR

3.2.1 Steel Reservoirs

The District has eight (8) steel reservoirs that are located throughout the District. The District initiated a recoating program in 2012 and seven of the eight have recently been re-coated, with the last one scheduled for 2020. The reservoirs are scheduled for a 15-year cycle and the recoating will begin again in 2028. The District's goal is to extend the life of these reservoirs essentially indefinitely by maintaining the protective coatings.

There is one additional 6MG reservoir planned at the Gheen site as part of the Santa Margarita Conjunctive Use Project (SMRCUP) as well as some smaller process reservoirs as part of the plant facilities.

Name	Capacity MG	Height ft.	Diameter ft.	Floor Elevation	Year Built	Last Painted & Relined
Sachse	10.0	40	208	1150	1979	2013
8.0 MG	8.0	40	185	1102	1980	2018
Gheen	6.0	40	160	1000	1972	2012
Rattlesnake	3.6	44	114	711	1950	2015
Sandia	3.2	40	124	1151	1987	2019
Toyon	0.4	24	54	1408	1981	2016
1.0 MG	1.0	22	90	1420	1974	2017
2.8 MG	2.8	40	110	1441	1987	Scheduled for 2020

TABLE 3-5: SUMMARY OF DISTRICT STEEL RESERVOIRS

3.3 Pump Stations

The District has five (5) pump stations, with four of the five serving higher elevations in the De Luz area. All the Pump Stations except for Toyon Pump Station have undergone recent improvements. After improvements to Toyon Pump Station are completed, there are no anticipated major pump station rehabilitation capital improvements scheduled at this time.

Toyon Pump Station is the smallest of the District's pump stations and services 63 accounts in the Toyon Service Area above Red Mountain Reservoir. The pump station, built in 1982,is in poor condition and at the end of its useful life. The current pump station is housed in a wood building that is also in poor condition. In order to ensure reliability of water service to the area, replacement of the pump station is needed prior to a major mechanical failure. The District plans to completely replace the Toyon Pump Station in FY 2020-21. The new pump station will be located next to the Red Mountain UV Treatment Facility.

The current Harris Pump Station was constructed in 1995 to meet the demand of the prior Harris Pump Station and the Conquistador Pump Station. The Conquistador Pump Station was destroyed in the flood of 1993. The pump station has four (4) 600 gpm pumps. The electrical gear including the motor control center was replaced in 2018 and the controls were replaced with variable speed motor controls. Harris Pump Station is one of the primary facilities for maintaining supplies in the De Luz high elevation zones.

The Donnil Pump Station provides significant capacity to move water to the higher elevation zones in De Luz. In 2008, the capacity of the pump station was expanded and additional improvements were made. Recently an emergency generator was added to ensure water reliability in the high elevation zones during power outages and emergencies.

The Daily Pump Station was completely re-constructed in 2016. All mechanical, electrical and instrumentation components were replaced. This is also a key pump station to provide flows to the De Luz high elevation zones.

Joan Lane Pump Station was constructed 2015 to replace a 320,000 gallon bolted tank that served a few meters, in an isolated area, at highest point of the De Luz High Pressure Zone. The pump station is skid mounted and pre-packaged with 3 centrifugal pumps, with a total capacity of 100 gpm and 180 feet of head. The pump station currently serves 8 meters.

An additional pump station is planned as part of the SMRCUP project. This pump station will supply water from the Gheen Zone to the Red Mountain Zone when the SMRCUP supply exceeds demand in the lower pressure zones.

Name	Number of Pumps	GPM 1	GPM 2	GPM 3	GPM 4	Pumped from Pressure Zone	Pumped to Pressure Zone
Toyon	2	310	225			Sachse	Toyon
Harris	4	600	600	600	600	De Luz Aqueduct	De Luz High
Donnil	3	400	400	400		De Luz Aqueduct	De Luz High
Daily	2	500	500	500		De Luz Aqueduct	De Luz High
Joan Lane	3	100	100	100		De Luz High	Joan Lane

TABLE 3-6: SUMMARY OF PUMP STATIONS

3.4 Treatment Facilities

The District currently has an Ultraviolet (UV) Disinfection facility that treats water coming out of Red Mountain Reservoir. Since the reservoir is uncovered, the treatment facility is required to meet EPA requirements. The District is also constructing a groundwater treatment plant as part of the SMRCUP project. The groundwater treatment plant will treat groundwater delivered from Camp Pendleton for distribution to District customers.

3.4.1 Red Mountain UV Treatment Plant

The Red Mountain UV treatment plant uses a combination of UV and chlorine disinfection to meet EPA microbial removal requirements. The EPA requires separate removal requirements for Giardia, Cryptosporidium and viruses. Figure 3-8 below shows a schematic of the treatment process for Red Mountain UV Plant. Water from Red Mountain Reservoir first flows through the UV reactors to achieve 3-log *Giardia* and 2-log *Cryptosporidium* inactivation, and then the water is chlorinated to achieve 4-log virus inactivation. The chlorine contactor is followed by ammonia addition to form chloramines in order to match imported water disinfection residual. The treated water then enters the Red Mountain Pressure Zone of distribution system.

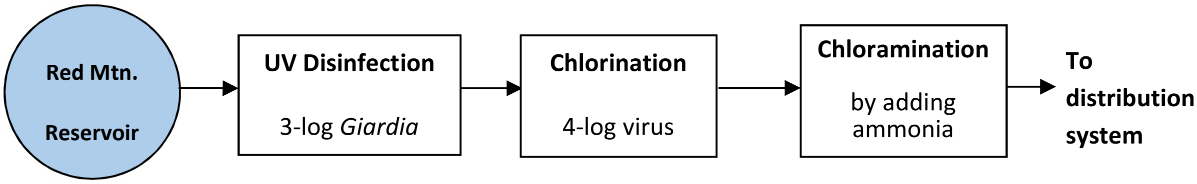

FIGURE 3-7: OVERALL PROCESS SCHEMATIC OF RED MOUNTAIN UV DISINFECTION FACILITY

The UV facility is designed to accommodate a SDCWA aqueduct shutdown at past projected peak demand where the only source of water would be from the Red Mountain Reservoir with a maximum flow of 49.7 MGD. Typically, the UV facility operates at the average day flow that is approximately 6.1 MGD. The disinfection facility design basis flow is shown in table 3-7.

Flow Condition	Normal Operation	Failure / Aqueduct Shutdown
Peak Flow (SDCWA Aqueduct Shutdown)	28.5 cfs (18.4 MGD)[1]	77 cfs (49.7 MGD)
Max. Day	17.8 cfs (11.5 MGD)	48 cfs (31.0 MGD)[2]
Ave. Day	9.5 cfs (6.1 MGD)	N/A

[1] Rounded to 18.5 MGD for design point
[2] Rounded to 50 cfs (32 MGD) for design point

TABLE 3-7: UV FACILITY DESIGN FLOW RATE SUMMARY (DESIGN POINTS IN SHADED CELLS)

3.4.2 Santa Margarita Groundwater Treatment Plant

The Santa Margarita Conjunctive Use Project will improve the water supply reliability for both the Fallbrook Public Utility District (FPUD) and the Camp Pendleton Marine Corps Base by integrating a local water supply and groundwater basin with imported water supplies. The project will also provide the "physical solution" to settle unresolved water rights litigation from the 1950's between the United States Government and the District over water rights on the Santa Margarita River as more fully described in Chapter 1.

The water will be delivered to the District's property south of the water reclamation plant, where a new treatment facility will reduce iron and manganese. A portion of the water will undergo reverse osmosis treatment to develop a final blended water quality that can be used for both potable consumption and agricultural use.

Following treatment, the water will be conveyed to consumers through the existing distribution system, after modifications to upsize pipelines near the treatment facility. The water will serve the

Gheen, Modified Town and Rattlesnake Pressure Zones as long as demand is adequate to use all of the supply. When the supply is greater than demand, the water can be stored in a new steel reservoir constructed next to the Gheen Reservoir or be pumped into Red Mountain Reservoir by a new pump station also to be located near the Gheen Reservoir (See Figure 3-6).

Based on the delivery schedule and past hydrology, it is expected that the project will deliver an average of 3,100 AFY, with the majority of water made available in wetter years.

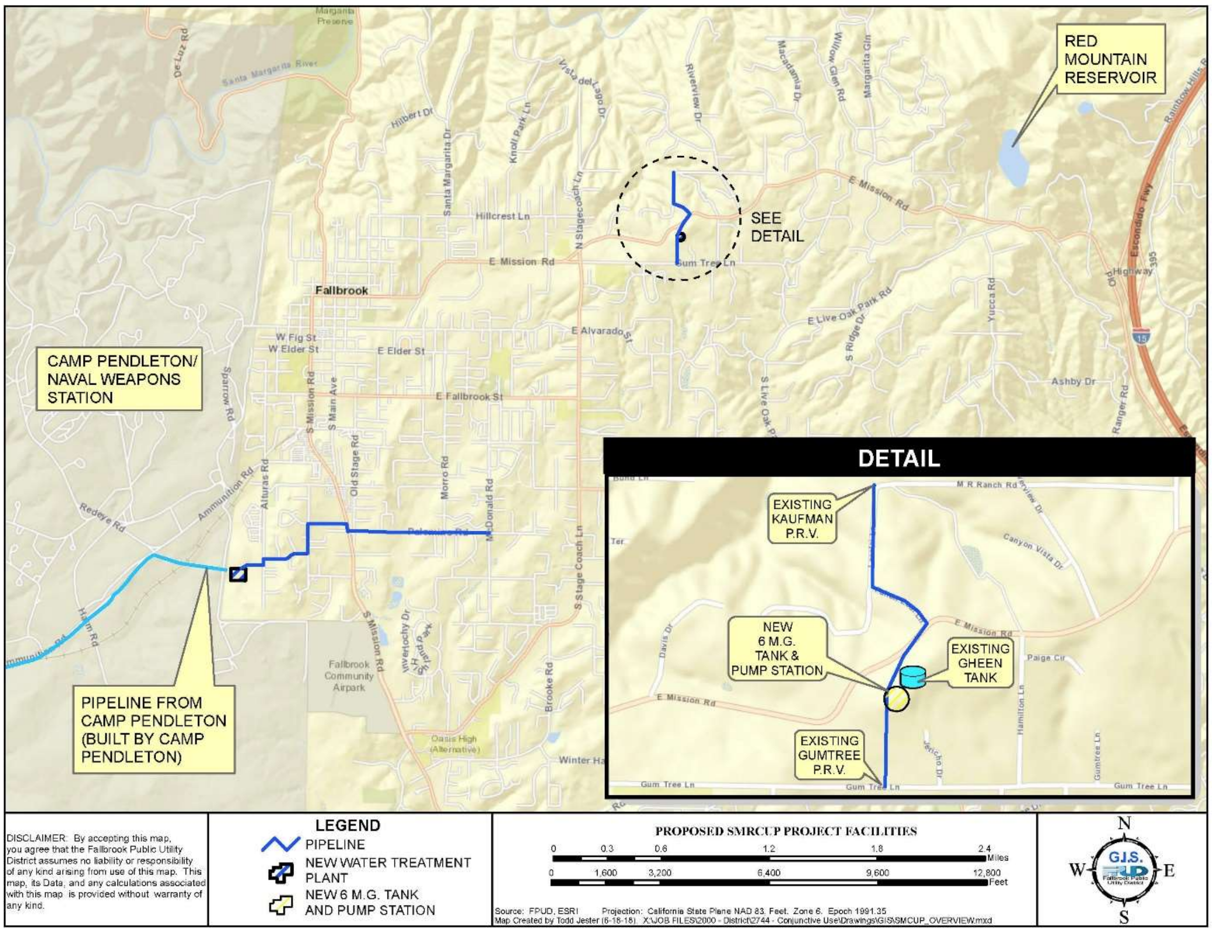

FIGURE 3-8: SMRCUP FACILITIES

Fallbrook Public Utility District

3.5 Interconnections with Other Agencies

Rainbow MWD Interconnections

The District has a number of adjacent boundaries with Rainbow MWD and there are a number of interconnections. The Districts recently developed a Memorandum of Understanding (MOU) to work together to improve these interconnections so the Districts can support each other's water needs during shutdowns or emergencies (See Table 3-6 and Figure 3-6).

Fallbrook Naval Weapons Station

Fallbrook Naval Weapons Station is a Detachment of Naval Weapons Station – Seal Beach and is located between Fallbrook and the Camp Pendleton Marine Corps Base. The Naval Weapons Station purchases water from the San Diego County Water Authority but does not have a connection to a SDCWA aqueduct. Water is delivered through the FPUD distribution system via a 4-inch water meter located near 752 West Elder Street. The District also has an emergency interconnect with NWS. SDCWA bills the Naval Weapons Station, FPUD is credited for the cost of then water and the Naval Weapons Station pays FPUD a wheeling fee.

Marine Corps Base Camp Pendleton

As part of the SMRCUP Project, the District will ultimately have a 24" connection to Camp Pendleton (CPEN). This connection will typically be used for deliveries from CPEN to the District, but in an emergency, it is also designed so the District can supply water to CPEN. CPEN would also purchase water directly from SDCWA and wheeling it through the District similar to NWS.

Emergency Interconnections

ID	Agency	SIZE	Valve Book Page	Pressure Zone	Supply Pipeline	HGL	Elevation	Pressure	Others HGL
1	RMWD	8	F 69.1	Red Mt	24	1140	1080	25	1282
2	RMWD	6	F 67	Red Mt	24	1140	975	70	1282
3	RMWD	6	F 254.1	Modified Town	6	890	600	125	897
4	RMWD	6	F 98	Red Mt	20	1140	925	90	897
5	RMWD	4	F 234	Gheen	20	1037	640	170	897
6	NWS	4	F 137.1	Gheen	10	1037	797	104	

TABLE 3-8: EMERGENCY INTERCONNECTIONS

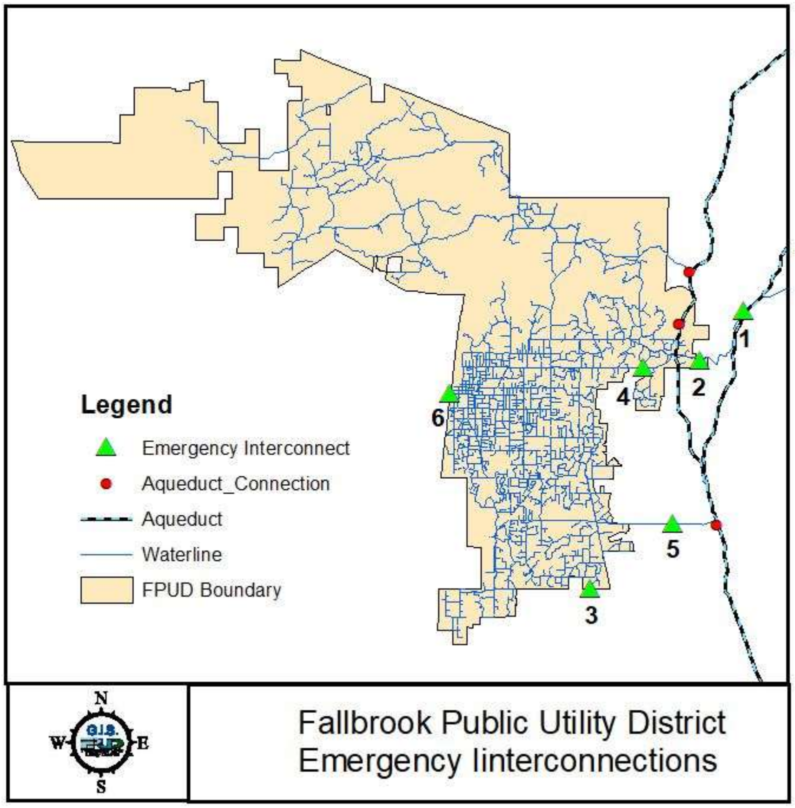

FIGURE 3-9: LOCATION OF EMERGENCY INTERCONNECTIONS

3.6 Planned Future Development and Buildout

Most of the future development in Fallbrook will be infill development. Existing utilities and infrastructure are nearby, making it economically feasible. Many of these projects occur on existing developed land or land being used for agriculture, with anticipation of minor long-term increase in water supply-demand. A summary of proposed projects that have developed and submitted tentative maps are listed below. If all projects were completed, it would result in an additional 392 housing units.

Current Land Development Projects

Map	Project Name	Parcels
TM 4713	Peppertree Unit 7	25
TM 4713	Peppertree Unit 8	45
TM 4713	Peppertree Unit 9 & 10	117
TM 5243	Beaver Creek	8
TM 5268	The Arbors	15
TM 5293	Bar Ranch	24
TM 5339	Dougherty Grove	28
TM 5350	Calavo	6
TM 5364	Grey Rabbit Hollow	10
TM 5510	Pacific Estates	22
TM 5553	McCormic- Sunnycrest	22
TM 5562	Constant Creek	10
TM 5577	Berk- Sunnycrest	21
TPM 20668	Mission Creek	3
TPM 20829	Palomino	5
TPM 20901	Rosemere	5
TPM 20924	Joseph	4
TPM 20972	Green Canyon	4
TPM 21193	Chandler Ranch	4
TPM 21213	Green Acres	4
TPM 21245	Alvarado- Zebu	5
TPM 21251	Rancho Ryan	5
Total Units		392

TABLE 3-9: POTENTIAL FUTURE DEVELOPMENTS

3.7 Annexation Districts and Special Assessment Districts

The District grew over time as areas annexed into the parent District. Each annexation area came with its own special requirements and assessments. Some areas deferred the original annexation fee, and that fee is set as an additional assessment when the parcel in that area requests water service. There are assessment areas in both the Fallbrook and De Luz areas.

Fallbrook Service Area Annexations

A summary of those annexations is below:

- **1950 Annexation** - All fees have been paid for the 1950 Annexation

- **1958 Annexation** -145 parcels and 3,216 acres of land have not paid fees. Listed below are preserved lands within the annexed area, with unpaid fees, that will never be developed (See Figure 3-8):
  - Wildlands Conservancy SMR Preserve- 1,349 acres
  - SDSU Santa Margarita Ecological Reserve (SMER) - 221 acres.
  - San Diego County SMR Preserve- 194 acres.
  - Land and Sea Preserve- 152 acres.
  - SDG&E Right of Way- 40 acres.
  - The remainder of the area of unpaid annexation fees is 1,161 acres and the annexation fee is $450/acre.
- **Airpark Annexation**- Of the remaining 40 acres of land with an unpaid annexation fee, only 9 acres have a possibility of being developed in the future. The annexation fee is $400/acre. (See Figure 3-9).
- **Red Mountain Ranch Annexation**- All areas of unpaid annexation are part of the Land and Sea Preserve and will never be developed. The annexation fee is 1,000/acre. (See Figure 3-10)

De Luz Service Area Annexations

There are three areas included in the De Luz Service Area Annexation (See Figure 3-11). The De Luz Parent District is the remainder of the De Luz Service Area that is not part of De Luz Improvement Districts 1 &2. These parcels were annexed into MWD and SDCWA but have not paid annexation fees into the District. Parcels in the De Luz Parent District are not paying District property tax assessment. Annexation to De Luz Improvement Districts 1 & 2 is required before water service can be provided. There are 947 acres of land in the parent district. The annexation fee is $1,000 plus $350/acre. The per-acre fee increases at a rate of 5% annually commencing July 1, 1988.

There are additional parcels in De Luz which did not annex into the De Luz Parent District and are also outside the District service area. Annexation into De Luz Parent District for these parcels would be an annexation of new area outside the District and would require action of the San Diego Local Agency Formation Commission (LAFCO). These areas are also outside the service area of MWD and SDCWA, with annexation to all three districts required. The fee for annexation into the De Luz Parent District and the Improvement Districts is $1,000 plus $450/acre. The per-acre fee increases at a rate of 5% annually commencing July 1, 1988.

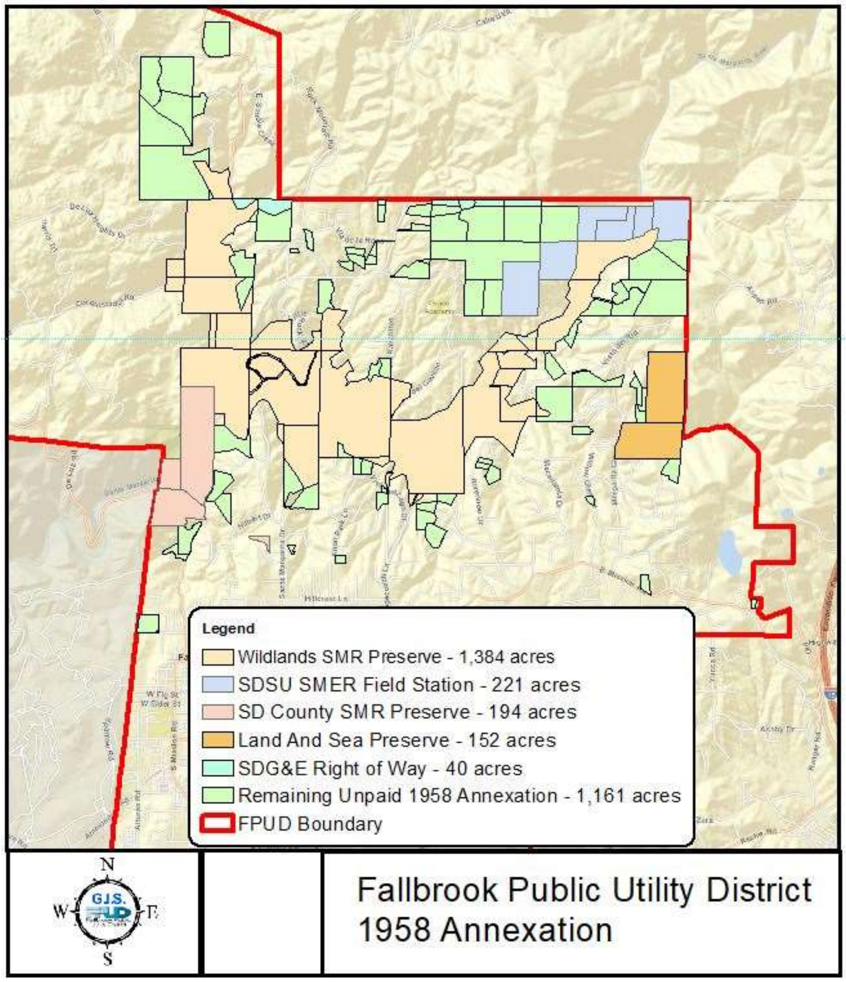

FIGURE 3-10: 1958 ANNEXATION

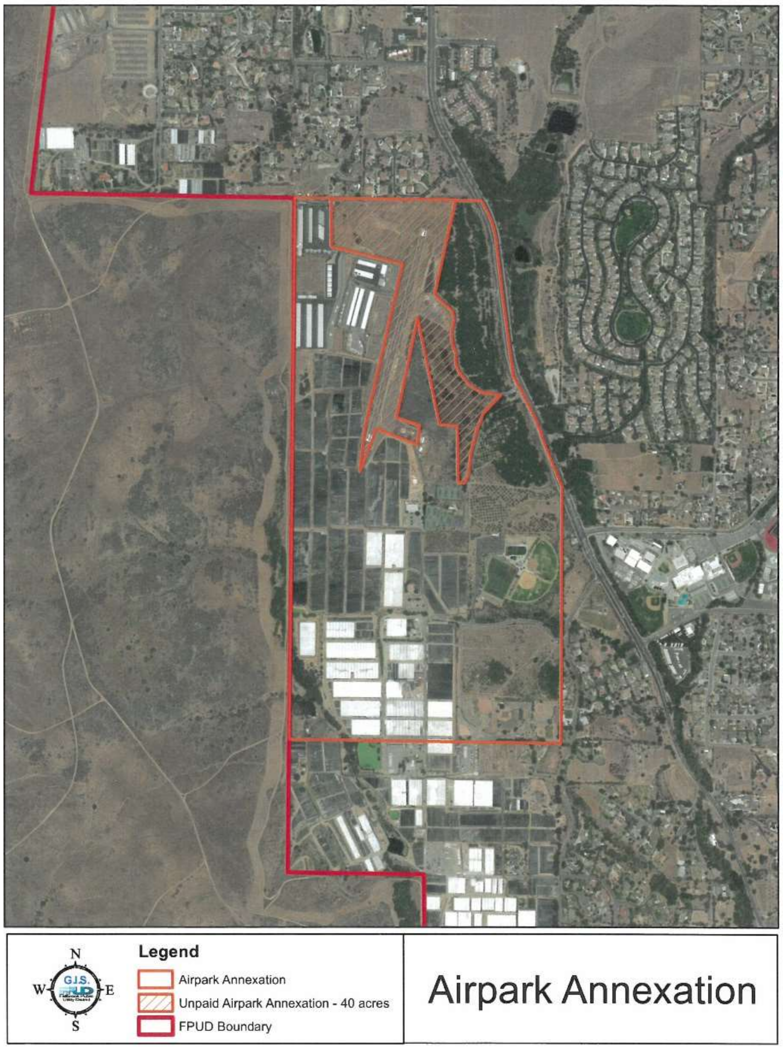

FIGURE 3-11: AIRPARK ANNEXATION

FIGURE 3-12: RED MOUNTAIN RANCH ANNEXATION

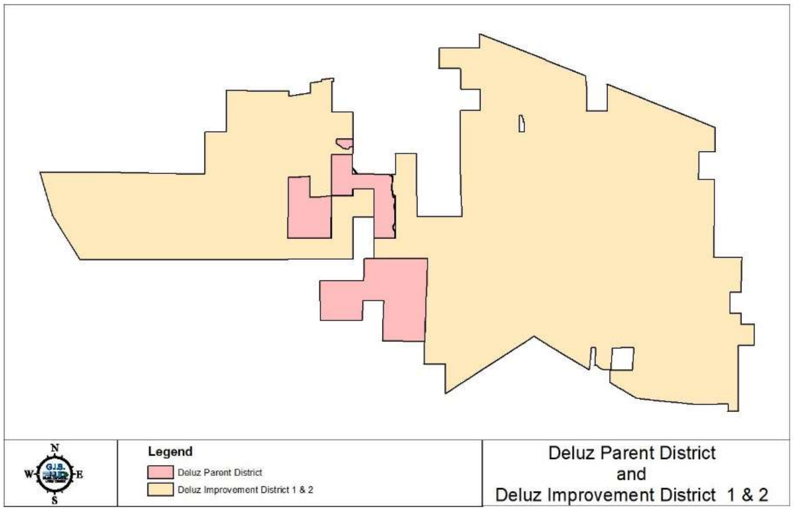

FIGURE 3-13: DE LUZ ANNEXATIONS

Chapter 4 – Wastewater

4.0 Background

The Fallbrook area was originally served by the Fallbrook Sanitary District, which was formed in 1947. In 1994, the Sanitary District was incorporated into the Fallbrook Public Utility District. The sanitary district currently serves approximately 5,000 accounts in a service area of 4,200 acres (see Figure 4-1). The sewer service area boundary is substantially smaller than the District's 28,000-acre water service area. The district began providing reclaimed water in 1991. The District's wastewater system consists of the following facilities:

- A Water Reclamation Plant (WRP) with a design capacity of 2.7 MGD average annual flow
- Six (6) lift stations
- Seventy-eight (78) miles of collection piping and forcemains
- Eighteen (18) miles of outfall piping from Fallbrook to the Pacific Ocean

Currently the WRP treats all influent flows to tertiary standards. The WRP inflows averaged approximately 2,000 AFY over the last five years. The amount of recycled water available varies slightly due to minor infiltration in the wet season, but as shown in Table 2-1 is on average between 155-175 AF per month. The amount of recycled water used by customers varies significantly from summer to winter due to irrigation needs, but the peak months occur in August and September where recycled demands account for roughly 50% of influent flows as shown in Table 4-1.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
WWTP Influent Flow (AF)	172	156	168	156	167	158	161	158	151	152	156	163	1918
Recycled Water Sales (AF)	33	30	40	56	70	72	78	80	78	60	36	26	660
% Monthly Sales of Total Sales	4.9%	4.5%	6.1%	8.5%	10.6%	11.0%	11.9%	12.1%	11.8%	9.2%	5.5%	3.9%	
Unused Recycled Water (AF)	140	126	127	100	97	85	82	79	73	91	120	137	1258
% Recycled Usage	19%	19%	24%	36%	42%	46%	49%	50%	52%	40%	23%	16%	34%

TABLE 4-1: MONTHLY WRP FLOWS AND RECYCLED WATER USAGE AVERAGE 2011-2015 (ALL FIGURES IN AF)

The current operating conditions are summarized in Table 4-2

Design Conditions	Units	Value
Average Annual Flow (2011 - 2015)	MGD	1.6
Peak Day Wet Weather	MGD	3.2
Accounts Served	#	4,966
Equivalent Dwelling Units (EDU's) Served	EDU's	8,375
Unit Flow	GPD/EDU	191

TABLE 4-2: CURRENT SEWER SYSTEM OPERATING CONDITIONS

The District's WRP was originally designed with a build-out annual average flow of 2.7 MGD. Since the current average annual flow is 1.6 MGD (60% of design flow) and the total population increase projected by the San Diego Association of Governments (SANDAG) is only a total of 24% by 2040, it is unlikely that the WRP will reach design capacity within a 20-30 year planning horizon. The system is designed to the original build-out capacity, which ensures capacity above the current long-term build-out scenario. There are currently no large developments planned that would cause an immediate increase in capacity needs. In addition, much of the sewer service area consists of lower-density developments on septic systems. Additional development may choose to go on septic versus connecting to sewer, so the exact build-out flow demands are uncertain.

Based on previous studies, the following build-out projections and peaking factors were utilized for the sewer flows to the WRP. Projections are based on maintaining the original build-out plant design capacity of 2.7 MGD average annual flow (Preliminary Design Report: Improvements to the Fallbrook Water Reclamation Plant, Black and Veatch 2012). These build-out flows are not anticipated to occur within the next 30 years.

Design Conditions	Units	Value
Average Annual Flow	MGD	2.7
Peak Hour Dry Flow	MGD	5.2
Maximum Month Flow	MGD	3.1
Peak Day Wet Weather Flow	MGD	4.7
Peak Hour Wet Weather Flow	MGD	6.2

TABLE 4-3: ULTIMATE BUILD-OUT PROJECTED OPERATING CONDITIONS

During the winter of 2016/17, several large storms occurred in succession, and data from this timeframe was used to estimate infiltration. The overall infiltration rate was estimated at 4% of dry weather flows. Most of the infiltration comes from older sections of the sewer system near downtown.

	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17
Total Influent Monthly (AF)	136.8	123.2	136.0	129.1	133.8	128.6	132.7	134.7	129.6	137.7	133.3	144.8	173.9
Dry Weather Average Monthly Influent (AF)	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4	132.4
Estimated Infiltration (AF)	4.4		3.6		1.3		0.3	2.3		5.3	0.8	12.3	41.4
% Infiltration	3%	0%	3%	0%	1%	0%	0%	2%	0%	4%	1%	9%	31%

TABLE 4-4: ESTIMATED COLLECTIONS SYSTEM INFILTRATION

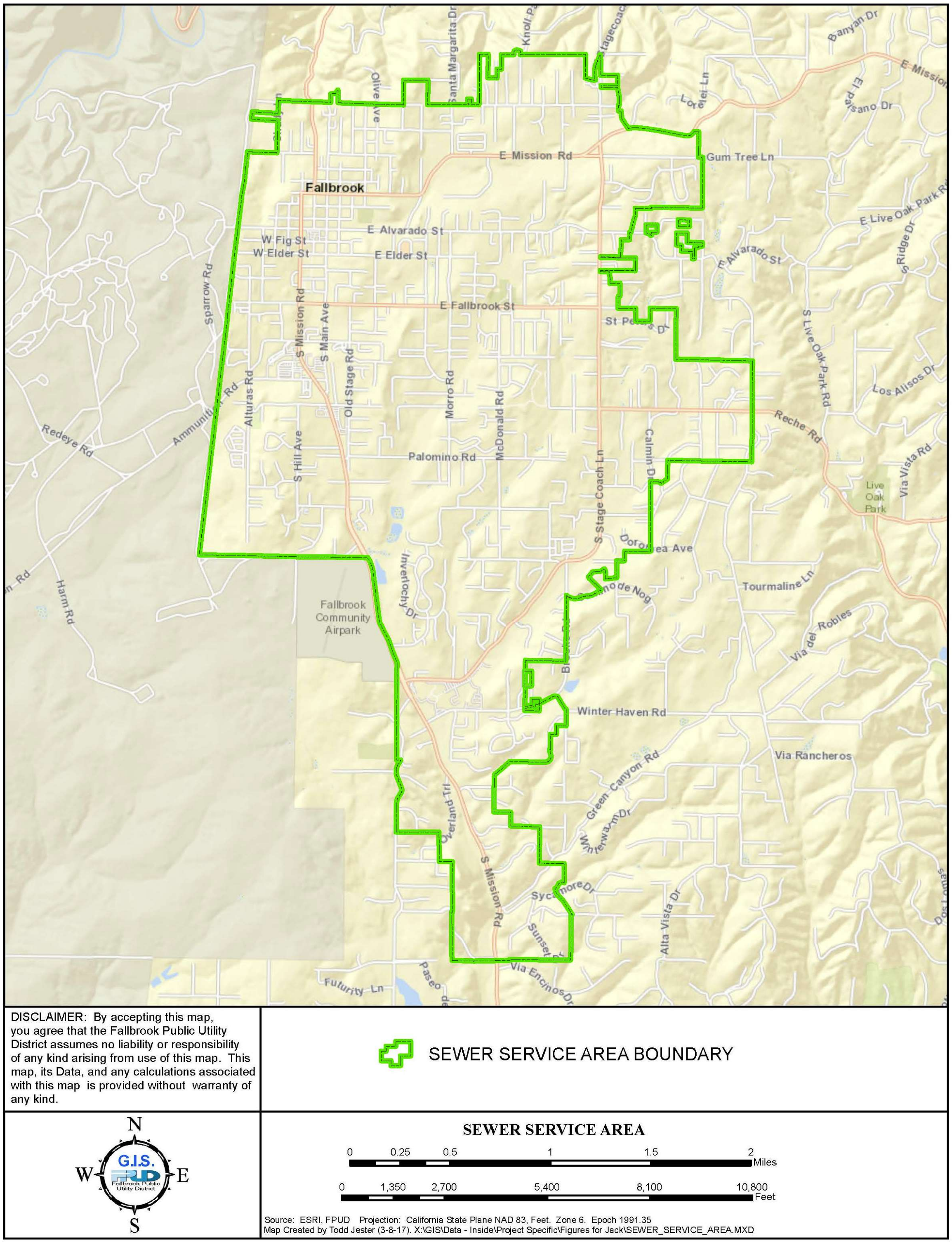

FIGURE 4-1: SEWER SERVICE AREA BOUNDARY

4.1 Water Reclamation Plant

The District completed a $30-millionrenovation of the water reclamation plant in 2016 that replaced the majority of electrical and mechanical equipment. The WRP was designed to accommodate build-out demands, and as of 2020 no future expansion is projected to be necessary. The project also included needed structural repairs. Most future requirements for the WRP will be to maintain existing equipment and proactively replace equipment as needed.

The WRP processes solids into Class A biosolids using a thermal sludge dryer. The dryer was installed in 2006, and has ongoing reliability issues. The system manufacturer went out of business, so maintenance of the system and system support is limited. District staff has been able to make some reliability improvements, with the goal of maintaining the system until it has reached the end of its useful life in 2023/24. At that time it will be replaced with another Class A sludge drying system. The District is also in the process of creating an asset management plan for individual components of the WRP to further develop a comprehensive long-term budget for the WRP.

4.2 Lift Stations

The District operates six (6) lift stations. The lift stations were installed from the 1960's to the 1990's and are in need of rehabilitation. The pumps and motors have been replaced through the years and the electrical components were replaced for many of the lift stations. However, a significant overhaul of the lift stations will be required over the next five to ten years. Three of the District's lift stations are small (less than 5,000 gpd) and 2 could be removed from service through extension of the collections system.

A summary of the lift stations and their capital needs are provided in Table 4-5 below.

Facility Name	Shady Lane	Hawthorne	Anthony's Corner	Overland Trail	Grean Canyon	Debby Street
Type	Below Grade Dry Well	Submersibles	Below Grade Dry Well	Series Dry Pit Submersibles	Below Grade Dry Well	Partial Dry Well Grinder Pumps
Current EDU's Served	265	6	1909	1122	7	14
Current Estimated Average Flow (gdp)[1]	50350	1140	362710	213180	1330	2660
Current Estimated Average Flow (gdp)[2]	20600	3000	338600	125600	4633	3013
Buildout EDU's Served	323	0	2250	2017	328	0
Estimated Buildout Average Flow (gdp)[1]	61370	0	427500	383230	62320	0
Number of Pumps	2	1	2	4	2	2
Pump HP	20	0.5	60	40	15	2
Year Installed	1965	1975	1978	1999	1965	1965
Chemical Facilities	None	None	Bioxide	None	None	None
Generator or MTS	Propane	None	None	Generator	MTS	None
Capital Needs	1. Larger Wetwell and Pumps 2. Relocate Pumps Above Grade	1. Replace with 530 lf of sewer	1. Coat Wetwell	1. Repair and coat concrete 2. Cover influent channel and add second grinder 3. Replace generator 4. Rehab building 5. Add overflow sump pump 6. Replace pumps and suction pipint	1. Coat Wetwell 2. FM Replacement	1. Replace with 3250 lf of sewer

1. Based on 190 gpd/EDU
2. Based on Pump Run Hours

TABLE 4-5: SEWAGE LIFT STATION IMPROVEMENT NEEDS

Shady Lane Lift Station

Shady Lane Lift Station will need to be replaced when additional planned developments come online, specifically the Dougherty Grove Development. There is a Shady Lane impact fee assessed to new developments within the Lift Station service area to help off-set the cost of the larger lift station. The replacement Lift Station will be designed for the build-out flow of 60,000 gpd. The estimated cost of the replacement lift station is $530,000.

Hawthorne Lift Station

Hawthorne Lift Station was designed as a temporary lift station until additional developments occurred that extended the sewer 530 linear feet(Figure 4-2). Given the Lift Station needs replacement it was determined that it will be more cost-effective for the District to extend the sewer and remove the lift station, rather than replacing the existing lift station. The estimated cost of the extension is $130,000 based on past installed sewer cost data of $250/lf.

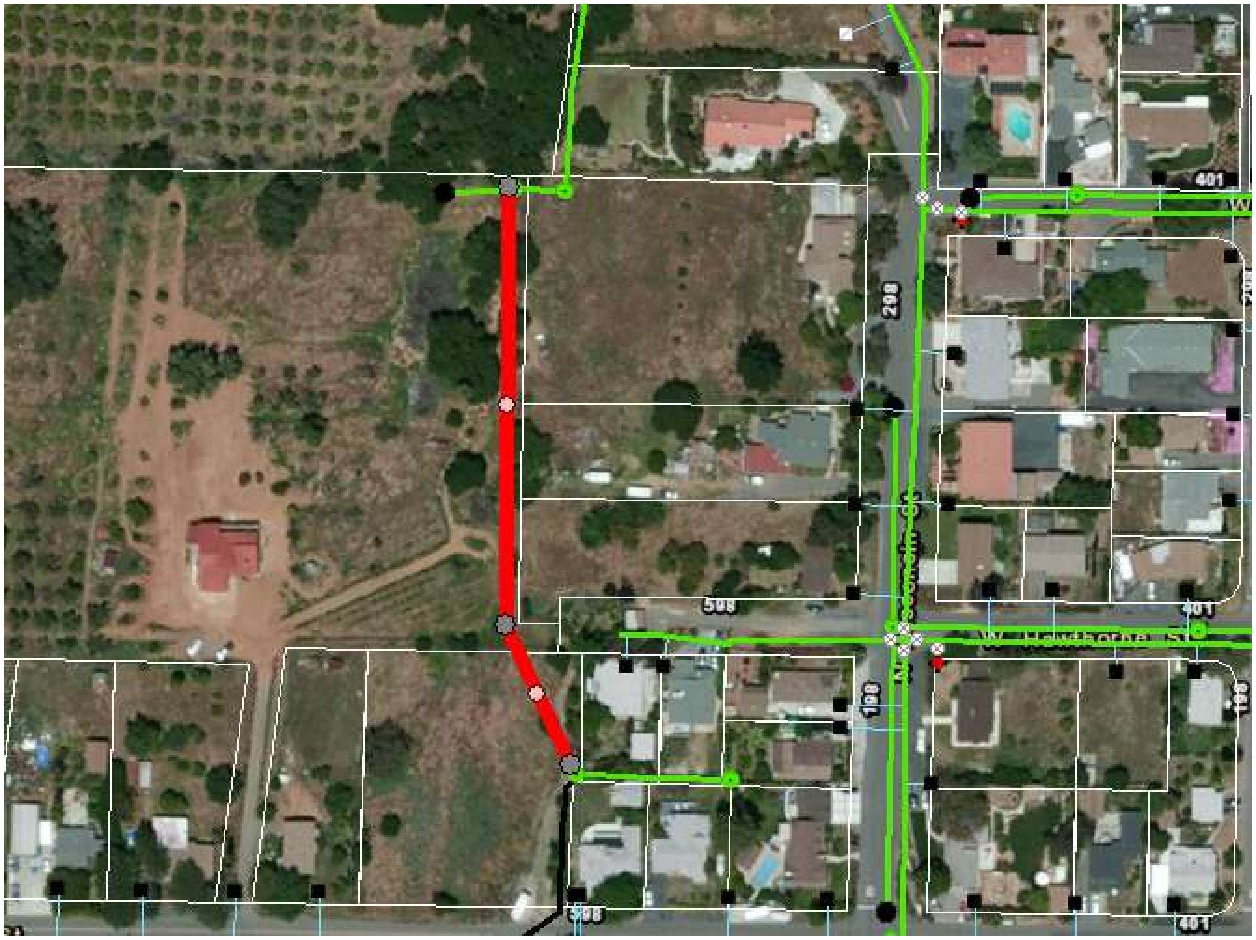

FIGURE 4-2: SEWER EXTENSION FOR REPLACEMENT OF HAWTHORNE LIFT STATION

Anthony's Corner Lift Station and Green Canyon Lift Station

While these lift stations have been in service for over 35 years, they are still in relatively good condition. The wetwells for both lift stations need to be coated. The forcemain from Green Canyon to Plant 2 is an early version of DR 18 PVC pipe. It has experienced numerous failures and needs to be replaced. The pumps and motors will need routine rehabilitation and replacement, but a complete replacement of the lift station is not planned at this time. Green Canyon would require replacement if the area begins to build out in a manner which puts new parcels on sewer. Given the lower density in this area, many parcels will likely remain on septic. Anthony's Corner Lift Station will be decommissioned as part of the rehabilitation of the Overland Trail Lift Station.

Debbie Street Lift Station

This station serves a low area for only 14 EDU's. The lift station was installed in 1965 and is a packaged fiberglass lift station. The overall condition is poor and it needs to be replaced. Several alternatives were evaluated for replacement, including the long-term operations and maintenance costs (See Appendix B). Table 4-6 summarizes the alternatives, while the preferred option is to extend the sewer south as shown in Figure 4.3.

Option	Total Capital Cost	Total Present Worth Cost*	Additional Comments
Option 1. Extend Sewer to the South	$770,000	$785,680	Potential to connect additional sewer customers
Option 2. Replace Lift Station	$550,000	$844,000	Requires ongoing maintenance of LS
Option 3. Jack and Bore Deep Sewer North	$815,000	$830,680	Results in 45' deep sewer section

* Based on Present Worth at 3%, 30 years

TABLE 4-6: COSTS FOR DEBBIE STREET LIFT STATION REPLACEMENT ALTERNATIVES

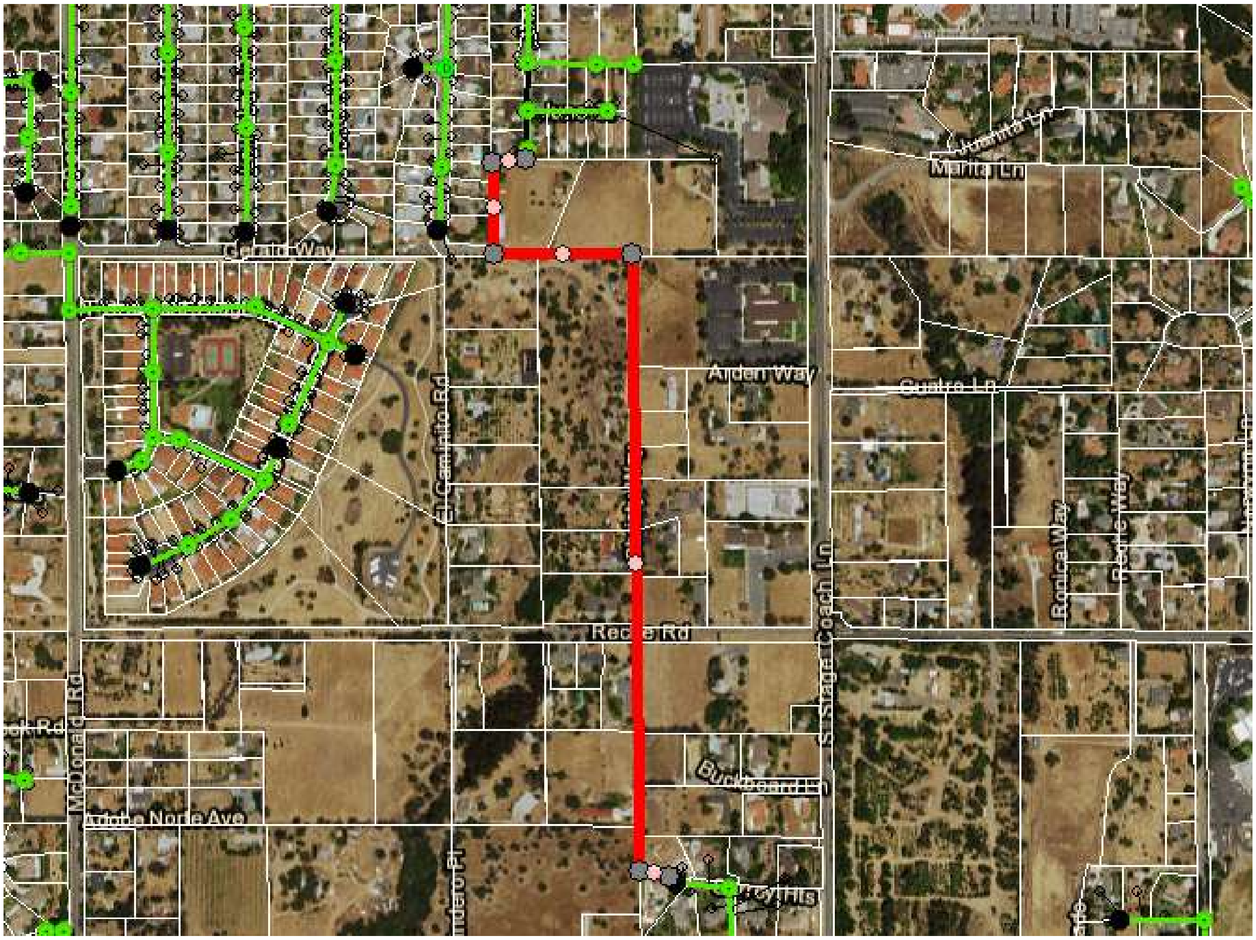

FIGURE 4-3: DEBBIE STREET LIFT STATION REPLACEMENT

Overland Trail Lift Station

Overland Trail Lift Station was originally a second Waste Water Treatment Plant (Plant 2) for the Fallbrook area. In 1999 it was converted to a lift station to pump sewage to the District's WRP. The lift station operates at a high discharge pressure given the elevation change from Overland Trail(approximately 480 feet MSL) to the WRP (680 feet MSL), with a high point along the forcemain south of the WRP(760 MSL). This configuration required two submersible pumps in series. The overall age of the facility requires structural and mechanical improvements including replacing the pumps as shown in Table 4-5. The District is currently rehabilitating the lift station, which will increase its capacity to accommodate flows currently processed at Anthony's Corner Lift Station.

4.3 Collections, Forcemains and Outfall

The District current operates 78 miles of sewer, 4.4 miles of forcemain and an 18-mile outfall. The collection system varies from 4-inch to 20-inch, with some collection pipes over 60 years old. A summary of collections and forcemains by size and age is shown in Table 4-7.Note: over a third of the collections sewer pipelines are over 50 years old.

	Age (Years Old)					
Diameter	**Less than 10**	**10-20**	**20-30**	**30-40**	**40-50**	**>50**
4	0.00%	0.00%	0.00%	0.08%	0.02%	1.39%
6	0.11%	0.50%	0.82%	11.02%	14.35%	18.00%
8	3.66%	10.58%	9.53%	6.84%	4.23%	8.77%
10	0.00%	0.00%	0.00%	0.29%	0.06%	1.75%
12	0.00%	0.03%	0.06%	0.63%	0.00%	3.22%
14	1.06%	2.06%	0.00%	0.00%	0.00%	0.00%
15	0.00%	0.00%	0.00%	0.09%	0.00%	0.03%
16	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%
18	0.33%	0.00%	0.00%	0.15%	0.00%	0.00%
TOTAL	***5.17%***	***13.17%***	***10.41%***	***19.14%***	***18.66%***	***33.17%***

TABLE 4-7: SIZE AND AGE OF COLLECTIONS SYSTEM

System expansion will occur due to development, but incrementally since many parcels in the service area plan to remain on septic. As a result, major capital projects for the collections system are related to maintaining reliability of the existing system in order to prevent breaks and spills.

4.3.1 Collections and Forcemain Capacity

The District did a capacity analysis in 1991, which evaluated potential capacity issues with increasing sewer flows. In this study, two (2) Main sections were identified to have potential capacity concerns: one along S. Mission road and one along Brandon and Alvarado Street. In 2001, the District hired Dudek Inc. to further evaluate alternatives to replace these sections. The District replaced and upsized the sewer section along S. Mission Rd in multiple phases, with the final phase being completed in 2015. The Brandon and Alvarado section was constructed in 2017 and 2018. At this time there are no other sewer sections that have capacity constraints, as flows have not increased since the 1991 projections. As shown in Table 4-8, sewer flows have decreased below levels in the early 1980's and are significantly lower than past peak flows. Increased demand is not expected due to low-density zoning and limited existing development plans, so capacity of the existing system is not a major driver for system improvements. The District continues to monitor manhole levels for signs of surcharging in the system. If there are signs of surcharging, the District will evaluate potential constraints. If the District experiences increasing development or flow rates, an update to the hydraulic analysis will be conducted.

Year	Flow - MGD (Monthly Average)	Comment
1988	1.4	*
1989	1.6	*
1990	1.7	*
1991	1.4	*
2001	2.0	**
2002	1.8	**
2003	2.0	**
2004	2.0	**
2005	2.3	**
2006	2.2	**
2007	1.9	***
2008	1.8	***
2009	1.8	***
2010	1.8	***
2011	1.8	***
2012	1.8	***
2013	1.7	***
2014	1.7	***
2015	1.7	***
2016	1.4	***

* From 1992 Wastewater Master Plan

** Number not adjusted for grit washing - slightly overestimate actual influent by 2-5%

*** Adjusted for grit washing - true influent

TABLE 4-8: HISTORIC TOTAL WASTEWATER FLOWS

4.3.2 Collections and Forcemain Rehabilitation

The District has a program to re-line or replace manholes and sewer lines. The District has initiated a program to re-line 1.200 linear feet per year and 10 manholes per year. This being a replacement rate of 0.3% of the collection system, the rate will need to increase to at least 1% per year as the system ages. The initial re-lining areas are concentrated in areas that have experienced infiltration and are located in parts of downtown that would require costly replacement. The District also completed a high-level, 100-year collections system replacement plan that looked at long-term capital costs needed to maintain the system. As shown in Figure 4-4, the replacement needs for the District are lower in the near terms, but will increase dramatically as the system ages. The District is in the process of updating this evaluation and better connecting it to actual field conditions, as well as consideration of including long-term effects of re-lining projects.

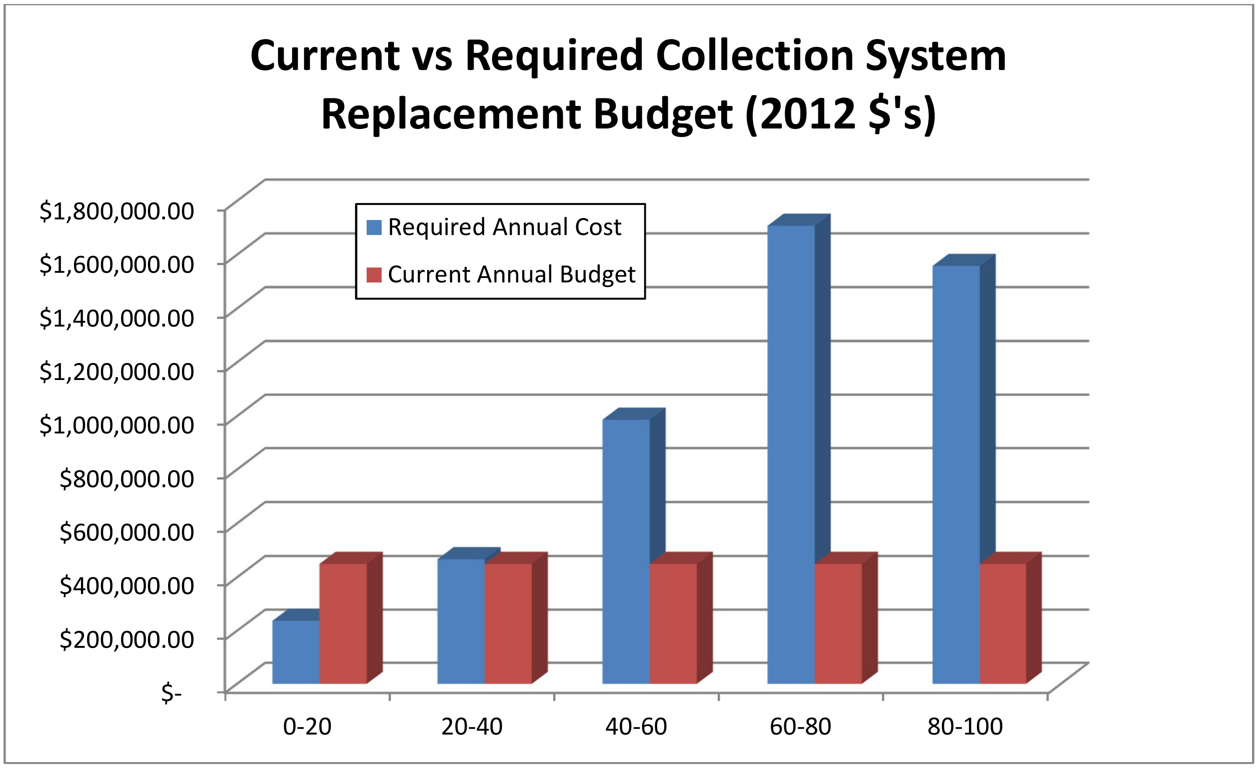

FIGURE 4-4: 100 YEAR COLLECTION SYSTEM REPLACEMENT BUDGET

The initial replacement objectives were to replace sections of forcemains that have experienced breaks and sections of the collections system previously been identified as undersized. The sections with capacity concerns were upsized in recent years. The other District priority is to replace sections of forcemain that have experienced breaks due to the condition of the PVC piping used. The District has completed the replacement of the forcemain from Overland Trail Lift Station to the WRP except for some limited piping within the WRP site. This piping is in the section where the system is operating under gravity so it has not experienced breaks. However, it is to be replaced as part of the Santa Margarita Conjunctive Use Project Construction. The next section of piping to be replaced will be the forcemain from Green Canyon to Overland Trail near Ostrich Farm Creek. This area has also experienced numerous leaks.

4.3.2 Collection System Expansion

Many parcels within the sewer service area are not currently on sewer due to of large lot sizes providing adequate space for septic systems, and the District does not expect them to connect to sewer. The District has capacity to serve build-out, but it may not be necessary given the planning and development in the sewer service area. Figure 4-5 highlights parcels not currently served by sewer within the service area boundary.

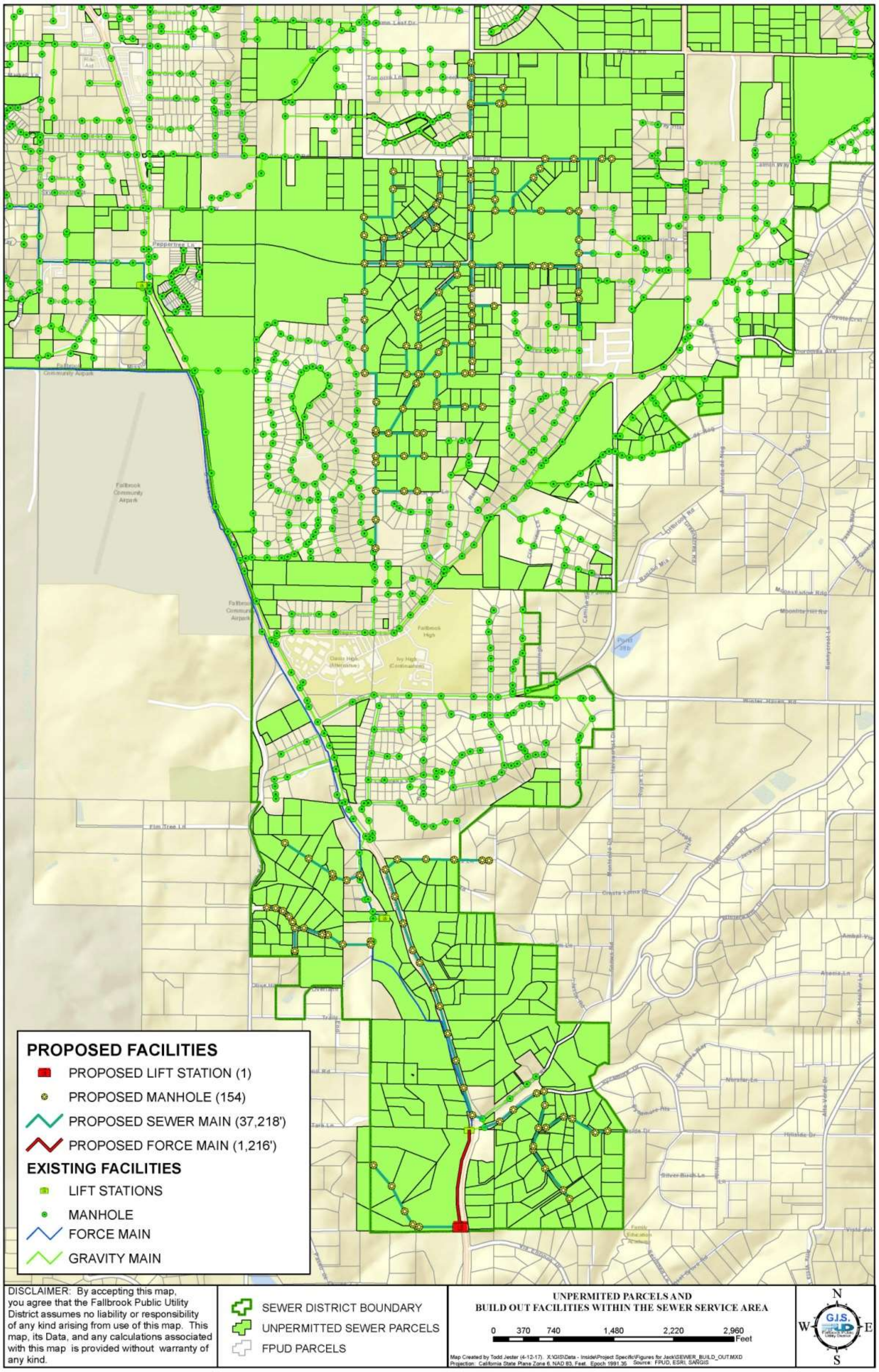

FIGURE 4-5: THEORETICAL BUILD-OUT OF SEWER SERVICE AREA

4.4 Potential Wastewater System Coordination with Other Agencies

FPUD is exploring opportunities to coordinate the collection system operation with other agencies to help reduce operating costs. FPUD is exploring the following opportunities with these agencies:

City of Oceanside

- Since FPUD will discharge brine down the outfall once the Santa Margarita Conjunctive Use Project comes on line, the District will no longer be able to use the outfall for recycled water service. To minimize outfall maintenance, the District transferred ownership of the western portion of the outfall to the City of Oceanside in 2019 and tied into the Oceanside outfall at the San Luis Rey Treatment Plant.

Naval Weapons Station

- Naval Weapons Station operates a small sewage collection system. FPUD provides treatment for the Weapons Station. Naval Weapons Station is looking to potentially contract out maintenance of the collections system. This would benefit FPUD by increasing utilization of equipment and resources to help reduce costs for FPUD sewer ratepayers.

4.5 Recommendations

The District should pursue the following steps for the sewer system:

4. Complete development of a comprehensive asset management plan for the WRP.
5. Continue replacement and rehabilitation of lift stations in accordance with the Master Plan.
6. Perform an update of collection system and force main asset management analysis and develop a long-term prioritized budget for replacements.
7. Increase manhole and collection relining to reach at least 1% of the total system per year.
8. Continue to pursue providing services for Naval Weapons Station.

Chapter 5 – Energy

5.0 Background

The Fallbrook Public Utility District (District) purchases power from San Diego Gas and Electric (SDG&E). In addition the District has a 1Megawatt (MW) single-axis tracking solar facility that was installed in 2011 and a 75 kilowatt (kW) roof mounted system that was installed in 2004. The 1 MW system offsets energy consumption at the Districts Water Reclamation Plant (WRP). The 75 kW system offsets energy demands at the District office.

The addition of the 1 MW system significantly decreased energy costs in Fiscal Year (FY) 11-12 as shown in Figure 4-1. In FY14-15, The District completed a major upgrade to the WRP. There were additional energy costs due to operation during construction, as well as costs related to operations staff developing protocols for new equipment. Energy costs from the facility have significantly decreased over the following years as operations were optimized.

Fiscal Year	Water Pump Stations	Water Reclamation Plant	Sewer Lift Stations	UV Facility	Other Facilities	Total Energy Costs
09-10	$169,505	$404,875	$66,361	$15,914	$51,879	$708,534
10-11	$145,219	$411,562	$67,296	$36,792	$55,374	$716,243
11-12	$160,850	$144,235	$68,870	$32,680	$71,763	$478,398
12-13	$159,547	$182,704	$60,955	$32,360	$76,390	$511,956
13-14	$163,472	$163,472	$44,327	$27,504	$155,766	$554,541
14-15	$148,508	$360,535	$86,400	$39,025	$105,016	$739,484
15-16	$185,612	$271,388	$81,600	$45,635	$51,933	$636,168
16-17	$177,465	$174,002	$84,843	$53,745	$43,150	$533,205

TABLE 5-1: DISTRICT TOTAL ENERGY COSTS BY FUNCTION

As shown in Figure 5-1, In FY16-17, the District purchased and produced approximately 2.4 Million Kilowatt Hours. The District produces about 50% of total energy demand.

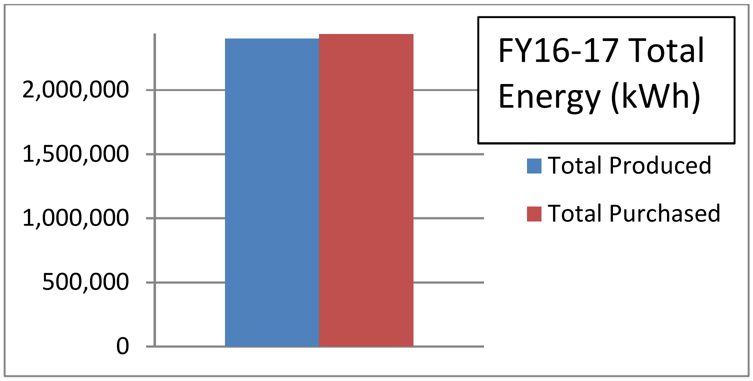

FIGURE 5-1: DISTRICT ENERGY PRODUCTION AND PURCHASES FY 16-17

5.1 Summary of Energy Use

The primary source of energy use for the District is operation of the Water Reclamation Plant. Even though the energy produced by the 1 MW system offsets energy consumption at the facility, this facility remains the highest energy user due to high energy requirements for processing wastewater. The next most significant source of energy consumption is the District pumping facilities. These facilities are primarily in the De Luz service area to feed higher elevations. Figure 5-2 identifies the breakdown of energy use by facility for the District.

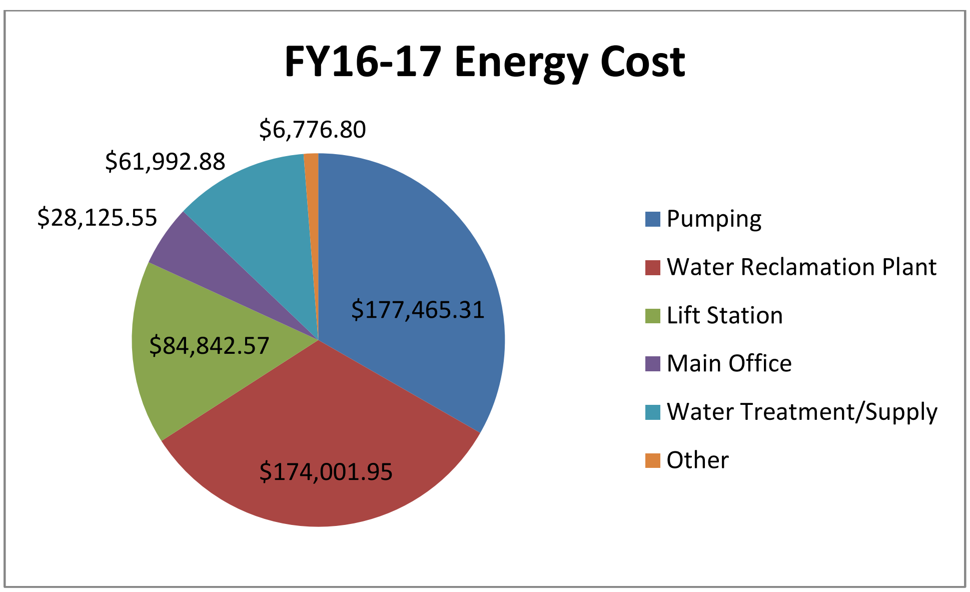

FIGURE 5-2: DISTRICT ENERGY COST FOR FY 16/17 BY FUNCTION

As shown in Table 5-2, the top seven individual accounts make up over 90% of the total energy use and these accounts should be the focus of additional energy savings.

Facility	FY16-17 Energy Cost
Water Reclamation Plant	$ 174,001.95
Donnil PS	$ 96,730.39
Harris Trail PS	$ 55,323.67
UV Plant	$ 53,745.48
Overland Trail LS	$ 47,190.30
Anthony's Corner LS	$ 32,998.42
District Office	$ 28,125.55
Total	**$ 488,115.76**
Total Actual District Energy	**$ 533,205.06**
% of Total from Top Seven Accounts	**92%**

TABLE 5-2: FY16-17 ENERGY COST BY INDIVIDUAL FACILITY

5.2 Evaluation of Solar Facility Performance

The largest investment in energy savings by the District was the construction of a 1 MW single-axis tracking solar facility adjacent to the WRP. The project was constructed for a total cost of $7.5 million and was financed using Qualified Energy Conservation Bonds (QECB) that have a term of 17 years and a rate of 1.8%. The District also received a California Solar Initiative (CSI) Rebate of $0.32/kWh produced by the facility over the first five years. The facility began operation in July 2011. The CSI rebate total of the first five years was $3.9 million, which refunded over half the cost of the project. The remaining loan balance will be paid over the next 12 years of the loan term. A projection of the expected cost of the solar facility versus no project is shown in Figure 5-3. The first five years show the actual performance, with projection is based on the following assumptions:

- Current QECB repayment schedule
- Future energy cost increases of 2.7% a year
- O&M cost increases of 2%/year until Year 15, then increase to $75,000/yr afterward to begin funding equipment replacements
- Solar production degradation of 0.5% a year

As shown in Figure 5-3, the solar facility has saved a significant expenditure over the first five years. Due to loan repayment structure, total costs will begin to reach the level of having no project. However, they offer significant long-term power cost savings after the loan is fully paid and the facility provides a long-term investment to help mitigate energy costs. The District has evaluated implementing solar at other facilities, but it was not deemed cost-effective due to loss of the CSI rebate program, changes in peak rates by SDG&E, and power demands at those sites.

5.3 Recommendation for Future Energy Savings

Based on the District's current energy costs and energy production facilities, a number of recommendations for further evaluation are recommended. The solutions are broken into 1) physical solutions through investments in technology or equipment and 2) operational solutions.

Physical Solutions

1. Evaluate use of battery technology to reduce demand charges. The power costs include usage charges based on kWh used and demand charges based on the peak kW of a facility. Batteries can help reduce demand charges and shift demand to off-peak usage charges. An analysis should be conducted to evaluate whether batteries would be cost-effective at the WRP or pump stations.
2. Evaluate the potential to produce methane and utilize gas production at the WRP. This would require conversion to anaerobic digestion and installation of cogeneration facilities.

3. Evaluate installation of variable frequency drives at lift stations and pump stations to reduce demand charges.

Operational Solutions

1. Utilize power monitoring to establish monthly energy use performance reports for WRP, UV Facility and Pump Stations. Set benchmarks and continually evaluate performance.
2. Evaluate upcoming power rate changes to determine changes in off-peak pumping times. Develop preferred operating hours for pumps and lift stations based on revised energy rates. Develop programming to support this if needed.
3. Evaluate operating pressures to lower them and possibly reduce pumping costs.

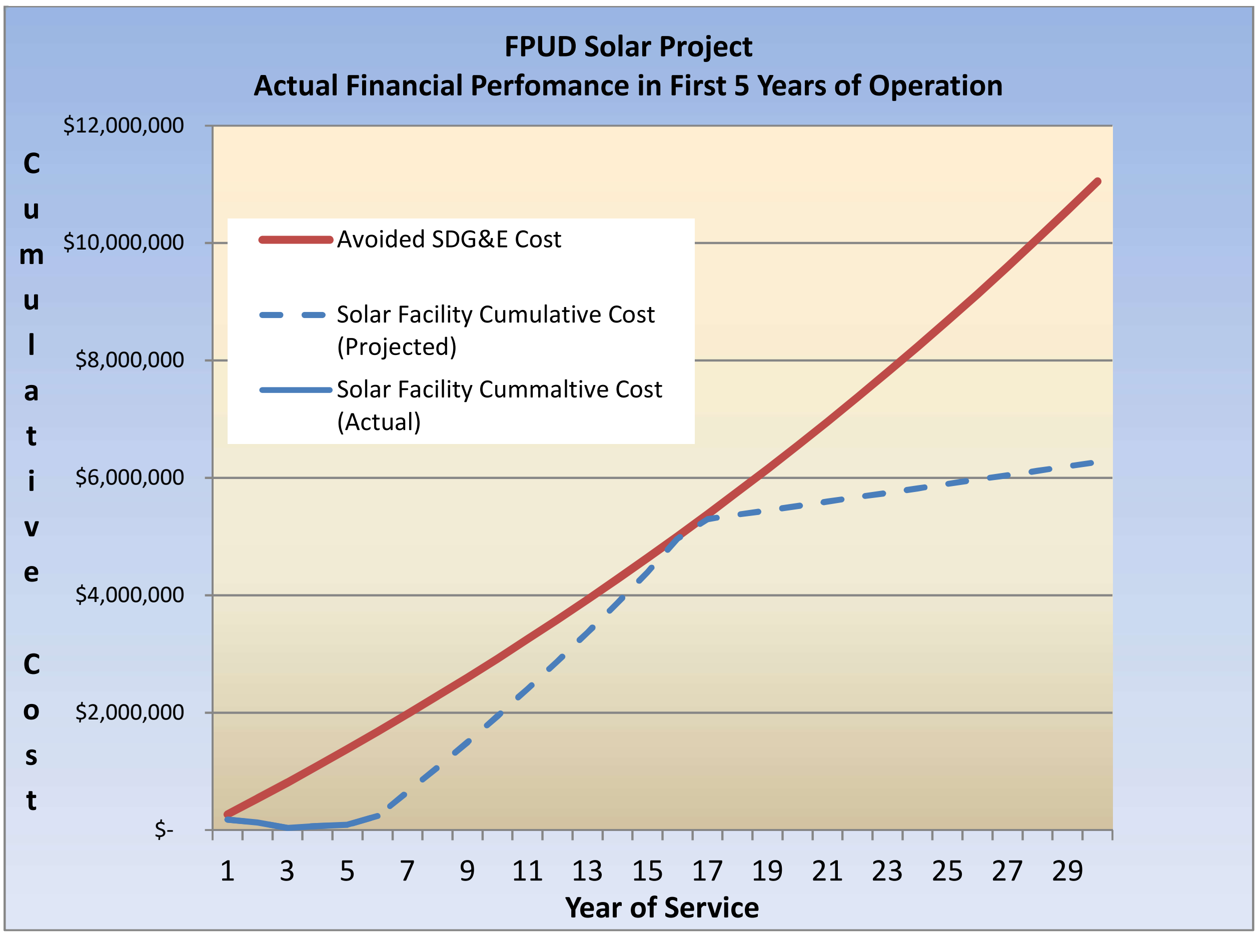

FIGURE 5-3 ACTUAL AND PROPOSED CUMULATIVE COSTS AND AVOIDED COSTS FOR SOLAR FACILITY