WSC
WATER SYSTEMS CONSULTING, INC.

Date: 10/9/2017

To: Brad Hagemann
General Manager
Avila Beach Community Services District

Prepared by: Spencer Waterman

Reviewed by: Daniel Heimel, P.E.

SUBJECT: **WATER RESOURCES ANALYSIS TECHNICAL MEMORANDUM –FINAL**

1 Purpose

This memo summarizes Water System Consulting, Inc.'s (WSC's) water resources analysis for the Avila Beach Community Services District (District), which evaluates historic and projected supply and demand considering various hydrologic conditions. The *Water Resources Analysis Technical Memorandum* (TM) water supply and demand projections are based on new data including:

- Revised Lopez Reservoir (Lopez) allocations due to enactment of the Low Reservoir Response Plan (LRRP)
- Purchase of 100 acre feet (AF) of State Water Project (SWP) "drought buffer" from the San Luis Obispo County Flood Control and Water Conservation District (SLOCFC&WCD)
- Changing demand patterns and future demand patterns assumptions
- Updated population, zoning and development plans
- Revised Lopez and SWP reliability projections

This TM presents the following components of the Water Resources Analysis:

1) Purpose
2) Background
3) Water Demand Characterization
4) Water Supply Characterization
5) Supply Reliability
6) References

2 Background

The District was established in 1997 to provide water and wastewater services to 150 acres in the Avila Beach region of San Luis Obispo County. It is located along latitude 35°10'55.86"N and longitude 120°43'58.88"W, with a mean elevation of 26 ft above sea level. The District provides water and sewer service to approximately 355 connections (see Section 3.2.1) in Avila Beach (see Figure 2-1).

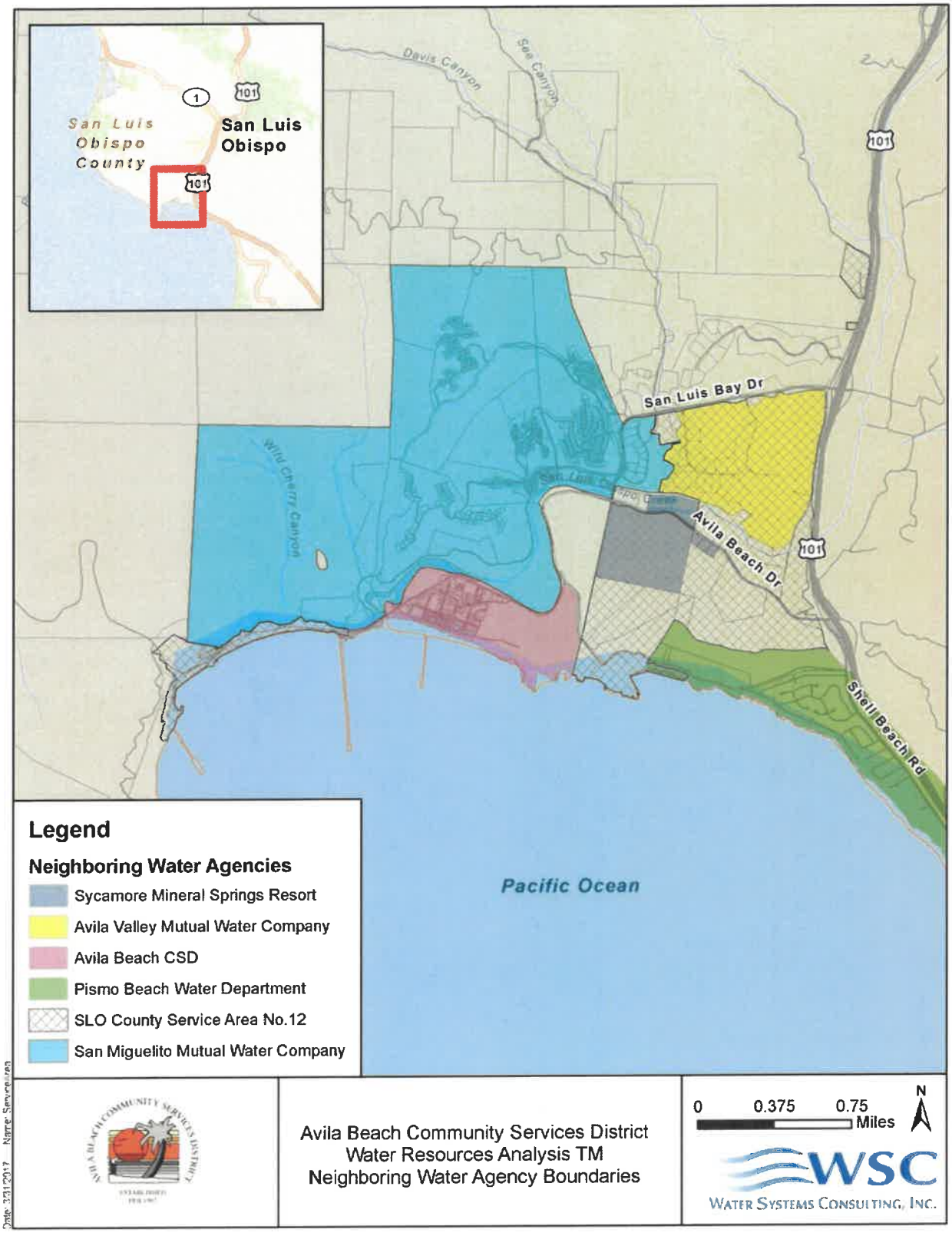

Figure 2-1. Avila Region Water Agencies

3 Water Demand Characterization

3.1 Historic Demand

The District's historic water demand, measured in acre-feet per year (AFY), is presented below in Table 3-1 for 2010-2016 and in Figure 3-1 for 1986-2016. Water demand includes all water sold to customers and non-revenue water that consists of water lost during production and distribution. Water demands have generally increased since 2005 with significant increasing trends from 2005-2009 and from 2010-2014[1]. It is assumed that the significant drop in water demand from 2015-2016 was due to the Governor's Executive Orders requiring Emergency Water Conservation Regulations including mandatory demand reduction targets, prohibitions and potential penalties for non-compliance due to extended drought conditions. These factors and the District's related implementation of its Water Shortage Response and Management Plan may have significantly reduced water demand, but there may be a "bounce-back" to higher demands once conservation efforts are eased when extended drought conditions are alleviated.

Table 3-1. District Water Demand 2010-2016

	2010	2011	2012	2013	2014	2015	2016
Water Demand (AFY)	74.28	79.17	80.98	85.04	87.69	76.39	77.73

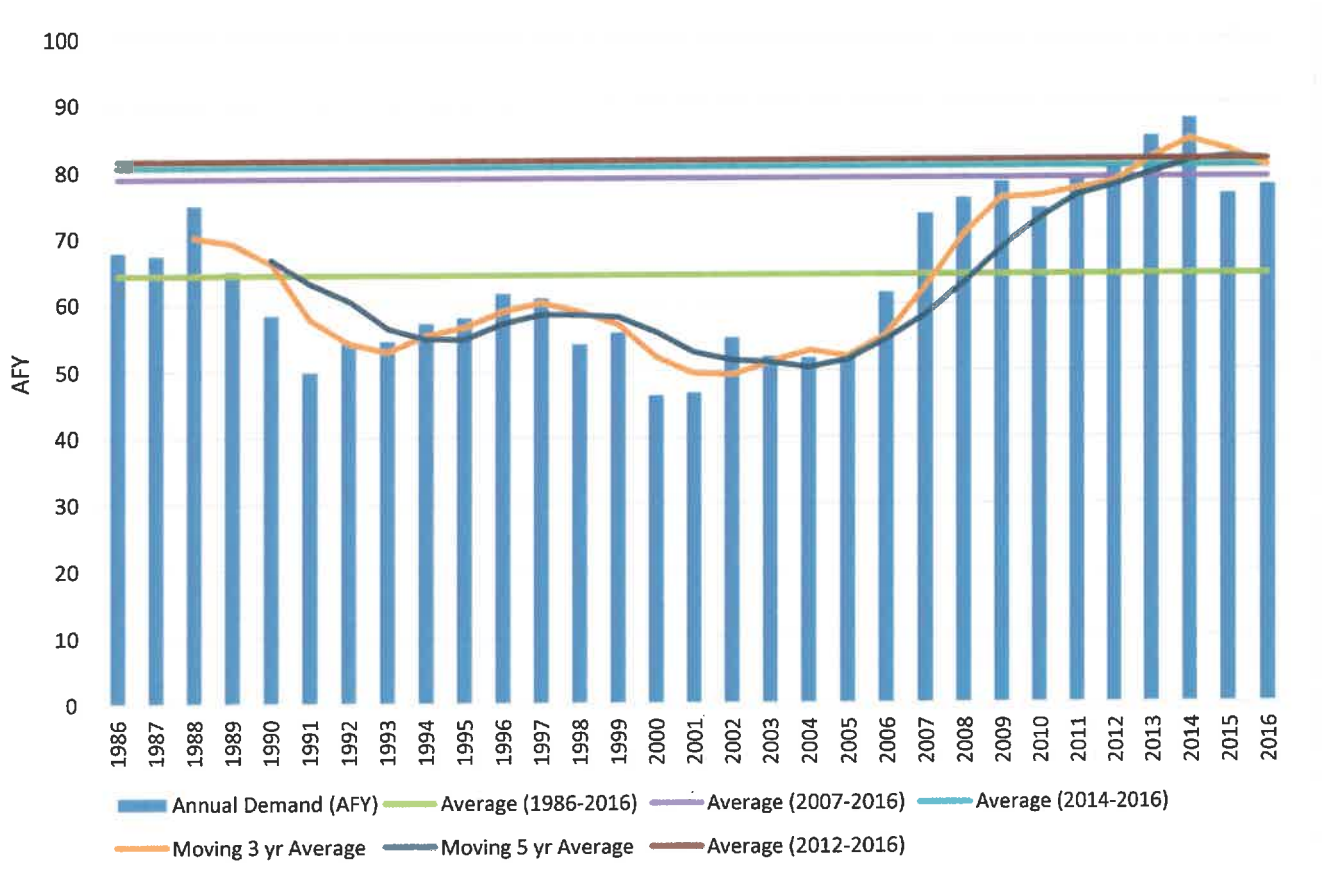

Figure 3-1. Historical Water Demand 1986-2016

[1] The significant decrease in water demand from 2000-2002 was due to the Unocal oil cleanup project that temporarily displaced customers located along Front Street. The subsequent increase in demand was due to customers coming back online.

Water demand is broken down into seven customer billing categories within the District's newly established billing system. The average percentage of water demand by customer category from 2015-2016 is shown in Figure 3-2.

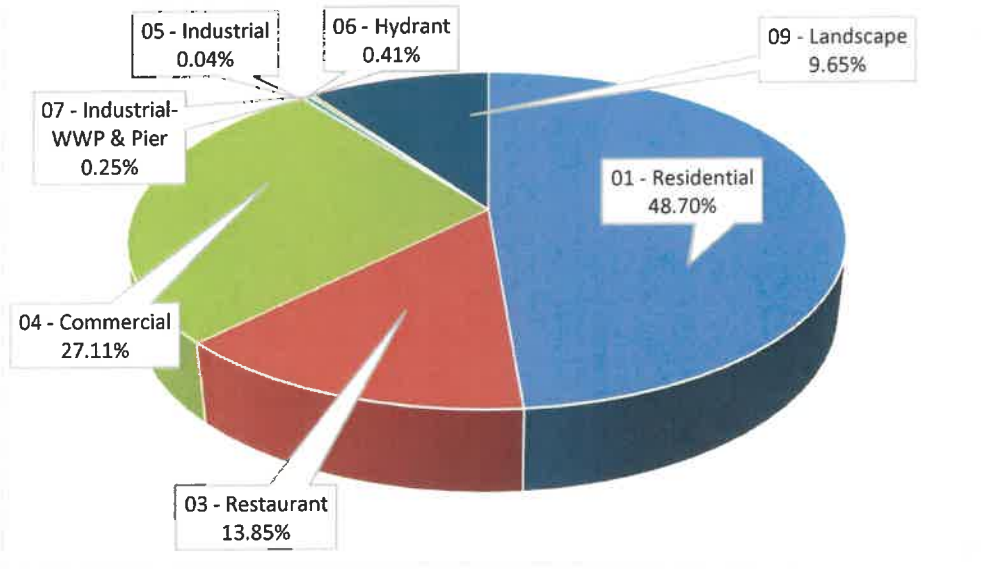

Figure 3-2. Water Usage Percentage by Customer Category

3.2 Future Demand

Water demand within the District is expected to increase as buildout occurs within the service area. The increasing trend in water demand from 2001 through 2014 is attributed to a combination of factors such as development and redevelopment, economic conditions leading to more local and regional tourism, and correlated increased commercial and hotel activity. As discussed in the previous section, the decrease in demand from 2015-2016 is assumed to be due to prolonged drought conditions, and State mandated conservation regulations. It is assumed that these factors have resulted in subsequent physical (e.g., turf replacement, water fixture replacement, etc.) and behavioral changes (e.g., irrigating less or quicker showers due to various media conservation campaigns and materials) in customer demand patterns associated with effective conservation programs. While physical conservation related changes result in essentially permanent demand reductions, behavioral changes may not yield permanent demand reductions. State mandated emergency water conservation regulations may have a short-term impact on demand reductions during drought conditions, but it is assumed that there will be a rebound to average demands due to customers' behavioral changes over the long-term. Therefore, for the purposes of projecting long-term water use, it is assumed that the five-year historical average water demand from 2012-2016 should be used to conservatively estimate future water demands as shown in Table 3-2 in gallons per day (gpd) and AFY.

Table 3-2. 2012-2016 Average Demand

Use Type	Average Water Demand 2012-2016 (gpd)	Average Water Demand 2012-2016 (AFY)
Residential	28,308	32
Commercial	32,758	37
Other	11,622	13
Total	**72,688**	**81**

The following sections describe two typical water demand estimation methodologies including the following:

1. Population and per capita water use methodology- correlates water demand with the best available data for historical population to create a per capita water demand factor that is applied to the best available data for projected population.
2. Parcel zoning and development methodology- correlates water to customers' parcel data, such as acres or dwelling units by zoning category, to create water demand factors that are applied to the best available data for projected acreages or dwelling units to be developed.

3.2.1 Demand Projections- Population and Per Capita Water Use Methodology

A common methodology used to estimate future water demand is a per capita water use methodology. This methodology involves establishing a water demand factor measured in gallons per capita per day (GPCD) and applying that factor to a projected population to estimate future demand. The best way to estimate the District's residential population is through the use of Geographical Information Systems (GIS)-based analysis of US Census data calculated using the California Department of Water Resources (DWR's) Population Tool, which was created for development of Urban Water Management Plans. According to the DWR Population Tool, which assumes a 1.21 persons per water connection factor, the District's population was 370 in 1990, 262 in 2000, 362 in 2010, and 362 in 2015.

The most recent data for population projections in the Avila Beach region is the County's Housing Element 2014-2019 (SAN LUIS OBISPO COUNTY DEPARTMENT OF PLANNING AND BUILDING, June 2014). The population is not directly estimated for the District, so it is assumed that the District's population will grow at the same rate as the surrounding region. Historic and projected water demand, population and GPCD are shown in Table 3-3.

The buildout population was also calculated, for comparison, based on identifying the number of future dwelling units in Section 3.2.2 (121 dwelling units) and applying the assumed 1.21 persons per water connection factor to yield 146 additional people, or a buildout population of 508. Because the buildout populations are so close using both population projection methods, the growth rates shown in Table 3-3 are assumed to be reasonable for planning purposes.

Table 3-3. Historical and Future Population and Water Demand

	2010	2015	2020	2025	2030	2035	2040	Buildout
Avila Beach Region Population[1]	1,464	1,508	1,624	1,699	1,830	2,020	2,121	2,204
Avila Beach Region Growth %	N/A	3%	8%	5%	8%	10%	5%	4%
ABCSD Estimated Population	362 [2]	428 [2]	461	482	519	573	602	626
Gallons Per Capita Per Day (GPCD)[3]	183	188	177	177	177	177	177	177
Estimated Water Demand (AFY)	74	76	91	96	103	114	119	124

[1] (SAN LUIS OBISPO COUNTY DEPARTMENT OF PLANNING AND BUILDING, June 2014)

[2] U.S. Census data from the DWR Population Tool

[3] 2010 and 2015 GPCD is based on actual production and population, but 2020-Buildout GPCD is assumed to equal the 2012-2016 average GPCD.

3.2.2 Demand Projections- Parcel Zoning and Development Methodology

An in-depth analysis of the existing zoning and potential development of each parcel within the District was completed for comparison to population based demand estimates described in the previous section. Customer billing records, parcel development data and zoning data was used to develop demand projections by executing the following steps:

1. Identify currently developed parcels that are served by the District and associate them with zoning categories and customer billing data. Group customer billing categories and zoning categories into water use type categories of Residential, Commercial and Other.
2. Identify water demand per water use type that is representative of future water demand (see Section 3.2) and develop water demand factors based on currently available development data (acreage, dwelling units, etc.) that is also available to project future development and associated water demand for each water use type.
3. Identify undeveloped parcels and parcels with potential to be redeveloped. Assign buildout development data to each parcel (acreage, dwelling units, etc.).
4. Apply the water demand factors developed in step 3 to the future development data to determine future demand projections.

GIS was used to identify parcels with and without existing customers located on them and their zoning, which was correlated to customer billing data to establish water use type categories of Residential, Commercial and Other. Because available existing and future development data varied by water use type category, Commercial and Other categories were associated with acreage and the Residential category was associated with dwelling units. While acreage could be used to project development for the Residential category, more specific dwelling unit data was available to project residential development. Because the existing dwelling units were not known for all existing Residential customers, a representative sampling of customers was used to estimate an average water demand per dwelling unit for which the number of dwelling units was known. Table 3-4 shows the water demand factors based on the 2012-2016 average water demand per acre of developed parcel (Commercial and Other categories) and water demand per dwelling unit (Residential category). For an explanation of why the 2012-2016 average water demand was utilized, refer to Section 3.2.

Table 3-4. Water Demand Factors by Water Use Type

Water Use Type	Average Water Demand 2012-2016 (gpd)	Developed Acres	Water Demand Factor	
			gpd	per unit
Residential[1]	NA		204	per dwelling unit
	28,308	20	1,385	per acre
Commercial	32,758	8	4,240	per acre
Other	11,622	12	945	per acre

[1] The water demand factor for future Residential development is measured in gpd per dwelling unit and the water demand factor for existing development is measured in gpd per acre because the total amount of dwelling units for all currently developed parcels is unknown. The gpd per dwelling unit factor was calculated using a representative sample of existing customers for which the number of dwelling units was known.

The water demand factors shown in Table 3-4 can be applied to future development projections of acreage and dwelling units per parcel to determine future water demand. Future demands must capture expected demands for existing customers, demands for new development on vacant parcels and demands for redevelopment of currently developed parcels. With District staff guidance, parcels with specific development projections were identified based on discussions

with County Planning and Building Department staff, received inquiries about potential water service connections, and standards from the County's Land Use Ordinance as shown in Figure 3-3.

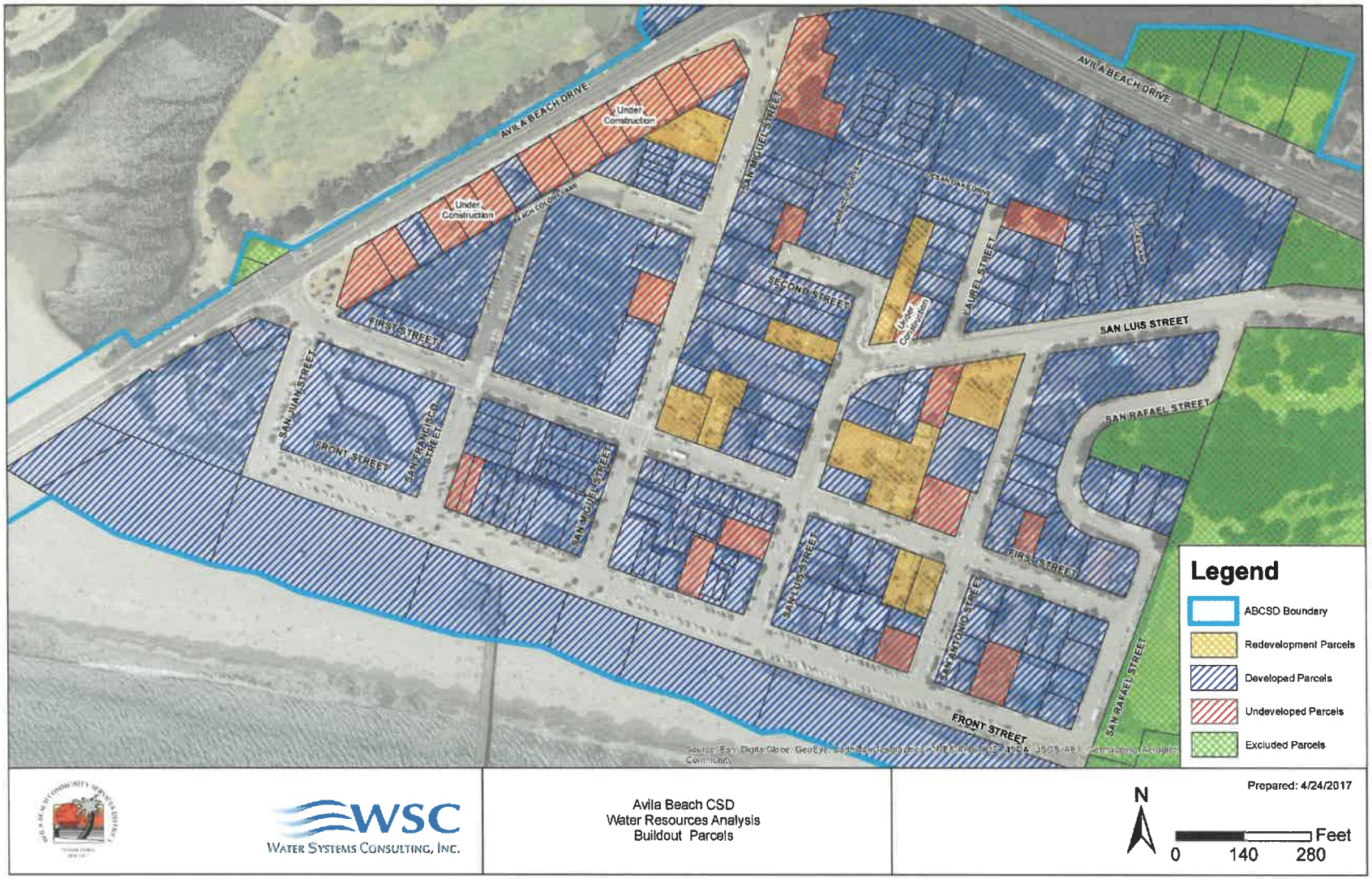

Figure 3-3. Buildout Parcels Map

Figure 3-3 shows the assumed buildout parcels that were assigned development projection units based on the water demand factors summarized in Table 3-4. Table 3-5 summarizes the total development projection units for each water use type for existing customers on currently developed parcels, potential future customers on undeveloped parcels, and potential future customers on currently developed parcels with the potential for redevelopment.

Table 3-5. Development Projection Units

Water Use Type	Developed Parcels	Undeveloped Parcels		Redevelopment Parcels		Buildout Parcels	
	acres	acres	dwelling units	acres	dwelling units	acres	dwelling units
Residential[1]	20	NA	64	3	58	17	122
Commercial	8	1	NA	0	NA	8	NA
Other	12	0	NA	0	NA	12	NA
Total	**40**	**1**	**64**	**3**	**58**	**37**	**122**

[1] The development unit used for future Residential development is measured in dwelling units and the development unit for existing development is measured in acres because the total amount of dwelling units for all currently developed parcels is unknown. Additionally, the acreages of Redevelopment Parcels with potential redevelopment dwelling units were subtracted from the Developed Parcels acreage to yield the net acreage for Buildout Parcels.

Table 3-6 shows estimated future water demands by water use type based on the water demand factors in Table 3-4 and projected buildout development units in Table 3-5. Table 3-7 shows water demands from 2020 through buildout assuming demands grow at the same rate as the population growth rate for the Avila Beach region from the County's Housing Element 2014-2019 as described in Section 3.2.1.

Table 3-6. Future Water Demand by Water Use Type

Water Use Type	Developed Parcels Demand (AFY)	Undeveloped Parcels Demand (AFY)	Redevelopment Parcels Demand (AFY)	Buildout Parcels Water Demand (AFY)
Residential	28	15	13	56
Commercial	37	3	0	39
Other	13	0	0	13
Total	**77**	**18**	**13**	**108**

Table 3-7. Future Water Demand by Water Use Type- 2020-Buildout

Water Use Type	Developed Parcels Demand (AFY)	2020 Demand (AFY)	2025 Water Demand (AFY)	2030 Water Demand (AFY)	2035 Water Demand (AFY)	2040 Water Demand (AFY)	Buildout Water Demand (AFY)
Residential	28	32	36	41	49	53	56
Commercial	37	37	37	38	39	39	39
Other	13	13	13	13	13	13	13
Total	**78**	**82**	**86**	**92**	**101**	**105**	**108**

The parcel by parcel analysis is assumed to be more accurate than the per capita analysis for planning purposes because of the detailed data available per parcel. Therefore, the demands used in Section 5.2 reflect the projections from the parcel based methodology.

4 Water Supply Characterization

4.1 Existing Supply

The District's water supply consists of surface water from Lopez Reservoir (Lopez) and the State Water Project (SWP). The District is entitled to 68 AFY of Lopez Water through a contract with the San Luis Obispo County Flood Control and Water Conservation District (SLOCFC&WCD) and CSA 12. The District also has a 100 AFY allocation of Table A SWP water and 100 AFY of SWP drought buffer through the SLOCFC&WCD, providing a total maximum deliverable allocation of 168 AFY. SWP Water is rarely allocated at 100% to SWP Contractors, so the drought buffer is used to supplement reduced allocations, but the maximum deliverable allocation cannot exceed 100 AFY for reasons described in Section 5.1.1. All groundwater within the District's service area is relatively high in total dissolved solids (TDS) due to seawater influence. The District's historical Lopez and SWP deliveries, allocation percentages and available allocation volumes are shown in Figure 4-1.

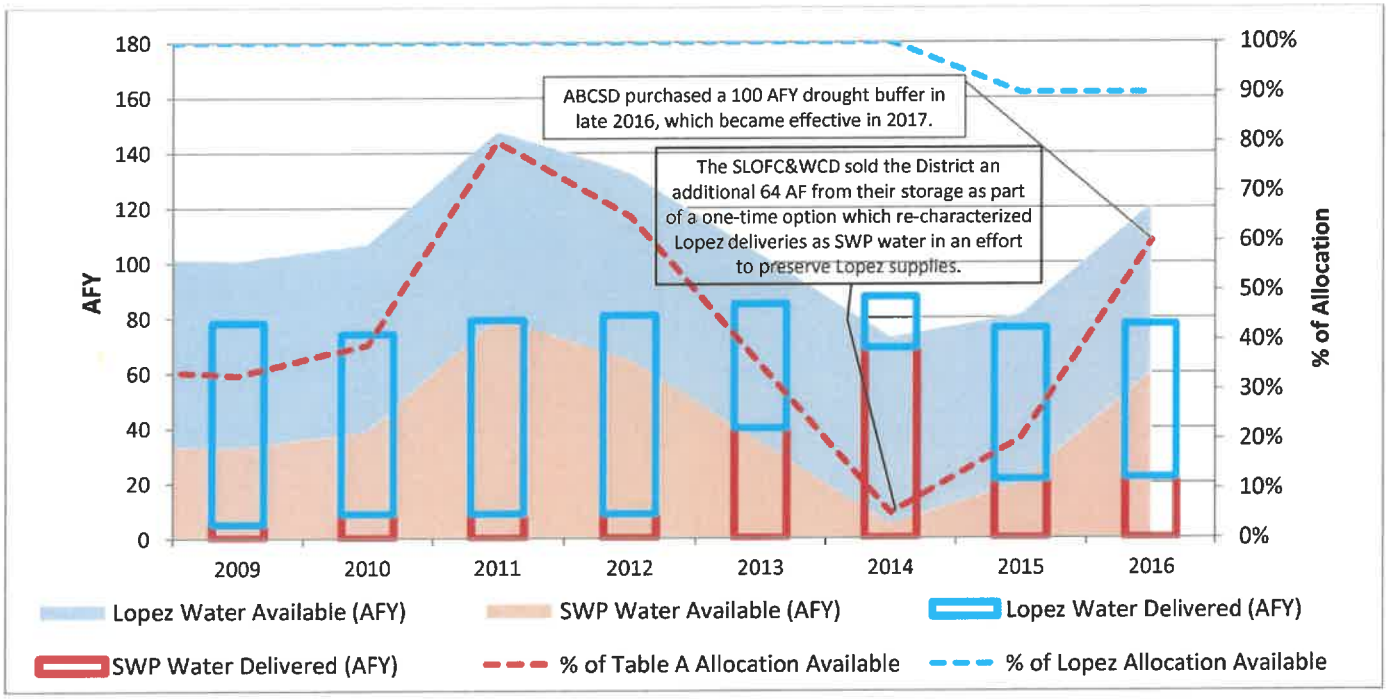

Figure 4-1. Historical SWP Table A Allocations and Deliveries to the District

4.1.1 SWP & Lopez Water Treatment and Conveyance

The District is a subcontractor to the SLOFC&WCD for 100 AFY of SWP water and 100 AFY of SWP drought buffer water (effective as of January 2017) in addition to being a subcontractor to CSA 12 for 68 AFY of Lopez water. The Coastal Branch of the SWP conveys water from the California Aqueduct to San Luis Obispo and Santa Barbara Counties. Water in the Coastal Branch pipeline is treated at the Polonio Pass Water Treatment Plant. SWP water from the Coastal Branch is delivered to the District through the Lopez pipeline, which is connected to the Coastal Branch near the intersection of Orcutt Rd. and Lopez Dr. From this connection, SWP water is conveyed to the Lopez Water Treatment Plant where it discharges into the potable water clearwell. Raw Lopez water is also conveyed in a separate pipeline from Lopez Reservoir to the Lopez Water Treatment Plant for treatment and discharge to the clearwell. Treated Lopez and SWP water is delivered through the Lopez pipeline. The Lopez pipeline consists of approximately 13 miles of pipeline and terminates in Port San Luis Obispo. Using the Lopez pipeline, the SLOFC&WCD delivers SWP water to the following SWP subcontractors: City of Pismo Beach; Oceano Community Services District (OCSD); San Miguelito Mutual Water Company

(SMMWC); Avila Beach Community Services District (District); Avila Valley Mutual Water Company (AVMWC); and the San Luis Coastal Unified School District. The Lopez contract agencies include the Cities of Arroyo Grande, Pismo Beach, Grover Beach, and communities of Oceano (OCSD) and Avila Beach (CSA 12). CSA 12 includes Avila Beach CSD and Port San Luis Harbor District, as well as additional small water systems and individual property owners located in the Avila Beach region. Figure 4-2 shows a schematic representation of the Lopez pipeline.

Figure 4-2. Lopez Pipeline

4.1.2 SWP Water

The contracts between the California Department of Water Resources (DWR) and the 29 SWP water contractors define the terms and conditions governing the water delivery and cost repayment for the SWP. SWP Table A is an exhibit to these contracts. All water-supply related costs of the SWP are paid 100% by the contractors, and SWP Table A serves as a basis for allocating some of the costs among the contractors. In addition, SWP Table A plays a key role in the annual allocation of available supply among contractors. When the SWP was being planned, the amount of water projected to be available for delivery to the contractors was 4,173 million acre feet per year. This was referred to as the maximum project yield. It was recognized that in some years the project would be unable to deliver that amount, and in other years project supply could exceed that amount. The SWP Table A amount was used as the basis for apportioning available supply to each contractor and as a factor in calculating each contractor's share of the SWP's costs. There are other contract provisions that permit changes to an individual contractor's SWP Table A allocation under special circumstances.

Every year, DWR conducts modeling studies of the SWP system to determine the annual allocation, or percentage of the amount of Table A that can be delivered by the SWP system. This allocation is revised throughout the year as hydrologic conditions and other factors change.

SLOFC&WCD's SWP Table A contract amount is 25,000 AFY (Department of Water Resources, 2003). The Central Coast Water Authority (CCWA) and SLOFC&WCD have entered into a Master Water Treatment Agreement, which defines the available capacity for treatment and conveyance for SLOFC&WCD as 4,830 AFY (1992). Since SLOFC&WCD has a higher Table A amount than the treatment and conveyance capacity in the Coastal Branch, they can use this "excess allocation" to improve reliability for their subcontractors. The District added 100 AFY of drought buffer to their 100 AFY Table A allocation in late 2016 that became effective in January 2017. SLOFC&WCD's SWP subcontractor allocations are summarized in Table 4-1.

Table 4-1. SLOFC&WCD SWP Allocation Summary (San Luis Obispo County Flood Control and Water Conservation District Zone 3, January 20, 2017)

	SWP Allocations (AFY)		
SWP Sub-Contractor	Water Service Amount	Drought Buffer (Supply)	Total Reserved
Chorro Valley Turnout			
Morro Bay, City of	1,313	2,290	3,603
California Men's Colony	400	400	800
County Operations Center	425	425	850
Cuesta College	200	200	400
Subtotal 1	***2,338***	***3,315***	***5,653***
Lopez Turnout			
Pismo Beach, City of	1,240	1,240	2,480
Oceano CSD	750	750	1,500
San Miguelito MWC	275	275	550
Avila Beach CSD	100	100	200
Avila Valley MWC	20	60	80
San Luis Coastal USD	7	7	14
Subtotal 2	***2,392***	**2,432**	**4,824**
Shandon	100	-	100
Subtotal 3	***100***	***0***	***100***
Total	**4,830**	**5,747**	**10,577**
SLO County Table A Allocation			*25,000*
"Excess Allocation"			**14,423**

4.1.3 Lopez Water Supply

The Lopez Project was constructed in 1968/69 and is operated by SLOFC&WCD Zone 3 (Zone 3). The Lopez Project has historically been a very reliable source of water supply. The reservoir's total capacity is 51,990 AF with a storage capacity of 49,200 AF. The annual safe yield of the reservoir is 8,730 AFY with 4,530 AFY apportioned to contract agencies and the remaining 4,200 AFY reserved for downstream releases to maintain environmental and agricultural flows downstream. In years when less water is required to be released downstream in the Arroyo Grande Creek, additional water (known as surplus water) may be available to the Zone 3 member agencies, which include the Cities of Arroyo Grande, Grover Beach, Pismo Beach, the OCSD and CSA 12, which includes the District.

Storage at the end of 2015 was 13,847 AF, or 28%, of total storage capacity. From the 4,530 AFY of entitlements, Lopez provides a contractual supply of 68 AFY to the District, except for years when reservoir storage is below 15,000 AF, such as 2015. More details about the reliability of Lopez water is described in Section 5.1.2. Table 4-2 shows the contracted entitlements for municipal users of Lopez water.

Table 4-2. Lopez Treatment and Distribution System Contract Entitlements

Water Contractor	Lopez WTP Water Supply Annual Entitlement (AFY)
Arroyo Grande	2,290
Oceano CSD	303
Grover Beach	800
Pismo Beach	892
CSA 12 Total	245
Avila Valley MWC Subtotal	*12*
San Miguelito MWC Subtotal	*4*
Avila Beach CSD Subtotal	*68*
Port San Luis Subtotal	*100*
Other CSA 12 Customers Subtotal	*61*
TOTAL	**4,530**

5 Supply Reliability

5.1 Supply Reliability by Source

The relative reduction in available supplies during dry water years is variable, and depends on the projected reductions from each specific water source.

5.1.1 SWP Water

Contracted Table A allocations vary annually due to hydrologic variability, maintenance and repairs. During the recent drought, the SWP Table A allocation dropped as low as 5% in 2014. To combat this problem, SLOCFC&WCD has developed a drought buffer system where water purveyors can purchase SCLOCFC&WCD's excess state water allocation. Drought buffer water is water that has no pipeline capacity for delivery. Rather, it is used to increase deliveries when Table A allocations are less than 100%. For example, if Table A allocations were 50% of contracted amounts, the District would receive 50 AFY of water without a drought buffer, but would receive an additional 50 AFY with a 100 AFY drought buffer. The District purchased a 100 AFY drought buffer in late 2016 to supplement their Table A allocation of SWP water.

DWR's *SWP 2015 Final Delivery Capability Report* estimates that the long-term average of Table A deliveries under historical conditions was approximately 62% of the maximum Table A amount (California Department of Water Resources, July 2015). The maximum delivery is estimated to be 98% and the minimum delivery is estimated to be 11%. The long-term average of 62% is assumed to be the average year supply available for the District's Table A allocation and drought buffer, or 100 AFY of deliverable supply. However, the likelihood that 62% of the maximum Table A amount is available varies in single dry and multiple dry years as shown in Figure 4-1. Single dry and multiple dry years are based on the lowest historical SWP percentage allocations applied to the District's 100 AFY and 100 AFY of drought buffer. The percentages for these years are 5% in 2014, and 15%, 5% and 20% for 2013-2015 respectively.

5.1.2 Lopez Water

The reliability of the District's Lopez Water allocation is determined by local hydrologic conditions and is governed by the contracts between the SLOFC&WCD and the Zone 3 member agencies. According to the Zone 3 2015 UWMP, Lopez is a very reliable source of water with an annual safe yield of 8,730 AFY. The Low Reservoir Response Plan (LRRP) was adopted in December 2014 and enacted in April 2015 when reservoir storage went below 20,000 af. The enactment of Stage 2 of the LRRP resulted in approximately a 10% decrease in municipal diversions and downstream releases as shown in Table 5-1 and Table 5-2. The Zone 3 2015 UWMP projects that municipal entitlements will remain constant at

4,530 AFY through 2035 under normal conditions, and that it will be able to supply all contracted agencies with their requested allocations in full during single dry years and multiple dry years until the fourth dry year (Wallace Group, June 2016). For planning purposes, it is assumed that water supply from Lopez Water during dry water years will meet the District's full allocation of 68 AFY, except in the third year of multiple dry years when it will be reduced by 10% to 61.2 AFY.

Table 5-1. Initial Prescribed Municipal Diversion Reduction Strategy Under the LRRP

Amount of Water in Storage (AF)	Municipal Diversion Reduction	Municipal Diversion (AFY)[1]
20,000	0%	4,530
15,000	10%	4,077
10,000	20%	3,624
5,000	35%[2]	2,941
4,000	100%	0

[1] The actual amount of water diverted may vary as agencies extend the delivery of their Lopez Entitlement.
[2] The 35% reduction provides sufficient water to supply 55 gallons per capita per day (GPCD) for the estimated population of the Zone 3 agencies (47,696 in 2010 per the 2010 Zone 3 UWMP). 55 GPCD is the target residential indoor water usage standard used in California Department of Water Resource's 2010 UWMP Method 4 Guidelines.

Table 5-2. Initial Prescribed Downstream Release Reduction Strategy Under the LRRP

Amount of Water in Storage (AF)	Downstream Release Reduction	Downstream Releases (AFY)[1]
20,000	9.5%	3,800
15,000	9.5%	3,800
10,000	75.6%	1,026
5,000	92.9%	300
4,000	100.0%	0

[1] These downstream releases represent the maximum amount of water that can be released. Actual releases may be less if releases can be reduced while still meeting the needs of the agricultural stakeholders and addressing the environmental requirements. (3, December 16, 2014)

5.1.2.1 Surplus Lopez Water

Historically, the District and other contracted agencies have received surplus water from Lopez depending upon yearly requirements for downstream release. The SLOCFC&WCD monitors the potential for surplus water availability consistent with the water supply agreement. For planning purposes, surplus water is not included as a reliable supply. The LRRP includes provisions for the Zone 3 agencies to extend the delivery of their Lopez water supplies while the LRRP is in effect. This in essence allows the Zone 3 agencies to carry over their unused Lopez supplies, minus evaporation, when under the LRRP.

5.1.3 Factors Affecting Supply Reliability

There are a variety of factors that can impact water supply reliability. The District relies solely on surface water, which is vulnerable to legal, environmental and climatic factors as shown in Table 5-3. The legal factors include the contractual obligations of Lopez water. Some environmental factors include the Endangered Species Act incidental take authorization requirements for steelhead and red-legged frogs downstream from the Lopez Water. For more information, see Section 5.1.3.2. Some climatic factors include extended drought conditions that could affect availability of Lopez and the SWP water supplies.

Table 5-3 Factors Affecting Water Supply Reliability

Water Supply Sources	Legal	Environmental	Water Quality	Climatic
Lopez Water	X	X		X
SWP Water		X		X

5.1.3.1 Legal Factors

The SLOCFC&WCD is in discussions with the SWRCB regarding obtaining an amended water rights permit for its operation of Lopez. The current permit only allows for "diversion to storage" and not "direct diversion". Currently, the Lopez Water utilizes "direct diversion" as part of its normal operations. The SLOCFC&WCD is requesting a time extension on its original permit to allow it to submit its application for an amended permit that would allow for "direct diversion". However, an amended permit cannot be obtained without a Habitat Conservation Plan (HCP), which is described in the Environmental Factors section below.

California's water rights system affects the SWP indirectly. The priority of an appropriative water right in California is subordinate to all prior water rights, whether appropriative or riparian. Therefore, if another entity increases its use on a SWP water supply source (i.e. the Delta, the upstream Sacramento or San Joaquin River, or a tributary to either river) the overall amount of water availability to the SWP will decline.

5.1.3.2 Environmental Factors

The District's surface water supply from the SWP has the potential to be affected by environmental issues, particularly involving the Delta Smelt in the Sacramento-San Joaquin Delta issues. SWP pumping capacities were reduced as a result of the May 2007 federal court ruling to protect Delta smelt. However, the District and other local SWP users have not been negatively affected to date by reduced SWP supplies since the District's Table A allocations to its subcontractors are typically fulfilled, even in dry years. This is due to the SLOFC&WCD's maintenance of excess, unused SWP entitlement. Therefore, even when SWP supplies are decreased, the SLOFC&WCD's excess SWP entitlement provides a buffer so that contracted volumes to water purveyors, like the District, may still be provided in full. However, it is possible that the Delta's fragile ecosystem, along with severely decreased precipitation patterns, may affect SWP supply reliability for the District at some point in the future. Additionally, at some point in the future the SLOFC&WCD's excess allocation, which does not include the District's drought buffer, may be sold to other parties and not available to the existing subcontracts for supply reliability.

Surface water from the Lopez Reservoir is a generally reliable water supply source for the District. However, deliveries have the potential to be affected by the presence of steelhead trout and the California red-legged frog that utilize the Arroyo Grande Creek watershed downstream of Lopez Dam, and are considered threatened species under the Federal Endangered Species Act. The Endangered Species Act permits non-federal entities to obtain incidental take authorization for protected species by developing a Habitat Conservation Plan (HCP). As of February 2015, the SLOFC&WCD initiated a new draft of the HCP that incorporates an updated model. The HCP update is still under development at the time of preparation of this TM. It is anticipated that a new downstream release program will be proposed to the environmental regulatory agencies in the near future (7). The HCP, in conjunction with contractual water supply obligations to the Zone 3 member agencies and releases for downstream users, is intended to maintain protection of steelhead, red-legged frog, and habitat enhancement for other environmentally sensitive biota.

5.1.3.3 Water Quality Factors

It is not anticipated that water quality will affect water management strategies and/or supply reliability for Lopez except possibly at very low Lopez water levels. In 2015, the State Water Resources Control Board (SWRCB) completed a Sanitary

Survey Report for Lopez Project and concluded no contaminants within the water supply, however the source was vulnerable to activities located near the drinking water source. The San Luis Obispo County (County) issued a Waterline Disinfection Procedures in 2015 to outline minimum requirements for disinfection and testing of new and repaired potable water mains.

The primary water quality factors affecting SWP supply reliability sources are from its main reservoir, the Delta. Because the Delta is an estuary, salinity levels are a water quality concern. The SWP monitors their operations to ensure compliance with regulatory standards.

5.1.3.4 Climatic Factors

Climatic factors affecting the reliability of a given water supply system generally are a function of seasonal precipitation and runoff characteristics. As such, limited recharge and/or drought conditions pose threats to availability of the District's surface water supplies.

California has experienced below-average precipitation and runoff since approximately 2006, resulting in reduced storage in SWP reservoirs. In response, DWR has continued to limit SWP allocations to contractors. However, the SLOFC&WCD's current condition of excess allocation has resulted in the District continually receiving its contracted allocation in full. Climate change may reduce the SWP's median reservoir carryover storage. Carryover water is the SWP's backup water supply used only during periods of supply shortage. This shortage would reduce the flexibility in the systems during critically dry years.

5.2 Supply & Demand Comparison in Average & Dry Conditions

5.2.1 Historic and Future Conditions

This section considers the District's water supply reliability during three climate-related water scenarios, or water year types: normal year, single dry year, and multiple dry years. This methodology of estimating supply reliability was developed by DWR for urban water suppliers' Urban Water Management Plans (UWMPs) and is considered an industry standard. These water year types are defined as follows:

Normal Year: The normal year is a year, or an averaged range of years, in the historical sequence that most closely represents mean rainfall and recharge levels and patterns, or available supply. It is defined as the mean usable supply available based on historical average conditions for each supply source.

Single Dry Year: This is defined as the year with the minimum useable supply. The supply quantities for this condition are derived from the minimum historical allocations available for each supply source.

Multiple Dry Years: This is defined as the three (or more) consecutive years with the minimum useable supply. Water systems are more vulnerable to these droughts of long duration, because they deplete water storage reserves in local and state reservoirs. The supply quantities for this condition are derived from the minimum of historical three-year running average yields.

5.2.2 Basis of Water Year Types

Historic SWP and Lopez allocations based on hydrologic records analyzed by DWR and the SLOFC&WCD were examined to establish a basis of historical normal year, and historical supply allocations were used to establish a basis of single dry and multiple dry years as shown in Table 5-4 and Table 5-5.

Table 5-4. Basis of Water Year Types

Supply Source	Average/ Normal Year [1]	Single Dry Year [2]	Multiple Dry Years[2]		
State Water Project	1921-2003	2014	2013	2014	2015
Lopez Reservoir	1991-1992	2015	2014	2015	2016

Notes:
1. Normal year supplies are based on current contractual agreements and historical allocations with the SWP and Lopez Project, and the Zone 3 Final Urban Water Management Plan Update 2015 (Wallace Group, June 2016).
2. Single and Multiple Dry values are based on actual SWP Table A allocation percentages from 2013-2015 applied to the District's Table A allocation and drought buffer, and Lopez allocations for 2014-2016.

Table 5-5. Historical Water Supply Conditions

Supply Source	Average/ Normal Year (AFY) [1]	Single Dry Year (AFY) [2]	Multiple Dry Years (AFY)[2]		
			Year 1	Year 2	Year 3
State Water Project	100	10	70	10	40
Lopez Reservoir	68	61.2	68	61.2	61.2
Total	**168**	**71**	**138**	**71**	**101**
Percent of Normal		**42%**	**82%**	**42%**	**60%**

Notes:
1. Normal year supplies are based on current contractual agreements and historical allocations with the SWP and Lopez Project, and the Zone 3 Final Urban Water Management Plan Update 2015 (Wallace Group, June 2016).
2. Single and Multiple Dry values are based on actual SWP Table A allocation percentages from 2013-2015 applied to the District's Table A allocation and drought buffer, and Lopez allocations for 2014-2016.

5.2.3 *Projected Normal Year Supply/Demand*

The normal year water demands through buildout are estimated based on the demands summarized in Section 3.2.2. The projected normal water year water supply and demand projections are provided in Table 5-6. The available supplies during a normal year represent 100 percent of the available supplies discussed in Section 4.

Table 5-6. Supply and Demand – Normal Year

Supply/Demand Condition	Projected Supply/Demand (AFY)					
	2020	2025	2030	2035	2040	Buildout
Supply Totals	168	168	168	168	168	168
Demand Totals	82	86	92	101	105	108
Supply and Demand Difference	**86**	**82**	**76**	**67**	**63**	**60**
Difference as Percent of Supply	**51%**	**49%**	**45%**	**40%**	**38%**	**35%**

5.2.4 *Projected Single Dry Year Supply/Demand*

The projected single dry year water demands through buildout are equivalent to normal year demands, assuming that water demands do not change as a result of dry conditions. The anticipated supply decrease during a single dry year, compared to a normal year, is based on the actual water supply from 2014 for SWP and 2015 for Lopez and assumes that additional supplies from stored, surplus or excess allocation are not available from the SWP or Lopez. As shown in Table 5-7, the District's supplies are consistently less than projected demands during single-dry year conditions.

Table 5-7. Supply and Demand Comparisons – Single Dry Year

Supply/Demand Condition	Projected Supply/Demand (AFY)					
	2020	2025	2030	2035	2040	Buildout
Supply Totals	71	71	71	71	71	71
Demand Totals	82	86	92	101	105	108
Supply and Demand Difference	**-11**	**-15**	**-21**	**-30**	**-34**	**-37**
Difference as Percent of Supply	**-17%**	**-21%**	**-29%**	**-41%**	**-47%**	**-52%**

5.2.5 Projected Multiple Dry Year Supply/Demand

The projected multiple dry year water demands through buildout are equivalent to normal year demands, assuming that water demands do not change as a result of dry conditions. The anticipated supply decrease during a multiple dry years period, compared to a normal year, is based on the actual water supply from 2013 through 2015 for State water and 2014-2016 for Lopez water and assumes that additional supplies from stored, surplus or excess allocation are not available from the SWP or Lopez. As shown in Table 5-8, the District's supplies are above and below projected demands during multiple-dry year conditions.

Table 5-8. Supply and Demand Comparison - Multiple Dry Year Events

Supply/Demand Condition	Projected Supply/Demand (AFY)					
	2020	2025	2030	2035	2040	Buildout
Year 1						
Supply Totals	138	138	138	138	138	138
Demand Totals	82	86	92	101	105	108
Supply and Demand Difference	56	52	46	37	33	30
Year 2						
Supply Totals	71	71	71	71	71	71
Demand Totals	82	86	92	101	105	108
Supply and Demand Difference	-11	-15	-21	-30	-34	-37
Year 3						
Supply Totals	101	101	101	101	101	101
Demand Totals	82	86	92	101	105	108
Supply and Demand Difference	19	15	9	0	-4	-7

5.3 Recommendations

Based on the analysis described in the previous sections, WSC recommends that the District continue to assess opportunities to bolster and diversify its supply portfolio to ensure reliability during dry years. The District's potential supply opportunities may include new sources, such as recycled water or desalinated water, and new allocations of existing sources through transfers or agreements with neighboring water suppliers. Other potential mechanisms to address supply shortages may include enhancing conservation programs or the District's Water Shortage Response and Management Plan to target specific demand reductions under various supply condition scenarios.

6 References

3, San Luis Obispo County Flood Control and Water Conservation District Zone. December 16, 2014. *Low Reservoir Response Plan.* December 16, 2014.

California Department of Water Resources. July 2015. *The State Water Project Final Delivery Capability Report 2015.* July 2015.

Central Coast Water Authority. The State Water Project in Santa Barbara County. *CCWA website.* [Online] http://www.ccwa.com/history/index.html.

Department of Water Resources. 2003. Contract between the State of California Deparment of Water Resources and San Luis Obispo County Flood Control and Water Conservation District for a Water Supply. 2003.

1992. *Master Water Treatment Agreement Between the Central Coast Water Authority and the San Luis Obispo County Flood Control and Water Conservation District.* 1992.

Montgomery Watson. 1998. *Operations Manual for the Central Coast Water Authority, Coastal Branch Treated Water Aqueduct.* 1998.

SAN LUIS OBISPO COUNTY DEPARTMENT OF PLANNING AND BUILDING. June 2014. *Housing Element 2014-2019 County of San Luis Obispo General Plan.* June 2014.

San Luis Obispo County Flood Control and Water Conservation District Zone 3. January 20, 2017. *LOPEZ PROJECT BRIEFING BOOK.* January 20, 2017.

Wallace Group. June 2016. *Zone 3 Urban Water Management Plan 2015 Update.* s.l. : San Luis Obispo County Flood Control and Water Conservation District, June 2016.