

EXECUTIVE SUMMARY

In July 2011, Zone 7 Water Agency (Zone 7) completed an evaluation of its long-term water supply (2011 WSE) to provide background for and facilitate preparation of Zone 7's Urban Water Management Plan (UWMP) and other agency planning efforts. The key assumptions, approach, analysis, and results were thoroughly vetted with the Livermore-Amador Valley's¹ local water supply retailers.

The 2011 WSE identified three potential water supply portfolios (Current Plan [i.e., California WaterFix], In-Valley [i.e., expanding planned recycled water], and Intertie [increasing imported water]) to help guide future water supply investments. The Current Plan was chosen as the preferred alternative. However, since that time, the Livermore-Amador Valley, and California at large, has been experiencing a severe drought.

The current drought underscored the need to update key assumptions made in Zone 7's 2011 WSE.

Update Includes New Data and Assumptions for Zone 7's Existing Water Supplies

As part of this evaluation, Zone 7 included updated and more conservative assumptions for State Water Project (SWP) allocations, revised key assumptions for existing supplies from Byron Bethany Irrigation District (BBID) and capacity of its Kern County groundwater banking programs, and evaluated a complete loss of the Delta due to earthquake or water quality. This evaluation also incorporated potential delays in transferring ownership of the Chain of Lakes to Zone 7 and for the first time, included an analysis of local climate change.

Update Includes Revised Projected Water Demands

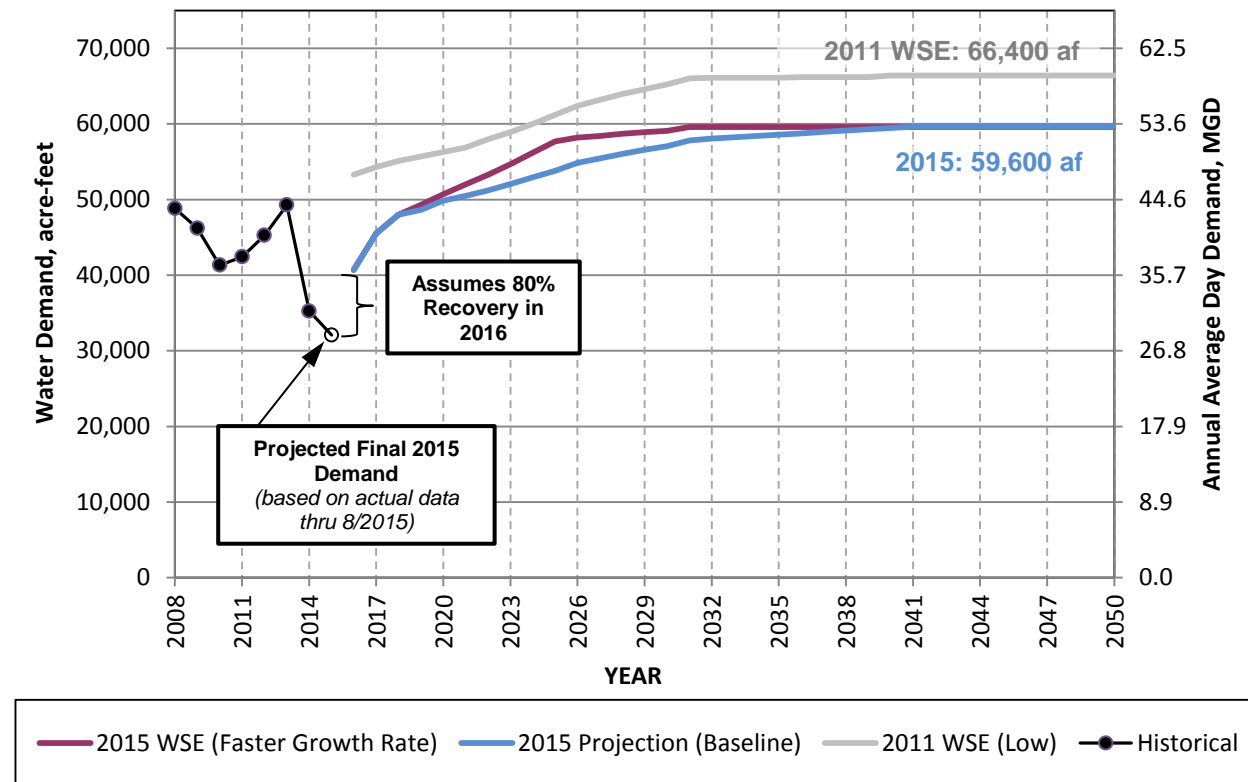
Zone 7 staff (Staff) worked closely with its local water supply retailers to revise projected water demands on Zone 7's water system, and evaluated both a "baseline" and "faster" growth rate to help account for uncertainty in some of the projections. Figure ES-1 compares the 2015 water demand estimates to both historical water demand and the estimates used in the 2011 WSE.

1 Livermore-Amador Valley, as defined in this report, refers to the cities of Livermore, Pleasanton, and Dublin. Zone 7 also serves, portions of San Ramon referred to as Dougherty Valley under a special agreement Dublin San Ramon Services District.



As shown in Figure ES-1, the 2015 projections are significantly higher than current demands and significantly lower than projections made as part of the 2011 WSE. Water demands in 2014 and 2015 are lower because of the Tri-Valley’s successful response to water use reductions put in place by Zone 7 and the local water supply retailers in 2014, and continued through a mandate by the State of California in 2015. The 2015 projections are lower than the 2011 projections due to new recycled water projects and water conservation programs being implemented by the local water supply retailers.

Figure ES-1. Updated Projected Water Demands on Zone 7’s Water System



Updated List of Feasible Water Supply Options

As part of the 2011 WSE, Staff worked with the local water supply retailers to develop an extensive list of potential water supply options for the Livermore-Amador Valley. The detailed list was included as Appendix G of the 2011 report. In preparing this update, staff reviewed each water supply option from 2011 and then met with all of its local water supply retailers to discuss which options on the list should be included in potential portfolios for this update and whether others should be added. Staff, with input from the local retailers, reduced the number of options available for building water supply portfolios to include only those that had at least

1,000 AF of supply and did not require end user compliance or ongoing enforcement.^{2,3} Projects with active partnerships (e.g., Bay Area Regional Desalination) were also included. Table ES-1 summarizes the water supply options used in this evaluation.

Table ES-1. Summary of Water Supply Options Used

Water Supply Option	Average Annual Yield, AFA	Average Annual Yield, MGD	Total Unit Cost, \$/AF
California WaterFix <i>(i.e., BDCP or Delta Fix)</i>	18,100 ^(a)	16.2	\$470
Regional Desalination	5,600	5	\$1,500 to \$2,100
Purified Recycled Water	4,800 to 7,770	4.3 to 6.9	\$1,500 to \$2,000

^(a) Incremental average water supply yield from improved SWP reliability if long-term average allocations increase from 48.5% to 71%.

Consideration of Facilities that Reduce Risk of Water Supply Shortage

As part of the 2011 WSE, Staff worked with the local water supply retailers to develop an extensive list of potential facilities or programs that would help reduce the risk of water supply shortages during droughts, Delta outages due to earthquakes or salinity, and emergency conditions (e.g., temporary loss of the South Bay Aqueduct or unplanned water treatment plant shutdowns). The detailed list was included as Appendix G of the 2011 report.

Staff worked with the local water supply retailers to reduce the list to five key facilities or programs. Table ES-2 summarizes the facilities and programs used in this evaluation. Note that the projects listed in Table ES-2 do not change water supply (except for California WaterFix), but help to leverage existing and/or planned water supplies.

² Zone 7 cannot rely on water supply options that require the end user (e.g., homes and businesses) to properly maintain and operate their own system for meeting projected long-term water demands; Zone 7 has no legal authority or funding to enforce the use of such systems.

³ Two examples of water supply options that require end user compliance and not included in portfolio analysis are greywater and rainwater capture systems.

Table ES-2. Summary of Facilities or Programs Used

Facility or Program	Description	Benefit	Estimate Cost, \$M
California WaterFix	Proposed water delivery upgrade for the State and Federal water projects that includes underground tunnels and state of the art fish screens.	In addition to water supply, the underground tunnels will help protect the Tri-Valley's largest source of supply from disruptions due to failure of levees in the Delta during earthquakes, sea level rise, or floods.	\$320
Reliability Intertie <i>(already in CIP)</i>	A 24-inch pipeline connecting Zone 7 with another major water agency.	Allows Zone 7 the opportunity to acquire emergency water supplies during rare events (e.g., earthquake).	\$24
Chain of Lakes Pipeline <i>(already in CIP)</i>	A 36-inch diameter pipeline from Cope Lake to Del Valle Water Treatment Plant (~6 miles) and a 12 MGD pump station.	Allows Zone 7 the ability to recharge the local groundwater basin, help perfect local water rights, and meet demands with stored water in the Chain of Lakes during catastrophic events (e.g., loss of the Delta).	\$32
Los Vaqueros Storage	Program stores a portion of SWP water, typically sent to Cawelo or Semitropic, in Los Vaqueros Reservoir.	Program might shore up available drought and emergency water supplies by providing alternative storage north of Zone 7's service area assuming the SBA is still operating or if the reliability intertie were in place.	\$3.5
Well Master Plan Wells	New wellfields constructed within the Livermore Valley Groundwater Basin	Provides access to additional groundwater storage.	\$53.7

Revised Portfolios

Staff worked with the local water supply retailers to combine the programs and projects listed in Tables ES-1 and ES-2 into four portfolios (Current Plan and Portfolios A through C). Table ES-3 presents each portfolio.

Table ES-3. Programs and Projects Included in Each Portfolio

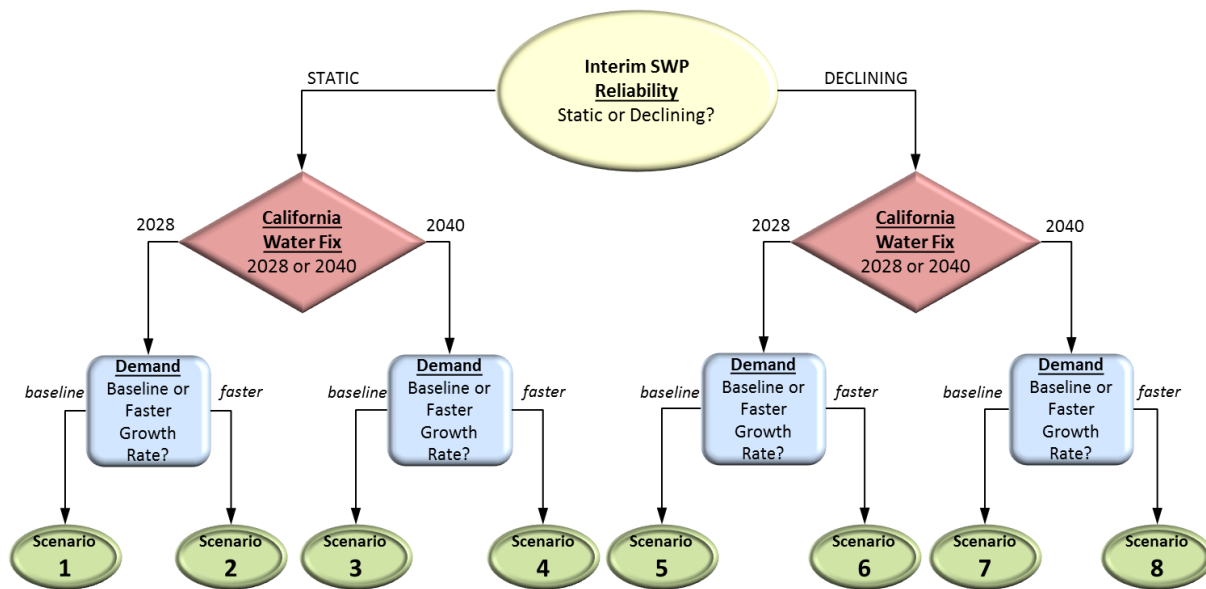
Option		Portfolio			
		Current Plan	A (Desalination)	B (Purified Recycled Water)	C (Desalination & Purified Recycled Water)
Water Supply Options	California WaterFix <i>(i.e., BDCP or Delta Fix)</i>	✓	✓	✓	✓
	Bay Area Regional Desalination		✓		✓
	Purified Recycled Water			✓	✓
Facilities	Chain of Lakes Pipeline	✓	✓	✓	✓
	Reliability Intertie	✓	✓	✓	✓
	Well Master Plan Wells	✓	✓	✓	✓
	Los Vaqueros Storage		✓	✓	✓



Eight Scenarios used for Analysis

Although the future yield from Zone 7's existing water supplies depend on many variables, three have the largest influence on determining future water supply needs: (1) interim reliability of the State Water Project until completion of the California WaterFix; (2) timing of the California WaterFix; and (3) projected water demands. Unlike the analysis completed in 2011, which looked at a static interim reliability of the State Water Project, a defined year for completion of the California WaterFix, and one set of projected water demands, this update used an expanded approach, evaluating several different outcomes for all three conditions. As shown in Figure ES-2, this resulted in eight scenarios.

Figure ES-2. Scenarios Used for Portfolio Analysis



Five Core Metrics and Three Lower Priority Metrics

Three key components within Zone 7's core mission are water supply reliability (i.e., reducing the risk of water shortages), managing the Livermore-Valley Groundwater Basin (i.e., local groundwater storage), and being fiscally responsible (i.e., considering and managing costs). Consequently, in addition to shortage, groundwater supply, and costs, which were included in the 2011 WSE, Staff added average reliability and minimum supply. Table ES-4 presents the core metrics used for this evaluation.

Table ES-4. Core Mission Metrics Used to Evaluate Portfolios

Metric	Description	Relation to Zone 7's Core Mission
Average Reliability	Average percent of demand met over all hydrologic conditions	The frequency Zone 7's system experiences no shortages indicates the benefits to reliability provided by a portfolio
Rare Large Shortages	Largest percent of unmet demand during major events (e.g., drought or loss of SBA)	The estimated magnitude of the rarest and largest shortages indicates how well a portfolio can reliably meet demands during extreme situations
Minimum Water Supply	Smallest per capita demand met during major events (e.g., drought or loss of SBA)	The estimated minimum supply indicates how well a portfolio can reliably meet demands during extreme situations
Average Groundwater Storage	Average percent full over all hydrologic conditions	The amount of available groundwater storage helps gage the success of a portfolio to help manage the local groundwater basin
Costs	Estimated total amortized dollars	Costs help identify the most fiscally prudent portfolios

Based on discussions at the Water Policy Roundtables, and in follow up discussions with the local water supply retailers, three other, lower priority metrics were also identified: Local Control, Diversification, and Energy Use. These three metrics are not considered core to Zone 7's mission but instead, provide additional information to help contrast the performance of each portfolio. Table ES-5 presents the three lower priority metrics used.

Table ES-5. Lower Priority Metrics Used to Evaluate Portfolios

Metric	Description
Diversification	The percentage of non-State Water Project water supplies within a water supply portfolio.
Local Control	The Largest percentage of total long-term average water supply under local control. Local control was defined as within the San Francisco Bay Area.
Energy Use	The Estimated long-term average energy use in Megawatt-Hours per year.



Results of the Portfolio Analysis

Table ES-6 presents the average calculated benefit for each portfolio across all eight scenarios, along with the estimated cost per unit of water demand. As shown in Table ES-5, Portfolios A through C have a higher benefit in all categories except cost. The additional unit cost of Portfolios A through C is 61% to 150% higher than the Current Plan. A significant investment would be required to implement any of those Portfolios. Table ES-5 also shows that although both local control and diversification can nearly double with Portfolios A through C, externally controlled SWP water supplies will continue to make up a majority (~70%) of total long-term average water supplies.

Table ES-6 also indicates that energy use could increase by 20% to 50% over the Current Plan if desalination, purified recycled water, or both are added to future water supply portfolios. This large increase in energy use could make Zone 7's future operational costs susceptible to increases associated with potential future energy cost increases or reliability, and could drastically increase Zone 7's carbon footprint.

Table ES-6. Summary of Benefits Provided by Each Portfolio

Metric		Comparative Target	Portfolio				
			Current Plan	A (Desalination)	B (Purified Recycled Water)	C (Desalination & Purified Recycled Water)	
Core to Zone 7's Mission	Average Reliability <i>% of demand, average of all hydrologic conditions</i>	≥ 98%	98%	99.3%	99.5%	99.8%	
	Rare Large Shortages (1% of the time) <i>average % rationing required</i>	≤ 61%	65%	50%	46%	32%	
	Rare Minimum Supply (1% of the time) <i>average gallons per capita per day</i>	≥ 55 GPCD	39	65	72	96	
	Average Groundwater <i>% Full</i>	≥ 80%	75%	80%	85%	89%	
	Costs	Capital, \$ M		\$192	\$268	\$345	\$417
		O&M, \$ M/year		\$1.3	\$5.7	\$6.4	\$10.1
		Amortized, \$ M/year		\$16	\$25	\$31	\$39
		Additional Unit Cost, \$/AF of demand		\$260	\$420	\$510	\$650
Lower Priority	Local Control, % locally controlled		11%	18%	21%	26%	
	Diversification, % diversified		12%	19%	21%	27%	
	Energy Use, MWH/year		81,370	98,170	102,349	119,149	

Additionally, a detailed review, by scenario, indicates that the Current Plan performs well in scenarios where the California WaterFix is not delayed or the interim SWP Reliability does not



decline. Consequently, future investments in Portfolios A through C, which might not be available for 6 to 7 years (i.e., around 2022), may only provide 6 to 10 years of “reliability” insurance if the California WaterFix is completed anywhere between 2028 to 2032, and if interim SWP reliability does not decline.

