POLICY ANALYSIS
FOR THE
PUBLIC AND PRIVATE
SECTORS
M.CUBED

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Agenda Item 6a

DATE: February 3, 2015
TO: City of Santa Cruz Water Supply Advisory Committee
FR: David Mitchell
RE: Baseline Water Demand Forecast Summary Report

I. Introduction

This memorandum describes the baseline water demand forecast for the City of Santa Cruz water system. The baseline water demand forecast represents future projected water demands given the following:

- Projected rates of growth in single-family, multi-family, and non-residential customer categories through 2030, as embodied in the City's General Plan and regional AMBAG projections.
- Projected increases in UCSC demands in accordance with the Water Supply Assessment/Sphere of Influence Amendment EIR.
- Anticipated conservation savings associated with plumbing codes, appliance standards, and the City's current level of conservation programming.
- Anticipated changes in demands due to forecasted increases in the cost of water and household income.

Thus, the baseline demand forecast is intended to characterize future demands on the system given current projections for growth, cost of water, regional income, plumbing code and appliance standards, and continuation of the City's existing conservation program. It does not incorporate potential future actions that may be taken by the City to further reduce demand for water through additional investment in conservation or adoption of City policies and regulations intended to reduce waste, promote efficiency, or otherwise limit water use. The potential benefits and costs of additional demand management will be addressed through the alternatives and scenario analyses. The purpose of the baseline demand forecast is to assess the magnitude of the supply-demand gap and system reliability under the status quo and to provide a point of reference for judging the efficacy of new demand management measures in terms of system reliability, cost, and other performance metrics.

The starting point for the baseline demand forecast is the 2010 UWMP demand projection. Adjustments are made to this forecast to account for future effects of plumbing codes/appliance standards, existing conservation programs, water rates, income growth, slower than projected growth in in-city commercial demand, and the effects of the current drought. The remainder of this memorandum describes the basis for and magnitude of each of these adjustments. In total, the adjustments reduce 2030 demand from what the 2010 UWMP projected by 18 percent, from 4,046 million gallons per year (mgy) to 3,302 mgy.

II. Forecast Period

The baseline demand projection covers the period 2015-2035. It is assumed for the projection that City buildout is reached by 2030. No further growth is assumed after this date in the projection. Between 2030 and 2035 demands are projected to decrease slightly due to real increases in the cost of water, on-going effects of plumbing code/appliance standards, and continuation of City conservation programs.

III. Adjustment for Plumbing Code/Appliance Standards

Plumbing codes and appliance standards for toilets, urinals, clothes washers, and showerheads will continue to reduce indoor residential and non-residential water demands over the forecast period. Plumbing codes for toilets, urinals, showerheads, and faucets were first adopted by California in 1991, mandating the sale and use of ultra-low flush toilets (ULFTs), 1 gallon-per-flush urinals, and low-flow showerheads and faucets. Effective January 1, 2014, AB 715 (enacted in 2007) requires that toilets and urinals sold and installed in California cannot have flush ratings exceeding 1.28 and 0.5 gallons per flush, respectively. Additionally, SB 407 (enacted in 2009) requires that commercial and residential properties built prior to 1994 must be fully retrofitted with water conserving plumbing fixtures by 2017 (single-family residential) or 2019 (multi-family residential and commercial). SB 837 (enacted in 2011) requires that sellers of real property disclose on their Real Estate Transfer Disclosure Statement whether their property complies with these requirements. Additionally, SB 407 conditions issuance of building permits for major improvements and renovations upon retrofit of non-compliant plumbing fixtures. Each of these laws is intended to accelerate the replacement of older, low efficiency plumbing fixtures, and ensure that only high-efficiency fixtures are installed in new residential and commercial buildings.

Federal appliance standards for water and energy use by residential and commercial clothes washers are further reducing indoor water demands. The maximum water factor for residential clothes washers under current federal standards is 9.5.[1] In March of this year, the federal standard will reduce the maximum water factor for top- and front-loading machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for top-loading machines will be further reduced to 6.5. For commercial washers, the maximum water factors were reduced in 2010 to 8.5 and 5.5 for top- and front-loading machines, respectively. Starting this year, the maximum water factor for Energy Star certified washers is 3.7 for front-loading and 4.3 for top-loading machines. EPA estimates that Energy Star washers comprised more that 60% of the residential market and 30% of the commercial market circa 2011.[2] A new Energy Star compliant washer uses about two-thirds less water per cycle than washers manufactured in the 1990s.

The effects of plumbing codes and appliance standards on future water demand were estimated with the Maddaus Water Management Decision Support System (DSS) model. DSS uses a plumbing fixture inventory and turnover model to estimate water savings over time from the replacement of toilets, urinals, showerheads, and clothes washers in existing single-family residential, multi-family residential, and commercial buildings and the installation of code-compliant fixtures in new buildings. The

[1] Water factor equals the number of gallons used per cycle per cubic foot of capacity. Prior to 2000, the water factor for a typical new residential clothes washer was about 12.

[2] Energy Star Unit Shipment and Market Penetration Report Calendar year 2011 Summary. Accessed on January 28, 2015 from:
http://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2011_USD_Summary_Report.pdf

estimated reduction in water demand (relative to 2010 fixture/appliance efficiency levels) is summarized in Table 1.

Table 1. Projected Water Savings from Plumbing Codes/Appliance Standards (MGY)

Sector	2015	2020	2025	2030	2035
Single Family	-17.8	-42.0	-77.3	-112.7	-134.1
Multi Family	-18.1	-39.7	-68.8	-97.8	-113.3
Non Residential	-3.2	-6.9	-10.2	-13.1	-14.8
Total	-39.1	-88.6	-156.3	-223.7	-262.3

IV. Adjustment for City's Existing Conservation Program

The City has had a long-standing commitment to water conservation and offers a variety of programs, informational materials, and incentives to help customers become more water efficient. The current level of programming represents a baseline level of investment in conservation below which it is not expected the City would ever go. The 2010 UWMP demand projection is adjusted downward to account for the expected water savings from this level of program activity over the forecast period. The current level of conservation programming is labeled Program A in the City's forthcoming Conservation Master Plan Update. A preliminary forecast of expected water savings for Program A was developed with the DSS model. The preliminary DSS forecast is based on an older, higher baseline demand forecast. Because water savings calculated by the DSS model are partly a function of the level of baseline demand,[3] the preliminary Program A savings were re-scaled to conform to the lower adjusted baseline demand forecast presented in this memorandum. The original DSS and re-scaled Program A savings projections are reported in Table 2.[4]

Table 2. Projected Water Savings from Program A Conservation Level (MGY)

Forecast	2015	2020	2025	2030	2035
Prelim. DSS	-46.6	-109.6	-143.0	-138.6	-133.5
Re-Scaled DSS	-40.4	-102.3	-131.2	-124.5	-117.6

V. In-City Commercial Growth Adjustment

The 2010 UWMP projected in-city commercial water use would increase by approximately 6 mgy per year over the forecast period. Over the past decade, however, new demand from the in-city commercial sector has been increasing at about a third this rate. On the other hand, the rate of hotel/motel growth has exceeded the 2010 forecast. To account for the slower overall growth in commercial demand while

[3] For example, water savings from household or commercial water audits are calculated as a percentage of pre-audit demand. As average demand changes, the magnitude of water savings changes too. If, for instance, a residential audit is forecast to reduce a household's water use by 5%, on average, then if average household water use is 300 gallons/day, audit savings would be 15 gallons/day, but if average household water use falls to 250 gallons/day, audit savings would be 12.5 gallons/day.

[4] The decrease in Program A savings after 2025 is primarily due to the way in which savings from toilet, urinal, and washer rebates are allocated overtime between the program category (active savings) and the plumbing code/appliance standard category (passive savings).

leaving room for accelerating growth in the hotel/motel sector, the increase in new in-city commercial demand forecasted in the 2010 UWMP has been reduced by half to 3 mgy per year. The reduction in forecasted demand due to this adjustment is shown in Table 3.

Table 3. Reduction in 2010 UWMP Demand Forecast for Slower Than Projected In-City Commercial Demand (MGY)

	2015	2020	2025	2030	2035
Com. Demand Adjustment	-14.3	-28.7	-43.0	-57.3	-57.3

VI. North Coast Agricultural Water Adjustment

The 2010 UWMP demand forecast included approximately 25 mgy of raw water irrigation deliveries. These deliveries are not part of the City's treated water demands and are handled separately in the Confluence model. Annual demand for the irrigation/golf customer category is therefore reduced by 25 mgy to account for this.

VII. Cost of Water Adjustment

The 2010 UWMP demand forecast did not account for the effect of future rate increases on future water demand. Municipal water service is a normal economic good: more is demanded at lower prices than at higher prices. Hundreds of studies have demonstrated this empirically.[5]

City water rates are forecast to increase by 10 percent per year over the next five years. This means that after adjusting for expected inflation, the cost of water will have increased 45 percent by 2020.[6] Thereafter, City water rates are likely to continue to outpace general inflation, leading to a more gradual but still upward trend in the cost of water. This is not unique to Santa Cruz. Water service costs have been increasing broadly across the country for more than a decade. Since 1998, the consumer price index for water, sewer, and trash service maintained by the U.S. Bureau of Labor Statistics has increased at an average annual rate of 4.4 percent whereas the annual increase in the general price index has averaged just 2.2 percent. Given these trends, Table 4 gives the projected increase in water rates relative to 2014 rates after adjusting for inflation.

Table 4. Projected Increase in Inflation-Adjusted Water Rates Relative to 2014

	2015	2020	2025	2030	2035
Projected Increase	6.7%	45.1%	59.7%	75.9%	93.7%

Responsiveness of demand to changes in price varies by customer category and season. Single-family residential demand tends to be more price responsive than multi-family residential demand. Commercial demand is typically less price responsive than residential demand. Summer demand is more price responsive than winter demand. Demand responsiveness can be measured empirically and is usually summarized in terms of a single parameter called price elasticity. The price elasticity

[5] For a review of the literature, see Dalhuisen, et al., "Price and Income Elasticities of Residential Water Demand: A Meta-Analysis." Land Economic, May 2003 79:292-308.

[6] We use Caltran's 2014 county-level inflation forecast for Santa Cruz County to calculate the inflation-adjusted increase in water cost.

parameter measures the expected percentage change in demand given a 1 percent change in price. Thus, if price elasticity is -0.1, then a 1 percent increase in price would be expected to cause a 0.1 percent decrease in demand and a 10 percent increase in price would be expected to cause a 1 percent decrease in demand.

The ranges for residential price elasticity for use in water planning studies recommended by the California Urban Water Conservation Council (CUWCC) are given in Table 5.[7] We selected residential elasticity values within these ranges to adjust future residential demand for the projected rate increases shown in Table 4. For non-residential demand we set the elasticity parameter to -0.10, which is consistent with two recent estimates of commercial price elasticity derived from demand data for 24 municipal water districts located throughout California.[8] The elasticity values used to adjust demands for future rate increases are shown in Table 6. The overall system weighted average price elasticity of -0.167 almost exactly matches a recent estimate of price elasticity for Bay Area Water Supply and Conservation Agency (BAWSCA) water districts serving communities along the San Francisco Peninsula.[9]

Table 5. Summary of CUWCC Recommended Ranges for Residential Price Elasticity

Single Family Residential Customers	**Range of Estimates**
Winter season	-0.10 to -0.30
Summer season	-0.20 to -0.50
Multi Family Residential Customers	
Winter Season	-0.00 to -0.15
Summer Season	-0.05 to -0.20

Table 6. Price Elasticity Parameters Used to Adjust Future Demand for Expected Rate Increases

Season	**Single Family**	**Multi Family**	**Non Residential**	**Overall System**
Winter	-0.150	-0.075	-0.100	
Summer	-0.300	-0.150	-0.100	
Wtd Annual Avg	-0.239	-0.116	-0.100	-0.167

The percentage demand adjustment resulting from applying the price elasticities in Table 6 to the rate increases in Table 4 are shown in Table 7.

[7] See Table 8-9 in CUWCC's Water Conservation Rate Structures Handbook.

[8] Both studies were prepared for California Water Services Company (Cal Water) within the last year. One estimated a commercial price elasticity of -0.06 and the other estimated an elasticity of -0.07. The difference between the two estimates is not statistically significant. Other studies of non-residential demand summarized in Steven Renzetti's book *The Economics of Water Demand* (2002) have reported greater price responsiveness, but these studies comingled commercial and industrial water uses and many are several decades old. We have rounded up the estimate to -0.1 to be conservative, but do not believe there is sufficient empirical evidence to justify a value beyond this.

[9] Using an econometric demand model, the BAWSCA study estimated a system-wide price elasticity of -0.168. See Regional Water Demand and Conservation Projections: Final Report. September 2014. Bay Area Water Supply and Conservation Agency.

Table 7. Percentage Demand Adjustment for Expected Rate Increases

Sector	2015	2020	2025	2030	2035
Single Family	-1.6%	-10.8%	-14.3%	-18.2%	-22.4%
Multi Family	-0.8%	-5.2%	-6.9%	-8.8%	-10.8%
Non Residential	-0.7%	-4.2%	-6.0%	-7.6%	-9.4%

VIII. Growth in Income Adjustment

It has also been demonstrated empirically that residential water demand is sensitive to level of income. Water use rises with income level due to larger homes, more water using fixtures and appliances, larger landscapes, and greater prevalence of pools and spas. While the relationship between water and income possibly has been moderating, recent studies still show a statistically significant positive relationship.[10] The two studies completed for Cal Water mentioned previously estimated income elasticities for single family residential demand of 0.208 and 0.375, respectively. For development of the baseline demand forecast, we use a single family income elasticity of 0.25. For the multi-family sector, we use an income elasticity of 0.05. We apply these elasticities to Caltran's 2014 county-level real per capita income forecast for Santa Cruz County. The resulting percentage demand adjustments are shown in Table 8.

Table 8. Percentage Demand Adjustment for Expected Real Increases in Per Capita Income

Sector	2015	2020	2025	2030	2035
Single Family	+0.7%	+3.7%	+6.4%	+8.8%	+11.2%
Multi Family	+0.1%	+0.7%	+1.3%	+1.8%	+2.2%

IX. Net Price and Income Adjustment

The price and income adjustments work in opposite directions. The net percentage adjustment from the two effects is given in Table 9. Note that for non-residential demand, only a price effect is assumed. The magnitudes of these adjustments in million gallons per year are reported in Table 10.

Table 9. Net Percentage Demand Adjustment for Expected Increases Rates and Per Capita Income

Sector	2015	2020	2025	2030	2035
Single Family	-0.9%	-7.1%	-7.9%	-9.4%	-11.3%
Multi Family	-0.6%	-4.5%	-5.6%	-7.0%	-8.6%
Non Residential	-0.7%	-4.2%	-6.0%	-7.6%	-9.4%

Table 10. Net Demand Adjustment for Expected Increases Rates and Per Capita Income (MGY)

Sector	2015	2020	2025	2030	2035
Single Family	-12.2	-96.0	-106.0	-125.0	-147.3
Multi Family	-4.8	-33.7	-41.9	-51.9	-62.2

[10] Reasons for possible moderation include more concentrated distribution of income, less urban flight to suburban areas by higher income households, on-going effects of plumbing codes and appliance standards that apply equally across all income categories, and changes in landscaping preferences away from large turf areas.

Non Residential	-6.4	-43.9	-59.3	-77.1	-95.1
Total	-23.3	-173.6	-207.2	-254.0	-304.6

X. Drought Recovery Adjustment

Mandatory Stage 3 drought restrictions coupled with drought rates caused a significant drop in City water sales in 2014. Monthly system demand in 2014 was 20 to 30 percent below 2013 levels. Mandatory Stage 3 drought restrictions were lifted in December 2014.[11] The baseline forecast for 2015-2035 is predicated on normal weather conditions. Nonetheless, from previous drought episodes we know that demands can take several years to recover from a severe rationing event. The baseline demand forecast therefore was adjusted to account for this recovery period. Non-residential irrigation demands were assumed to recover relatively quickly over two years. Residential demands were assumed to recover more gradually over five years. This pattern is consistent with what has been observed historically in Santa Cruz as well as other parts of California. Table 11 gives the drought adjustments for each customer category.

Table 11. Drought Recovery Adjustment (MGY)

Sector	**2015**	**2016**	**2017**	**2018**	**2019**
Single Family	-206	-103	-52	-26	-13
Multi Family	-78	-39	-20	-10	-5
Commercial	-51	-26	0	0	0
Municipal	-10	0	0	0	0
Irrigation/Golf	-31	-10	0	0	0
UCSC	-52	-26	0	0	0
Total	-428	-204	-72	-36	-18

XI. Baseline Demand Forecast

The above adjustments are applied to 2010 UWMP forecasted water sales to get adjusted water sales. Miscellaneous water uses and system losses are then added to adjusted water sales to get the baseline demand forecast. Miscellaneous water uses and system losses are estimated at 7.5 percent of total baseline demand. In total, the adjustments reduce 2030 demand from what the 2010 UWMP projected by 18 percent, from 4,046 million gallons per year (mgy) to 3,302 mgy. A summary of the adjustments and resulting baseline forecast is provided in Table 12. The 2010 UWMP and adjusted baseline forecasts are compared in Figure 1. Demand adjustments by customer category are provided in Attachment 1.

[11] The City Council is assessing the need to return to Stage 3 mandatory restrictions on a month-to-month basis.

Table 12. Baseline Demand Forecast (MGY)

Year	2010 UWMP Sales 1/	Plumb. Code Adj	Scaled PRGM A Savings	Com Growth Adj	North Coast Adj	Price/ Income Adj	Drought Adj	Adj Sales	Misc/ Losses 2/	Adj Baseline Demand	2010 UWMP Demand	% Difference
2015	3405	-39	-40	-14	-25	-23	-428	2835	230	3065	3685	-17%
2016	3435	-49	-52	-17	-25	-51	-204	3037	246	3284	3717	-12%
2017	3464	-58	-62	-20	-25	-86	-72	3140	255	3395	3749	-9%
2018	3494	-68	-76	-23	-25	-125	-36	3141	255	3396	3782	-10%
2019	3524	-78	-89	-26	-25	-167	-18	3122	253	3375	3814	-12%
2020	3554	-89	-102	-29	-25	-174	0	3136	254	3390	3846	-12%
2021	3572	-101	-111	-32	-25	-179	0	3124	253	3377	3846	-12%
2022	3590	-114	-120	-34	-25	-186	0	3111	252	3364	3846	-13%
2023	3608	-127	-128	-37	-25	-193	0	3098	251	3349	3845	-13%
2024	3627	-141	-130	-40	-25	-200	0	3090	251	3341	3845	-13%
2025	3645	-156	-131	-43	-25	-207	0	3082	250	3332	3845	-13%
2026	3664	-172	-130	-46	-25	-216	0	3076	249	3325	3885	-14%
2027	3682	-186	-128	-49	-25	-225	0	3070	249	3319	3925	-15%
2028	3701	-199	-127	-52	-25	-234	0	3064	248	3313	3966	-16%
2029	3720	-212	-126	-54	-25	-244	0	3059	248	3307	4006	-17%
2030	3739	-224	-125	-57	-25	-254	0	3054	248	3302	4046	-18%
2031	3739	-233	-123	-57	-25	-263	0	3038	246	3284	4046	-19%
2032	3739	-241	-122	-57	-25	-274	0	3020	245	3265	4046	-19%
2033	3739	-249	-120	-57	-25	-284	0	3004	244	3248	4046	-20%
2034	3739	-256	-119	-57	-25	-294	0	2988	242	3230	4046	-20%
2035	3739	-262	-118	-57	-25	-305	0	2972	241	3213	4046	-21%

1/ 2010 UWMP demand less miscellaneous water uses and system losses.

2/ Miscellaneous water uses and system losses calculated at 7.5% of adjusted baseline demand.

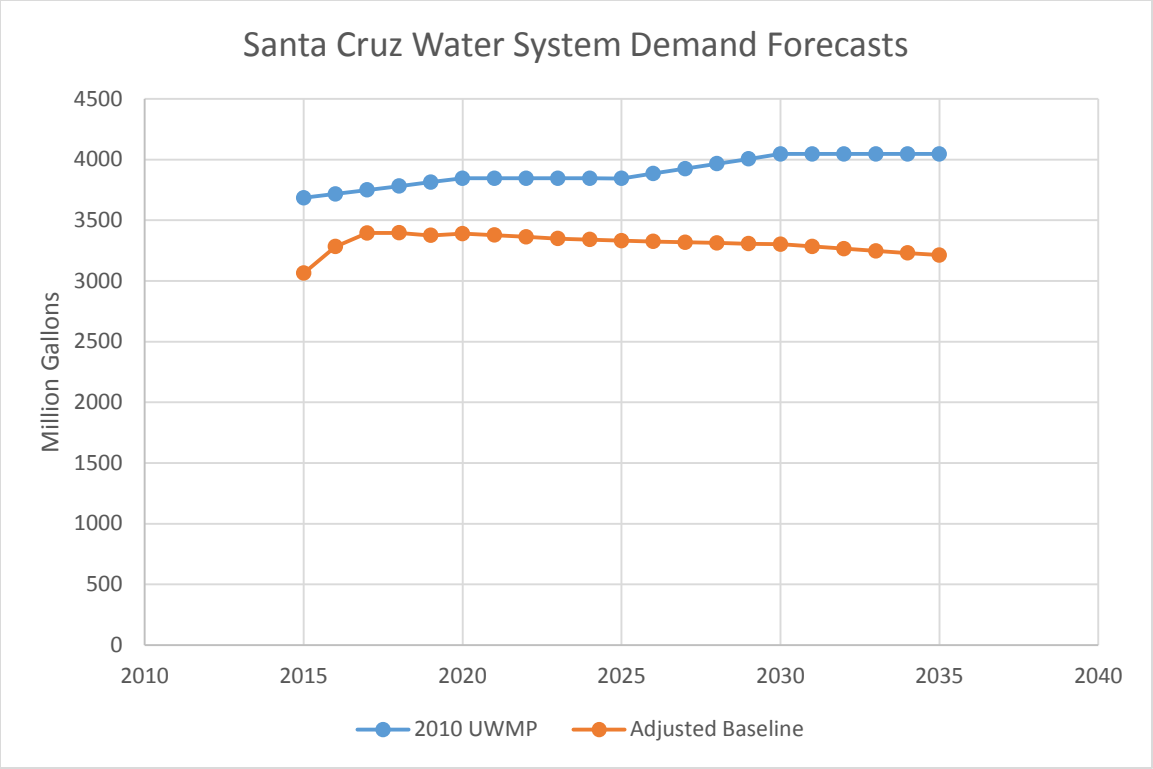
Santa Cruz Water System Demand Forecasts
Million Gallons
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2010
2015
2020
2025
2030
2035
2040
2010 UWMP
Adjusted Baseline

Figure 1

Attachment 1: Demand Adjustments by Customer Category

Single Family Residential (MGY)

Year	UWMP	Code Adj	Price/Inc Adj	Drought Adj	Adj UWMP	% Diff	2014 Actual
2014	1362	-13		-412	936	-31%	936
2015	1367	-18	-12.2	-206	1131	-17%	
2016	1372	-22	-27.5	-103	1219	-11%	
2017	1377	-27	-48.0	-52	1250	-9%	
2018	1382	-32	-70.1	-26	1254	-9%	
2019	1387	-36	-94.5	-13	1243	-10%	
2020	1392	-42	-96.0	0	1254	-10%	
2021	1397	-48	-97.3	0	1251	-10%	
2022	1402	-55	-99.1	0	1248	-11%	
2023	1407	-62	-101.4	0	1244	-12%	
2024	1412	-69	-103.7	0	1239	-12%	
2025	1417	-77	-106.0	0	1234	-13%	
2026	1422	-85	-109.3	0	1227	-14%	
2027	1427	-93	-112.8	0	1221	-14%	
2028	1432	-100	-116.7	0	1215	-15%	
2029	1437	-107	-120.7	0	1210	-16%	
2030	1442	-113	-125.0	0	1204	-16%	
2031	1442	-118	-129.0	0	1195	-17%	
2032	1442	-122	-133.6	0	1186	-18%	
2033	1442	-126	-138.1	0	1177	-18%	
2034	1442	-130	-142.5	0	1169	-19%	
2035	1442	-134	-147.3	0	1161	-20%	

Multi-family Residential (MGY)

Year	UWMP	Code Adj	Price/Inc Adj	Drought Adj	Adj UWMP	% Diff	2014 Actual
2014	762	-14		-156	592	-22%	592
2015	767	-18	-4.8	-78	666	-13%	
2016	772	-22	-10.2	-39	700	-9%	
2017	776	-26	-16.8	-20	713	-8%	
2018	781	-31	-24.1	-10	716	-8%	
2019	785	-35	-31.9	-5	713	-9%	
2020	790	-40	-33.7	0	717	-9%	
2021	795	-45	-35.2		714	-10%	
2022	799	-50	-36.8		712	-11%	
2023	804	-56	-38.5		709	-12%	
2024	808	-62	-40.2		706	-13%	
2025	813	-69	-41.9		702	-14%	
2026	818	-75	-43.8		698	-15%	
2027	822	-82	-45.7		695	-15%	
2028	827	-87	-47.7		692	-16%	
2029	831	-93	-49.7		689	-17%	
2030	836	-98	-51.9		686	-18%	
2031	836	-101	-53.8		681	-19%	
2032	836	-105	-55.9		675	-19%	
2033	836	-108	-58.0		670	-20%	
2034	836	-111	-60.1		665	-20%	
2035	836	-113	-62.2		660	-21%	

Commercial/Industrial (MGY)

Year	UWMP	Growth Adj	Code Adj	Price/Inc Adj	Drought Adj	Adj UWMP	% Diff	2014 Actual
2014	683	-11	-2.5	0.0	-102	567	-17%	567
2015	690	-14	-3.2	-4.5	-51	617	-11%	
2016	696	-17	-4.0	-9.4	-26	640	-8%	
2017	703	-20	-4.8	-15.3	0	663	-6%	
2018	710	-23	-5.5	-21.8		659	-7%	
2019	716	-26	-6.2	-28.8		655	-8%	
2020	723	-29	-6.9	-31.0		656	-9%	
2021	729	-32	-7.6	-33.1		657	-10%	
2022	736	-34	-8.3	-35.2		658	-11%	
2023	743	-37	-8.9	-37.4		659	-11%	
2024	749	-40	-9.6	-39.6		660	-12%	
2025	756	-43	-10.2	-42.0		661	-13%	
2026	763	-46	-10.8	-44.3		662	-13%	
2027	769	-49	-11.4	-46.8		662	-14%	
2028	776	-52	-12.0	-49.3		663	-15%	
2029	783	-54	-12.6	-51.9		664	-15%	
2030	790	-57	-13.1	-54.6		665	-16%	
2031	790	-57	-13.5	-57.0		662	-16%	
2032	790	-57	-13.8	-59.5		659	-17%	
2033	790	-57	-14.2	-62.0		656	-17%	
2034	790	-57	-14.5	-64.6		654	-17%	
2035	790	-57	-14.8	-67.2		651	-18%	

Municipal (MGY)

Year	UWMP	Growth Adj	Code Adj	Price/Inc Adj	Drought Adj	Adj UWMP	% Diff	2014 Actual
2014	54	0	0		-21	33	-39%	33
2015	54	0	0	0	-10	44	-19%	
2016	54	0	0	-1	0	53	-1%	
2017	54	0	0	-1	0	53	-2%	
2018	55	0	0	-2		53	-3%	
2019	55	0	0	-2		52	-4%	
2020	55	0	0	-2		53	-5%	
2021	55	0	0	-3		52	-5%	
2022	55	0	0	-3		52	-5%	
2023	55	0	0	-3		52	-5%	
2024	55	0	0	-3		52	-6%	
2025	55	0	0	-3		52	-6%	
2026	55	0	0	-3		52	-6%	
2027	55	0	0	-4		52	-7%	
2028	56	0	0	-4		52	-7%	
2029	56	0	0	-4		52	-7%	
2030	56	0	0	-4		52	-8%	
2031	56	0	0	-4		52	-8%	
2032	56	0	0	-5		51	-8%	
2033	56	0	0	-5		51	-9%	
2034	56	0	0	-5		51	-9%	
2035	56	0	0	-5		51	-9%	

Irrigation/Golf (MGY)

Year	UWMP	N.Coast Adj	Code Adj	Price/Inc Adj	Drought Adj	Adj UWMP	% Diff	2014 Actual
2014	250	-25	0		-93	132	-47%	132
2015	251	-25	0	-2	-31	193	-23%	
2016	252	-25	0	-3	-10	214	-15%	
2017	253	-25	0	-5	0	222	-12%	
2018	253	-25	0	-7		221	-13%	
2019	254	-25	0	-10		220	-14%	
2020	255	-25	0	-10		220	-14%	
2021	256	-25	0	-11		220	-14%	
2022	257	-25	0	-12		220	-14%	
2023	258	-25	0	-12		220	-15%	
2024	259	-25	0	-13		221	-15%	
2025	260	-25	0	-14		221	-15%	
2026	261	-25	0	-15		221	-15%	
2027	262	-25	0	-16		222	-15%	
2028	264	-25	0	-17		222	-16%	
2029	265	-25	0	-17		222	-16%	
2030	266	-25	0	-18		223	-16%	
2031	266	-25	0	-19		222	-17%	
2032	266	-25	0	-20		221	-17%	
2033	266	-25	0	-21		220	-17%	
2034	266	-25	0	-22		219	-18%	
2035	266	-25	0	-23		218	-18%	

UC Santa Cruz (MGY)

Year	UWMP	Drought Adj	Adj Demand	Actual
2014	263	-104	159	159
2015	276	-52	224	
2016	289	-26	263	
2017	301	0	301	
2018	314	0	314	
2019	326	0	326	
2020	339	0	339	
2021	340	0	340	
2022	341	0	341	
2023	342	0	342	
2024	343	0	343	
2025	344	0	344	
2026	345	0	345	
2027	346	0	346	
2028	347	0	347	
2029	348	0	348	
2030	349	0	349	
2031	349	0	349	
2032	349	0	349	
2033	349	0	349	
2034	349	0	349	
2035	349	0	349	

System Total Baseline Demand Forecast

Year	SFR	MFR	BUS/IND	MUNI	IRR/GOLF	UCSC	SUBTOTAL	PRGM A SAVINGS	SUBTOTAL	MISC/LOSS	TOTAL
2015	1131	666	617	44	193	224	2875	-40	2835	230	3065
2016	1219	700	640	53	214	263	3089	-52	3037	246	3284
2017	1250	713	663	53	222	301	3203	-62	3140	255	3395
2018	1254	716	659	53	221	314	3217	-76	3141	255	3396
2019	1243	713	655	52	220	326	3210	-89	3122	253	3375
2020	1254	717	656	53	220	339	3238	-102	3136	254	3390
2021	1251	714	657	52	220	340	3235	-111	3124	253	3377
2022	1248	712	658	52	220	341	3232	-120	3111	252	3364
2023	1244	709	659	52	220	342	3226	-128	3098	251	3349
2024	1239	706	660	52	221	343	3220	-130	3090	251	3341
2025	1234	702	661	52	221	344	3214	-131	3082	250	3332
2026	1227	698	662	52	221	345	3205	-130	3076	249	3325
2027	1221	695	662	52	222	346	3198	-128	3070	249	3319
2028	1215	692	663	52	222	347	3191	-127	3064	248	3313
2029	1210	689	664	52	222	348	3185	-126	3059	248	3307
2030	1204	686	665	52	223	349	3179	-125	3054	248	3302
2031	1195	681	662	52	222	349	3161	-123	3038	246	3284
2032	1186	675	659	51	221	349	3142	-122	3020	245	3265
2033	1177	670	656	51	220	349	3124	-120	3004	244	3248
2034	1169	665	654	51	219	349	3107	-119	2988	242	3230
2035	1161	660	651	51	218	349	3090	-118	2972	241	3213