

**Supplemental
Expert Report and Recommendations of**

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**Regarding Water Supply and Demand in the
California American Water Company's Monterey
Main System**

Prepared for:

The Marina Coast Water District

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WATER DEMAND MANAGEMENT

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SCOPE OF INVESTIGATION

I was retained by the Marina Coast Water District to determine the reliable water sources available to the California-American Water Company (“Cal-Am”) for the Monterey Main system over the next five to ten years that will allow Cal-Am to reduce its unlawful water diversions from the Carmel River in accordance with provisions of a cease-and-desist order from the State Water Resources Control Board. This report is intended as a supplement to the report WaterDM submitted to the Marina Coast Water District on April 21, 2020 and the supplement utilizes and expands on the research, analysis, and forecasts prepared for the original report. For this supplement, I was specifically asked to consider Cal-Am’s available sources excluding the proposed Pure Water Monterey Expansion recycling facility and the proposed Monterey Peninsula Water Supply Project desalination project, neither of which are expected to be on-line before 2022. This report explores how Cal-Am can manage supply and demand until additional supplies become available.

My opinions are based on my understanding of the information available as of the date of this report and my experience evaluating municipal and industrial water supplies and demands and conservation measures. In forming my opinions, I also considered the documents, testimony, and other materials listed in Appendix A. Should additional information become available to me, I reserve the right to supplement this report based on any additional work that I may conduct based on my review of such materials.

SUMMARY OF OPINIONS AND CONCLUSIONS

As result of my review of the items listed in Appendix A and other related and relevant documents and reports, my own independent analysis, and my expertise in municipal and industrial water use, water management, and engineering, I offer the following opinions and conclusions:

With careful management of supplies and demands, Cal-Am can comply with the cease and desist order and reduce its Carmel River diversions by 2022, but current supplies are not sufficient for the long-term and offer limited cushion in the near-term.

In 2022, when Cal-Am must reduce diversions from the Carmel River in compliance with provisions of a cease-and-desist order from the State Water Resources Control Board¹ the combination of available, reliable water supplies for the Monterey Main system totals 10,100 AF. In WaterDM's April 21, 2020 report demand was forecast to be 10,098 AF in 2025 under the most likely scenario.

Cal-Am can address this situation before 2022 by building up reserve storage in the Seaside Basin which provides banked water to draw on if it becomes necessary. This storage will help balance supply to meet variable demands in the coming years, but Cal-Am must also carefully manage demand in the Monterey Main system to ensure that it balances with available supply through all months of the year. Proven demand management tools should also be implemented as quickly as possible.

This is a water supply situation that requires judicious management of Cal-Am's available supplies over the coming few years and increased demand management measures to ensure there is sufficient supply to meet forecasted demands and essential services such as fire protection until additional sources of supply can be brought online.

Cal-Am and its customers are confronted with a situation in the coming years where the expected demand equals the available supply in the Monterey Main system supplemented with a banked storage reserve. Until an additional long-term water supply is realized, options such as leases or purchases could provide water much sooner and at a lower cost.

¹ The original order, issued in 1995, determined that Cal-Am was extracting over 14,000 acre-feet per year from the river when it had a legal right to 3,376 acre-feet. The Board determined that these excess diversions were adversely affecting the river's population of federally-threatened Central Coast steelhead. The Board ordered Cal-Am to develop or purchase alternative water supplies so it could end its excess diversions. Subsequent orders issued by the Board have included additional requirements, with Cal-Am currently required to end its excess diversions and be able to rely on other sources of water by December 2021.

Analysis and Recommendations

Overview

Beginning in January 2022, the California-American Water Company (“Cal-Am”) must reduce its water diversions from the Carmel River system in accordance with provisions of a cease-and-desist order from the State Water Resources Control Board. Neither the proposed Pure Water Monterey Expansion water recycling project nor the proposed Monterey Peninsula Water Supply Project desalination project are likely to be completed and on-line by January of 2022 and it is uncertain when additional supplies will be available. The purpose of this supplemental report is to analyze the available sources of water and explore how water service can be reliably supplied during this period of uncertainty.

This report is intended as a supplement to the report WaterDM submitted to the Marina Coast Water District on April 21, 2020 and the supplement utilizes and expands on the research, analysis, and forecasts prepared for the original report.

Water Demand Forecasts

In its April 21, 2020 report, WaterDM prepared two forecasts for the Cal-Am Monterey Main System to estimate future average annual production, inclusive of treatment losses and non-revenue water. The growth rate in each forecast is based on the Association of Monterey Bay Area Governments’ 2018 forecast of anticipated population increase from 2020 to 2040.²

- The “Current gpcd”³ forecast assumed the current rate of daily per person water usage continues into the future, without any increases in efficiency or conservation reductions.
- The “Continued efficiency” forecast includes the impacts of ongoing efficiency improvements by applying an indoor reduction factor.

Notably, both of these forecasts are higher than the forecasts Cal-Am itself produced for its most recent General Rate Case Application, which estimated demand for 2021 and 2022 at 9,789 acre-feet per year.⁴ WaterDM’s “Continued efficiency” forecast for 2021 was 10,008 AF and for 2022 was 10,030 AF as shown in Table 2.

In this supplemental report, only the “Continued efficiency” forecast is used to evaluate supply adequacy over the coming years. The “Continued efficiency” forecast represents future production assuming slow, steady ongoing demand reductions from existing conservation

²This likely over-estimates Cal-Am’s future growth because it includes new population in portions of the cities of Monterey, Seaside, and Del Rey Oaks within the Fort Ord Buildout that will be served water by the Marina Coast Water District.

³ gpcd = gallons per capita per day

⁴ California-American Water Company. 2019. (U-210-W)

activities relative to current per-capita use. Specifically, the “Continued efficiency” forecast includes the anticipated impacts of continuing the long-term water conservation program measures described in published documents and recent testimony from Cal-Am and Monterey Peninsula Water Management District. It does not assume any drought restrictions or mandatory demand curtailments are applied. In my professional judgement, the “Continued efficiency” forecast represents the most likely forecast of future average annual production, inclusive of treatment losses and non-revenue water. By applying the additional demand management measures discussed in this supplement, Cal-Am could better manage peaks and reduce usage below this forecast level. Thus the “Continued efficiency” forecast used in this report to evaluate the adequacy of water supply over the coming years could be considered a conservative forecast.

Water Supply

Water Supply for the Monterey Main System

Cal-Am delivers water to its Monterey Main system from a diverse collection of water sources. Cal-Am has historically relied heavily on diversions from the Carmel River and Seaside Basin native groundwater to provide water to the Monterey Main system. In the future withdrawals from both sources must be reduced. Even under the best of circumstances it will be at least 2022 and likely later before a new water supply source is online. Cal-Am must carefully manage its supply portfolio in the coming years.

Table 1 presents the water supply sources available to Cal-Am for the coming years and Table 2 shows projected deliveries in the Monterey Main system including the Pure Water Monterey project along with the demand forecast prepared by WaterDM. All of the supply sources shown in Table 2 are documented in Table 1. The anticipated available reliable water supply in 2030 from each source is included and the total is 10,100 AF plus available banked storage. Each source of water and the volume of available reliable supply is described in detail in the sections below.

Carmel River

Diversions from the Carmel River, Cal-Am’s primary water source, must be reduced in accordance with a cease-and-desist order from the State Water Resources Control Board. The original order, issued in 1995, determined that Cal-Am was extracting over 14,000 acre-feet per year from the river when it had a legal right to 3,376 acre-feet. The State Water Resources Control Board determined that these excess diversions were adversely affecting the river’s population of federally threatened Central Coast steelhead and riparian habitat. The Board ordered Cal-Am to develop or purchase alternative water supplies so it could end its excess diversions.

Table 2 shows Carmel River production reducing to the mandated 3,376 AF in 2022. This is the volume to which Cal-Am has a legal right and is comprised of 2,179 AF from License 11866; 1,137 AF of pre-1914 appropriative rights; and 60 AF of riparian rights.⁵

Table 2 also shows an additional 300 AF of Carmel River supply based on Permit 21330.⁶ Cal-Am's annual reports to the State Water Resources Control Board show that it has withdrawn an average of 428 AF per year from 2017-2019 under this permit. To model the impacts of drought, it was assumed that Cal-Am will not divert any water under this permit once every five years, as shown in Table 2.

Also shown are expected deductions to its annual Carmel River Effective Diversion Limit that will be assessed to Cal-Am in 2020 and 2021 pursuant to the Cease and Desist Order.

Through 2021 Cal-Am is permitted to carry over Carmel River water it does not withdraw under its permits as a credit and to draw on this credit as the maximum amount of 750 AF per year. Usage of water in this carryover credit account is also reflected in Table 2. If this carryover credit were continued after 2021, it would provide a valuable source of supply until credits are exhausted.

Seaside Groundwater Basin – Native Groundwater

Along with the Carmel River, the diversions of native groundwater from the Seaside Groundwater Basin must also be reduced which impacts Cal-Am Monterey. The Seaside Basin was over pumped by Cal-Am prior to the issuance of the 2006 Seaside Groundwater Basin adjudication which imposed triennial reductions in operating yield until the basin's "Natural Safe Yield" is achieved. For Cal-Am, the last reduction will occur on October 1, 2021 and Cal-Am will have rights to 1,474 acre-feet per year.

The Seaside Basin Watermaster states Cal-Am's "payback amount is currently estimated to be 18,000 acre-feet", thus 25.7 years of 700 AF per year re-payments would complete the payback.⁷ Cal-Am's agreement with the Watermaster requires payback to commence once the desalination project comes online. For the purposes of this analysis it was assumed that this obligation will only be triggered once Cal-Am obtains a permanent additional supply of water. It should be noted that to the extent Cal-Am can bank water in 2020 and 2021, it will benefit the Seaside basin and act as an offset to any delay in the payback.

⁵ Monterey Peninsula Water Management District. 2020. Supply and Demand for Water on the Monterey Peninsula prepared by David Stoldt. (3-13-2020, 12-3-2019, and 9-16-2019) (p.3)

⁶ "In 2013, Cal-Am received Permit 21330 from the State Water Board for 1,488 AFA from the Carmel River. However, the permit is seasonally limited to December 1 through May 31 each year and subject to instream flow requirements." MPWMD Report (p.3)

⁷ Seaside Basin Watermaster Jan. 8, 2020 Letter to Rachel Gaudion. Subject: Draft Supplemental Environmental Impact Report for the Proposed Modifications to the Pure Water Monterey Groundwater Replenishment Project (Draft Supplemental EIR)

Table 1 and Table 2 show 1,474 AF of supply available from the Seaside Basin from 2020 – 2030. This reflects a full utilization of Cal-Am’s rights and a deferral of payback. Table 2 shows Cal-Am pumping 1,734 AF in 2021 as it steps down pumping to Natural Safe Yield of 1,474 AF beginning October 1, 2021.

The Seaside Basin Watermaster’s 2019 report to the Court overseeing the groundwater adjudication states that the total usable storage space in the entire Seaside Groundwater Basin is 52,030 AF. The report also describes the current allocation of that usable storage space among the Seaside Basin pumpers with Cal-Am allocated 28,733 acre-feet.⁸ This allocation allows Cal-Am to bank water as described in the Seaside Basin Storage Reserve section below. This reserve will be an available supply “cushion” Cal-Am has to meet demand without relying on the Carmel River.

Aquifer Storage and Recovery

Cal-Am participates in an aquifer storage and recovery (ASR) project that allows for the capture of excess Carmel River flows through wells along the river from December through May. This river water is then transferred through existing conveyance facilities and injected into the Seaside Groundwater Basin for later extraction. This project operates with four ASR well sites capable of both injection and extraction. Ownership and operation of this source water project has various components split between Cal-Am and the Monterey Peninsula Water Management District.⁹

There are two water rights that support the ASR system: Permit 20808A which allows maximum diversion of 2,426 AF and Permit 20808C which allows up to 2,900 AF for a total potential maximum annual diversion of 5,326 AF.¹⁰ But in reality Cal-Am will only be able to divert, inject, and store the maximum permitted volume in the wettest of years.

Based on long-term historical precipitation and streamflow data, the ASR system is estimated to divert an average of 1,920 AF per year to storage. Table 1 and Table 2 assume 1,300 AF of ASR injection and recovery per year for 2022 – 2030 and includes the impact of periodic drought hydrology.

Careful management of Cal-Am’s storage allocation in the Seaside Groundwater Basin and optimizing the storage opportunities it provides will help ensure a long-term reliable supply for the Cal-Am Monterey service area. Once the storage reserve is established (as shown in Figure 1 and Table 3), Cal-Am could recover more than 1,300 AF when needed.

⁸ Seaside Basin Watermaster Annual Report – 2019, December 5, 2019

⁹ California-American Water Company. 2019. (U-210-W) Update to General Rate Case Application, A.19-07-004. Direct Testimony of Christopher Cook. (p.7)

¹⁰ MPWMD Report (p.3)

Sand City Desalination Plant

Cal-Am has an operating agreement for the Sand City Desalination Plant, a small facility designed to produce 300 acre-feet of water per year. Due to discharge permit requirements, to date the Sand City plant has never produced the full 300 AF and the maximum that it has ever produced was 276 AF in 2011. Over the life of the plant it has averaged 209 AF of production per year but it has only averaged 188 AF per year of production from 2016 – 2019.¹¹ Table 1 and Table 2 conservatively include 150 AF per year of production well below the long-term average of 209 AF per year.

Pure Water Monterey

Monterey One Water in partnership with the Monterey Peninsula Water Management District developed the Pure Water Monterey Groundwater Replenishment Project to create a reliable source of water supply to replace and supplement existing water supply sources for the Monterey Peninsula. The Pure Water Monterey project also makes available advanced treated water to the Marina Coast Water District.

The Pure Water Monterey Project is designed to produce 3,500 acre-feet per year of purified recycled water to compose a portion of Cal-Am’s water supply and to assist in complying with the State Water Resources Control Board orders. The source waters for Cal-Am’s portion of the Pure Water Monterey Project are agricultural produce wash water and drainage flows from the Blanco Drain and Reclamation Ditch.

The Pure Water Monterey Project includes a 4 million gallon per day capacity water purification facility for treatment and production of purified recycled water that is conveyed and stored in the Basin using paired sets of shallow and deep injection wells. Project conveyance facilities include ten miles of pipeline from the purification facility to injection wells in the Seaside Groundwater Basin. This pipeline is owned and operated by the Marina Coast Water District.

Once injected, the purified recycled water augments existing groundwater supplies and can provide 3,500 acre-feet per year of water to Cal-Am for extraction and direct use. Pure Water Monterey is operational in 2020 and Table 2 includes 3,500 AF per year of recovery from the Pure Water Monterey project starting in 2022. Table 2 also shows that in 2024 and 2029 (once every five years), under drought conditions, Cal-Am will only recover 2,500 AF of Pure Water Monterey supplies. In these and any year where demand exceeds supply, the deficit can be made up from Cal-Am’s banked storage reserve.

Prior to 2022, under the cease and desist order, Cal-Am is penalized 1 AF of its Carmel River effective diversion limit for every 1 AF of Pure Water Monterey recovered for use. So during 2020 and 2021, it would be beneficial for Cal-Am to continue using available Carmel River water while banking excess Pure Water Monterey water in the Seaside Basin.

¹¹ MPWMD Report

Seaside Basin Groundwater Storage Reserve

Cal-Am is allocated 28,733AF of total storage in the Seaside Groundwater Basin.¹² “Cal-Am’s report to the State Water Board for the period ending March 31, 2020, showed a Month End ASR Storage Balance of 1,644 AF. Leading up to the cease and desist order deadline at the end of 2021, Cal-Am can continue diversions from the Carmel River while storing and banking excess Pure Water Monterey water in the Seaside Basin as carryover in addition to the 1,000 AF drought reserve and the operating reserve discussed below.

The analysis of Cal-Am’s potential storage build up in the Seaside Basin, including the impacts of drawing on this reserve during hypothetical drought years in 2024 and 2029, is presented in Table 3 and Figure 1. During the hypothetical drought years, Table 3 and Figure 1: Potential buildup of Seaside Basin groundwater reserve, 2020-2030 show Cal-Am fully utilizing its ASR carryover by 2028 and then using some of its Pure Water Monterey carryover in 2029. If confronted with this situation during a real drought in the coming years and after obtaining any necessary permission, Cal-Am could chose to draw from any of these available storage accounts. Just one of many possible drought supply options is shown in this analysis.

Under the Water Purchase Agreement, the first 1,000 AF of water produced in the Pure Water Monterey facility is being injected and stored as an operating reserve in the Seaside Basin. This reserve will be banked during 2020, when it is estimated a total of 1,750 AF will be injected. Starting in 2022, when Cal-Am begins withdrawing water from the Pure Water Monterey project, an additional 250 AF per year will be added to the operating reserve until after three years it totals 1,750 AF. The operating reserve is owned by the Monterey Peninsula Water Management District and is available to ensure Cal-Am can recover 3,500 AF per year.

Under the Water Purchase Agreement for Pure Water Monterey, an additional and separate 1,000 AF drought reserve will be built up over five years in increments of 200 AF. In Table 3 and Figure 1 this is shown starting in 2025.

After injection, water in the operating reserve and drought reserve are owned by the Monterey Peninsula Water Management District and maintained for the benefit of Cal-Am. Cal-Am owns the ASR and Pure Water Monterey carryover water.

This banked storage provides a valuable and necessary buffer for Cal-Am to use if drought or higher demand than forecasted should occur. Table 2 shows that in 2024 (assuming a drought year) and in 2026 – 2030 demand is forecast to be higher than projected available supply and withdrawals from banked storage are necessary.

¹² Seaside Basin Watermaster Annual Report – 2019, December 5, 2019

Table 1: Cal-Am Monterey Main System water supply sources 2022 - 2030

Water Source	AF/Year	Notes	Regulator	Data Source
Carmel River – Cease and Desist Order	3,376 AF.	2,179 AF from License 11866; 1,137 AF of pre-1914 appropriative rights; and 60 AF of riparian rights.	SWRCB Order 2016-0016	Cal-Am reports to the SWRCB
Carmel River – Permit 21330	300 AF	Only available Dec. – May.	SWRCB	Cal-Am reports to the SWRCB
Seaside Basin Native Groundwater*	1,474 AF	Reflects a delay in repayment of Cal-Am’s 25-year obligation to leave 700 AF of the 1,474 AF it is entitled.	Seaside Basin Watermaster	Watermaster’s annual reports.
ASR Recovered Water	1,300 AF	Based on long-term historical precipitation and streamflow, ASR system may be capable of recovering an average of 1,920 AF per year.	SWRCB Water Rights Permits 20808A & C	Cal-Am reports to the SWRCB
Sand City Desalination Plant	150 AF	300 AF capacity. Has averaged 209 AF over life of plant.	SWRCB Order 2016-0016 & Division of Drinking Water	Cal-Am reports to the SWRCB
Pure Water Monterey	3,500 AF	Withdrawals prior to 2022 will reduce Effective Diversion Limit from the Carmel River.	Division of Drinking Water & Seaside Basin Watermaster	TBD
Additional Withdrawal from storage (excluding ASR recovery)*	As needed	Variable volume of additional recoveries from storage taken as required.	SWRCB Water Rights Permits 20808A & C	Cal-Am reports to the SWRCB
TOTAL	10,100 AF			

*Adjusted from WaterDM’s April 21, 2020 report.

Table 2: Cal-Am Monterey Main System current supply sources and forecast demand, 2020 - 2030

Cal-Am Water Supply (AF)	2020	2021	2022	2023	2024*	2025	2026	2027	2028	2029*	2030
Carmel River	8,310	8,310	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376
Deductions Pursuant to Cease & Desist Order											
Missed milestone	(250)	(1,250)									
ASR Injection Water	(600)	(600)									
Sand City Deduction	(150)	(150)									
Carmel River Carryover Credit	750	750									
Carmel River Permit 21330	250	300	300	300	-	300	300	300	300	-	300
Carmel River Total (net)	8,310	7,360	3,676	3,676	3,376	3,676	3,676	3,676	3,676	3,376	3,676
Seaside Basin	1,820	1,734	1,474	1,474	1,474	1,474	1,474	1,474	1,474	1,474	1,474
ASR recovery		764	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Sand City Desal	150	150	150	150	150	150	150	150	150	150	150
Pure Water Monterey	<i>1,750 inject</i>	<i>3,500 inject</i>	3,500	3,500	2,500	3,500	3,500	3,500	3,500	2,500	3,500
Withdrawal from Storage Reserve to Meet Demand	-	-	-	-	1,275	-	20	42	64	1,385	107
Total	10,280	10,008	10,100	10,100	10,075	10,100	10,120	10,142	10,164	10,185	10,207
Continued Efficiency Forecast	9,985	10,008	10,030	10,053	10,075	10,098	10,120	10,142	10,164	10,185	10,207

*Drought year

Table 3: Potential buildup of Seaside Basin groundwater reserve, 2020-2030

Groundwater Storage (AF)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ASR Carryover	1,644	1,644	1,644	1,644	369	369	349	307	243	-	-
PWM Operating Reserve	1,000	1,000	1,250	1,500	1,750	1,750	1,750	1,750	1,750	1,750	1,750
ARWRA Drought Reserve	-	-	-	-	-	200	400	600	800	1,000	1,000
PWM Carryover	750	4,250	4,250	4,250	4,250	4,250	4,250	4,250	4,250	3,108	3,001
End of Year Groundwater Storage	3,394	6,894	7,144	7,394	6,369	6,569	6,749	6,907	7,043	5,858	5,751

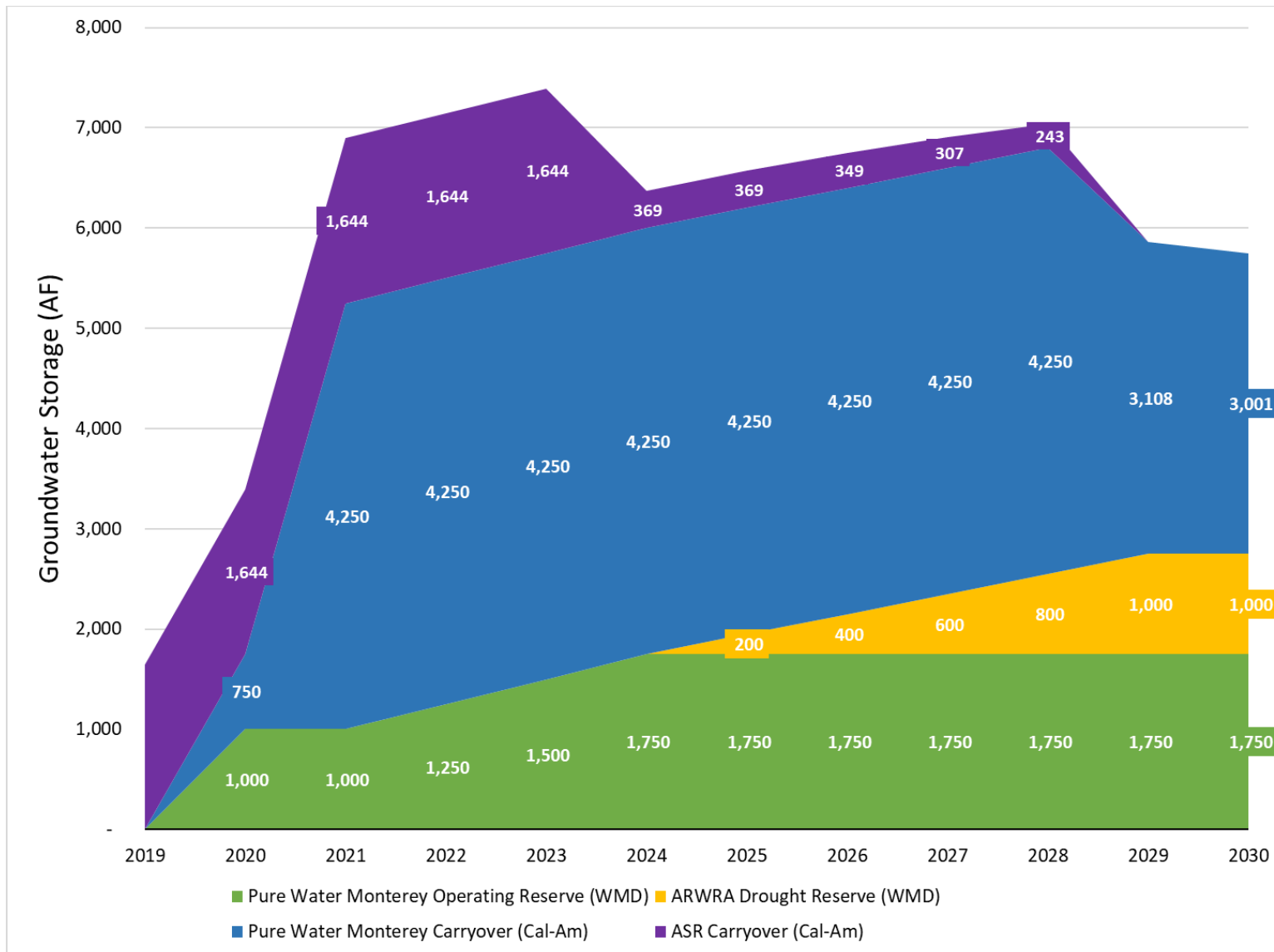


Figure 1: Potential buildup of Seaside Basin groundwater reserve, 2020-2030

Total Supply in 2022 and Beyond

As shown in Table 2, in 2022 and going forward under the assumption of full compliance with reduction of Carmel River diversions under the cease and desist order, Cal-Am will have 10,100 AF per year of water supply plus the buffer of banked storage in the Seaside Basin. Figure 2 shows the combination of the available annual water supply and buildup of banked storage reserve along with the continued efficiency forecast and the impact of two hypothetical droughts in 2024 and 2029. This analysis illustrates how the buildup of storage provides a reserve for Cal-Am to draw upon if necessary.

Even with the storage buffer provided by the Seaside Basin, a situation where supply essentially equals demand is undesirable and problematic over the long-term for Cal-Am's customers from economic, fire protection, water quality, and infrastructure perspectives. While Cal-Am has sufficient resources to meet demand and halt its illegal Carmel River diversions in 2022, the water customers of the Monterey Main system need additional sources of water.

In WaterDM's April 21 report it was noted that with the addition of the Pure Water Monterey Expansion project providing an additional 2,250 acre-feet per year of supply to Cal-Am, the combination of Cal-Am's available and reliable water resources provides sufficient supply potential to meet annual future demand in 2040 by more than 1,200 acre-feet (an 11.9% surplus).

While proposals for new desalination or water recycling once realized will improve the supply situation greatly, leases or purchases could provide water on at least a temporary basis much sooner and at a lower cost. Cal-Am and the Monterey Peninsula Water Management District should consider every option available for supplementing and managing Cal-Am's Monterey Main system supply and demand.

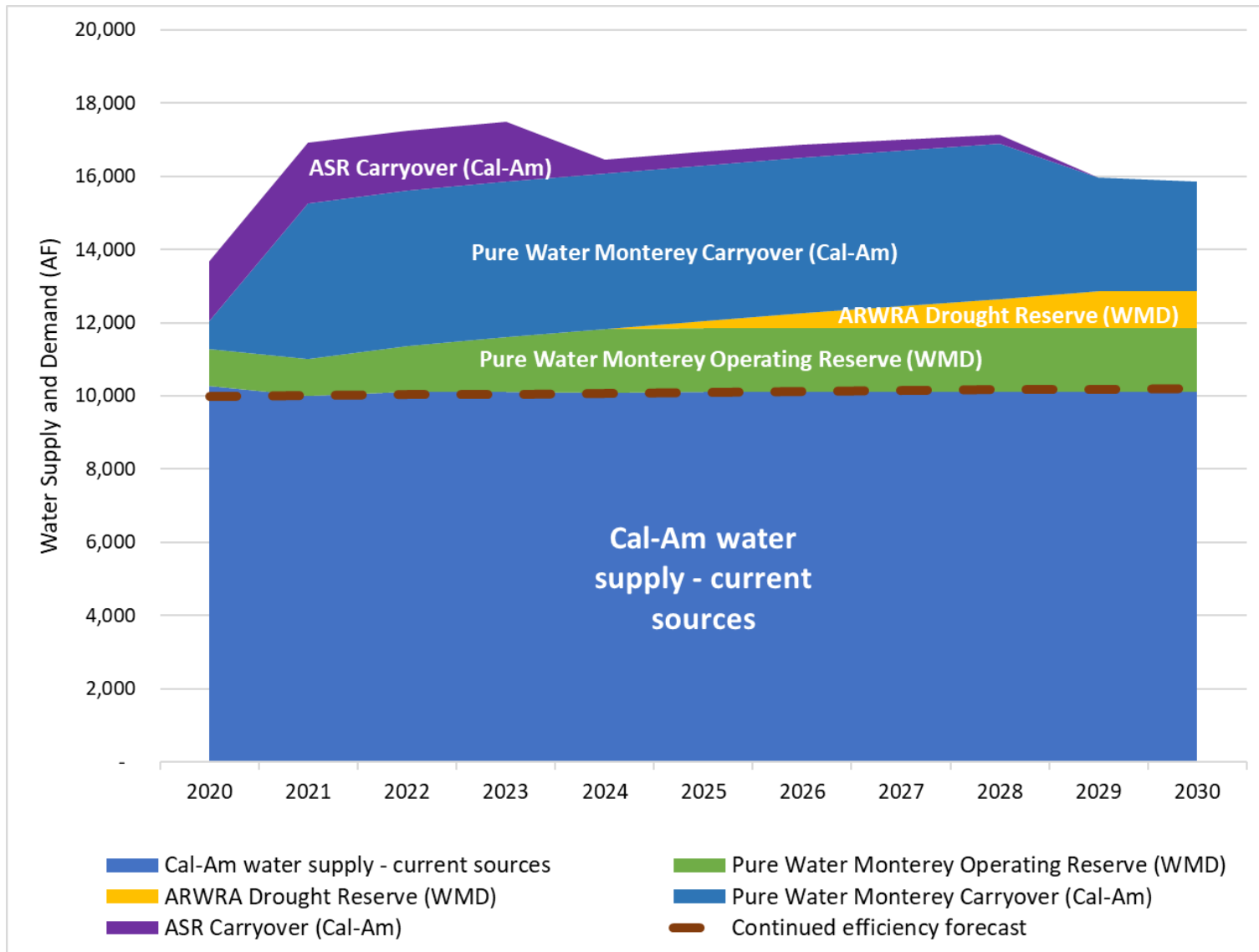


Figure 2: Cal-Am Monterey Main System current supply sources, forecast demand, and potential buildup of Seaside Basin groundwater reserve, 2020-2030

Water Demand Management

WaterDM's April 21 report noted that the Monterey region has been regarded as a model for water conservation programs for many years. Cal-Am and the Monterey Peninsula Water Management District implement an array of effective demand management policies and programs that are likely to extend water efficiency gains. Cal-Am implements an active water conservation program including a steeply inclining five-tier block rate pricing structure and customer incentives for installing drought tolerant landscapes and high-efficiency fixtures and appliances. Cal-Am also implements a rigorous utility-scale water loss control program aimed at reducing real losses in its distribution system. Local development regulations ensure that all new and remodeled buildings are equipped with high-efficiency fixtures and appliances.

Cal-Am's local efforts are in parallel to broader policy measures at the state level, designed to further increase efficiency. The State of California has implemented a series of laws and directives to ensure future water efficiency across the state including Assembly Bill 1668 and Senate Bill 60 which effectively mandate an ongoing reduction in per capita use. Cal-Am's continued compliance with these regulations and its active efforts to reduce customer water demand in the future are likely to gradually further decrease per capita water use across the service area.

All of the measures currently implemented will be extremely helpful in increasing water efficiency in the region, but more can be done to manage demand in the Monterey Main system.

Expand Demand Management with Water Budgets

To halt illegal diversions and comply with the cease and desist order, customers of the Monterey Main system must manage their water use to match an available volumetric target over the coming years. An effective approach for managing demand to match an available supply target is the establishment of customer specific monthly water budgets.

A water budget represents a reasonable volume of usage for each customer, based on the specific needs and requirements of each customer and the available water supply. The water budget is a volumetric target based on the legitimate needs of the customer and the available water supply and provides a customer-specific mechanism for monitoring compliance with demand management measures.¹³ Water budgets are a familiar concept in the region with Santa Cruz, Hayward, and Visalia all utilizing water budgets in some form. In Southern California water budgets are utilized by LADWP, Irvine Ranch, Eastern Municipal, and many other urban water providers.

The approach of using water budgets to manage demand was successfully implemented during California's most recent period of drought by the California Water Company in its Visalia District. For the Visalia District, the mandated drought reduction goal was 32% below its 2013

¹³ Mayer, P.W. et. al. 2008. Water Budgets and Rate Structures: Innovative Management Tools. Journal of the American Water Works Association. May 2008. Vol. 100, No. 5.

residential per capita water use to be achieved by February 2016. This state-mandated goal served as motivation for the creation of customer level budgets, set at 32% reduction from 2013 usage.¹⁴ Drought surcharges were based on the extent of overuse. Customers using less than their monthly budget could bank savings in that month and use it to offset excess use in a future billing period. The Visalia water budget program was successful in achieving the demand reduction goals.¹⁵

The water budgets implemented in the Monterey Main system need not be tied to the water rate or penalty structure and can be primarily informational. Even without a connection to the water rate structure, water budgets serve the dual purpose of communicating with customers what is a reasonable and expected volume of use during a time of shortage and informing Cal-Am and/or the Monterey Peninsula Water Management District every time usage exceeds a budgeted amount. This enables the customer to immediately act if their usage exceeds budgeted amounts and it empowers the utility to address any customer with usage that is deemed unreasonable given the supply limitations. This in turn enables demand management across the entire system, tuned to the desired level of consumption to the extent possible.

Other Demand Management Measures

Other measures that Cal-Am should consider for managing demand until additional supply comes online include:

- adjust irrigation schedules – particularly during peak summer months
- strictly enforce water waste ordinances
- eliminate all but essential line flushing and hydrant testing
- limits on all non-essential uses
- leak detection – utilize metering technology like AMI and adaptive technology like home flow monitoring¹⁶ to reduce customer-side leakage

Running out of water is not an acceptable option and an effective demand management plan must be readied in advance so that necessary measures can be implemented when and if they are needed in the coming years.

¹⁴ Exceptions were made if the reduction resulted in a water budget that fell below a specified health-and-safety volume. If this happened, the larger health-and-safety budget was used instead. Visalia also offered an appeals and variance process.

¹⁵ Bamezai, A. L. Maddaus, et. al. 2019. Use and Effectiveness of Municipal Irrigation Restrictions During Drought. Alliance for Water Efficiency. Chicago, IL.

¹⁶ Devices by companies like Flume and Phyn detect customer-side leaks and abnormal usage and provide automatic alerts.

Conclusions and Recommendations

For the April 21 report, WaterDM conducted an analysis of the historic production trends in the Cal-Am service area and forecast growth in the service area. WaterDM developed an independent forecast of future water requirements based on the Associated Monterey Bay Area Governments (AMBAG) 2018 forecast of future population growth for the Cal-Am service area.

For this supplemental report, WaterDM considered Cal-Am's available sources from 2020 – 2030 excluding the proposed Pure Water Monterey Expansion recycling facility and the proposed Monterey Peninsula Water Supply Project desalination project, neither of which are expected to be on-line before 2022. This report explores how Cal-Am can manage supply and demand until such a supplemental supply source becomes available.

With careful management of supplies and demands, Cal-Am can comply with the cease and desist order and reduce its Carmel River diversions by 2022, but current supplies are not sufficient for the long-term and offer limited reserve in the near-term.

In 2022, when Cal-Am must reduce diversions from the Carmel River in compliance with provisions of a cease-and-desist order from the State Water Resources Control Board the combination of available, reliable water supplies for the Monterey Main system totals 10,100 AF. In WaterDM's April 21, 2020 report demand was forecast to be 10,098 AF in 2025 under the most likely scenario.

Cal-Am can address this situation before 2022 by building up reserve storage in the Seaside Basin which provides banked water to draw on if it becomes necessary. This storage will help balance supply to meet variable demands in the coming years, but Cal-Am must also carefully manage demand in the Monterey Main system to ensure that it balances with available supply through all months of the year. Proven demand management tools should also be implemented as quickly as possible.

This is a water supply situation that requires judicious management of Cal-Am's available supplies over the coming few years and increased demand management measures to ensure there is sufficient supply to meet forecasted demands and essential services such as fire protection until additional sources of supply can be brought online.

Cal-Am and its customers are confronted with a situation in the coming years where the expected demand equals the available supply in the Monterey Main system supplemented with a banked storage reserve. Until an additional long-term water supply is realized, options such as leases or purchases could provide water much sooner and at a lower cost.

Appendix A – Materials Considered¹⁷

Literature, Reports & Publicly Available Sources

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Montgomery and Associates. 2019. Technical Memorandum. Expanded PWM/GWR Project SEIR: Groundwater Modeling Analysis

Monterey One Water. May 28, 2010 Progress Report on Pure Water Monterey Expansion.

Monterey One Water. November 12, 2019 M1W presentation to the Monterey County Farm Bureau and the Grower-Shipper Association and the September 30-2019 M1W board meeting

Monterey One Water. April 2020. FINAL Supplemental Environmental Impact Report for the Proposed Modifications to the Pure Water Monterey Groundwater Replenishment Project.

Monterey One Water. April 11, 2020. Source Water Operational Plan Technical Memorandum. Prepared by Bob Holden, PE, and Alison Imamura, PE.

Monterey Peninsula Water Management District. 2020. Supply and Demand for Water on the Monterey Peninsula prepared by David Stoldt. (3-13-2020, 12-3-2019, and 9-16-2019)

Monterey Peninsula Water Management District. 2020. March 6 response to the Hazen Report including supporting exhibits prepared by David Stoldt.

Monterey Peninsula Water Management District. Map created by Eric Sandoval. 2/17/2006.

Seaside Basin Watermaster Annual Report – 2019, December 5, 2019

Seaside Basin Watermaster Jan. 8, 2020 Letter to Rachel Gaudion. Subject: Draft Supplemental Environmental Impact Report for the Proposed Modifications to the Pure Water Monterey Groundwater Replenishment Project (Draft Supplemental EIR)

Voice of San Diego. 8/29/2017. Desal Plant Is Producing Less Water Than Promised.
<https://www.voiceofsandiego.org/topics/science-environment/desal-plant-producing-less-water-promised/> (Accessed 4/9/2020).

Appendix B - Summary of Qualifications and Experience - Peter Mayer, P.E.

PETER W. MAYER, P.E.

Principal
Water Demand Management
1339 Hawthorn Ave.
Boulder, CO 80304
720-318-4232
peter.mayer@waterdm.com

WORK EXPERIENCE

Principal, WaterDM - 2013-present. (Registered Professional Engineer, Colorado, PE 0038126)
Vice President, Partner, and Senior Project Engineer, Aquacraft, Inc. 1995-2012
Editor, Calvert Independent, 1988-1990
Coordinator, University of Wisconsin, College Year in India Program, Madurai, India 1991-92
Educator-Fellow, Oberlin Shansi Memorial Association, Madurai, India 1986-88
Station Manager, WOBC-FM, Oberlin, Ohio 1985-86

AFFILIATIONS

American Water Works Association
Associate Editor AWWA Water Science
Member– Customer Metering Practices Committee, Distribution and Plant Operations Division
Chair – M22 manual 3rd and 4th ed. re-write sub-committee
Member – M6 manual 6th ed. Re-write sub-committee
Former Trustee – Water Conservation Division
American Water Resources Association
American Society of Civil Engineers
Alliance for Water Efficiency
Colorado River Water Users Association
Colorado Water Wise
Colorado Water Congress

EDUCATION

Master of Science, 1995, Water Resources Engineering, Department of Civil, Environmental and Architectural Engineering, University of Colorado, Boulder.

Bachelor of Arts, 1986, Oberlin College, Oberlin Ohio. Anthropology (Honors).

SELECTED PROJECTS

City of Tucson Water Conservation and Integrated Water Resources Plan (2019-2020)

Peter Mayer is working with Tucson staff to develop a 10-year water conservation implementation plan to integrate this work with the City's long-term integrated water resources plan being conducted by a large consulting team.

California DWR Research and Development of Indoor Residential Water Use Standards (2019-2021)

Peter Mayer is advising the California Department of Water Resources on a series of research projects to investigate indoor residential per capita use for the purpose of reporting to the legislature on future efficiency standards.

Metropolitan Water District of Southern California Demand Management Cost Functional Assignment (2018 – 2019)

Peter Mayer developed an analysis of Metropolitan’s demand management and local resources development programs for the purpose of functional cost assignment in the ratemaking process.

New York City Integrated Water Resources Plan (2018 – 22)

Peter Mayer is leading the water conservation task of this five-year planning project awarded to a team lead by Hazen and Sawyer.

Northglenn Colorado Integrated Water Resources Plan (2019-20)

WaterDM is teamed with ELEMENT Water Consulting to prepare an integrated water resources plan for the City of Northglenn, a suburb of Denver.

Northern Water Conservation Program Planning (2017-18)

Peter Mayer worked closely with the Northern Colorado Water Conservancy District to plan for the future of their regional conservation program.

Westminster Rate and Fee Cost of Service Study (2017-18)

Peter Mayer was a member of the Raftelis Consulting team which developed this extensive cost of service analysis for this Colorado utility.

Rachio Water Management Implementation and Research (2016 –18)

Peter Mayer served as an expert advisor and technical consultant to the Rachio irrigation control and technology company. Together, they implemented peak day water management programs.

FL v. GA, 142, Original (2016)

Peter Mayer testified as an expert witness on municipal and industrial water use on behalf of the State of Georgia at the US Supreme Court trial held in November 2016. Peter prepared an expert report, expert testimony, testified at the trial, and was deposed in this case.

Water Resource Foundation #4689 Assessing Water Demand Patterns to Improve Sizing of Water Meters and Service Lines (2016-20)

Peter Mayer was the Principal Investigator for this research study taking place in Colorado and Arizona that closely examined meter and service line sizing.

Austin Water Integrated Water Resources Plan (2016-17)

Peter Mayer was an expert advisor to the CDM/Smith team on water demand and conservation and assisted in preparation of the Austin Integrated Water Resources Plan.

Colorado State Water Supply Initiative (2009-10, 2016-19)

Peter Mayer was part of a team that prepared technical analysis of future water demands and requirements in Colorado as part of the State's ongoing planning efforts.

New York City Water Board Water Demand Management Planning (2014 – 2019)

Peter Mayer was the lead for this project that prepared ten water conservation plans for wholesale customers of the NYC Water Board located in Westchester County and other upstate NY locations.

Outdoor Water Savings Initiative, Alliance for Water Efficiency (2014 – present)

Peter Mayer is the director of research for the Alliance for Water Efficiency's Outdoor Water Savings Initiative. Peter completed a literature review project in 2015, managed the landscape transformation study (2019) and is currently managing the drought response and water savings study (2020).

Residential End Uses of Water Study Update, Water Research Foundation (2010 – 2016)

Peter Mayer was the co-principal investigator of this research study that measured residential water use in 25 cities across the US and Canada. Final report is available from the Water Research Foundation.

Hilton Head PSD Water Demand Management Plan (2015)

Peter Mayer lead a team that prepared a long term water demand management plan for this coastal island community.

City of Arvada Expert Witness Services (2016)

Peter Mayer was hired as an expert witness on municipal and industrial water demands by the City of Arvada. Peter prepared and submitted an expert report in preparation for trial. The report was accepted by both sides and deposition and testimony were not required.

City of Arvada Water Supply and Demand Study (2014 –2016)

Peter Mayer led a team that evaluated future water supply and demands for this Denver suburb, under climate change conditions.

Roaring Fork Regional Water Conservation Planning (2014 - 2015)

Working with ELEMENT Water Consulting, Peter Mayer prepared a series of water conservation plans for Aspen, Basalt, Carbondale, and Glenwood Springs, Colorado and a regional conservation plan for the entire Roaring Fork Valley. An important goal of these plans was to ensure adequate environmental flows in local rivers and creeks.

City of Louisville Water Conservation Plan (2015)

Peter Mayer worked with CH2M to prepare a state approved water conservation plan for the City of Louisville Colorado.

City of Greeley Water Conservation Plan and Avoided Cost Analysis (2014 –2015)

Peter Mayer worked closely with the City of Greeley staff to update their water conservation plan for the next 7 years and to complete an avoided cost analysis that evaluates the impact of Greeley’s water efficiency efforts since 1992 on customer water rates.

Senior Technical Advisor, Alliance for Water Efficiency (2007 – 2019)

The Alliance for Water Efficiency is a national NGO focused on promoting water conservation and efficiency. Peter Mayer helped found the organization and now served as a senior technical advisor and the newsletter editor for 12 years.

G480 Water Conservation Program Operation and Management Standard (2011-2013, 2018-19)

The G480 is a voluntary water conservation program operation and management standard approved by AWWA and ASNSI in 2013. Peter Mayer chaired the subcommittee that created the standard and was a key author of the document. He is a member of the subcommittee developing version 2.0.

Eastern Municipal Water District – Water Efficient Guidelines for New Development (2012-13)

Peter Mayer prepared a set of detailed, voluntary water efficiency guidelines for new construction in the Eastern Municipal Water District that go beyond current building codes and standards to increase water use efficiency.

City of Westminster Residential Demand Study and Conservation Plan Preparation (2012)

Peter Mayer and Aquacraft conducted a residential end use study in Westminster, Colorado to determine water use patterns and the level of water efficiency achieved. This information was then used in support of preparation of new water conservation plan for the City.

Northern Water Conservation Survey and Plan Development (2011)

The Northern Colorado Water Conservancy District hired Peter Mayer and Aquacraft to conduct a survey of its’ 45 municipal members. The results of the survey were used to update Northern’s water conservation plan for the Bureau of Reclamation.

Colorado Water Supply Initiative Municipal and Industrial Conservation Strategies (2010)

In support of the Statewide Water Supply Initiative (SWSI), the Interbasin Compact Committee (IBCC), and other water conservation efforts throughout the state, the CWCB contracted with Peter Mayer and Aquacraft to develop the conservation strategies section of the 2010 SWSI update.

Best Practices Guide for Colorado Water Conservation (2010)

Colorado Water Wise contracted with Peter Mayer and Aquacraft to research and produce a guidebook on water conservation best practices for Colorado. The guide was published in 2010 and is available for free download.

Evaluation of California Weather-Based “Smart” Irrigation Controller Programs (2005-2009)

Smart irrigation controllers that use prevailing weather conditions to adapt water applications to the actual needs of plants represent a significant advancement. Peter Mayer was the principal investigator on this study for the California Department of Water Resources, the California Urban Water Conservation Council, and approximately 30 participating water agencies examined the impact of 3,112 smart controllers on water use in northern and southern California.

Water Conservation: Customer Behavior and Effective Communications (2006 – 2009)

Peter Mayer and Aquacraft subcontracted to ICF International on this AwwaRF research project which examined water conservation social marketing programs and measured the impact of utility outreach efforts on customer behavior. The study examined water conservation communication campaigns in terms of customer recognition, attitudinal changes, behavior modification, and verifiable water use reductions and recommended the most effective methods and techniques for designing and implementing water conservation social marketing campaigns.

Water Budgets and Rate Structures: Innovative Management Tools (2005-2007)

Water budget rate structures are an innovative and increasingly popular tool for water utilities trying to convey an effective water efficiency message. This AwwaRF Tailored Collaboration project co-lead by Aquacraft and A&N Technical Services examined all aspects of water budgets and how they fit into the pantheon of water rate structures.

Water Conservation Plan Development and Demand Forecasting (2006–2010)

The State of Colorado requires that utilities seeking loans file a water conservation plan that includes detailed demand forecasts that incorporate water conservation. Aquacraft has developed conservation plans and demand forecasts for the cities of Aurora, Fort Collins, Glenwood Springs, Westminster, and Greeley, Colorado. In addition, Peter Mayer was contracted by the Colorado Water Conservation Board to review submitted conservation plans for compliance with statute.

Expert Testimony NEORSW Wastewater Case (2008)

Working with the Department of Justice, Peter Mayer developed a detailed research plan for the City of Cleveland to help them determine the contribution of wastewater flows from single-family, multi-family, and non-residential customers.

US EPA National Water Efficiency Market Enhancement Program (2004-2005)

The EPA is interested in starting a water efficiency program comparable the Energy STAR program. This project involves investigating potential product categories and product lines that

improve water efficiency and could be including the EPA program, such as weather-based irrigation control technology.

City of Carnation Water Conservation Demand Analysis (2004-2005)

In late 2004 Peter Mayer worked with the Pacific Institute, Carollo Engineers, and King County, Washington to determine the conservation potential evaluate the cost-effectiveness of water conservation in new and existing homes and businesses in the City of Carnation. Carnation is a small town that is currently not sewered. The County and the City are working together to provide a sanitary sewer system and treatment facility.

National Multiple Family Submetering and Allocation Billing Program Study (2002-2004)

Charging residents in multi-family house separately for water is growing trend in the United States. Peter Mayer was the principal investigator for this study which looked at the entire phenomena of submetering and allocation billing techniques and examined the potential water savings, regulatory issues, utility concerns, water rates, and regulatory climate.

Tampa Retrofit Project (2002-2003)

Colorado Department of Human Services Water Rights Study (2003)

Pinellas County Utilities Water Conservation Opportunities Study, (2002)

Virtual Water Efficient Home Web Site, (2001-2002)

East Bay MUD Conservation Retrofit Study, (2001-02)

CII Demand Assessment and Conservation Plan, Westminster, CO, (2000-01)

Seattle Home Water Conservation Study, Seattle Public Utilities and EPA, (1999-2000)

Commercial and Institutional End Uses of Water, AWWARF, (1998-2000)

Water Conservation Plan, City of Thornton, CO, (1998-2000)

Demand Analysis for the University of Colorado, (2000)

Water Conservation Futures Study, City of Boulder, CO, (1998-1999)

Water Efficiency in Water Wise and Standard New Homes, (1999-2000)

Residential End Uses of Water Study, AWWARF, (1996-1999)

Comparison of Demand Patterns among CI and SF Customers, Westminster, (1997-1998)

Analysis of Southern Nevada Xeriscape Project, (1998-2000)

Westminster, Peak Use Study, (1996)

Westminster Residential Water Use Study, (1995-1996)

PUBLICATIONS AND PRESENTATIONS

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Mayer, P.W. 2017. Water Conservation Keeps Rates Low in Tucson, Arizona. Alliance for Water Efficiency. Chicago, IL.

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Mayer, P.W. 2016. Water Research Foundation Study Documents Water Conservation Potential and More Efficiency in Households. *Journal of the American Water Works Association*. October 2016 108:10.

Mayer, P.W. 2016. American Water Demand Trends and the Future of Conservation. Keynote Address- Gulf Coast Water Conservation Symposium, Houston, TX.

DeOreo, W.B., P. Mayer, J. Kiefer, and B. Dziegielewski. 2016. Residential End Uses of Water, Version 2. Water Research Foundation. Denver, CO.

Shimabuku, M., D. Stellar, and P. Mayer. 2016. Impact Evaluation of Residential Irrigation Audits on Water Conservation in Colorado. *Journal of the American Water Works Association*. May 2016, 108:5. Denver, Colorado.

Mayer, P.W., P. Lander, and D. Glenn. 2015. *Outdoor Water Use: Abundant Savings, Scant Research*. *Journal of the American Water Works Association*. February 2015, 107:2. Denver, Colorado.

Mayer, P.W. 2015. American Water Use Trends 1995-2015 and Future Conservation Potential. WaterSmart Innovations Conference. Las Vegas, NV.

Mayer, P.W. 2015. Introducing AWWA's New M22 Manual - Sizing of Water Service Lines and Meters. Proceedings of the AWWA Annual Conference and Exposition. Anaheim, CA. and North American Water Loss Conference. Atlanta, GA.

Mayer, P.W. et. al. 2014. *Conservation Efforts Limit Rate Increases for Colorado Utility*. *Journal of the American Water Works Association*. April 2014, 106:4. Denver, Colorado.

Mayer, P.W. et. al. 2013. Conservation Limits Rate Increases for a Colorado Utility. Alliance for Water Efficiency, Chicago, IL.

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Mayer, P.W. et. al. 2009. Water Efficiency Benchmarks for New Single-Family Homes. WaterSmart Innovations Conference. Las Vegas, NV.

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DeOreo, W.B., M. Gentili, and P.W. Mayer, 2004. *Advanced Cooling Water Treatment Pays for Itself in Urban Supermarkets*. Proceedings of the Water Sources Conference 2004, Austin, TX.

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W.B. DeOreo, A. Dieteman, T. Skeel, P. Mayer, et. al. 2001. *Retrofit Realities*. Journal American Water Works Association, March 2001.

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Mayer, P.W. and W.B. DeOreo. 1995. *A Process Approach for Measuring Residential Water Use and Assessing Conservation Effectiveness*. AWWA Annual Conference Proceedings. Anaheim, California.

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AWARDS

- 2019 AWE Distinguished Service Award – “In Recognition and with Appreciation for His 12 Years as Editor of the Water Efficiency Watch Newsletter 2007 – 2019).
- 2013 AWWA Water Conservation Division Best Paper Award – “Insights into Declining Single Family Residential Water Demands.”
- 2013 Quentin Martin Best Research-Oriented Paper Award, ASCE-EWRI Journal of Water Resources Planning and Management, March 2013. Awarded for "Estimating and Verifying United States Households’ Potential to Conserve Water" by Francisco J. Suero, A.M.ASCE;

Peter W. Mayer; David E. Rosenberg, A.M.ASCE

- 2010 AWWA Water Conservation Division Best Paper Award – “Improving Urban Irrigation Efficiency by using Weather-Based ‘Smart’ Irrigation Controllers.”
- 2008 AWWA Water Conservation Division Best Paper Award – “Water Budgets and Rate Structures: Innovative Management Tools.”
- 2006 AWWA Water Conservation Division Best Paper Award – “Third Party Billing of Multi-family Customers Presents New Challenges to Water Providers”
- 1996 Montgomery-Watson Master’s Thesis Award, Second Place
- 1996 American Water Works Association Academic Achievement Award, Honorable Mention