CASE NO. S269099 (CONSOLIDATED WITH S271493)

In the Supreme Court
of the State of California

GOLDEN STATE WATER COMPANY,
CALIFORNIA-AMERICAN WATER COMPANY,
CALIFORNIA WATER SERVICE COMPANY,
LIBERTY UTILITIES CORP.
AND CALIFORNIA WATER ASSOCIATION
Petitioners,

v.

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Respondent.

VOLUME 2 OF JOINT APPENDICES TO THE OPENING BRIEF ON THE MERITS

File 2 of 4 – Pages 272-523 – Joint Appendices Q-W

[Opening Brief on the Merits Filed Concurrently]

After Decisions Nos. 20-08-047 and 21-09-047
Of the Public Utilities Commission of the State of California

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The appendices in support of this petition contain true and correct copies of the following documents or excerpts:

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Dated: September 1, 2022

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JOINT APPENDIX Q

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low – Income Customers of Investor-Owned Water Utilities, and Affordability.	Rulemaking 17-06-024

ADMINISTRATIVE LAW JUDGE'S RULING INVITING COMMENTS ON WATER DIVISION STAFF REPORT AND RESPONSES TO ADDITIONAL QUESTIONS

This ruling invites parties to comment on the California Public Utilities Commission's (Commission's) Water Division Report on Low-Income, LIRA Program, Drought Forecasting Mechanisms, Small Water System Consolidation (Staff Report) held on August 2, 2019. The Staff Report is attached to this ruling as Attachment A. This ruling also presents additional questions for the parties to address.

1. Workshops, Staff Reports, and Next Steps

The last proceeding workshop was held on August 2, 2019 to address outstanding issues and party comments received on the following topics: 1) consolidation of at-risk systems; 2) forecasting/drought; and 3) rate design. The State Water Resources Control Board (SWRCB) Draft AB 401 Report has not yet to be finalized. The Commission continues to work collaboratively with the SWRCB and will also continue to monitor progress on finalizing the report and any subsequent legislation that results later as to a statewide low-income water program.

As noted in previously rulings, the proposed decision in this proceeding may include amendments to the Commission's program rules in the areas of consolidation, forecasting, rate design, and other implementation measures to enhance water affordability, including low-income programs. In order to ensure a complete record for consideration in this proceeding the parties, in addition to commenting on the attached Staff Report, are to respond to the questions set out below. Parties may also provide comments on any other relevant matter within the scope of this proceeding. Responses to the below questions are to be provided no later than September 16, 2019 with replies to responses due on September 23, 2019.

2. Questions Presented for Party Comment

Parties are to provide comment on the attached Staff Report in addition to responding to the following questions. Parties in answering the below questions should consider the information set out in the Public Review Draft, Achieving the Human Right to Water in California, an Assessment of the State's Community Water Systems,[1] issued in August 2019 by the Office of Environmental Health Hazards Assessment, California Environment Protection Agency, attached to this ruling as Attachment B. Parties may also include any other relevant comments as to how information in Attachment B should be considered for purposes of issues within the scope of the proceeding.

[1] https://oehha.ca.gov/media/downloads/water/report/achievinghr2w08192019.pdf

1. How should utilities incorporate drought-year sales into forecasted sales?
2. What weight should be assigned to drought-year sales in a forecast model?
3. Should the Commission adopt a specific sales forecasting model to be used in GRCs?
4. How should a sales forecasting model incorporate revisions in codes and standards related to water efficiency?
5. How are penetration rates over time recognized in sales forecast models to account for changes to codes and standards related to water efficiency?
6. For utilities with a full Water Revenue Adjustment Mechanism (WRAM)/Modified Cost Balancing Account (MCBA), should the Commission consider converting to Monterey-style WRAM with an incremental cost balancing account? Should this consideration occur in the context of each utility's GRC?
7. Should any amortizations required of the Monterey-style WRAM and incremental cost balancing accounts be done in the context of the GRC and attrition filings?
8. Should Tier 1 water usage for residential be standardized across all utilities to recognize a baseline amount of water for basic human needs?
9. Should water usage for basic human needs be based on daily per capital consumption levels specified in Water Code Section 10609.4 or some other standard or criteria?
10. To achieve affordability of water usage for basic human needs, should the rate for Tier 1 water usage be set based on the variable cost of the water (i.e., no fixed cost recovery should be included in Tier 1 rates)?
11. Should individual household budgets be developed for setting Tier 1 usage or should the average household size in the ratemaking area be the basis for establishing Tier 1

usage, and if so, how would large-size households be protected from high water bills?

12. If the Commission adopts a uniform name for utility low-income programs, what should this name be?
13. How should a pilot program be designed that provides a low-income benefit to water users who are not customers of the utility in multi-family buildings?
14. What mechanism in the pilot program design (Question 13) will ensure that the low-income benefits flow to the benefit of the water user as opposed to the utility customer?
15. Should a reporting mechanism be established to evaluate the success of current and future iterations of utility low-income programs in delivering affordable water service to low-income households? What metrics should be reported (*e.g.*, rate of non-payment of monthly water bills by low-income customers, rate of service disconnection among low-income customers, number of late payments and or requests for payment plans among low-income customers, enrollment penetration among the population of eligible low-income households)
16. Should the Commission adopt a specific timeline, such as suggested by CWA, in processing water system consolidation requests by Commission-jurisdictional utilities?
17. Are current utility affiliate transaction rules sufficient for utilities to take on the administration of failing water systems identified by the Water Board? If not, what changes to the rules are needed to facilitate utilities assuming an administrative oversight role for failing water systems?
18. Should the Commission's staff role in implementing recovery in rates for safe drinking water funding loans for utilities be changed or expanded?

3. Service of Ruling on Related Proceedings

This ruling directs the Commission's Process Office to serve this ruling to the following referenced proceedings:

- Application (A.) 14-11-007;
- A.14-11-009;
- A.14-11-010;
- A.14-11-011;
- A.15-02-001;
- A.15-02-002;
- A.15-02-003;
- A.15-02-013;
- A.15-02-024;
- A.15-03-004; and
- Rulemaking 15-03-010.

Any party to the above referenced proceedings may submit comments or questions to be considered as to the relevant matters consistent with the filing dates for party responses and replies.

IT IS RULED that:

1. Parties may submit comments on the Staff Report attached to this ruling Attachment A and responses to the questions presented in this ruling no later than September 16, 2019.

2. Parties may submit replies to the comments and responses of other parties no later than September 23, 2019.

3. The Commission Process Office shall serve notice of this ruling on the following proceedings: Application (A.) 14-11-007; A.14-11-009; A.14-11-010; A.14-11-011; A.15-02-001; A.15-02-002; A.15-02-003; A.15-02-013; A.15-02-024; A.15-03-004; Rulemaking 15-03-010

Dated September 4, 2019, at San Francisco, California.

/s/ DARCIE L. HOUCK

Darcie L. Houck
Administrative Law Judge

ATTACHMENT A

Report on Low-Income Workshop

LIRA Program, Drought Forecasting Mechanisms, Small Water System Consolidation

A California Public Utilities Commission Workshop

Imbrecht Hearing Room, 1516 9th St, Sacramento, CA

August 2, 2019

R.17-06-024

Prepared by:
Jeremy Ho, Utilities Engineer
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August 27, 2019

Summary and Introduction

On August 2, 2019, the California Public Utilities (Commission) held a workshop in Rulemaking R.17-06-024 at the California Energy Commission's Imbrecht Hearing Room at 1516 9th Street, Sacramento. The workshop was directed by Commissioner Martha Guzman Aceves, Commissioner Genevieve Shiroma, and Administrative Law Judge Darcie Houck. The purpose of the workshop was to discuss the Low Income Rate Assistance (LIRA) Program, drought forecasting mechanisms, and consolidation of small water systems. Topics were addressed by three panels as explained below. The workshop began at approximately 10 am and concluded at about 4 pm.

Speakers at the workshop included representatives of the California Water Associate (CWA) represented by Jack Hawks and Lori Dolqueist, Public Advocates Office (CalPA) represented by Suzie Rose and Richard Rauschmeier, Del Oro Water Company (Del Oro) represented by Janice Hanna, California American Water Company (Cal-Am) represented by Evan Jacobs and Nick Subias, State Water Resource Control Board (SWRCB) represented by Max Gomberg, Pacific Institute represented by Laura Feinstein, Golden State Water Company (GSWC) represented by Jenny Darney-Lane, A&N Technical Services (A&N) represented by Thomas Chesnutt, Leadership Counsel for Justice and Accountability (LCJA) represented by Michael Claiborne, and Community Water Center (CWC) represented by Debi Ores. In attendance were primarily representatives from investor-owned utilities (IOUs) and nonprofit groups, as well as municipal water utility representatives. There was also a telephone line available for participants.

After the Commissioners' introductions, the first panel discussed LIRA programs. The second panel discussed drought forecasting mechanisms, and the third panel discussed consolidation of small water systems. The Commissioners and the Administrative Law Judge concluded the workshop and indicated the next steps moving forward.

First Panel: LIRA Programs

The morning panel consisted of representatives from Del Oro, CalPA, Cal-Am, SWRCB, and Pacific Institute and were provided a series of questions on the ability-to-pay, number of people per household, Tier-1 baseline, or a standard monthly discount rate/dollar value for the entire state.

Del Oro began by stating that Class C and D water systems would have difficulty funding LIRA programs mainly due to the size of their served customers. Class C and D water systems contain less than 2,000 water connections each. In addition, some of the water systems are located in low-income areas and include up to 95% low-income households. Under such circumstances the 5% of households that are not low-income households would have to offset the cost of the LIRA programs for the 95% that would participate in the LIRA programs. That would cause the bills of the few non-LIRA customers to increase dramatically. Instead of using a LIRA program for each utility, Del Oro proposes to use a statewide program to have a larger pool of participants to help achieve assistance for low-income customers.

Next, Cal-Am addressed the questions by stating that IOU rates will continue to see upward pressure to assist with increasing updates in infrastructure and new water quality challenges. The current structure for Cal-Am's billing system is an inclining tiered-rate system which assists in conservation by increasing quantity rates as more water is used. In addition, Cal-Am already provides a LIRA program, allowing users to receive a 20% discount on the first two tiers that the customer is billed. Cal-Am explained that creating a dollar amount LIRA program could cause large variability with recovery costs. For example, if ratepayers with low water bills would participate in the low-income program and the discount is larger than the water bill, then the ratepayer may not pay anything for their utility bill. Cal-Am's main concern with the ability-to-pay method are the privacy issues connected to customer personal information being hacked similar to recent events with Capital One.

Commissioner Guzman Aceves questioned Cal-Am regarding their advice letter for establishing a tariff that provided a discount to low-income multi-family renters. She suggested that such a program might work better as a pilot in the Water Affordability proceeding. Parties were generally open to this idea, especially with conditions to show a direct benefit to those customers.

SWRCB discussed updates to the AB401 draft report that was released in January 2019. After receiving much input from commenters, SWRCB is considering reducing the essential service amount of water from 12 Hundred Cubic Feet (CCF) to 6 CCF, an amount that would be associated with indoor usage only. If a Tier-1 baseline were to be used, it should reflect the indoor essential usage of 6 CCF and may be adjusted depending on extreme circumstances such as household size or medical reasons or geographical differences.

SWRCB stated that measuring the number of people in a household would be very difficult and might not yield correct results for the affordability crisis. While California has an affordability crisis for water, there are other crises occurring, such as the housing crisis. The SWRCB noted that the majority of low-income households in California are renters whose water costs are included in their rent paid to the landlord. SWRCB suggested providing a rental credit which could be received through income taxes.

Determining a comprehensive ability-to-pay approach would be too difficult to administer by including all necessary household costs without explaining cost details. Instead, SWRCB proposed using an income-based approach as opposed to enumerating other expenses. In addition, a third-party can facilitate a community-based program that will aid households in crisis of facing a water disconnection. Such a program would emulate a program similar to that of energy utilities, the Energy Crisis Intervention Program (ECIP) which is part of the federally funded Low-Income Heating Assistance Program (LI-HEAP), which assists households who have been disconnected or are on the verge of disconnection for electricity or gas. To address a program's efficacy, SWRCB requires utilities to submit Electronic Annual Reports which report the number of disconnections, amounts of delinquency, and length of delinquency.

CalPA stated that if a Tier-1 baseline cost were implemented, the rate should be as low as possible regardless of the effect on the revenue requirement. The other tiers should be adjusted as necessary through the GRC process to provide the necessary revenue. The baseline should be applied to all customers to assist with the Human Right to Water Act. In addition, the discount would assist with customers that are currently low-income but are not enrolled in existing low-income programs to automatically enroll them in the discount program. CalPA was opposed to the idea of considering essential usage on a “per-capita” basis and believes that the Commission should create a methodology that addresses household-size variability within the state. Providing discounts based on the household size is difficult to gauge. Some households might under-report the number of residents due to legal reasons. Others might exaggerate the number to receive a larger baseline amount and game the system. Of course, such gaming would penalize the honest households. Determining whether a program is operating efficiently would require collecting information on the rate of non-payment bills, rate of late payments, and number of low-income households in the LIRA program.

CalPA believes that consolidation is not an adequate method to create more affordable rates. PAO pointed out that while consolidation can make expensive rates cheaper, it will also cause cheaper rates to become more expensive. At Public Participation Hearings, the primary topic for consolidation of water systems is how the low-cost community’s rates will increase. In addition, there is a risk during consolidation that a low-cost district will become a high-cost district if a pollutant is to be addressed through regulation at any point in time. There are better methods, from CalPA’s point of view, to help provide affordable rates than consolidation of utility systems. Such methods include IOUs providing their own discount programs or instituting a statewide program across utility systems.

CalPA presented a preliminary analysis of water usage within California and whether limiting water on a “per-capita” basis or on a household basis would be more appropriate. The report analyzed data from 2013 to 2017 and focused primarily on consumption during the winter months as a representation of indoor usage, which assumes that households do not use as much outdoor irrigation during these months. A majority of the data was provided for connections in the South Coast region which consists of the Los Angeles County region. The data showed no clear correlation between LIRA vs non-LIRA household water usage. For example, in one district, LIRA households may use less water, while in another district, LIRA households use more water. During the winter months viewed, water usage ranged anywhere between 4 CCF to 13 CCF with an average usage of 6-8 CCF. CalPA suggests reviewing water bills at the connection level which would help to mitigate privacy issues when providing a discount to low-income households.

Second Panel: Drought Forecasting Mechanisms

GSWC began by addressing a drought forecasting mechanism. GSWC stated that they continue to work with CalPA to create more accurate sales forecasts. GSWC argued that while setting accurate forecasts is a top priority, it is futile to establish low forecasts if the intention is to be more accurate. Adjustments between the GRC years will assist in accuracy of the forecasts, as opposed to a steep increase in rates due to under-forecasting. Steep and sudden increases may shock customers, whereas more frequent smaller rate adjustments may be less unsettling.

GSWC believes that the Sales Reconciliation Mechanisms (SRM) in conjunction with escalation filings are necessary to obtain a better gauge on increases for the utility’s rates. GSWC submits SRMs and escalation filings concurrently to prevent multiple rate increases from appearing on customer bills. SRMs are calculated when a 10% difference between actual and forecasted sales is reached. SRMs improve the accuracy of rates to customers. Sometimes the Water Revenue Adjustment Mechanism (WRAM) provides money back to customers or alternatively creates a balance that is charged to customers.

CWA stated that since the GRC process began, differences between forecasts from CalPA and IOUs have gotten smaller as they collaborate and reach agreements. However, sales forecasts based on the New Committee Method (NCM) and other older forecasting methods were not very good. Current methods are producing more accurate three-year forecasting. Still, if government agencies wish to move toward a longer forecasting period (e.g. 5 or 10 years), there is an inherent difficulty, for no forecasting method can account for natural disasters or other fundamental changes. CWA believes such events can only be considered when they occur. SRMs assist utilities in using recent accurate data to update rates based on current events such as increases in purchased power or purchased water expenses. In addition, SRMs are the best possible option to adjust rates and enhance the accuracy of rates on a timely basis.

Regarding future climate change and effects on drinking water, CWA stated that IOUs have limited information. The few programs in place are pilot programs, and their results – when they come – will only be understood when evaluated. It will take a long time before we can reach firm conclusions. Even so, IOUs are reviewing methods for water conservation as a top priority by reviewing alternatives like ground water storage. IOUs can plan for the projects, but depending on the longevity of the project, the forecasts may not be accurate.

CalPA began their discussion by stating that in recent years the NCM has played less of a role in sales forecasts. Recent forecasts have improved, but there is still room for further improvements. In the past, IOUs used average data, but CalPA suggested using better data and models to create better forecasts. The new forecasting model will account for the utilities' actions encouraging customers to switch to more water efficient appliances by evaluating control group experiences to model the data and analytically explain the effects in the future.

CalPA disagrees with the use of the WRAM due to drastic reductions in public participation. CalPA asserted that WRAMs address a single issue for rate making, namely "how did sales change". A major flaw with the current method is that the WRAM does not analyze whether the utility spent the amount they proposed. CalPA posed the question of why utilities should be protected from sales changes if the funds were not spent, and the customers did not benefit? Why should utilities be allowed to request more money if the changes in sales are not the result of beneficial programs? During drought years, Sale Reconciliation Mechanisms (SRMs) can be used to adjust depending on actual sales compared to forecasted results. However, the main issue is that the WRAM balances are so high. CalPA is opposed to adding another mechanism to counter the WRAM balances. CalPA explains that the IOUs' main risk is the sales variability. If the sales variability is removed as an impediment to financial stability, along with rate of return, the impact on affordability would be greatly reduced.

CalPA provided some background on SRMs stating that the mechanism was originally a pilot program that would be used as an assistance to step filings. When WRAMs were introduced, they made the step filings more complex and as a result SRMs became more complex. While SRMs and step filings are occurring at the same time, the public may not realize that the rate changes are occurring at the same time, and the trend is that rates are generally increasing. A suggestion from CalPA was to not only look at the previous year's sales but analyze other factors such as the capital budget, leak adjustments, and uncollectable expense. If there are mistakes in the capital budget, the IOUs are shifting the problem from the company to the customers by increasing rates.

A&N believes there are better ways for drought forecasting. However, IOUs need to be able to adjust due to environmental changes, not only due to droughts, but also wildfires and earthquakes. Any unconditional forecasts will not be getting more accurate and may get more inaccurate in the future. A&N suggested that reconciliation and adjustments can help drive the forecasts, however, IOUs need to go a step further by relaying information to their customer base to reduce water usage. What doesn't work is telling customers to reduce water usage and then realizing that revenue is down. A&N presented an article by Financing Sustainable Water on *Building Better Water Rates for an Uncertain World.*[1]

A&N asserted that the best method to deal with a water shortage and customer costs is not to have a water shortage in the first place. IOUs weren't allowed to invest in water use efficiency up to a level of cost effectiveness. The correct focus should be on the customers and customer focused bills. Cost effectiveness programs reduce customer bills in the long term. A study for the Los Angeles Department of Water and Power found that savings of 26% of water were possible. CalPA stated we should work for more water efficiency programs.[2]

Third Panel: Consolidation of Small Water Systems

LCJA began the third panel by explaining the need for a community-driven solution to safe drinking water. Since LCJA works with small water communities of 200 water connections or less, many of the small water communities are open to the idea of consolidation to make their rates more affordable. In order to make rates more affordable, consolidation has moved slowly in the past, and immediate actions are needed to provide safe drinking water to these communities. The Commission and communities should continue to find solutions to safe and reliable drinking water together.

CWC agrees with LCJA that community involvement is necessary in providing safe drinking water and the consolidation process. Yet we should keep in mind that rates need to be affordable for all systems that are being consolidated. In some cases, when small water systems were consolidated, the rates became unaffordable. That circles back the issue of human right to water and the need to ensure that rates are fair. CWC also stated that the consolidation process is too slow for small water systems. CWC believes that the Commission is understaffed and advocates for more people to assist in speeding up the process. CWC answered the question of whether having an IOU assist with operations, as opposed to acquiring the system, by stating that while owners of at-risk systems generally do not want the system back, sometimes the views of the owners do not align with the views of the customers.

[1] https://www.financingsustainablewater.org/tools/building-better-water-rates-uncertain-world

[2]Alliance for Water Efficiency: LADWP Rates Conservation Report
<http://www.allianceforwaterefficiency.org/ladwpratesnr.aspx>

To expand on the discussion between LCJA and CWC on the time required for the consolidation process, CWA presented a proposed timeline for the Commission to review and approve consolidation of at-risk systems of both private and public utilities. Currently IOUs file advice letters when acquiring Class C and D water systems for $5 million or less but need to file an application for obtaining a water system for more than $5 million. While Senate Bill (SB) 88 and Assembly Bill (AB) 2501 implement very good customer notices, most IOUs tend to go beyond these requirements by holding public participation hearings on consolidating water systems.[3,4]

CWA continued by addressing changes to Decision (D).99-10-064 and the need for an at-risk assessment. CWA anticipates a large influx of work to be conducted by Class A and B water utilities to assist with AB 2501 and SB 200 which requires an administrator to assist at-risk water systems.[5,6] Once the risks are mitigated, the administrator will return the water system back to the original owners. In some instances where a large water system is assisting an at-risk system, the owner of the at-risk system no longer wants the system and tries to sell the system.

Cal-Am agreed with the discussion topics from CWA and added that during the acquisitions of smaller systems, there is a need to improve and implement data requirements. The current process for at-risk water systems includes notice to customers, proposed rates and sales forecasts, appraisal of the system, and one-year and five-year forecasts of operations costs of the system. But even with all these provisions, there is still much uncertainty that needs to be discussed between parties before acquiring the systems. Cal-Am discussed a need to have the Commission and the SWRCB collaborate and discuss the administration positions discussed in AB 2501 and SB 200

CalPA stated that there is no regulation from the Commission when an IOU moves to acquire a publicly owned utility but needs to submit documents for a CPCN and rate design with the Commission after the publicly owned utility is acquired. CalPA voiced concern regarding CWA's proposal to consolidate processes for acquiring a struggling public system and acquiring an investor-owned system. CalPA acknowledges that the process takes time, but this occurs because time is necessary for a thorough review of the information provided by the acquiring and the acquired utilities. D.99-10-064 focuses on systems that have violations, but CalPA advocates to prioritize troubled or soon-to-be troubled systems in order to provide water to all of California at an affordable price.

Wrap Up: Next Steps and Closing

Commissioner Guzman Aceves and Commissioner Shiroma thanked all the panelists for their insights on the topics discussed during the workshop and the people in attendance.

Administrative Law Judge Houck explained that the next steps are to receive the Staff Workshop Report. A ruling will attach the report, additional questions, and request comments from parties. A proposed

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[3]Senate Bill 88 <https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB88>
[4]Assembly Bill 2501 < https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2501>
[5]D99-10-064 <http://docs.cpuc.ca.gov/DecisionsSearchForm.aspx>
[6]Senate Bill 200 <https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB200>

decision will be drafted and submitted for comments before the final decision will be submitted to the Commissioners for voting.

The workshop was then adjourned.

(END OF ATTACHMENT A)

ATTACHMENT B

PUBLIC REVIEW DRAFT

ACHIEVING THE HUMAN RIGHT TO WATER IN CALIFORNIA

AN ASSESSMENT OF THE STATE'S COMMUNITY WATER SYSTEMS

AUGUST 2019

Office of Environmental Health Hazard Assessment

California Environmental Protection Agency

OEHHA

SCIENCE FOR A HEALTHY CALIFORNIA

Contributors

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Abbreviations

AB 685	Assembly Bill No. 685
AL	Action Level
ACS	American Community Survey
CAR	Conventional Affordability Ratio
CPT	County Poverty Threshold
COV	Coefficient of Variation
CWS	Community Water System
DAC	Disadvantaged Communities
DBCP	1,3-Dibromo-3-Chloropropane
DP	Deep Poverty
eAR	Electronic Annual Report
GW	Ground Water
HCF	Hundred Cubic Feet
IQR	Interquartile Range
JMP	Joint Monitoring Program
LCR	Lead and Copper Rule
MCL	Maximum Contaminant Level
MHI	Median Household Income
MOE	Margin of Error
MTBE	Methyl *Tert*-Butyl Ether
OEHHA	Office of Environmental Health Hazard Assessment
PCE	Perchloroethylene
PHG	Public Health Goal
PPIC	Public Policy Institute of California
PUC	Public Utility Commission
SDAC	Severely Disadvantaged Community
SDWIS	Safe Drinking Water Information System
SJV	San Joaquin Valley
SW	Surface Water
TMF	Technical, Managerial, and Financial Capacity

TCR	Total Coliform Rule
TTHM	Total Trihalomethanes
TCE	Trichloroethylene
1,2,3-TCP	1,2,3-Trichloropropane
UN	United Nations
UNICEF	United Nations Children's Fund
UN CESCR	United Nations Committee on Economic, Social, and Cultural Rights
US EPA	US Environmental Protection Agency
WHO	World Health Organization
WQM	Water Quality Monitoring Database

Introduction

Reliable access to safe and affordable water is fundamental to human health and well-being. While many Californians may take safe and affordable drinking water for granted, some residents receive water of marginal quality, or that they struggle to afford. Still others can lose access to water during periods of drought.

In California, nearly 300 communities rely on water sources that contain elevated levels of arsenic, which can cause cancer, birth defects, and heart disease. Other Californians depend on small water systems, and domestic wells impacted by contaminants like nitrate, which can likewise cause detrimental health outcomes. Across the state, contaminated water sources disproportionately burden low-income communities and communities of color, further exacerbating persistent inequities. In addition, many low-income households depend on water systems struggling with issues such as aging infrastructure, unreliable supplies, and a cost structure that pushes water rates to unaffordable levels. Climate change is also dramatically affecting water quality, availability, and affordability. In light of these trends, it is increasingly critical for the state to develop methods for identifying drinking water challenges, and to design and implement solutions that improve the quality of water delivered to California households, while also improving supply resiliency and affordability for all Californians.

In 2012, with the enactment of Assembly Bill (AB) 685 (Eng, Chapter 524, Statutes of 2012), California became the first state to declare that every human being in our state has a right to clean, safe, affordable, and accessible water adequate for human consumption and sanitary purposes. The legislation instructed all relevant state agencies, including the State Water Resources Control Board (State Water Board, or Board), to consider the human right to water when revising, adopting, or establishing policies, regulations, and grant criteria pertinent to water uses. More recently, on July 24, 2019, the Governor signed Senate Bill (SB) 200 (Monning, Chapter 120, Statutes of 2019), which directs the state to “bring true environmental justice” to its residents, and to “begin to address the continuing disproportionate environmental burdens in the state by creating a fund to provide safe drinking water in every California community, for every Californian.”

State Agency Efforts to Develop and Implement Policy Solutions

The State Water Board strives to protect the quality, accessibility, and affordability of California’s water by developing and enforcing environmental and drinking water standards, tracking comprehensive water quality data, and administering water conservation programs, among various other efforts. As such, the Board plays a critical role in delivering safe, clean, affordable and accessible drinking water to state residents.

In 2016, the Board adopted a Human Right to Water Resolution making the human right to water, as defined in AB 685, a primary consideration and priority across all of the state and regional boards' programs (State Water Resources Control Board Resolution No. 2016-0010. 2016). As part of its efforts to achieve the human right to water, the Board also enlisted the expertise of the Office of Environmental Health Hazard Assessment (OEHHA), to develop a framework for evaluating the quality, accessibility, and affordability of the state's drinking water supply. The Human Right to Water Assessment and Data Tool—comprised of this draft written report and an accompanying web platform—marks a first step toward developing a baseline from which to comprehensively track challenges in water quality, accessibility and affordability that individual California water systems face. This baseline assessment includes an examination of our state's community water systems' capacities, deficiencies, and vulnerabilities. This draft report also provides a conceptual framework and method for tracking the state's progress in delivering clean, safe, affordable, and accessible water through community water systems.

Other complementary methods to assess and track water system needs and vulnerabilities include:

- The Water Board's interactive map of out-of-compliance systems[1], and its Needs Assessment (Senate Bill No. 862. 2018),[2] which is aimed at prioritizing the Board's funding, assistance and regulatory work in the State's most vulnerable or unsustainable systems;
- The Water Board's assessment of low-income affordability challenges and a plan for statewide low-income rate assistance (Assembly Bill No. 401. 2015);[3] and
- The Department of Water Resource's working assessment of small and rural system supply vulnerabilities (Assembly Bill No. 1668. 2017).[4]

Each of these efforts focuses on current water system and household issues, and specific policy mechanisms to address them.

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[1] See: Human Right to Water Portal at https://www.waterboards.ca.gov/water_issues/programs/hr2w/, which provides information about all of the Board's work on implementing the human right to water, including a map of out-of-compliance systems.

[2] The Water Board was directed to conduct a needs assessment pursuant to the Budget Act of 2018; http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB862

[3] (Assembly Bill No. 401. 2015) directed the Water Board to develop a plan and recommendations for a statewide low-income rate assistance program.

[4] (Assembly Bill No. 1668. 2017) directed the Department of Water Resources, in consultation with the Water Board and other stakeholders, to evaluate supply vulnerabilities for small and rural water systems.

OEHHA's Assessment and Data Tool

OEHHA's tool uniquely complements past and ongoing efforts, including those listed above, by offering information that the public and decision makers can view at the statewide or system-level, and across all three principal components of the State's human right to water. The data tool is designed to support state and local government agencies including the State Water Board and regional boards, the Legislature, researchers, and community organizations in policy planning and implementation, and in designing programs to deliver safe and affordable water to households and individuals. The data tool is also designed to show how our various community water systems might be assessed and tracked over time.

OEHHA intends to expand the scope of the assessment and refine the tool over time as additional data on water quality, accessibility and affordability in California becomes available. For example, in future versions OEHHA will seek to include state small water systems, schools, private wells, and marginalized populations (e.g., people experiencing homelessness), as well as tribal water systems. Similarly, sanitation is a critical component of the human right to water that OEHHA will seek to include in future versions. As OEHHA adds additional systems and populations to its tool, the data and metrics can continue to support refined and additional policy implementation efforts at the state, regional, and local levels.

This draft report first presents an overview of the assessment and data tool. Next, it introduces each of the three components—water quality, water accessibility and water affordability—along with the indicators that comprise each component. Each section includes draft results for each indicator and component. The report then explains how the data tool works and walks readers through a series of hypothetical cases with supporting visual information. The draft report also includes several appendices that describe additional data and indicators that could be added into future versions of the assessment and data tool, and provides details on various technical aspects of the methods.

After receiving public comment on this updated draft, OEHHA intends to finalize this first version of the framework and tool. OEHHA welcomes and looks forward to receiving the public's input on this draft document and suggestions for how to incorporate additional data and indicators into future versions.

Assessment Framework and Data Tool: Approach and Overview

Approach to Building the Assessment

In developing this baseline assessment and data tool, OEHHA drew on existing international approaches to tracking the human right to water (See Box 1), most importantly those of the World Health Organization and the United Nations' Joint Monitoring Program (WHO and UNICEF 2017). OEHHA adapted these approaches to develop specific indicators that address the conditions and needs of California (Villumsen M. and Jensen M. H. 2014).[5] These efforts are also intended to complement and build upon the work of the State Water Board and other agencies to ensure the quality, accessibility, and affordability of California's drinking water supply.[6]

The goals of this assessment and data tool are to:

1) Reflect core, California-specific objectives for safe, clean, affordable, and accessible water for all state residents.
2) Create a system of indicators of water quality, accessibility and affordability that can be examined individually or in groups to allow for a nuanced understanding of key domestic water issues.
3) Develop a working data set and analytic framework for evaluating trends in the provision of clean, safe, accessible and affordable water to all Californians, and assess progress over time.

In moving toward these goals, the data tool will serve as an adaptable approach for adding or refining indicators in the future, based on public input, policy needs and data availability.

Assessment Overview

Assessing the overall adequacy of the provision of water means taking into account the following three objectives:

Water Quality: The water supplied to California residents should be safe to use. This means that it should be free from harmful bacteria and other pathogens, and that the levels

[5] OEHHA followed Villumsen and Jensen's (2014) methodology for developing the framework for the screening tool, while drawing on international tracking efforts such as the United Nations' Joint Monitoring Program (UNICEF 2017).

[6] Drinking water supply refers to domestic water supply used for household purposes such as drinking, cooking, bathing, etc.

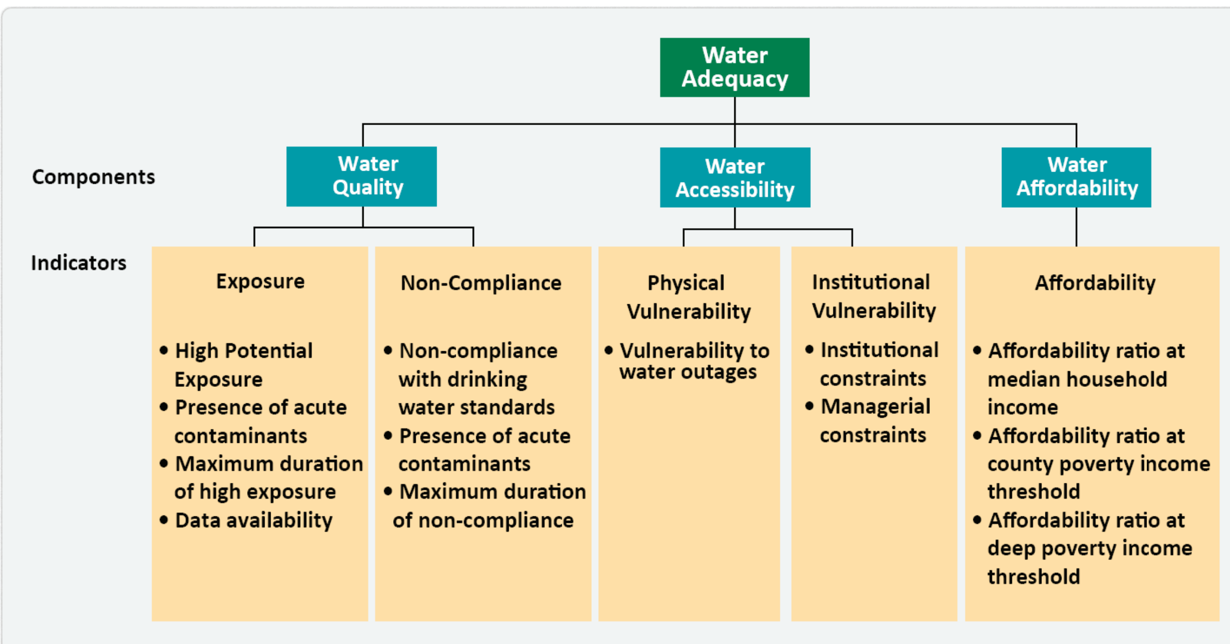
of chemical contaminants such as solvents and pesticides, nitrates, heavy metals, and radioactivity should not pose significant public health risks.

Water Accessibility: Water should be accessible in sufficient and continuous amounts to meet everyday household needs. For example, it should be available for drinking, preparing food, bathing, clothes washing, household cleaning, and toilet use.

Water Affordability: Water to meet household needs should be affordable, taking into consideration other household living expenses, and the direct and indirect costs associated with obtaining access to the water.

The assessment uses indicators to characterize these three components. A total of 13 indicators are used to measure water quality, accessibility, and affordability for households served by community water systems. These are represented in Figure 1. Each indicator has been chosen based on current data availability, data coverage and data quality. Other indicators that have not been included due to data limitations may be added or refined in future versions, as improvements in data collection permit (see Appendix, Table A1).

Figure 1. Proposed Assessment Framework. Components are indicated in blue boxes. In each yellow box, subcomponent names are indicated at the top, followed by individual bulleted indicators.



Unit of Analysis

This first assessment and data tool analyzes community water systems. These are defined as public water systems that serve at least 15 year-round service connections, or regularly serve at least 25 yearlong residents (Health and Safety Code Section 116275). Community water systems were included if they were active during the 2008-2016 study period. A total of 2,903 community water systems met this criterion (OEHHA 2017).[7]

Time Period

This assessment focuses on data from the most recent time period available across each dataset. For most indicators, the data are from 2016, or as close to 2016 as possible. However, the assessment offers a long-term view of water quality, as the water-quality indicators cover the period from 2008 to 2016 (This is discussed in the section on the Water Quality component.)

Box 1: The Human Right to Water

The Human Right to Water is broadly defined as the right of individuals to safe, accessible and affordable water for drinking and sanitation. Whether this right is met is best assessed for each individual. However, most monitoring efforts typically assess the proportion of a population with access to safe and affordable water. In this current report, OEHHA focuses on households served by community water systems, which provide water to approximately 90% of California's population.

A comprehensive evaluation of the human right to water and sanitation must focus on all points of access, including schools, communities reliant on domestic wells, etc. Accordingly, with time, this assessment would expand to include sanitation and all such populations in order to provide a complete picture of the human right to water in California.

Indicator Selection and Scoring

To create indicators for each component, we:

- Assess sources of data for quality, coverage, and availability.
- Select data for the relevant time period that is high quality, provides broad coverage, and is publicly available.

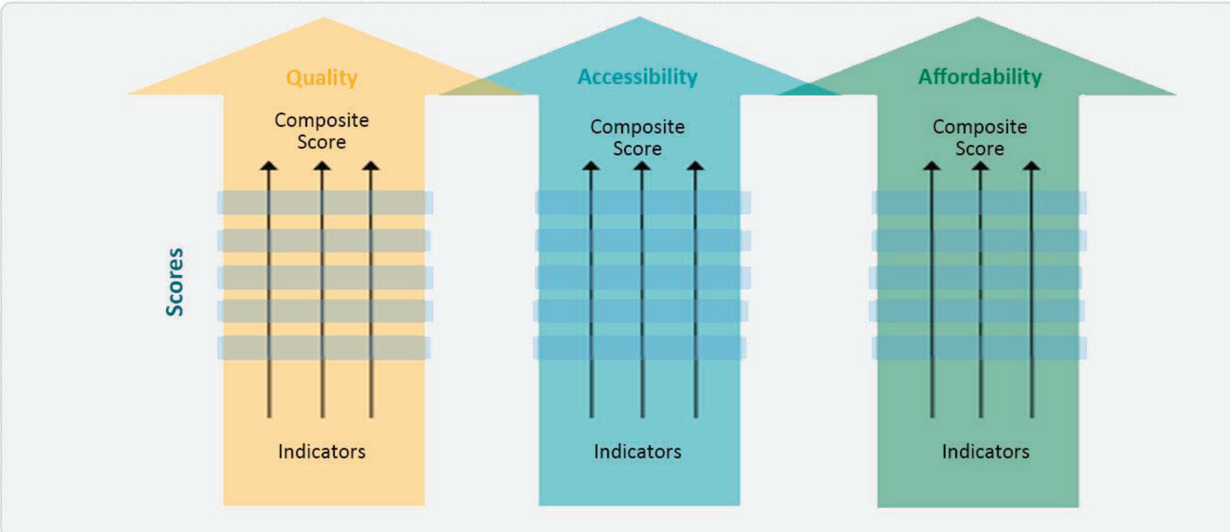
As shown conceptually in Figure 2, we then:

- Calculate each indicator value.
- Assign scores to each indicator, with higher values given to systems that perform favorably in the area that the indicator represents, and lower values given to systems

[7] This number includes five service areas provided by the Los Angeles Department of Water & Power, as well as the parent system itself. The five service areas were used to better estimate intra-system water quality and affordability variability for this system. This approach is further described in OEHHA's CalEnviroScreen 3.0 report (OEHHA 2017).

that perform less favorably. This results, for example, in a higher water-quality score for better water quality, and a lower score for poorer water quality. Develop a composite scoring approach for each component, so that individual water systems have an overall score for water quality, accessibility and affordability based on the indicators that comprise each component.

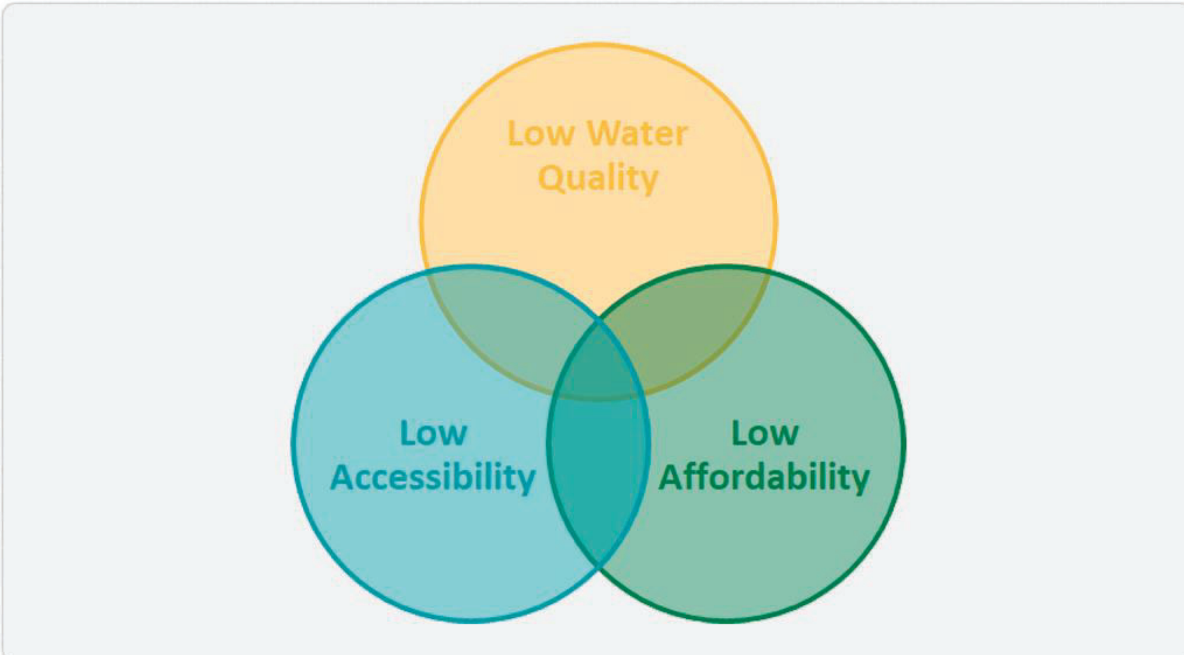
Figure 2. Conceptual View of the Proposed Assessment and Tool. The assessment is composed of three core components, with indicators assigned to each component. Higher indicator scores reflect better water quality, accessibility or affordability.



A Holistic View of Water Systems

While individual indicators associated with each of the assessment's three components provide useful information, decision-makers may wish to assess water systems across components, to better understand the relationship between various water delivery and service characteristics. For this purpose, it is valuable to use the three composite component scores for a given system, to illustrate a system's overall status. Such a cross-component view can allow users to understand how a system's water quality, accessibility and affordability might relate to each other, as demonstrated conceptually in Figure 3, which is further elaborated upon later in the report (see Figure 41). The cross-component view offered by this assessment can help identify water systems and regions that may need a more in-depth evaluation of water challenges. A cross-component view can also signal which systems are doing well in one or more of three areas. Periodic updating of the indicators will also illuminate broad trends and progress over time.

Figure 3. Conceptual View of How Multiple Challenges Can Affect Individual Water Systems. The proposed framework and data tool allow users to view overall trends for each human right to water component, while also comparing the overall status of a water system across these three components.



While a cross-component view yields valuable information, each of the three components alone, and their associated indicators, offer important data and scores that are useful for planning and shaping policy solutions to local water system challenges. A holistic view of an individual or set of water systems should not replace a more specifically tailored view that might facilitate the development of an appropriate solution to a particular system-level challenge. For example, a system with unsafe drinking water needs an immediate remedy to address water quality, regardless of whether the supply is plentiful and the rates are low. In other words, a system's deficiencies in any given single component should not be outweighed or downplayed by more favorable performance in the other components.

This first assessment and data tool focus on households served by community water systems. With time and further data acquisition efforts, later assessments would seek to incorporate information on sanitation, domestic well users and other key populations. These are further discussed in the "Future Considerations" chapter at the end of the report.

Component 1: Water Quality

Water Quality and Its Subcomponents

Clean water that is safe to drink is essential to human health. However, not everyone in the state experiences the same level of drinking water quality.

Water quality is evaluated here in two basic ways:

- A "contaminant exposure" subcomponent, which measures the extent of exposure of a water system's customers to chemical and microbiological contaminants in the system's drinking water.
- A "non-compliance" subcomponent, which measures the extent to which a water system fails to comply with primary drinking water standards, specifically the Maximum Contaminant Levels (MCLs).[8]

These two subcomponents provide different kinds of critical information in evaluating the quality of the water provided by water systems.

Measuring which contaminants people can be exposed to at the tap is important. Compliance status also offers important information about how successfully water systems are meeting regulatory requirements that pertain to public health. However, measuring compliance alone may not fully capture the public health implications of exposure to drinking water contaminants because compliance with most regulatory standards is determined by whether a water system meets federal and state drinking water standards at their individual water sources, such as a well, the site of a surface water intake, or the treatment facility.[9] Figure 4 illustrates the various points that each subcomponent focuses on (Balazs, Morello-Frosch et al. 2011; OEHHA 2017).[10] It highlights how the compliance sub-component is based on measurements at Points A and C, while the exposure sub-component is based on measurements at Point D.

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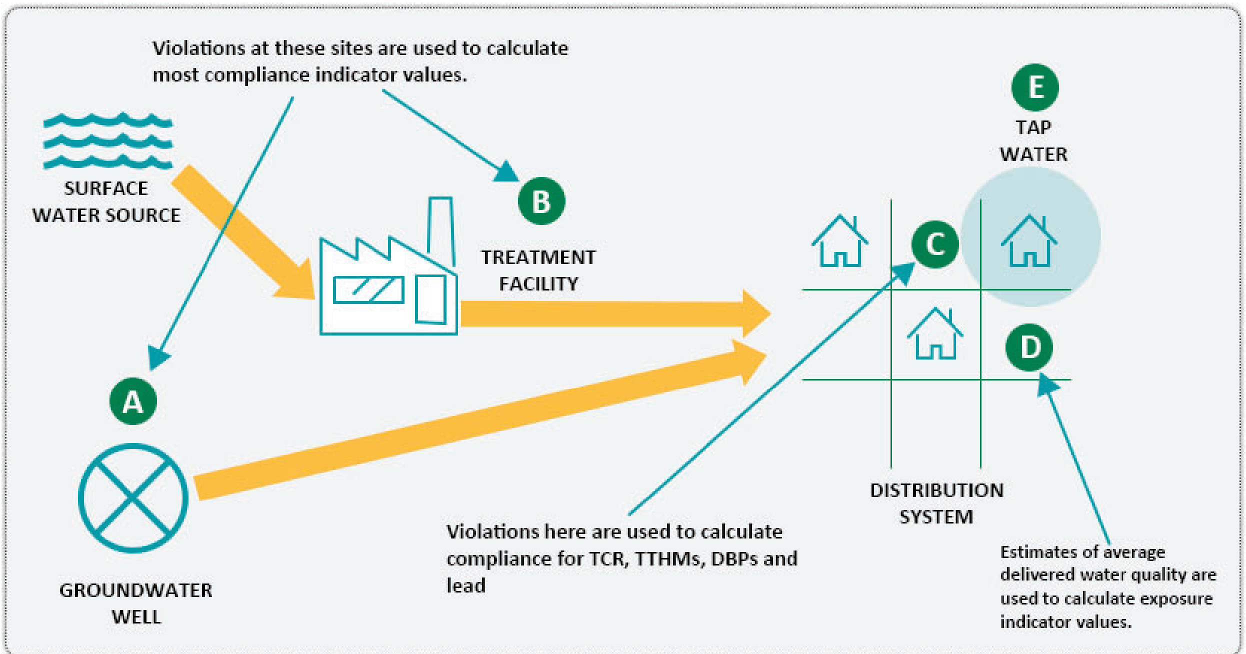
[8] Most human right to water efforts, such as the United Nations' Joint Monitoring Program, only evaluate water quality in relation to compliance with regulatory standards.

[9] Exceptions include samples for the Total Coliform Rule (TCR), the Lead and Copper Rule (LCR) and the Disinfectants/Disinfection Byproducts Rule (DBPR). For example, compliance for TCR is determined using water samples taken from the distribution system.

[10] Data about water quality at the tap is not widely available, so the average quality of delivered water is used here to represent potential exposure. This is the best way available to accurately capture information about water quality before water enters the household distribution system (Balazs, Morello-Frosch et al. 2011; OEHHA 2017).

Figure 4. A Hypothetical Community Water System. Generally, compliance with regulatory standards is assessed at the site of a groundwater well (A) and/or at the treatment facility (B), though for lead, disinfection byproducts, total trihalomethanes and the Total Coliform Rule compliance is assessed within the distribution system, at places like Point C. The "non-compliance" subcomponent measuring MCL violations detected at points A, B and C are used to calculate the compliance indicator values. Point D represents OEHHA's estimate of water quality representative of a system's average delivered water quality. The "exposure" subcomponent measures contaminants at point D. Average water quality calculated in the distribution system (D) is used to represent an estimate of tap water quality at Point E, for which data is not available.



Time Period of Coverage

Water-quality data for this initial version of the tool was drawn from a nine-year period from 2008 to 2016, the three most recent consecutive three-year compliance periods for which data are available (US EPA 2004).[11] Since not all systems are required to report monitoring data for all contaminants each year, using this nine-year period results in a greater chance of capturing water quality monitoring data for a given system, since all systems would need to sample during a nine-year compliance cycle. This nine-year period reflects information for the most

[11] US EPA guidelines govern the monitoring and reporting of drinking water quality over three-year compliance periods, within nine-year compliance cycles (US EPA 2004). Our study period spans the third compliance period of the 2002-2010 compliance cycle (i.e., 2008-2010), and the first and second compliance period of the 2011-2019 compliance cycle (i.e., 2011-2016). Data collection for the 2016-2019 compliance period data collection is currently ongoing, as data for 2019 is still being collected.

recent three full compliance periods.[12] However, since the most recent data are from 2016, the water quality component does not reflect current compliance and exposure status.

Contaminants Selected

Approximately 122 drinking water contaminants are regulated in California under federal and state law. Of these, nearly 100 have primary drinking water standards, and the remaining have secondary standards. From a human-right-to-water perspective, consideration of all such contaminants is important. However, for this first version of the tool, OEHHA selected a subset of contaminants to characterize the water quality component of the tool. Each contaminant was selected based on whether there was significant coverage of water quality sampling data for that contaminant in the Water Quality Monitoring database across water systems in the 9-year time period between 2008 and 2016.

OEHHA started with 19 contaminants that had been considered for use in the CalEnviroScreen 3.0 drinking water quality indicator (OEHHA 2017). From this list, OEHHA selected 14 contaminants for which at least 80% of community water systems in the state reported at least one monitoring sample[13]:

> Arsenic, barium, benzene, cadmium, carbon tetrachloride, lead, mercury, methyl tertiary butyl ether (MTBE), nitrate, perchloroethylene (PCE), perchlorate, trichloroethylene (TCE), toluene, and xylene (See Table 1).[14]

Four additional contaminants associated with significant health effects, and for which there are a significant number of MCL violations (but for which less than 80% of water systems had samples), were deemed to be "high priority" and were also selected:

> 1,2-dibromo-3-chloropropane (DCP), 1,2,3-trichloropropane (1,2,3-TCP), total trihalomethanes (TTHM) and uranium (See Table 1).[15]

Finally, total coliform was included since it is an important measure of microbiological contamination, though there is no statewide sampling data available of coliform samples (but

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[12]The current compliance status of a system is available in the USEPA annual compliance report and on the Water Board's Human Right to Water Portal: https://www.waterboards.ca.gov/water_issues/programs/hr2w/

[13] Regulations require water systems to sample and test for a particular subset of chemicals unless the water system can demonstrate that these chemicals are not used, manufactured, transported, stored, or disposed of within their source watershed or within the zone of influence of their groundwater source(s). Upon a successful demonstration, systems are considered non-vulnerable to the subset of chemicals, and testing for them is not required. This subset of chemicals is not included in this report, since the report relies on chemicals with universal sampling and testing requirements.

[14] While radium-226 and radium-228 (radioactive breakdown products of uranium) meet the criteria for inclusion, an assessment is underway regarding how best to include sampling data for these contaminants. The current assessment does not currently include these contaminants.

[15] The presence of hexavalent chromium is a serious health concern, but this chemical is not currently included because it does not have an MCL (State Water Board 2017).

data is available for compliance status). Future versions of this tool will explore additional contaminants, including those with secondary drinking water standards.

Table 1. Contaminants Used to Characterize the Water Quality Component. The table indicates whether the contaminant was used for the exposure or compliance subcomponents, and the percentage of systems statewide that had at least one water quality monitoring sample in the period from 2008 to 2016.

Contaminant	Used in Exposure Indicators	Used in Compliance Indicators	Percent of Systems with Water Quality Monitoring Data
Arsenic	Yes	Yes	95%
Barium	Yes	Yes	95%
Benzene	Yes	Yes	93%
Cadmium	Yes	Yes	95%
Carbon tetrachloride	Yes	Yes	93%
Dibromochloropropane (DBCP)	Yes	Yes	59%
Lead	Yes	**No**	95%
Mercury	Yes	Yes	95%
Methyl tertiary butyl ether (MTBE)	Yes	Yes	93%
Nitrate	Yes	Yes	97%
Perchloroethylene (PCE)	Yes	Yes	92%
Perchlorate	Yes	Yes	96%
Trichloroethylene (TCE)	Yes	Yes	92%
1,2,3-Trichloropropane (1,2,3-TCP)	Yes	**No**	63%
Toluene	Yes	Yes	92%
Total coliform	Yes	Yes	Not available
Total trihalomethanes (TTHM)	Yes	Yes	74%
Uranium	Yes	Yes	45%
Xylene	Yes	Yes	92%

Exposure Subcomponent

Approach

For the exposure subcomponent, OEHHA developed four exposure indicators that measure:

1. The nature of contaminant concentrations ("high potential exposure").
2. Whether contaminants are acutely toxic.
3. The duration of high potential exposure.
4. The availability of monitoring data.

For each of these indicators, average delivered water quality for each contaminant is used to represent exposure to drinking water contaminants at the tap. A contaminant's MCL is used as the benchmark against which to compare measured concentration levels. Potential exposure—measured as the annual average concentration of delivered water quality—is considered high if the annual average water concentration of a contaminant is at or above the MCL. Potential exposure is considered not high if it is below the MCL. Indicating that a potential exposure is not high under this approach is not intended to suggest an absence of health risk for a contaminant. OEHHA's Public Health Goals (PHG) for drinking water are the benchmark used to determine health risks from exposure to contaminants. However, it is not practical to use the PHGs as a benchmark for these indicators, as the detection limits for many contaminants are well above their corresponding PHGs.

OEHHA made the following adjustments for specific contaminants:

- For 1,2,3-TCP, the 2017 MCL is used as the benchmark.
- For lead, tap water sampling results for the 90th percentile of samples (as per the Lead and Copper Rule) are used in place of average delivered water quality estimates. Lead levels are then assessed against the lead Action Level Exceedances instead of an MCL, since there is no MCL for lead. Therefore, we compare the average of these 90th percentile results in a given water system to lead's Action Level (Title 17 2012).[16]
- Total coliform counts are monitored regularly.[17] Here, MCL violations of the Total Coliform Rule (TCR) were used to represent high potential exposure events, instead of the average contaminant concentration, as is done for other contaminants. MCL violations of the TCR are used to calculate both exposure and compliance indicators.[18]

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[16] Lead and Copper Rule; Title 17, California Code of Regulations, section 64673. The only system-level information on lead available statewide is from sampling pursuant to the Lead and Copper Rule. While source-level lead sampling data is also available, such data does not approximate lead levels in the home. Instead, following the Lead and Copper Rule, a subset of homes within each system are sampled, and the 90th percentile results are publicly available and can be used to estimate potential exposure levels. As a result, however, estimated lead exposure levels may be under or over-represented for the average lead levels of a water system.

[17] TCR results are sent as hardcopies by laboratories directly to the State Water Board District Offices and Local Primacy Agencies. Compliance decisions are made manually by regulators, and entered into the Water Board's Safe Drinking Water Information System database.

[18] Future assessments and data tools may include new measures of bacteriological contamination to reflect the

Data Source

Water Quality Monitoring (WQM) Database, 2008-2016, Available at URL: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDTlibrary.shtml

Estimating Potential Exposure

As noted above, *average delivered water quality for each water system* serves as a proxy for average exposure at the tap. For each contaminant of interest, annual average delivered water quality was calculated using the following steps:

- Sources providing delivered water were identified for each water system (OEHHA 2017).
- An average contaminant level for each relevant source was calculated.
- An annual, time-weighted, system-level average concentration was calculated for each contaminant, using source-level water quality sampling results (OEHHA 2017) (e.g., point D in Figure 4).[19]

Indicators

Water Quality Indicator 1: High Potential Exposure

This indicator evaluates the number of contaminants with high potential exposure levels. We define *high potential exposure* as a situation in which a system's average annual contaminant concentration is at or above the MCL for the contaminant at least once during the study period.

Method

To create the indicator of "high potential exposure" for each water system we:

- Estimated the average annual concentration of delivered water for each contaminant (except for Total Coliform)
- Assessed whether the concentration was greater than the MCL (or the Action Level for lead) at least once in the time period for each contaminant.
- Counted the number of contaminants whose average annual concentration was greater than its MCL (or Action Level for lead)
- Added a count if the system exceeded the TCR MCL at least once during the study period.

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implementation of the recently revised TCR.

[19] Here, we used the approach developed in CalEnviroScreen 3.0 where water quality monitoring samples were taken from the State Water Board's Water Quality Monitoring database. Samples for sources that represented delivered water included post-treatment or untreated sources. For systems that had no treated or untreated sources, water quality samples from "raw" sources were used.

The reason for considering whether a system had "at least one" such high exposure instead of counting the exact number of high potential exposures is to account for variation in the amount of water quality monitoring data available by year. Some systems sample more or less frequently based on their monitoring requirements, but would ideally have data for at least one year during the 9-year time period. Counting "at least one" high exposure in the 9-year time period accounts for monitoring or reporting bias in which some systems may have fewer years of data (and therefore fewer high potential exposures) due to lack of reporting or monitoring, not because of their prescribed monitoring schedule.

Scoring Approach

To score this indicator we assessed the distribution of the data and assigned water systems the following scores:

- 0, if the system had 4 or more contaminants with high potential exposure.
- 1, if the system had 3 contaminants with high potential exposure.
- 2, if the system had 2 contaminants with high potential exposure.
- 3, if the system had 1 contaminant with high potential exposure.
- 4, if the system had 0 contaminants with high potential exposure

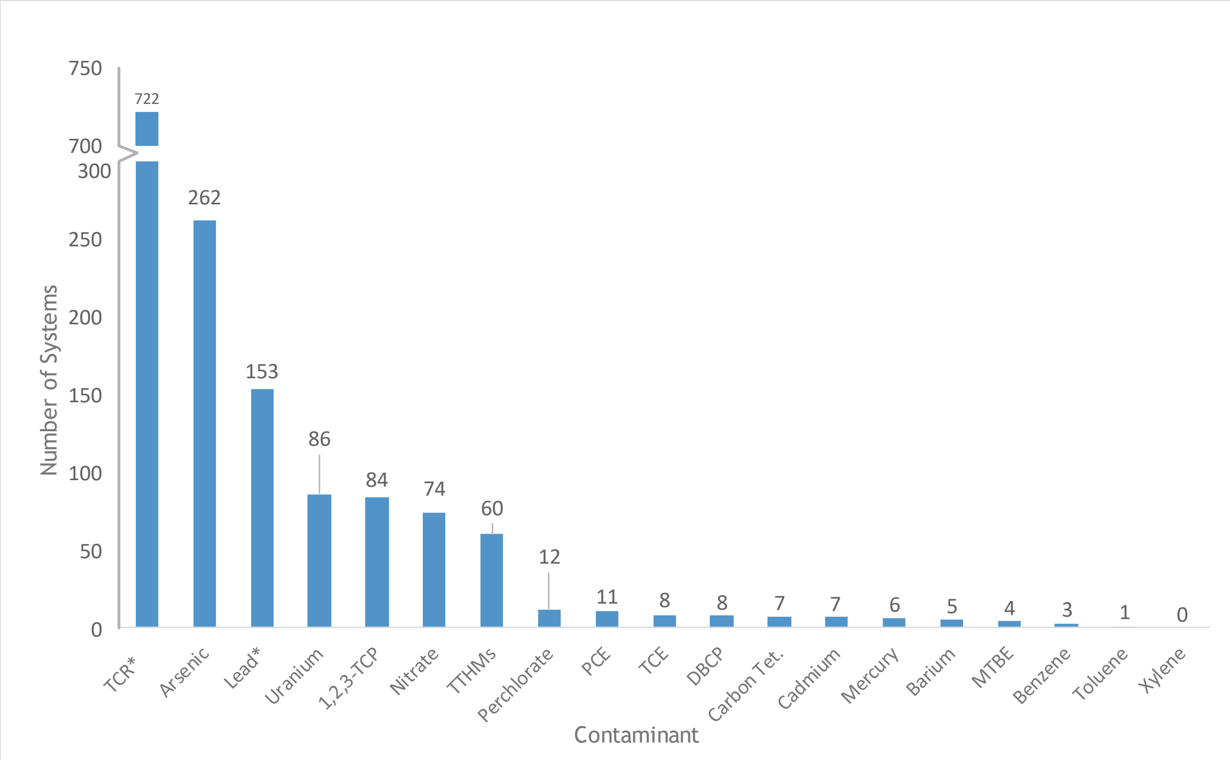
Results

All 2,903 community water systems evaluated had some form of water quality information available for at least one contaminant. As shown in Table 2, most water systems (~58%) did not have any contaminants with high potential exposures. For the majority of those that did, it was due to one contaminant (~33%). As illustrated in Figure 5, the most common high exposure contaminant was Total Coliform, followed by arsenic and lead.

Table 2. Water Quality Indicator 1: High Potential Exposure. Number of systems with contaminants whose annual average concentration was greater than the MCL at least once during the nine-year period 2008-16, with associated indicator score.

Number of Contaminants	Indicator Score	Number of Systems	Percent
0	4	1,696	58.4
1	3	953	32.8
2	2	210	7.2
3	1	39	1.3
4 to 5	0	5	0.2
Total		2,903	100

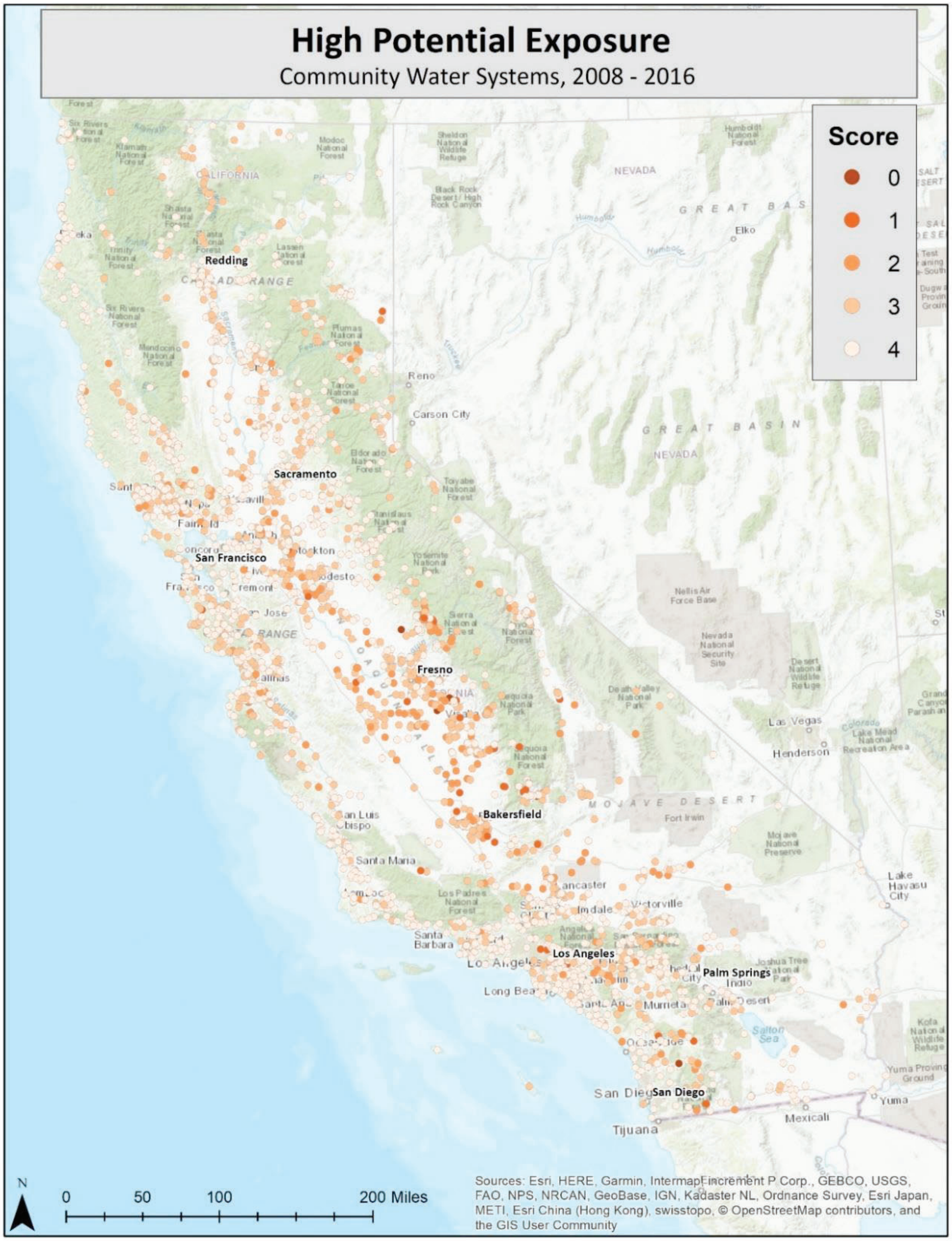
Figure 5. Number of Systems with High Potential Exposure (Annual average concentration exceeds MCL at least once in nine-year period, 2008-16)†. N=2,903. Maximum contaminant or relevant threshold used*.



** MCL for all contaminants used, except for lead, in which the Action Level is used. For lead, Lead and Copper Rule monitoring data for samples at the 90th percentile is used to estimate average exposure. For Total Coliform, MCL violation of the Total Coliform is used as a proxy measure of exposure.*

Figure 6 plots the scores for each community water system across the state.

Figure 6. Water Quality Indicator 1. High Potential Exposure. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 2.



Water Quality Indicator 2: Presence of Acute Contaminants

This indicator assesses if any of the contaminants for which there was high potential exposure are *acute contaminants*. Here, *acute contaminants* refer to those that pose *an acute risk*, defined as a situation in which there is the potential for a contaminant or disinfectant residual to cause acute health effects (i.e., death or illness) as a result of a single short period of exposure measured in seconds, minutes, hours, or days (Health and Safety Code section 64400). Among the contaminants regulated in California, the following are considered acute or semi-acute for the purpose of Tier 1 Public Notice: nitrate, nitrite, or nitrate plus nitrite, perchlorate, and E. coli/fecal coliform (Title 26).[20]

Method

To create the indicator of acute contaminants we:

- Determined whether there was a high potential exposure for any of the aforementioned contaminants.
- For each system, we summed the total number of acute contaminants that had a high potential exposure (sum can equal 0, 1, 2 or 3). This approach does not measure an acute exposure event, but rather identifies whether the high potential exposure was for an acute contaminant.

Only 'acute' TCR MCL violations are considered for this indicator (i.e., E. coli/fecal coliform), as opposed to all TCR MCL violations in the high potential exposure indicator.

Scoring Approach

To score this indicator we assigned water systems the following scores:

- 0, if the system had 2 to 3 acute contaminants with high potential exposure.
- 2, if the system had 1 acute contaminants with high potential exposure.
- 4, if the system had no acute contaminants with high potential exposure.

Results

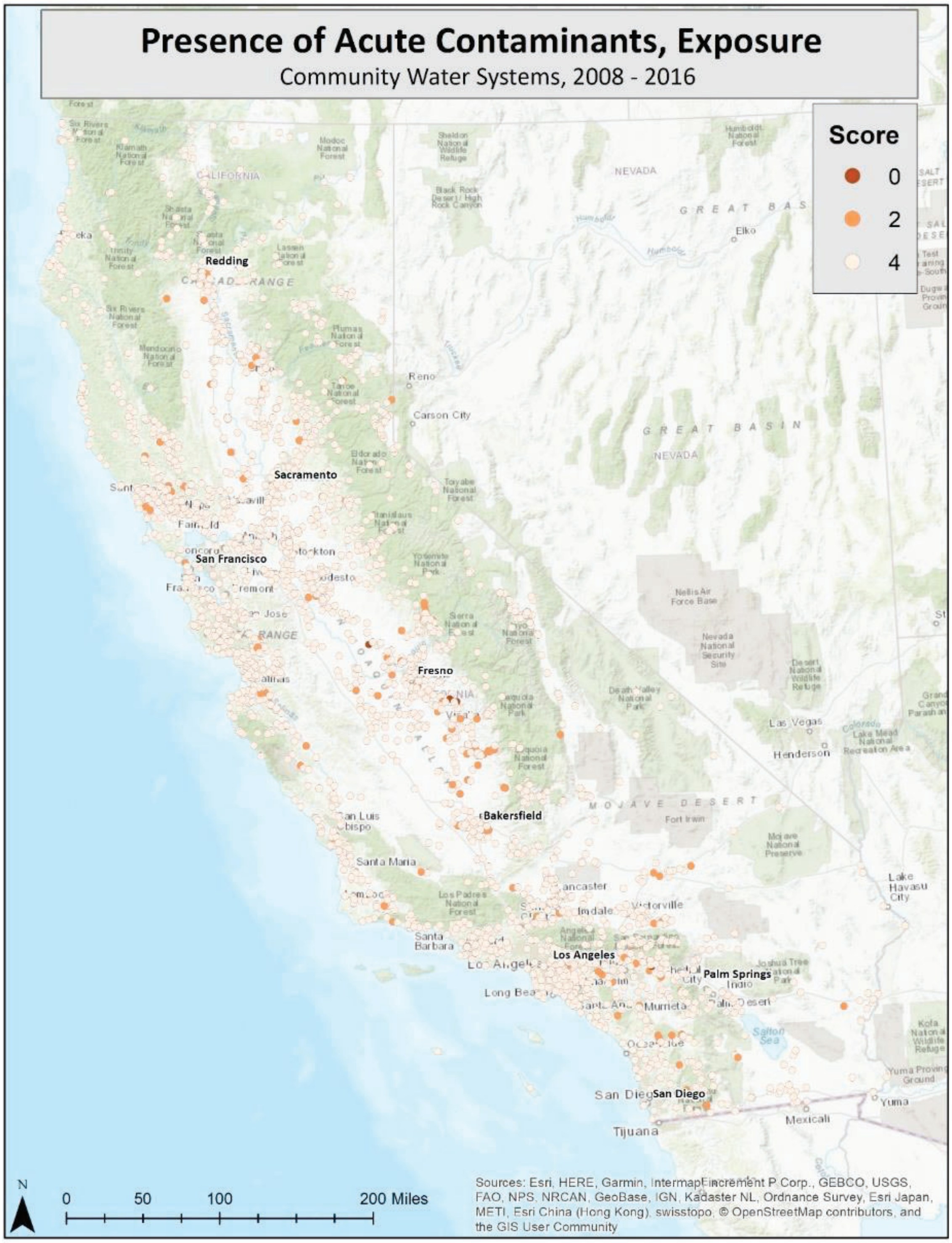
In the 9 year study period, 151 systems had high potential exposure for only one acute contaminant (Table 3). Of these, 74 were for nitrate, 74 were for TCR, and 12 were for perchlorate. Three systems had 2 acute contaminants, nitrate and TCR. One system had violations for all 3 acute contaminants. The map below shows the scores for each community water system across the state (Figure 7).

[20] Chlorine dioxide is also an acute contaminant, but is not included in this assessment. (Health and Safety Code section 64463.1a)

Table 3. Water Quality Indicator 2: Number of Acute Contaminants with High Potential Exposure. High potential exposure for nitrate and perchlorate assessed, alongside acute MCL violations of the Total Coliform Rule, with associated indicator score.

Number of Acute Contaminants	Indicator Score	Number of Systems	Percent
0	4	2,748	94.7
1	2	151	5.2
2 to 3	0	4	0.1
Total		2,903	100

Figure 7. Water Quality Indicator 2: Presence of Acute Contaminants. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 3.



Water Quality Indicator 3: Maximum Duration of High Potential Exposure

This indicator measures the duration of high potential exposure for each of the 19 selected contaminants by summing the number of years for which each contaminant had high potential exposure (from 2008 to 2016). The indicator score is based on the maximum duration of high potential exposure across all contaminants during the nine-year study period (2008-2016). In contrast to Indicator 1, which captures how many systems have had any high-contaminant concentrations, this indicator focuses on the recurring nature of contamination. Accordingly, it highlights systems that show an ongoing contamination problem. Capturing this recurring exposure is important, especially when such exposure involves contaminants whose health effects are associated with chronic exposure. A long duration of high potential exposure can also signal that a system may need additional resources or support to remedy contamination.

Method

To create this indicator we:

- Used the estimated average annual concentration for each contaminant (except for TCR).
- Summed the number of years (from 2008 to 2016) for which any contaminant's annual average concentrations was greater than the MCL (or Action Level for lead) for each contaminant, and summed the total years of TCR MCL violations.
- Selected the maximum duration of across the 19 contaminants.

Scoring Approach

For this indicator we assigned water systems the following scores:

- 0, if the system had 6 or more years of high potential exposure.
- 1, if the system had 4-5 years of high potential exposure.
- 2, if the system had 2-3 years of high potential exposure.
- 3, if the system had 1 year of high potential exposure.
- 4, if the system had 0 years of high potential exposure.

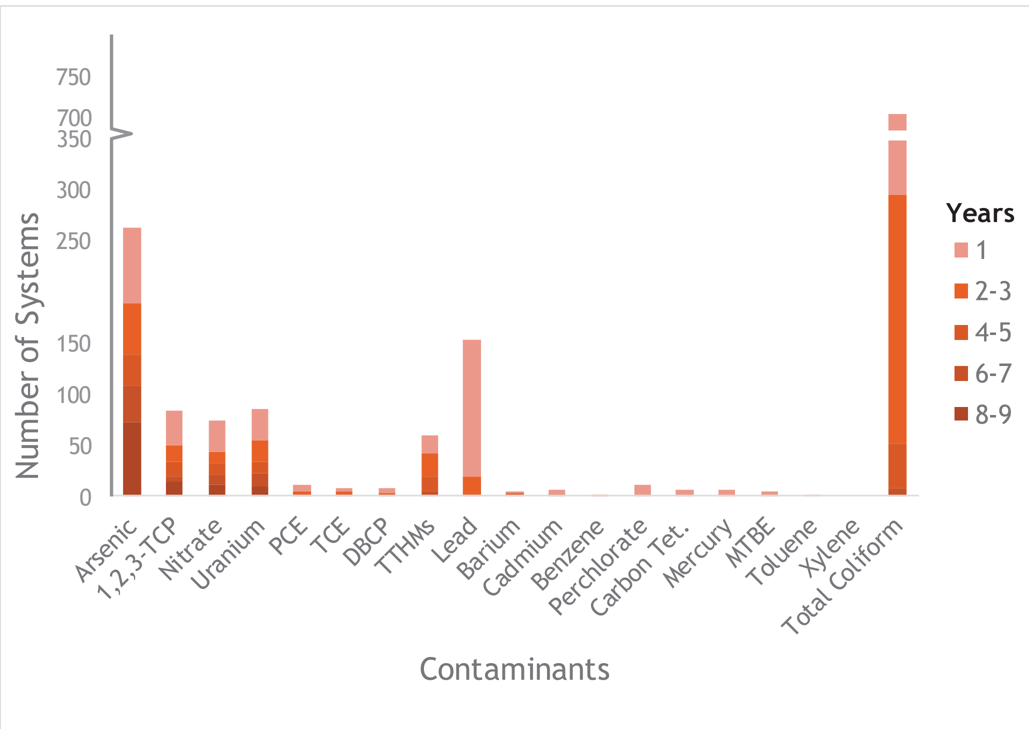
Results

As shown in Table 4, most water systems had no year or one year of high potential exposure. However, roughly 20 percent of systems had multiple years of high exposure. Figure 8 shows that this was mostly for arsenic. Also shown in Figure 8, arsenic had the largest number of systems (n=72) with the longest duration of high exposure (8 to 9 years). Only one contaminant—xylene—had no systems with high potential exposure.

Table 4. Water Quality Indicator 3: Maximum Duration of High Potential Exposure. Indicator score is applied to systems based on maximum years of high potential exposure across all contaminants, 2008-2016.

Maximum Duration of High Potential Exposure (Years)	Indicator Score	Number of Systems	Percent
0	4	1,696	58.4
1	3	592	20.4
2 to 3	2	325	11.2
4 to 5	1	112	3.9
6+	0	178	6.1
	Total	2,903	100

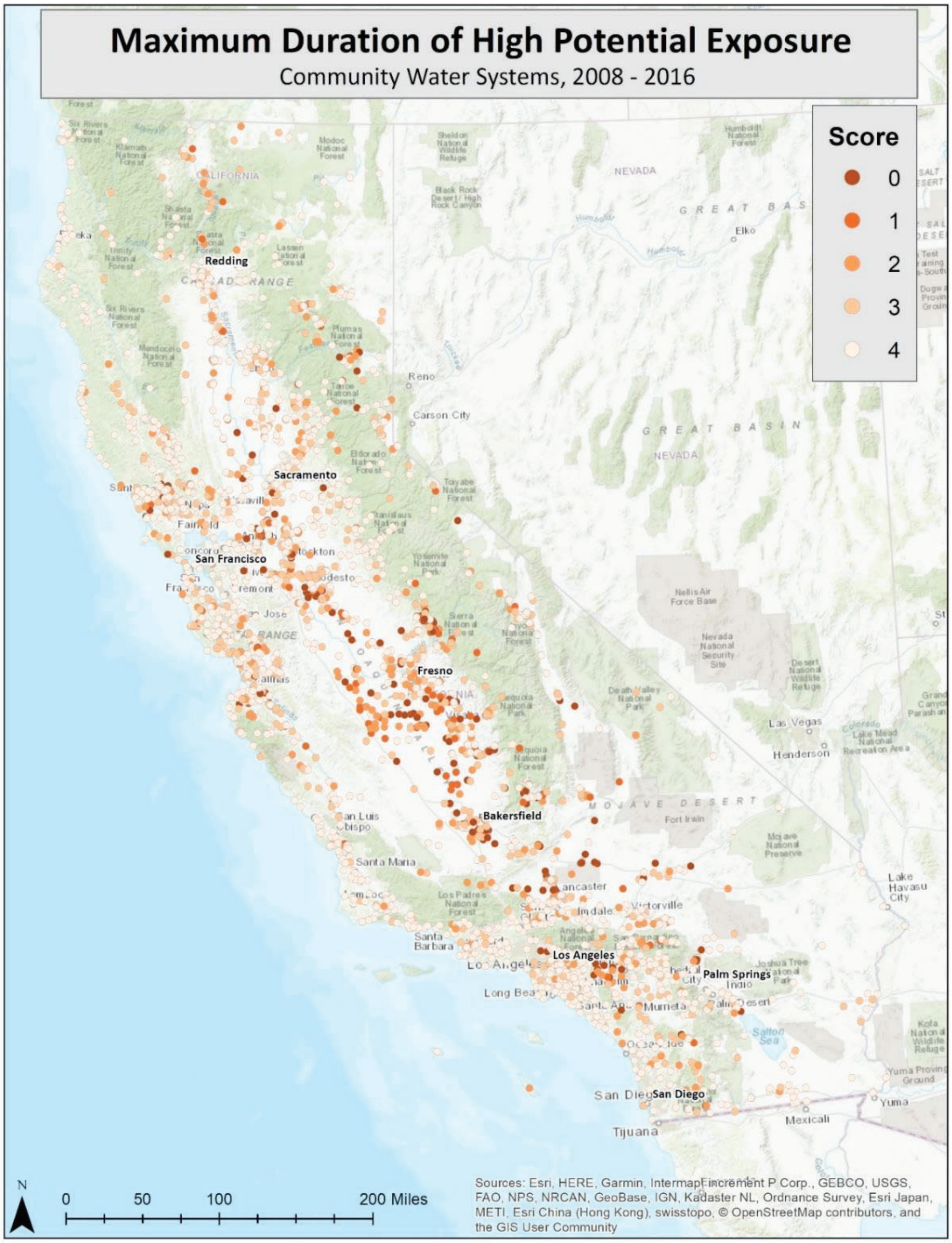
Figure 8. Duration of High Potential Exposure, by Contaminant. Maximum contaminant or action level (for lead) used*,† N= 2,903 community water systems.



** Duration of high exposure refers to how many years a given system had an annual average contaminant concentration exceed that contaminants MCL (or Action Level for lead).*
† The possible range of years of duration for each contaminant is 0 to 9. Inclusion of Total Coliform is based on systems that received at least one TCR MCL violation in a given year.

The map below shows the scores for each community water system across the state (Figure 9).

Figure 9. Water Quality Indicator 3: Maximum Duration of High Potential Exposure. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 4.



Water Quality Indicator 4: Data Availability

Water quality monitoring is essential to ensure compliance with drinking water standards, and to ensure that water systems and their customers have adequate information. Indicator 4 measures how much data is available to evaluate water quality in current water sampling databases (Title 22).[21] It is used to characterize the adequacy of information with respect to a system's water quality.

This indicator evaluates the extent of system water quality sampling data for 14 contaminants for which a system must have conducted water quality monitoring. According to US EPA's Standardized Monitoring Framework (US EPA 2004), the following 11 contaminants should be sampled at least once every nine years: arsenic, barium, cadmium, mercury, benzene, MTBE, carbon tetrachloride, toluene, TCE, PCE, and xylene. Two contaminants—lead and perchlorate—should be sampled at least three times every nine years.[22] Nitrate and total coliform must be sampled in each of the study period's nine years. Because monitoring results for total coliform are not included in state water quality monitoring databases, total coliform is not included in this indicator.

Method

To create this indicator we:

- Assigned each of the 14 contaminants noted above a value of one or zero, depending on whether the water system had at least the minimum number of samples required. For each contaminant, a 1 means the water system had the minimum number of samples, while a value of 0 means the water system did not have the minimum number of samples.
- Summed the count of this binary value across all fourteen contaminants.

Scoring Approach

To score this indicator, we assessed the distribution of the data and applied a qualitative assessment of what level of data availability was of lesser or greater concern. The final scores were assigned as follows:

- 0, if the system had no contaminants with the minimum required data in the time period.

[21] Note that this indicator is different than Monitoring and Reporting violations which capture instances of a water system not adhering to monitoring and reporting requirements (Title 22, California Code of Regulations. Section 60098),

[22] According to monitoring regulations, sampling for these contaminants must actually occur once in each compliance period. However, for the purposes of this report (and based on guidance we received from the State Water Board), sampling results occurring during any three years of the entire time period of 2008 to 2016 are considered sufficient.

- 1, if the system had 1 to 8 contaminants with the minimum required data in the time period.
- 2, if the system had 8 to 11 contaminants with the minimum required data in the time period.
- 3, if the system had 12 or 13 contaminants with the minimum required data in the time period.
- 4, if the system had all 14 contaminants with the minimum required data in the time period.

Results

Table 5 shows that more than 60% of systems did not have the minimum data required for the 14 contaminants.

Table 6 lists by contaminant the number of systems that did not have the minimum required data. The contaminants with the largest number of systems lacking the minimum required data were nitrate and lead.[23] The locations of systems with missing data were dispersed throughout the state, as shown in Figure 10.

Table 5. Water Quality Indicator 4: Data Availability for 14 Contaminants. Indicator scores are shown†.

Number of Contaminants with Required Data	Indicator Score	Number of Systems	Percent
14	4	1,120	38.7
12 to 13	3	1,317	45.4
8 to 11	2	238	8.2
1 to 7	1	153	5.3
0	0	75	2.6
	Total	2,903	100

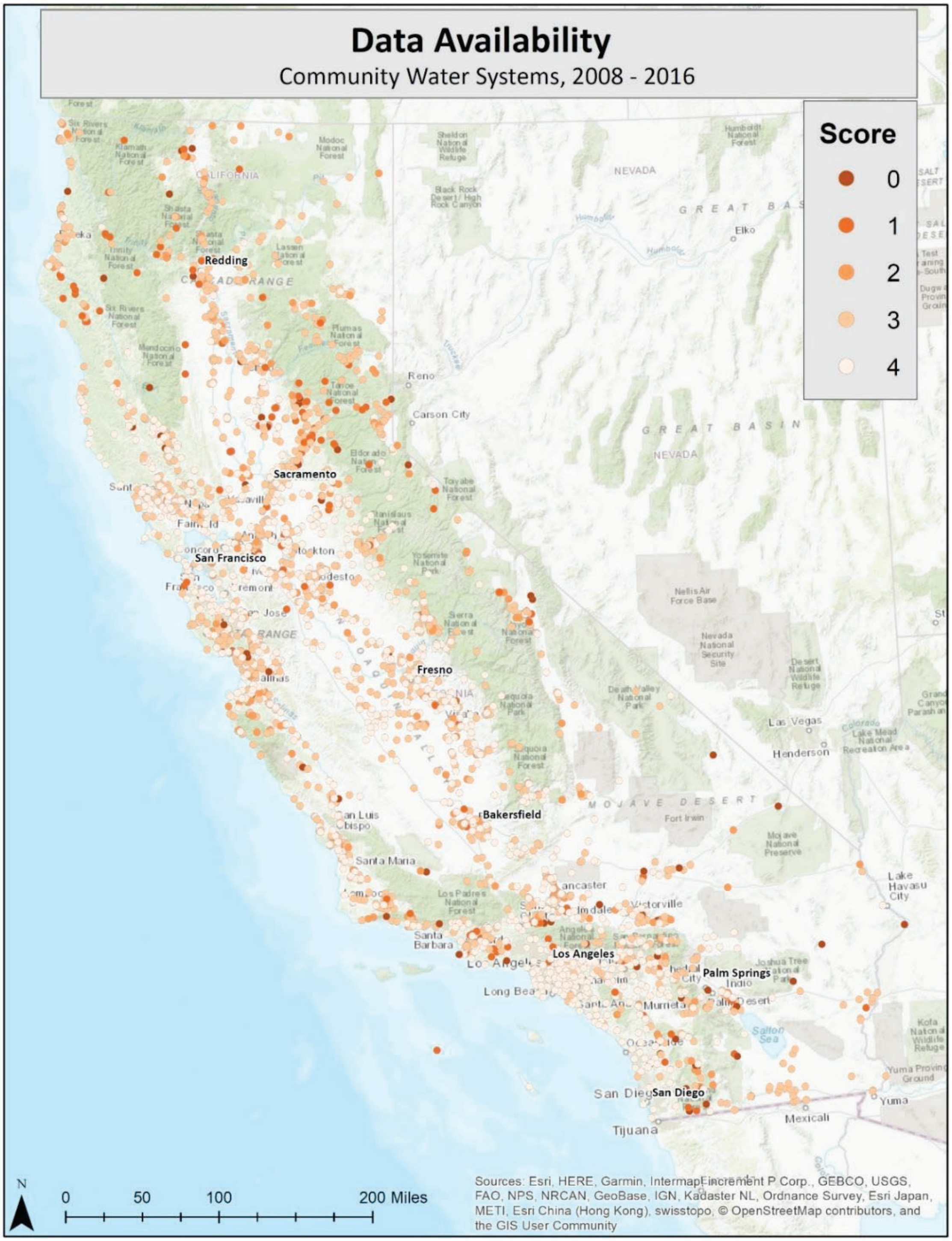
† Number of systems with contaminants that had available data in the 9-year time period.

[23] This does not necessarily mean this number of systems had no data, just that they did not meet the sampling requirements in accordance with the US EPA monitoring framework described above.

Table 6. Number of Systems without Required Water Quality Data by Contaminant, as per minimum sampling requirements under the monitoring framework.

Contaminant	Number of systems without required data	Percent of Total (N=2,903)
Arsenic	131	4.5
Barium	154	5.3
Benzene	217	7.5
Cadmium	153	5.2
Carbon Tetrachloride	217	7.5
Lead	1,163	40.0
Mercury	154	5.3
MTBE	208	7.2
Nitrate	1,401	48.3
PCE	219	7.5
Perchlorate	525	18.0
TCE	219	7.5
Toluene	218	7.5
Xylene	229	8.0

Figure 10. Water Quality Indicator 4: Data Availability. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 5.



Non-Compliance Subcomponent

Approach

The non-compliance indicators capture regulatory non-compliance with drinking water standards that can be associated with occasional (or ongoing) increases in contaminant concentrations *at the source or distribution level*.[24] Here, we consider an instance of non-compliance to be based on whether an MCL violation has occurred and is reported for the 19 primary drinking water contaminants listed in Table 1.

Data Source

Safe Drinking Water Information System (SDWIS) from the State Water Board, 2008-2016. Available at URL:

http://www.swrcb.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/

Indicators

Water Quality Indicator 5: Non-Compliance with Primary Drinking Water Standards

This non-compliance indicator evaluates the number of contaminants that have been in non-compliance with the MCL during the study period for 17 of the 19 contaminants of interest (see Table 1). The two excluded contaminants are 1,2,3-TCP and lead. The chemical 1,2,3-TCP is excluded because its MCL was not effective until 2017, meaning that no MCL violations were issued during the study period. Lead is not included because there is no MCL for lead, only an Action Level. However, monitoring and reporting violations of the Lead and Copper Rule (LCR) are included in the count of Monitoring and Reporting violations, which is part of the accessibility component.

Method

To calculate this indicator, we:

- Counted the total number of contaminants that had at least one MCL violation during the study period.

[24] Here, the term source refers to a facility that contributes water to a water distribution system, such as one associated with a well, surface water intake, or spring. Distribution level refers to sample sites within the distribution system where compliance is determined for specific contaminants (e.g., Total Coliform, Lead and Copper Rule).

Scoring Approach

To score this indicator we assessed the distribution of the data and assigned water systems the following scores:

- 0, if the system had 4 contaminants with at least one MCL violation.
- 1, if the system had 3 contaminants with at least one MCL violation.
- 2, if the system had 2 contaminant with at least one MCL violation.
- 3, if the system had 1 contaminants with at least one MCL violation.
- 4, if the system had 0 contaminants with MCL violations.

Results

As shown in Table 7, two-thirds of systems had no MCL violations in the entire nine-year period. Approximately 29% of systems had one contaminant with at least one MCL violation in the study period. Slightly over 5% had two or more contaminants with at least one MCL violation.

Table 7. Water Quality Indicator 5: Number of Contaminants That Had at Least One MCL Violation† and Associated Indicator Scores.

Number of Contaminants with at Least One MCL Violation	Indicator Score	Number of Systems	Percent
0	4	1,909	65.8
1	3	841	29.0
2	2	135	4.6
3	1	16	0.6
4	0	2	<0.1
Total		2903	100

† 1,2,3-TCP and lead are excluded.

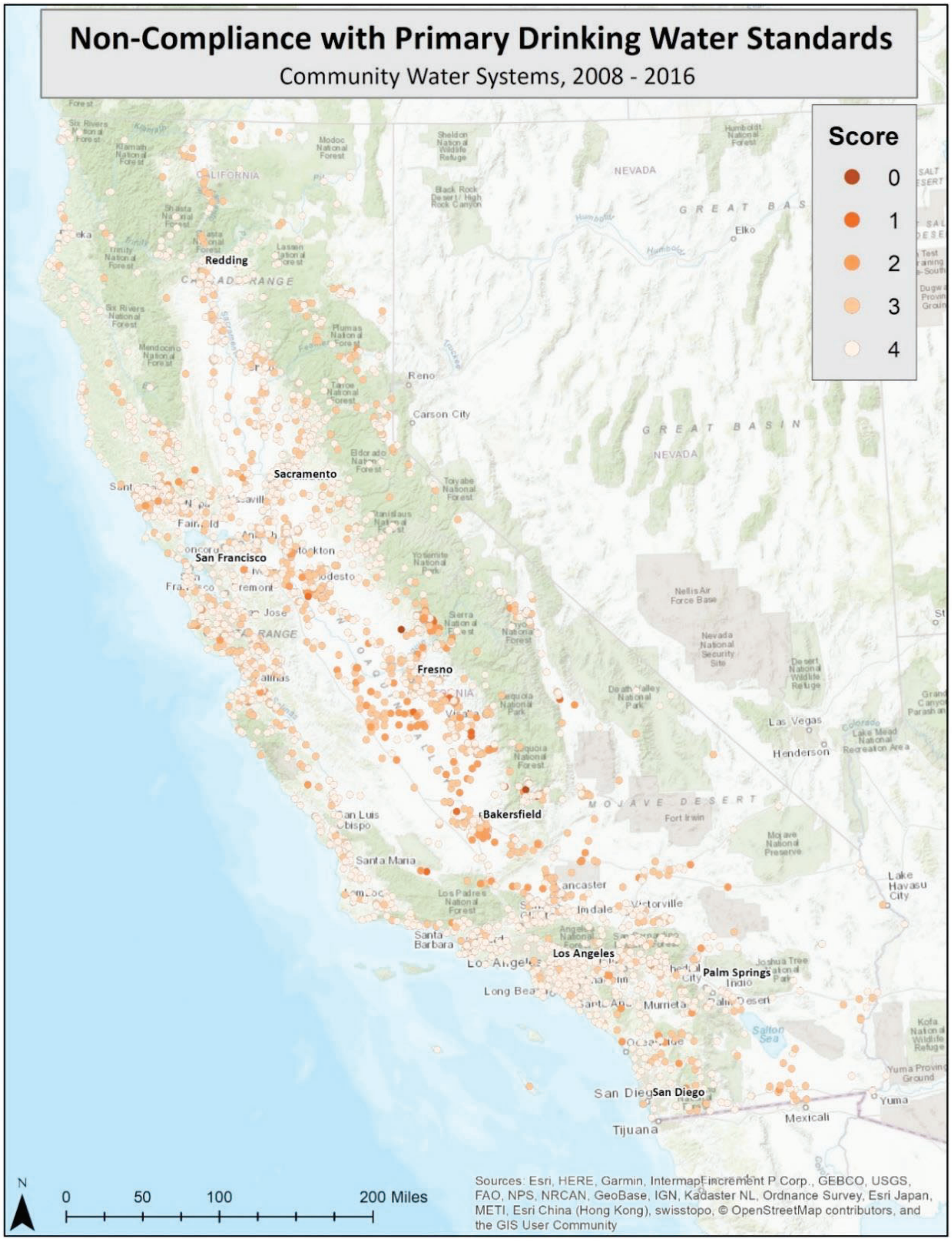
The most prevalent types of violations were for total coliform, arsenic, nitrate, TTHMs, and uranium, as shown in Table 8.

Table 8. Number of Systems with at Least One Recorded MCL Violation, 2008-2016 (n=2,903).

Contaminant	Number of Systems with at Least One MCL Violation
Arsenic	187
Barium	0
Benzene	0
Cadmium	1
Carbon Tetrachloride	0
DBCP	5
Mercury	0
MTBE	1
Nitrate	80
PCE	1
Perchlorate	5
TCE	2
Toluene	0
Total Coliform	722
TTHMs	112
Uranium	51
Xylene	0

While this indicator and Water Quality Indictor 1 (High Potential Exposure) seem similar, the two measures are based on distinct approaches. This indicator addresses violations, which are assessed at the source level. For Water Quality Indicator 1, exposure is measured at the system level. Of the 262 systems that had high potential exposure at least once in the study period, 97 did not receive an MCL violation. This could potentially signal systems that have potential exposure challenges, despite being in compliance with regulatory standards. The map below shows plots the scores for each community water system across the state (Figure 11).

Figure 11. Water Quality Indicator 5: Non-Compliance with Primary Drinking Water Standards. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 7.



Water Quality Indicator 6: Presence of Acute Contaminants

This non-compliance indicator assesses which, if any, of the non-compliance events have involved acute contaminants, namely nitrate, nitrite, or nitrate plus nitrite, perchlorate and E. coli/fecal coliform violations.

Method

To create the indicator of acute contaminants we:

- Determined whether an acute MCL violation for nitrate, perchlorate or E. coli/fecal coliform had occurred at any point during the time period (2008-2016).
- For each system, we summed the total number of acute contaminants in violation.

Scoring Approach

To score this indicator we assigned water systems the following scores:

- 0, if the system had 2 to 3 acute contaminants with relevant MCL violations.
- 2, if the system had 1 acute contaminant with relevant MCL violations.
- 4, if the system had no acute contaminants with relevant MCL violations.

It is important to note that, for systems with more than one MCL violation, this indicator does not consider whether the MCL violations occurred at the same time. Thus this indicator assesses the extent to which an acute MCL event happened between 2008 and 2016, not the timing of multiple MCL violations.

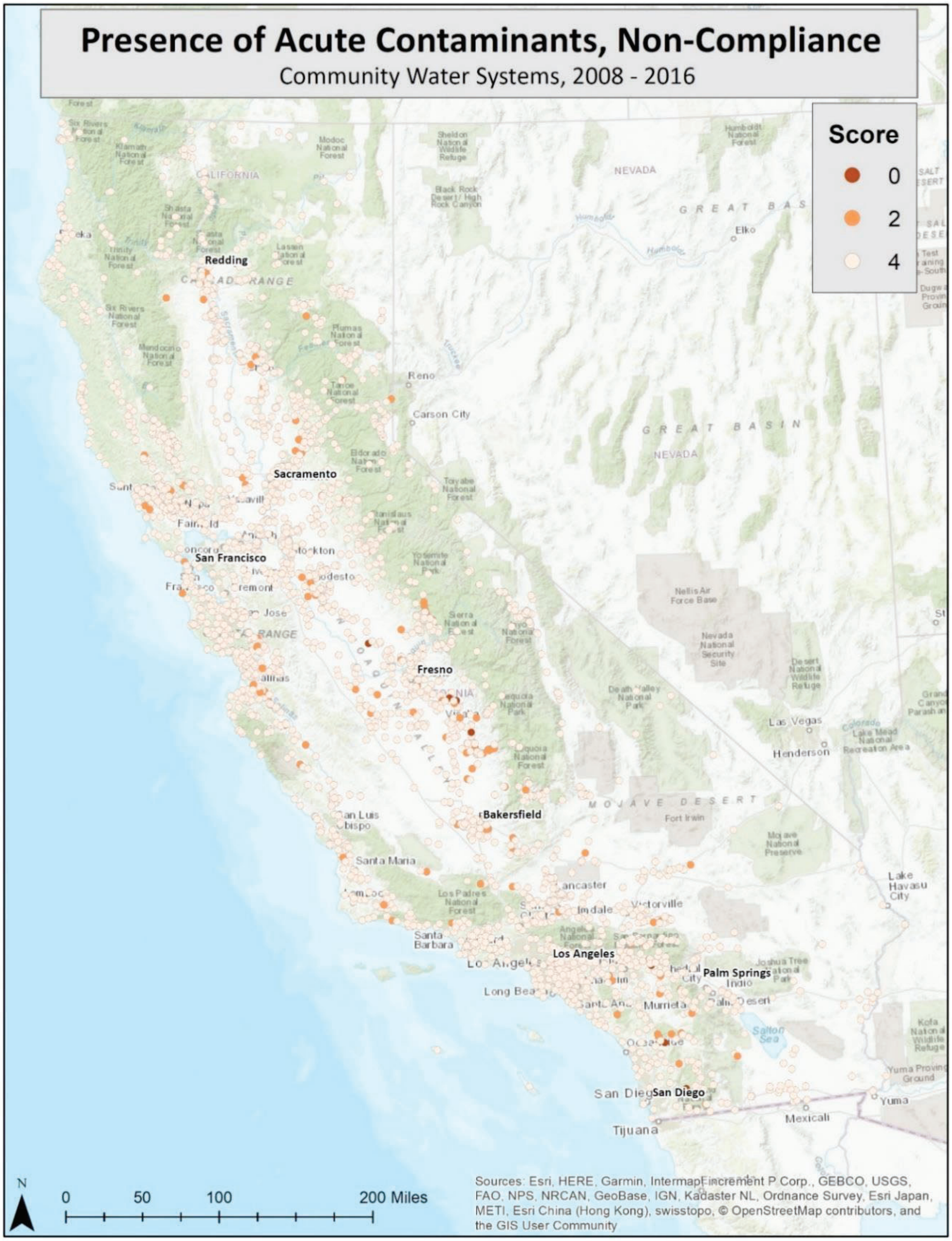
Results

Nearly 95% of systems had no acute MCL violation during the time period (Table 9). Among the remaining 5% (n=151), 81 were for TCR MCLs, 80 were for nitrate MCL violations and 5 were for perchlorate MCL violations. Among the 81 systems with acute TCR violations, five also had nitrate MCL violations. Among the 80 systems with nitrate MCL violations, three also had perchlorate MCL violations. The map below shows plots the scores for each community water system across the state (Figure 12).

Table 9. Water Quality Indicator 6: Number of Acute Contaminants with Non-Compliance. MCL violations for nitrate and perchlorate assessed, alongside acute MCL violations of the Total Coliform Rule.

Number of Acute Contaminants	Indicator Score	Number of Systems	Percent
0	4	2,745	94.6
1	2	151	5.2
2 to 3	0	7	0.2
Total		2,903	100

Figure 12. Water Quality Indicator 6: Presence of Acute Contaminants, Non-Compliance. For a definition of score values, please consult Table 9.



Water Quality Indicator 7: Maximum Duration of Non-Compliance

This indicator assesses the maximum duration of non-compliance across all contaminants. To do so, for each system, the indicator sums the number of years (from 2008 to 2016) in which a given contaminant has been cited for at least one MCL violation.[25] Importantly, the total number of violations *per year* is not counted, to control for various types of differences in monitoring and reporting across systems. Thus if one system experienced four nitrate violations in a given year, and another experienced only one, both systems would be considered to have had "at least one" nitrate MCL violation in that given year. The indicator then selects the contaminant with the maximum duration of non-compliance for each system.

Method

To create this indicator we:

- Determined whether a system had at least one MCL violation in a given year (excluding lead and 1,2,3-TCP).
- For each contaminant, summed the number of years with at least one MCL violation.
- Selected the contaminant with the maximum duration of non-compliance across all contaminants, and recorded the duration as the "maximum duration of non-compliance".

Besides water quality itself, the total number of years for which a system has MCL violations may vary for several reasons, including varying monitoring schedules, waivers on monitoring, and reporting bias (e.g., a MCL violation was not issued, recorded or reported, but should have been). Thus while this measure is meant to capture total duration of non-compliance for any given contaminant, some potential for measurement error exists.

Scoring Approach

To score this indicator we assessed the distribution of the data and assigned water systems the following scores:

- 0, if the maximum duration of non-compliance for a system was 6 or more years.
- 1, if the maximum duration of non-compliance for a system was 4-5 years.
- 2, if the maximum duration of non-compliance for a system was 2-3 years of non-compliance.
- 3, if the maximum duration of non-compliance for a system was 1 year.

[25] It is important to note that this indicator considers duration in terms of how many years had at least one recorded MCL violation. This is separate from any regulatory determinations of compliance, which are most often based on the running annual average for a given contaminant, and consider compliance during an annual timeframe.

- 4, if the system had zero years of non-compliance.

Results

Table 10 and Figure 13 provide the number of systems and their maximum duration of non-compliance. Two thirds of systems had no MCL violation. Nearly 19% of systems had two or more years of non-compliance for any given contaminant, with 51 systems having nine years of non-compliance.

Table 10. Water Quality Indicator 6: Maximum Duration of MCL Violation. Maximum number of years in which a system had at least one MCL violation is indicated, with associated indicator score.[†]

Maximum Duration of Non-Compliance (Years)	Indicator Score	Number of Systems	Percent
0	4	1,909	65.8
1	3	460	15.9
2 to 3	2	287	9.9
4 to 5	1	100	3.4
6+	0	147	5.0
Total		2,903	100

† 1,2,3-TCP and lead are not included.

Figure 13 shows the total number years of non-compliance by contaminant. While TCR has the most number of systems with duration of non-compliance more than 1 year, arsenic is the contaminant for which the most number of systems had the longest duration of non-compliance. The map below shows plots the scores for each community water system across the state (Figure 15).

Figure 13. Number of Systems by Maximum Years of Non-Compliance. **N=2903 community water systems.**

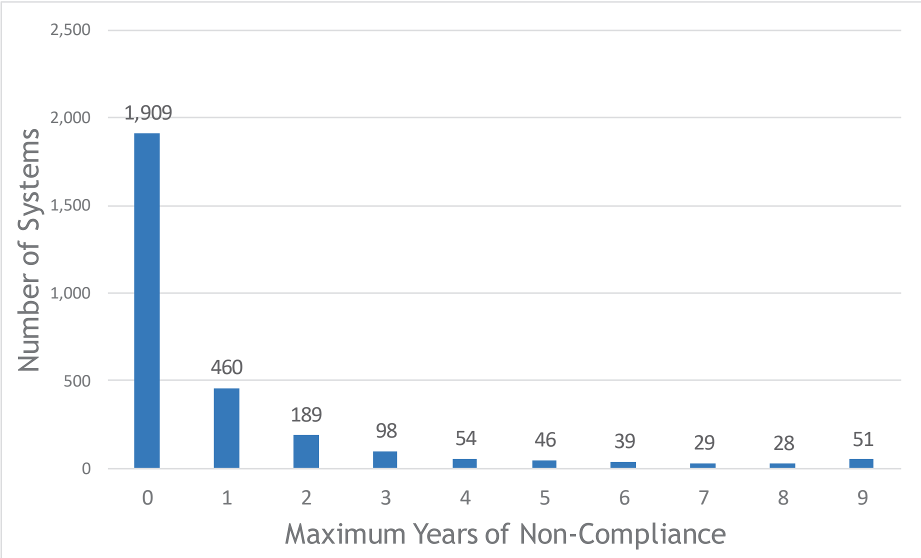


Figure 14. Number of Years, by Contaminant, for which Systems Had at Least One Annual MCL Violation. N=2903 community water systems.

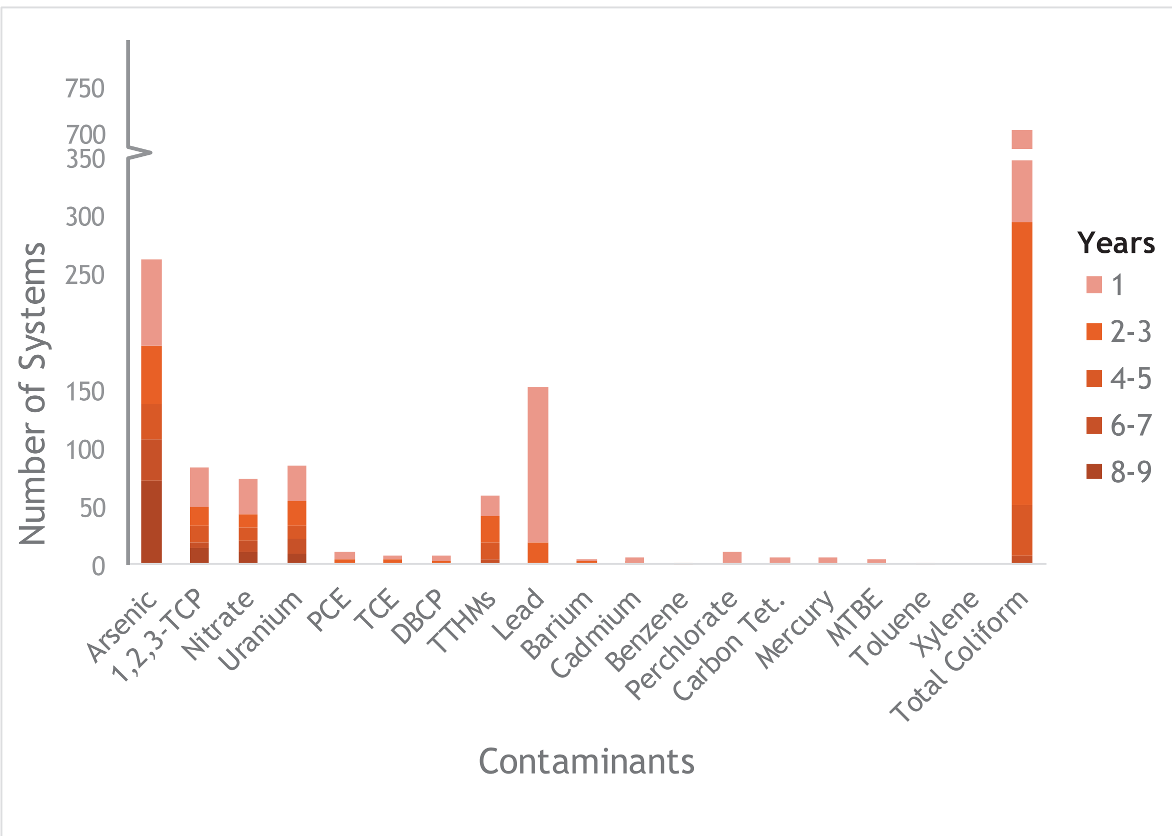
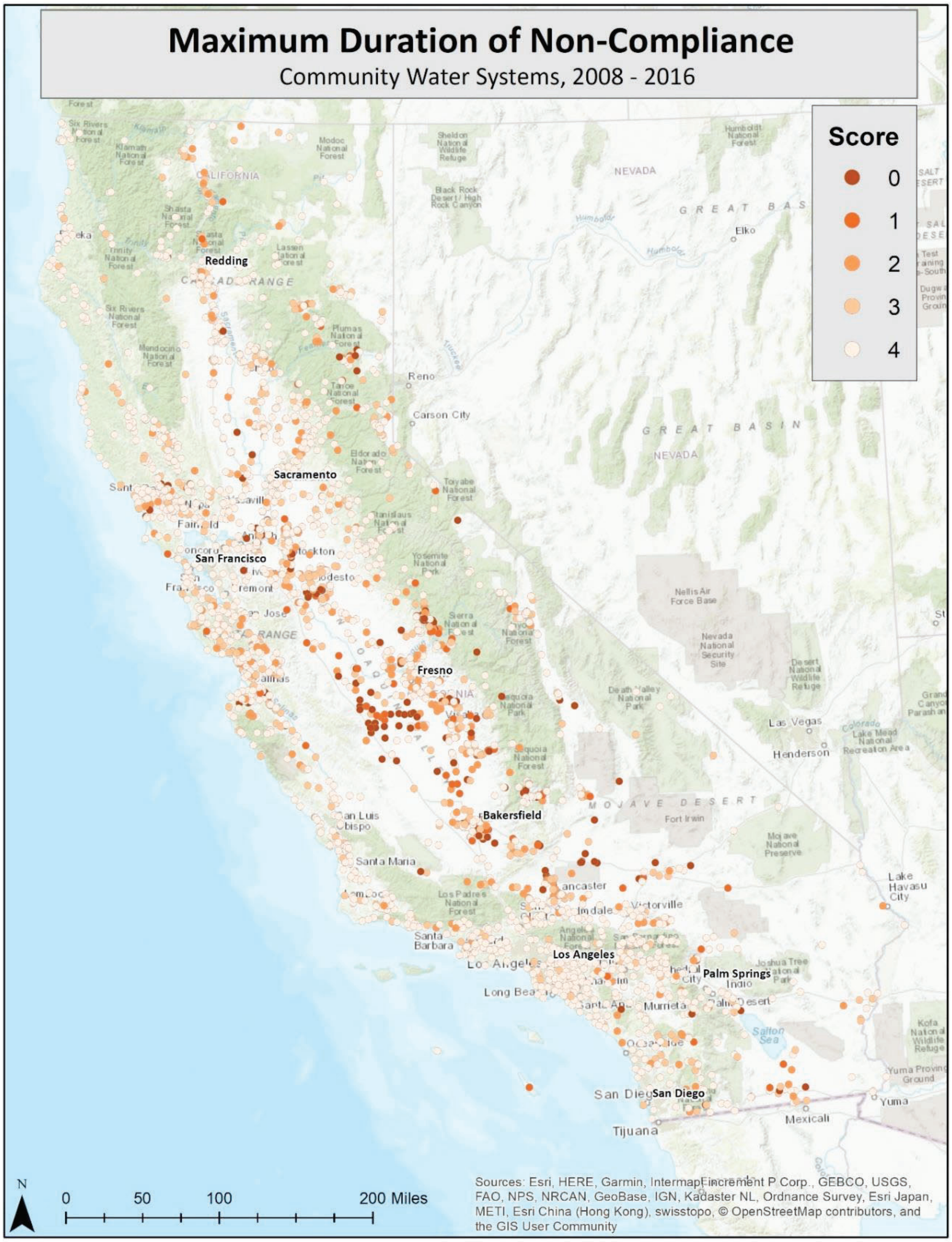


Figure 15. Water Quality Indicator 7: Maximum Duration of Non-Compliance. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 10.



A Composite View of Water Quality

Individual water quality indicators help highlight specific water quality problems. However, combining individual indicator scores to create a composite water quality score can highlight the performance of systems across several or all indicators, and which systems have the greatest cumulative water challenges. Figure 16 illustrates how individual indicator scores can be combined to yield a composite water-quality component score.

Scoring Approach

The exposure and compliance subcomponents were treated equally, contributing equal weight to the final component score. Within each sub-component, after each indicator was calculated and scored, weights were applied to different indicators to adjust for various factors. The following steps outline the particular weights assigned, and the final equation used to calculate the component score.

- For the acute exposure (Indicator 2) and acute non-compliance (Indicator 6), a weight of 0.25 was applied, as a way of providing additional weight for exposures and violations of acute contaminants beyond what is captured in Indicators 1 and 5.
- For the maximum duration of exposure (Indicator 3) and duration of MCL non-compliance (Indicator 7), a weight of 2 was applied, to address the importance of a system having long duration periods of high potential exposure or non-compliance.
- Data availability (Indicator 4) was weighted by 0.25. This weight was selected to give some additional weight to lack of data, without conferring the same weight as known problems.
- Sub-component scores were calculated after applying the appropriate aforementioned weights to each sub-component's indicators. In particular, the weighted indicator scores in each sub-component were added to come up with sub-component scores. Each sub-component score was placed on a scale of 0 to 4. Then, the two sub-component scores were averaged, with higher scores reflecting better outcomes.

This results in an equation of:

$$\boldsymbol{Composite\ Water\ Quality\ Score} = \frac{1}{2} \times (\text{Exposure Subcomponent Score}) + \frac{1}{2} \times (\text{Non-Compliance Subcomponent Score})$$

where:

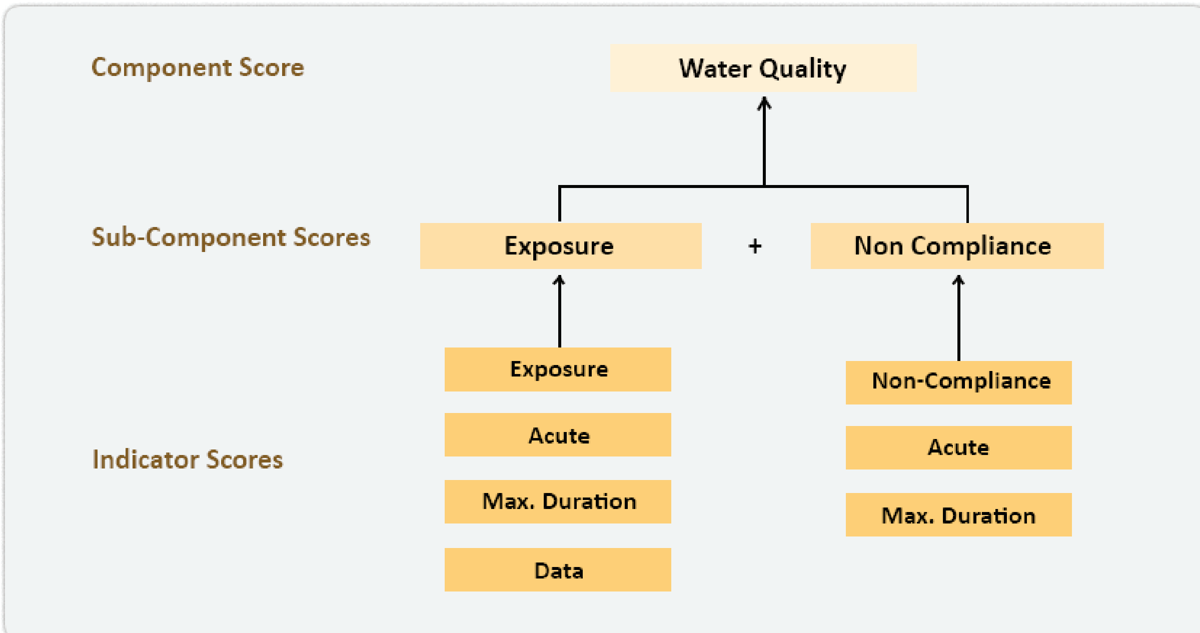
$$\boldsymbol{Exposure\ Subcomponent\ Score} = \text{Potential High Exposure Score} + 2 \times (\text{Maximum Duration Potential High Exposure Score}) + \frac{1}{4} \times (\text{Acute})\ \frac{1}{4} \times (\text{Data Availability Score})$$

and,

$$\textit{Non-Compliance Subcomponent Score} = \text{Non-Compliance Score} + 2 \times (\text{Maximum Duration Non-Compliance Score}) + \frac{1}{4} \times (\text{Acute Score})$$

Figure 16 illustrates the composite approach.

Figure 16. Creation of Composite Water Quality Score.



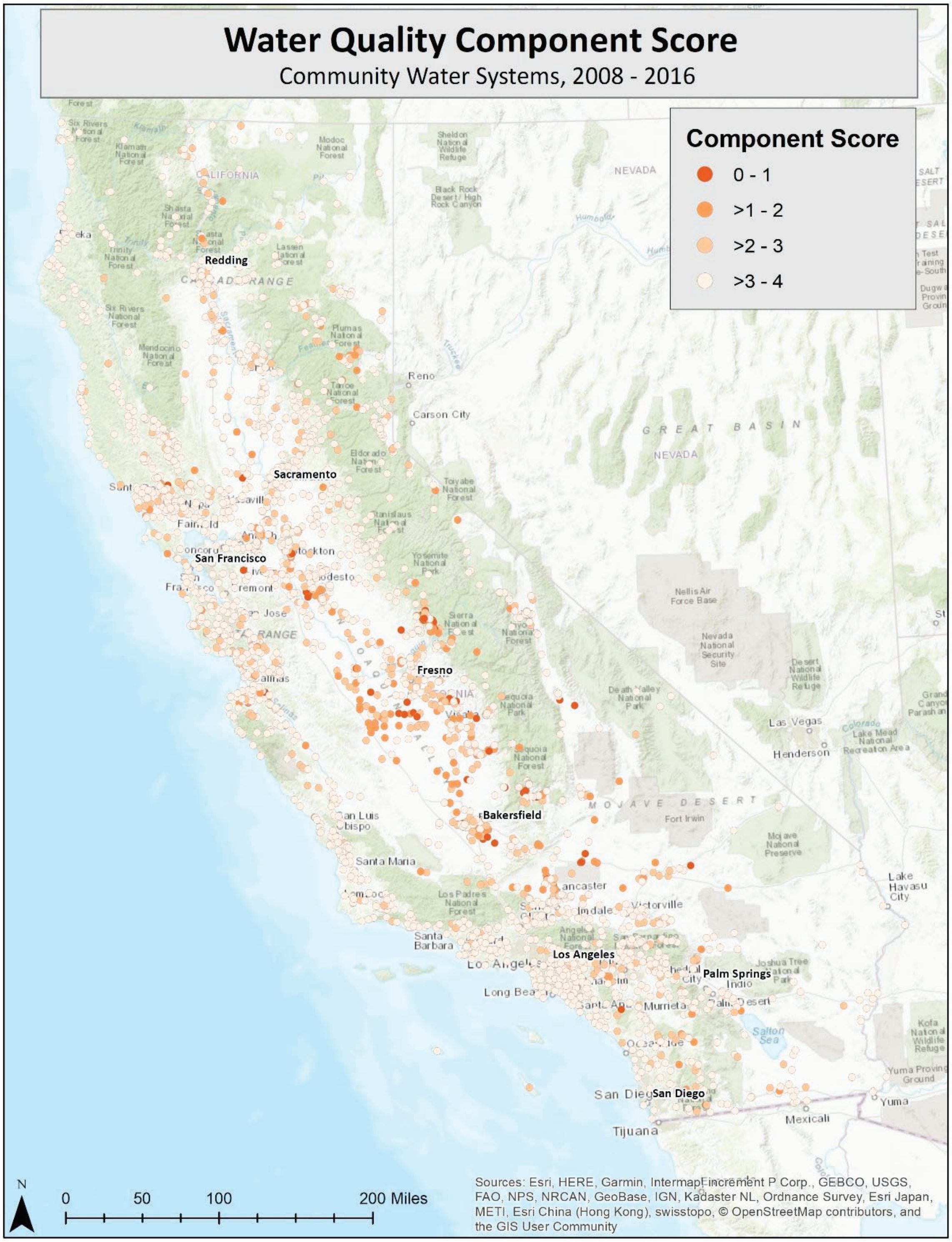
Results

2,903 systems received a composite water quality score, shown in Figure 17, and Table 11. The composite water quality component score ranged from 0.29 to 4, with a score of 4 indicative of high water quality. Twenty three percent of systems had a composite score of 4. Seventy-seven percent of systems had a score less than 4, meaning these systems had some type of water quality problem for at least one indicator. Still, 1153 systems had a score less than 4 but greater than 3.5. For these systems, 23% of systems had a score of 3 for the data availability indicator, and scores of 4 for all other indicators. Roughly 9% of systems scored with values less than 2 indicating lower scores across multiple water quality indicators. Figure 17 shows the composite water quality score across the state, with lower scores concentrated in the San Joaquin Valley.

Table 11. Composite Water Quality Scores.

Composite Water Quality Score	Number of Systems	Percent
4	660	23
3-<4	1,551	53
2-<3	439	15
1-<2	201	7
0-<1	52	2
Total	2,903	100

Figure 17. Map of Composite Water Quality Score (for 2,903 community water systems).+



+ For specific water quality results, system-level data should be consulted.

Key Findings for Water Quality

- 23% of the 2,903 systems evaluated had a perfect water quality score (score=4); 53% had scores between 3 and 4, indicating relatively good overall water quality.
- 24% of systems (692) received composite scores of less than 3. These systems face some of the biggest water quality challenges.
- When looking at these trends by system size, small systems consistently had lower average individual-indicator and composite scores than medium- and large-size systems.
- Smaller systems had a greater tendency than larger systems to have less data availability and longer duration of MCL violations. The difference in average scores for smaller and larger water systems was the greatest for those two indicators.
- Regional trends highlight that some of the lowest composite water quality scores occur in the San Joaquin Valley and the Central Coast regions of the state.
- Nearly 60% of systems (n=1,696) had no high potential exposure. However, approximately 33% of systems had at least one contaminant with high potential exposure. Nearly 10% had high potential exposure for two or more contaminants, during the study period. If counts of total coliform rule are excluded, nearly 77% of systems had no high potential exposure events.
- Eighty systems had 9 years of potential high exposure, encompassing less than 3% of systems. Overall, arsenic had the largest number of systems (n=72) with the longest duration of high exposure, ranging from 8 to 9 years.
- Approximately 66% of systems had no MCL violations among the 17 contaminants assessed. Excluding TCR MCL violations, approximately 86% of systems had no MCL violation in the entire study period. Among the 34% of systems that did have at least one MCL violation, 6% had MCL violations for two or more contaminants.
- Nearly 19% of systems had two or more years of non-compliance for any given contaminant, with 51 systems having nine years of recurring non-compliance. Contaminants with the longest duration of non-compliance were arsenic, nitrate, TTHMs and uranium.

Component 2: Water Accessibility

Water Accessibility and Its Subcomponents

Reliable, sufficient and continuous access to water to meet basic household needs is a fundamental component of the human right to water. However, this access is not always assured. Some water systems in the state are particularly vulnerable to supply interruptions. For example, during the 2012-16 drought a number of water systems could not provide enough water to supply their customers' basic needs, and a large number of domestic wells went dry.

The water accessibility component addresses concerns of this kind. It measures both the physical and institutional factors that can influence whether a water system can provide adequate supplies of water to meet household needs.

Water access is determined by a number of factors. These typically include:

1) The physical quantity of water that a water system can provide, or that a population can obtain (i.e., adequate volume).
2) The availability and reliability of the supply (i.e., whether the supply is sufficient and continuous, even in periods of drought).
3) How people or water systems access water (e.g., groundwater and/or surface water, location, and collection time).
4) The water system's institutional capacity to provide a reliable and adequate supply.

The water accessibility component consists of two subcomponents: 1) the *physical* vulnerability of a water system to inadequate water supply and provision, and 2) the *institutional* vulnerability of a water system to inadequate water supply and provision.

Physical vulnerability refers to the factors that may influence or determine the availability and reliability of a system's water supply. For example, physical vulnerability may be shaped by how many wells a groundwater-dependent system has, and whether these wells offer an adequate supply of water based on the number of customers served or the storage capacity of the water system. A groundwater-dependent system with only one well is more vulnerable to a water outage than a system with dozens of wells, as the former has no additional supplies to draw on. Also, a system with a well or wells in a groundwater basin highly vulnerable to drought is more likely to experience shortages than a system with wells that draw from a more stable groundwater basin.

Institutional vulnerability refers to the ability of a water system to make necessary infrastructure investments and conduct the operations and maintenance needed to provide adequate water to customers. Institutional vulnerability is shaped, in part, by a water system's capacity to meet its water supply challenges. For example, a system that has low institutional capacity may not be able to adequately address water contamination or supply vulnerability because of technical, managerial or financial limitations. Generally, indicators in both subcomponents shape water accessibility in both the short and long-term. In later versions, OEHHA will seek to include additional measures of current access problems, as well as future risks.

Physical Vulnerability Subcomponent

Overview

The physical vulnerability subcomponent currently contains one indicator that represents the potential vulnerability of a water system to water shortages or outages based on the number and types of water sources a system has. In future assessments OEHHA will seek to incorporate additional indicators of physical accessibility related to sufficiency and continuity of supply, such as vulnerability to drought, etc. (See Appendix, Table A1).

Indicator

Water Accessibility Indicator 1: Physical Vulnerability to Water Outages

This indicator assesses how vulnerable a water system is to a supply outage (or shortage). It identifies a system's main water source type (e.g., groundwater, surface water, or combined groundwater-surface water), and how many permanent and backup sources a system can use in case of emergency, such as a period of drought. These backup sources include emergency sources that a system would only use intermittently, as well as interties to other systems (i.e., "consecutive connections"). The indicator assumes that groundwater-reliant systems with fewer wells are more vulnerable to supply-based outages than either surface water systems with multiple intake points, or combined systems (i.e., systems with surface water and groundwater sources).

Data Source

Safe Drinking Water Information System (SDWIS-State), State Water Board, 2017

Method

To create this indicator we:

- Selected all active, permanent or emergency/standby/back-up sources based on the Source Availability code in SDWIS-State.

- Selected sources that were either wells, reservoirs, springs, intakes or consecutive connections, for each water system. Here, consecutive connections refers to connections (or interties) that a system has to other systems.
- Designated a system as groundwater-only, surface-water only, or groundwater-surface water systems based on the federal primary source type[26].
- Summed the total number of sources for each system, by federal source type.

Scoring Approach

This indicator was scored as follows:

- 0, if the system was "groundwater only" with one source.[27]
- 1, if the system was a "groundwater only" system with 2 sources, or a surface water or groundwater-surface water system with 1-2 sources.
- 2, if the system was a surface water, groundwater or combined groundwater-surface water system with 3-4 or more sources.
- 3, if the system was a surface water, groundwater or combined groundwater-surface water system with 5-9 or more sources.
- 4, if the system was a surface water, groundwater or combined groundwater-surface water system with 10 or more sources.

Results

Of the 2,903 systems in our study, 2,078 (72%) were classified as groundwater systems. The remaining 746 (26%) systems were either surface water systems (n=288), or groundwater-surface water systems (n=458). The remaining 79 (~3%) systems had unknown source types.

Of the 2,078 groundwater-only systems, approximately 16% (n=478) had only one well (Figure 18). Approximately 15% (n=419) of systems of any source type had 10 or more sources. Table 12 indicates the number of systems with varying numbers of sources, and the associated indicator score. The map in Figure 19 shows these results across the state.

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[26] Groundwater-only systems were designated as such if their federal primary source type was groundwater, purchased groundwater (GWP), groundwater under-the-influence of surface water or purchased groundwater under-the-influence (GUP). Surface-water only systems were designated as such if their federal primary source type was either surface water (SW) or purchased surface water (SWP). Systems with combined groundwater-surface water were designated as such if their federal primary source type was SW or SWP, but the system had at least one GW/GUP/GWP well indicated. This indicator, including its scoring, was developed in consultation with the State Water Board's Division of Drinking Water. The designation of groundwater, surface water, or combined groundwater-surface water differs from the federal designation status.
[27] A source can be a groundwater well or a spring.

Figure 18. Number of Sources, by Water Source Type.* 2,903 systems in study.[†]

** Sources include active permanent or active back-up/standby/emergency sources that are wells, reservoirs, intakes, consecutive connections, or springs. Groundwater-only systems were designated as such if their federal primary source type was groundwater (GW), purchased groundwater purchased (GWP), groundwater under-the-influence of surface water or purchased groundwater under-the-influence (GUP). Surface-water only systems were designated as such if their federal primary source type was either surface water (SW) or purchased surface water (SWP). Systems with combined groundwater-surface water (GW-SW) were designated as such if their federal primary source type was SW or SWP, but the system had at least one GW/GUP/GWP well indicated.*

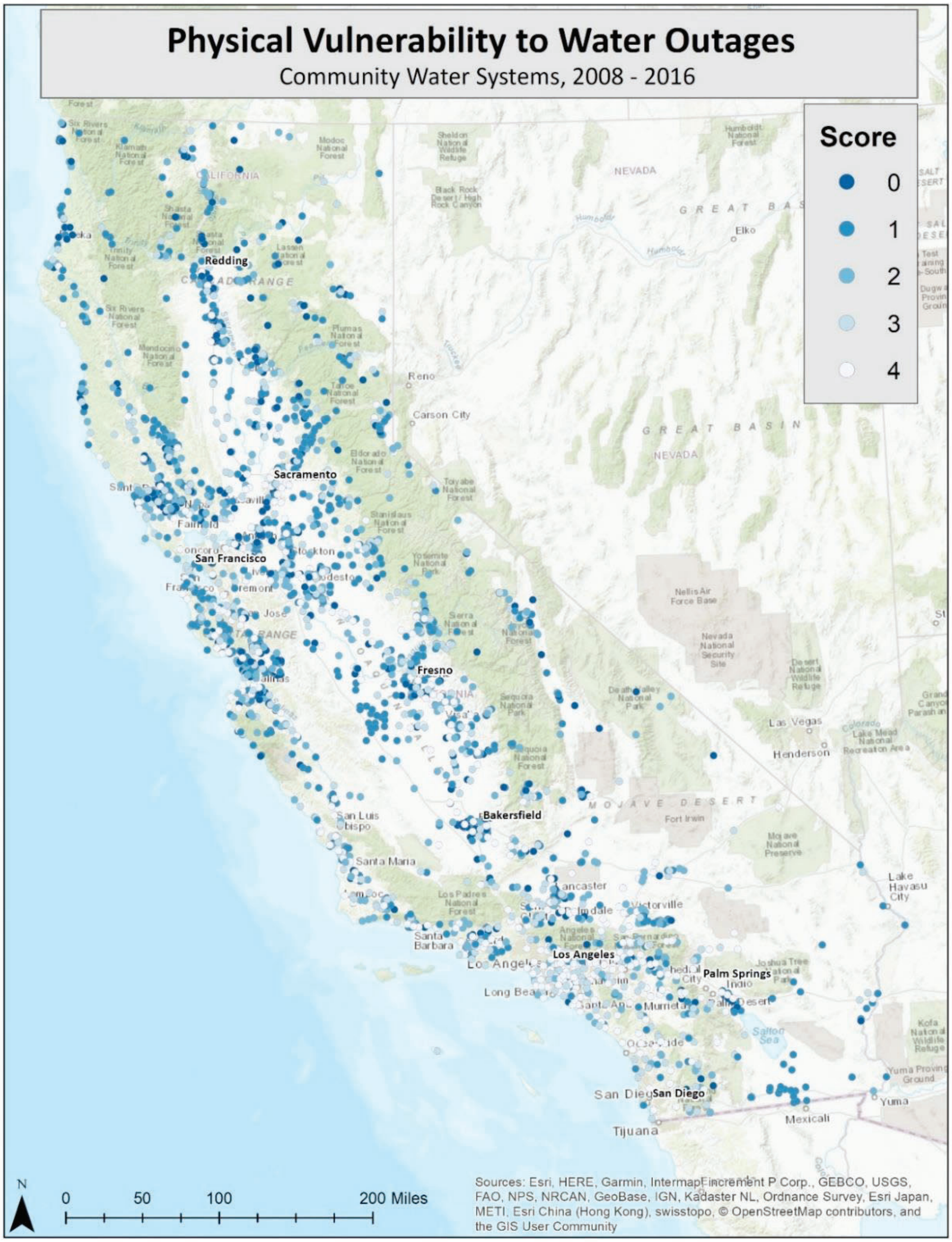
† Data represented is for 2017.

Table 12. Access Indicator 1: Vulnerability of Systems to Water Outages.[†]

Number and Type of Sources	Indicator Score	Number of Systems	Percent
10+ Sources	4	419	14.4
5 - 9 Sources	3	453	15.6
3 - 4 Sources	2	577	19.9
2 Sources in GW-only, or 1 - 2 Sources in GW-SW, or SW only system	1	897	30.9
1 Source in GW-only system	0	478	16.5
Unknown	NA	79	2.7
Total		2,903	100

† GW=groundwater; SW=surface water; GW-SW= groundwater & surface water system.

Figure 19. Map of Indicator 1: Physical Vulnerability to Water Outages. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 12.



Institutional Vulnerability Subcomponent

Overview

Institutional vulnerability refers to the ability of a water system to make necessary infrastructure investments and to conduct the operations and maintenance needed to provide safe and adequate water to customers. The subcomponent of institutional vulnerability includes two indicators that measure institutional characteristics of a system that can impede access to an adequate water supply. The first indicator represents potential institutional constraints. The second represents managerial constraints. Importantly, a number of other metrics not yet included help capture key components of a system's institutional constraints, including its technical, managerial and financial (TMF) capacity. These include staffing and training levels, governance structure, rate-setting expertise, debt ratio, and operating/expense ratios. In future assessments, OEHHA will seek to include additional metrics that capture such aspects.

Indicators

Water Accessibility Indicator 2: Institutional Constraints

This indicator uses a combination of information about a system's size and available economic resources to jointly define a system's institutional constraints. For example, larger systems have greater economies of scale that allow them to finance capital improvements and operate efficiently. Although some systems in disadvantaged communities are well run and successfully operated, systems with greater proportions of socioeconomically disadvantaged residents tend to face additional financial constraints, as their customer base may be generally less financially able to afford necessary system upgrades.

Challenges and benefits due to system size and socioeconomic status of the community can mutually exacerbate, or reinforce, each other. For example, a small system that serves a more socioeconomically disadvantaged population may have less institutional capacity than a small system that serves an affluent population. Likewise, a system that is large and serves a disadvantaged population presumably benefits from economies of scale to overcome some of the population's economic disadvantages. Thus, disadvantaged communities served by small systems face even greater challenges to maintain safe, accessible, and affordable water.

To characterize system size, this indicator draws on data on a system's number of service connections. To characterize socioeconomic status, the indicator uses state definitions of disadvantaged and severely disadvantaged communities. The term disadvantaged community (DAC) has multiple definitions. For drinking water applications, it is defined by the State of California as a community with an annual Median Household Income (MHI) that is less than 80 percent of the statewide MHI (Public Resources Code section 75005[g]). A severely disadvantaged community (SDAC) is a community with less than 60 percent the statewide MHI. According to US Census American Community Survey (ACS) 5-Year Data for 2011-2015, the statewide MHI was $61,818; hence, the calculated household income threshold is $49,454 for DACs, and $37,091 for SDACs.

Data Source

US Census American Community Survey (ACS) 5-Year Data: 2011 – 2015

Safe Drinking Water Information System (SDWIS-State), State Water Board, 2017

Drinking Water Systems Service Areas, Tracking California, CDPH. Available at URL: https://www.trackingcalifornia.org/water-systems/water-systems-landing

Method

The following steps were taken to categorize systems by system size and socioeconomically disadvantaged status:

- The number of service connections for a water system was determined, and the system was assigned a category of large (10,000+ service connections), medium (200-9,999 connections), or small (15-199 service connections) (State Water Resources Control Board 2015).[28]
- The median household income for the service boundary of each water system that had a geographic boundary available was calculated, using areal, household-based weighting that combined water system service area boundaries with census blocks and assigned relevant block group income data (See Appendix B2.3).
- Exclusion criteria to MHI calculations were applied. Systems were excluded if block groups had no MHI, if 15% or more of a system's block groups did not have MHI data, or if the MHI data contained a certain amount of error (see Appendix B3.4 for more details).
- The community served by the water system was designated as a non-disadvantaged community, a disadvantaged community, or a severely disadvantaged community. This designation is based on the 2012 Proposition 84 and 1E Guidelines.
- The system was categorized based on the joint combination of size and the community's DAC status

[28] The three size categories follow common cutoffs, as indicated in (State Water Board 2015). For our purposes, intermediate and medium-sized systems are combined into one category of "intermediate/medium" following common cutoffs (Safe Drinking Water Plan for California. Report to the Legislature in compliance with Health and Safety Code Section 16365, State Water Board. June 2015)

Scoring Approach

Scores for this indicator were assigned based on pre-determined categories. Systems received the following scores:

- 0, if the system was small and serves a DAC or SDAC.
- 1, if the system was small and serves a non-DAC/SDAC.
- 2, if the system was medium size and serves a DAC or SDAC.
- 3, if the system was medium size and serves a non-DAC/SDAC.
- 4, if the system was large, regardless of the community's DAC status.

Results

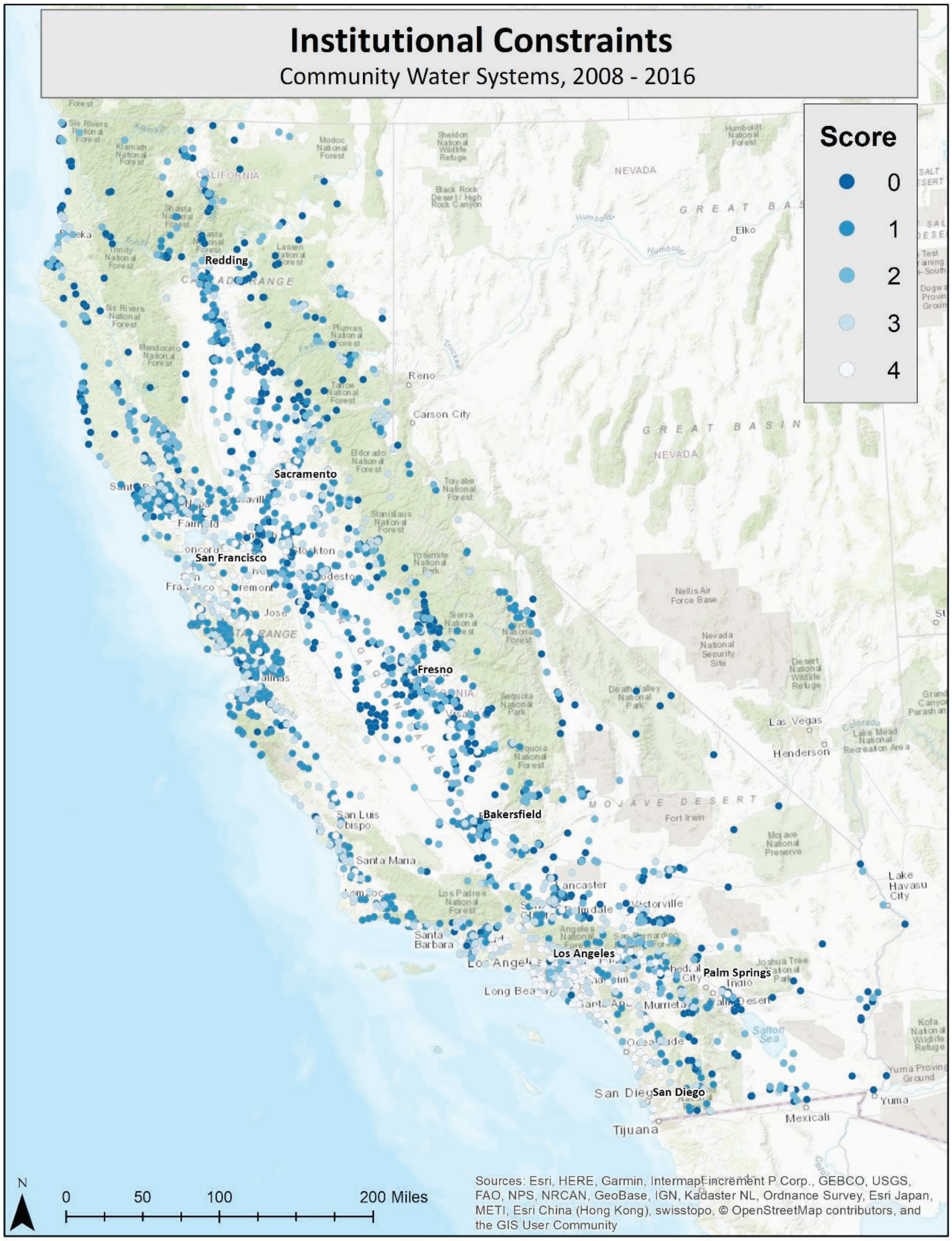
We calculated MHI for the 2,903 systems in our evaluation. Of these, 20 systems did not have adequate population data to estimate system-level weighted MHI, 69 systems were excluded based on 15% or more of block groups missing MHI data, 69 systems had no MHI data, and 27 were excluded because of error criteria. Of the remaining 2,718 systems, 11 did not have connections information. Therefore, 2,707 systems are covered by this indicator because they have both MHI data and connections information.

Table 13 highlights the indicator score based on combinations of system size and DAC status. Categories are divided as large systems (i.e., with 10,000+ connections) that are DAC, SDAC or non-DAC; medium-sized systems that are non-DAC; medium-sized systems that are SDAC or DACs; small systems that are non-DAC; small systems that are SDACs or DACs. Figure 20 shows these results across the state.

Table 13. Access Indicator 2: Overall Institutional Constraints. Associated indicator scores are shown. Study period 2008-2016, with DAC status calculated for 2011-2015.

System Size (No. Connections)	Disadvantaged Community Status	Indicator Score	Number of Systems	Percent
Large (10,000+)	Non-DAC, DAC, SDAC	4	223	7.7
Medium/Intermediate (200 – 9,999)	Non-DAC	3	463	15.9
Medium/Intermediate (200 – 9,999)	DAC, SDAC	2	333	11.5
Small (15 – 199)	Non-DAC	1	1,011	34.8
Small (15 – 199)	DAC, SDAC	0	677	23.3
Unknown	Unknown	*NA*	196	6.8
Total			2,903	100

Figure 20. Map of Indicator 2: Institutional Constraints. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 13.



Water Accessibility Indicator 3: Managerial Constraints

The third accessibility indicator represents certain managerial constraints. The managerial constraints of a water system depend on various factors, such as a water system's staffing levels and the training and technical expertise of the staff. Because this data is not readily available for all water systems, OEHHA worked with the State Water Board's Division of Drinking Water to identify an indicator that could show managerial constraints in addressing contamination and/or maintaining adequate water supply.

The selected indicator represents the number of monitoring and reporting violations that a water system receives. These violations assess the degree to which a water system complies with monitoring and reporting requirements for particular contaminants and treatment techniques (Title 22). Systems with a good compliance record for these requirements are deemed to have fewer managerial constraints. Systems with significant monitoring and reporting violations are deemed to have more managerial constraints– inadequate number or training of staff, or some other unresolved issue – that results in the monitoring and reporting violations.

Data Source

Safe Drinking Water Information System (SDWIS-State), State Water Board, 2008-2016

Method

To develop this indicator we:

- Extracted all monitoring and reporting violations for Consumer Confidence Reports, Total Coliform Rule, nitrate, disinfection byproducts, Surface Water Treatment Rules, the Groundwater Rule, the Lead and Copper Rule. These correspond with violation codes of 3, 4, 23, 24, 26, 27, 31, 36, 38, 51, 52, 53, 56, 71, and 72.
- Summed all instances of Monitoring and Reporting violations by system for the aforementioned rules.
- Scored the indicator based on the distribution of this sum.

Scoring Approach

We assessed the distribution of the data and assigned systems the following scores:

- 0, if the system had 16 or more Monitoring and Reporting (M&R) violations, across the years 2008-2016.
- 1, if the system had 6-15 M&R violations.
- 2, if the system had 3-5 M&R violations.
- 3, if the system had 1 to 2 M&R violations.

- 4, if the system had zero M&R violation.

Results

We found that 1,035 systems (36%) had at least one Monitoring and Reporting violation during the study period (Figure 21). The total number of Monitoring and Reporting violations ranged from 0 to 37 violations.

Table 14 summarizes the types of analytes that had monitoring and reporting violations for each type of Monitoring & Reporting violation of interest. The largest contributors to the total count of Monitoring and Reporting violations were Chemical Contaminant violations (for nitrate, n=173) and TCR violations (n=623).

Table 15 indicates the distribution of this indicator and the associated indicator score. Figure 22 shows a map of the statewide distribution of these scores.

Figure 21. Total Number of Monitoring and Reporting Violations by System.

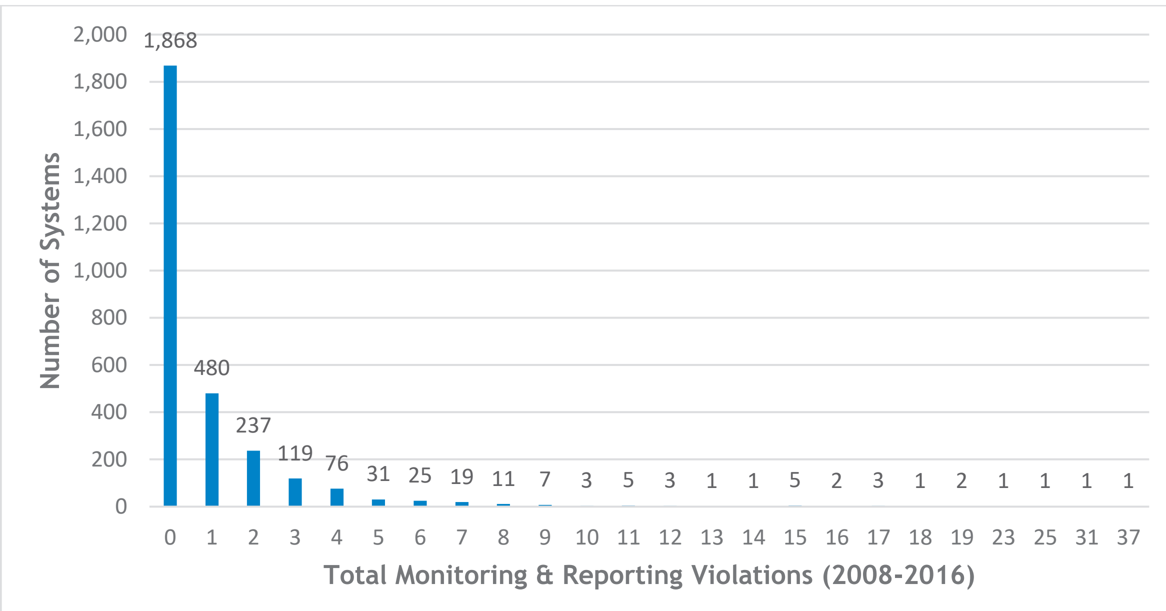


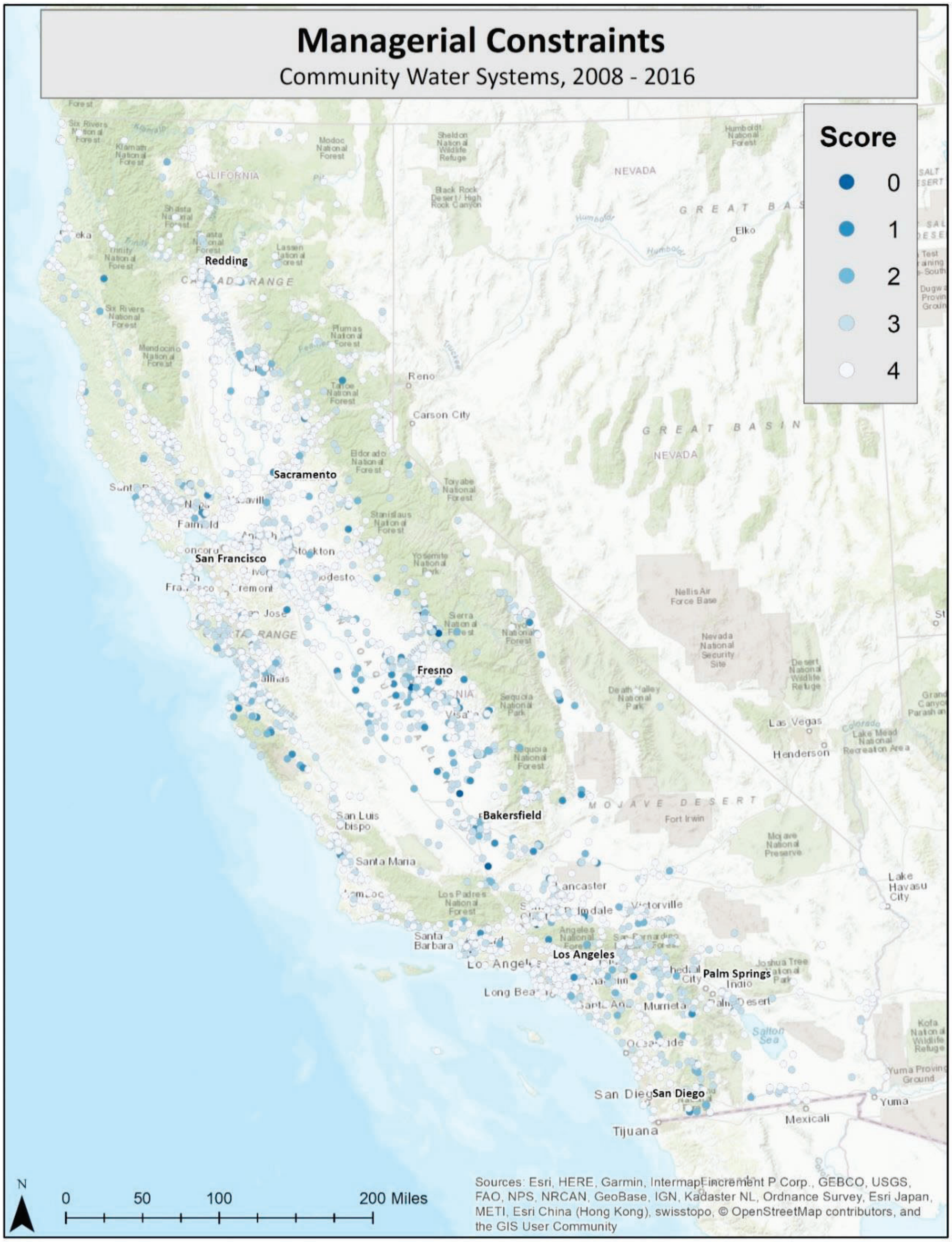
Table 14. Types of Monitoring and Reporting Violations for the 2008-2016 Study Period.

Type of Violation	Number of Violations
Consumer Confidence Report	68
Lead & Copper Rule	58
Chemical Contaminant Monitoring	173 (all for nitrate)
Disinfection By-Product Monitoring	79, includes 1 for bromate, 1 for total carbon, 7 for chlorine, 33 for total haloacetic acids, and 37 for total trihalomethanes
Surface Water Treatment Rule	32, includes 3 for chlorine, 1 for coliphage, 2 for Groundwater Rule, 5 for Interim Enhanced Surface Water Treatment Rule, 19 for Surface Water Treatment Rule, and 4 for turbidity
Total Coliform Rule Monitoring	623

Table 15. Access Indicator 3: Managerial Constraints. Indicator based on total monitoring and reporting violations in the study period.

Total Monitoring & Reporting Violations	Indicator Score	Number of Systems	Percent
0 violations	4	1,868	64.4
1-2 violations	3	717	24.7
3-5 violations	2	226	7.8
6-15 violations	1	80	2.8
16+ violations	0	12	0.4
Total		2,903	100

Figure 22. Map of Indicator 3: Managerial Constraints. Higher scores represent a better outcome for this indicator; lower scores represent poorer outcomes. For a definition of score values, please consult Table 15.



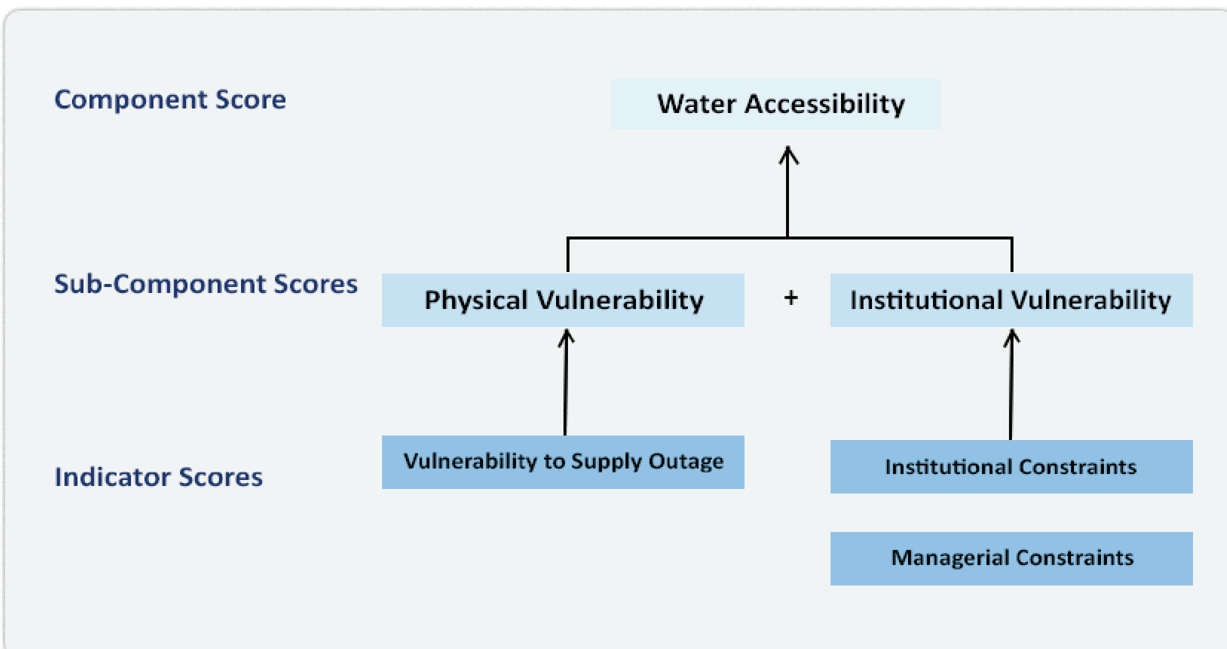
A Composite View of Water Accessibility

The three water accessibility indicator scores can be combined to create a composite water accessibility score. This composite score can serve to highlight systems that have some of the lowest scores across all accessibility indicators, and are therefore the most burdened in the area of accessibility. Figure 23 represents how individual indicator scores are combined to yield a composite water accessibility component score.

Scoring Approach

- After each individual indicator was calculated and scored (see individual indicator scoring approach, above), Accessibility Indicators 2 and 3 were averaged to produce a score for the Institutional Vulnerability subcomponent.
- The score for Accessibility Indicator 1 (the lone indicator for the Physical Vulnerability component) was averaged with the Institutional Vulnerability subcomponent score to produce a composite accessibility component score.
- Composite scores ranged from 0-4, with lower scores indicating a greater burden.

Figure 23. Creation of Composite Water Accessibility Score.



Results

2,637 systems had a composite water accessibility score. The composite score ranged from 0 to 4. Across these systems, the mean composite component score was 2.1. Overall, approximately 24.5% of systems received a score of 3 or higher. Approximately 46% of systems had a score of 2 or lower, with just over 5% of systems had a composite score less than one (Table 16). Compared to water quality, the larger fraction of systems with lower scores can be explained by a few key trends. First, as shown in earlier sections, 16% of systems were groundwater reliant and had only one source, and thus received a score of 0. With regards to institutional indicators, approximately 25% of systems are small and serve either disadvantaged or severely disadvantaged communities. Finally, 11% of systems received a score of 2 or lower for managerial constraints.

Table 16. Composite Water Accessibility Score.

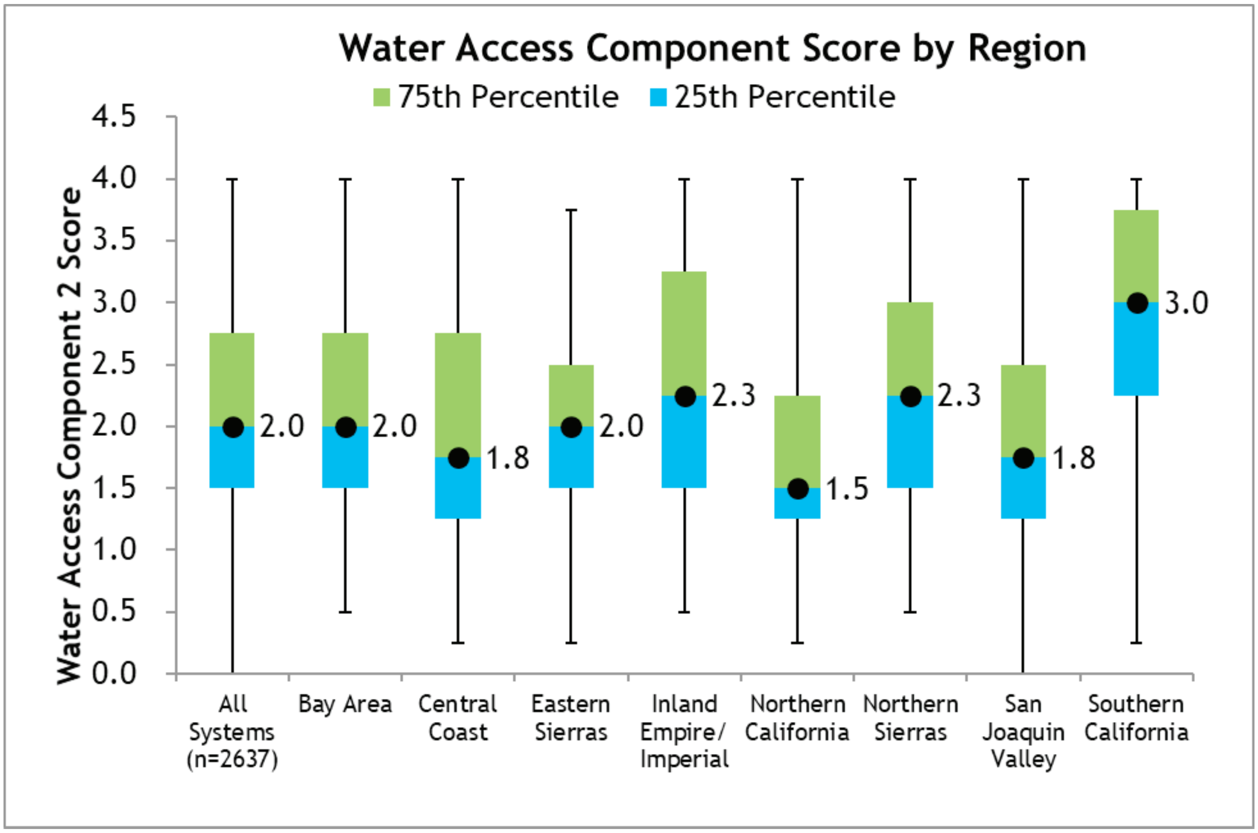
Composite Water Accessibility Score	Number of Systems	Percent
4	144	5.5
3-<4	502	19.0
2-<3	767	29.1
1-<2	1076	40.8
0-<1	148	5.6
Total	2,637	100

Geographic Observations

Figure 24 highlights scores by region (See Figure 25 for a map of regions). This figure highlights that the lowest water accessibility scores occurred in Northern California (median=1.5), the Central Coast (median=1.8) and the San Joaquin Valley (median=1.8), though there were low-scoring systems across all regions. For a map of regions, please see Figure 25.

Figure 26 shows the composite water accessibility score across the state. There is a relatively large spread of scores from 0 to 4 throughout California. Unlike the composite water quality scores, however, lower scores are distributed more evenly across the state.

Figure 24. Composite Water Accessibility Score by Region.



Among the 148 systems that received a composite water accessibility score of 1 or less, several key patterns emerge. First, a disproportionate number of systems (33%) were located in the San Joaquin Valley. By comparison, the SJV accounts for 22% of systems statewide. A disproportionate number (73%) were severely disadvantaged or disadvantaged, compared to 38% of systems statewide being DAC or SDAC. In addition, all systems with composite scores of 1 or lower (100%) were small, compared to 62% of systems being small statewide.

Figure 25. Map of Statewide Regions.

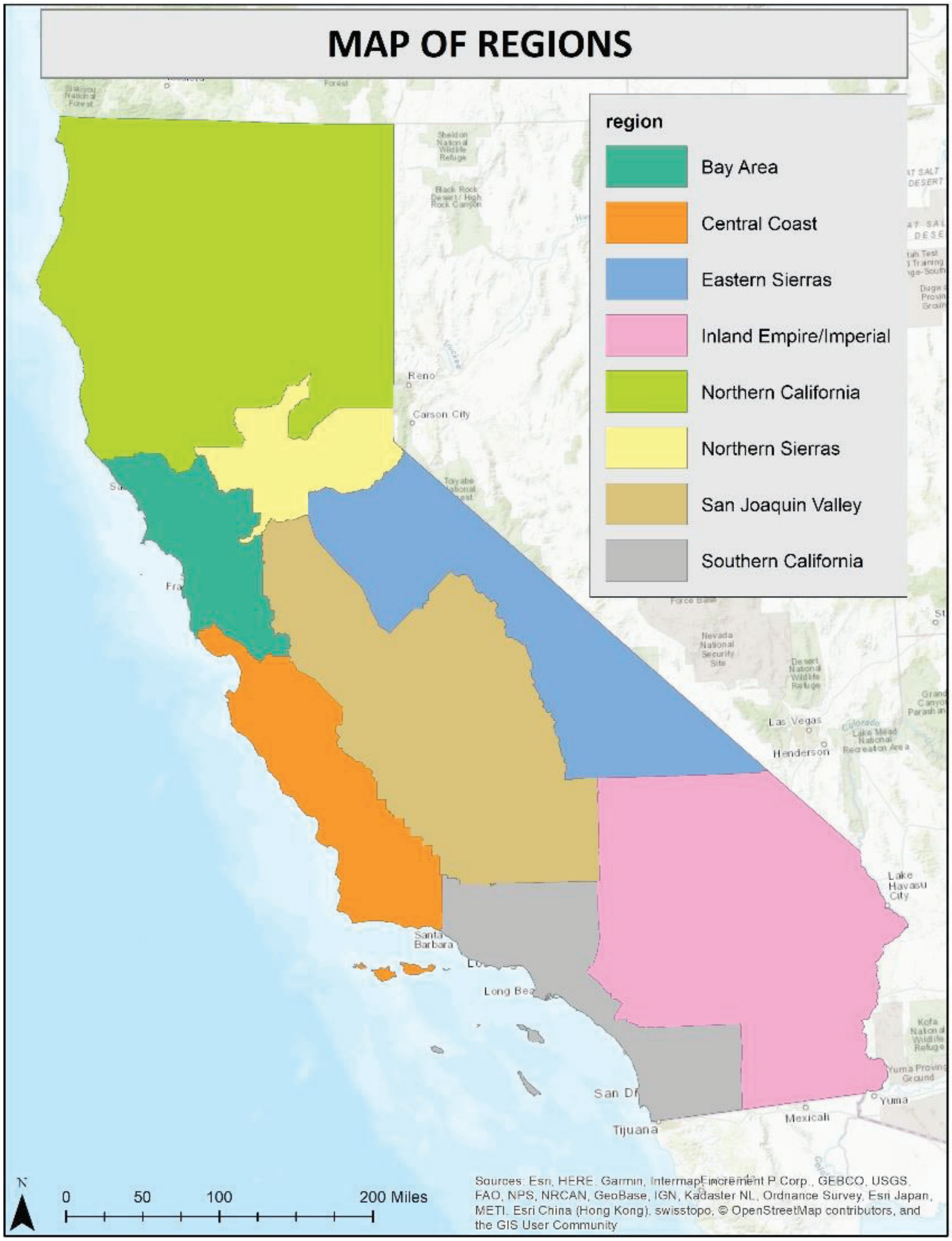
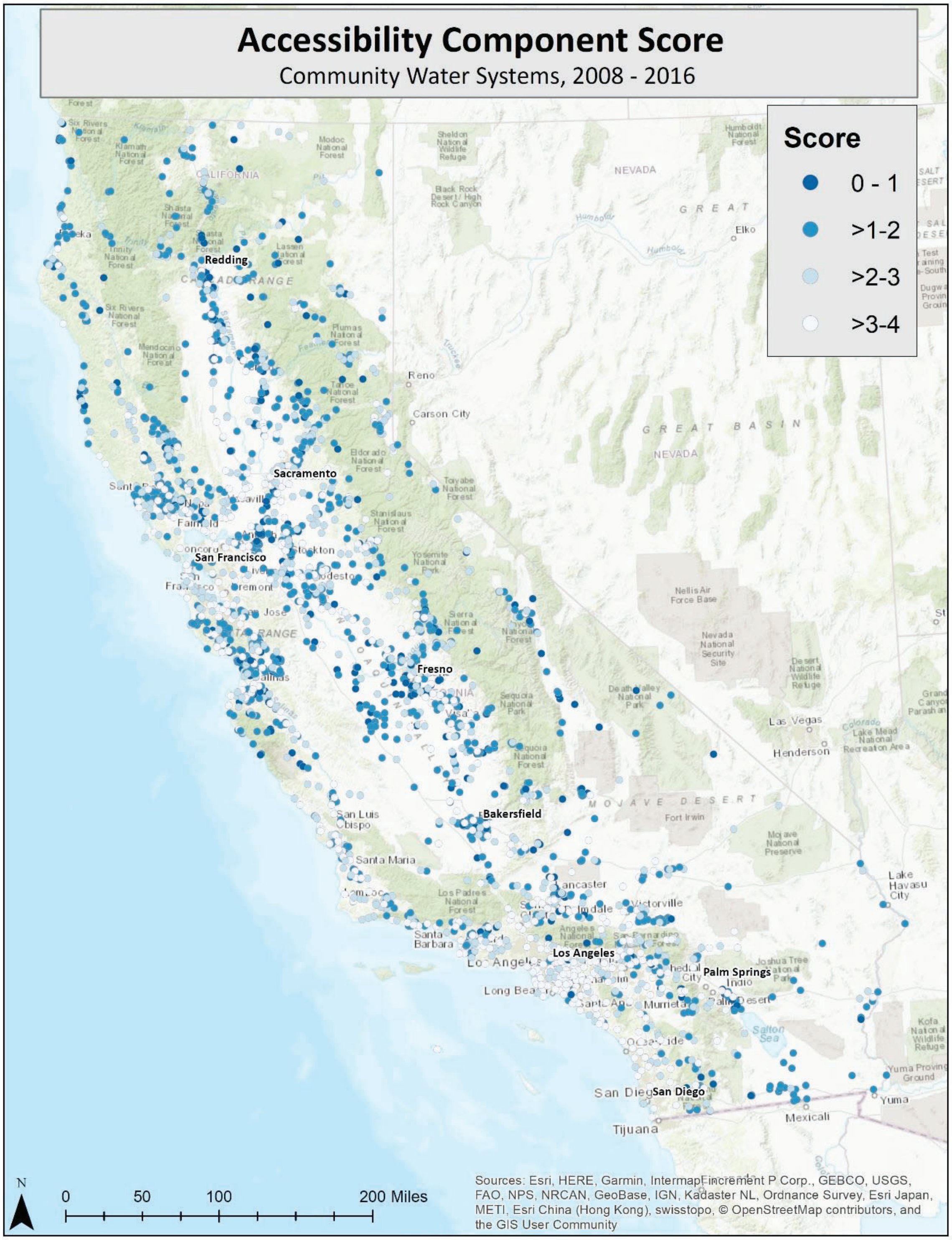


Figure 26. Map of Composite Water Accessibility Scores across the State. Study period 2008-2016; n = 2,637.



+ Given the aggregate nature of this component these scores do not mean a water system did not have high accessibility scores for individual indicators. For specifics, system-level data should be consulted.

Additional Research/Next Steps

The current indicators described in this chapter do not capture all aspects of water accessibility. Other aspects can include the quantity of water generally available to serve a specific area based on the condition of its source(s) and regulatory and statutory requirements (e.g., Sustainable Groundwater Management Act). Conditions related to climate change, such as drought, fire, extreme heat, and sea level rise, can also affect accessibility. Future versions of this tool are expected to include additional indicators related to supply vulnerability.

Water accessibility has a multi-level nature. Households and individuals can take their own actions to access water, such as purchasing bottled water or obtaining water from other alternative sources (e.g., private wells). The types of alternative sources and distances to them is a relevant consideration (Balazs, Morello-Frosch et al. 2011; Christian-Smith J, Balazs C et al. 2013). Although the current draft focuses on system-level measurements of accessibility, household-level coping approaches are also critical, especially as the most marginalized Californians, such as populations lacking housing, or those that do not have access to water where they live. Future versions explore the whether it is possible to address household and individual accessibility, though such efforts are likely to prove extremely challenging to do data constraints.

Potential future indicators are further described in Table 22. Examples of such indicators focused on physical accessibility could include: supply resiliency (e.g., vulnerability to drought) and measures of infrastructure quality (e.g., age of water system infrastructure, main breaks, etc.). Additional institutional indicators could include metrics related to staffing and governance capacity, training and funding received, and community capacity to pay for necessary infrastructure. The inclusion of any of these metrics would be contingent upon adequate data. OEHHA is coordinating with other state agencies and stakeholders, including the Water Board, the Department of Water Resources, water systems, community organizations, and local governments in considering other possible indicators and datasets.

Key Findings for Accessibility

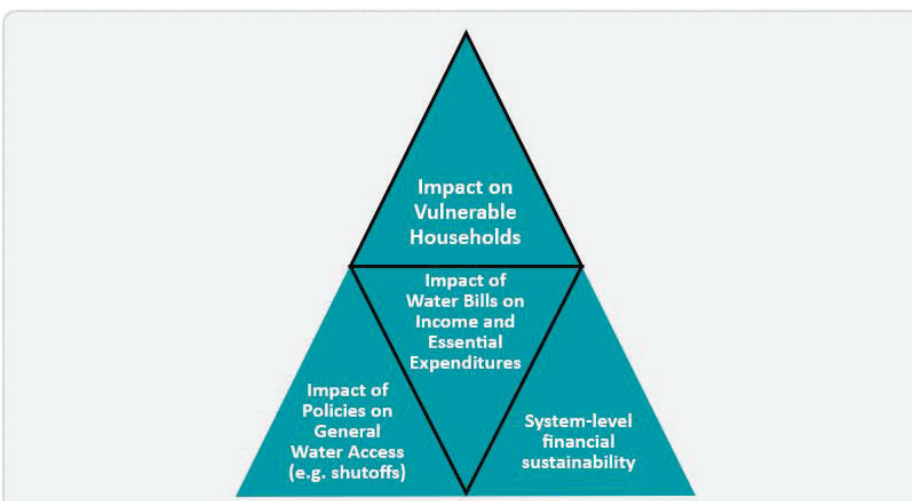
- Approximately 16% of systems have only one water source and rely solely on groundwater. These systems are particularly vulnerable to water outages.
- Roughly 25% of systems are small and serve DAC or SDAC populations. While future work is needed to measure institutional constraints, these systems likely face significant institutional constraints.
- The vast majority of systems have no monitoring and reporting violations.
- Overall, nearly 46% of systems have composite water accessibility scores of 2 or lower, indicating particularly low scores. These low scores are mainly the result of systems vulnerable to physical water outages and systems that are both small and DAC/SDAC.

A central consideration in achieving the human right to water is whether customers can afford to pay for their water. Water affordability is typically assessed by measuring the direct and indirect costs of water charged to a household, relative to the household's income level. Measuring water affordability can help inform how water costs affect the attainment of households' other basic needs such as housing and food. To address issues of non-discrimination and equity, water should be affordable to the most vulnerable populations, and users should be free from unnecessary disconnections (UN CESCR 2002).

Figure 27 summarizes the concepts that commonly influence affordability considerations, and highlights the two areas of affordability that form the main focus here: the ratio of water bills to income and the impact of water bills on economically vulnerable households. The current assessment is focused on the cost of water for drinking, cooking, and hygiene, but could easily incorporate the cost of sewer and sanitation charges should such data become available.

Another core aspect highlighted in Figure 27 is the sustainable financial capability of water systems, or the adequacy of revenue streams and their management to cover ongoing and long-term infrastructure maintenance, capital costs and upgrades necessary to maintain adequate water quality (Davis JP and Teodoro MP 2014; OECD 2010; US EPA 1998a). These aspects are not directly captured in the current assessment.

Figure 27. Core Aspects of Affordability. Triangles highlighted in black indicate areas that the Affordability Component focuses on.



Historically, US EPA has used affordability ratios to measure the impact of a water system's average water bill on a household earning the median household income (US EPA 1998a). US EPA's affordability ratio (known as the Residential Indicator) is an indicator used primarily to screen water systems for affordability challenges when they are meeting compliance standards for water quality. Water is understood to be unaffordable if water bills exceed a pre-established percentage of median household income (See Box 2: What is an affordability ratio?). Concerns about the adequacy of this approach have resulted in extensive discussions about best practices and about the limitations of the conventional affordability ratio approach (See Works Cited for further discussion).

Box 2: What is an affordability ratio?

An affordability ratio captures the impact of a water bill on a household's income. In its most generic form, this ratio typically consists of a water bill at a specified volume of water divided by an income level. The resulting ratio is meant to capture the fraction of a household's income that is spent on water bills. Typically, the affordability ratio is evaluated against a threshold to determine whether water bills are or are not affordable.

Conventional affordability ratios often use average water bills divided by a region's median household income level. However, these ratios have limitations. Ideally, the value used for water bills includes all costs (including any fees, sewer, or other charges). Additionally, household income should represent total household income minus other essential expenditures (such as housing and food), so that water is not misrepresented as affordable at the expense of other basic needs (e.g. food).

Indeed, improved affordability ratios specify the water bill inclusive of all charges for a particular volume of water, and aim to measure disposable income minus other essential expenditures.

Building on this rich discussion, OEHHA developed three affordability indicators to measure affordability at three income levels at the water system scale (see Box 3: Summary of Affordability Measures and (Goddard J.J., Ray I. et al. 2019).[29]

This chapter first discusses water bill data and methods used to create the affordability indicators and common thresholds for expressing whether water is affordable. It then presents each of the three affordability indicators, followed by the calculation of a composite affordability indicator and water system affordability score. The chapter concludes with a

[29] Data limitations make it hard to analyze affordability at the household level. Information about household water bills and income level would be needed. Therefore, indicators that screen for potential household concerns are often developed at larger geographic scales (for example, at the water system or census-tract scale).

discussion of data gaps, which are significant for this component, and observations on water affordability in California's community water systems.

Works Cited contains a literature review relevant to the creation of the affordability indicators and Appendix B includes technical and methodological details about the indicators we present.

Unlike the Water Quality and Water Accessibility components outlined above, the Affordability Component has no subcomponents.

Box 3: Summary of Affordability Measures Calculated for Each Water System

This chapter describes three affordability indicators, and one composite metric. The three affordability indicators are based on the generic formula of an affordability ratio (AR) for a specified volume of water:

$$AR = \frac{System\ wide\ Average\ Bill\ for\ 600\ cubic\ feet\ of\ water\ per\ month}{Specified\ Income\ Level}$$

Affordability Ratio at the Median Household Income Level (AR_{MHI})

- Calculates water bills relative to the median household income within a water system's service area.
- Identifies affordability challenges, if any, that median-income households served by the system may face.

Affordability Ratio at the County Poverty Threshold (AR_{CPT})

- Calculates water bills relative to the county poverty income level.
- The number of households below the county poverty level is also calculated.

Affordability Ratio at the Deep Poverty Level (AR_{DP}).

- Calculates water bills relative to the deep poverty level (one-half the income of the poverty level).
- The number of households below the deep poverty level is also calculated.

These three indicators are used to create a **Composite Affordability Ratio** which uses the number of households at the three income levels described above to create a household-weighted affordability ratio for households below the median income level.

Method to Create Affordability Ratios

Four main steps were taken to create the three affordability ratios. The general formula used to calculate the affordability ratios (ARs) is:

$$AR = \frac{Systemwide\ Average\ Annual\ Water\ Bill}{Annual\ Income}$$

To apply this formula to create the affordability indicators, OEHHA followed these steps for each water system:

1. Selected water consumption level (same for all systems) based on available water bill data.
2. Selected water bills reported for the water consumption level.
3. Estimated three income levels for each water system: median household income, county poverty income and "deep poverty" (one-half of the county poverty income level).
4. Estimated the number of households within each system earning below the three income levels.

These data are then used to estimate three affordability ratios for each water system, at three income levels, and to weight them to create a household-weighted average composite affordability ratio for households earning below the median income in each water system.

STEP 1: SELECTING A WATER CONSUMPTION LEVEL

Water systems annually report average residential water bill data at three volumes of monthly consumption (600, 1200, and 2400 cubic feet) to the State Water Board through annual electronic reports. OEHHA selected water bills reported at 600 cubic feet (6 HCF) due to this volume's alignment with basic water needs and conservation goals. This amount is approximately 150 gallons per household per day per household.[30] As such, this volume falls within the range of basic needs water consumption for people in California (though it is significantly above international standards for essential water) and falls near California water conservation goals (Gleick P 1996).[31] For most households, 6 HCF per month would not be enough water to cover landscaping and other water uses that are generally not considered to

[30] This is equivalent to 50 gallons per person per day in a 3-person household or 37 gallons per person per day in 4-person household. The average household size in California in 2015 was 2.9 persons per household.

[31] (Gleick P 1996) proposes a basic water requirement of 50 liters per capita per day (13 gallons). This is equivalent to 150 liters (39.6 gallons) for a three-person household and 200 liters (52.8 gallons) for a four-person household. Gleick's study presents a range of 57-165 liters per capita per day (15-45.6 gallons), depending on the region, technological efficiencies, and cultural norms. (Feinstein L 2018)recommends evaluating water affordability in California using a measure of 43 gallons per capita per day, equivalent to 129 gallons per three-person household and 172 gallons per four-person household. A provisional standard of 55 gallons per capita per day is identified in (California Water Code 2009) section 10608.2 for indoor water use for urban water suppliers who are aiming to reduce water demand.

be basic needs. Even so, some households may require higher levels of essential water use, for example, larger households; households with people facing illness or with disabilities; or households in more water-stressed areas of the state.

OEHHA selected 6 HCF per month as representing essential water needs, given currently available statewide datasets, while acknowledging the diversity of water needs of households in the state. For additional discussion, see Appendix B1 Water Bill Dataset Selection & Use.

STEP 2: SELECTING AVERAGE WATER BILL AT 6 HCF

We estimated affordability using the annual average water bill for 6 HCF per month (See Box 4: Affordability Considerations: What is in a Water Bill?). We relied on water bill data reported by water systems[32] in the State Water Board's Electronic Annual Reporting survey (eAR) (See Appendix B1 Water Bill Dataset Selection & Use for detailed methodology).[33]

Prior to selecting this approach, we reviewed four available datasets on water bills for California community water systems (See Appendix Table B1). Ultimately, OEHHA selected the State Water Board's eAR survey because:

- The eAR data are publicly available.
- The eARs are updated every year, and thus this indicator can be re-calculated each year.
- Despite data gaps discussed below, the eAR data has a high level of coverage of California water systems (compared with other four datasets; See Appendix Table B1).
- The eAR data were reported as average monthly residential water costs for a specific volume of water.

For all three affordability ratios, we:

- Reviewed water bill data for community water systems.
- Applied exclusion criteria for potential outliers (i.e. very low and very high water bills). (See Appendix B3 Data Cleaning & Exclusions for detailed methodology.)

After collecting income data and addressing missing data and data reliability concerns (See Appendix B3.4.1 Data Reliability in Census Data), 1,158 systems were ultimately included in OEHHA's affordability assessment. The median water bill for 6 HCF across water systems with data was $41.39/month (See Appendix B3 Data Cleaning & Exclusions) (State Water Resources Control Board 2019).

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[32] Systems are asked to report average residential water bills at specified water volumes, with no specification in the survey question to include additional fees or sewer charges in the estimate. Therefore, OEHHA interprets the available data provided in the eAR to represent a minimum cost for water at the specified volumes–or the water rate given 6 HCF, excluding sewer charges.

[33] Other approaches to estimating water bills are to calculate an estimated average water usage and use rate information to calculate an average annual water bill.

STEP 3: ESTIMATING INCOME LEVELS

We took the following steps to calculate income levels (See Appendix B2 Income Data Selection & Use for more details):

Median Household Income (MHI)[34]:

- Applied the steps described in the Institutional Constraints section (page 51)
- Applied OEHHA's MHI exclusion criteria to remove unreliable estimates where relevant, as discussed in Appendix B3.4.1 Data Reliability in Census Data.

County Poverty Threshold (CPT):

- Collected data from Public Policy of Institute of California on County level poverty thresholds (see Appendix B2.2.1 Selecting Poverty Level Income).
- Assigned each system the County Poverty Threshold of its respective county. (Of California's 58 counties, 38 counties have unique poverty thresholds and the remaining 20 are in three groups with equal thresholds due to Census suppression criteria.) (US Census Bureau 2016)

Deep Poverty (DP), was calculated to be 50% of the CPT.

STEP 4: ESTIMATING NUMBER OF HOUSEHOLDS BELOW INCOME LEVELS

For each water system, to estimate the number of households below the MHI, County Poverty Threshold, and Deep Poverty Level, OEHHA:

- Estimated the number of households in each of the Census's 16 income brackets from ACS 2011-2015 Table B19001. This was done by apportioning block group level data to water systems through a set of steps. First, we calculated the percent of households in each income bracket for all block groups. Second, we estimated the number of households in each block group served by a given water system by intersecting water system boundaries with populated census blocks. Then, we multiplied the Census data (i.e. the percentage of households in each income bracket) by the estimated number of households in each block group served by a water system. These data were summed across all block groups intersecting a water system, resulting in a household weighted estimate for the number of households in each income bracket for each system (See B2.3.1 Areal-Household Weighting Methodology).
- Excluded systems that do not meet OEHHA's data-inclusion criteria based on Census data reliability (See Appendix B3.4.1 Data Reliability in Census Data).[35]

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[34] Median household income is gross income, i.e. it does not exclude taxes or other essential expenditures.

[35] OEHHA sought to improve reliability of census estimates used by aggregating data to water system boundaries and excluding systems with unreliable data. Even so, estimates should be considered in light of their potential unreliability per census measures of error. Appendix B3.4 provides further details and discussion on this topic.

- Approximated the number of households below the particular income level within each system[36] by using linear interpolation between points across the Census income brackets, summing the number of households below the income level, and dividing that sum by the total households within the water system. (See Appendix B4 Composite Affordability).

[36]PPIC poverty thresholds, indexed against the percentage of households at that income level, may *under-estimate* the actual percentage of households in poverty because PPIC estimates are proxies for disposable income and Census estimates of households by income brackets are estimates of total income. At poverty and deep poverty income levels, it is likely that disposable and gross income levels are not substantially different, but given that we cannot measure this we recognize that our approach results in a more conservative measure of poverty levels and may under-estimate the number of households facing AR_{CPT} or AR_{DP} within a system. In the current study, the average percentages of households in poverty or in deep poverty within water systems corroborates PPIC's state-wide estimates at the county level, despite different overall analyses.

Box 4: Affordability Considerations: What is in a Water Bill?

Water bills typically reflect the price of water consumed by a household plus any fees and subsidies for drinking water and sewer services. The price of water may be fixed or vary with the volume consumed. Water bills may vary widely across water systems, even for the same volume of water. Variability in water bills is due to many factors, including water costs, operations and maintenance costs, administrative costs, debt service on capital investments, energy costs, and water quality variations. Water bills cannot fully capture the cost of water in cases where households pay for bottled water (costs referred to as replacement costs).

When measuring affordability, water bills are most frequently used to represent total water costs to households. However, depending on what data is reported and/or collected, water bills do not always include wastewater costs, or long-term infrastructure and maintenance costs.

California's eAR survey asks systems to report the average water bill at a specified volume of water consumed. Water bills reported at a fixed volume (e.g., 6 HCF in this report) are thus for an average water bill for an essential use volume and may not reflect what a household *actually* pays for water. A completely accurate water bill for 6 HCF would need to include wastewater charges, infrastructure charges, and other important fees that may not be captured in the average water bill estimates reported.

The contractual relationship between renters and homeowners represents another challenge. The Water Board estimates that between 25% and 46% of Californians rent their homes (State Water Resources Control Board 2019). Water bills are paid by owners, who pass costs on to tenants, in theory, proportional to a renter's water use. However, the relationship between what renters should pay for water and what they actually pay is not generally metered or documented. As a result, the use of water bills may underestimate or overestimate how much renters pay for water. The indicators in this report thus assume that renters pay proportionally to their use (i.e., 6 HCF), but they do not directly consider affordability for renters.

A total of 1,561[37] out of 2,903 community water systems had water bill data that could be included in the affordability calculations (See Appendix B1 Water Bill Dataset Selection & Use). After applying a set of exclusion criteria (see Appendix B3 Data Cleaning & Exclusions), this resulted in 1,158 systems, or 40% of community water systems, assigned affordability scores (This contrasts with the Water Quality Component for which OEHHA evaluated 100% of community water systems, and 91% in the Water Accessibility Component).

[37] Los Angeles Department of Water and Power (LADWP) was divided into five smaller sub-systems. The umbrella system was removed before further evaluation of data reliability.

The relatively low number of systems in the assessment is discussed later in this chapter, though it is worth noting that these 1,158 community water systems, while only about 40% of the total number of community water systems, represent approximately 90% of the population served by community water systems in California. However, very small systems and those serving severely disadvantaged communities are under-represented in this analysis. The impact of this smaller sample size relative to the total number of community water systems is likely significant, and is discussed in greater detail below in the "Affordability Data Gap" section. For this reason, the initial results presented below should not be used to represent complete statewide trends, as this would require the complete dataset.

Scoring

Most affordability studies use a specific threshold to determine if the percent of household income spent on water is affordable or not. The present assessment does not select a specific threshold against which affordability ratios are determined to be "unaffordable." Instead, multiple thresholds represent the spectrum from more to less affordable.

There is no single agreed-upon affordability threshold. Instead, there are several thresholds cited internationally, nationally and in California that can be relevant for assessing affordability. Internationally, water is typically considered unaffordable when costs are greater than 3% of disposable incomes (United Nations Development Program 2006). Nationally, US EPA has applied a threshold of 2.5% to identify drinking water affordability challenges in water systems (US EPA 2002). There are several potential benchmarks for judging water affordability at the three income levels used in OEHHA's report. In California, State Revolving Fund programs consider loans for water projects to be unaffordable when repayment costs result in water bills that exceed 1.5% of median household incomes in disadvantaged communities (those earning 80% or less than the state's median household income) (State Water Resources Control Board 2018). See Appendix A2 Approaches to Measuring Affordability for further discussion of approaches to measuring water affordability, including the use of thresholds.

We assigned indicator scores to water systems based on a combination of assessing the distribution of the data and using existing affordability benchmarks as follows:

- 0, when the average water bill exceeds 2.5% of the relevant income level (e.g., MHI, CPT, DP).
- 1, when the average water bill ranges from 1.5% to less than 2.5% of the income level.
- 2, when the average water bill ranges from 1.0% to less than 1.5% of the income level.
- 3, when the average water bill ranges from 0.75% to less than 1.0% of the income level.
- 4, when the average water bill is less than 0.75% of the income level.

Indicators

Affordability Indicator 1: Affordability Ratio for the Median Household Income level (AR_{MHI})

This affordability ratio, AR_{MHI}, is based on the median household income level of the population served in each community water system (see Methods Section of Institutional Constraints indicator for information on how MHI is calculated, as well as Appendix B2.3). AR_{MHI} is evaluated using water bills reported for an essential minimum water volume of 600 cubic feet (6 HCF). Across the 1,158 systems, MHI ranged from $17,400 to $250,000 (median=$60,500).

The affordability ratio at MHI (AR_{MHI}) is calculated as:

$$AR_{MHI} = \frac{System\ wide\ Average\ Bill\ for\ 6\ HCF/month\ \times\ 12\ months}{Annual\ Median\ Household\ Income\ of\ Water\ System}$$

The affordability ratio is expressed as a percentage.

An affordability ratio using the median income level indicates the water bill burden for households at the 50th percentile of the income distribution in a water system. Thus, if water bills are high for households at the median income level, water is unaffordable for at least 50 percent of households in a water system. High water bills at the MHI may also indicate that the water system's financial capacity is at risk for being unsustainable, because household affordability and system financial capacity are interrelated.

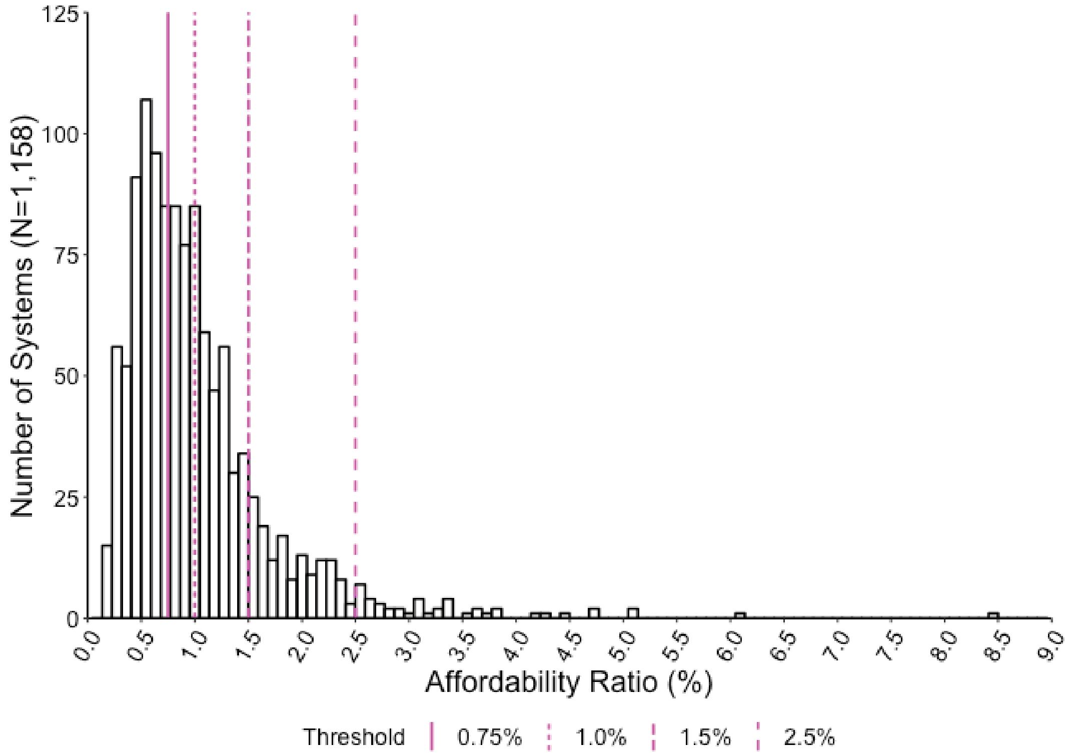
Data Source

State Water Board's electronic annual reports (eAR), 2015.
US Census American Community Survey (ACS) 5-Year Data: 2011 – 2015
Tracking California, Public Health Institute. Water Boundary Tool. Available at URL: https://trackingcalifornia.org/water-systems/water-systems-landing.

Results

Among the 1,158 systems with data, affordability ratios ranged from 0.16% to 8.49%, with a median of 0.85% (Figure 28). Figure 28 shows how the indicator scores are distributed across the 1,158 systems with data. Among these systems, 15.8% of systems had average water bills exceeding 1.5% of the median household income. Of these, 66.5% serve severely disadvantaged or disadvantaged communities, defined by their overall economic status (see Accessibility Chapter). Table 17 provides an indicator score to these affordability values and represents systems not included in analysis (due to missing data or exclusion criteria) as "No Data". Figure 29 highlights these indicator scores across the state.

Figure 28. Affordability Ratio and Scores at Median Household Income (as Percent) for Community Water Systems. Data for 1,158 community water systems in 2015†.



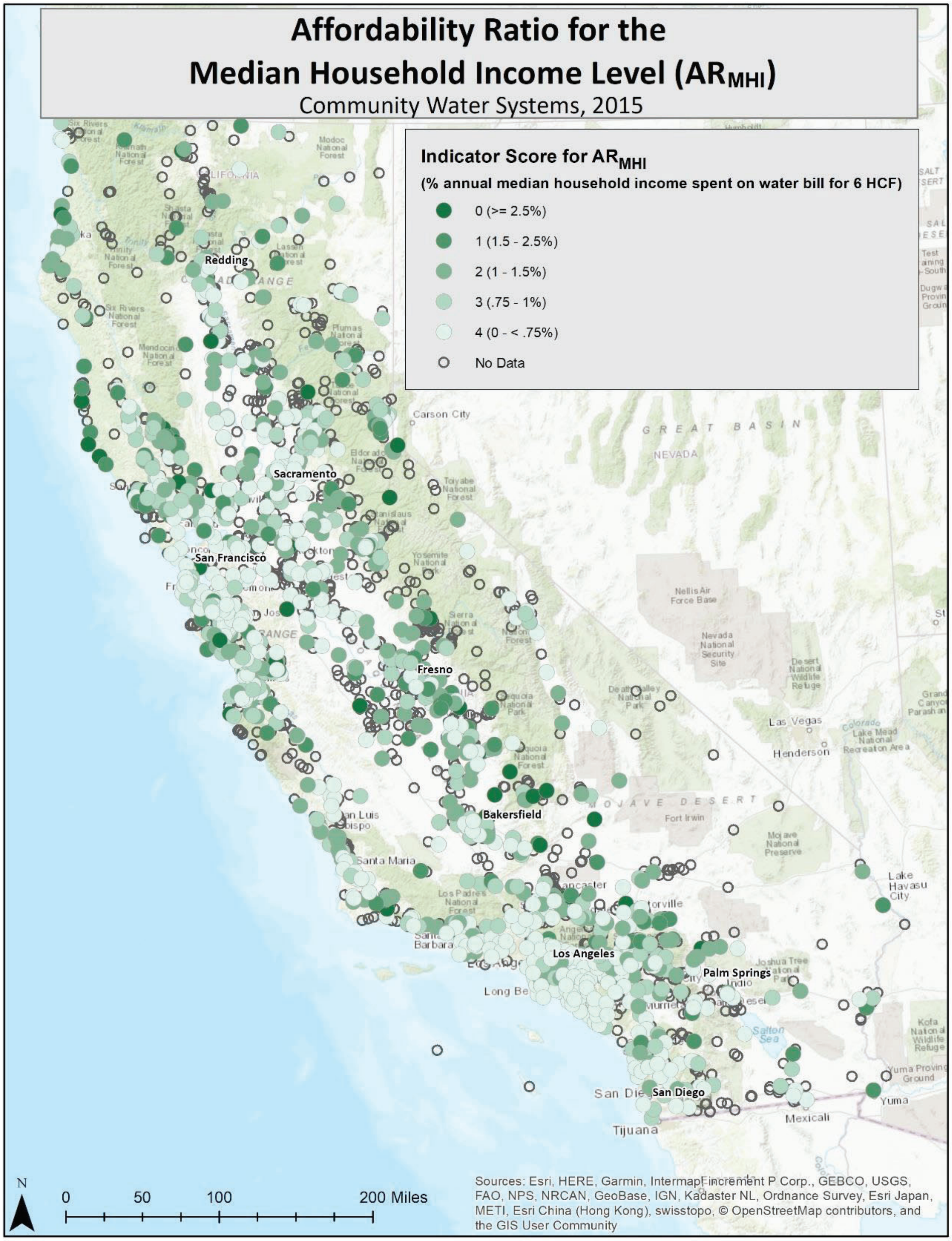
† The four dashed lines delimit the five bins used to score the affordability ratio.

Table 17. Affordability Ratio at Median Household Income. Number of community water systems in various affordability ranges, with associated indicator score. Study period, 2015. Note: the percent of systems shown reflects the state's 2,903 community water systems, with the percent of systems in the analysis indicated in parentheses (n=1,158) †.

Composite Affordability Ratio Range	Composite Affordability Score	Number of Community Water Systems (CWS)	Percent of All CWS (N=2,903) (Percent of systems in Analysis, n=1,158)	Population*	Percent Population (among 2903 systems)
0 to <.75%	4	475	16.4 (41)	21,500,000	61.1
0.75% to <1%	3	238	8.2 (20.6)	5,790,000	16.5
1% to <1.5%	2	262	9.0 (22.6)	4,280,000	12.2
1.5% to <2.5%	1	138	4.7 (11.9)	437,000	1.2
>=2.5%	0	45	1.6 (3.9)	25,000	0.1
	Sub-total	1,158	39.9 (100)	32,000,000	91.1
No Data	N/A	1,745	60.1 (N/A)	3,110,000	8.9
	Total	2,903	100	35,100,000	100

† OEHHA used census block population data from 2010 to estimate a total of approximately 35.1 million people living in areas served by water systems.
** Population reported at three significant figures. The population figure shown indicates the number of people served by systems with that given affordability ratio; it does not represent the number of people facing that actual affordability ratio.*

Figure 29. Affordability Ratios at Median Household Income Levels for 1,158 systems. Income data based on ACS 5-Year Summary 2011-2015. See Appendix B3.5 for a map of systems with "No Data".



Affordability Indicator 2: Affordability Ratio for the County Poverty Threshold (AR_{CPT})

This affordability indicator is based on the county poverty income level threshold, which OEHHA refers to as AR_{CPT}. Economically vulnerable households and individuals are expressly considered with regard to their ability to pay for water with this indicator (CESCR (United Nations Committee on Economic 2002).[38]

The AR_{CPT} is calculated as:

$$AR_{CPT} = \frac{System\ wide\ Average\ Bill\ for\ 6\ HCF\ per\ month\ \times\ 12\ months}{County\ Poverty\ Threshold\ for\ Water\ System's\ County}$$

The affordability ratio is expressed as a percentage.

In developing this indicator, OEHHA evaluated several existing datasets and measures of poverty. Ultimately, the county poverty income thresholds calculated by the Public Policy Institute of California (PPIC) were selected (Bohn S, Danielson C et al. 2013).[39] The PPIC calculates county poverty income thresholds based on the approach of the US Census, using data on the expenditures needed for a family of four to stay out of poverty within a given county (for more information, see Appendix B2.2.2 Poverty Level Incomes by Water System).

The PPIC thresholds offer two important advantages over other approaches that were considered. First, the income levels identified by each PPIC county poverty income threshold are a proxy for disposable income (e.g., income after taxes)—rather than gross income (See Appendix B2 Income Data Selection & Use).[40] Second, the PPIC's thresholds explicitly account for differences in housing costs across counties in California, thus including a key driver of differential household expenditures across the state (See Box 5: High Cost of Living Considerations). For the 1,158 systems covered, County Poverty Thresholds range from \$23,710 to \$36,150 (see Appendix B2.2.2 Poverty Level Incomes by Water System for more information). Figure 30 shows the large percentage of households living at or below the county poverty level in many of the 1,158 community water systems covered in our analysis.[41]

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[38] UN General Comment No. 15 on the Right to Water notes "that poorer households should not be disproportionately burdened with water expenses as compared to richer households."

[39] The PPIC uses these county poverty thresholds to calculate its California Poverty Measure. OEHHA uses the county poverty thresholds in its affordability indicators and thus does not include additional income or benefits households in poverty may receive.

[40] Other studies have explored alternate metrics for poverty-level affordability ratios. Some evaluate affordability at the 20th percentile with discretionary income (Teodoro M.P. 2018) or at every income decile ((Sawkins and Dickie 2005)). Alternative sources for poverty-level data include area income estimates produced by the Housing and Urban Development, recommended in the Pacific Institute report (Feinstein L 2018). See Appendix B2 for discussion.

[41] OEHHA sought to improve reliability of census estimates used by aggregating data to water system boundaries and excluding systems with unreliable data. Even so, estimates should be considered in light of their potential unreliability per census measures of error. Appendix B3.4.1 Data Reliability in Census Data provides further details

Box 5: High Cost of Living Considerations

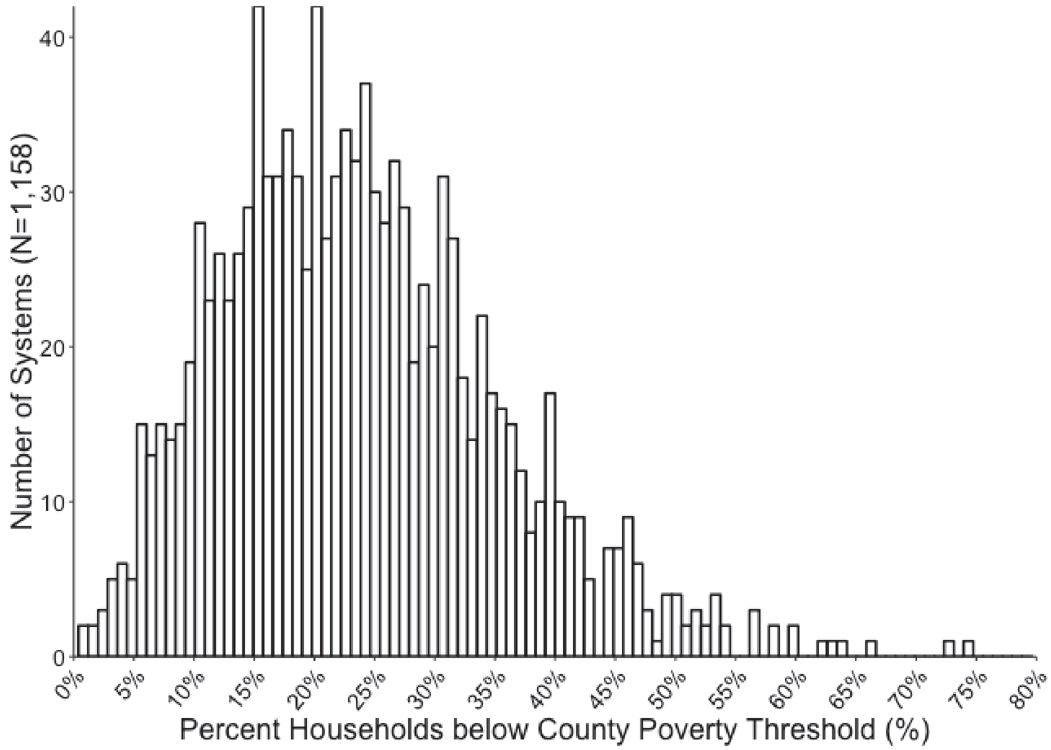
A household's ability to pay for water hinges on its disposable income, and the cost of other non-water essential expenditures. Ideally, an affordability ratio would reflect disposable income minus non-water essential expenditures. Thus the household's water bill would be compared to its remaining discretionary income and not infringe on other basic needs such as shelter.

California's high cost of living, which varies regionally, affects the amount of income available to households to pay for water. Two households may pay the same water bill and have the same income level. However, the household in a region with the higher cost of living will have less discretionary income to allot to its water bill.

CPT and DP approximate poverty and deep poverty level disposable incomes with cost-of-living adjustments, but their affordability ratios do not remove housing costs. Therefore, households in expensive housing areas will have a higher CPT but a lower affordability ratio for a household paying the same water bill in a more affordable region. This represents a common limitation. Removing essential expenditures - like housing- from income levels may improve representation of affordability challenges but requires additional assumptions and data that are not readily available at the water system scale, especially in small and rural systems (See Appendix A3 for further discussion).

and discussion on this topic.

Figure 30. Percent of Households At or Below County Poverty Thresholds, Across 1,158 Community Water Systems. Data based on ACS 5-Year Summary 2011-2015.



The affordability ratio AR_{CPT} represents the income of individual households within that county that are at or near the county poverty threshold level. For example, a particular system may have 1% of its households living at the poverty level. In this case, this ratio would only apply to 1% of households. Accordingly, AR_{CPT} is considered in conjunction with information on the percentage of households within a water system that are at or below the California county poverty threshold.

Data Source

State Water Board's electronic annual reports (eAR), 2015.

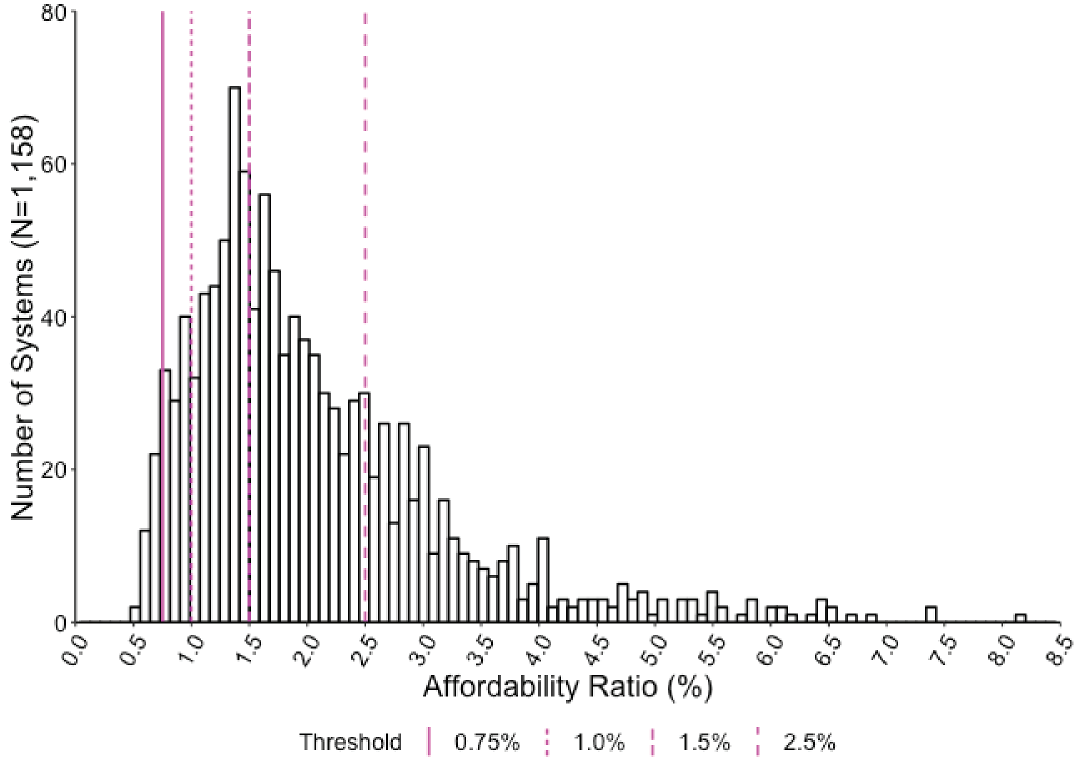
Public Policy Institute of California (PPIC) California County Poverty Thresholds, 2015.

Tracking California, Public Health Institute. Water Boundary Tool. Available at URL: https://trackingcalifornia.org/water-systems/water-systems-landing.

Results

Among the 1,158 systems with the required data, affordability ratios at the poverty threshold (AR_{CPT}) ranged from 0.55% to 8.14%, with a median of 1.76% (Figure 31). Table 18 scores these AR_{CPT} results accordingly.

Figure 31. Affordability Ratio at County Poverty Threshold (as Percent) for Community Water Systems. Data for 2015, n=1,158 community water systems.†



† The four dashed lines delimit the five bins used to score the affordability ratio.

Table 18. Affordability Ratio at County Poverty Threshold. Number of community water systems in various affordability ranges, with associated indicator score. Study period 2015. Note: the percent of systems shown is reflective of the 2,903 Community Water Systems, with the percent of systems in the analysis indicated in parentheses (n=1,158) †.

Composite Affordability Ratio Range	Composite Affordability Score	Number of Community Water Systems (CWS)	Percent of All CWS (N=2,903) (Percent of systems in Analysis, n=1,158)	Population*	Percent Population (among 2903 systems)
0 to <.75%	4	44	1.5 (3.8)	2,560,000	7.3
0.75% to <1%	3	96	3.3 (8.3)	3,480,000	9.9
1% to <1.5%	2	294	10.2 (25.4)	12,800,000	36.4
1.5% to <2.5%	1	418	14.4 (36.1)	11,500,000	32.7
>=2.5%	0	306	10.5 (26.4)	1,680,000	4.8
Sub-total		1,158	39.9 (100)	32,000,000	91.1
No Data	N/A	1,745	60.1 (N/A)	3,110,000	8.9
	Total	2,903	100	35,100,000	100

† OEHHA used Census block population data from 2010 to estimate a total of approximately 35.1 million people living in areas served by water systems.
** Population shown to three significant figures. The population figure shown indicates the number of people served by systems with that given affordability ratio; it does not represent the number of people facing that actual affordability ratio.*

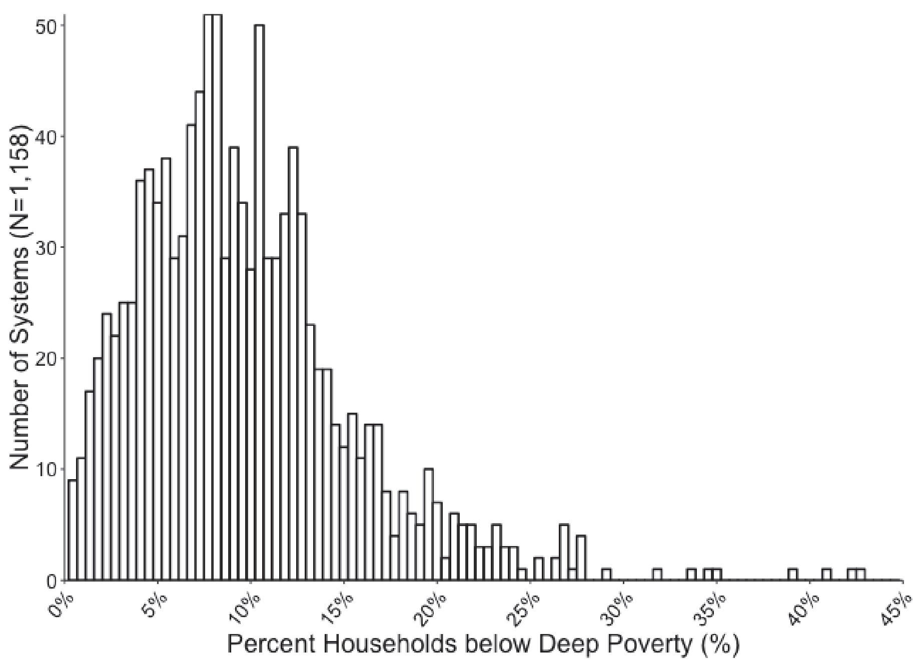
Affordability Indicator 3: Affordability ratio for the deep poverty threshold (AR_{DP})

This indicator addresses some of the most vulnerable households with an affordability ratio for households in deep poverty (AR_{DP}). Here, deep poverty is defined as being at half the county poverty-level income, based on the PPIC county poverty thresholds. (See discussion in Affordability Indicator 2.) AR_{DP}, the affordability ratio at the Deep Poverty threshold, is calculated as:

$$AR_{DP} = \frac{System\ wide\ Average\ Bill\ for\ 6\ HCF\ per\ month\ \times\ 12\ months}{\frac{1}{2} \times\ County\ Poverty\ Threshold\ for\ Water\ System's\ County}$$

Figure 32 shows that for many community water systems included in the assessment, a substantial fraction of households are at or below the deep poverty level.[42] Deep Poverty levels ranged from \$11,860 to \$18,080 (median = \$14,820) (See Appendix B2.2.2 Poverty Level Incomes by Water System). These households are likely facing affordability challenges across a range of essential needs.

Figure 32. Percent of Households At or Below County Deep Poverty Level Thresholds, Across 1,158 Community Water Systems. (Based on ACS 5-Year Summary 2011-2015).



[42] OEHHA sought to improve reliability of census estimates used by aggregating data to water system boundaries and excluding systems with unreliable data. Even so, estimates should be considered in light of their potential unreliability per census measures of error. Appendix B3.4.1 Data Reliability in Census Data provides further details and discussion on this topic.

Research into trade-offs among water bills and other essential expenditures is scarce in the U.S., but two recent studies suggests that households facing unaffordable water will forgo housing and health related bills to pay for water (Cory D.C. and Taylor L.D. 2017; Rockowitz, Askew-Merwin et al. 2018). Estimating affordability for households with extremely vulnerable income levels allows for representation of economically marginalized groups. The AR_{DP} is considered in conjunction with a measure of the percentage of households that live at or below the deep poverty income level within a water system. Still, this may not capture families or individuals living without homes, or families facing seasonal, temporary or inconsistent work, or other conditions that may result in extreme poverty.

Data Source

State Water Board's electronic annual reports (eAR), 2015.

Public Policy Institute of California (PPIC) California County Poverty Thresholds, 2015.

Tracking California, Public Health Institute. Water Boundary Tool. Available at URL: https://trackingcalifornia.org/water-systems/water-systems-landing.

Results

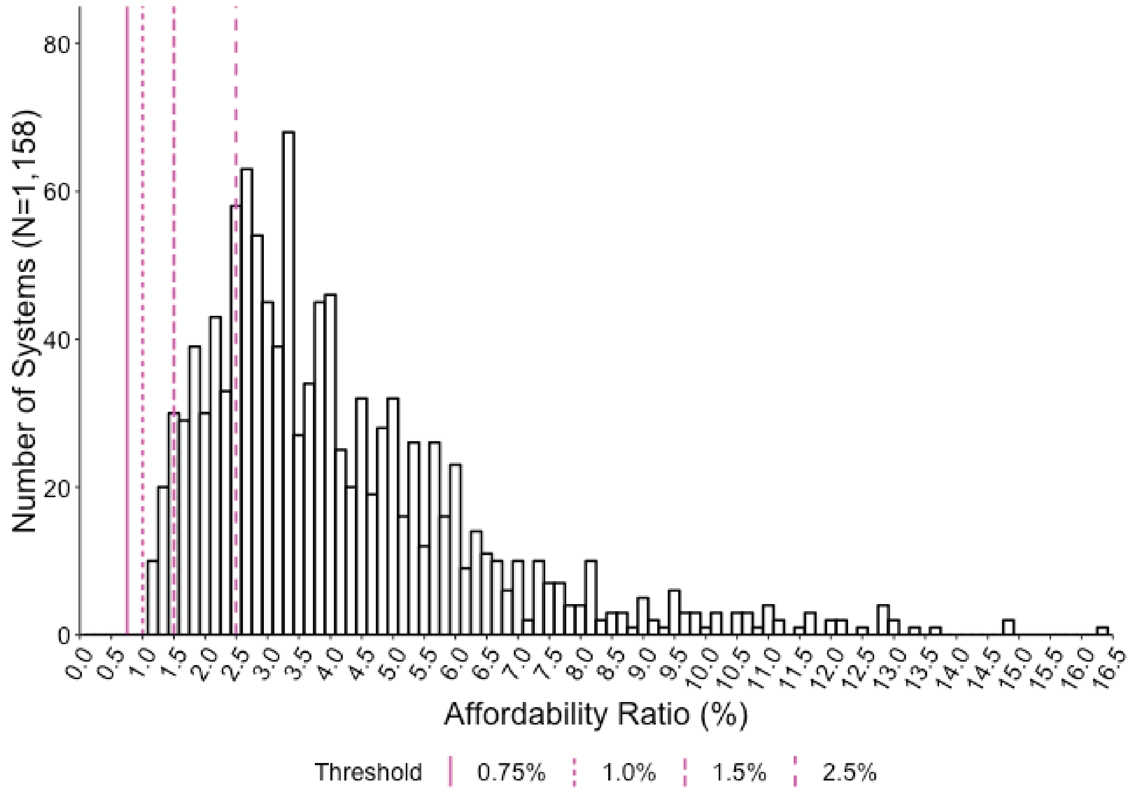
Table 19 and Figure 33 show the affordability ratios for those in deep poverty. They show that, by almost any measure of affordability, water is unaffordable for the majority of people living in deep poverty.

Table 19. Affordability Ratio and Indicator Scores at Deep Poverty Level. Number of community water systems (n=1,158 of 2,903 community water systems) falling in various affordability ranges, with associated indicator score. Note: the percent of systems shown is reflective of the 2,903 Community Water Systems, with the percent of systems in the analysis (n=1,158) indicated in parentheses †.

Composite Affordability Ratio Range	Composite Affordability Score	Number of Community Water Systems (CWS)	Percent of All CWS (N=2,903) (Percent of systems in Analysis, n=1,158)	Population*	Percent Population (among 2903 systems)
0 to <.75%	4	0	0 (0)	0	0
0.75% to <1%	3	0	0 (0)	0	0
1% to <1.5%	2	44	1.5 (3.8)	2,560,000	7.3
1.5% to <2.5%	1	214	7.4 (18.5)	11,000,000	31.3
>=2.5%	0	900	31.0 (77.7)	18,400,000	52.5
	Sub-total	1,158	39.9 (100)	32,000,000	91.1
No Data	N/A	1,745	60.1 (N/A)	3,110,000	8.9
	Total	2,903	100	35,110,000	100

† OEHHA used Census block population data from 2010 to estimate a total of approximately 35.1 million people living in areas served by water systems.
** Population rounded to nearest thousand. The population figure shown indicates the number of people served by systems with that given affordability ratio; it does not represent the number of people facing that actual affordability ratio.*

Figure 33. Affordability Ratio at Deep Poverty Level (as Percent) for Community Water Systems. Data for 2015, n=1,158 community water systems.†



† The four dashed lines delimit the five bins used to score the affordability ratio.

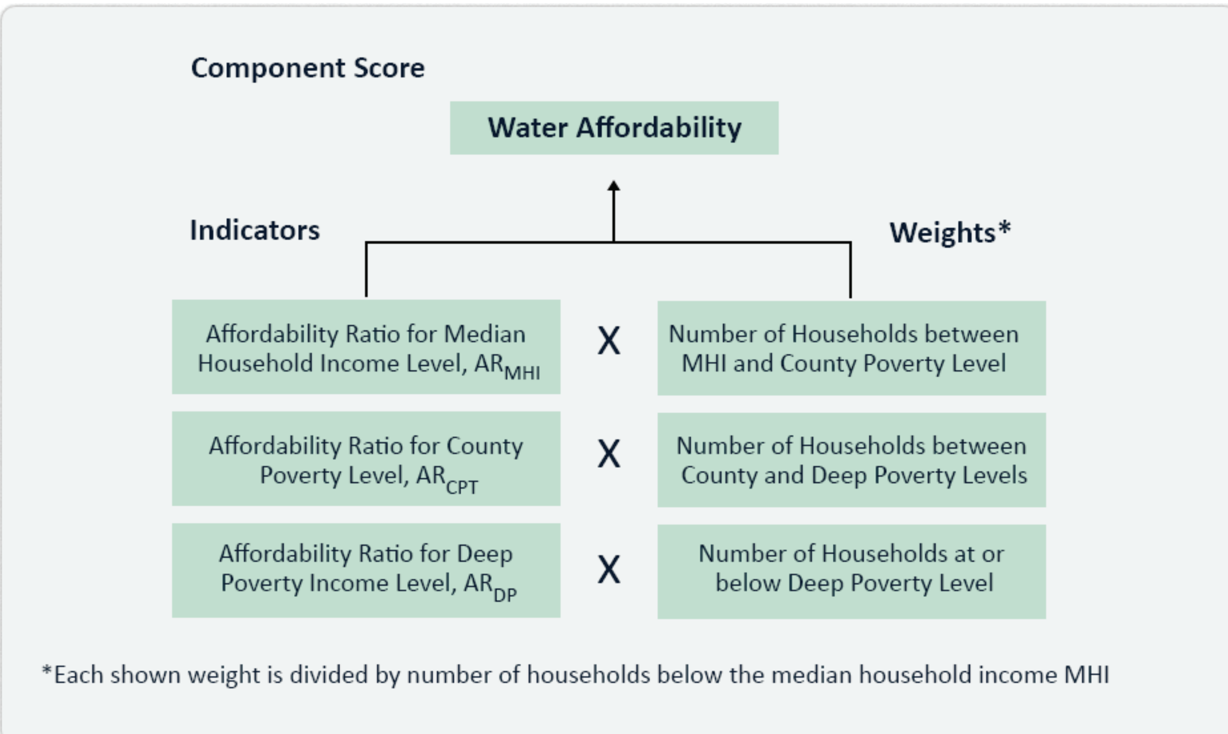
A Composite View of Water Affordability

OEHHA's composite affordability score is based on a household-weighted composite affordability ratio that is based on the three aforementioned affordability ratios (Figure 34). Any given system can have a range of income levels among the households it serves. For example, some water systems may have large proportions of households with very high-income levels, very few households at the poverty level, and no households in deep poverty. Other systems may have most households earning around the median income level, with few households living in poverty. In other cases, the median income level and poverty income levels may be very similar. Large systems, in particular, may have large numbers of both high- and low-income households. Ultimately, the percent of households living at different income levels must be assessed in order to understand the representativeness of any one of the three affordability indicators.

Our approach addresses these variations by using the three individual affordability indicators, plus information on the percentage of households at the three income levels, to create a household-weighted affordability ratio. Each of the three affordability indicators is weighted by the percentage of households at or below the corresponding income level within the water system. The composite ratio sums these household-weighted indicators to construct a system-wide, household- weighted affordability ratio focused on the bottom half of the income distribution. This provides a better understanding of how water rates affect a water system's lower-income households while still providing important information on the overall affordability of the system's water bills for an essential volume of water. See Appendix B4 Composite Affordability for more detail and a discussion of the limitations of this approach.

Ultimately, the composite affordability ratio is given a score from 0 (least affordable) to 4 (most affordable). This composite affordability score is best viewed in conjunction with the aforementioned individual indicators so that one can identify particular burdens faced by households at the median, poverty, or deep-poverty income levels. As such, the three affordability indicators and the composite affordability ratio should be considered jointly when screening a system for water affordability challenges.

Figure 34. Creation of a Composite Water Affordability Score for Each Water System.



Data Source

State Water Board's electronic annual reports (eAR), 2015.

US Census American Community Survey (ACS) 5-Year Data: 2011 – 2015

Public Policy Institute of California (PPIC) California County Poverty Thresholds, 2015.

Tracking California, Public Health Institute. Water Boundary Tool. Available at URL:

https://www.trackingcalifornia.org/water-systems/water-systems-landing

Estimating the Composite Affordability Ratio for a Community Water System

The composite affordability ratio is calculated as described in Figure 34:

$$Water\ System\ Composite\ Affordability\ Ratio = \frac{AR_{MHI} \times (HH_{MHI} - HH_{CPT}) + AR_{CPT} \times (HH_{CPT} - HH_{DP}) + AR_{DP} \times HH_{DP}}{HH_{MHI}}$$

where HH_{MHI}, HH_{CPT}, and HH_{DP} are the numbers of households below the median household income (MHI), county poverty threshold (CPT) and deep poverty (DP).

To estimate the composite affordability ratio for each water system, OEHHA:

- Calculated the number of households within each affected income group associated with an affordability ratio. AR_{MHI} is associated with the number of households in the water system between the median household income (MHI) and the county poverty threshold: HH_{MHI}-HH_{CPT}. Similarly, AR_{CPT} is associated HH_{CPT} - HH_{DP}. AR_{DP} is associated with HH_{DP}.
- Multiplied each AR by the number of associated households. Summed together the three household-weighted affordability ratios and divided by the total number of households below the median income level within the water system. In this way, the bottom 50% of the income distribution, below the MHI, was represented. For the 26 systems that have the MHI below the CPT, their composite ratio was still measured as the household-weighted ratio below the MHI (See Appendix B4 Composite Affordability).

General Results

Table 20 and Figure 35 show the distribution of the composite affordability ratio for the 1,158 community water systems with sufficient data to estimate affordability ratios. A substantial fraction of water systems analyzed – 17% of 1,158 systems - had a composite affordability score showing that water bills were greater than 2.5% of income for the average household below the MHI across water systems.

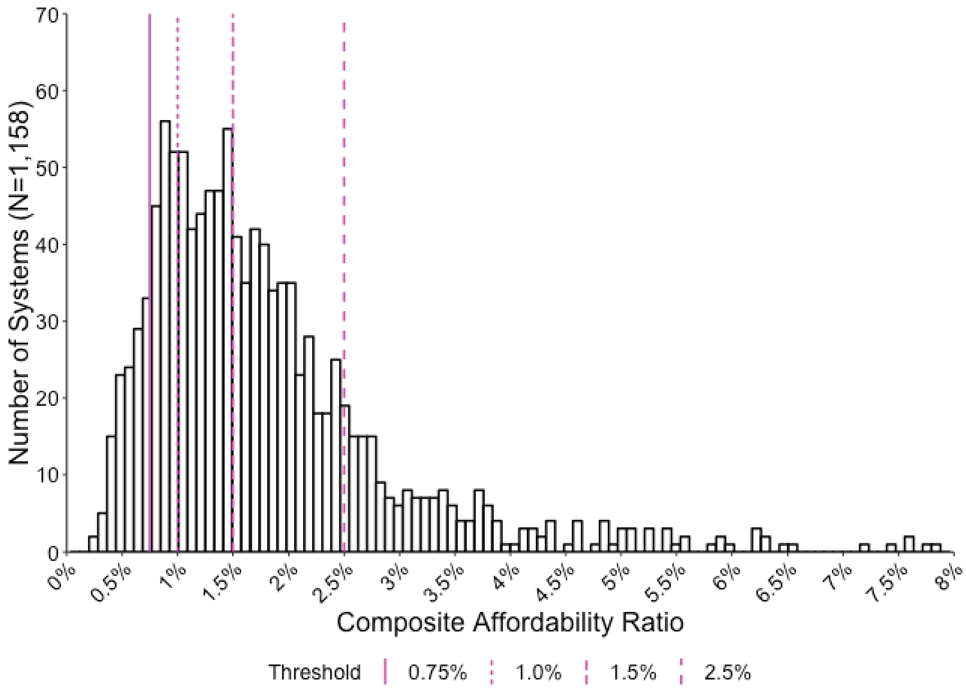
Table 20. Composite Affordability Ratios and Associated Scores for Community Water Systems (n=1,158 with scores), Study Period 2015. Note: the percent of systems shown is reflective of the 2,903 Community Water Systems, with the percent of systems in the analysis indicated in parentheses (n=1,158) [†].

Composite Affordability Ratio Range	Composite Affordability Score	Number of Community Water Systems (CWS)	Percent of All CWS (N=2,903) (Percent of systems in Analysis, n=1,158)	Population*	Percent Population (among 2903 systems)
0 to <.75%	4	123	4.2 (10.6)	4,230,000	12.0
0.75% to <1%	3	151	5.2 (13.1)	6,770,000	19.3
1% to <1.5%	2	298	10.3 (25.7)	13,100,000	37.3
1.5% to <2.5%	1	383	13.2 (33.1)	6,780,000	19.3
>=2.5%	0	203	7.0 (17.5)	1,110,000	3.2
	Sub-total	1,158	39.9 (100)	32,000,000	91.1
No Data	N/A	1,745	60.1 (N/A)	3,110,000	8.9
	Total	2,903	100	35,100,000	100

[†] OEHHA used Census block population data from 2010 to estimate a total of approximately 35.1 million people living in areas served by water systems.

** Population rounded to nearest thousand. The population figure shown indicates the number of people served by systems with that given affordability ratio; it does not represent the number of people facing that actual affordability ratio.*

Figure 35. Composite Affordability Ratio: Weighted by Prevalence of Households at Different Income Levels At or Below the MHI. Data for 2015, n=1,158 community water systems†.

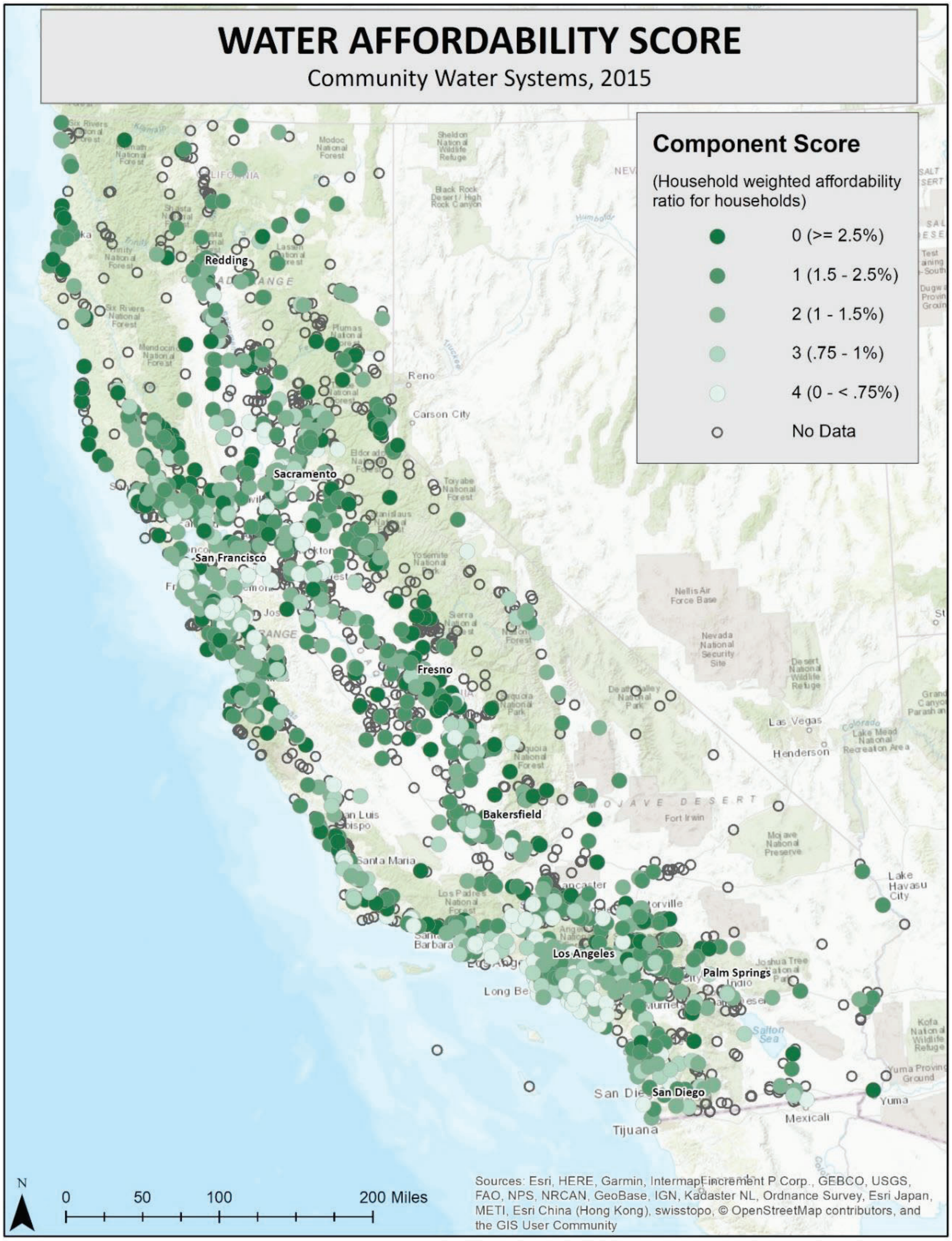


† The four dashed lines delimit the five bins used to score the affordability ratio.

Table 20 also shows the composite affordability scores, which ranged from 0 to 4, with lower scores representing systems with higher water bill burdens for households below the median income level. The mean score was 1.66 and the median was 1. Overall, approximately half of systems analyzed (n= 586 of 1,158) had scores of 0 to 1, corresponding to affordability ratios of greater than 1.5%. Approximately 10.6% of systems analyzed had a composite score of 4, indicating very affordable water.

The scores for the composite affordability ratios for the community water systems with adequate affordability data are marked on a map of California in Figure 36. The map highlights a cluster of systems along the North Coast with low affordability scores, as well as the Central Coast region, the southern San Joaquin Valley and the Imperial Valley/Inland Empire region. However, a number of exceptions are apparent. The next sections analyze the scores by system size, disadvantaged community status and region to further explore factors associated with affordability.

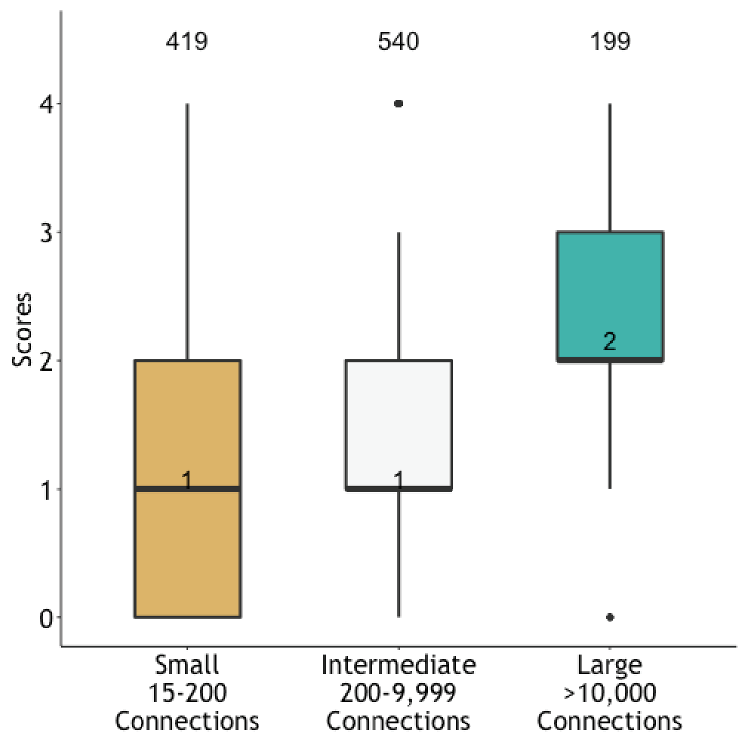
Figure 36. Composite Water Affordability Scores for Community Water Systems across the State. Lower scores mean less affordable water. Colored circles are for 1,158 systems with adequate data to score. Open circles outlined in black indicate systems without data.



Composite Affordability Scores by Water System Size and DAC Status

As shown in Figure 37, small and medium-sized systems face greater affordability challenges – as identified by their lower composite scores–compared to larger systems. In this figure, the horizontal bar on the box plots in the diagram represents the median composite affordability score, the lower end of the box represents the 25th percentile the upper end of the plot represents the 75th percentile, the "whiskers" show 1.5 times the interquartile range, and the top and bottom-most points represent the maximum and minimum scores, respectively. The figure shows the median composite affordability score is 1 for small systems (15-199 connections), 1 for medium systems (200-9,999 connections), and 2 for large systems (10,000+ connections).

Figure 37. Composite Affordability Score by System Size. The number of systems by size category are indicated above boxplot. Data for water bills (2015) and income (ACS 5-Year 2011-2015), n = 1,158 community water systems.

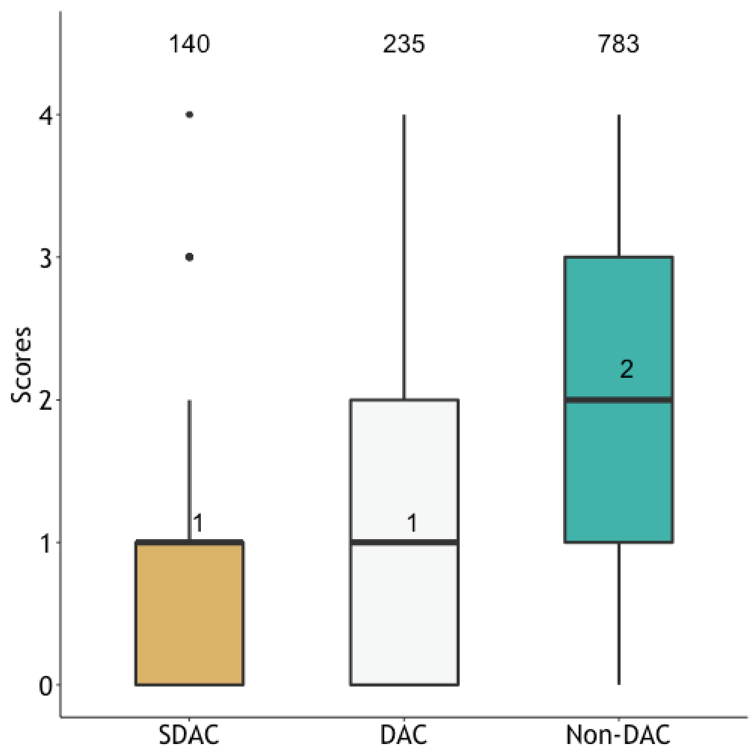


Thus 25% of small water systems included in the assessment have the lowest score (0), indicating substantial lack of affordability for the households served. The median score for large systems is 2, indicating that those households below the median household income that are served by large systems face some affordability challenges, but generally to a lesser extent than those served by the medium and small systems. There was a large and disproportionate lack of affordability data for small systems (see section on data gaps below). Consequently, the findings for small systems should be seen as provisional.

Affordability scores can also be compared across disadvantaged community status for the different water systems. A disadvantaged community (DAC) for the purpose of water system service is defined as a community with 80% of the statewide MHI and a severely disadvantaged community (SDAC) is defined as a community with less than 60% of the statewide MHI (Cal. Wat. Code §79505.5 and §13476). Statewide MHI in the American Community Survey (2011-2015) was $61,818; hence the calculated threshold is $49,454 for DACs and $37, 091 for SDACs.

Figure 38 shows affordability scores as a function of DAC and SDAC status of the water systems. The median score in both SDACs and DACs was 1, compared to a score of 2 in non-DAC/SDAC water systems. The upper end of the box indicates the 75th percentile, and the lower end of the box indicates the 25th percentile. Thus 25% of water systems for both SDAC and DAC have the lowest score, indicating a potential affordability challenge for the households served.

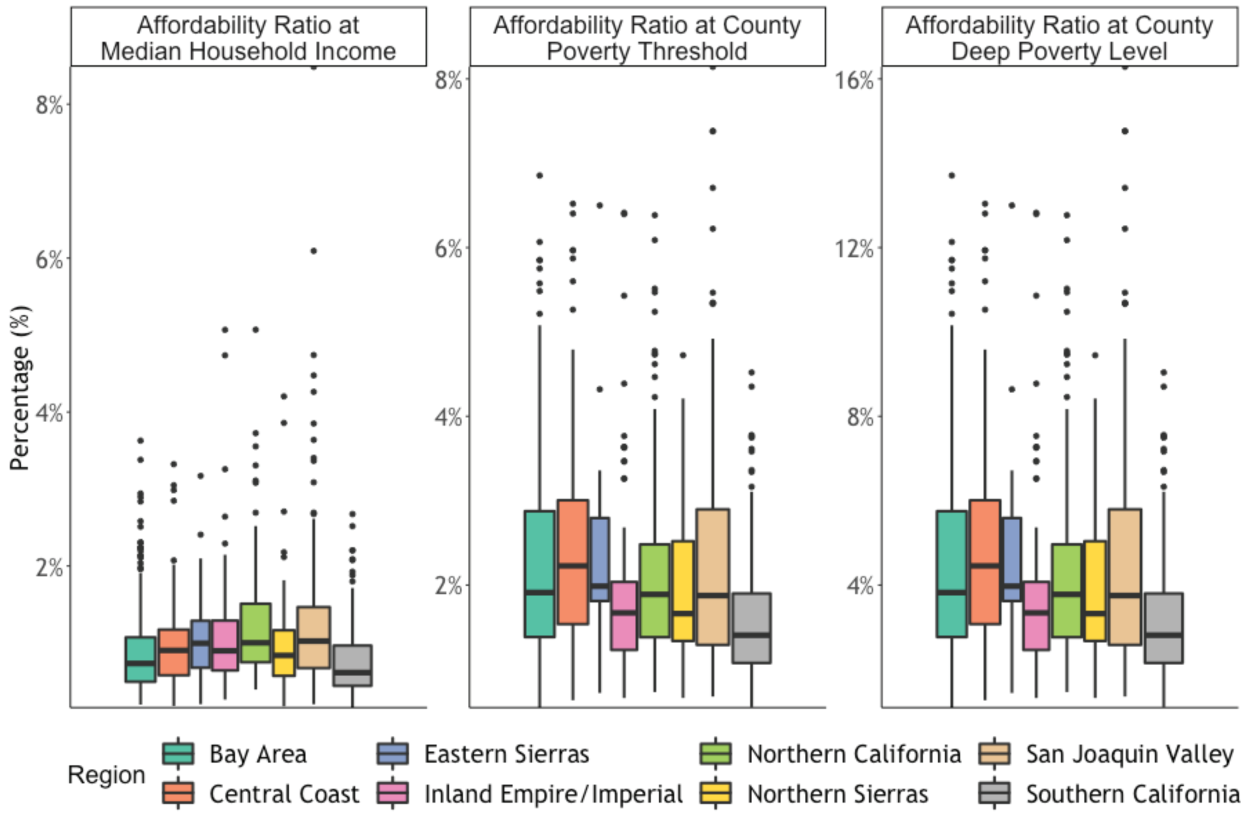
Figure 38. Affordability Component Score by DAC Status. System counts indicated above boxplots. Data for water bills (2015) and income (ACS 5-Year 2011-2015), n = 1,158 community water systems.



Affordability Ratios by Region

Where Figure 36 above maps the composite affordability scores on a statewide scale, Figure 39 shows the affordability ratios by region of the state for the three different income levels – MHI, county poverty threshold and deep poverty. In these box plots, the median affordability ratio is represented by the horizontal line in each of the box plots (See Figure 25 for a map of regions). The figure shows that, regardless of region, affordability challenges are faced by at least some systems at each of the three income levels. It also shows that, overall, at the median income level, water is fairly affordable for half the systems in the assessment regardless of region. Households earning county poverty and deep poverty level incomes face substantially higher affordability challenges relative to those earning the median income in the same system in every region.

Figure 39. Affordability Ratios for Three Income Levels by Region. Note that y-axes differ in scale across boxplots. Data for water bills (eAR 2015) and income (ACS 5-Year 2011-2015 and PPIC 2015), n = 1,158 community water systems.



The number of systems represented: Bay Area (n=155); Central Coast (n=161); Eastern Sierra (n=58); Inland Empire/Imperial (n=117); Northern California (n=153); Northern Sierra (81); San Joaquin Valley (n=183); Southern California (n=250).

But again, there are challenges for all regions even at median income level. Not shown in the figure, the Northern California, San Joaquin Valley, Eastern Sierras, and Inland Empire/Imperial regions have the highest household-weighted affordability ratios for households earning below the median income level, at levels of 2.1%, 2.1%, 1.9% and 1.9%, respectively. Accordingly, these regions have the lowest composite water affordability scores, indicating that these regions have relatively less affordable water overall. Of course, data for all Community Water Systems would be required to gain a complete view of region wide trends.

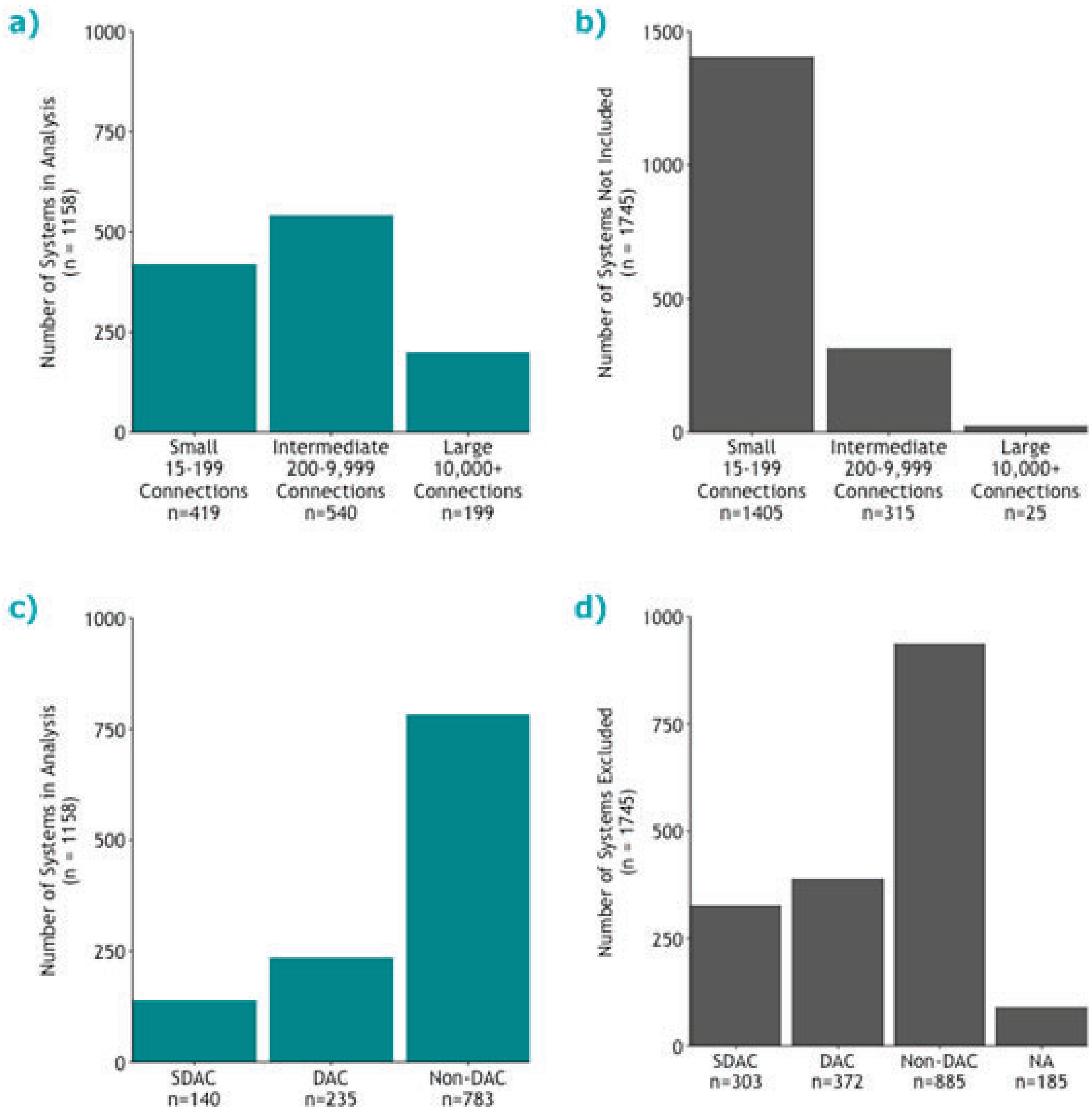
Affordability Data Gaps: A Key Consideration

Of the 2,903 community water systems in OEHHA's list, only 1,561 water systems reported water bill data in the electronic annual report. Therefore, as a starting point, only 53% of community water systems had water bill data with which OEHHA could estimate affordability ratios. Of the 1,561 water systems with water bill data, 1,530 systems also had US Census income data available. Of these 1,530 systems, OEHHA excluded 372 systems due to several exclusion criteria discussed in Appendix B3 Data Cleaning & Exclusions and B4 Composite Affordability and Box 6. Thus, the final list of systems in the affordability analysis included 1,158 systems or 40% of community water systems, compared to 100% and 91% for the Water Quality and Water Accessibility Components, respectively. These 40% of systems serve approximately 90% of the California population.

Missing data is a critical challenge that leaves us with gaps in our understanding, and can also bias our interpretation of results (See Box 6: What About Systems That Were Not Included?). Small systems make up about 63% of community water systems in California. However, just 36% of systems that were included in the affordability assessment are small (i.e., less than 200 connections). Intermediate and large systems make up approximately 34% of the community water systems in California. However, approximately 56% of systems included in the affordability assessment are intermediate or large. As such, these systems are overrepresented compared to small systems. In sum, this indicates a bias by system size in the missing data. The proportion of SDAC, DAC, and Non-DAC systems in OEHHA's analysis is relatively similar to the overall distribution among all California community water systems, however SDAC systems are somewhat underrepresented in the current analysis, relative to DAC and Non-DAC systems, and a large number of non-DAC systems have missing data (See Figure 40).

It is important to note that as more system-level affordability data becomes available and methods improve to increase data reliability, the aforementioned affordability findings across water systems would change. Some changes in overall results would be due to having new data availability–e.g. the inclusion of more small water systems. However, results may also change within systems, if water system practices change over time. All things constant, based on the initial findings shown in Figure 37 and Figure 38, OEHHA expects the affordability ratios to indicate more systems with affordability challenges if: 1) data from smaller, SDAC, DAC and non-DAC water systems become available, and 2) current trends of water rates increasing faster than inflation persist. The availability of rate assistance and new efforts to mitigate these challenges could improve affordability ratios, however. A variety of efforts may help address these data gaps, which will be explored in OEHHA's public workshops. Certainly, OEHHA will fold in additional data from the electronic Annual Report as it becomes available. Alternatively, survey or modeling efforts to fill in missing data could also be useful.

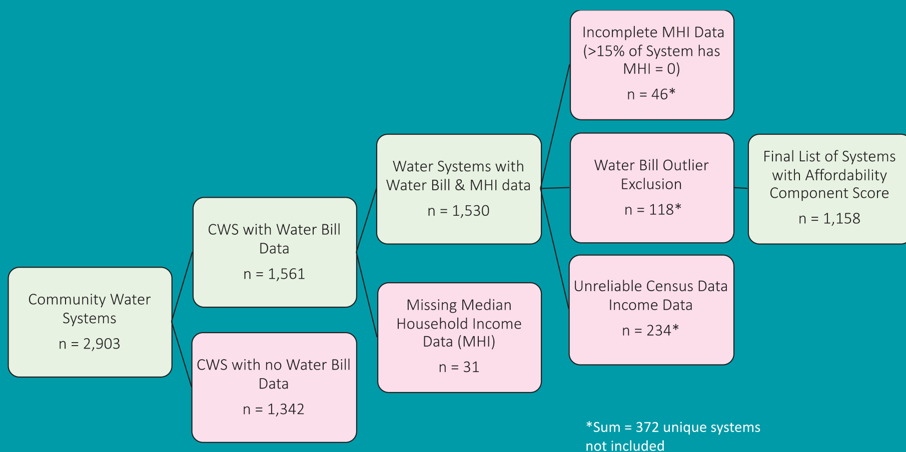
Figure 40. Comparison of System Size and DAC Status for Systems Included in Analysis Versus Systems Not Included in Analysis. Figures indicate systems included in the current analysis (dark green bars, Figures a and c) and systems not included in analysis (dark gray bars, b and d). Figures 39a and 39b indicate system size by connections. Figures 39c and 39d indicate disadvantaged community status for severely disadvantaged (SDAC), disadvantaged (DAC), and non-disadvantaged (Non-DAC) water systems. Data for water bills (2015) and income (ACS 5-Year 2011-2015).



Box 6: What about Systems that Were Not Included?

About 60% of water systems do not have adequate data to estimate affordability ratios. Some systems are not included in the analysis because they lack reported water cost data in the eAR, had potentially inaccurate water bills (outliers), or because they lack reliable census data for which to calculate income-level statistics. The flow chart below indicates why systems are not included in the affordability indicator analysis (See Appendix B3.2 for more details):

- 77% of the 1,745 systems not included in the affordability analysis had no water bill data reported in the eAR.
- 23% of the 1,745 systems not included in the affordability analysis had missing income data or were excluded due to unreliable income or water bill data for calculating affordability ratios.



Characteristics of systems with missing or excluded data:

- The systems with missing or excluded data serve approximately 8.9% of the state's population. This means that while a large fraction of systems are missing data, the 1,158 systems shown in OEHHA's results serve a large majority of Californians.
- Small systems account for 81% of the 1,745 systems not analyzed for affordability indicators.
- Severely disadvantaged community water systems are overrepresented relative to DAC and Non-DAC water systems in the list of systems not analyzed for affordability indicators. In particular, 26.5% of systems not included in the analysis are SDAC, whereas they make up 19% of systems in the full community water system list.

To truly know what we might expect if data for systems with missing data were filled in, data filling and/or modeling efforts are needed. However, from the above characteristics one might expect:

- OEHHA anticipates that data filling efforts will reveal *more systems with higher water bills* since current results indicate that smaller water systems have the highest water bills, on average, and a majority of systems with missing data are small.
- For systems with missing data that are both small and SDAC or DAC (an estimated 38% of missing systems for which we have adequate income data), we might expect the systems with missing data to have relatively *low* (i.e., more unaffordable) *composite affordability scores*.

Additional Research/Next Steps

OEHHA will explore several additional indicators for water affordability (See Table 22), and explore what counts for 'basic' water needs, depending on the number of people in the household. Additionally, integrating an analysis of socio-economic indicators, such as the percentage of households using low-income assistance programs to pay for utilities, has been suggested to support the identification of systems and households with a high-water affordability burden (Mack E.A. and Wrase S 2017; Teodoro M.P. 2018). Additional future areas to explore include: households relying on private wells or state small systems, and costs to households to maintain wells, test and treat their water, and manage well failures. Both data and new approaches are needed to incorporate the affordability challenges faced by people relying on these water sources.

Finally, the human right to water includes the right to affordable water for sanitation purposes. While this report assumes that the 6 HCF reported is used by households to cover basic hygiene, the water bills used do not explicitly consider wastewater and sanitation costs. As these data become available, OEHHA can incorporate these costs with water bills to comprehensively assess the affordability of water for domestic use and sanitation.

Summary and Key Findings for Affordability

In the present assessment, water affordability is assessed for households at the water system scale (US EPA 1998a). The resulting affordability ratios for each water system are a first-order approximation of the types of affordability challenges that individual households face at particular income levels at and below the MHI. To truly measure affordability at the household level, individual water bills and income levels would be required, but to understand trends and the scale of challenges, some level of aggregation to the water system level is needed. Measuring water affordability at the water system scale provides a useful basis for screening for challenges and tracking progress.

As a tracking tool, OEHHA's set of affordability indicators can be used in a several ways. The three affordability indicators reflect the affordability ratios for households at the median, poverty, and deep poverty income-level within a particular water system, and thus provide measures of affordability both for the general populations served by a system and those facing economic challenges. The AR_{MHI} corresponds to the water bill burden for the 50th percentile household within each water system–if AR_{MHI} is high, water bills are likely a substantial burden for half of the water system's households. This reflects a water-system level challenge wherein household water affordability may threaten the water system's financial capability. AR_{CPT} and AR_{DP} reflect a screen for water bill burden on vulnerable households. Low water bill burdens at these levels reflect affordable rates for households at or near poverty levels. Finally, the household-weighted composite ratio reflects affordability concerns for a water system that may be driven by high water bills and/or high percentages of households at low income levels. The composite ratio should thus be considered in light of its component parts – the three affordability indicators and two household poverty indexes representing the proportion of households at different income levels.

In sum, a number of observations can be observed:

Water Bills

- Water bills at the essential needs level of 600 cubic feet (6 HCF) - corresponding to 150 gallons per household per day range by a factor of ten (approximately $15 per month to $175 per month) across community water systems.
- Some of the highest bills reported are for small water systems, but there is variability in water bills across all system sizes.

Affordability Ratio for the Median Household Income Level

- Water is relatively affordable for a majority of households at the median household income level of community water systems.
- A majority of water systems with water bills greater than 1.5% of the system's median household income would be identified as economically disadvantaged according to the Water Board's criterion. *[Among the 1,158 water systems with affordability ratios, 15.8% (n=182) had water bills for 6 HCF exceeding 1.5% of the median household income. Of these, two-thirds (121 systems) are severely disadvantaged or disadvantaged systems.]*
- For approximately a fifth of water systems, affordability ratios for median household incomes are between 1-1.5%, indicating potential future challenges if water rates increase.
- Geographically, affordability ratios for households earning median household income levels in their water system are highest overall in Northern California and the San Joaquin Valley, although there is a substantial spread in affordability ratios within each region, with affordability challenges present for some systems in each region.

Affordability Ratio for County Poverty Threshold Income Level

- Water is relatively affordable for households earning disposable incomes at the county poverty level in a majority of water systems.
- Some households at the poverty level have substantial water bill burdens. For 16% of water systems, water bills at the essential use level amount to 3% or more of disposable income, a common threshold for low-income water affordability.
- Geographically, affordability ratios for households earning county poverty income levels are highest overall for water systems in the Central Coast (mean = 2.4%), San Francisco Bay Area (mean = 2.3%), San Joaquin Valley (mean = 2.25%), and Eastern Sierra (mean = 2.2%), although there is substantial spread with significant affordability challenges present for some systems in each region.

Affordability Ratio for Deep Poverty Threshold Income Level

- Water is relatively unaffordable for households earning disposable incomes at the deep poverty level in for the majority of water systems.
    - For 62% of water systems, water bills at the essential use level amount to greater than 3% of disposable income at the deep poverty level. Geographically, affordability ratios for households earning deep poverty income levels are highest overall in the Central Coast (mean = 4.8%), San Joaquin Valley (mean = 4.5%), San Francisco Bay Area (mean = 4.6%), and Eastern Sierra (mean = 4.5%).

Overall

- There is a large disparity in water affordability between households earning the county poverty income level and those earning median household income levels.
- The composite affordability score shows slightly different geographic patterns of unaffordability compared to individual indicators. There is a substantial overall spread in the composite affordability ratios within each region, with significant affordability challenges present for some systems in each region.
- Data gaps in affordability will need to be continually addressed. The systems with missing or excluded data serve approximately 8.9% of the state's population. A majority of systems missing data are small systems.

A Holistic View of Water Systems: Applications and Cases

Applications

Once the tool is populated with data, it can help shed light on the quality, accessibility and affordability of drinking water in California. The tool's results can then be used in four main ways, at the water system or statewide level:

- To assess indicator scores.
- To assess scores for a particular component (e.g., composite water quality score).
- To compare measures of water quality, accessibility, and affordability at the system level.
- To track and update progress in achieving the overall human right to water.

The tool offers a holistic view of California's drinking water and the challenges associated with it that many California communities are facing. It can be useful to regulators, policy-makers, water system operators, and members of the public, who may approach solutions to water issues in different ways and with different concerns, making our state more collectively equipped to understand and face its water challenges.

For example, regulators or water system operators may have information on the status of compliance for a particular water system. The tool can augment this understanding in several ways. First, the tool provides additional water quality information, such as exposure metrics. This can help decision-makers consider potential exposure threats *alongside* compliance challenges. Similarly, system operators and water planners can utilize previously unquantified metrics, such as those that measure affordability challenges, to weigh the needs and stresses of individual communities in their decision-making. Additionally, by viewing information across the three principal components, those who oversee water systems can consider disparate but interrelated characteristics of water delivery and water service that are not usually considered together.

As for members of the public, including community groups and community members already deeply engaged in water issues, this tool can provide a useful, consolidated source of information across issues, regions, and time periods. For community members who may currently lack access to technical information, this tool offers a useful way to access, decipher and visualize the information they need to have a productive dialogue with water systems and regulators.

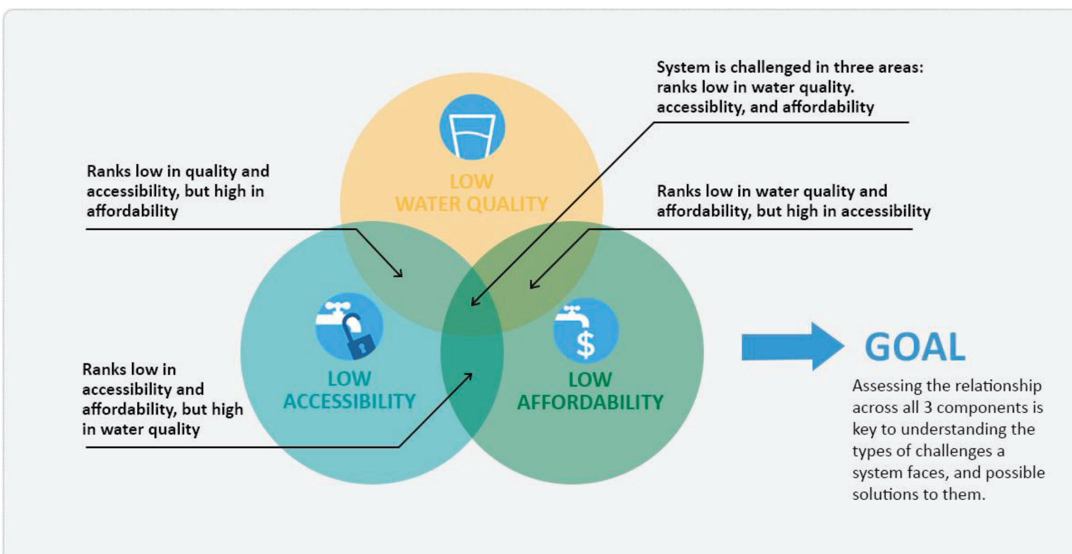
Finally, this tool allows for regional and statewide assessments of key trends across components. Previous initiatives have documented particular water challenges across the state, as well as a wide variety of challenges in particular regions. This tool, however, brings together information on water quality, accessibility and affordability, allowing the state and its residents to gain a holistic understanding of big-picture trends. In doing so, the tool may help Californians achieve the human right to water in a more consistent, equitable way.

The data tool's usefulness is best illustrated by Figure 41. The three components are shown in circles and are described as types of challenges: low water quality, low accessibility, and/or low affordability. Water systems may face one or more—or even all three—of these challenges, and these challenges may overlap with and even reinforce each other. In other cases, water systems may have no challenges in any of the three components, which is also critical information to capture.

Using this tool, a decision-maker or member of the public may ask: Which systems show particular types of water quality challenges, or which systems face affordability challenges? They can also ask: Which systems face *both* affordability challenges *and* water quality challenges; or which systems enjoy good water quality, but face threats to accessibility?

This section provides examples of the types of information the data tool could help generate, and shows how multiple, overlapping challenges can be identified. Assessing and understanding these combined challenges is critical for devising relevant, sustainable and equitable solutions to the provision of water statewide.

Figure 41. Diagram of the Three Components in the Human Right to Water Assessment and Data Tool, and the Combinations of Challenges a Water System May Face.



Hypothetical Case Studies

Water systems in the state operate under diverse sets of conditions, and face a range of water challenges. This section presents three hypothetical cases to show how the tool could function to understand these conditions. Ultimately, as these cases highlight, the data tool enables an assessment of crosscutting issues, at multiple levels (e.g., at the indicator, subcomponent or component level).[43]

Hypothetical System A: Here, this system faces challenges in all three components. Water quality, accessibility and affordability are all low.

This hypothetical small water system is located in a rural agricultural region, has fewer than 200 service connections, and serves 500 people. The median household income is $40,000. The system has one groundwater well and no backup sources. On average, water bills for 6 Hundred Cubic Feet (HCF) in this community are $65 per month, or $780 per year.

From 2008 to 2016, the system faced a number of **water quality** challenges. Exposure levels were high and the system faced a number of compliance hurdles. In particular, during the nine-year time period, the system had average concentration levels of nitrate between 45 and 65 milligrams per liter (mg/L) in eight of the nine years. As the MCL for nitrate is 45 mg/L, this information indicates that potential exposure was high (i.e., concentration levels exceeded the MCL), and the duration of high potential exposure was long. During this time period, the system also received at least one nitrate MCL violation in eight of the nine years, and at least one acute TCR MCL violation in eight of the nine years. Thus, the duration of the non-compliance period was also long. All data requirements were met.

Regarding **accessibility**, with only one groundwater well, the system is considered to be physically vulnerable to water outages. As a small system serving a predominantly economically disadvantaged community, it is estimated to have relatively high institutional constraints (i.e., low score). It had ten monitoring and reporting violations, indicating potential managerial constraints.

With regard to **affordability**, residents served by the system also face a number of challenges. A household earning the median income level would be spending two percent of its income on water. This is nearly double what research has determined is the average spent on water in industrialized countries (Smets 2017) and 0.5 percent higher than the threshold used to guide financial assistance to DACs in the State Drinking Water Revolving Fund. Households living at the county poverty level of $24,151 would pay 3.2 percent of their income ($780/$24,151) on water. Those living in deep poverty ($12,075) would spend nearly 6.5% of their income on water. Because 20 percent of this water system's population lives at or below the county poverty threshold, a significant portion of economically vulnerable residents living in the community are particularly vulnerable to affordability challenges. Figure 42 depicts results for

[43] In this report, we focus on the overall component outcome, rather than subcomponent outcomes.

each of the indicators. Table 21 further serves to summarize the key information the tool can provide.

As described above, the results for nearly all indicators provided in the tool signal that this system faces serious challenges. However, how is one to use this information? To begin, the decision-maker may be interested in comparing this system to others to determine whether this is a system with relatively large or average challenges. Doing so could assist the decision-maker in determining what types of solutions might benefit the community served by the water system, whether to consolidate with a nearby larger system, assign an administrator, or allocate resources (e.g., training and capacity building, technical decision-making support, or financial support), and what types of resources might be best suited to address the community's needs.

Second, the benefit of viewing information specific to each component, and across components, is that when the decision-maker devises solutions to these challenges, she or he may need to carefully assess trade-offs. For example, it could prove critical to address the fact that System A has had on-going water quality problems for an acute contaminant such as nitrate. The community served by the system may need to consider developing a new well, an intertie with a nearby system, or a treatment facility. However, such solutions could potentially increase the cost of delivering water. Since affordability is already a challenge for households served by this system, a sustainable and equitable solution would need to address the challenges described in all three component areas, including affordability.

Figure 42. Chart Summarizing Case Study Results. The rows show the results for each of the three hypothetical water systems. The columns represent the 13 indicators in the three components. The color of each box indicates the level of concern regarding a specific indicator. Dark blue boxes represent greater concern. Medium-blue boxes indicate a more moderate level of concern, light blue boxes indicate little concern, and white boxes indicate no concern.

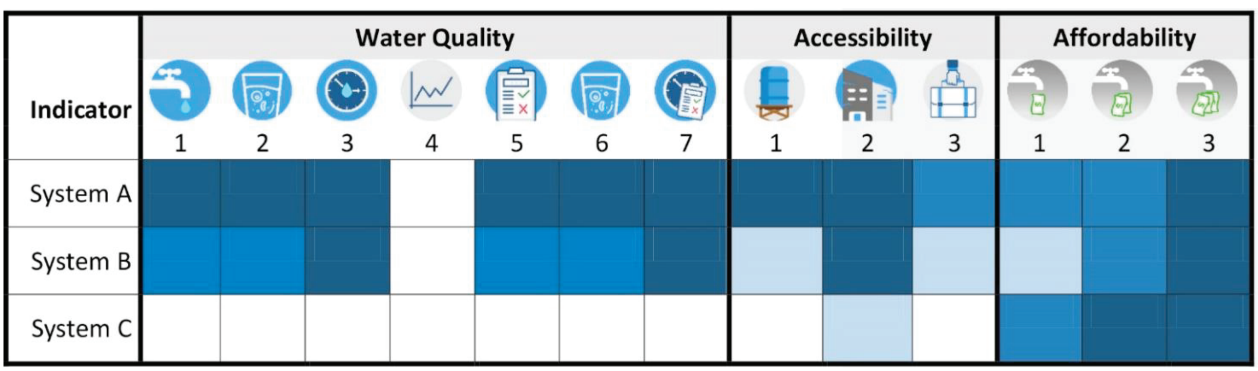


Table 21. Summary Table for Hypothetical System A. Water challenges in all three areas. This chart provides an example of how information can be translated into a clearly legible diagram, accessible to all kinds of stakeholders.

Component	Indicator	Description of outcome
Water Quality	**Potential high exposure**	Eight years of potentially high exposure levels of nitrate, averaging between 45-65 mg/L.
	Presence of acute contaminants	Yes: nitrate and total coliform.
	Maximum duration of potential high exposure	Eight years of high nitrate levels.
	Data availability	The system has monitoring data for all contaminants.
	Non-compliance with primary drinking water standards	During the nine-year study period, the system had one or more MCL violations in eight of the nine years.
	Presence of acute contaminants in non-compliance	Yes: nitrate and total coliform.
	Maximum duration of non-compliance	Eight years of nitrate MCL violations.
Water Accessibility	**Physical vulnerability to water outages**	One groundwater well.
	Institutional constraints	Small, disadvantaged community.
	Managerial constraints	The system had no monitoring and reporting violations.
Water Affordability	**Affordability ratio at the median household income**	2%
	Affordability ratio at the county poverty threshold	3.2%. Here, 20% of the population lives at or below the county poverty income level.
	Affordability ratio at the deep poverty threshold	6.5%

Hypothetical System B: Here, a system faces some challenges in water quality and accessibility, but the key challenge lies in affordability.

This mid-sized hypothetical system, serving roughly 3,300 residents, is located in a rural, non-agricultural region of the state. The system has four groundwater sources and two surface water intakes. Median household income is $39,000. Average water bills for 6 HCF of water are $55 per month, or $660 per year. From 2008 to 2016, the water system received notification of on-going total coliform violations, with TCR MCL violations in six of the nine years. All data requirements were met.

With regard to ***accessibility***, the indicators do not signal major accessibility challenges, other than those challenges stemming from the system's potential institutional constraints.

However, with regard to ***affordability***, the residents who are served by the system face key challenges. The county poverty level is $25,361. Nearly 30 percent of the residents served by this water system live at or below this level. Nearly 5 percent of residents live at or below the deep poverty level of $12,680. Thus, while the affordability ratio for households at the median income level is 1.7 percent ($660/$39,000), the affordability ratio for households living at or below the county poverty level is significantly higher (2.6 percent), and is even higher for those living in deep poverty level (5.2 percent).

These affordability results highlight the usefulness of having multiple affordability indicators. In this case, while the affordability ratio at the median household income may not signal a major concern, the presence of a large proportion of residents who live at or below the poverty level indicates that there are pressing affordability challenges that might otherwise be missed.

As with System A, Figure 42 highlights the indicators that show key challenges in this system. A decision-maker assessing System B would likely want to address the ongoing TCR violations. However, the most urgent area of focus may be affordability challenges. At least 50 percent of households spend 1.7 percent or more of their income on water bills. Thirty percent or more of households face more acute affordability challenges, making them some of the most economically vulnerable residents served by the system.

Hypothetical System C: Here, a system has relatively high water quality and accessibility, but relatively low affordability.

The third hypothetical system, System C, is located in an urban county and serves nearly 30,000 people. The median household income in this community is $42,100. The system has more than ten groundwater wells and one surface water intake. The average water bill for 6 HCF is $85 per month, or $1020 per year. The system had no monitoring and reporting violations.

This system has had no **water quality** challenges in the time period, and has relatively strong **accessibility**, based on the current indicators. The main challenge for this system is with regard to **affordability**.

At least 50 percent of the households served by this water system are paying approximately 2.4 percent of their income on water. Ten percent of the community's households earn income levels at or below the county poverty income level of $33,493. Thus, these households pay 3 percent of their income on water. While less than 0.5 percent of households in the community earn incomes at or below the deep poverty level of $16,746, these households pay 6.1 percent of their income on water.

These three affordability indicators highlight different affordability challenges. The affordability ratio for the median household income shows that the majority of the system's households (i.e. 50%) face considerable affordability challenges, given the typical affordability thresholds used. At least ten percent of the households served by the water system are economically vulnerable and face special hardship in paying their water bills. While only a small fraction of households pay 6.1 percent or more of their income for water, these are the most vulnerable households, whose cases need to be considered by planners and decision-makers.

Strategies to address the affordability challenges of this system should be explored with care. The fact that water quality and accessibility are high could be a function of the fact that water bills adequately cover the technical, managerial, and financial needs of the system. A simple decrease in rates could potentially compromise the system's high water quality. Thus, the decision maker focused on alleviating affordability burdens for economically vulnerable residents would need to consider how best to do so without compromising the high water quality. The tool helps highlight the need to balance decisions that impact one component, with potential consequences affecting other components.

Cross-Component Assessments

The ability to assess how systems are doing across all three components is an important asset of the tool. Figure 42 represents one manner in which decision-makers or users of the tool could take a holistic view, and look across three components. However, users of the tool may wish to ask more specific questions, such as:

- Which systems have low composite component scores in all three components?
- How do trends in composite component scores change over time?

The United Nation's Joint Monitoring Program (JMP) uses qualitative service levels to define and compare the adequacy of drinking water services (as well as hygiene and sanitation) across countries. For example, the JMP defines its highest level of water adequacy as "Safely Managed", meaning water that is located on the premises, available when needed, and free from fecal and priority chemical contamination.[44] Among other things, its annual report on the state of drinking water across the globe then summarizes the extent to which populations across the globe have Safely Managed drinking water. In a California-oriented version, the Pacific Institute (Feinstein L 2018) proposes a similar approach in which the highest level of

[44] Affordability metrics are still being established.

water service is defined as Satisfactory and includes a series of qualitative benchmarks to define it.

This human right to water assessment and data tool do not currently define thresholds for each component that determine whether a score is "acceptable" or not. Instead, users may utilize their own thresholds to explore outcomes. For example, a user may wish to highlight all systems with composite component scores below 1. Alternatively, users may not be interested in particular thresholds and may wish to analyze trends over time. For example, users may wish to track how individual systems' composite component scores for water quality, accessibility and affordability improve from the first rendition of this tool to subsequent years in which the tool is updated.

The tool, with these various uses provides a means against which to measure progressive realization of the human right to water.

Summary

In summary, the cases described above show how the tool's results can be used by state and local agencies, water system operators and members of the public to understand the challenges that individual water systems may face, and help them move toward identifying technical solutions. These system-level results can also be used to provide state-level understanding of general progress in achieving the human right to water across water systems. For example, when users view the results in combination, they can assess overall trends across water systems in each of the three components. As updated versions of the tool are released and these results are assessed over time, users could gain a holistic picture of evolving patterns in any one component, or across all three.

In sum, this assessment and tool enable users to:

- Evaluate California's progress toward ensuring accessible, safe, and affordable drinking water in community water systems.
- Identify which indicators and components pose significant challenges for a given water system.
- Access information that that can help lead to potential solutions to challenges or combinations of challenges in a particular system.
- Identify particular types of support and assistance for communities based on needed improvements to the water systems.
- Quantify overall trends across the state and/or regions to gain a picture of the overall level of challenge in one or more components. In particular, this report provides a baseline set of results, which can then be used to assess how trends change over time.

Public workshops and discussions can help guide consideration as to how to holistically assess systems *across* all three components.

Conclusions and Next Steps

OEHHA and the Water Board envision a role for this assessment and data tool in providing a baseline of information that can inform efforts to ensure that all households receive clean, safe, accessible and affordable water. The data tool and assessment can be used to focus the state's attention on water systems facing the greatest challenges over time. Coupled with the Water Board's existing information, OEHHA's tool offers a flexible, versatile, and adaptable way for the Board to view and evaluate progress towards achieving the human right to water in California.

In the near term, this tool and assessment may also be instructive to the Water Board as it implements SB 200. As an urgency measure signed by Governor Newsom in July 2019, SB 200 immediately established the Safe and Affordable Drinking Water Fund in the State Treasury, with funds to be prioritized and administered by the Board. Other state and local agencies, drinking water service providers, and technical assistance program administrators may also find the assessment and data tool useful in prioritizing solutions to unique water system challenges, and in evaluating the effectiveness of proposed solutions to address those challenges.

Ultimately, the strength of this tool lies in its holistic and versatile approach. The tool can provide the user with an overall sense of water quality, accessibility and affordability on a state or regional level, while also demonstrating how individual water systems perform in those areas. This can prompt decision-makers to ask new and probing questions about California communities and the water that sustains them. Which systems face water quality and affordability challenges? Which systems have low water quality, but perform well in other ways? What accounts for this unevenness, and how are water systems addressing it? How do these systems fare over time, and why? The ability to ask these questions facilitates the development of better-tailored approaches to delivering clean, safe, affordable and accessible water to communities across the state.

OEHHA will take several next steps in developing and refining this tool. In addition to soliciting feedback on this draft report and its associated web platform through public and scientific workshops, OEHHA intends to expand the scope of the assessment and refine the data tool to offer the most comprehensive view of drinking water possible.

Future Considerations

This first assessment and data tool focus on households served by community water systems. With time and further data acquisition efforts, additional areas that this framework seeks to incorporate include:

- **Sanitation:** Sanitation is an integral part of the human right to water. Incorporating sanitation into the assessment and data tool will require an assessment of what statewide datasets exist to adequately characterize the adequacy and affordability of sanitation for both centralized and decentralized systems. Incorporating sanitation will also require assessing how to obtain wastewater costs in order to address the full picture of water costs and related affordability.
- **State Small Water Systems:** These are water systems with 5 to 14 service connections that do not serve more than an average of 25 people for more than 60 days of the year. An assessment of state small water systems will require significant data acquisition, including but not limited to: identifying and compiling the geographic boundaries of these water systems, and developing appropriate methods for how to estimate water quality, accessibility and affordability in these systems. In particular, because water-quality requirements for state smalls are less stringent than for community water systems, this will require an assessment of how to best characterize water quality in these systems, given inherent data limitations.
- **Households reliant on domestic wells:** An estimated 1.5 to 2.5 million Californians rely on domestic wells (Johnson T.D. and Belitz K 2014; USGS 2014). While several efforts are currently underway to approximate the location of domestic-well households and measure their water quality, research is still needed to identify accessibility and affordability concerns for these households. This presents a particular challenge since there are currently no statewide testing or reporting requirements.
- **Schools and daycare centers:** While a majority of schools are served by community water systems, some schools have their own water supply and are designated “non-transient non-community water systems”. It will be important to estimate water challenges in both types of settings, but especially for those with their own water supply.
- **Transient and homeless populations:** People lacking housing are particularly vulnerable to not having clean and accessible drinking water. Assessing the human right to water among this group will require particular data and methodological questions pertaining to how to accurately assess the location and number of people in this group, and the type of drinking water and sanitation services used.

- **Tribal Water Systems:** The right of indigenous peoples to retain the integrity of water resources on their territory is generally protected under international, federal, and state law.[45] The UN Declaration of the Rights of Indigenous Peoples, for example, requires states to "consult and cooperate in good faith with the indigenous peoples concerned" in matters of water and land rights.[46] In California, several tribes hold senior water rights, and others manage their own water systems. In 2017, the State Water Board adopted several beneficial use designations, conferring additional protections for water resources used for tribal traditional cultural, ceremonial, and subsistence purposes. While these other policies are in place to protect access to clean and safe water for California's Native American Tribes, indigenous rights to water can be vulnerable – particularly during periods of drought. OEHHA and the Board recognize the importance of ensuring that the human right to water for indigenous peoples is prioritized, and is currently working to include more comprehensive data to capture water systems located on tribal lands, or otherwise serving tribes in the state, and anticipates updating future versions of the tool with this data.

A partial list of potential indicators or units of analysis for future versions of the tool is included in Table 22 below.

Table 22. Potential Indicators or Units of Analysis for Future Versions of the Tool and Assessment.

Component or Units of Analysis	Potential Indicator
Water Quality (Safe/Clean)	• Average potential contaminant exposure to secondary contaminants • Violations of Maximum Contaminant Levels (MCLs) for secondary contaminants
Water Accessibility	• Vulnerability to climate change and/or drought • Drought impacted systems • Applied for emergency interim solutions/drought funding • Supply shortages reported • Availability of alternative sources of water (e.g., proximity to vended water) • Service interruptions • Moratorium on service connections • Degree of reliance on purchased water sources

[45] For example, the UN Committee on Economic, Social, and Cultural Rights (2002), General Comment 15, protects water resources on ancestral lands "from encroachment and unlawful pollution."(See, The Right to Water, UN Doc E/C.12/2002/11. Paragraph 16 (d).)

[46] UN General Assembly. United Nations Declaration on the Rights of Indigenous Peoples (2007). UNGA Resolution 61/295. A/61/L.67 and Add.1. September 13, 2007.

Component or Units of Analysis	Potential Indicator
	• Amount of water available to customers • Average/median water use of water utility per customer • Total source capacity of system/population • Measures of infrastructure quality (e.g., age of water system infrastructure, main breaks, etc.).
Water Affordability	• Water affordability for different volumes of water • Water affordability ratios disaggregated by demographic characteristics of water systems: ○ By socio-economic variables in American Community Survey such as percent unemployed, percent public assistance income, percent disabled, percent food stamps, etc. • Water affordability including replacement costs (for bottled water) • Water affordability including sanitation costs • Number of delinquent or uncollectible bills • Amount of bills in arrears • Number of water shut offs • Percent of water systems providing subsidies • Percent of eligible customers receiving rate assistance
Additional Sub-Groups, Units of Analysis or Topics to Consider	• Private domestic wells • State small water systems • Schools • Day care centers • Sanitation • Persons experiencing homelessness • Private well owners • Tribal water systems

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Appendix A

A1 Affordability in Context

A1.1 Affordability in the International Context

In the international context, issues of affordability fall under the broader topic of "accessibility" within General Comment 15 (GC15). GC15 requires that "direct and indirect costs and charges associated with securing water must be affordable" to all (UN CESCR 2002). GC15 also emphasizes the role of equity in understanding affordability (UN CESCR 2002), and includes the "right to be free from interference [of access], such as the right to be free from arbitrary disconnections," (UN CESCR 2002)'. [47] Accordingly, the AAAQ Framework articulates two dimensions of economic accessibility: "that water and water facilities must be affordable to all and that the total costs (direct + indirect costs) associated with water must not threaten the realization of other rights or basic needs" (Villumsen M. and Jensen M. H. 2014).

A1.2 Affordability in the US Context

In the U.S. context, the Environmental Protection Agency (US EPA) defines affordability as "both a function of the price of water and the ability of households (and other water users) to pay for water" (US EPA 1998a). In particular, the US EPA recommends that states include affordability considerations when providing loans and assistance to water systems seeking to comply with the Clean Water Act and Safe Drinking Water Act (SDWA). US EPA developed affordability guidelines and criteria over several decades (US EPA 1984, 1998a). US EPA's 1998 guidelines for states advise water systems to evaluate drinking water affordability with a two-stage approach similar to that outlined for wastewater in 1997 (US EPA 1997). [48] This approach calls for:

[47] This provision was reiterated in the U.S. context when former UN Special Rapporteur on the Human Right to Water, Catarina de Albuquerque responded to large scale water shut offs in Detroit, MI in 2014: "Disconnection of water services because of failure to pay due to lack of means constitutes a violation of the human right to water and other international human rights." Office of the UN High Commissioner for Human Rights, Joint Press Statement by Special Rapporteur on adequate housing as a component of the right to an adequate standard of living and to right to non-discrimination in this context, and Special Rapporteur on the human right to safe drinking water and sanitation, Visit to city of Detroit (United States of America 18-20 October 2014) (October 20, 2014), available at http://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=15188.

[48] These guidelines present a two-step process focused on household and system-level financial impacts of permittees (e.g., any entity that is granted a National Pollutant Discharge Elimination System (NPDES) permit) coming into compliance with the Clean Water Act. Their "Residential Indicator" is similar to the conventional affordability ratio (water cost/household income) and measures the financial impact of current and future utility cost requirements on residential customers to establish the degree of financial impact posed by rates.

1) Measuring domestic water affordability ratios (water bill divided by median household income)(US EPA 1998a)[49] and
2) Determining what type of variances[50] or financial support a system may need based on a system's financial capacity.

Implicit in these guidelines is the notion that affordability comprises both the ability of a water system and its customers (the community) to support the cost of compliance with the SDWA (US EPA 1998a).

Two essential points emerge from EPA guidelines. Firstly, household affordability is a unique topic, to be represented at the *household level*, though it is most often measured at the *system-level*, for the median household. Secondly, affordability is a component of a water system's financial capacity. In both cases, a system-level metric of affordability (i.e., average water costs relative to median household income) is used to characterize household affordability burdens and screen for system level financial capacity.

In California, water affordability is a pressing issue leading to its inclusion in California's human right to water bill (Assembly Bill No. 685. 2012. Eng, Chapter 524). In 2015, the State Water Board found that water costs had increased by 42 to 47 percent in the last two decades, and that small water systems (i.e., fewer than 200 service connections) pay approximately 20 percent more for water than larger systems (State Water Resources Control Board 2015).

A2 Approaches to Measuring Affordability

A2.1 Conventional Affordability Ratio

Generally, there are two main approaches to measure water affordability (Hancock K. E. 1993).[51] First, and most conventionally, affordability is measured as an affordability ratio as in EPA guidelines –EPA refers to this as the Residential Indicator, and academically it is frequently known as the Conventional Affordability Ratio (CAR).

Most often, this is assessed as what fraction of a median household income is needed to cover direct and indirect costs of obtaining water services (including for drinking, hygiene and sanitation) (UN CESCR 2002).[52] If the resultant ratio exceeds a designated threshold (See Appendix Table A1), households in the area of analysis are considered to face unaffordable water costs. Importantly, these thresholds reflect policy choices about the appropriate or

[49] US EPA also proposes several alternate approaches to calculating this indicator: 1) including wastewater charges in addition to drinking water charges; 2) using the average household income rather than the median; and 2) adjusting income for poverty effects. (US EPA 1998a)
[50] Variances allow water systems to use treatment technologies that remove the maximum amount of a specific contaminant with affordable technologies in cases where such technologies are protective of public health but do not meet drinking water standards. See (US EPA).
[51] It should be noted that affordability approaches to drinking water reflect those of housing affordability, which economists have been analyzing for decades. For a summary of ratio and residual income approaches, see article.
[52] Direct costs usually refer to the price per unit of water, whereas indirect costs may be related to lifeline rates, connection surcharges etc.

socially accepted ratio of what counts as affordable and have previously been implemented at the state level.[53]

A2.2 Affordability Thresholds

A range of thresholds exist to evaluate affordability ratios. In general, these thresholds range from 1.5% - 5% and vary as to whether they include both drinking water and sanitation (Appendix Table A1) as well as what type of income is used in the denominator (gross income or income less taxes and other expenses). In the U.S., two common water system-scale thresholds are used to assess water system-level affordability of water costs as a proportion of median household income: 2% and 2.5%. The 2% threshold was initially used to measure drinking water affordability nationally at the household level to understand if a water system was eligible for variance from regulations in the 1986 Safe Drinking Water Act (US EPA 1998a). Subsequent state-level affordability assessments related to water system eligibility status for disadvantaged assistance have used a range of affordability ratios and additional criteria.[54] The threshold of 2.5% for drinking water was developed as a metric to assess affordability relative to the cost of compliance with the SDWA at a national level (US EPA 2002).[55] This threshold of 2.5% is also commonly cited as the affordability threshold for the cost of drinking water provision at the household level. The origin of the 2.5% threshold derived from an assessment of what median-level households pay for other basic expenses (based on Consumer Expenditure Surveys), the average costs of avoidance-behavior (like consuming bottled water), and a motivation to minimize water system variances to the Clean Water Act (US EPA 1998b). In California, the California Department of Public Health (CDPH), which previously oversaw provision of drinking water in the state, set an affordability threshold of 1.5% for disadvantaged communities as part of its Safe Drinking Water State Revolving Fund (SDWSRF) program, which primarily targets small water system technical, managerial, and financial (TMF) capacity and assisted disadvantaged communities (California Department of Public Health 2009).[56] This lower threshold is on par with thresholds in other SDWSRFs around the country, where ranges of affordability thresholds vary, e.g., between 1.25% and 1.5% (US EPA 2000).

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[53] For example, for California. See (US EPA 2000).

[54] Thresholds implemented at the state level to determine affordability criteria range from 1% to 5% among case studies reported in two US EPA studies: (US EPA 1998a) and (US EPA 2000). In these, affordability thresholds are sometimes combined with other criteria to determine affordability such as: socioeconomic conditions of a system and comparison of pre and post-SDWA costs on median household income.

[55] Note: A water system is eligible for variances if the maximum increase in costs to the water system does not exceed the "expenditure margin" of the system, which is defined as the difference between the affordability threshold (2.5%) and the baseline component (actual water bills relative to median household income). The affordability threshold of 2.5% is used to determine the maximum water costs a water system can afford given the median household income among water districts of specific size classes. For example, a median household income is determined at the level of all large water systems across districts, e.g., and not at the household or water system level.

[56] In cases where financial assistance is requested for disadvantaged communities, the CDPH aimed to help communities achieve a "target user cost" for water services of 1.5% MHI.

Appendix Table A1. Commonly Used Affordability Ratio Thresholds.

Thresholds shown by organization or study.

Affordability Ratio Threshold	Water Cost Included	Organization Using Threshold (Studies Applying Threshold)
1.5% of MHI	*Drinking water services*	*California Department of Public Health* (California Department of Public Health 2009) *UCLA Luskin Center for Innovation* (Pierce G, McCann H et al. 2015)
2% of MHI	*Wastewater services*	*U.S. Environmental Protection Agency* (US EPA 1997)[57]
2% of MHI	*Drinking water services*	*U.S. Environmental Protection Agency* (US EPA 1998a) *AB 2334* (Assembly Bill No. 2334 2012)[58] *Public Policy Institute of California 2014* (Hanak E, Gray B et al. 2014)[59] *Christian-Smith et al 2013 (Pacific Institute, Community Water Center and California State University, Fresno)* (Christian-Smith J, Balazs C et al. 2013)
2.5% of MHI	*Drinking water services*	*U.S. Environmental Protection Agency* (US EPA 2002)[60]

[57] Note that here, affordability of water costs to households is calculated prior to a secondary screening of water system financial capability.

[58] Note that AB 2334 did not pass and was not added to the State Water Code, despite significant support for the bill by non-profit and activist groups across California (see hearings on California Water Plan: Affordable Drinking Water Analysis from 2012). Nonetheless, the Pacific Institute study using this threshold has been widely cited and used in other legislative, non-profit, and policy support circles to highlight the high burden of water costs on Californian community water systems.

[59] This study estimated drinking water affordability at the county-level and estimated that 13% of single-family households may face unaffordable water rates (i.e., greater than 2% of estimated annual income).

[60] Note: This document is frequently referenced as a source for US EPA's affordability threshold criteria. However, as noted above, the scale and focus of this threshold criteria are to assess affordability to determine a system's ability to comply with Safe Drinking Water Act related regulations (e.g., MCL compliance). Few make these distinctions in considering the threshold level for application at the household scale (however see comments and considerations in (Fisher, Sheehan et al. 2005) and (Rubin S. J. 2011). Additionally, US EPA commissioned the 2002 review to consider the 2.5% threshold, and while the committee found the threshold to be generally acceptable, they also proposed that some systems are likely struggling to keep water costs below 2.5% of median household income. A 2003 review by the Small Systems Working Group for National Drinking Water Advisory Council (NDWAC) cited above was inconclusive on the threshold and instead suggested an incremental threshold approach based not on existing expenditures but direct affordability impacts specific to a given ruling.

Affordability Ratio Threshold	Water Cost Included	Organization Using Threshold (Studies Applying Threshold)
3% of Income (often disposable)	*Drinking water & wastewater services*	*United Nations Development Program* (*UNDP 2006)* *UN Office of the High Commissioner for Human Rights* (OHCHR 2010) [61]
4.5% of MHI	*Drinking water & wastewater services*	*U.S. Environmental Protection Agency*[62] *Mack and Wrase (2017)* (Mack E.A. and Wrase S 2017)
5% of MHI	*Drinking water & wastewater services*	*AAAQ* (Villumsen M. and Jensen M. H. 2014); *German International Water Policy and Infrastructure group (GTZ)* (Deutsche Gesellschaft für Technische Zusammenarbeit 2009).[63] *World Bank* (Banerjee S.G. and Morella E 2011)
5% of Discretionary Income for 20th Income Percentile	*Drinking water (or wastewater)*	*Pacific Institute 2018* (Feinstein L 2018) *Teodoro (2018)* (Teodoro M.P. 2018)

A2.3 Residual Income Approach

A second way to measure affordability is the "residual income" approach. In this method, the proportion of income going to household costs for drinking water and sanitation is measured in relation to:

a) household expenditures on all essential goods and services related to other protected rights (Kessides I, Miniaci R et al. 2009), [64]
b) household expenditures in general, and

[61] UN-Water Decade Programme on Advocacy and Communication. "The Human Right to Water Media Brief." Available at URL: www.un.org/waterforlifedecade
[62] This study used the combined US EPA drinking water and wastewater affordability thresholds of 2.5% and 2%, respectively, to determine the minimum incomes required to adequately afford 4.5% MHI based on water costs obtained from a survey of 296 water systems across the US Identifying the number of households with incomes incapable of staying below the 4.5% MHI threshold for average annual water costs, this study estimates that 11.9% of households face unaffordable water rates across the US.
[63] Note that the GTZ report does not cite or reference support for the 5% threshold here.
[64] In this approach, a minimum and maximum standard for consumption is set to ensure that under-consumption is not seen as 'affordable' (or as a solution to an affordability problem becomes the choice to decrease consumption) or that over-consumption is not mistaken as 'unaffordable'.

c) the poverty line.

Data requirements for this type of analysis are hard to fulfill, however.[65] Water affordability is thus commonly assessed using affordability ratios and thresholds (UN CESCR 2002).[66]

A2.3 Hours at Minimum Wage

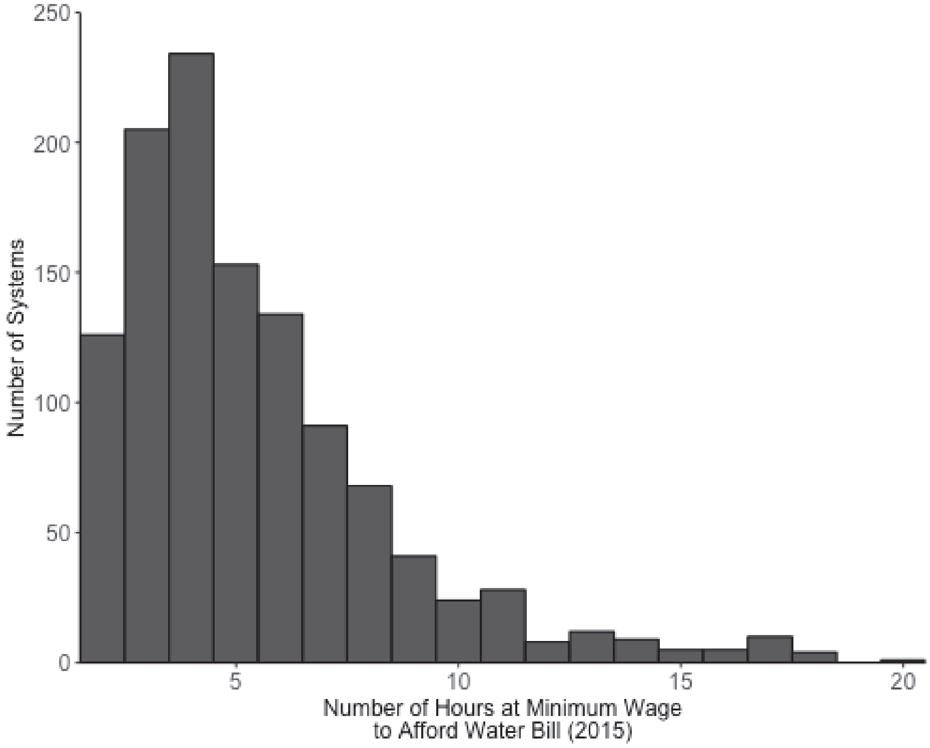
Teodoro 2018 suggested representing affordability as a measure of hours worked at minimum wage (HM) with the explicit use for “purposes of budgeting, planning, rate-setting, and policy design” (Teodoro M.P. 2018). The HM metric was developed for water and sewer costs combined, but could feasibly be developed for each bill separately. Teodoro argues that HM is familiar and intuitive as a complementary metric to affordability ratios. OEHHA determined that as an outcome indicator, HM is not as applicable for the human right to water approach in California given the available alternatives. Firstly, minimum wages do not vary much across a state except in select cities. As such, HM simply reflects a re-scaling of the water bill data. For example, in the case of California in 2015, the minimum wage was nine dollars per hour for all but 14 cities (Department of Industrial Relations 2015; LA Times 2016). Water systems falling outside of these 14 cities share the same scaling factor of nine dollars per hour (i.e. all water bills would simply be divided by 9). Secondly, tying affordability to a set number of minimum wage hours worked risks normalizing inadequate minimum wages. Finally, while the indicator has appeal, it is unclear if HM would provide additional information that is not captured in the AR_{DP} indicator.

For reference, OEHHA estimated results for HM given the final affordability dataset of 1,158 systems, using the statewide minimum wage number of nine dollars per hour. Results indicate that the average HM is 5.4 hours worked (median = 4.6 hours), or 67% of a full eight-hour workday. In other words, to pay the average bill across systems, one would have to work the equivalent of 5.4 hours at minimum wage. Over half the systems have water bills that would require someone to work more than 4.6 hours at minimum wage. (Teodoro M.P. 2018) suggests an HM greater than 8 hours for a family of four would be considered unaffordable. Figure A1 demonstrates a histogram of this data, which is right-skewed like the water bill data. 183 systems, or 15.8% of systems with affordability data (n=1,158), have water bills that would require more than 8 hours of labor at minimum wage to afford. This number likely overestimates the number of systems with HM >= 8 hours given those water systems falling within cities that have higher minimum wage values.

[65] Though a recent study by (Teodoro M.P. 2018) indicates how expenditures might be incorporated into affordability ratios.

[66] Direct costs usually refer to the price per unit of water, whereas indirect costs may be related to lifeline rates, connection surcharges etc.

Figure A1. Hours at Minimum Wage to Afford Water Across Systems (N = 1,158).



A3 Limitations to Affordability Ratios, Adjustments, and Alternatives

The water system-level affordability ratio (and other aggregated indicators), while often the best possible option given data constraints, suffers from limitations relating to the numerator, denominator, and the threshold. In terms of water costs (i.e., the numerator in affordability ratios) the affordability ratio approach does not typically specify what volume of drinking water should be protected as a human right. This is particularly important in drought-stricken states like California, where fees and rate structures aiming to incentivize conservation during dry spells may lead to affordability issues (Cooley H, Donnelly K et al. 2016). High water costs to disincentive excessive consumption may benefit environmental outcomes but could compromise the right to water for vulnerable households that require more water (e.g., sick individuals or pregnant women). What is more, what should be considered a 'basic' amount to be protected by this human right to water can vary by context. Water affordability ratios also ideally include water costs for sewer or storm water services (Teodoro M.P. 2018).

In terms of income (i.e., the denominator in affordability ratios), median household incomes at the water system scale do not reflect the vulnerability of low-income households within a water system. Variations of the median income ratio approach to address these concerns include using different denominators, for example the 20th percentile income level to capture low income households (Gawel E, Sigel K et al. 2013) or income less expenditures on other essential goods (i.e. discretionary income) (Teodoro M.P. 2018). Such an approach takes into consideration the fact that water bills may be paid at the expense of other essential costs to households like food, fuel, healthcare, and housing. Without information about essential expenditures like food and housing, use of gross income overlooks trade-offs households may be forced to make among essential expenditures (Cory D.C. and Taylor L.D. 2017). Such studies require data that is often difficult to acquire at a water system scale or in non-urban areas. For example, while one might be able to calculate a crude income distribution for each water system based on the 16 income brackets provided by the Census (Table B19001), the 20th percentile income for each water system may not represent economically vulnerable groups in wealthier systems. Relatedly, in smaller systems that are very low-income, even the 70th percentile may be considered 'low income'. The percentile approach advanced by AR_{20} thus becomes less applicable in smaller, more rural systems (as opposed to the urban areas evaluated by (Teodoro M.P. 2018). Others advocate evaluating affordability *within* a water system where income levels of residents can vary widely within a community (Christian-Smith J, Balazs C et al. 2013). These approaches aim to address the limitation that median income levels are less representative of households with incomes that diverge substantially from the median.

Another limitation of affordability ratios concerns selection of a threshold to evaluate whether water is affordable or unaffordable. Preexisting thresholds to determine what counts as affordable were recently argued to be too high or inadequately supported (NAPA 2017). Concern over this threshold has existed for nearly two decades. A 2002 Scientific Advisory Board review of US EPA's affordability criteria for the SWDA's threshold of 2.5% and the National Drinking Water Affordability Working Group recommendations to US EPA in 2003 both suggested lowering US EPA's 2.5% threshold. In the latter case, a lower threshold–i.e., 1.5%– was suggested as a way to better enable lower-income systems to acquire representation through the indicator and thus financial support for water system compliance (National Drinking Water Advisory Council 2003; US EPA 2002). [67] The United States Conference of Mayors compared water costs in major California cities to the mid-point of each income bracket in the Census to show that households far from the median income of a region were misrepresented with the application of the 2.5% threshold (US Conference of Mayors 2014). Their exercise highlights both the importance of the threshold choice and the need to look at various income levels. (Teodoro M.P. 2018) also emphasizes these limitations noting that affordability is rarely as simple as a yes/no phenomenon. At the same time, (Teodoro M.P. 2018) and recently the Pacific Institute (2018) develop thresholds of 5% for drinking water as a proportion of income less essential expenditures, but acknowledge this is a somewhat arbitrary number itself. More research is required to identify whether these–and existing thresholds–are appropriate. Affordability analyses in California already use lower thresholds for affordability at the median income level (See Appendix Table A1). Tradeoffs exist between aggregate indicators

[67]There was some disagreement and ambivalence about the value of the fixed-threshold approach and value, and the report also proposes a variety of approaches outside of the income threshold method.

and the choice of thresholds used, which may risk obscuring vulnerable populations in the process of representing water affordability (Kessides I, Miniaci R et al. 2009).

Additional proposals to address limitations with the water system scale affordability ratio include tabulations of households by income levels within a water system, or using geographic scales (i.e., block groups) that capture finer spatial heterogeneity within a water system (Christian-Smith J, Balazs C et al. 2013).

Affordability Methods

B1 Water Bill Dataset Selection & Use

B1.1 WATER BILL DATASET SELECTION

To date, no comprehensive database on water rates, water usage, average water costs, or average water bills exists in the state of California. The Public Utility Commission (PUC) maintains water rate information for PUC-regulated systems. The State Water Board's Division of Drinking Water collects information on water rates (e.g., price of water at different tiers or the price of a fixed rate) and bills (e.g., reported average monthly water bill), and requires that systems report this information in annual electronic reports, but coverage is incomplete (see Appendix Table B1). Various private entities, including consulting firms and private water companies also collect water rate information which is then used to estimate average bills. OEHHA reviewed various datasets that have compiled water rate (or cost) data across the state (Appendix Table B1). We selected the Electronic Annual Reporting (eAR) dataset to be used in our affordability calculation, as it had the largest coverage and is publicly accessible, and has the highest chances of being continually updated and maintained.

Appendix Table B1. California Relevant Datasets with Monthly Water Cost Data by Water System.

Dataset	Year of Dataset	% Coverage (Systems with Cost Data)*	Entity Collecting Data
Electronic Annual Reporting (eAR)	2015	52%	State
American Water	2014	19%	Private water company
Pacific Institute	2013	2%	Non-governmental organization
Black & Veatch	2006	<10%	Private consulting firm

**Coverage estimates based on calculations prior to removing outliers. In other words, these values do not consider data quality concerns within each dataset but simply show the overlapping systems that have water cost data between each dataset and OEHHA's community water system list (n=2,903). Black & Veatch data did not identify water systems by unique system numbers, thus the reported coverage is an approximation based on the number of water systems they report data for.*

B1.2 WATER BILL CHOICE OF VOLUME TO USE IN AFFORDABILITY STUDY

Overall, California's residential water use is declining. The average use in 2016 was 85 gallons per capita per day.[68] The question of what counts as essential or basic needs for protection in the human right to water is an important topic that varies depending on location and situation (e.g., sick populations and pregnant women require more water to meet basic needs, as might different climatic regions). Affordability ratios can invoke a basic needs approach to exclude luxury uses like extensive landscaping (National Consumer Law Center 2014)[69], while still attending to water needs for vulnerable populations and larger families (e.g., those with undocumented persons and lower-income multi-family homes).

The affordability indicators use water bills for 6 HCF, or nearly 50 gallons[70] per person per day given a household of three or 37 gallons per person per day assuming a household size of four.

[68] Water use varies substantially depending on season. 85 gallons per day on average reflects a range from 64 gallons per day to 109 gallons per day between winter and summer use. See: (Legislative Analyst's Office 2017) See, for example: (National Consumer Law Center 2014)
[69] See, for example: (National Consumer Law Center 2014)
[70] Note: The system wide average bill for 6 hundred cubic feet (6 HCF) of water as given by eAR, and does not include or account for any disaggregation or categorization based on the end use of the water (e.g., direct consumption or gardening).

Appendix Table B2 demonstrates how the volume used in OEHHA's affordability indicators compares to California-specific studies on water needs and conservation goals.

In the future, OEHHA may choose to evaluate a range of affordability ratios including an average monthly water volume of 12 HCF, 300 gallons per household per day, or approximately 100 gallons per person per day assuming a household size of three, or 75 gallons per person per day assuming a household size of four.

Appendix Table B2. Water Bill Volume in eAR Reports Compared to California-Relevant Water Needs.

Water Bill Volume is equivalent to …	Volume per person per day assuming 3-person HH	Volume per person per day assuming a 4-person HH	Gleick (1996) Basic Water Requirements[71]: *13 gallons (50 liters) per person per day with a range of 15 to 53 gallons (57 to 200 liters) per person per day*	Pacific Institute (2018)[72]: *43 gallons (163 liters) per person per day*	California Water Code Conservation[73] *55 gallons (208 liters) per person per day*
6 HCF (4488 galllons or 16,990 liters)	**50 gallons** (189 liters)	**37 gallons** (144 liters)	IN RANGE; ABOVE BASIC WATER REQUIREMENT	IN RANGE	RANGE FALLS BELOW
12 HCF (8977 gallons or 33,980 liters)	**100 gallons** (378.5 liters)	**75 gallons** (283 liters)	RANGE FALLS ABOVE	RANGE FALLS ABOVE	RANGE FALLS ABOVE

[71] Here, (Gleick P 1996) proposes a basic water requirement of 50 liters per capita per day (13 gallons). This is equivalent to 150 liters (39.6 gallons) for a 3-person household and 200 liters (52.8 gallons) for a 4-person household, but presents a range of 57-200 liters per capita per day (15-53 gallons per capita per day) depending on region, technological efficiencies, and cultural norms.

[72] In this report, Pacific Institute recommends evaluating water affordability in California at 43 gallons per capita per day, equivalent to 129 gallons per 3-person household and 172 gallons per 4-person household.

[73] A provisional standard of 55 gallons per capita per day is identified in (California Water Code 2009) indoor water use for urban water suppliers aiming to reduce water demand.

B2 Income Data Selection & Use

B2.1 INCOME IN AFFORDABILITY RATIOS OVERVIEW

Ideally, income for all three indicators would be disaggregated into *gross income*, *disposable income*, and *essential expenditures* (Teodoro M.P. 2018). This would allow OEHHA to experiment with additional affordability measures (namely the residual income approach (Gawel E, Sigel K et al. 2013) and better articulate the water bill burden for median and low-income households within a water system. As and if this data becomes available, OEHHA will incorporate it into its human right to water assessment.

With respect to the denominator of affordability ratios (income levels), it is important to note a few caveats. When interpreting AR_{MHI}, it should be noted that the affordability ratio at the median income level is representative of the central tendency of affordability ratios for a water system. It is therefore unlikely to adequately depict households with incomes substantially below or above the median, especially in systems where there is a wide distribution of income.

When interpreting AR_{CPT} and AR_{DP} it is important to recognize that their denominator derives from county-level poverty thresholds (discussed more below), which are based on expenditure estimates within a given county that best reflect a "basic needs budget"–approximating *disposable* income (i.e. gross income less taxes). Disposable income is preferred to gross income because of its ability to better reflect real income constraints for households. However, in the current assessment the economic burden of other rights (health, shelter, food) and essential expenses are not accounted for, and thus water affordability as it relates to other essential rights is not possible to measure.

B2.2 POVERTY LEVEL INCOME DATASET SELECTION

B2.2.1 Selecting Poverty Level Income

Human right to water frameworks emphasize that affordability should consider issues of equity—i.e. more vulnerable households and individuals should be expressly considered with regards to their ability to pay for water (UN CESCR 2002). [74] Additionally, reviews of US EPA's conventional affordability ratio (NAPA 2017; OEHHA 2017; US EPA 2014)[75] as well as academic studies (Teodoro M.P. 2018) have emphasized the importance of evaluating affordability for lower-income households. In line with the view that the affordability analyses should explicitly consider lower-income levels, the second and third affordability indicator measures the impact of water bills on households living at the poverty and deep poverty level.

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[74] General Comment No. 15 on the Right to Water, by the Office of the United Nations High Commissioner for Human Rights, notes that equity considerations regarding affordability "demand that poorer households should not be disproportionately burdened with water expenses as compared to richer households." (UN CESCR 2002:9).

[75]Note: early suggestions to amending EPA's residential indicator–which looks at affordability at the median income level–included evaluating affordability at the 10th or 25th income percentiles.

OEHHA looked for income data for poverty levels that enabled the best representation of water bill burden on vulnerable households. Disposable income reflects the available income to households better than total income (which includes taxes unavailable for spending on essentials).[76]

OEHHA evaluated two types of poverty income data due to their California-specific context: California County Poverty Thresholds[77] created by PPIC and Housing Income Limits (HCD 2015) created by the California Department of Housing and Community Development (HCD). While both PPIC and HCD aim to represent vulnerable income levels, their methodologies and aims are distinct. PPIC primarily aims to provide a California-specific version of the US Census's Supplemental Poverty Measure, which requires adjustments to the national poverty thresholds in order to capture differences in housing costs across the state (Bohn S, Danielson C et al. 2013).[78] HCD primarily aims to capture housing affordability challenges in the California context, which requires adjustments to national level income levels set by the U.S. Department of Housing and Urban Development (HUD).

The key distinction between PPIC's County Poverty Thresholds and HCD's Income Limits is that PPIC uses *expenditure-based* estimates to construct thresholds, whereas HCD uses *income-based* estimates to determine its income limits for Section 8. As such, PPIC's thresholds can be understood as a "basic needs budget"–or an approximation of disposable income–to remain out of poverty in the California context, whereas HCD's income limits reflect estimates of gross income. Consequently, in most cases, HCD's income limits are *higher* than PPIC's poverty thresholds.

B2.2.2 Poverty Level Incomes by Water System

OEHHA assigned each water system the poverty level income threshold and the deep poverty income threshold of its respective county.

Figure B1 and Figure B2 demonstrate the distribution of water systems by county poverty and deep poverty threshold levels, respectively.

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[76] Understanding a household's disposable income and their expenditures on non-water related essential needs (e.g. housing, health care, food) allows for an even better representation of a water bill's impact on a household's budget.
[77] OEHHA collected data directly from PPIC based on the assumption of a 4 person household (2 adults, 2 children) and a dual housing-adjustment index weighted for the number of homeowners and renters in the state.
[78] Note: this document contains the same technical methodology applied for developing poverty thresholds in 2015.

Figure B1. Histogram of California County Poverty Thresholds. Data for 2015, n = 1,158 Systems.

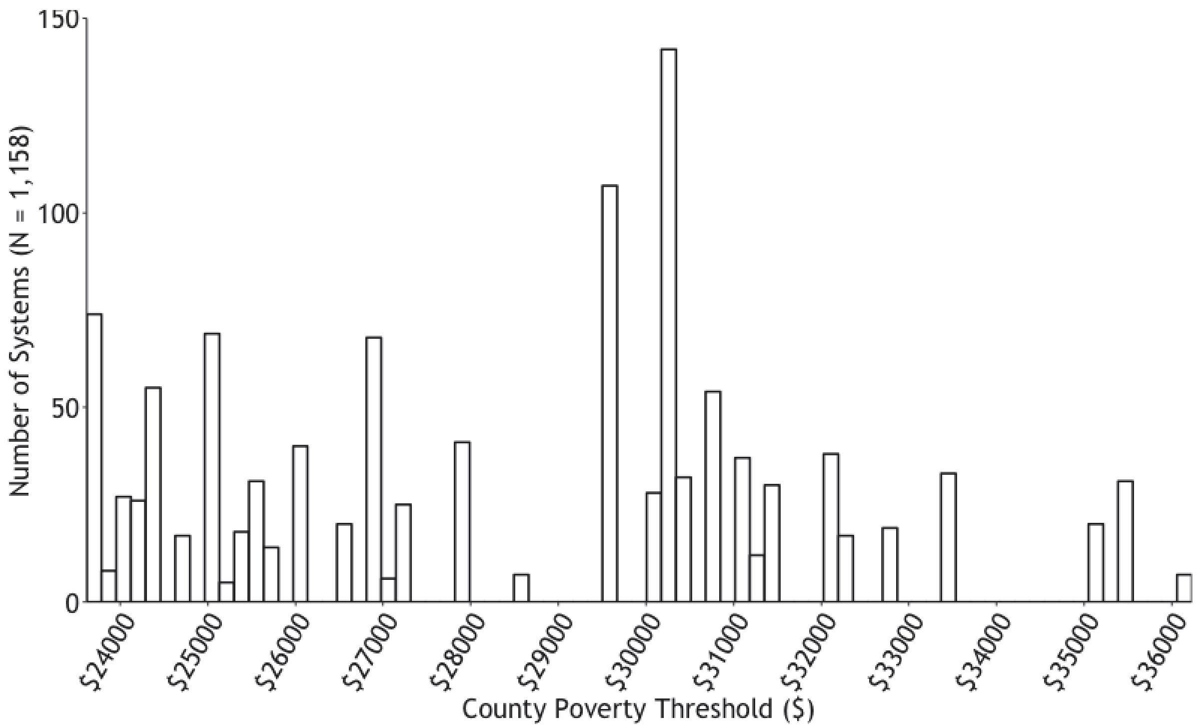
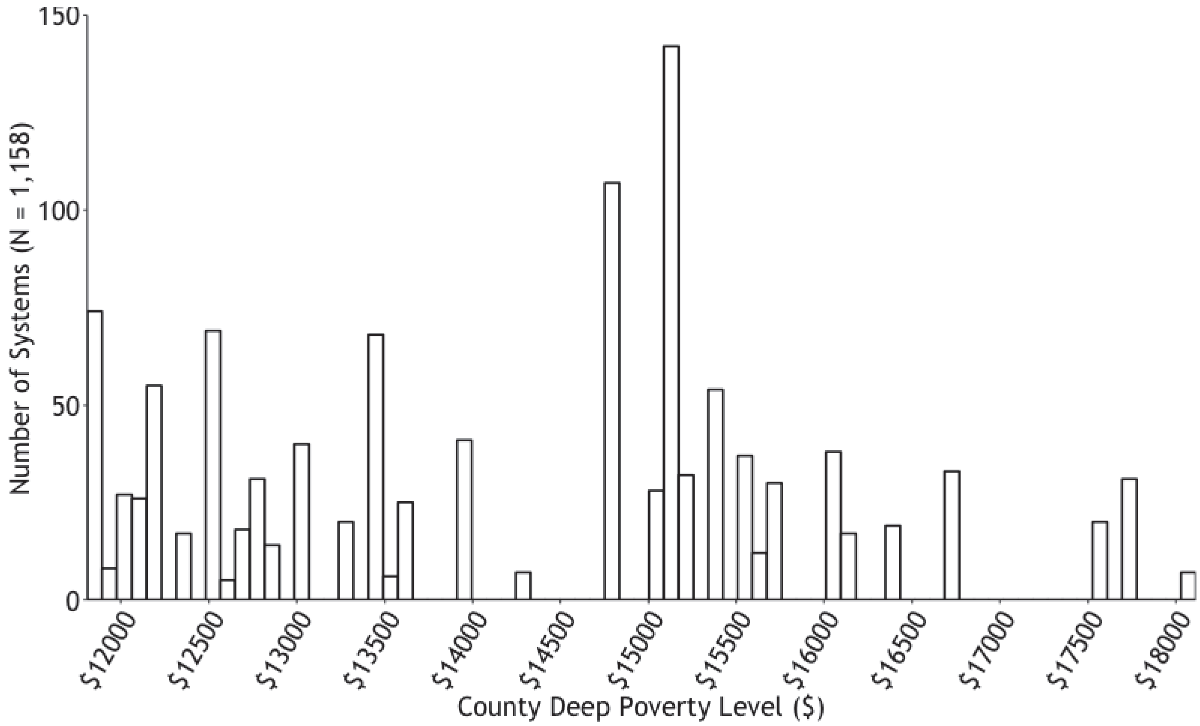


Figure B2. Histogram of California County Deep Poverty Thresholds. Data for 2015, n = 1,158 systems.



OEHHA chose PPIC's poverty thresholds because of its focus on poverty level budgets rather than income, and because PPIC poverty thresholds meet more of OEHHA's selection criteria for developing ratios that capture water bill burden for vulnerable income levels (Appendix Table B3).

Appendix Table B3. California Relevant Datasets with Poverty Level Incomes.

Selection Criteria for Demonstrating Water Bill Burden	HCD: State Income Limits for Housing	PPIC: County Poverty Thresholds
Income that captures 'lower income' households to represent acute affordability challenges	✓	✓
Income levels that reflect cost-of-living variations	✓	✓
Income that does not include taxes ('disposable income')	✗	✓

Selection Criteria for Demonstrating Water Bill Burden	HCD: State Income Limits for Housing	PPIC: County Poverty Thresholds
Disposable income level AND essential expenditures *disaggregated* (to enable calculation of discretionary income)	×	×

B2.3 INCOME DATA AT WATER SYSTEM BOUNDARY

B2.3.1 Areal-Household Weighting Methodology

Because census geographies do not overlap with water system boundaries, OEHHA uses the area of a water system overlapping with populated census geographies to apportion households to water system boundaries. OEHHA follows CalEnviroScreen 3.0 methodology of intersecting populated blocks and block groups with water system boundaries to estimate the number of households (rather than population as in CalEnviroScreen) within each water system. For each system, an estimated median household income and an estimated number of households within each income bracket is constructed as follows:

1) Blocks and block groups are linked to water systems by OEHHA
2) Each water system is assigned a number of households based on the area intersecting between populated blocks and water system boundaries (this is also known as the "areal weight")
3) The number of households intersecting water systems at the block level is aggregated to the respective block group level, resulting in an estimated number of households within each block group served by the water system.
4) Block group estimates are multiplied by the portion of households within the block group that are determined to be served by the water system
5) For each system, the weighted block group estimates calculated in 4) are summed across all block groups intersecting the water system
6) The resultant sum is divided by the total number of households in the water system for (a household weighted average) MHI or for an estimated percentage of households in each income bracket within the water system.

B2.3.2 Limitations of Approach

Two main limitations should be considered when interpreting results:

1) Underlying block-level estimates of populated households to create block group level weights for water systems have sampling error.
2) Areal-household weighting assumes that block group level data are homogenously distributed across the block group; this can result in the under or over estimation of

estimates if there is spatial heterogeneity within the block group. This assumption likely leads to inaccuracy for water systems in very rural, large areas.

3) Several water system boundaries have been approximated, and the accuracy of reported system boundaries could impact the weights assigned to each water system (OEHHA 2017).

B3 Data Cleaning & Exclusions

B3.1 CLEANING WATER BILL DATA

The eAR database includes 6,656 systems. The eAR dataset contains information from water systems about water rates in addition to a question about the "average monthly residential customer water bill" using three different volumes (6 HCF, 12 HCF, and 24 HCF).[79] We cleaned the water bill data according to the following steps:

1) All zeros, blanks and N/A were not included;
2) Any water cost values were averaged when a range of values was reported;
3) Where Flat Base Rate reported as rate structure and the Flat Base Rate were provided along with the billing frequency as monthly, but reported average monthly water bill was left blank, the Flat Base Rate value was used as the average monthly water bill.

After applying these steps, 1,689 systems had cleaned, reported water bill data. All changes were tracked for every system. This list of systems with water bill data were merged with OEHHA's list of 2,903 Community Water Systems (CWSs), resulting in 1,561[80] water systems with water bill data present in the OEHHA CWS list. Of these 1,561 community water systems with water bill data, 1,530 systems had both water bill, median household income, and total households across income bracket data prior to any exclusions.

B3.2 OVERVIEW OF EXCLUSIONS & FINAL ASSESSMENT LIST BIAS

Due to the wide range of monthly water bills in the electronic Annual Report (eAR), we determined several steps were necessary to crosscheck this data. Ultimately, OEHHA chose to exclude 118 systems with very high and very low water bill data. Additionally, OEHHA excluded several systems for the affordability assessment due to data reliability concerns or missing data. Systems with very high and very low water bills were excluded in a potential outlier assessment (n = 118). Systems with more than 15% of their block groups missing MHI data were excluded (n = 46). Systems with unreliable data according to exclusion criteria discussed below were excluded (n = 234). Of the 401 systems in these exclusion lists, 26 systems overlapped, for a

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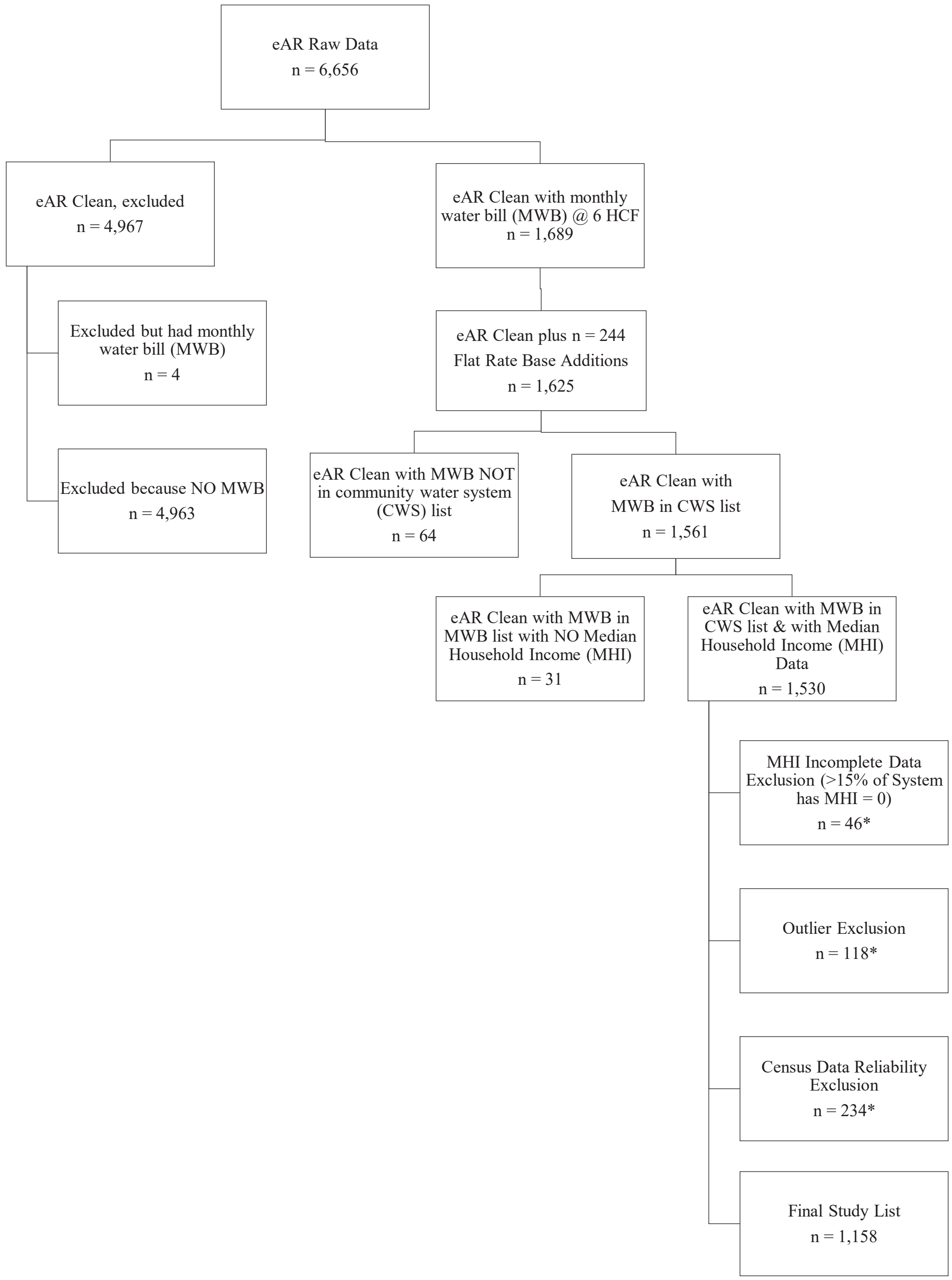
[79] Reported values are not disaggregated by rates and fees, but additional costs to users based on other surcharges, fire suppression surcharges, as well as discounts to users based on lifeline subsidies, should be included in the calculation.

[80] To this list, we broke Los Angeles Department of Water and Power (LADWP) into five smaller LADWP sub-systems and removed the umbrella system. The reported average monthly water cost for the LADWP umbrella system was used as the average monthly water cost for the five smaller sub-systems, whose median household incomes were different based on the MHI study explained previously.

total of 372 unique systems that OEHHA excluded. Of the 1,530 systems with water bill and income data, the 372 systems were excluded to create a final list of 1,158 systems for the affordability assessment. Below, these exclusions are discussed in detail (See Appendix B4 Composite Affordability).

Figure B3 shows the sequence of exclusions based on the available data.

Figure B3. Data Cleaning Tree for Monthly Water Bills at 6 HCF and Income Data for Affordability Study.



** Three systems overlap between outlier systems and MHI incomplete data systems and 23 systems overlap between outlier systems and Census data reliability study for a total of 26 systems falling into more than one exclusion category.*

Overall, small systems and those serving severely disadvantaged communities are under-represented in the study (See Appendix B3.5 and "Missing Data: A Key Consideration" in the main report). Approximately 36% of systems included in the water affordability assessment are small systems (<200 connections), but small systems make up about 63% of the full community water system list. We see the effects of this bias in the overall list of missing data (1,745 systems)–a disproportionate number of smaller systems are excluded from the study (81% of systems without data are small). The final study list also has a slightly lower percentage of SDAC systems (12%) than the overall community water system list (18.5%). Both biases appear to be driven due to water systems that do not report water bills; but a similar bias occurs through system exclusions based on census data unreliability.

B3.3 EXCLUSIONS – WATER BILL DATA

B3.3.1 Method of Excluding Water Bills

We conducted an outlier study to verify extreme values in the dataset. . As such, we considered several criteria for excluding systems with very high or very low water bills in the cleaned monthly water bill dataset for community water systems (n=1,561 prior to any exclusions):

1) Tukey box plots (1977);
2) Hubert and Vandervieren adjusted box plots for skewed distributions (Hubert M and Vandervieren E 2008);
3) Qualitative threshold based on prior knowledge.

We used these methods to identify systems on the ends of the distribution. No prior baseline exists to truly determine whether systems with very low or very high water bills are true outliers among California's community water systems. As such, we used thresholds determined using (Hubert M and Vandervieren E 2008) method for skewed distributions. This approach established a lower monthly water bill threshold of $14.20 and an upper monthly water bill threshold of $180.20 (Appendix Table B4). Using these thresholds, 89 systems had monthly water bills that fall below the lower threshold and 29 systems have monthly water bills that fall above the upper threshold.

OEHHA has conducted two small surveys of water systems with bill data that fell into very high or very low ranges during 2014 and 2015. The results largely indicated that while many systems *do* have water bills above $180.02 and below $14.20 per month for 6 HCF, the reporting is frequently inaccurate in the direction we expected (e.g. higher water bills were often over reported and vice versa). Further research is required to understand the quality of water bill data overall, however. OEHHA is open to alternate methods of outlier assessment and data verification and will consider including the systems excluded in this analysis in future reports.

It is important to note that the water systems falling above or below the threshold set by the (Hubert M and Vandervieren E 2008) method are statistical outliers, not necessarily real outliers. As such, these results provide OEHHA with a conservative list of systems to evaluate water affordability during this first round of indicator creation.

Appendix Table B4. Identification of Upper and Lower Thresholds Used to Exclude Outliers.*

Metrics	Results
Q1	$28.76
Median of Dataset	$40.87
Q3	$61.00
Interquartile Range (IQR)	$32.20
Medcouple (MC) +	0.3
Lower Fence (threshold) = Q1 – [1.5 × exp(-4 × MC) × IQR]	$14.20
Number of systems below threshold (in affordability study)	89
Upper Fence (threshold) = Q3 + [1.5 × exp(3 × MC) × IQR]	$180.02
Number of systems above threshold (in affordability study)	29

**All calculations were conducted using adjboxStats in the robustbase package of R 3.3.2.*
+The medcouple is the median of an array calculated using the kernel function as reported in the adjusted box plot method. A positive value (MC > o) reflects a right-skewed distribution.

B3.3.2 Results of Water Bill Data for Final Study List

Among the 1,158 systems included in OEHHA's affordability assessment, the median water bill for 6 HCF across all systems was $41.39/month (average = $48.81 per month). Small water systems (i.e., less than 200 connections) have the highest median water bill ($55.00/month across systems) and more variability in the water bills in the upper quartile relative to intermediate and large systems. Figure B4 indicates the range of monthly water bills across water systems by system size. Small systems have a greater range of average water bill overall (e.g., $15.00/month to $175.74/month) relative to large systems with more than 10,000 connections (ranging from $15.00/month to $94.72/month on average). Water bills also vary by the disadvantaged community (DAC) status of a water system. Figure B5 highlights that non-DACs (those with median household incomes greater than 60% of the California statewide median household income) have more variability in the upper quartile of water bills relative to intermediate and small systems. Non-DAC systems also have a higher median water bill ($44.83) than the median water bill of DACs ($36.00) and severely disadvantaged communities (SDAC) ($37.85).

Figure B4. Average Monthly Water Bill for 6 HCF for Community Water Systems by System Size. Results shown for systems in affordability study sample for all systems (n=1,158), small systems (n=419), intermediate/medium systems (n=540), and large (n=199) systems. Study period 2015.

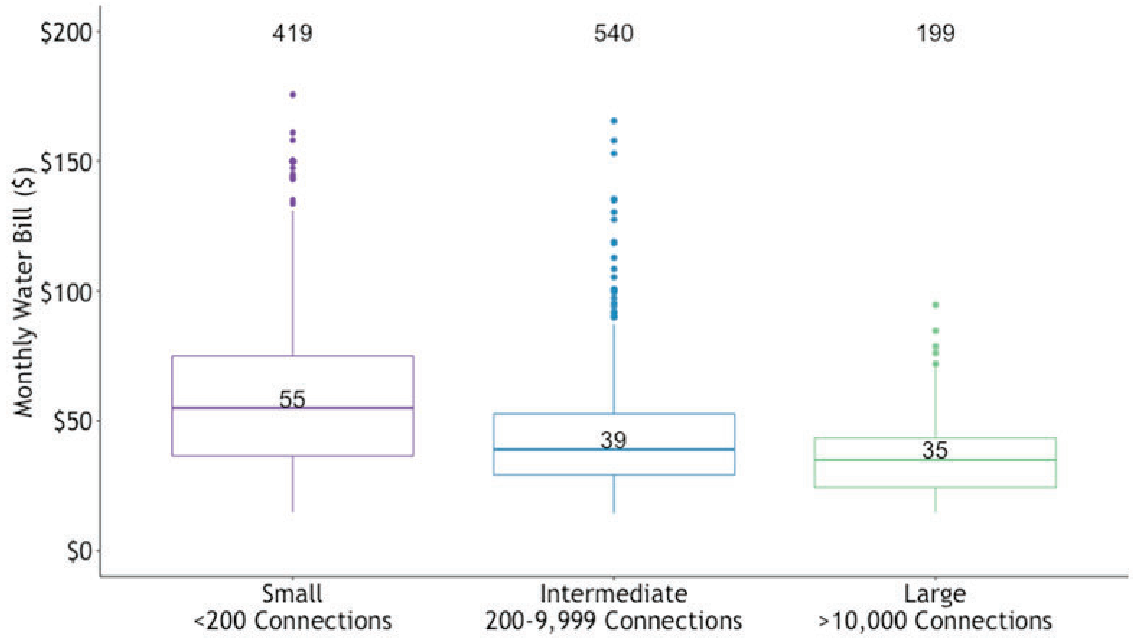
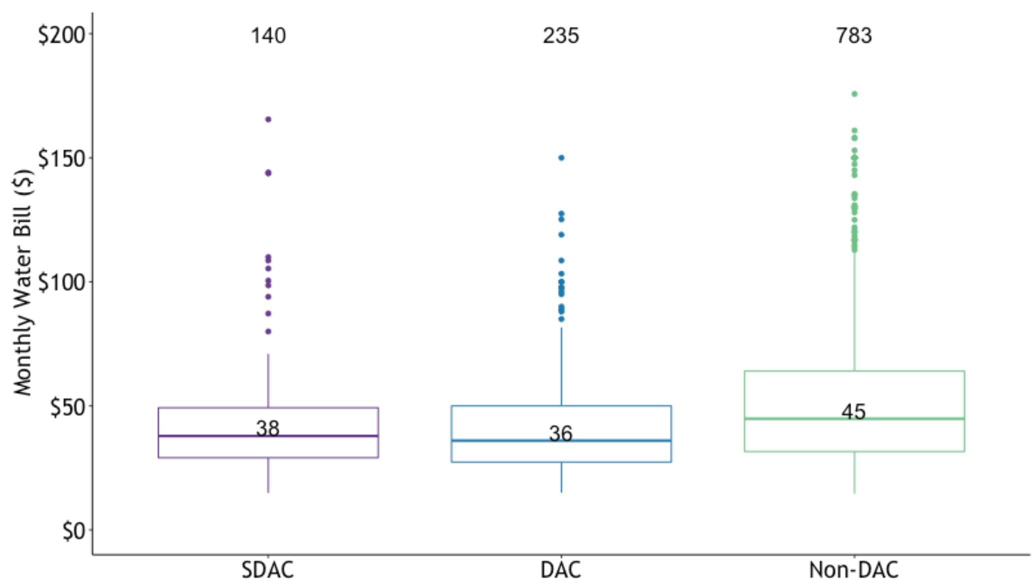


Figure B5. Average Monthly Water Bill for Community Water Systems by DAC Status. Results shown for systems in affordability study sample (n=1,158) for SDAC (n=140), DAC (n=235), and Non-DAC/SDAC (n=783) systems. Study period 2015.†



† Disadvantaged Community Status is based on the statewide Median Household Income from the U.S. Census American Community Survey 5-Year Data (2011-2015). The California statewide MHI was $61,094. DAC = Disadvantaged Community status defined as a system with MHI below $49,454, or 80% of statewide MHI. SDAC = Severely Disadvantaged Community status defined as a system with MHI below $37,091, or 60% of statewide MHI. For purposes of this analysis, if a system is an SDAC, it is not counted as DAC. Non-DAC/SDAC are those systems greater than 60% of the MHI.

These findings must be viewed in a relative sense, based on income. A household in an SDAC community whose monthly water bill is $45, and has an annual median household income of $23,844 (as per data) would be spending roughly 2.3% of annual income on water. A household in a DAC community whose monthly water bill is $45.25 bill and whose median household income is $47,728 would be spending 1.2% of annual income on water bills. And a household in a non-DAC/SDAC community whose water bill is $60.50 and MHI is $74,595 would be spending 0.97% annually on water bills. Thus the slightly lower median bills in DAC and SDAC systems can still pose a financial burden in those communities. Furthermore, as water affordability impacts the most vulnerable households in any water system, higher bills in non-DAC systems could have the greatest impacts on households who earn well below the median income of that community. In essence, until an affordability ratio is calculated, the monthly bill carries less particular meaning.

B3.4 EXCLUSIONS – INCOME DATA

B3.4.1 Data Reliability in Census Data

The American Community Survey (ACS) provides quantitative information on sample error for their estimates. The Census provides margins of error (MOE) for each ACS estimate to quantify the magnitude of error between an estimated data point and its actual value, which is a measure of precision (US Census Bureau, 2015). The ACS creates MOEs at 90% confidence levels[81]:

$$Margin\ of\ Error_{90\%\ Confidence\ Interval} = Standard\ Error\ \times\ 1.645$$

The Coefficient of Variation (COV) for each data point can be calculated by back-calculating the standard error for each estimate from the Census-reported MOEs. COV is equivalent to the relative standard error, which measures the ratio between an estimate's standard error and the estimate itself:

$$Coefficient\ of\ Variation = \frac{Standard\ Error}{Estimate} \times 100$$

Coefficients of variation can then be used to determine the reliability of ACS estimates.

[81] Note: In the Panel's assessment of the ACS data, they point out that the 90% CI used by ACS is not standard survey research practice; rather 95% CI are typically used (thus MOE would be equivalent to the SE divided by 1.96). Using 95% CI will result in larger COVs and reflect greater uncertainty in the data.

B3.4.2 Reliability Criteria using Coefficients of Variation

Three sets of estimates are impacted by data reliability concerns: median household income, number of households in income brackets (16 brackets), and total number of households. Median household income data is used in both the Institutional Capacity Indicator and the first Affordability Indicator (AR_{MHI}). Total Households and the Number of Households in each Income Bracket are used for creating household indexes of systems falling below income levels; these are used as weights in the Composite Affordability Ratio.

To our knowledge, no methodology exists to construct new margin of error estimates for a block group estimate that has been weighted by household counts and aggregated to a new, non-census designated geography. As such, we developed exclusion criteria for census block group estimates for systems falling within one block. Future assessments will investigate the potential for alternate exclusion criteria that better captures error propagation for systems intersecting more than one block group.

Each estimate has margin of error data from which we can calculate coefficients of variation. We use the following exclusion criteria for water systems that are within one block group, as outlined in CalEnviroScreen 3.0:

a. Coefficient of error greater than 50 (meaning the Standard Error was less than half of the estimate) **AND**
b. Standard Error was greater than the mean Standard Error of all California census tract estimates for the data of interest.

For the 16 estimates of Number of Households in Income Brackets, we chose to exclude the system from the affordability assessment if more than two of the sixteen estimates were unreliable by this exclusion criteria.

B3.4.3 Results of Reliability Assessment–Institutional Constraints Indicator

Reliability of Median Household Income

OEHHA evaluated the total community water system list for data reliability regarding Median Household Income. Of the 2,903 water systems in OEHHA's community water system list, 1,418 systems fall into one block group. Of the 1,418 systems within one block group, 1,265 of them (89%) have fewer than 200 connections. The average number of connections is 98 (median = 45), and 75 percent of the systems have below 95 connections. In sum, systems within one block group are typically very small.

Of the 1,418 water systems within one block group, 27 systems did not meet the data reliability criteria for Median Household Income. This resulted in 27 exclusions, or 2,876 water systems in the full community water system list included for further analysis for the Institutional Capacity Indicator.

Institutional Capacity Indicator Final Study List

Of the 2,876 water systems remaining for analysis after excluding data based on reliability criteria, 89 systems had no Median Household Income Data (MHI = 0) and 69 systems had over 15% of their household-weighted area with missing data (MHI = NA). This resulted in 2,718 systems eligible for the Institutional Capacity Indicator before calculating disadvantaged community status by the number of service connections.

B3.4.4 Results of Reliability Assessment–Affordability Indicators

Of the 1,530 systems with water bill and income data prior to any exclusions, 505 systems fall within one block group. Of the 505 systems with one block group, 430 of them (85%) have fewer than 200 connections. The average number of connections is 118 (median = 53), and 75 percent of the data fall below 130 connections. In sum, the systems within one block group are typically very small.

Overall, the results suggest that MHI and Total Household estimates are relatively reliable. The other data–households by income bracket, used to construct HH_{MHI}, HH_{CPT}, and HH_{DP}–are more unreliable according to the criteria.

Total Households Data Reliability

There are no estimates in the "Total Households" data that meet the unreliability criteria.

Median Household Income Data Reliability

Of the 505 systems with data to evaluate reliability, there is one MHI estimate with no MOE. Of the 504 estimates for Median Household Income, 8 systems have unreliable estimates (or 1.5% of the 504 systems).

Household Income Brackets Data Reliability

On average, across all 505 systems, 231 systems had more than 2 unreliable estimates among the 16 Number of Households in Income Bracket estimates. Of these 231, 5 systems overlapped with the 8 systems found to have unreliable MHI estimates.

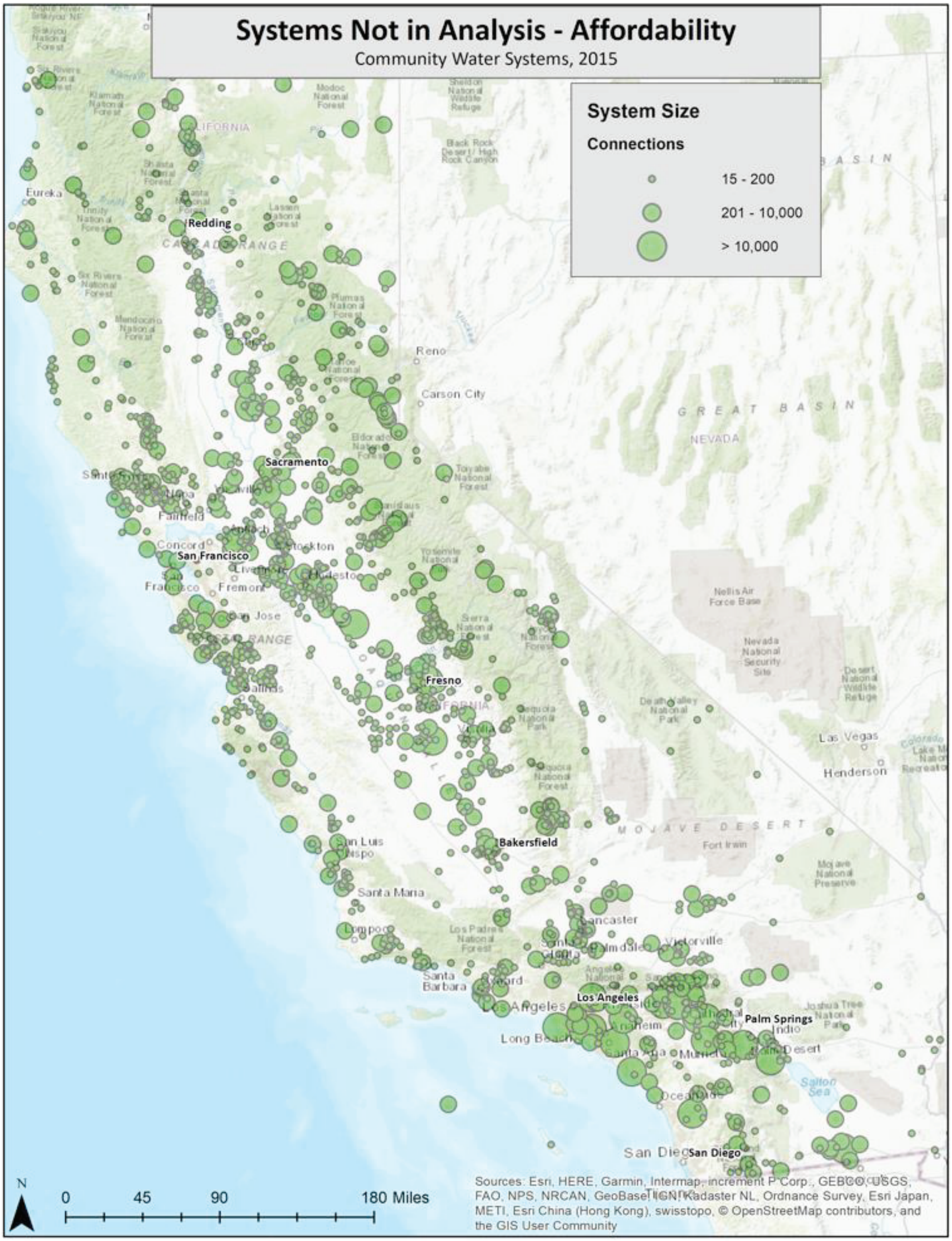
Affordability Indicator Final Study List

Of the 1,530 systems with income and water bill data, we eliminated 234 unique systems from the affordability study due to exclusion criteria for Census reliability.

B3.5 MAP OF SYSTEMS NOT INCLUDED IN FINAL ANALYSIS

Figure B6 shows water systems not included in the affordability analysis due to: missing water bill data (Appendix B3 Data Cleaning & Exclusions), potential outlier water bill data (Appendix B3 Data Cleaning & Exclusions), and/or unreliable or missing census data (Appendix B4 Composite Affordability). See "Missing Data: A Key Consideration" in main report for more detailed analysis.

Figure B6. Water Systems Not Included in Affordability Analysis by System Size. n = 1,745 systems of 2,903 community water systems.



B4 Composite Affordability Ratio and Scores

B4.1 HOUSEHOLDS POVERTY INDICES

As noted in the Affordability Chapter of the main report, OEHHA's composite affordability indicator is calculated using a household-weighted average of the three affordability indicators. To calculate the number of households below each income level for the Composite Affordability Indicator, OEHHA used the American Community Survey (ACS) 5 Year 2011-2015 Data "Household Income in the Last 12 Months" from Table B19001. Table B19001 provides the number of households in each income bracket, across 16 income bins, as well as data on the Total Number of Households.

Using this data, OEHHA calculated the total percentage of households in the water system at or below the Median Household Income, County Poverty Threshold, and Deep Poverty Level for each water system in the study. Because these incomes do not correspond perfectly with the upper or lower value of the income bins designated by the Census, OEHHA used linear interpolation to sum the proportion of households within each system below the two poverty levels. [82]

As noted above, we then estimated the approximate number of households living at or below the MHI, County Poverty Threshold, or Deep Poverty level within a system, as follows:

Household Index 1: HH_{MHI}

$$\#\ of\ Households\ Below\ Median\ Household\ Income = \sum Households\ in\ Water\ System\ below\ MHI$$

Household Index 2: HH_{CPT}

$$\#\ of\ Households\ Below\ County\ Poverty\ Threshold = \sum Households\ in\ Water\ System\ below\ CPT$$

Household Index 3: HH_{DP}

$$\#\ of\ Households\ Below\ Deep\ Poverty\ Level = \sum Households\ in\ Water\ System\ below\ DP$$

B4.2 ASSUMPTIONS AND LIMITATIONS FOR COMPOSITE AFFORDABILITY INDICATOR: AR_{WTAVG}

As described in the Main text, OEHHA estimate a household-weighted average across the three affordability ratios to estimate a composite affordability ratio focused on the lower-half of the income distribution, for each system, as follows:

[82] Linear interpolation analysis was conducted using the "approx." function in the stats package from R Version 3.3.2.

$$Water\ System\ Composite\ Affordability\ Indicator = \frac{AR_{MHI} \times (HH_{MHI} - HH_{CPT}) + AR_{CPT} \times (HH_{CPT} - HH_{DP}) + AR_{DP} \times HH_{DP}}{HH_{MHI}}$$

Twenty-five systems had Median Household Incomes that are lower than the California county poverty threshold. To maintain consistent approximations for the bottom 50th percentile of households in the composite ratio, these systems were household weighted from the median level down:

$$Water\ System\ Composite\ Affordability\ Ratio\ for\ Systems\ where\ MHI \leq CPT = \frac{AR_{MHI} \times (HH_{MHI} - HH_{DP}) + AR_{DP} \times HH_{DP}}{HH_{MHI}}$$

While the composite affordability indicator for each system represents an improvement on using one screening indicator to represent a water system's potential affordability problems, the current metric is not without its limitations. Specifically, the composite affordability indicator has four types of error that OEHHA identified and attempted to mitigate. First, individual census estimates were evaluated for reliability and an exclusion criterion applied (Appendix B3.4.1 Data Reliability in Census Data), but only for systems falling within one block group. Census data reliability improves through the use of geographic aggregation (i.e. multiple block groups combined) as well as the use of percentages as opposed to absolute numbers. However, OEHHA did not evaluate error for areal-household weighted census estimates in water systems with more than one block group. Future work is needed to assess the potential unreliability of these estimates.

Second, due to the methodology to assign census data to water systems discussed in Appendix B2.3.2 Limitations of Approach, the underlying data does not reflect a full representation of each system but rather an approximation. For example, while the proportion of households below the median household income within a water system is, on average, 50%, this is not always the case. This is likely due in part to the methodology assigning census data to water systems, which takes a weighted average of median incomes from the block groups that make up the water system. This is not a true median, and as such, will not always reflect 50% of the population. Of 1,158 systems in the affordability study, the average percentage of households below the estimated median income level is 50.7% with a standard deviation of 3.9%. Household estimates (e.g. HH_{CPT}) are best used as proportions of households at the different income levels, rather than the absolute number of households.

Third, household indexes may under-estimate the actual number of households facing poverty levels. This is largely because census income brackets are based on total income, whereas CPT and DP are estimates of disposable income. At such low-income levels, it is likely that gross and disposable income are relatively similar–but OEHHA does not evaluate this. As such the composite affordability indicator may under-estimate the average household affordability challenge within a water system.

Finally, the composite ratio reflects a weighted average affordability indicator for households living below the median income level of the water system. However, the average is based on three specific income levels which makes the average more specific than choosing one income to represent affordability, but coarser than a household weighted average that considers many income levels.

OEHHA will continue to investigate ways to improve and build upon and improve the methodology and data reliability concerns in future versions of the report.

(END OF ATTACHMENT B)

JOINT APPENDIX R

Decision 13-05-011 May 9, 2013

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the matter of the Application of the Golden State Water Company (U 133 W) for an order authorizing it to increase rates for water service by $58,053,200 or 21.4% in 2013, by $8,926,200 or 2.7% in 2014; and by $10,819,600 or 3.2% in 2015.	Application 11-07-017 (Filed July 21, 2011)

(See Attachment 1 for Appearances)

DECISION ON THE 2011 GENERAL RATE CASE FOR GOLDEN STATE WATER COMPANY

applicants in each upcoming GRC proceeding to provide testimony that, at a minimum, addresses the following WRAM Options[96]:

Option 1: Should the Commission adopt a Monterey-style WRAM rather than the existing full WRAM?[97]

Option 2: Should the Commission adopt a mechanism that bands the level of recovery, or refund, of account balances based on the relative size of the account balance.[98]

Option 3: Should the Commission place WRAM/MCBA surcharges only on higher tiered volumes of usage, thereby benefiting customers who have usage only in Tier 1 or have reduced their usage in the higher tier levels?

Option 4: Should the Commission eliminate the WRAM mechanism?

Option 5: Should the Commission move all customer classes to increasing block rate design and extend the WRAM/MCBA mechanisms to these classes?

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[96] D.12-04-048 authorizes the ALJ in this proceeding, among others, to require testimony on the WRAM Options as a part of the review of the WRAM and MCBA mechanisms. Pursuant to D.12-04-048, the WRAM Options were considered in this proceeding as part of the review of Golden State's conservation rate pilot programs. Golden State, DRA, and TURN submitted supplemental testimony on the WRAM Options.

[97] The Monterey-style WRAM is not a revenue decoupling mechanism as such, it is rather a revenue adjustment mechanism that allows the utility to true-up the revenue it actually recovers under its conservation rate design with the revenue it would have collected if it had an equivalent uniform rate design at actual sales levels.

[98] For example, an annual WRAM/MCBA under-collection/over-collection less than 5 percent of the last authorized revenue requirement would be amortized to provide 100 percent recovery/refund, balances between 5-10 percent would be amortized to provide only 90 percent recovery/refund, and balances over 10 percent would be amortized to provide only 80 percent recovery/refund.

developed and acknowledged that, under a worst case scenario in which no WAF payments materialized, ratepayers would pay all litigation costs.

72. The WRAMs/MCBAs established for Golden State are functioning as intended because the WRAMs/MCBAs have severed the relationship between sales and revenues and, as a result, have removed most disincentives for Golden State to implement conservation rates and conservation programs.

73. The cost savings resulting from conservation are being passed on to ratepayers because cost savings associated with purchased water, purchased power, and pump taxes (i.e. MCBA over-collections) are being properly returned to ratepayers; and increases in total costs associated with these items are passed through to ratepayers.

74. It is not possible at this time to determine how much of the reduction in water consumption is the result of conservation rates and conservation programs, and how much is due to other factors such as weather or economic conditions.

75. During the time that Golden State's conservation programs have been in effect, the consumption forecasting methodology set forth in the Revised Rate Case Plan adopted in D.07-05-062 has led to significant over-estimates of forecasted water consumption.

76. Large WRAM under-collections are the result of over-estimated sales forecasts but over-estimated sales forecasts result from underestimating reductions in consumption from factors such as weather, the economy, drought declarations, or conservation rates.

77. The sales forecasts must be improved in order to reduce WRAM balances.

78. Neither the Louisville Study nor the American Water Works Association publication describing the Louisville Study is part of the record, and as a result, the Commission is not able to determine if a study similar to the Louisville Study would provide the information needed to improve sales forecasts.

79. Because there is no information in the record on the cost to conduct a study similar to the Louisville Study, we are not able to determine if the benefits of a study similar to the Louisville Study are worth the costs.

80. During the time that Golden State's conservation rates have been in effect, the negotiated consumption forecasts have led to significant over-estimates of forecasted water consumption.

81. Using a more accurate sales forecasting methodology as a starting point could lead to improved negotiated forecasts.

82. A comparison of actual consumption under conservation rates to the forecasts developed with the current RRCP methodology and other methodologies agreed upon through negotiations will help the Commission better determine the reasonableness of future proposed forecasts.

83. We should consider modifications to existing tools that may improve the accuracy of consumption forecasts before undertaking a potentially costly study that has not been sufficiently specified.

84. Golden State should submit with its next rate case application an analysis comparing, beginning in 2007 through the period where then-current data is available, (1) the actual consumption by ratemaking area by year, (2) the consumption forecast by ratemaking area by year using the current RRCP

methodology, and (3) the consumption forecast by ratemaking area by year based on negotiations.[117] The analysis should compare the differences and percent difference between forecasts and actuals, and include graphs that display the comparisons.

85. Golden State and DRA should be required to meet to consider modifications to the RRCP's sales forecasting methodology that would improve the accuracy of Golden State's sales forecasts under conservation rates, and the estimated costs to implement any proposed modifications. In the next GRC, Golden State and DRA, jointly or separately, should be required to report on this effort, including a discussion of any recommended modifications to the RRCP's sales forecasting methodology or the limitations that prevent improvements to the methodology.

86. Any potential modifications to the sales forecasting methodology discussed in this decision that may be proposed by parties in the next GRC should apply only to Golden State.

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[117] The stipulation adopted by D.08-01-043 states that the parties used the five-year average to forecast sales for all classes except residential and commercial and that DRA accepted Golden State's estimate for all classes in all Region I areas except for residential and commercial classes in Arden Cordova, Clearlake, Santa Maria and Simi Valley, which were settled after several discussions.

The settlement adopted by D.10-12-059 states that the parties used the RRCP methodology to forecast sales for Clearlake, and used actual 2009 sales to forecast residential and commercial sales in the other Region I ratemaking areas.

The settlement adopted by D.10-11-035 for Regions II and III does not identify the methodologies used to develop the negotiated forecast but states that the parties updated their respective models using the most recent weather and consumption data then settled on water consumption.

87. Other utilities have not yet reviewed the WRAM Options in their GRCs, as required by D.12-04-048, and, therefore, it is premature to address this issue on an industry-wide basis.

88. Because the WRAMs/MCBAs established for Golden State are functioning as intended, none of the WRAM Options set forth in D.12-04-048 should be adopted at this time.

89. None of the WRAM Options address the inaccurate forecasts that are resulting in large WRAM balances.

90. Adoption of WRAM Options 1, 2, or 4 would tie sales to revenues, and, as a result, would discourage Golden State from offering conservation rates and conservation programs, and undermine efforts to reduce water consumption in the state.

91. WRAM Option 3, TURN's proposal to limit the WRAM surcharge to Tiers 2 and 3, and TURN's proposal for an inclining WRAM surcharge should not be adopted because they would result in even larger WRAM surcharges on customers that exceed Tier 1 usage.

92. WRAM Option 5 should not be adopted because, except for non-general metered customers, all customer classes currently have a WRAM, and there is not sufficient consumption data for non-general metered customers.

93. Golden State has made progress in reducing water losses. Therefore, it is not necessary at this time to consider removing unaccounted for water expenses from the MCBA or to establish a penalty/reward mechanism in connection with unaccounted for water.

94. Golden State has been responsive in correcting violations of the California Department of Public Health's drinking water regulatory program, and compliant with reporting to its customers in its annual Consumer Confidence

JOINT APPENDIX S

IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

CALIFORNIA WATER ASSOCIATION
Petitioner,

v.

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Respondent.

Decisions Nos. 20-08-047 and 21-09-047

Of the Public Utilities Commission of the State of California

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Exhibit O

Comments of California Water Association Responding to Administrative Law Judge's September 4, 2019 Ruling (September 16, 2021)

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**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low-Income Customers of Investor-Owned Water Utilities, and Affordability.	Rulemaking 17-06-024 (Filed June 29, 2017)

COMMENTS OF CALIFORNIA WATER ASSOCIATION RESPONDING TO ADMINISTRATIVE LAW JUDGE'S SEPTEMBER 4, 2019 RULING

John K. Hawks
Executive Director
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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low-Income Customers of Investor-Owned Water Utilities, and Affordability.	Rulemaking 17-06-024 (Filed June 29, 2017)

COMMENTS OF CALIFORNIA WATER ASSOCIATION RESPONDING TO ADMINISTRATIVE LAW JUDGE'S SEPTEMBER 4, 2019 RULING

In accordance with the *Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Responses to Additional Questions* issued on June 21, 2019 ("Ruling"), California Water Association ("CWA") hereby submits these comments on the accompanying Staff Report and its responses to the questions posed in the Ruling. As directed by the Ruling, CWA has considered the information set out in the *Public Review Draft, Achieving the Human Right to Water in California, an Assessment of the State's Community Water Systems* ("OEHHA Report") in answering the questions posed. CWA makes this filing as a party to this proceeding, and on behalf of the Class A water utilities named as respondents.[1]

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[1] The Class A water utilities named as respondents to this proceeding are as follows: California Water Service Company, California-American Water Company, Golden State Water Company, Great Oaks Water Company, Liberty Utilities (Apple Valley Ranchos Water) Corp., Liberty Utilities (Park Water) Corp., San Gabriel Valley Water Company, San Jose Water Company, and Suburban Water Systems.

I. INTRODUCTION

CWA is a statewide association representing the interests of investor-owned water utilities subject to the Commission's jurisdiction that serve reliable, high-quality drinking water to nearly 6 million Californians. CWA has actively participated in this proceeding and again reiterates its appreciation for the Commission's continued commitment to ensuring that its policies and guidance in this subject area meet current challenges and conditions. CWA and CWA-member companies attended and actively participated in the August 2, 2019 workshop on the Low-Income Rate Assistance ("LIRA") programs, drought forecasting mechanisms, and consolidation of small water systems ("Workshop").

II. COMMENTS ON STAFF REPORT FOR AUGUST 2, 2019 WORKSHOP

The Staff Report summarizes the presentations and discussion during the August 2, 2019 Workshop. CWA appreciates having had the opportunity to present at that August workshop and hear from stakeholders in this proceeding. CWA offers the following recommendations to clarify certain parts of the Staff Report and to respond to points that were made during the workshop and noted in the Staff Report.

<u>CWA Comments on Summary of Panel 1: LIRA Programs</u>

- The Staff Report states that "some of the water systems are located in low-income areas and include up to 95% low-income households."[2] This statement should be clarified to explain that some of the water systems serve customer

[2] Staff Report, p. 2.

bases in which a large percentage of the customer base, as high as 95%, qualifies as low-income households.

- The Staff Report states that "[i]nstead of using a LIRA program for each utility, Del Oro proposes to use a statewide program to have a larger pool of participants to help achieve assistance for low-income customers."[3] CWA previously addressed challenges with smaller water systems implementing low-income customer assistance programs and suggested that a better solution would be for the Commission-approved programs to be replaced by a larger statewide program (including both investor-owned utilities and public agencies) that would spread the burden across a statewide pool of contributors.[4]
- The Staff Report states "Cal-Am explained that creating a dollar amount LIRA program could cause large variability with recovery costs."[5] CWA previously expressed this same concern and recommended that the Commission adopt a standardized monthly discount rate (*i.e.*, a percentage of the overall customer bill amount or a percentage of the monthly service charge) rather than a standardized dollar amount.[6]
- The Staff Report states "SWRCB stated that measuring the number of people in a household would be very difficult and might not yield correct results for the

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[3] *Id.*

[4] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), pp. 16-17.

[5] Staff Report, p. 3.

[6] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), p. 17.

affordability crisis."[7] CWA agrees with the State Water Resources Control Board's ("SWRCB") assessment of the challenge.[8]

- The Staff Report states "SWRCB proposed using an income-based approach as opposed to enumerating other expenses."[9] CWA agrees with this SWRCB recommendation.
- The Staff report outlines some of the arguments raised by the Public Advocates Office ("Cal PA") in opposition to consolidation.[10] CWA disagrees with these arguments and believes that they are shortsighted and misplaced. As previously explained, among the other benefits associated with consolidations, they allow larger utilities to offer low-income customer assistance programs to small customer bases for which such programs would not be sustainable on their own.[11]

<u>CWA Comments on Summary of Panel 2: Drought Forecasting Mechanisms</u>

- The Staff Report states "GSWC argued that while setting accurate forecasts is a top priority, it is futile to establish low forecasts if the intention is to be more accurate."[12] This should be clarified to explain simply that it does not make sense to establish very low sales or high sales forecasts if they are not likely to

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[7] Staff Report, p. 3.

[8] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), pp. 15-16.

[9] Staff Report, p. 3.

[10] Staff Report, p. 4.

[11] *Reply Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 17, 2019), pp. 13-14.

[12] Staff Report, p. 4.

be accurate. Instead, CWA emphasizes the need to be flexible with respect to the choice of forecasting method, focusing instead on the goal of achieving the most accurate sales forecast possible.

- The Staff Report states that "[a]djustments between the GRC years will assist in accuracy of the forecasts, as opposed to a steep increase in rates due to under-forecasting."[13] This should be clarified to explain that adjustments to the adopted sales within the GRC cycle will assist in generating the appropriate price signals – and therefore, appropriate rates, surcharges or surcredits within that GRC cycle – and will prevent a steep increase or decrease in future surcharges/surcredits and rates in the next GRC due to over or under-forecasting sales in the current GRC.
- The Staff Report summarizes the discussion by Golden State Water Company regarding the Sales Reconciliation Mechanism ("SRM") and Water Revenue Adjustment Mechanism ("WRAM").[14] However, the Staff Report fails to capture some of the nuances associated with those mechanisms, most notably the fact that they can go both ways and possibly return refunds to customers. CWA recommends that this paragraph be revised to the following:

> GSWC believes that the Sales Reconciliation Mechanisms (SRM) filed in conjunction with escalation filings are useful to adjust rates based on more accurate sales forecasts. In fact, GSWC submits its SRMs and escalation filings concurrently, which prevents multiple rate adjustments from appearing on customer bills. Based on the pilot SRM adopted by the CPUC in GSWC's 2014 GRC, the SRMs are triggered for the following year when a 10%

[13] Staff Report, p. 4.

[14] Staff Report, pp. 4-5.

> or greater difference between actual and forecasted sales is reached (the trigger is now at 5%, effective with GSWC's 2017 GRC decision). The adopted sales forecasts are adjusted by 50% of the difference. SRMs help rectify the inaccuracy of sales forecasts and by extension the rates charged to customers. Sometimes the balance in the Water Revenue Adjustment Mechanism (WRAM) is over-collected and money is refunded back to customers. Alternatively, when there is an under-collection, these previously approved revenues are recovered from customers. Use of the SRM helps to reduce the size of under- or over-collections in the WRAM.

- The Staff Report states "CWA stated that since the GRC process began, differences between forecasts from CalPA and IOUs have gotten smaller as they collaborate and reach agreements."[15] CWA stated during the workshop that this trend started after the WRAM was first implemented by water utilities (the GRC process began decades ago), so the words "WRAM implementation" should be substituted for "the GRC process" in the Staff report.
- The Staff Report states "Still, if government agencies wish to move toward a longer forecasting period (e.g. 5 or 10 years), there is an inherent difficulty, for no forecasting method can account for natural disasters or other fundamental changes."[16] The point CWA made was that the GRC process utilized by the Commission incorporates forecasts that are as many as five years out; thus, it is difficult to create forecasts with a high degree of accuracy. Additionally, forecasting methods are unable to account not only for natural disasters and

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[15] Staff Report, p. 5.

[16] *Id.*

drought, but also simply more variable and extreme weather events, which can just as dramatically affect water sales.

- The Staff Report also completely omits many of the factual statements made by CWA regarding the WRAM. First, CWA explained during the workshop that the WRAM helps the Commission further certain policy goals, such as conservation, low-income support and affordability. For the latter two, achieving the low-income support through low first-tier rates requires more revenue to be recovered in the upper tiers, which leads to more revenue instability, thus necessitating a WRAM. Second, it is necessary to note that Cal PA's assertions about the financial risk have been raised repeatedly over the last 10 years, and the Commission has rejected those assertions each and every time. Lastly, the WRAM itself does not make rates more or less affordable, since it is dealing with recovery of fixed cost amounts that have already been authorized to be recovered as just and reasonable, except to the extent that it helps the Commission pursue affordability programs. It should be noted that all of these points apply to companies without WRAMs, but who have Lost Revenue Memorandum Accounts and recover those balances when they reach Commission-approved thresholds.
- The Staff Report states that Cal PA claimed, without reference to any evidence or other basis, that "[w]hen WRAMs were introduced, they made the step filings more complex and as a result SRMs became more complex."[17] Contrary to Cal PA's claim, the calculation of the step increase was never affected by the

[17] Staff Report, p. 5.

implementation of the WRAM. Likewise, it is unclear what is meant by the WRAMs making SRMs "more complex." Cal PA's claims on this point are meritless and confusing and should be disregarded completely.

- The Staff Report summarizes Cal PA's argument that "[i]f there are mistakes in the capital budget, the IOUs are shifting the problem from the company to the customers by increasing rates."[18] If this is Cal PA's argument, it is factually incorrect. As stated by the Golden State Water Company representative during the workshop, the Pro Forma earnings test for escalation year step increases protects customers from rate increases if the adopted capital improvements have not been made.

CWA Comments on Summary of Panel 3: Consolidation of Small Water Systems

- The Staff Report states: "Currently IOUs file advice letters when acquiring Class C and D water systems for $5 million or less but need to file an application for obtaining a water system for more than $5 million."[19] This is not correct. The representative from California Water Association proposed this approach as a procedural improvement in order to remove the distinction between acquisitions of Commission-regulated water utilities and all other types of public water system acquisitions and to provide for a more expedited process for acquisitions of smaller, at-risk water systems either failing to provide safe, reliable drinking water to their customers or nearing the point where they will not be able to supply safe, reliable drinking water. This proposal was based on the current statutory

[18] *Id.*, p. 6.
[19] *Id.*, p. 7.

requirements set forth Section 851 of the Public Utilities Code, which requires an order from the Commission (hence, an application) when a Commission-regulated utility is disposing of equipment or property, or selling itself when the transaction is valued at more than $5 million. For the same transaction parameters, but at values of less than $5 million, an advice letter filing for Commission approval will suffice, unless the Commission determines that the transaction requires a more comprehensive review (at which time it can require an application). Furthermore, under the settlement agreement approved by the Commission in D.99-10-064, Commission-regulated utilities may also file an advice letter for approval of the purchase of an inadequately operated and maintained small water utility.[20] Finally, when a Commission-regulated utility acquires a publicly owned water system, it may file an advice letter to place rates into effect (Commission approval is not required for the acquisition itself).[21] As representatives for California-American Water Company and Del Oro Water Company explained at the workshop, utilities are often directed to file full applications for certain acquisitions, rather than being allowed to use the approved advice letter processes.

- The Staff Report states "Cal-Am agreed with the discussion topics from CWA and added that during the acquisitions of smaller systems, there is a need to improve and implement data requirements."[22] This incorrectly paraphrases what

[20] D.99-10-064, Appendix D, §3.02. "An 'inadequately operated and maintained small water utility' is any operation serving under 2,000 customers that is subject to an outstanding order of the Department of Health Services to implement improvement." *Id.*, Appendix D, §3.01.

[21] *Id.*, Appendix D, §§4.01-4.02.

[22] *Id.*

was stated at the workshop. The point made here was that there is a general need to make the process more efficient and improve the delays associated with the acquisition of smaller systems. With respect to data requirements, the representative of California-American Water concurred with CWA's recommendation that the Commission should establish a standard data request protocol for consolidation applications based upon the generally applicable data requests that it has observed in multiple proceedings before the Commission.[23] The Commission should not adopt the overbroad and often inapplicable set of requirements proposed by Cal PA, which was adapted from policies established by the Pennsylvania Public Utilities Commission under very different circumstances (i.e., for mergers or acquisitions of very large utilities).[24]

- The Staff Report states "Cal-Am discussed a need to have the Commission and the SWRCB collaborate and discuss the administration positions discussed in AB 2501 and SB 200." This is accurate and CWA concurs with the recommendation for collaboration, but suggests that the term "administration" used in the Staff Report be changed to "administrator" for clarity in order to match the terminology used in those bills.

III. RESPONSES TO QUESTIONS PRESENTED FOR PARTY COMMENT

CWA Response to Questions 1-3:

[23] *Reply Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 24, 2019), pp. 8-9.

[24] *Id.*, pp. 6-8.

1. **How should utilities incorporate drought-year sales into forecasted sales?**

2. **What weight should be assigned to drought-year sales in a forecast model?**

3. **Should the Commission adopt a specific sales forecasting model to be used in GRCs?**

In recent years, nearly all the large water utilities before the Commission have incorporated drought-year sales into their forecasted sales as part of their GRCs in some form or another. As outlined by CWA representatives during the August 2, 2019 workshop, sales forecasts based on the "New Committee Method" and other older forecasting methods have become less reliable as water utilities have sought to achieve advances towards meeting mandatory conservation goals. One reason for this is that the impacts of drought and the associated customer response can vary greatly not only between water utilities, but even between districts within the same company. For example, certain districts subject to water supply restrictions unrelated to weather or drought may be affected differently than other districts between drought and non-drought years.[25] Consequently, the manner in which a utility should incorporate drought-year sales into forecasted sales will necessarily vary from district to district, including with respect to the appropriate weight assigned to drought-years. The variability among customers in each district is not limited to drought either – utilities can face challenges associated with wildfires and other disasters that can greatly impact forecasted sales in certain regions, but leave others untouched. Therefore, the Commission should avoid imposing a specific sales forecasting model to be used in

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[25] *See, e.g.,* D.18-09-017, pp. 18-19 (describing restrictions on water supply imposed by the SWRCB for California-American Water Company's Monterey District).

GRCs for all utilities. Instead, utilities and other stakeholders should be directed to utilize the best tools and data available to collaboratively develop the most accurate forecasts **on a district-by-district basis**. Water supply and customer usage patterns are far from uniform across California and do not easily lend themselves to a rigid, pre-ordained approach.

Nonetheless, despite the best efforts of the Commission and stakeholders, no forecasting methodology can guarantee accuracy in light of drought, natural disasters, or other unforeseen events. Therefore, it is also imperative that the Commission allow utilities to utilize tools such as Sales Reconciliation Mechanisms to ensure that the effective rates continue to reflect actual conditions experienced through the attrition years of the GRC cycle.

CWA Response to Questions 4-5:

4. **How should a sales forecasting model incorporate revisions in codes and standards related to water efficiency?**

5. **How are penetration rates over time recognized in sales forecast models to account for changes to codes and standards related to water efficiency?**

Trends in water consumption attributable to changes in codes and standards relating to water use efficiency are difficult to discretely measure and typically occur gradually as infrastructure and consumer appliances and fixtures are upgraded over time. Therefore, except for changes in codes or standards that will cause an abrupt and drastic change in water consumption, the impact of most codes and standards changes will be adequately reflected in the historical water consumption data that underlies sales forecast models. Accordingly, the Commission generally does not need to provide for a discrete or express modification or adjustment in its sales forecast models to reflect changes in applicable codes or standards. Where abrupt and drastic changes are anticipated, these unique circumstances should be addressed on a case-by-case basis.

<u>CWA Response to Question 6:</u>

> **6. For utilities with a full Water Revenue Adjustment Mechanism (WRAM)/Modified Cost Balancing Account (MCBA), should the Commission consider converting to Monterey-style WRAM with an incremental cost balancing account? Should this consideration occur in the context of each utility's GRC?**

No, the Commission should **<u>not</u>** consider reverting full WRAM/Modified Cost Balancing Account ("MCBA") mechanism to Monterey-style WRAMs with incremental cost balancing accounts in this proceeding. As previously explained by CWA,[26] proposing to convert existing WRAMs, the balances of which have been decreasing steadily in recent years, to Monterey-style WRAMs in this rulemaking proceeding is a procedurally improper method for seeking to modify several final Commission Decisions and falls well outside the scope of this proceeding. These mechanisms do not have anything to do with providing assistance to low-income customers.

Despite the similarity in name, the Monterey-style WRAM does not fulfill the same purpose as the full WRAM/MCBA. Instead, the Monterey-style WRAM is only a rate design tool limited to mitigating the uncertainty associated with rate design changes (as opposed to uncertainty associated with utility revenue more generally). Additionally, the Monterey-style WRAM does not decouple sales from revenues and therefore fails to address the perverse incentive for water utilities to increase water sales and discount conservation efforts. Over time, for the majority of the Class A water utilities the

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[26] *Reply Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 24, 2019), pp. 2-3.

Commission has moved away from Monterey-style WRAMs and towards adoption of full WRAMs due to the shortcomings of the former. The full WRAM/MCBA mechanisms allow utilities to implement conservation rates and other policy initiatives of the Commission, without undermining their financial stability.

The Commission just recently affirmed this and other benefits associated with the full WRAM/MCBA mechanisms in D.16-12-026.[27] Therefore, the suggestion that the Commission should evaluate whether to revert such mechanisms back to Monterey-style WRAMs with incremental cost balancing accounts comes as an unwelcome surprise for CWA and its member water utilities. The goal should be to build upon the existing framework, not take a step backwards.

If, despite the reasons outlined above, the Commission nonetheless decides to consider reverting existing WRAM/MCBA mechanisms to Monterey-style WRAMs with incremental cost balancing accounts, it should consider doing so solely in the context of each utility's GRC. Each utility before the Commission faces widely varying circumstances and, accordingly, it would be inappropriate to broadly impose such a major change across the entire water utility sector. For such a change to be imposed against the request of the utility, it must be shown that the specific circumstances facing

[27] D.16-12-026, pp. 40-41 ("The MCBA accounts for lower costs associated with reduced water sales. With demand reduction, water utilities purchase less water from its purchased water sources, use less energy to pump water through the system, buy and use fewer chemicals to provide safe drinking water. Wholesale water costs have increased during the drought as competition for scarcer water supplies drove up prices. Pumping of groundwater increased for some water IOUs as they were unable to obtain purchased water when the SWRCB severely curtailed, and for a time ceased State Water Project deliveries. Reductions in water consumption did not always result in commensurate cost reductions for the water IOU, and the MCBA accounted for the cost effects. We conclude that, at this time, the WRAM mechanism should be maintained. There is a continuing need to provide an opportunity to collect the revenue requirement impacted by forecast uncertainty, the continued requirement for conservation, and potential for rationing or moratoria on new connections in some districts. These effects will render uncertainty in revenue collection and support the need for the WRAM mechanism to support sustainability and attract investment to California water IOUs during this drought period and beyond.").

the utility in question warrant such a change. In lieu of that showing, which cannot be made on a wholesale basis, the Commission should not consider reverting full WRAM/MCBAs to Monterey-style WRAM and incremental cost balancing accounts.

<u>CWA Response to Question 7:</u>

> **7. Should any amortizations required of the Monterey-style WRAM and incremental cost balancing accounts be done in the context of the GRC and attrition filings?**

As a preliminary matter, CWA understands this question to be directed as to Monterey-Style WRAMs and incremental cost balancing accounts specifically, as opposed to general full WRAM/MCBA mechanisms. The CPUC's required methodology for amortizing water utility balancing accounts is prescribed by Standard Practice U-27-W, Standard Practice for Processing Rate Offsets and Establishing and Amortizing Memorandum Accounts ("U-27-W"). U-27-W's prescribed method of amortization is uniform for all kinds of balancing accounts, including Monterey-style WRAMs and incremental cost balancing accounts. The procedure for amortizing balancing accounts is clearly stated, allowing amortization, in addition to GRCs, by advice letter:[28]

> 43. Reserve account amortization for Class A utilities will be part of the General Rate Case or may be by advice letter when the account over or under collection exceeds 2%, at the utility's option.

The existing disposition mechanisms and triggers for amortizing reserve accounts have been carefully tailored to balance the need to alleviate burgeoning cumulative under- and over-collections with the need to avoid an excessive number of

[28] Standard Practice U-27-W, p.10

rate changes over a short period of time. In proposing the manner in which the amortizations of balances in those types of accounts occur, each water utility must balance these same considerations in light of the circumstances the utility and its customers are facing. For example, the circumstances might warrant prompt amortization of a balance in the Monterey-style WRAM and incremental cost balancing account between a GRC and attrition filing. There is no basis for carving out Monterey-style WRAMs and incremental cost balancing accounts from U-27-W for more restrictive recovery treatment.

CWA Response to Questions 8-10:

8. **Should Tier 1 water usage for residential be standardized across all utilities to recognize a baseline amount of water for basic human needs?**

9. **Should water usage for basic human needs be based on daily per capital consumption levels specified in Water Code Section 10609.4 or some other standard or criteria?**

10. **To achieve affordability of water usage for basic human needs, should the rate for Tier 1 water usage be set based on the variable cost of the water (i.e., no fixed cost recovery should be included in Tier 1 rates)?**

As a preliminary matter, for the purposes of this proceeding, CWA refers to "Tier 1" water usage as the consumption-related rate at which customers are billed for a prescribed initial amount of water use. Customers who limit their water consumption to this tier typically pay the base service charge plus volumetric charges for Tier 1 usage.

As previously outlined, CWA believes that a baseline rate should be implemented as a uniform first tier rate rather than a flat fee.[29] The baseline quantity of water would

[29] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), pp. 14-15.

be billed at that first-tier rate. Setting the first-tier rate at a baseline level provides a "discounted" price, yet preserves the conservation signal intended to address drought conditions and promote water-efficient behaviors. While CWA recommends this general approach, CWA recommends against setting a standard rate for Tier 1 usage and against setting a standard breakpoint between Tier 1 and Tier 2 usage. The circumstances facing each utility within each of their districts varies greatly across the State – based on differences in climate, water supply availability and other factors. Therefore, the parameters of the baseline rate design for each utility should be based upon the actual conditions for the customers to whose water service it is to be applied.

Water Code Section 10609.4 sets forth a statewide standard for indoor residential water and was recently codified into law under Assembly Bill 1668 (2018, Friedman) ("AB 1668"). That section also sets forth a mechanism for the SWRCB and the Department of Water Resources to conduct studies and jointly recommend to the Legislature a standard for indoor residential water use in lieu of the numbers currently established in the statute.[30] However, AB 1668 was meant to establish "long-term standards for the efficient use of water" as a broad statewide policy goal.[31] As highlighted above, the actual customer water use habits for each water utility currently vary greatly between different parts of the State, even between districts of the same company. Therefore, it is appropriate to continue to establish the baseline water usage for basic human needs for rate design purposes based upon the current average usage at the district level.

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30 Water Code § 10609.4(b).

31 Assembly Bill 1668 (2018, Friedman), Legislative Counsel's Digest, available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1668.

Generally, with respect to "should the rate for Tier 1 water usage be set based on the variable cost of the water," doing so may present practical challenges. Most important, such a rule would necessarily require all of the fixed costs of utility service assigned for recovery in Tier 1 volumetric charges to then be recovered in the upper tiers. Not only will this potentially steep discount to a significant percentage of the utility's sales create substantial volatility and instability in the recovery of approved revenues, as usage in the higher tiers may not allow for full recovery, but also this approach effectively creates a potentially excessive amount of costs to customers who happen to require usage in the higher tiers. CWA recalls the difficult lessons learned from the Commission's experience with water Lifeline rates in the 1970s and 1980s.[32]

CWA recommends that the Commission allow each utility the flexibility to design and propose rate design frameworks that are appropriate to the specific customer base in each district. The effectiveness of a water utility's rate design in providing a basic quantity of water at a low-income rate is best determined during each water utility's respective GRC process.

While the Commission should rightfully strive to set forth general principles and goals for the utilities to achieve in this proceeding, many of the details of implementation are going to depend on the specific circumstances for each utility district and so should be addressed on a district-by-district basis. This will require a careful and nuanced approach.

<u>CWA Response to Question 11:</u>

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[32] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), pp. 13-14; D.86-05-064, pp. 8-9 (providing history of Lifeline rates for water).

11. Should individual household budgets be developed for setting Tier 1 usage or should the average household size in the ratemaking area be the basis for establishing Tier 1 usage, and if so, how would large-size households be protected from high water bills?

As previously outlined, CWA recommends that if the Commission establishes a specific baseline quantity of water at a low-cost, it should be consumption-based rather than based on household size.[33] CWA has raised grave concerns regarding the gathering, verification, and enforcement of information on the number of people residing in a customer household. A low-income customer assistance program based upon a water utility verification of household size for purposes of determining a water use budget would be burdensome, extremely complex and very difficult to administer. Policing the number of residents in a household goes well beyond the scope of what a water utility does as a part of its routine operations. Moreover, there is no effective manner of policing a system based on people in a household without infringing upon the privacy of customers. Unlike other examples of public agencies that may have access to sources of information such as customer tax returns, Commission-regulated water utilities do not easily have access to such information (nor should such access be granted).[34]

Nonetheless, the question posed in the Ruling raises a real concern: how large-size households should be protected from high water bills. This issue is currently being studied as part of the AB 401 report. Therefore, more generally, CWA recommends

[33] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), p. 15.

[34] D.18-07-010, pp. 16-17.

that the Commission adopt an approach that is consistent with the approach ultimately adopted as policy for the State of California.

<u>CWA Response to Question 12:</u>

12. If the Commission adopts a uniform name for utility low-income programs, what should this name be?

As previously explained in this proceeding,[35] CWA recommends the Commission adopt the nomenclature used by the U.S. Environmental Protection Agency, the Water Research Foundation and water utilities in numerous other states: Customer Assistance Program.

Using this name better reflects the purpose of the program and avoids two immediate issues – the stigma associated with the phrase, "low income" and the unwarranted attention to rates. Use of the term "rates" in the name unnecessarily distracts from the underlying purpose of the program. Programs to enable households to better afford and pay water bills are driven not by rates, but by the incomes of the households requiring assistance. Rates charged by the Class A water utilities are reviewed and authorized by the Commission every three years. By law, those rates must be "just and reasonable,"[36] and in every Commission Decision authorizing rates, there is a specific finding that the rates are "just and reasonable." It is inappropriate to use the term "rates" or any iteration thereof in the name of a program that does not address "rates."

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[35] *Opening Comments of California Water Association on Order Instituting Rulemaking* (August 21, 2017), pp. 6-7.

[36] Public Utilities Code §451.

The real purpose of low-income assistance programs is to assist those households that have trouble meeting essential living expenses, of which water is just one. Accordingly, CWA considers the word "customer" to be the more accurate reference. It is the customer who is being assisted, not the rate itself. Additionally, the term "customers" rather than "ratepayers" better describes the true goal of the programs – to help customers who need broader access to existing or new social welfare programs designed to assist them in paying their bills.

CWA Response to Questions 13-14:

> **13. How should a pilot program be designed that provides a low-income benefit to water users who are not customers of the utility in multi-family buildings?**
>
> **14. What mechanism in the pilot program design (Question 13) will ensure that the low-income benefits flow to the benefit of the water user as opposed to the utility customer?**

CWA generally supports the Commission allowing small-scale pilot programs upon the request of a water utility in circumstances where the utility has determined that it would be appropriate to provide discounted bills to master-metered low-income housing facilities under certain conditions. However, as previously explained in this proceeding,[37] CWA does not think it would be effective or enforceable to give discounts to master-meter customers with a requirement that those benefits be passed on to low-income tenants living in those multi-family properties. The challenges of administering and adjudicating landlord-tenant relationships go well beyond the service responsibilities and capabilities of water utilities. Additionally, the cost of implementing

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[37] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), p. 7.

complete sub-metering in all those multi-family properties would likely dwarf the potential savings from any low-income customer assistance program.

Previously, CWA suggested that the water customer assistance benefit could potentially be delivered through a tenant's energy bill in those instances where the same user is individually metered or sub-metered by the energy utility.[38] This idea was also evaluated in the State Water Resources Control Board's *Options for Implementation of a Statewide Low-Income Water Rate Assistance Program Report* issued January 3, 2019 ("AB 401 Draft Report").[39] However, several energy utilities have raised serious concerns and major programmatic challenges with that proposal, which were recently outlined in the comments and reply comments filed by those parties in this proceeding.[40]

Therefore, CWA now recommends that the water customer assistance benefit be delivered through a specific program established through new legislation or through an existing state-administered assistance program. CWA concurs with the suggestion by SDG&E and SoCalGas that the CalFresh program may be the best existing option to distribute customer assistance benefits due to there being a current mechanism to deliver benefits to tenants and an existing state agency with considerable experience

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[38] *Id.*

[39] *Options for Implementation of a Statewide Low-Income Water Rate Assistance Program* (January 3, 2019) ("Draft AB 401 Report"), p. 24.

[40] *Joint Comments of San Diego Gas & Electric Company (U 902 M) and Southern California Gas Company (U 904 G) on Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Modifying the Procedure Schedule* (July 10, 2019); *Opening Comments of Pacific Gas and Electric Company on Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Modifying Proceeding Schedule* (July 10, 2019); *Reply Comments of Pacific Gas and Electric Company on Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Modifying Proceeding Schedule* (July 17, 2019).

managing such a program.[41] Thus, any potential pilot program should be designed to distribute benefits to tenants in multi-family buildings through CalFresh or one of the other existing programs suggested in the AB 401 Draft Report, as opposed to trying to provide benefits through water or energy bills.[42]

<u>CWA Response to Questions 15:</u>

> **15. Should a reporting mechanism be established to evaluate the success of current and future iterations of utility low-income programs in delivering affordable water service to low-income households? What metrics should be reported (e.g., rate of non-payment of monthly water bills by low-income customers, rate of service disconnection among low-income customers, number of late payments and or requests for payment plans among low-income customers, enrollment penetration among the population of eligible low-income households)**

As previously explained in this proceeding, the mechanisms currently in place are sufficient for monitoring the existing low-income water customer assistance programs.[43] Each Class A water utility with a customer assistance program provides information to the Commission regarding that program on a routine basis. Additionally, the administration and efficacy of the customer assistance programs of each individual Class A water utility are periodically reviewed as a part of each utility's General Rate Case proceeding. Also, the Commission's Low-Income Oversight Board, which includes a water utility representative, advises the Commission regarding low-income issues and serves as a liaison for low-income customers and representatives.

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[41] *Id.*, p. 3.

[42] Draft AB 401 Report, p. 25.

[43] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), pp. 20-21.

CWA Response to Questions 16

> **16. Should the Commission adopt a specific timeline, such as suggested by CWA, in processing water system consolidation requests by Commission-jurisdictional utilities?**

Yes. The Commission currently has specific timelines for processing water system consolidation requests by Commission-jurisdictional water utilities as set forth in D.99-10-064.[44] However, as previously highlighted by CWA,[45] these schedules are often ignored. It is currently taking much too long for customers to realize the benefits of a consolidation associated with safe and reliable water service, including access to the low-income assistance and conservation programs that support the main subject of this rulemaking proceeding. Timelier processing of authorizations for acquisitions consistent with the Commission-approved timelines under D.99-10-064 would greatly facilitate beneficial consolidation of at-risk water systems. CWA looks forward to working with the Commission and other parties at the upcoming workshop to develop a reasonable schedule for acquisition proceedings that will allow customers to realize the benefits of such transactions in a more timely and efficient manner.

CWA Response to Questions 17:

> **17. Are current utility affiliate transaction rules sufficient for utilities to take on the administration of failing water systems identified by the Water Board? If not, what changes to the rules are needed to**

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[44] D.99-10-064, Appendix D, pp. 4-6.

[45] *Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling* (July 10, 2019), p. 8.

facilitate utilities assuming an administrative oversight role for failing water systems?

The current affiliate transaction rules applicable to Commission jurisdictional water utilities[46] provide a sufficient baseline set of rules to allow for water utilities to take on the administration of failing water systems identified by the SWRCB. The failing water systems identified by the SWRCB each present different challenges that will be unique to the individual circumstances of that system. Accordingly, the Commission should allow its jurisdictional water utilities the flexibility to utilize the framework that is best suited to address the specific issues relevant to the troubled system.

For example, in some cases, it may make sense for a water utility to use a non-jurisdictional affiliate to take on administration of that system. In other cases, it may be more efficient for the water utility to directly take on administration of the system through non-tariffed products and services (NTP&S) using any excess capacity of resources.[47] The current affiliate transaction rules anticipate both scenarios and provide adequate safeguards and robust oversight components to protect utility ratepayers. To the extent that a different process is needed for individual circumstances of a troubled system that are not sufficiently addressed by the affiliate transaction rules, the Commission should address such scenarios on a case-by-case basis with the goal of facilitating the water utility's administration of the failing water systems.

CWA Response to Questions 18:

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[46] D.10-10-019, Appendix A (Rules for Water and Sewer Utilities Regarding Affiliate Transactions and the Use of Regulated Assets for Non-Tariffed Utility Services).

[47] *Id.*, pp. A-12 to A-15 (setting forth rules for "Provision of Non-tariffed Products and Services (NTP&S)").

18. Should the Commission's staff role in implementing recovery in rates for safe drinking water funding loans for utilities be changed or expanded?

The Commission previously analyzed this issue in proceeding R.04-09-002, which resulted in decision D.06-03-015 setting forth general rules to govern the receipt and use of state grant funds, including safe drinking water funding loans, for water utilities. The Commission currently evaluates requests for authorization for utilities to enter into safe drinking water funding loans and, in many cases, implement surcharges or other ratemaking mechanisms to pay for those loans. The Commission has found that such loans "provide a much lower cost of capital than either equity or other forms of debt."[48] In addition, the Commission has found that, in conjunction with its own oversight, the conditions set by the SWRCB for the safe drinking water funding loans "ensure proper accounting and handling of the loan proceeds and surcharges collected."[49] Thus, the Commission should strive to facilitate the use of such safe drinking water funding loans where possible.

Aside from recommending speedy approval of safe drinking water funding loan authorization requests, CWA does not have any specific concerns to raise here regarding the role of the staff in that process at the Commission. In many instances, however, it would be helpful for water utilities to have the assistance of Commission staff in interfacing with SWRCB staff through the application process and

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[48] Resolution W-5168, p. 8; *see also* D.08-09-002, p. 20 ("A zero or low interest SDWSRF loan, and the associated surcharge to repay it, is the least expensive and therefore most reasonable option for financing the construction of the Lucerne Treatment Plant."); D.05-01-048, p. 8 ("Because long-term borrowings under the SDWSRF generally represent a much lower interest rate than equity or other forms of debt, it is to the utility's advantage and that of its customers to avail itself of such funds.").

[49] Resolution W-5168, p. 8.

implementation of such loans. Having greater coordination between the two agencies and the utility enables everyone to work more efficiently and allows customers to have the benefits of this low-cost financing option.

IV. CONCLUSION

CWA appreciates having been afforded the opportunity to provide these comments on the Staff Report and in response to the questions posed in the Ruling.

Respectfully submitted,

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September 16, 2019

JOINT APPENDIX T

IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

CALIFORNIA WATER ASSOCIATION
Petitioner,

v.

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Respondent.

Decisions Nos. 20-08-047 and 21-09-047

Of the Public Utilities Commission of the State of California

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Exhibit N

Comments of the Public Advocates Office on the Water Division's Staff Report and Response to Additional Questions (September 16, 2019)
("September 16, 2019 PAO Comments")

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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low – Income Customers of Investor-Owned Water Utilities, and Affordability.	Rulemaking 17-06-024

COMMENTS OF THE PUBLIC ADVOCATES OFFICE ON THE WATER DIVISION'S STAFF REPORT AND RESPONSE TO ADDITIONAL QUESTIONS

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September 16, 2019

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I. INTRODUCTION

Pursuant to Administrative Law Judge (ALJ) Houck's *Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Responses to Additional Questions* (Ruling) issued on September 4, 2019, the Public Advocates Office at the California Public Utilities Commission submits these comments.

II. COMMENTS ON WATER DIVISION STAFF REPORT

The Water Division's Staff Report contains a number of inaccuracies regarding the Public Advocates Office's comments and positions at the August 2, 2019 Workshop. The responses to the ALJ's questions below provide the Public Advocates Office's positions for the topics associated with the Staff Report.

III. RESPONSES TO ADDITIONAL QUESTIONS

1. How should utilities incorporate drought-year sales into forecasted sales?

When a utility forecasts sales as a part of its General Rate Case (GRC) application, it should analyze historical trends and past sales. As a part of this process, the utility should take into account drought-year and non-drought-year sales. The Rate Case Plan for Class A Water Utilities provides for the standard forecasting methodology using the New Committee Method, and discounting drought-year sales.[1] Whether utilizing the New Committee Method or other forecasting methodologies, drought-year sales should not be discounted.

2. What weight should be assigned to drought-year sales in a forecast model?

It is appropriate for utilities to include the data from drought years when assessing historic data; however utilities should not provide additional weight to this data. The Commission already has mechanisms in place to ensure that, in the event of a drought or other instance where a utility suffers a water shortage, utilities are able to change existing rate structures, and track lost revenue from reduced sales due to conservation or

[1] D.07-05-062.

easier to examine forecasting and water use trends. The WRF report provides a variety of other useful suggestions in determining penetration rates over time for changes to codes and standards related to water efficiency.

6. For utilities with a full Water Revenue Adjustment Mechanism (WRAM)/Modified Cost Balancing Account (MCBA), should the Commission consider converting to Monterey-style WRAM with an incremental cost balancing account? Should this consideration occur in the context of each utility's GRC?

Yes. However, the Commission should provide the clear and unambiguous policy direction in this Rulemaking that utilities should convert full WRAMs to Monterey-style WRAMs. Implementation of this policy can then proceed efficiently in pending and future GRCs of all Class A water utilities.

More importantly, however, the Monterey-style WRAM is superior because it operates without transferring sales risk to ratepayers. Unlike Monterey-style WRAMs, the blunt operation of a full WRAM is incapable of distinguishing between the effects of conservation rate design and other impacts to utility revenue such as weather and general economic cycles. Since most revenue impacts are normal business risks for which investor-owned water utilities earn a commensurate return, it is inequitable for ratepayers to suffer such risk through operation of a full WRAM while utility shareholders realize the return.

7. Should any amortizations required of the Monterey-style WRAM and incremental cost balancing accounts be done in the context of the GRC and attrition filings?

Yes. In order to have Monterey-Style WRAM amortizations be consistent with amortization of other reserve accounts addressed on page 10 of Standard Practice U-27, the "amortization for Class A utilities will be part of the General Rate Case or may be by advice letter when the account over or under collection exceeds 2%, at the utility's option."

The above guidance from the Standard Practice balances the interest of maintaining the GRC as the venue for comprehensive assessment of cumulative rate

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BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low-Income Customers of Investor-Owned Water Utilities, and Affordability.

Rulemaking 17-06-024
(Filed June 29, 2017)

REPLY COMMENTS OF CALIFORNIA WATER ASSOCIATION RESPONDING TO ADMINISTRATIVE LAW JUDGE'S SEPTEMBER 4, 2019 RULING

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September 23, 2019

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I. REPLIES TO PUBLIC ADVOCATES OFFICE'S COMMENTS

1. The Commission should reject PAO's recommendation to order utilities to convert all WRAMs to Monterey-style WRAMs.

CWA vehemently disagrees with PAO's recommendation that "utilities should convert full [water revenue adjustment mechanisms ("WRAMs")] to Monterey-style WRAMs."[5] As outlined in CWA's opening comments on the Ruling, the reversion to Monterey-style WRAMs would be a step backwards that eliminates the benefits that full WRAMs offer in contrast to Monterey-style WRAMs.[6] The two mechanisms are very different and serve different purposes: the full WRAM is a **revenue** adjustment mechanism, based on the variance between adopted and actual sales; the Monterey WRAM is a **rate** adjustment mechanism, based on the variance between revenues yielded by tiered rates versus uniform rates — it has nothing to do with variances in sales. Accordingly, conflating the two in a rulemaking that should have no bearing on the rate design of Class A water companies beyond consideration of a baseline quantity rate is misguided.

PAO asserts that "the Monterey-style WRAM is superior because it operates without transferring sales risk to ratepayers."[7] This is false, because it mischaracterizes how the full WRAM works. The fact is that the WRAM reduces the risk of sales uncertainty affecting the utility's recovery of fixed costs without a shortfall or a windfall, while the absence of a WRAM (with or without a Monterey-style WRAM) leaves in place the risk of a shortfall or a windfall in fixed cost recovery due to actual sales variations from adopted sales quantities approved in a utility's general rate case. If "sales risk" is defined as the risk of a revenue requirement shortfall or windfall due to realized sales variations, then putting a WRAM in place reduces sales risk for

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[5] PAO Opening Comments, p. 5.

[6] *Comments of California Water Association Responding to Administrative Law Judge's September 4, 2019 Ruling* (September 16, 2019) ("CWA Opening Comments"), pp. 39-41.

[7] PAO Opening Comments, p. 5.

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IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

CALIFORNIA WATER ASSOCIATION
Petitioner,

v.

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Respondent.

Decisions Nos. 20-08-047 and 21-09-047

Of the Public Utilities Commission of the State of California

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Exhibit P

Reply Comments of the Public Advocates Office on the Water Division's Staff Report and Response to Additional Questions (September 23, 2019)
("September 23, 2019 PAO Comments")

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BEFORE THE PUBLIC UTILITIES COMMISSION
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REPLY COMMENTS OF THE PUBLIC ADVOCATES OFFICE ON THE WATER DIVISION'S STAFF REPORT AND RESPONSE TO ADDITIONAL QUESTIONS

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September 23, 2019

315022531

I. INTRODUCTION

Pursuant to Administrative Law Judge (ALJ) Houck's *Administrative Law Judge's Ruling Inviting Comments on Water Division Staff Report and Responses to Additional Questions* (Ruling) issued on September 4, 2019, the Public Advocates Office at the California Public Utilities Commission submits these reply comments.

II. THE COMMISSION SHOULD GIVE NO WEIGHT TO UNSUPPORTED CLAIMS BY THE CALIFORNIA WATER ASSOCIATION (CWA), AND SHOULD INSTEAD USE A DATA-DRIVEN PROCESS IN CONSIDERING POLICY CHANGES

In its September 16, 2019 Opening Comments, CWA makes various claims that are unsupported by any evidence or authority.

First, CWA states "adjustments to the adopted sales within the GRC cycle will assist in generating the appropriate price signals – and therefore, appropriate rates, surcharges or surcredits within that GRC cycle – and will prevent a steep increase or decrease in future surcharges/surcredits and rates in the next GRC due to over or under-forecasting sales in the current GRC."[1] However, CWA fails to provide any support for this claim. Adjustments to adopted sales within the GRC cycle will *only* generate appropriate price signals and prevent steep increases or decreases in future rates *if* the most recent year of recorded sales provide a more accurate sales forecast than the forecast generated in the GRC.[2] The forecast generated in a utility's GRC can (and should) take more variables into account than one year of past sales, and therefore can (and should) result in a more accurate forecast than the proposed adjustments within the GRC cycle.[3]

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[1] CWA Opening Comments at p. 5.

[2] For example, when the pilot Sales Reconciliation Mechanism (SRM) adopted in D. 14-08-011 (Ordering Paragraph 43, at p. 111) for California Water Company is triggered for any ratemaking area, the new sales forecast for that ratemaking area is changed for the following year to be equal to an average of the sales forecast adopted in the GRC (50% weight) and the sales from the prior year (50% weight). Therefore, 50% of the new sales forecast does not take any other variables into account except for the previous year's sales forecast. Other existing pilot SRMs operate in essentially the same manner.

[3] For a detailed recommendation of what sales forecasts should include, see the Public Advocates Office July 10, 2019 Comments on the ALJ Ruling Inviting Comments on Water Division Staff Report and Modifying Proceeding Schedule at pp. 9-10.

final decision for each utility's GRC authorizes yearly Step Filings via Advice Letter.[16] The Rate Case Plan provides the following example language for a sample Ordering Paragraph for escalation year increases: "An escalation advice letter, including workpapers, *may* be filed in accordance with General Order (GO) 96-B no later than 45 days prior to the first day of the escalation year." (emphasis added).[17] If the final decision utilizes the example language from the Rate Case Plan, the utility could choose to only file an advice letter for a Step Increase when it is not overearning, thereby ensuring that rates are only adjusted if the filing results in a rate increase, and avoiding filing if it would result in a rate decrease. Therefore, a utility with an SRM may not even have to perform a Pro Forma earning test each year. Altogether, CWA's claim that the existing Pro Forma earnings test protects customers from rate increases associated with an SRM is patently false.

The Commission should not allow utilities to utilize tools such as SRMs. CWA's arguments in support of SRMs are inaccurate and unsupported. However, in the event that the Commission decides to allow utilities to utilize tools such as SRMs, at a minimum the Commission should require an earnings test to ensure that rates are not increased when a utility is already overearning.

V. THE COMMISSION SHOULD DISREGARD CWA AND SCE'S INACCURATE AND MISLEADING ARGUMENTS IN SUPPORT OF WRAM

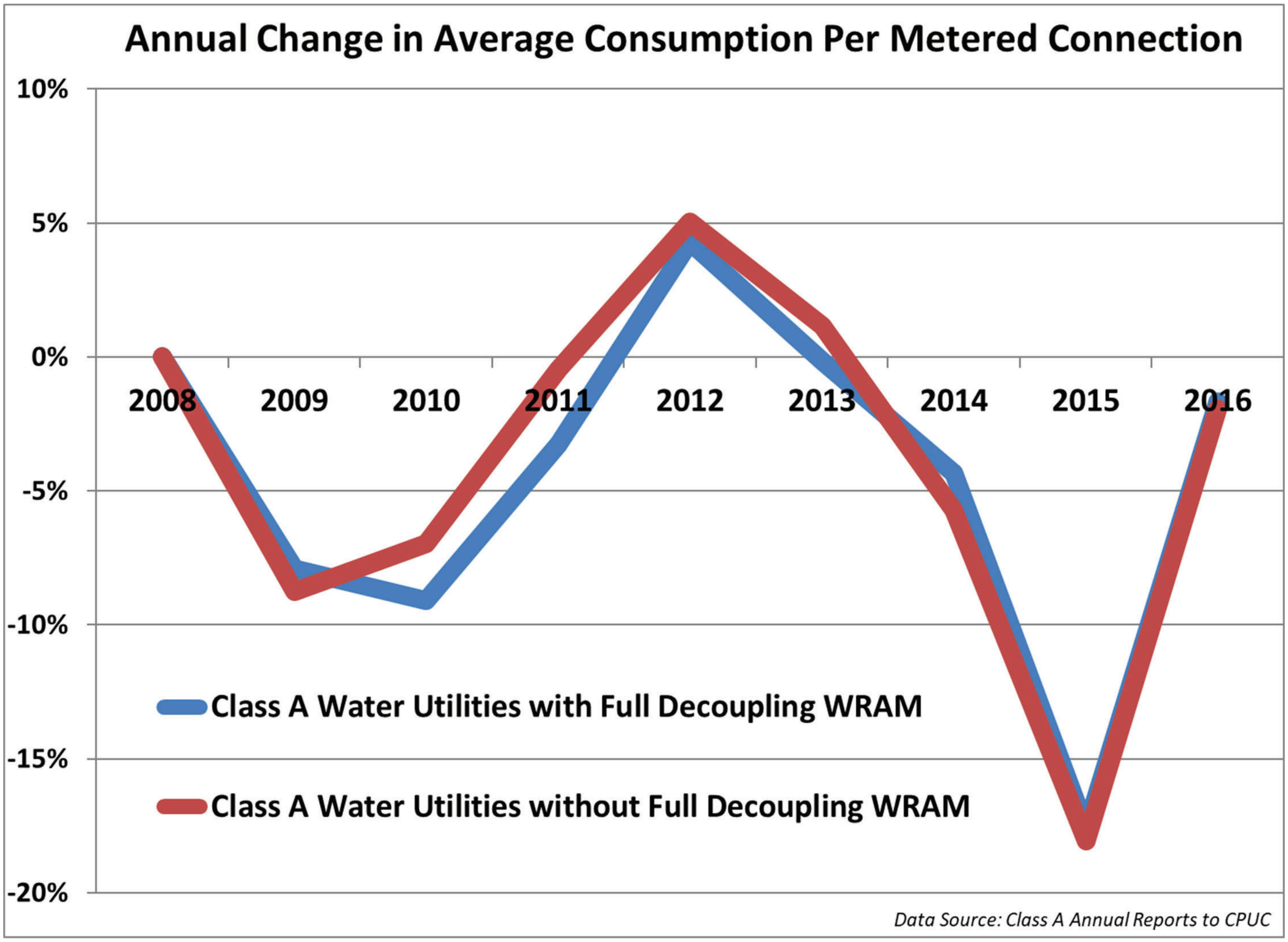
CWA claims in its Comments that "the Monterey-style WRAM does not decouple sales from revenues and therefore fails to address the perverse incentive for water utilities to increase water sales and discount conservation effort."[18] However, this statement is not supported by actual data. As shown by the graph below, water utilities with and without full decoupling WRAM have shown almost identical trends in annual sales

[16] Appendix A to D. 07-05-062 states at p. A-13: "In addition to relevant issues raised in the proceeding, each decision...unless deviation is otherwise expressly justified in the decision, shall include standard ordering paragraphs providing for escalation year increases subject to an earnings test.

[17] Ibid, at footnote 4.

[18] CWA Comments at p. 13.

fluctuations. CWA's claim that the Monterey-style WRAM (or lack of a full decoupling mechanism) adversely affects conservation efforts is contradicted by a simple examination of Class A water utilities' Annual Reports to the Commission.



CWA also incorrectly states that "the WRAM itself does not make rates more or less affordable."[19] Southern California Edison Company (SCE) similarly argues that WRAMs "permit the utilities to collect the authorized revenue requirement to invest in infrastructure and conservation programs while passing along savings in volume-related production expense to customers."[20] These statements are misleading. WRAM provides

[19] CWA Opening Comments at p. 7.

[20] SCE Opening Comments at p. 5.

a guaranteed recovery of nearly the entire authorized revenue requirement, and the authorized revenue requirement includes the utilities' profits, or authorized rates of return. Therefore, WRAM shifts a significant portion of the risk of a utility earning authorized profits to customers, without adjusting rates of return for this reduced risk. Consequently, WRAM can in fact have a significant impact on affordability.

Furthermore, contrary to CWA's assertion that WRAM is dealing with fixed cost amounts that have already been authorized to be recovered, the WRAM actually tracks *estimated* fixed costs. If estimated fixed costs do not materialize—as is common when a utility underspends authorized capital budgets—the WRAM is incapable of detecting this variance. For customers, this adds insult to injury since WRAM surcharges are then added to bills not only for sales that did not occur but for costs that did not occur either. Thus, there should be little surprise at the widespread dissatisfaction with WRAM amongst all but the utilities who unreasonably profit from their existence.

The Commission should disregard CWA and SCE's inaccurate and misleading statements in support of WRAM and should end the experiment with full revenue decoupling for water utilities.

VI. CONCLUSION

The Public Advocates Office appreciates the opportunity to respond to the comments of other parties to this proceeding, and respectfully requests that the Commission adopt its recommendations.

Respectfully submitted,

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September 23, 2019

JOINT APPENDIX W

IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

CALIFORNIA-AMERICAN WATER COMPANY
Petitioner,

v.

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Respondent.

Decision Nos. 20-08-047 and 21-09-047

Of the Public Utilities Commission of the State of California

EXHIBIT O

Comments of California-American Water Company on the Proposed Decision of Commissioner Guzman Aceves, R.17-06-024, July 27, 2020

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BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low – Income Customers of Investor-Owned Water Utilities, and Affordability.	R.17-06-024

COMMENTS OF CALIFORNIA-AMERICAN WATER COMPANY ON THE PROPOSED DECISION OF COMMISSIONER GUZMAN ACEVES

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July 27, 2020

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INDEX OF RECOMMENDED CHANGES

The California Public Utilities Commission (CPUC) should not eliminate the decoupling water revenue adjustment mechanism/modified cost balancing account (WRAM/MCBA).

- The issue of elimination of the WRAM/MCBA is outside the scope of the proceeding and was never explicitly identified in the scoping memos. If the CPUC intends to address this issue, it should do so in a separate proceeding that would provide parties, particularly those interested in conservation issues, a fair and full opportunity to participate.
- The Monterey-style WRAM (M-WRAM) does not provide the same benefits as the decoupling WRAM/MCBA. The M-WRAM does not address revenue fluctuation due to changes in customer usage. The M-WRAM is therefore not compatible with steeply tiered rate designs that target high-use customers.
- The necessary rate design changes resulting from elimination of the decoupling WRAM/MCBA would negatively impact low-income customers and efficient water users by increasing overall rates, while conversely providing a price break to customers with the highest usage. This would be a significant shift in cost recovery from low-income customers and would result in an ongoing burden.
- The record in this proceeding on the conservation impact of the decoupling WRAM/MCBA is incomplete and ignores the significant conservation achievements of the utilities with WRAM/MCBAs. As CAW's analysis demonstrates, the transition to a less steeply tiered rate design will weaken price signals to high-use customers, likely leading to increased consumption.

The low-income pilot program should be based on Advice Letter (AL) 1221.

- AL 1221 proposed to provide discounted water rates to low-income housing providers.
- Legal, administrative, and institutional obstacles prevent CAW from providing benefits directly to low-income non-customers.

The CPUC should modify the consolidation minimum data requirements (MDRs) to maintain the incentive to pursue such transactions.

- The MDRs should reflect California legal and regulatory requirements.
- The MDRs should not be unduly burdensome and should make the consolidation process and efficient and effective as possible.

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I. INTRODUCTION

Pursuant to Rule 14.3 of the Rules of Practice and Procedure of the California Public Utilities Commission (CPUC),[1] California-American Water Company (CAW) submits these comments on the *Proposed Decision of Commissioner Guzman Aceves* (PD).

CAW supports the CPUC's efforts to provide assistance to low-income customers and ensure affordability of water service. CAW has a long history of providing support to low-income customers, including establishing one of the first water low-income assistance programs in 1996,[2] and most recently, by its innovative proposal to provide rate relief and assure the viability of low-income housing providers.[3] CAW is concerned, however, that this proceeding, which began as an examination of the low-income support programs of CPUC-regulated water utilities, has gone dangerously astray.

While well-intentioned, the PD is procedurally deficient, mischaracterizes key concepts, and is based on an inadequate record. **Instead of providing assistance and support to low-income water customers, the PD, if adopted, will result in increased rates for CAW's most economically vulnerable customers, while conversely, providing a benefit to high-volume water users in CAW's wealthiest communities**. This would not be a one-time impact – making this change would result in the largest shift of costs to low-income customers in years. Adoption of the PD would also undermine critical conservation efforts by eliminating the water revenue adjustment mechanism/modified cost balancing account (WRAM/MCBA), one of the most effective conservation tools for CPUC-regulated water utilities. The PD also makes substantial errors in law and fact with respect to the pilot program for low-income multi-family housing and recommends unworkable and burdensome reporting requirements for consolidation applications. CAW respectfully requests that the CPUC modify the PD as forth in Attachment A to these comments.[4]

At a time when Californians are facing significant challenges due to the economic effects of the COVID-19 emergency, as well as experiencing impacts from climate change such as increased temperatures, wildfires, sea level rise, and threat of drought, the CPUC should not take action that will

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[1] Due to issues related to service of the PD, assigned Administrative Judge Haga confirmed via email on July 6, 2020 that the deadline for opening comments is July 27, 2020 and the deadline for reply comments is August 3, 2020.
[2] D.96-12-005, p. 9.
[3] *See* Attachment B, CAW Advice Letter 1221, submitted January 18, 2019 and rejected June 7, 2019.
[4] CAW also generally supports the comments filed by the other WRAM/MCBA companies (California Water Service Company, Golden State Water Company, and Liberty Utilities Corp.) and the California Water Association.

render low-income customers even more vulnerable.[5] CAW urges the CPUC to take the time to conduct a thorough and comprehensive review of the relevant issues in order to avoid placing greater financial stress on millions of Californians.

II. ELIMINATION OF THE WRAM/MCBA WILL INCREASE RATES FOR CAW'S MOST VULNERABLE CUSTOMERS AND DISCOURAGE CONSERVATION

The PD recommends that the WRAM/MCBA be eliminated and that the four Class A water utilities with decoupling WRAM/MCBAs transition to what is known as a Monterey-style WRAM (M-WRAM) in their next general rate cases.[6] CAW's current rate designs were developed to be compatible with the decoupling WRAM/MCBA, and are collectively the most conservation-oriented rate design of any CPUC-regulated water company.[7] The PD fails to consider the impact on customers if the utilities with decoupling WRAM/MCBA rate designs transition to M-WRAM style rate designs.

In most of its districts, California American Water's current rate designs include four rate tiers, with steep differentials between the tiers and a low percentage of fixed cost recovered through the meter charge. The rates in the upper tiers are significantly higher in order to target high-volume water users. The rate design in CAW's Monterey District is even more aggressive, with five rate tiers and a spread between tier 1 and 5 of 800%. For the majority of our customers, the percentage of revenue recovered through the monthly service charge ranges from a low of 10% to a high of 27%, far lower than the standard rate design of 50%. No matter how well forecasted, revenue from these types of rate designs will always be volatile. With higher rates in upper tiers, even small changes in water usage result in large changes in revenue collection. The CPUC has recognized this, noting that for CAW's Monterey District, "revenue recovery has been particularly volatile given the high rates in the upper tiers."[8]

Because this volatility cannot be fully addressed through improved forecasting, this type of highly aggressive targeted rate design is only possible where sales have been decoupled from revenue. As discussed in more detail below, the M-WRAM is incompatible with most of CAW's current rate designs. While the non-WRAM utilities also have tiered conservation rate designs, those rates designs generally tend to have fewer tiers, less substantial differentials between the tiers, and recover a larger portion of

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[5] The CPUC recently noted, "While ensuring the affordability of utility services is a longstanding priority for the Commission, its importance has been magnified this year by COVID-19, which has placed great financial stress on millions of Californians." D.20-07-032, p. 3.
[6] PD, pp. 47-57.
[7] The current four-tier rate design for most CAW districts was initially adopted through the a settlement between California American Water, Natural Resources Defense Council, Division of Ratepayer Advocates and The Utility Reform Network. D.12-11-006, p. 4.
[8] D.16-12-003, p. 48.

revenue through the monthly service charge.

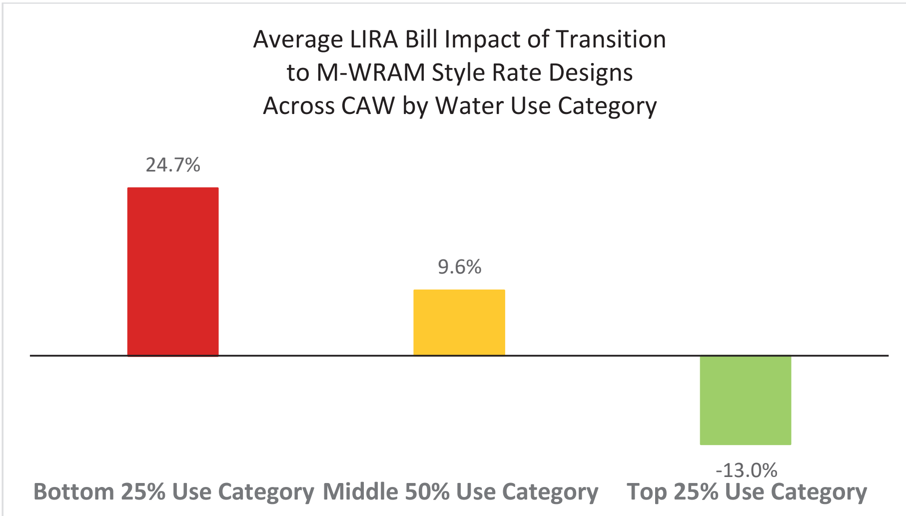
Without the decoupling WRAM/MCBA, CAW would have to modify its rate designs to reduce revenue instability, and so that they more closely resemble the rate designs of the M-WRAM utilities. While the details of the transition from the WRAM/MCBA would be addressed in CAW's next GRC, certain rate design changes would be necessary and unavoidable. **This transition would inevitably lead to rate increases for low-income customers and rate decreases for customers who use the most water.**

With the decoupling WRAM/MCBA, CAW would have to modify its rate designs to capture more revenue in the fixed monthly service charge. CAW would likely have to increase the meter charge by 1.5 to 2.0 times in districts to stabilize recovery. This is in keeping with the rate designs currently in effect for Class A water utilities without WRAM/MCBAs. All customers, including customers enrolled in CAW's low-income support program, must pay the monthly service charge. Therefore, the necessary increased recovery through the service charge will inevitably lead to higher bills for low-income customers.

CAW would also have to reduce the number of rate tiers, since having more tiers and higher rates in the top tiers increases revenue instability. CAW currently has a five-tier rate design in its Monterey District and four-tier rate designs in most of its other districts. Without the decoupling WRAM/MCBA, CAW would need to transition to two or three-tier rate designs similar to the M-WRAM utilities. CAW would also have to decrease or "flatten" the differentials between the rate tiers. Under such a design, the rates per unit in the lowers tiers would increase as compared to current rate designs.

In preparation for these comments, CAW analyzed the customer rate impact of a transition to M-WRAM style rate designs. The graph below shows that transitioning from CAW's current rate designs to M-WRAM style rate designs would have a substantially negative impact on low-income customers.[9] The average low-income customer under an M-WRAM rate design across CAW's service divisions would see their bill increase by 25% if they consume in the bottom 25% use category or 10% if they consume in the middle 50% use category.

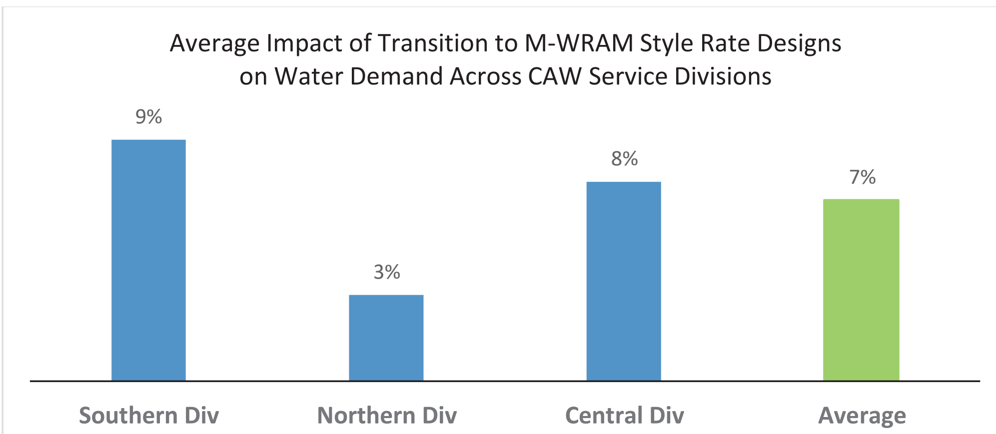
[9] Average effect on CAW LIRA customers of rate designs used by Suburban, San Jose Water, Great Oaks, and San Gabriel, on customer water bills (based on 2020 authorized revenue requirement for Cal-Am and 2019 customer water use).



The graph below demonstrates the change in bills for a sample district under the rate designs of the M-WRAM utilities. It shows that the low use and low-income customers will experience the largest percentage bill increases, while those that consume the most water will see the largest bill decreases.

This graph shows that transition from CAW's current rate designs to M-WRAM style rate designs would increase rates for customers with the most efficient water use and reduce rates for customers with the highest consumption. Moreover, while there are some exceptions, customers with the highest consumption levels tend to be located in wealthier communities (usually because of the link between lot size and consumption) and many customers with low consumption are located in economically disadvantaged communities.[10] Therefore, **CAW's wealthiest customers will likely be the biggest beneficiaries of the transition from CAW's current rate designs to M-WRAM rate designs**.

CAW is also concerned that transitioning to an M-WRAM style rate design, which will lessen the financial consequences for high water-use customers, will lead to increased consumption. The graph below shows the projected consumption impact of the transition by CAW Division and across the state.[11] Statewide water use is projected to increase by 7%, with higher use customer demand growing at much higher rates. **In Monterey, the pricing signals conveyed by an M-WRAM style rate design would push demand higher by 8%, resulting in water consumption in excess of the limits established by the State Water Resources Control Board (SWRCB). This would force the Monterey Peninsula into rationing and likely result in significant customer fines and penalties by the SWRCB.**



CAW's ability to maintain consumption within legal limits in the Monterey District will be substantially impaired without its aggressive rate design, which, as discussed below, is only workable in conjunction with the WRAM/MCBA. The CPUC has previously recognized the implications of failure to comply with the SWRCB orders. "The consequences would include increasingly burdensome conservation

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[10] For example, LIRA customers in the Ventura or San Marino Districts, consuming at the 25th percentile would see a 50% increase in their bills, while customers in these districts that consume at the 99th percentile would see a 40% reduction. In the Monterey District, a customer in the 99th percentile would receive a bill decrease of 52% from $528 to $276 per month.

[11] Average effect to water demand in CAW's Divisions and Statewide of the transition to an M-WRAM style rate design based on an average of those used by Suburban, San Jose Water, Great Oaks, and San Gabriel (based on 2019 customer water use).

measures almost certainly followed by rationing. There would be little to no opportunity for the Monterey Peninsula to return to normal economic conditions, nor could local agencies achieve their plan goals for moderate growth."[12] While CAW is concerned with the weaker conservation signals that would be provided under an M-WRAM style rate design in all of its districts, the impact of such changes in the Monterey District could be particularly ruinous.

As demonstrated above, transitioning from CAW's current rate designs to M-WRAM style rate designs due to elimination of the decoupling WRAM/MCBA will unavoidably raise rates for low-income customers and give a price break to the highest water users. This proceeding, which was established to assist low-income customers, has not provided a full and fair opportunity to examine the impact of the transition from WRAM utilities' current rate designs to rate designs similar to those of the M-WRAM utilities, and to determine whether the alleged benefits of eliminating the decoupling WRAM/MCBA would outweigh the negative effect of such transitions on low-income customer rates and conservation.

III. ELIMINATION OF THE WRAM/MCBA IN THIS PROCEEDING IS NOT JUSTIFIED

In support of the directive that the decoupling WRAM/MCBA be eliminated and that the four Class A water utilities with WRAM/MCBAs transition to M-WRAMs, the PD claims that the decoupling WRAM/MCBA is not necessary to achieve conservation[13] and that the non-decoupling M-WRAM will provide the same benefits.[14] The record is void of any facts to support these claims. As discussed in more detail below, elimination of the WRAM/MCBA is not only beyond the scope of the proceeding, there is nothing in the record proving that the WRAM/MCBA harms low-income customers (the ostensible focus of this rulemaking) or that its elimination would in any way benefit these customers. Rather, as discussed above, the opposite is true.

A. Elimination of the WRAM/MCBA is Outside the Current Scope of the Proceeding

The PD claims that "consideration of changes to the WRAM/MCBA is and has always been within the scope of this proceeding."[15] The initial purpose of this rulemaking, however, was to examine the low-income support programs of CPUC regulated water utilities and the issues concerning affordability of water service for low-income and disadvantaged communities.[16] Elimination of the WRAM/MCBA was not

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[12] D.18-09-017, p. 124, fn. 333.
[13] PD, pp. 54-56.
[14] *Id.*, p. 48.
[15] *Id.*, p. 52.
[16] R.17-06-024, *Order Instituting Rulemaking evaluating the Commission's 2010 Water Action Plan Objective of Achieving Consistency between the Class A Water Utilities' Low-Income Rate Assistance Programs, Providing Rate Assistance to All Low-Income Customers of Investor-Owned Water Utilities, and Affordability*, July 10, 2017, pp. 9-13.

identified as part of the scope of this proceeding in either of the Phase I scoping memos.[17]

The PD cites to the fact that parties raised the issue of elimination of the WRAM/MCBA during an August 2019 workshop as support for its claim that the issue is within the scope of the proceeding,[18] but just because a party raises an issue does not mean that it is within the scope. Indeed, the CPUC did not even mention the WRAM/MCBA until more than two years after the proceeding commenced, in a September 2019 ruling seeking comments on a Water Division staff report.[19]

The CPUC has expended significant effort in increasing the transparency and accessibility of its proceedings, including, most recently, modifying the Rules of Practice and Procedure.[20] Eliminating a key conservation tool like the WRAM/MCBA in a proceeding where the possibility was never identified in the initial scope and was not even raised until a ruling two years later, however, does not provide for a transparent process, and deprives parties, particularly those interested in conservation issues, of a full and fair opportunity to participate.

B. The Record on Conservation is Inadequate

The record in this proceeding is grievously inadequate to consider what the PD characterizes as "the foundational issue of whether WRAM/MCBA should continue."[21] For example, one of the main justifications for the PD's elimination of the decoupling WRAM/MCBA is that it is allegedly not necessary to achieve conservation. The only purported support for this claim, however, is a citation to a graph in the September 23, 2019 reply comments of the Public Advocates Office (CalPA) (which the other parties had no opportunity to address) and a vague and confusing reference to consumption data from the SWRCB.[22] The PD states that SWRCB data from 2015-2019 purportedly demonstrates that conservation achieved by the Class A and Class B water utilities without WRAM/MCBAs during this period exceeded the conservation achieved by the Class A water utilities with WRAM/MCBAs.[23] There was no citation provided to this data however, and according to an email from assigned Administrative Law Judge Haga, the PD's reference to a "Table A" containing this data was an error.

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[17] R.17-06-024, *Scoping Memo and Ruling of Assigned Commissioner*, January 9, 2018, pp. 2-3; R.17-06-024, *Amended Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge*, July 9, 2018, p. 3.
[18] PD, p. 52.
[19] In comments, California Water Association noted that this issue was outside the noticed scope of the proceeding. *Reply Comments of California Water Association Responding to Administrative Law Judge's June 21, 2019 Ruling*, pp. 2-3; *Comments of California Water Association Responding to Administrative Law Judge's September 4, 2019 Ruling*, p. 13.
[20] *See* Draft Resolution ALJ-381, issued May 14, 2020.
[21] PD, p. 52.
[22] *Id.*, pp. 54-55.
[23] *Id.*, p. 55.

Not only is the claim regarding conservation from 2015-2019 unsupported, it is factually inaccurate. Specifically, it ignores the earlier period after adoption of the WRAM/MCBA when the WRAM/MCBA water utilities achieved more substantial conservation results. Additionally, due to the drought, for much of the period cited in the PD the CPUC had expanded the use of conservation rate structures and decoupling mechanisms for the M-WRAM utilities. There is nothing in the record to support the assumption that this level of conservation could continue absent these decoupling mechanisms.

As discussed above, transition to an M-WRAM style rate design will likely lead to increased consumption for CAW's customers. CAW is concerned that there has been no opportunity to explore the difference between various types of tiered rates designs and whether the conservation benefits achieved thus far can be maintained without decoupling.

C. The M-WRAM Does Not Provide the Same Benefits as the WRAM/MCBA

The PD's other key justification for elimination of the WRAM/MCBA, that the M-WRAM provides the same benefits,[24] is similarly unsupported. The difference between the decoupling WRAM/MCBA and the M-WRAM is stark. The M-WRAM allows recovery (or refund) of the difference between the actual revenues billed and the revenues that would have been billed at the same usage under what is known as "standard" rate design, where 50% of fixed costs are recovered in the monthly service charge and the remainder of the revenue requirement is recovered in a single flat block rate usage charge per unit of water consumed. The M-WRAM does **not** account for changes in consumption in response to price signals from tiered rates.

CAW has experienced longstanding water supply constraints in its Monterey District.[25] The M-WRAM was adopted in a 1996 general rate case decision for CAW's Monterey District to allow CAW to implement an experimental conservation-oriented rate design.[26] The rate design adopted in that proceeding allowed for recovery of 25% of fixed cost recovery through the monthly service charge, no service charge for low-income customers, and three quantity rate tiers.[27] The M-WRAM tracked the difference between this new conservation rate design and the standard CPUC rate design.

Due to the water supply constraints affecting the Monterey District, and the threat of severe rationing and multi-million dollar fines, CAW had to implement increasingly aggressive conservation rate designs to specifically target non-essential uses, primarily excessive outdoor watering, through increased

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[24] *Id.*, p. 59.
[25] A detailed discussion of the Monterey District water supply issues was included in D.18-09-017, pp. 3-9.
[26] D.96-12-005, pp. 13-16.
[27] The conservation rates were actually set to over-collect the authorized revenue requirement because the first tier and third tier rates were simply a percentage of the standard rate, including recovery of 75% of fixed costs in the variable quantity rates.

upper block quantity rates aimed at the customers using the most water.[28] As the rate designs became more aggressive, however, it became clear that the M-WRAM was insufficient, since it did not address revenue volatility due to customer reaction to increasingly strong pricing signals in upper tiers. As a result, CAW suffered severe under recoveries of the revenue requirement.

The SWRCB's issuance of a draft Cease and Desist Order in 2008 increased the possibility of severe rationing and/or fines for the Monterey District and intensified the need for even stronger pricing signals. It was only with the adoption of the decoupling WRAM/MCBA for the Monterey District, however, that CAW was able to implement its current five-tier rate design, which specifically targets high levels of use in upper tiers.[29] CAW would not have been able to implement this rate design under the M-WRAM. Since, as discussed above, the revenue instability inherent in this rate design (a side effect of necessarily targeting high-use customers) cannot be fully addressed through forecasting, it was only feasible with the introduction of the decoupling WRAM/MCBA.

The history of CAW's Monterey District demonstrates the error of the PD's claim that the M-WRAM provides the same or even similar benefits as the decoupling WRAM/MCBA. While the M-WRAM may have helped some of the transition to tiered rates, it does not address fluctuations in water use due to tiered rate pricing signals. Thus, the most significant conservation successes of the CPUC-regulated water utilities were achieved in conjunction with decoupling mechanisms, either the WRAM/MCBA or the temporary decoupling mechanisms authorized during the drought.

This is because not all tiered rate designs are the same. By decoupling sales from revenue, the WRAM/MCBA allows water utilities to move beyond basic tiered rates to rate designs that more strongly encourage conservation and efficient use of water, and to specifically target customers using the highest amounts of water. In the case of the Monterey District, this has allowed CAW and its customers to avoid economically crippling rationing and potential multi-million dollar fines. This benefit could not be maintained under the M-WRAM.

D. The PD Contains Concerning Errors and Inaccuracies

The PD is replete with factual errors and inaccuracies that indicate that the CPUC has not fully analyzed the continuation of the WRAM/MCBA. For example the PD incorrectly states, "This is the first time the CPUC has taken input to consider the foundational issue of whether WRAM/MCBA should continue,

[28] D.00-03-053, pp. 22-25; D.04-07-035, pp. 5, 12; D.05-03-012, pp. 5-7.
[29] D.09-07-021, pp. 123-127, Appendix A.

and if so, in what form it should continue."[30] The PD ignores Rulemaking 11-11-008, which considered this exact issue, and decided to maintain the WRAM/MCBA after full and fair opportunity to develop the record by all interested parties. The scoping memo in that proceeding explicitly referenced the WRAM/MCBA, including whether there are other mechanisms that accomplish the same results as the WRAM/MCBA.[31] Later, a proposal to eliminate the WRAM/MCBA was issued for discussion at scheduled workshops.[32] In its decision, the CPUC stated, "We conclude that, at this time, the WRAM mechanism should be maintained,"[33] plainly contradicting the PD's claim that this is the first time the CPUC has considered the issue of whether the WRAM/MCBA should continue and if so, in what form.

The PD's discontinuation of the WRAM/MCBA is based upon statements that demonstrate a worrying lack of understanding of ratemaking and rate design. For example, the PD includes a finding of fact stating that the "use of tired [sic] rate design is a reasonable means to stabilizing revenues."[34] Actually, tiered rates are inherently destabilizing, since, by design, they magnify the effect of consumption changes due to price signals. Indeed, elsewhere the PD notes that rate tiers create an *unstable* revenue effect due to changes in water usage.[35] It would be incorrect for the CPUC to adopt such fundamental misstatement as a finding of fact.

E. If the CPUC Wishes to Again Consider Continuation of the WRAM/MCBA, it Should Do So in a Separate Rulemaking

If the CPUC is inclined to revisit continuation of the decoupling WRAM/MCBA, it should do so in a separate proceeding with adequate notice and opportunity for interested parties to participate. A separate proceeding is important since the purported focus of the current rulemaking on low-income issues does not provide transparency regarding the potential for substantial changes to the CPUC's water conservation policy.[36] As part of the proceeding, it should examine historical data with respect to conservation in order to

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[30] PD, p. 52.
[31] R.11-11-008, *Assigned Commissioner's Third Amended Scoping Memo and Ruling Establishing Phase II*, pp. 13-16. "Is there a policy or procedure that would accomplish the same results as the WRAM and MCBAs without the attendant issues discussed in the previous questions especially in light of the drought and the Executive Order?" *Id.*, p. 15.
[32] R.11-11-008, *Administrative Law Judges' Ruling Setting Workshop and Further Schedule R.11-11-008*, Attachment B, p. B3.
[33] D.16-12-026, p. 41.
[34] PD, Finding of Fact 13, p. 84.
[35] *Id.*, p. 50.
[36] Furthermore, a second amended scoping memo was recently issued providing for a Phase II of this proceeding to address the effects of the COVID-19 pandemic on both customers and water utilities. Attempting to address an issue of the magnitude of elimination of the WRAM/MCBA through a further amendment and phase in this proceeding would be inefficient and cause confusion.

determine how the decoupling WRAM/MCBA affected conservation efforts. It should also consider how the decoupling WRAM/MCBA impacted the development of tiered rate designs, including designs that provide a lower basic quantity rate for low-income customers and target customers with inefficient water uses. As part of that proceeding, the CPUC could also address the claims made in the PD regarding customer confusion and intergenerational inequities, and whether the potential for reduced conservation and increased rates for low-income customers is an acceptable trade-off for ameliorating these issues. Based on a full and comprehensive record, the CPUC would then be prepared to determine whether the decoupling WRAM/MCBA furthers its policy goals with respect to conservation and affordability, and whether the negative consequences of elimination would outweigh any benefits.

IV. THE LOW-INCOME MULTI-FAMILY HOUSING PILOT SHOULD BE BASED ON ADVICE LETTER 1221

The PD states, "We believe California-American Water Company's Advice Letter 1221 for establishing a tariff that provided a discount to low-income multi-family renters provides a good starting point for a pilot."[37] CAW submitted Advice Letter (AL) 1221 (included with these comments as **<u>Attachment B</u>**) to the CPUC on January 18, 2019 and it was rejected on June 7, 2019. In AL 1221, CAW proposed to provide a low-income discount to master-metered affordable housing facilities with an entirety of tenants who each individually meet the qualifications for CAW's low-income support program. While CAW agrees that AL 1221 provides a good starting point for a pilot, it appears, however, that the PD's directives for the pilot program do not reflect AL 1221.

Specifically, AL 1221 did **<u>not</u>** propose to provide benefits directly to low-income multi-family renters. As set forth in AL 1221, the discount would be provided to the master account holder (the CAW customer), and would be equal to the applicable low-income monthly discount in the service area and all tiers of the residential or multi-residential tariff.[38] The goal of AL 1221 was to provide relief and assure the viability of low-income housing providers, particularly in cases where lease payments, including utilities, are set by government regulation and a potential increase in water rates might not be able to be passed on to tenants.[39]

Although the PD cites AL 1221, which does **<u>not</u>** provide direct benefits to non-customers, as the starting point for the pilot, it directs CAW to file within 60 days an advice letter setting forth a "pilot program that provides a discount to water users in low-income multifamily dwellings that do not pay their water bill

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[37] PD, p. 64.
[38] <u>Attachment B</u>, AL 1221, p. 2.
[39] *Id.*

directly through the utility."[40] The PD provides no explanation or justification for the massive shift from providing a discount to the low-income housing provider, a direct customer of CAW, to providing benefits to low-income non-customer tenants in master-metered multi-family dwellings. There is absolutely nothing in the record of this proceeding to support the conclusion that CAW has the ability to provide a direct benefit to non-customer tenants. Indeed, comments of parties indicate the exact opposite, that due to the challenges associated with providing such direct benefits to non-customers (including but not limited to the fact that most multi-family buildings are not submetered for water service), the CPUC should await the outcome of the Assembly Bill (AB) 401 process.[41]

The SWRCB recommendations for implementation of a statewide low-income water rate assistance program, prepared as part of the AB 401 process, recognize the inherent challenges in attempting to provide assistance to non-customer tenants of multi-family buildings. The SWRCB report was based on an extensive record that was the result of a multiyear process that included input from experts and the public.[42] The SWRCB report noted, "there remains no mechanism to deliver benefits to non-sub-metered tenants who are solely master-metered."[43] The SWRCB also recognized the legal challenges associated with attempts to require landlords to pass on the full affordability benefit to tenants[44] and ultimately concluded that the most workable solution would be to provide a benefit through the state income tax system to low-income households who are not directly billed by a water provider.[45]

Neither the PD nor the record of this proceeding provide any indication that CAW has the ability to overcome the legal, administrative and institutional obstacles associated with providing direct benefits to low-income non-customer tenants of multi-family buildings, and certainly not that it would be able to

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[40] PD, pp. 64-65.

[41] *Comments of the Public Advocates Office on Water Division's Staff Report and Response to Additional Questions*, p. 8; *Comments of California Water Association Responding to Administrative Law Judge's September 4, 2019 Ruling*, pp. 21-23.

[42] "A formal process to facilitate public and expert input began in 2016. As of October 2018, there have been numerous opportunities for public comment, including 17 public events consisting of community meetings, workshops, and symposiums that allowed for remote and in-person participation. The public process engaged over 1,460 participants and generated 152 public comment letters. Moreover, an invited group of expert stakeholders from water associations, water systems, environmental justice advocacy groups, and food, energy and housing assistance programs convened three times to provide targeted input." SWRCB Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program Appendices, Appendix B, p. 5. https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_appendices.pdf

[43] SWRCB Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program Appendices, Appendix K, p. 91.

[44] *Id.*, p. 92.

[45] SWRCB Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program, p. 31. https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

develop a plan to do so within the 60 days provided the PD. Indeed, the CPUC itself was previously "unable to determine an equitable way" to provide a low-income benefit to non-customers.[46]

CAW therefore recommends that the CPUC modify the PD to implement a pilot program to allow discounts for low-income multi-family housing providers, such as set forth in AL 1221, not a program providing direct benefits to non-customer tenants of multi-family housing.

V. THE CPUC SHOULD MAINTAIN INCENTIVES FOR WATER UTILITIES TO PURSUE CONSOLIDATION

CAW is pleased that the PD recognizes consolidation as "a means to improve affordability, by leveraging greater economies of scale and scope, and by importing best, or better, practices related to operating a water utility, as well as designing rates to allow recovery of reasonable expenses," as well as the CPUC's obligation to "ensure the process to achieve consolidation is as effective and efficient as possible."[47] Over the last decade, CAW has been involved in numerous consolidation efforts throughout the state, ranging from acquisition of a 173-connection mutual water company[48] to purchase of a CPUC-regulated Class B water company serving more than 4,700 customers.[49] While the timing of the proceedings associated with these transactions has varied, generally it has exceeded the schedules adopted in D.99-10-064.[50] Therefore, CAW understands the CPUC's eagerness to take action to improve the process. As with the PD's elimination of the WRAM/MCBA, however, CAW is concerned that adoption of the consolidation minimum data requirements (MDRs) in the PD will actually do more harm than good. The CPUC should modify the PD in order to preserve the California Legislature's intent to incentivize such transactions.[51]

The PD combines the proposed consolidation MDRs from CWA and CalPA, and then adds several additional requirements. Simply adopting the lists of both parties fails to recognize the distinctions between the two proposals. CWA examined data requests issued in multiple consolidation proceedings (most of which were CAW proceedings) and developed a list based on the most frequently requested information.[52] CalPA copied a list of "Standard Data Request" items adopted by the Pennsylvania Public Utilities

[46] D.05-05-015, p. 4.
[47] PD, p. 68.
[48] Resolution W-5080.
[49] D.19-12-038.
[50] D.99-10-064, Appendix D.
[51] "Providing water corporations with an incentive to achieve these scale economies will provide benefits to ratepayers." Pub. Util. Code §2719(d).
[52] *Reply Comments of California Water Association Responding to Administrative Law Judge's September 4, 2019 Ruling*, pp. 8-9.

Commission.[53] Since CalPA simply copied the Pennsylvania requirements, they are not necessarily compatible with California law.

For example, the PD's consolidation MDR 18 (proposed by CalPA) directs applicants to "Provide a copy of the source for the purchase price and number of customers for each comparable acquisition used in the appraisals."[54] This is copied verbatim from the Pennsylvania order,[55] and reflects Pennsylvania law requiring appraisals "employing the cost, market and income approaches."[56] In California however, CPUC-regulated utilities are required to provide a reproduction or replacement cost new less depreciation (RCNLD) appraisal.[57] Such an appraisal is not based on comparable sales of other utilities. Thus, if the appraisal was based on the information included in proposed consolidation MDR 18, it would comply with Pennsylvania law but violate the mandates in California for water system appraisals under the Public Utilities Code.

The CPUC does a disservice by incorporating a list from another state without determining its applicability to California transactions. California and the CPUC have been leaders in establishing policies to assist vulnerable populations. Given the importance of consolidation, CAW is dismayed that the CPUC has not made the effort to develop MDRs that actually apply to the California water utilities it regulates.

The changes the PD proposes are not minor. They are an extensive list of additional requirements the implications of which have not been adequately addressed in the PD or this proceeding. The PD does not provide any explanation as to how the individual MDRs would result in "an acceleration in processing the application or advice letter."[58] In practice, because many of the MDRs request irrelevant or overly burdensome information, they threaten to lengthen, not shorten, proceedings and make some acquisitions, especially of smaller entities, less likely. For example, the PD includes a requirement to include a list of recommended, proposed or required capital improvements to the acquired water system for the next ten years, with cost estimates.[59] Since there is no obligation for the CPUC to consider future capital projects in determining whether to approve a water system purchase, there is no justification for this requirement,

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[53] *Id.*, pp. 6-8.
[54] PD, p. 74.
[55] See Pennsylvania Public Utilities Commission, Section 1329 Applications (accessed July 27, 2020), available at: http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/section1329_applications.aspx#:~:text=C.S.,a%20municipal%20corporation%20or%20authority (a copy of the relevant document is available under the "Orders" section for the link titled "Standard Data Requests").
[56] 66 Pa. C.S. § 1329(a)(3).
[57] Pub. Util. Code §2720(b); D.99-10-064, Appendix D, p. 2; D.19-04-015, p. 17.
[58] PD, p. 71.
[59] *Id.*, p. 76.

which would likely require significant expenditures by the buyer.[60]

The consolidation MDRs also fail to consider that many of these transactions are years in the making. Requiring provision of documentation regarding "all offers to purchase the water system or water system assets"[61] or copies of "any written correspondence,"[62] neither with any limitations with respect to timing, would require documents from years ago to be provided, without any showing as to how such documents would be necessary or even relevant to the CPUC's review. Adopting unnecessarily burdensome consolidation MDRs will not make the process more efficient, and could make such beneficial transactions less attractive to potential buyers and sellers. Similarly, the one-size-fits all consolidation MDRs impose the same disclosure requirements for small acquisitions as for large ones. There is a danger that imposing such extensive burdens in the context of smaller acquisitions will have a chilling effect.

CAW respectfully requests that the CPUC modify the consolidation MDRs as set forth in Attachment A to take into account the different types of transactions that may occur, to reflect California legal requirements, and to ensure that the MDRs truly work to make the consolidation process as efficient and effective as possible. If more information is needed with respect to the documentation that would be most helpful to various types of consolidation proceedings, CAW recommends that the CPUC seek further input on this issue and address it in a subsequent decision.

VI. CONCLUSION

At a time when Californians are facing significant challenges due to the economic effects of the COVID-19 emergency, as well as experiencing impacts from climate change, the CPUC should not take action that will reduce conservation incentives, lead to higher bills for low-income customers, and create disincentives to provide aid to vulnerable communities. CAW urges the CPUC to modify the PD as indicated in Attachment A and take the time to conduct a thorough and comprehensive review of the relevant issues in order to avoid such harmful consequences.

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[60] If adopted, the CPUC should maintain the legislative intent to incentivize such transactions by allowing for recovery of costs associated with increased documentation required by this and other consolidation MDRs.
[61] PD, p. 73.
[62] *Id.*, p. 74.

July 27, 2020

Respectfully submitted,

By: */s/ Sarah E. Leeper*

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Attachment A

FINDINGS OF FACT (PD, pp. 83-85.)

3. The major purpose of adopting WRAM/MCBA was to decouple sales from revenues ~~and thus promote conservation~~.

5. ~~The ICBA provides that variable costs are reduced under the Monterey Style WRAM mechanism~~. ~~The various options for modifying or eliminating WRAM/MCBA as ordered by D.12-04-048 were not adjudicated and resolved in subsequent GRC proceedings~~.[63]

8. ~~While the WRAM/MCBA was adopted to encourage conservation, the~~ **The** application of ~~this ratemaking mechanism~~ **the WRAM/MCBA** has led to substantial undercollections ~~and subsequent increases in quantity rates~~ **in certain areas**.

9. **Achieving** ~~C~~**c**onservation of water use is **a joint effort** by customers~~, not~~ **and** the utility.

11. ~~Conservation for WRAM utilities measured as a percentage change during the last 5 years is less than conservation achieved by non-WRAM utilities, including Class B utilities~~.

13. ~~The WRAM/MCBA mechanism is not the best means to minimize intergenerational transfers of costs when compared to an alternative available to the utilities and the Commission~~.

The goal of ~~T~~**t**iered rate design **is to encourage** ~~causes~~ customers to use less water at increased costs per unit consumed. **More steeply tiered rate designs lead to less revenue stability**. ~~; thus, use of tired rate design is a reasonable means to stabilizing revenues~~

14. The Monterey-Style WRAM combined with the ICBA is a method to account **for the change from standard rate design to tiered rate design** ~~for lesser quantity sales and stabilize revenues~~. ~~Implementation of a Monterey-Style WRAM means that f~~ **F**orecasts of sales ~~become very~~ **are** significant in establishing test year revenues.

17. A single, straight-forward name will aid outreach to consumers and statewide coordination in the delivery of assistance to low-income consumers. California-American Water Company's Advice Letter 1221 for establishing a tariff that provided a discount to low-income multi-family ~~renters~~ **housing providers** provides a good starting point for a pilot.

---

[63] It appears that some of the findings of fact were mis-numbered or not numbered at all.

CONCLUSIONS OF LAW (PD, pp. 85-86.)

2. Consideration of changes to the WRAM/MCBA ~~is and has always been~~ **not** within the scope of this proceeding as part of our review of how to improve water sales forecasting.

3. ~~Elimination of the~~ **If the Commission wishes to assess the** WRAM/MCBA mechanism **it should do so in a separate proceeding with adequate notice and opportunities for interested and affected parties to provide input.** ~~is a policy decision not determined by law~~.

~~The Monterey-style WRAM provides better incentives to more accurately forecast sales while still providing the utility the ability to earn a reasonable rate of return~~.

4. ~~As WRAM utilities have individual factors affecting a transition to Monterey-Style WRAM mechanism, this transition should be implemented in each WRAM utilities' respective upcoming GRC applications~~.

10. California-American Water Company should be directed to file a Tier 3 advice letter, within 60-days of the issuance of this decision, outlining a pilot program **based on AL 1221** that provides a discount to ~~water users in~~ low-income multi-family **housing providers** ~~dwellings that do not pay their water bill directly through the utility~~.

ORDERING PARAGRAPHS (PD, pp. 87-89.)

3. ~~California-American Water Company, California Water Service Company, Golden State Water Company, Liberty Utilities (Park Water) Corporation, and Liberty Utilities (Apple Valley Ranchos Water) Corporation, in their next general rate case applications, shall transition existing Water Revenue Adjustment Mechanisms to Monterey-Style Water Revenue Adjustment Mechanisms~~.

5. California-American Water Company shall file a Tier 3 advice letter, within 60-days of the issuance of this decision, outlining a pilot program that provides a discount to ~~water users in~~ low-income multi-family **housing providers** ~~dwellings that do not pay their water bill directly through the utility~~.

6. Each water utility shall comply with existing reporting requirements as summarized below:

- Annual reporting requirements from Decision (D.) 11-05-004.
- To each Annual Report, ~~attach~~ **reference** Minimum Data Requests submitted in the prior year period as part of 1) General Rate Case (GRC) filing, 2) applications for acquisitions (or expansion based on new requirement in this decision).

- Compliance, and associated data and analysis with orders from D.14-10-047, and D.16-12-026 in each GRC filing.
- Inclusion of disconnection and payment behaviors required in this proceeding beginning in June 2020 through June 2021.

CONSOLIDATION MDRs (PD, pp. 72-76)

1. Estimate the potential monthly incremental cost impact on existing and acquired customers following the actual results of the Buyer's most recently authorized tariffs.
    a. If a Buyer has pending request before the Commission to change rates, it must also calculate the above using data as proposed in its pending request.
2. If the Buyer ~~has a present intention~~ **is seeking authority** to increase the acquired system's rates to a certain level, please state the basis for the targeted rate and period of time for such targeted rate to be implemented.
3. Provide the annual depreciation expense using the proposed rate base of the acquired assets. If the exact depreciation expense is not available, provide the best estimate of the annual depreciation expense. Show how the depreciation expense is calculated.
4. Provide an estimate of the annual revenue requirement of the system proposed to be acquired. Provide the assumptions for the annual revenue requirement, including expected rate of return, expected depreciation expense, O&M expenses, etc.
5. Other than the revenue requirement data requested above, separately identify all other approved and/or intended impacts to customer bills (i.e., surcharges, passthrough fees, etc.).
6. Provide a listing of any entities that currently receive free service from the acquired utility.
7. If the acquired utility has increased rates in the last year, please state the date of the increase and provide a copy of the new rate schedule and the total annual revenues ~~produced~~ **projected** under the new rates.
8. Are there any leases, easements, and access to public rights-of-way that Buyer ~~will~~ **expects to be** need**ed** in order to provide service which will not be conveyed at closing? If yes, identify when the conveyance will take place and whether there **are expected to**~~will~~ be additional costs involved.
9. Provide a breakdown of the estimated transaction and closing costs. Provide invoices to support any transaction and closing costs that have already been incurred.

10. Describe known and anticipated general expense savings and efficiencies under Buyer's ownership. State the basis for ~~all~~ assumptions used in developing these savings and efficiencies and provide all supporting documentation for the assumptions.

11. Provide a copy of the Seller's request for proposals (if there was one) and any accompanying exhibits with respect to the proposed sale of the water system or water system assets.

12. Provide a copy of the **response to the** request for proposals **(if there was one)** ~~and exhibits~~ of the Buyer for the purchase of the acquired water system or water system assets.

13. ~~Provide a copy of the Buyer's offer to purchase the acquired water system or water system assets and the Seller's response to that offer~~.

14. ~~Provide a copy of all offers to purchase the water system or water system assets received by the Seller~~.

15. For each Utility Valuation Expert (UVE) providing testimony or exhibits, please provide the following:

a. A list of valuations of utility property performed by the UVE **in the past two years**;

b. A list of appraisals of utility property performed by the UVE **in the past two years**;

c. A list of all dockets in which the UVE submitted testimony to a public utility commission or regulatory authority related to the acquisition of utility property **in the past two years**; and

d. An electronic copy of or electronic link to **written** testimony in which the UVE testified on public utility fair value acquisitions in the past two years.

16. Explain each discount rate used in the appraisals and valuations, including explanations of the capital structure, cost of equity and cost of debt. State the basis for each input. Provide all sources, documentation, calculations and/or workpapers used in determining the inputs.

17. Explain whether the appraisal/valuation used replacement cost or reproduction cost and why that methodology was chosen.

18. ~~Provide a copy of the source for the purchase price and number of customers for each comparable acquisition used in the appraisals~~.

19. ~~Have Buyer and Seller either directly or through an intermediary (i.e. UVE) corresponded with regard to negotiating a fair market value or acquisition price of the assets at issue in this case? If yes, provide the following information:~~

~~a. Identify the nature and date(s) of correspondence;~~

~~b. Identify the type(s) of correspondence (i.e. written, verbal, etc.); and~~

~~c. Provide copies of any written correspondence exchanged~~.

20. Are there any outstanding compliance issues, including but not limited to water quality violations, that the Seller's system has pending with the Board's Division of Drinking Water? If yes, provide the following information:

a. Identify the compliance issue(s);

b. Provide an estimated date of compliance;

c. Explain Buyer's anticipated or actual plan for remediation;

d. Provide Buyer's estimated costs for remediation; and

e. Indicate whether the cost of remediation was or is anticipated to be factored into either or both fair market valuation appraisals offered in this proceeding.

21. Are there any outstanding compliance issues that the Seller's system has pending with the US Environmental Protection Agency? If yes, provide the following information:

a. Identify the compliance issue(s);

b. Provide an estimated date of compliance;

c. Explain Buyer's anticipated or actual plan for remediation;

d. Provide Buyer's estimated costs for remediation; and

e. Indicate whether the cost of remediation was or is anticipated to be factored into either or both fair market valuation appraisals offered in this proceeding.

22. Provide copies of all notices of a proposed acquisition given to affected customers.

23. Provide copies of all disclosures and customer notices required by Pub. Util. Code § 10061 related to the sale and disposal of utilities owned by municipal corporations.

24. Describe other requests to be included in the application, including but not limited to requests for approval of:

a. Consulting, transition of service, water wholesaling, or other agreements;

b. Interim rate increases outside of a general rate case proceeding or other special rate treatment (e.g., CPI-U rate increases, or rate increases under Class C/D requirements);

c. Facilities construction;

d. Memorandum or Balancing Accounts.

25. Identify the ratepayer benefits that accrue to current ratepayers of the system being acquired due to this transaction.

26. ~~Provide a copy of the due diligence analysis, if any, prepared by the applicant in connection with the proposed transaction~~.

27. Identify all actions the applicant has taken with governmental agencies related to obtaining required permits and/or approvals to effectuate the acquisition.

28. Provide all workpapers that support the testimony for each of the witnesses that accompany the application, in native format where possible.

- ~~A list of recommended, proposed or required capital improvements to the acquired water system for the next ten years, with cost estimates~~;
- If applicable, supporting documentation for the designation of Disadvantaged Community; and
- If applicable, documents required by Pub. Util. Code Section 10061(c).

CERTIFICATE OF SERVICE

I, John D. Ellis, am over 18 years old and not a party to this action. I am employed in the City and County of San Francisco, California. My business address is Four Embarcadero Center, 17th Floor, San Francisco, CA 94111-4109.

On September 1, 2022, I served a true and correct electronic copyof the above titled **VOLUME 2 OF JOINT APPENDICES TO THE OPENING BRIEF ON THE MERITS** on all parties by electronically filing and serving the documents via True Filing and/or email:

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I provided the document listed above electronically on the TrueFiling Website for electronic service to the persons on the above service list and/or sent the document to the persons on the above service list by e-mail.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on September 1, 2022 in San Francisco, California.

/s/ John D. Ellis
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I, John D. Ellis, am over 18 years old and not a party to this action. I am employed in the City and County of San Francisco, California. My business address is Four Embarcadero Center, 17th Floor, San Francisco, CA 94111-4109.

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/s/ John D. Ellis
John D. Ellis

STATE OF CALIFORNIA
Supreme Court of California

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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

9/1/2022

Date

/s/John Ellis

Signature

Ellis, John (269221)

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