2022

DRINKING WATER
NEEDS ASSESSMENT

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

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Acknowledgements

Contributors

This report was prepared by the California State Water Resources Control Board within the California Environmental Protection Agency (CalEPA). Contributing authors include:

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DEFINITION OF TERMS

This report includes the following defined terms.

"**Affordability Threshold**" means the level, point, or value that delineates if a water system's residential customer charges, designed to ensure the water systems can provide drinking water that meets state and federal standards, are unaffordable. For the purposes of the 2022 Affordability Assessment, the State Water Board employed affordability thresholds for the following indicators: Percent Median Household Income; Extreme Water Bill; Percent Residential Arrearages; and Residential Arrearage Burden. Learn more about current and future indicators and affordability thresholds in Appendix E.

"**Adequate supply**" means sufficient water to meet residents' health and safety needs at all times. (Health & Saf. Code, § 116681, subd. (a).)

"**Administrator**" means an individual, corporation, company, association, partnership, limited liability company, municipality, public utility, or other public body or institution which the State Water Board has determined is competent to perform the administrative, technical, operational, legal, or managerial services required for purposes of Health and Safety Code section 116686, pursuant to the Administrator Policy Handbook adopted by the State Water Board. (Health & Saf. Code, §§ 116275, subd. (g), 116686, subd. (m)(1).)

"**Affordability Assessment"** means the identification of any community water system that serves a disadvantaged community that must charge fees that exceed the affordability threshold established by the State Water Board in order to supply, treat, and distribute potable water that complies with federal and state drinking water standards. The Affordability Assessment evaluates several different affordability indicators to identify communities that may be experiencing affordability challenges. (Health & Saf. Code, § 116769, subd. (2)(B).

"**Arrearage**" means debt accrued by a water system's customers for failure to pay their water service bill(s) that are at least 60 days or more past due.

"**At-Risk public water systems**" or "**At-Risk PWS**" means community water systems with up to 30,000 service connections or 100,000 population served and K-12 schools that are at risk of failing to meet one or more key Human Right to Water goals: (1) providing safe drinking water; (2) accessible drinking water; (3) affordable drinking water; and/or (4) maintaining a sustainable water system.

"**At-Risk state small water systems and domestic wells**" or "**At-Risk SSWS and domestic wells**" means state small water systems and domestic wells that are located in areas where groundwater is at high-risk of containing contaminants that exceed safe drinking water standards. This definition may be expanded in future iterations of the Needs Assessment as more data on domestic wells and state small water systems becomes available.

"**California Native American Tribe**" means federally recognized California Native American Tribes, and non-federally recognized Native American Tribes on the contact list maintained by the Native American Heritage Commission for the purposes of Chapter 905 of the Statutes of 2004. (Health & Saf. Code, § 116766, subd. (c)(1).) Typically, drinking water systems for

federally recognized tribes fall under the regulatory jurisdiction of the United States Environmental Protection Agency (U.S. EPA), while public water systems operated by non-federally recognized tribes currently fall under the jurisdiction of the State Water Board.

"**Capital costs**" means the costs associated with the acquisition, construction, and development of water system infrastructure. These costs may include the cost of infrastructure (treatment solutions, consolidation, etc.), design and engineering costs, environmental compliance costs, construction management fees, general contractor fees, etc. Full details of the capital costs considered and utilized in the Needs Assessment are in Appendix C.

"**Community water system**" or **CWS**" means a public water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents of the area served by the system. (Health & Saf. Code, § 116275, subd. (i).)

"**Consistently fail**" means a failure to provide an adequate supply of safe drinking water. (Health & Saf. Code, § 116681, subd. (c).)

"**Consolidation**" means joining two or more public water systems, state small water systems, or affected residences into a single public water system, either physically or managerially. For the purposes of this document, consolidations may include voluntary or mandatory consolidations. (Health & Saf. Code, § 116681, subd. (e).)

"**Constituents of emerging concern**" means synthetic or naturally occurring chemicals or material that have been detected in water bodies, that cause public health impacts, and are not regulated under current primary or secondary maximum contaminant level (MCL). For purposes of the 2022 Risk Assessment, three chemicals: hexavalent chromium, 1,4-dioxane, and per- and polyfluoroalkyl substances (PFAS), were incorporated.

"**Contaminant**" means any physical, chemical, biological, or radiological substance or matter in water. (Health & Saf. Code, § 116275, subd. (a).)

"**Cost Assessment**" means the estimation of funding needed for the Safe and Affordable Drinking Water Fund for the next fiscal year based on the amount available in the fund, anticipated funding needs, and other existing State Water Board funding sources. Thus, the Cost Assessment estimates the costs related to the implementation of interim and/or emergency measures and longer-term solutions for HR2W list systems and At-Risk public water systems, state small water systems, and domestic wells. The Cost Assessment also includes the identification of available funding sources and the funding and financing gaps that may exist to support interim and long-term solutions. (Health & Saf. Code, § 116769.)

"**Disadvantaged community**" or "**DAC**" means the entire service area of a community water system, or a community therein, in which the median household income is less than 80% of the statewide annual median household income level. (Health & Saf. Code, § 116275, subd. (aa).)

"**Domestic well**" means a groundwater well used to supply water for the domestic needs of an individual residence or a water system that is not a public water system and that has no more than four service connections. (Health & Saf. Code, § 116681, subd. (g).)

“**Drinking Water Needs Assessment”** or “**Needs Assessment**” means the comprehensive identification of California drinking water needs. The Needs Assessment consist of three core components: the Affordability Assessment, Risk Assessment, and Cost Assessment. The results of the Needs Assessment inform the State Water Board’s annual Fund Expenditure Plan for the Safe and Affordable Drinking Water Fund and the broader activities of the SAFER Program. (Health & Saf. Code, § 116769.)

“**Electronic Annual Report**” or “**EAR**” means is a survey of public water systems, currently required annually, to collect critical water system information intended to assess the status of compliance with specific regulatory requirements, provides updated contact and inventory information (such as population and number of service connections), and provides information that is used to assess the financial capacity of water systems, among other information reported.

“**Fire flow**” it is the amount of water designated to be used for firefighting purposes.

“**Fund Expenditure Plan**” or “**FEP**” means the plan that the State Water Board develops pursuant to Article 4 of Chapter 4.6 of the Health and Safety Code for the Safe and Affordable Drinking Water Fund, established pursuant to Health and Safety Code section 116766.

“**Human consumption**” means the use of water for drinking, bathing or showering, hand washing, oral hygiene, or cooking, including, but not limited to, preparing food and washing dishes. (Health & Saf. Code, § 116275, subd. (e).)

*“***Human Right to Water**” or “**HR2W***”* means the recognition that “every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking and sanitary purposes,” as defined in Assembly Bill 685 (AB 685). (California Water Code § 106.3, subd. (a).)

“**Human Right to Water list**” or “**Failing: HR2W list**” means the list of public water systems that are out of compliance or consistently fail to meet primary drinking water standards. Systems that are assessed for meeting the HR2W list criteria include Community Water Systems and Non-Community Water Systems that serve K-12 schools and daycares. The HR2W list criteria were expanded in April 2021 to better align with statutory definitions of what it means for a water system to “consistently fail” to meet primary drinking water standards. (Health & Saf. Code, § 116275(c).)

“Intertie” means an interconnection allowing the passage of water between two or more water systems.

“**Local Primacy Agency**” or “**LPA**” means a local health officer within a county to whom the State Water Board has delegated primary responsibility for the administration and enforcement of California Safe Drinking Water Act. LPA is authorized by means of a local primacy delegation agreement if the local health officer demonstrates that it has the capability to meet the local primacy program requirements established by the State Water Board pursuant to subdivision (h) of Health and Safety Code section 116375. (Health & Saf. Code, § 116330, subd. (a).)

“**Maximum Contaminant Level**” or “**MCL**” means the maximum permissible level of a contaminant in water. (Health & Saf. Code, § 116275, subd. (f).)

“**Median household income**” or “**MHI**” means the household income that represents the median or middle value for the community. The methods utilized for calculating median household income are included in Appendix A and Appendix E. Median household incomes in this document are estimated values for the purposes of this statewide assessment. Median household income for determination of funding eligibility is completed on a system-by-system basis by the State Water Board’s Division of Financial Assistance.

“**Medium Community Water Systems”** means water systems that served up to 30,000 service connections or 100,000 population served.

“**Non-Community Water System**” means a public water system that is not a community water system. (Health & Saf. Code, § 116275, subd. (j).)

“**Non-transient Non-Community Water System**” means a public water system that is not a community water system and that regularly serves at least 25 of the same persons for six months or more during a given year, such as a school. (Health & Saf. Code, § 116275, subd. (k).)

“**Operations and maintenance**” or “**O&M**” means the functions, duties and labor associated with the daily operations and normal repairs, replacement of parts and structural components, and other activities needed by a water system to preserve its capital assets so that they can continue to provide safe drinking water.

“**Point-of-use**” or **“POU**” means a water treatment device that treats water at the location of the back-end customer.

“**Point-of-entry**” **or “POE**” means a water treatment device that is located at the inlet to an entire building or facility.

“**Potentially At-Risk**” means community water systems with 30,000 service connections or less, or population served up to 100,000 and K-12 schools that are potentially at-risk of failing to meet one or more key Human Right to Water goals: (1) providing safe drinking water; (2) accessible drinking water; (3) affordable drinking water; and/or (4) maintaining a sustainable water system.

“**Primary drinking water standard**” means: (1) Maximum levels of contaminants that, in the judgment of the state board, may have an adverse effect on the health of persons. (2) Specific treatment techniques adopted by the state board in lieu of maximum contaminant levels pursuant to Health & Saf. Code, section 116365, subd. (j). and (3) The monitoring and reporting requirements as specified in regulations adopted by the state board that pertain to maximum contaminant levels. (Health & Saf. Code, § 116275, subd. (c).)

“**Public water system**” or “**PWS**” means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. A PWS includes any collection, pre-treatment, treatment, storage, and distribution

facilities under control of the operator of the system that are used primarily in connection with the system; any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system; and any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption. (Health & Saf. Code, § 116275, subd. (h).)

"**Resident**" means a person who physically occupies, whether by ownership, rental, lease, or other means, the same dwelling for at least 60 days of the year. (Health & Saf. Code, § 116275, subd. (t).)

"**Risk Assessment**" means the identification of public water systems, with a focus on community water systems and K-12 schools, that may be at risk of failing to provide an adequate supply of safe drinking water. It also includes an estimate of the number of households that are served by domestic wells or state small water systems in areas that are at high risk for groundwater contamination. Different Risk Assessment methodologies have been developed for different system types: (1) public water systems; (2) state small water systems and domestic wells; and (3) tribal water systems. (Health & Saf. Code, § 116769)

"**Risk indicator**" means the quantifiable measurements of key data points that allow the State Water Board to assess the potential for a community water system or a transient non-community water system that serves a K-12 school to fail to sustainably provide an adequate supply of safe drinking water due to water quality, water accessibility, affordability, institutional, and/or TMF capacity issues.

"**Risk threshold**" means the levels, points, or values associated with an individual risk indicator that delineates when a water system is more at-risk of failing, typically based on regulatory requirements or industry standards.

"**Sanitary survey**" means a comprehensive inspection to evaluate water system potency to provide safe drinking water to their customers and to ensure compliance with the federal Safe Drinking Water Act (SDWA).

"Sounder" means a tool used to measure groundwater depth in a well.

"**Significant Deficiencies"** means identified deficiencies by State Water Board staff or LPA staff during a Sanitary Survey and other water system inspections. Significant Deficiencies include, but are not limited to, defects in the design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that U.S. EPA determines to be causing or have the potential for causing the introduction of contamination into the water delivered to consumers.

"**Safe and Affordable Drinking Water Fund**" or "**SADWF**" means the fund created through the passage of Senate Bill 200 (SB 200) to help provide an adequate and affordable supply of drinking water for both the near and long terms. SB 200 requires the annual transfer of 5 percent of the annual proceeds of the Greenhouse Gas Reduction Fund (GGRF) (up to $130 million) into the Fund until June 30, 2030. (Health & Saf. Code, § 116766)

"**Safe and Affordable Funding for Equity and Resilience Program**" or "**SAFER Program**" means a set of State Water Board tools, funding sources, and regulatory authorities designed

to meet the goals of ensuring safe, accessible, and affordable drinking water for all Californians.

"**SAFER Clearinghouse**" means a database system, developed and maintained by the State Water Board to assist with the implementation, management, and tracking of the SAFER Program.

"**Safe drinking water**" means water that meets all primary and secondary drinking water standards, as defined in Health and Safety Code section 116275.

"**Score**" means a standardized numerical value that is scaled between 0 and 1 for risk points across risk indicators. Standardized scores enable the evaluation and comparison of risk indicators.

"**Secondary drinking water standards**" means standards that specify maximum contaminant levels that, in the judgment of the State Water Board, are necessary to protect the public welfare. Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the public welfare. Regulations establishing secondary drinking water standards may vary according to geographic and other circumstances and may apply to any contaminant in drinking water that adversely affects the taste, odor, or appearance of the water when the standards are necessary to ensure a supply of pure, wholesome, and potable water. (Health & Saf. Code, § 116275, subd. (d).)

"**Service connection**" means the point of connection between the customer's piping or constructed conveyance, and the water system's meter, service pipe, or constructed conveyance, with certain exceptions set out in the definition in the Health and Safety Code. (See Health & Saf. Code, § 116275, subd. (s).)

"**Senate Bill No. 200**" means a legislative law that enabled the State Water Board to establish the Safe and Affordable Funding for Equity and Resilience (SAFER) Program to advance the goals of the Human Right to Water. (Senate Bill No. 200, CHAPTER 120)

"Senate Bill No. 552" means a legislative law that requires small water suppliers and non-transient non-community water systems, to apply draught resiliency measures subject to funding availability. (Senate Bill No. 552, CHAPTER 245)

"**Severely disadvantaged community**" or "**SDAC**" means the entire service area of a community water system in which the MHI is less than 60% of the statewide median household income. (See Water Code § 13476, subd. (j))

"**Source capacity**" means the total amount of water supply available, expressed as a flow, from all active sources permitted for use by the water system, including approved surface water, groundwater, and purchased water. (Title 22 of the California Code of Regulations, § 64551.40.)

"**Small community water system**" means a CWS that serves no more than 3,300 service connections or a yearlong population of no more than 10,000 persons. (Health & Saf. Code, § 116275, subd. (z).)

“**Small disadvantaged community**” or “**small DAC**” or “**SDAC**” means the entire service area, or a community therein, of a community water system that serves no more than 3,300 service connections or a year-round population of no more than 10,000 in which the median household income is less than 80% of the statewide annual median household income.

“**State small water system**” or “**SSWS**” means a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year. (Health & Saf. Code, § 116275, subd. (n).)

“**State Water Board**” means the State Water Resources Control Board.

“Static well level” means the resting state of the water level in a well under normal, no pumping conditions.

“**Technical, Managerial and Financial capacity**” or “**TMF capacity**” means the ability of a water system to plan for, achieve, and maintain long term compliance with drinking water standards, thereby ensuring the quality and adequacy of the water supply. This includes adequate resources for fiscal planning and management of the water system.

“**Waterworks Standards**” means regulations adopted by the State Water Board entitled “California Waterworks Standards” (Chapter 16 (commencing with § 64551) of Division 4 of Title 22 of the California Code of Regulations). (Health & Saf. Code, § 116275, subd. (q).)

“**Weight**” means the application of a multiplying value or weight to each risk indicator and risk category within the Risk Assessment, as certain risk indicators and categories may be deemed more critical than others.

EXECUTIVE SUMMARY

In 2016, the California State Water Resources Control Board (State Water Board) adopted a Human Right to Water Resolution[1] making the Human Right to Water (HR2W), as defined in Assembly Bill 685, a primary consideration and priority across all the state and regional boards' programs. The HR2W recognizes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking and sanitary purposes."

In 2019, to advance the goals of the HR2W, California passed Senate Bill 200 (SB 200), which enabled the State Water Board to establish the Safe and Affordable Funding for Equity and Resilience (SAFER) Program. SB 200 established a set of tools, funding sources, and regulatory authorities that the State Water Board harnesses through the SAFER Program to help struggling water systems sustainably and affordably provide safe drinking water.

The annual Drinking Water Needs Assessment (Needs Assessment) required to be carried out by the SAFER Program provides foundational information and recommendations to guide this work.[2] The Needs Assessment is comprised of Risk, Affordability, and Cost Assessment components. Enhancement of the 2022 Needs Assessment consisted of internal workgroup recommendations and a public workshop in February 2022, all of which were detailed in a publicly available white paper.[3] The public feedback was incorporated into the final methodology and results.

Three different water system types: public water systems, state small water systems and domestic wells, are analyzed within the 2022 Needs Assessment. Different methodologies were developed for these system types based on data availability and reliability.

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[1] State Water Resources Control Board Resolution No. 2016-0010
https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf

[2] California Health and Safety Code section 116769 (b) states "The fund expenditure plan shall be based on data and analysis drawn from the drinking water needs assessment..."

[3] January 28, 2022 White Paper: Proposed Changes for the 2022 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/needs-assessment-white-paper-draft.pdf

The results of the annual Needs Assessment are utilized by the State Water Board and the SAFER Advisory Group[4] to inform the prioritization of available state funding and technical assistance within the Safe and Affordable Drinking Water Fund (SADWF) Fund Expenditure Plan (FEP).[5] The State Water Board typically hosts a series of workshops throughout the year to inform the FEP.

The Needs Assessment is not a static analysis. The State Water Board annually updates the Needs Assessment, and it provides a valuable snapshot of the overall resources needed to bring failing systems into compliance with drinking water standards and prevent At-Risk water systems from failing. By incorporating this Needs Assessment into the SAFER Program and implementation of SADWF, the State Water Board will continue to lead on long-term drinking water solutions. At the same time, this Needs Assessment gives clarity to the work that must collectively be done by state, federal, local and stakeholder partners. Only together will we be successful in achieving the Human Right to Water goal for all Californians.

2021 RETROSPECTIVE

FAILING: HR2W LIST SYSTEMS

The State Water Board tracks community water systems and K-12 schools that meet the Failing: HR2W list criteria and when they are removed from the list. In 2021 there were 416 unique water systems on the Failing: HR2W list at one point throughout the year (Table 1). In 2021 there were 115 unique water systems that came onto the Failing: HR2W list, 38 of these systems were added in April 2021 due to the adoption of expanded Failing: HR2W list criteria. In 2021, 48 unique water systems were removed from the Failing: HR2W list.

Table 1: 2021 Failing: HR2W List Systems

Water Systems	Number of Unique Systems	Total Population Served	Average Number of Service Connections	# of Systems on List Greater than 3-Yrs.
Small Water Systems[6]	396 (95%)	305,303 (28%)	210	170
Medium Water Systems[7]	22 (5%)	779,639 (72%)	9,400	7
TOTAL:	**416**	**1,084,942**	**689**	**177**

[4] SAFER Advisory Group
https://www.waterboards.ca.gov/safer/advisory_group.html

[5] Safe and Affordable Drinking Water Fund
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/safer.html

[6] 3,000 service connections or less

[7] Greater than 3,000 service connections. No system with greater than 30,000 service connections has been on the Failing: HR2W list since September 2019

PROVIDING ASSISTANCE

The goal of the SAFER Program is to help address Failing and At-Risk systems – building local capacity through consolidations, administrators, technical assistance, and long-term solutions to ensure systems are able to operate sustainably and achieve the HR2W. The State Water Board utilizes a diverse set of programs and tools to help support water system capacity. The following summarizes how they were utilized in 2021 to support California water systems:

- 27 water systems, serving 13,651 population were consolidated.
- The State Water Board's sent out approximately 1,100 letters to water systems recommending consolidation and hosted 12 Water Partnership Training events across the state.
- There are approximately 170 active consolidations either in early stages of development or in the funding processes. Approximately 30% of water systems on the 2021 Failing: HR2W list are considering consolidation or in full development of the consolidation alternative and progressing forward.
- Since 2020, the State Water Board has designated 13 public water systems in need of an administrator and held public meetings for all the impacted communities. This represents approximately 3,300 people and 900 service connections in seven counties.
- In 2021, the SAFER Program provided short-term solutions, such as emergency well repairs, and bottled and hauled water provision to nearly 28,000 individuals. Long-term solutions, such as construction and consolidation, were completed for 81 communities, including nearly 200,000 individuals. Planning assistance (towards construction of long-term solutions) was provided to 171 communities, including over 135,000 individuals.
- The State Water Board provided approximately $301 million to 871 water systems for residential and commercial COVID-19 arrearage relief to approximately 536,000 accounts customers.
- In 2021, the State Water funded approximately $13 million for technical assistance to support 554 water systems.
- In 2021, the State Water Board and Local Primacy Agencies competed sanitary surveys for 886 community water systems and 909 non-community water systems. Identifying more than 20 significant deficiencies.

ENHANCEMENTS TO THE 2022 NEEDS ASSESSMENT

DROUGHT-RELATED ENHANCEMENTS

In response to stakeholder feedback after the release of the 2021 Needs Assessment, the State Water Board focused its refinement efforts on better identifying challenges and needs associated with drought, the risk assessment:

- Added new source capacity risk indicators to the Risk Assessment for public water systems: 'Source Capacity Violations' and 'Bottled or Hauled Water Reliance.'

- Worked in partnership with the Department of Water Resources (DWR) to develop a new combined Risk Assessment for state small water systems and domestic wells that utilizes both the Aquifer Risk Map (water quality risk) and DWR's Drought Risk Vulnerability Tool.
- Conducted a targeted drought infrastructure cost assessment for implementation of SB 552 requirements for small water systems.

ADDITIONAL ENHANCEMENTS

The State Water Board has made several other enhancements to all three components of the 2022 Needs Assessment:

- The Risk Assessment for public water systems was expanded to include medium-size community water systems with service connections between 3,300 and 30,000 or a population served up to 100,000. This expanded inventory aligns with the expanded State Water Board funding eligibilities for medium-size systems.
- The Risk Assessment for public water systems removed five risk indicators and added new indicators, including: 'Constituents of Emerging Concern,' 'Income,' 'Operating Ratio,' and 'Days Cash on Hand'.
- New Affordability indicators were added for the Risk Assessment and Affordability Assessment utilizing data from the 2021 Drinking Water Arrearage Payment Program: 'Percent Residential Arrearages' and 'Residential Arrearage Burden.'
- Socio-economic analyses related to the Risk and Affordability Assessments were performed. The State Water Board identified where Failing: HR2W list and At-Risk communities are experiencing high pollution burden or poverty and quantified the percent of non-white customers served.

2022 NEEDS ASSESSMENT RESULTS

RISK ASSESSMENT

The purpose of the Risk Assessment is to identify public water systems, and state small water systems and regions where domestic wells are at-risk of failing to sustainably provide a sufficient amount of safe and affordable drinking water. Approximately 70 new water systems are added to the Failing: HR2W system list each year.[8] The identification of At-Risk water systems and domestic wells allows the State Water Board to proactively target technical assistance and funding towards communities to prevent systems from failing to achieve the goals of the HR2W.

The State Water Board has developed two different Risk Assessment methodologies to identify At-Risk water systems and domestic wells. The first methodology is for community water systems with up to 30,000 service connections or 100,000 population served and K-12 schools. The second methodology identifies state small water systems and domestic wells that

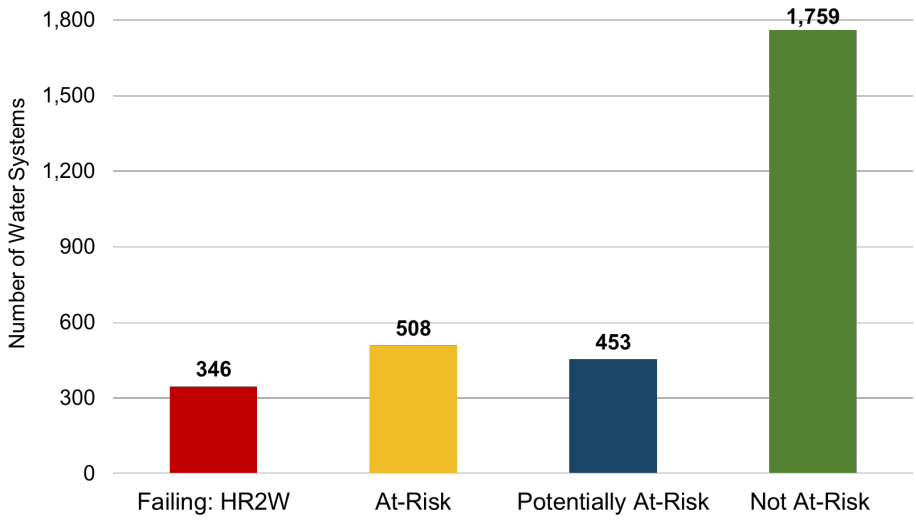
[8] Average based on systems added to the Failing: HR2W list between 01.01.2017 through 12.31.2021

are at a high risk of drought and/or accessing source water that may contain contaminants that exceed safe drinking water standards.

At-Risk Public Water Systems

Utilizing the new thresholds and after removing the 346 Failing: HR2W list systems, the 2022 Risk Assessment results identified 508 (19%) At-Risk water systems, 453 (17%) Potentially At-Risk water systems, and 1,759 (65%) Not At-Risk water systems (Figure 1).[9] Compared to the 2021 Risk Assessment results, the 2022 Assessment identifies fewer At-Risk water systems, but maintains the same predictive power of identifying Failing: HR2W list systems as the 2021 Assessment.

Figure 1: Number of Community Water Systems and K-12 Schools At-Risk and Potentially At-Risk (n=3,066)



At-Risk State Small Water Systems & Domestic Wells

The Risk Assessment methodology developed for state small water systems and domestic wells is designed to identify areas where groundwater is likely to be at high risk of drought and/or containing contaminants that exceed safe drinking water standards. Statewide, the top contaminants that contributed to higher risk designations in domestic wells and state small water systems are nitrate, arsenic, gross alpha, 1,2,3-trichloropropane, uranium, and hexavalent chromium.

Table 2 shows the approximate counts of state small water systems statewide located in different risk areas based on data from the 2022 Needs Assessment. Based on the 2022 analysis there are 631 state small water systems At-Risk for water quality and 321 At-Risk for drought, respectively. There are 378 state small water systems that are at-risk for both water

[9] 2022 Risk Assessment results for public water systems: Attachment A1 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022risk.xlsx

quality and water shortage. These are the most vulnerable At-Risk state small water systems. An interactive map is available online.[10]

Table 2: State Small Water System Results (Statewide)

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Water Quality Risk Only	631 (50%)	75 (6%)	426 (33%)	141 (11%)
Drought Risk Only	321 (25%)	411 (32%)	535 (42%)	6 (0%)
Combined Risk Assessment	**378 (30%)**	**438 (34%)**	**455 (36%)**	**2 (0%)**

Figure 2: At-Risk State Small Water Systems

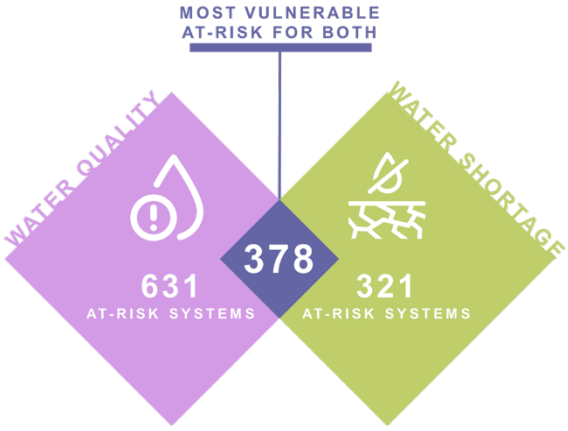


Table 3 shows the approximate counts of At-Risk domestic wells[11] statewide located in different risk areas based on data from the 2022 Needs Assessment. Based on the 2022 analysis there are approximately 92,635 domestic wells At-Risk for water quality and 90,974 At-Risk for drought respectively. When analyzed, using the Combined Risk Assessment method, there approximately 64,176 domestic wells that are At-Risk for both water quality and drought risk. These domestic wells can be viewed as the most vulnerable of the At-Risk wells identified.

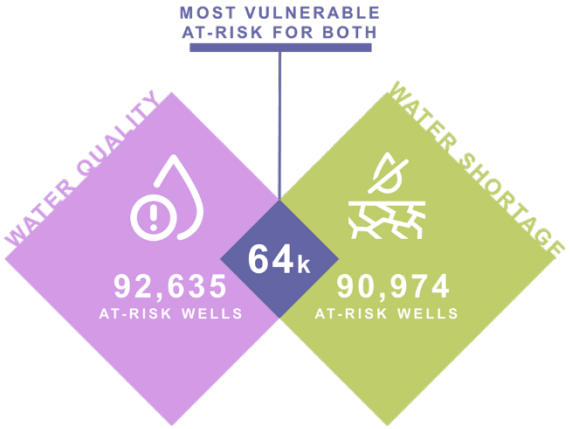
[10] Combined Risk for State Small Water Systems and Domestic Wells (Needs Assessment) https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=122823a570424891986ff72846b37b83

[11] Domestic well locations are approximated using the OSWCR domestic well completion records. Learn more in Appendix B

Table 3: Domestic Well Results (Statewide)

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Water Quality Risk Only	92,635 (30%)	17,078 (5%)	134,282 (43%)	68,192 (22%)
Drought Risk Only	90,974 (29%)	88,340 (28%)	132,709 (43%)	164 (0%)
Combined Risk Assessment	**64,176 (21%)**	**90,840 (29%)**	**157,146 (50%)**	**25 (0%)**

Figure 3: At-Risk Domestic Wells



DROUGHT INFRASTRUCTURE COST ASSESSMENT

The State Water Board has conducted a targeted Drought Cost Assessment. The Drought Infrastructure Cost Assessment estimates the costs associated with drought infrastructure requirements for small community water systems (15 – 2,999 service connections) in accordance with Senate Bill 552's addition of section 10609.62 to the California Water Code. The Drought Cost Assessment utilizes some cost assumptions from the 2021 Cost Assessment Model as well as new cost data derived from internal and external discussions, public feedback and vendor pricing. Table 4 summarizes the Drought Infrastructure Cost Assessment results for small community water systems (CWS) and K-12 schools.[12]

Table 4: Drought Infrastructure Cost Assessment Results

Drought Requirement	# Small CWS	Point Est. Total[13]	Range Total in $ Millions
Monitor Static Well Levels	1,213 (46%)	$2,450,000	$1- $5

[12] Drought Infrastructure Cost Assessment Data and Results: Attachment C1 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022cost.xlsx

[13] All point estimate totals have been rounded to the nearest ten thousand digits.

Drought Requirement	# Small CWS	Point Est. Total[13]	Range Total in $ Millions
Membership CalWARN / Mutual Aid	2,634 (100%)	$0	$0
Back-up electrical supply	1,872 (71%)	$244,940,000	$122 - $490
Back-up source: new well or intertie	895 (34%)	$1,911,590,000	$956-$3,823
Meter all service connections	1,275 (48%)	$245,330,000	$123 - $491
TOTAL:	**2,634**	**$2,404,320,000**	**$1,202-$4,809**

AFFORDABILITY ASSESSMENT

The Affordability Assessment identifies community water systems that serve disadvantaged communities (DAC/SDAC) that must charge their customers' fees which exceed the affordability threshold established by the State Water Board to provide adequate safe drinking water. The 2022 Affordability indicators include:

- **%MHI**: average residential customer charges for 6 hundred cubic feet (HCF) per month meet or exceed 1.5% of the annual Median Household Income (MHI) within a water system's service area.
- **Extreme Water Bill**: customer charges that meet or exceed 150% and 200% of statewide average drinking water customer charges at the 6 HCF level.
- **Percent of Residential Arrearages**: high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due.
- **Residential Arrearage Burden**: measures how high the residential arrearage is if it were distributed across the total residential rate base.

To assess which systems may be facing the greatest affordability burden, State Water Board further analyzed how many water systems exceeded thresholds for multiple affordability indicators. Affordability burden is ranked from low (only one affordability indicator threshold exceeded), medium, (two affordability indicator thresholds exceeded), or high (three or four affordability indicator thresholds exceeded). Of the 2,868 community water systems analyzed, most resulted in a low affordability burden (21%) followed by a medium affordability burden (11%) and a high affordability burden (3%). It is worth noting, there are no clear trends across community economic status and affordability burdens.[14]

The State Water Board identified 69 (5%) DAC/SDAC water systems that have a high affordability burden, 175 (12%) with a medium affordability burden, and 311 (22%) with a low affordability burden (Table 5). When analyzing the results of the Affordability Assessment with

[14] 2022 Affordability Assessment Data and Results: Attachment D1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022affordability.xlsx

the results of the 2022 Risk Assessment, there are 53 Failing: HR2W list and At-Risk DAC/SDAC systems that have a high affordability burden (Table 6).

Table 5: Affordability Assessment Results

Community Status	Total Systems Assessed	High Affordability Burden[15]	Medium Affordability Burden[16]	Low Affordability Burden[17]
DAC/SDAC	1,408	69 (5%)	175 (12%)	311 (22%)
Non-DAC	1,287	20 (2%)	142 (11%)	315 (23%)
Missing DAC Status	173	0 (0%)	6 (3%)	7 (10%)
TOTAL:	**2,868**	**89 (3%)**	**323 (11%)**	**633 (21%)**

Table 6: Affordability Assessment Results by 2022 SAFER Program Status

SAFER Program Status	Total Systems Assessed	High Affordability Burden	Medium Affordability Burden	Low Affordability Burden
HR2W DAC/SDAC	184	20 (11%)	34 (18%)	48 (26%)
At-Risk DAC/SDAC	276	33 (12%)	46 (17%)	55 (20%)
TOTAL:	**460**	**53 (12%)**	**80 (17%)**	**103 (22%)**

The State Water Board recognizes the need to refine affordability indicators utilized in the Affordability Assessment and enhance the methodology to better identify communities that may be facing affordability challenges. The State Water Board will begin conducting additional research and stakeholder engagement needed to develop new affordability indicators and the appropriate affordability thresholds necessary for inclusion in the Risk and Affordability Assessments.

SOCIO-ECONOMIC ANALYSIS OF NEEDS ASSESSMENT RESULTS

For the first time, the State Water Board has compared the results of the Risk and Affordability Assessments to socio-economic data to better understand the communities most in need. The results of this analysis are summarized below:

- Failing: HR2W list systems and At-Risk public water systems, state small water systems, and domestic wells areas have higher pollution burdens, are typically located

[15] Community water system met the minimum threshold for 3 or 4 of the affordability indicators.

[16] Community water system met the minimum threshold for 2 of the affordability indicators.

[17] Community water system met the minimum threshold for 1 of the affordability indicators.

in areas with higher poverty, greater linguistic isolation, and serve a greater proportion of non-white households than systems and domestic well locations that are Not At-Risk.

- When compared with Non-DAC/SDAC water systems, DAC/SDAC water system service areas tend to have higher pollution burdens, a higher percentage of households in poverty, a higher percentage of limited English-speaking households, and are likely to serve a greater proportion of non-white communities.
- Systems with a high affordability burden have higher pollution burdens, percentages of households that are less than two times the federal poverty level, and greater linguistic isolation than medium and low affordability burden systems.

INTRODUCTION

ABOUT THE NEEDS ASSESSMENT

In 2016, the State Water Board adopted a Human Right to Water Resolution making the Human Right to Water (HR2W), as defined in Assembly Bill 685, a primary consideration and priority across all of the state and regional boards' programs.[18] The HR2W recognizes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking and sanitary purposes."

In 2019, to advance the goals of the HR2W, California passed Senate Bill 200 (SB 200) which enabled the State Water Board to establish the Safe and Affordable Funding for Equity and Resilience (SAFER) Program. SB 200 established a set of tools, funding sources, and regulatory authorities the State Water Board can harness through the SAFER Program to help struggling water systems sustainably and affordably provide safe drinking water to their customers. Among the tools created under SB 200 is the Safe and Affordable Drinking Water Fund (Fund). The Fund provides up to $130 million per year through 2030 to enable the State Water Board to develop and implement sustainable solutions for underperforming drinking water systems.

The SAFER Program harnesses the Fund together with other State Water Board funding programs to advance the implementation of interim and long-term solutions for communities across the state. The State Water Board prioritizes SAFER Program funding annually through the Fund Expenditure Plan (FEP). The annual FEP is to be informed by "data and analysis drawn from the drinking water Needs Assessment", per California Health and Safety Code section 116769.

The State Water Board's Drinking Water Needs Assessment (Needs Assessment) consists of three core components: the Risk Assessment, Cost Assessment, and Affordability Assessment. The State Water Board's Needs Analysis Unit in the Division of Drinking Water (DDW) leads the implementation of the annual Needs Assessment in coordination with the Division of Water Quality (DWQ) and Division of Financial Assistance (DFA). The University of

[18] State Water Board Resolution No. 2016-0010
https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf

California, Los Angeles (UCLA) was contracted in 2019 (agreement term: 09.01.2019 through 03.31.2021) to support the initial development of 2021 Needs Assessment methodologies for the Risk and Cost Assessments. Since the conclusion of this contract, the State Water Board has advanced the refinement of the Needs Assessment's methodologies.

SB 200 calls for the identification of "public water systems, community water systems, and state small water systems that may be at risk of failing to provide an adequate supply of safe drinking water." As well as "an estimate of the number of households that are served by domestic wells or state small water systems in high-risk areas."[19] Therefore, different Risk Assessment methodologies have been developed for different system types:

Public Water Systems
The Risk Assessment methodology currently utilizes 22 risk indicators to identify At-Risk K-12 schools and community water systems servicing up to 30,000 service connections and no more than 100,000 population served. Risk indicators assess risk in the following categories: water quality, accessibility, affordability, and TMF (technical, managerial, and financial) capacity.

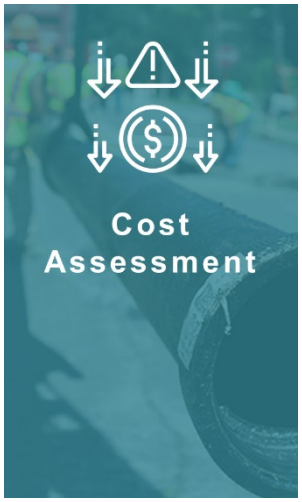
State Small Water Systems & Domestic Wells
The Risk Assessment methodology for state small water systems and domestic wells utilizes the State Water Board's Aquifer Risk Map[20] and DWR's Drought and Water Shortage Vulnerability Assessment for Self-Supplied Communities[21] to identify areas that are at-risk due to water quality and drought.

Tribal Water Systems
The State Water Board is partnering with Indian Health Services, U.S. Environmental Protection Agency, and tribal communities to understand the best way to integrate tribal drinking water needs into the Needs Assessment.

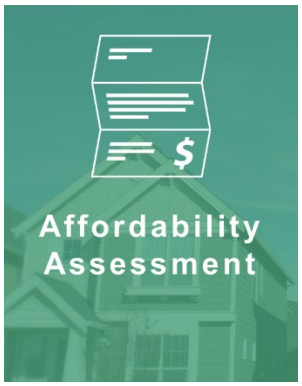
[19] California Health and Safety Code section 116769

[20] Aquifer Risk Map Webtool
https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=17825b2b791d4004b547d316af7ac5cb

[21] Drought and Water Shortage Risk Explorer Tool for Small Water Suppliers and Rural Communities
https://dwr.maps.arcgis.com/apps/MapSeries/index.html?appid=3353b370f7844f468ca16b8316fa3c7b



SB 200 directs the State Water Board to "estimate the funding needed for the next fiscal year based on the amount available in the fund, anticipated funding needs, other existing funding sources."[22] Thus, the Cost Assessment estimates the costs related to the implementation of interim and/or emergency measures and longer-term solutions for Failing: HR2W list and At-Risk systems. The 2022 Needs Assessment focused on estimating the costs of implementing drought infrastructure resiliency measures for small water systems required in Senate Bill 552. Future iterations of the Cost Assessment will incorporate drought-focused infrastructure solutions.



SB 200 calls for the identification of "any community water system that serves a disadvantaged community that must charge fees that exceed the affordability threshold established by the board in order to supply, treat, and distribute potable water that complies with federal and state drinking water standards."[23] The Affordability Assessment evaluates several different affordability indicators to identify communities that may be experiencing affordability challenges.

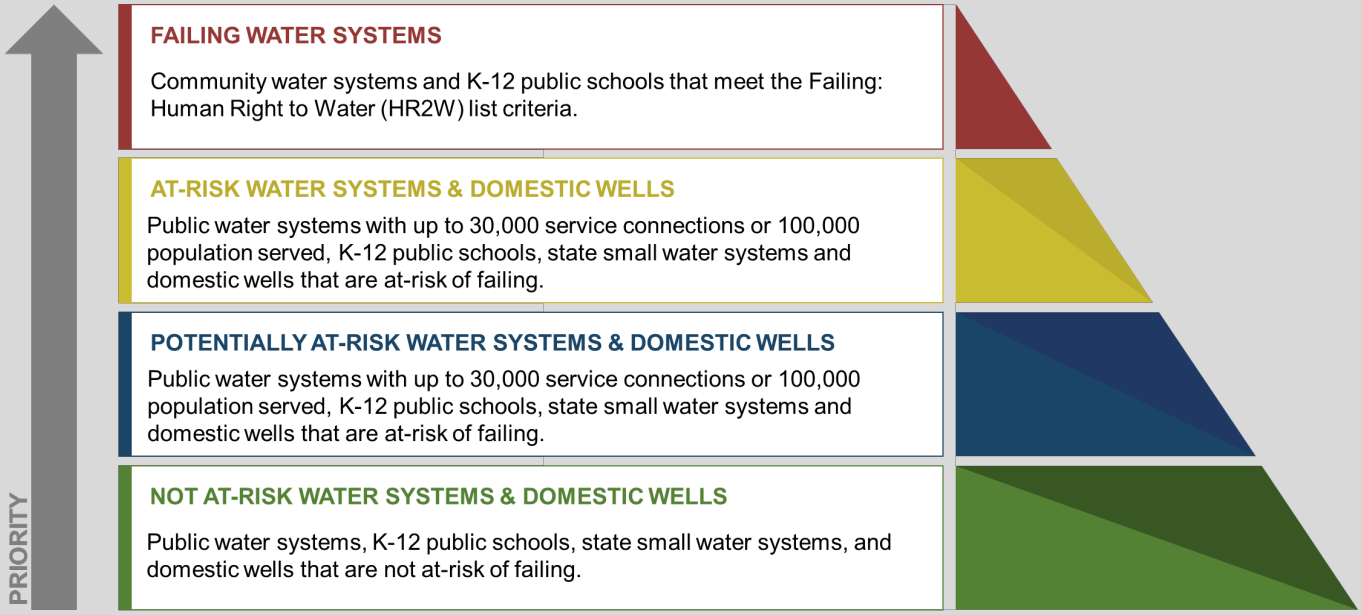
The State Water Board conducts the Needs Assessment annually to inform the annual Fund Expenditure Plan, support implementation of the SAFER Program, and advance its water system Technical, Managerial, Financial (TMF) Capacity Development Strategy. The results of the Needs Assessment will be used by the State Water Board and the SAFER Advisory Group[24] to inform prioritization of public water systems, tribal water systems, state small water systems, and domestic wells for funding in the Safe and Affordable Drinking Water Fund Expenditure Plan; inform direction for State Water Board technical assistance; and to develop strategies for implementing interim and long-term solutions (Figure 4).

[22] California Health and Safety Code section 116769.

[23] California Health and Safety Code section 116769 (2) (B).

[24] SAFER Advisory Group
https://www.waterboards.ca.gov/safer/advisory_group.html

Figure 4: SAFER Program Priorities, From Highest to Lowest



SYSTEMS ANALYZED IN THE NEEDS ASSESSMENT

California has more than 7,000 active water systems, 1,300 state small water systems, and more than 300,000 known domestic wells. The State Water Board classifies water systems into different water systems "types" or "classifications," which often correspond to different regulatory requirements, etc.

Table 7: Water System Classifications

Water System Type	Definition[25]	# of Active Systems
Public Water System (PWS)	A system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.	7,323
Community Water System (CWS)	A public water system that serves at least 15 service connections used by yearlong residents or regularly	2,866

[25] California Health and Safety Code Section 116275.

Water System Type	Definition[25]	# of Active Systems
	serves at least 25 yearlong residents of the area served by the system.	
Non-Community Water System (NCWS)	A public water system that is not a community water system.	4,457
Non-Transient, Non-Community Water System (NTNC)	A public water system that is not a community water system and that regularly serves at least 25 of the same persons over six months per year (e.g., K-12 school, year around business, etc.).	1,485
Transient, Non-Community Water System (TNC)	A public water system that does not meet the definition of a community water system or non-transient, non-community water system, which serves 25 or more people at least 60 days out of a year or there are 15 or more service connections that are not used by yearlong residents (e.g., restaurants, gas stations, parks, etc.).	2,972
State Small Water System (SSWS)	A system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year.	1,316[26]
Domestic Well (DW)	A groundwater well used to supply water for the domestic needs of an individual residence or a water system that is not a public water system and that has no more than four service connections. (Health & Saf. Code, § 116681, subd. (g).)	312,187[27]

The 2022 Needs Assessment's components analyze different inventories of water system types. Table 8 summarizes the water system types included in each component.

[26] The 2022 Needs Assessment analyzed 1,273 state small water systems where data was available.

[27] This represents the number of domestic well records identified using the Department of Water Resources Online System for Well Completion Reports (OSWCR). The actual count and location of active domestic wells is currently unknown.

Table 8: Systems Included in the Needs Assessment

Needs Assessment Component	Water Systems Included
Failing: HR2W List	• All community water systems. • Non-transient Non-community K-12 schools.
Risk Assessment for Public Water Systems	• Community water systems up to 30,000 service connections and up to 100,000 population served. ○ Wholesalers are excluded. • Non-transient Non-community K-12 schools.
Risk Assessment for State Small Water Systems and Domestic Wells	• All state small water systems where location data is available. • "Domestic" well completion reports from the Department of Water Resources Online System for Well Completion Reports.
Drought Infrastructure Cost Assessment	• Community water systems between 15 to 2,999 service connections. • Non-transient Non-community K-12 schools.
Affordability Assessment	• All community water systems ○ Wholesalers are excluded • Non-transient Non-community K-12 schools – excluded because they do not charge for water.

HR2W: FAILING WATER SYSTEMS

Many Californians still do not have access to safe, affordable drinking water. California is the first state to do an in-depth study of this issue. It follows California's leadership in adopting the first Human Right to Water policy in the nation 10 years ago.

The State Water Board assesses water systems that fail to meet the goals of the Human Right to Water and maintains a list and map of these systems on its website. Systems that are on the Failing: Human Right to Water list (Failing: HR2W list) are those that are out of compliance or consistently fail to meet primary drinking water standards. Systems that are assessed for meeting the HR2W list criteria include Community Water Systems (CWSs) and Non-Community Water Systems (NCWSs) that serve schools and daycares. The Failing: HR2W list

criteria were expanded in April 2021 to better align with statutory definitions of what it means for a water system to "consistently fail" to meet primary drinking water standards.[28]

Table 9 summarizes the new expanded criteria. Additional details regarding the history of the Failing: HR2W list and criteria methodology can be found on the State Water Board's Failing: HR2W webpage.[29]

Table 9: Expanded Criteria for Failing: HR2W List Water Systems

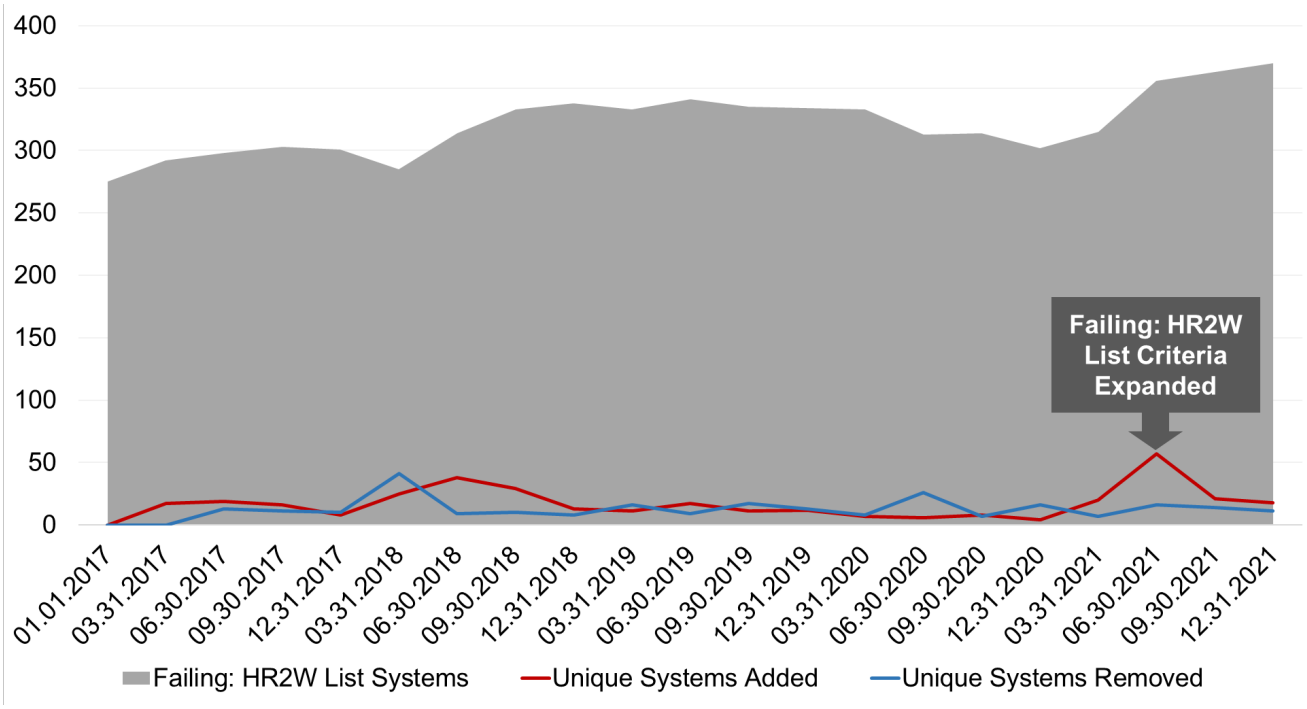
Criteria	Before 3.2021	After 4.2021
Primary MCL Violation with an open Enforcement Action	Yes	Yes
Secondary MCL Violation with an open Enforcement Action	Yes	Yes
***E. coli* Violation with an open Enforcement Action**	No	Yes
Treatment Technique Violations (in lieu of an MCL): • One or more Treatment Technique violations (in lieu of an MCL), related to a primary contaminant, with an open enforcement action; and/or • Three or more Treatment Technique violations (in lieu of an MCL), related to a primary contaminant, within the last three years.	Partially	Expanded
Monitoring and Reporting Violations (related to an MCL or Treatment Technique): • Three Monitoring and Reporting violations (related to an MCL) within the last three years where at least one violation has been open for 15 months or greater.	No	Yes

Since January 2017, there have been 585 unique water systems on the Failing: HR2W list. Figure 5 depicts the unique number of systems that have been on the list from January 2017 through December 2021.

[28] California Health and Safety Code section 116275(c).

[29] Human Right to Water | California State Water Resources Control Board https://www.waterboards.ca.gov/water_issues/programs/hr2w/

Figure 5: Number of Systems on the Failing: HR2W List 01.01.2017 through 12.31.2021

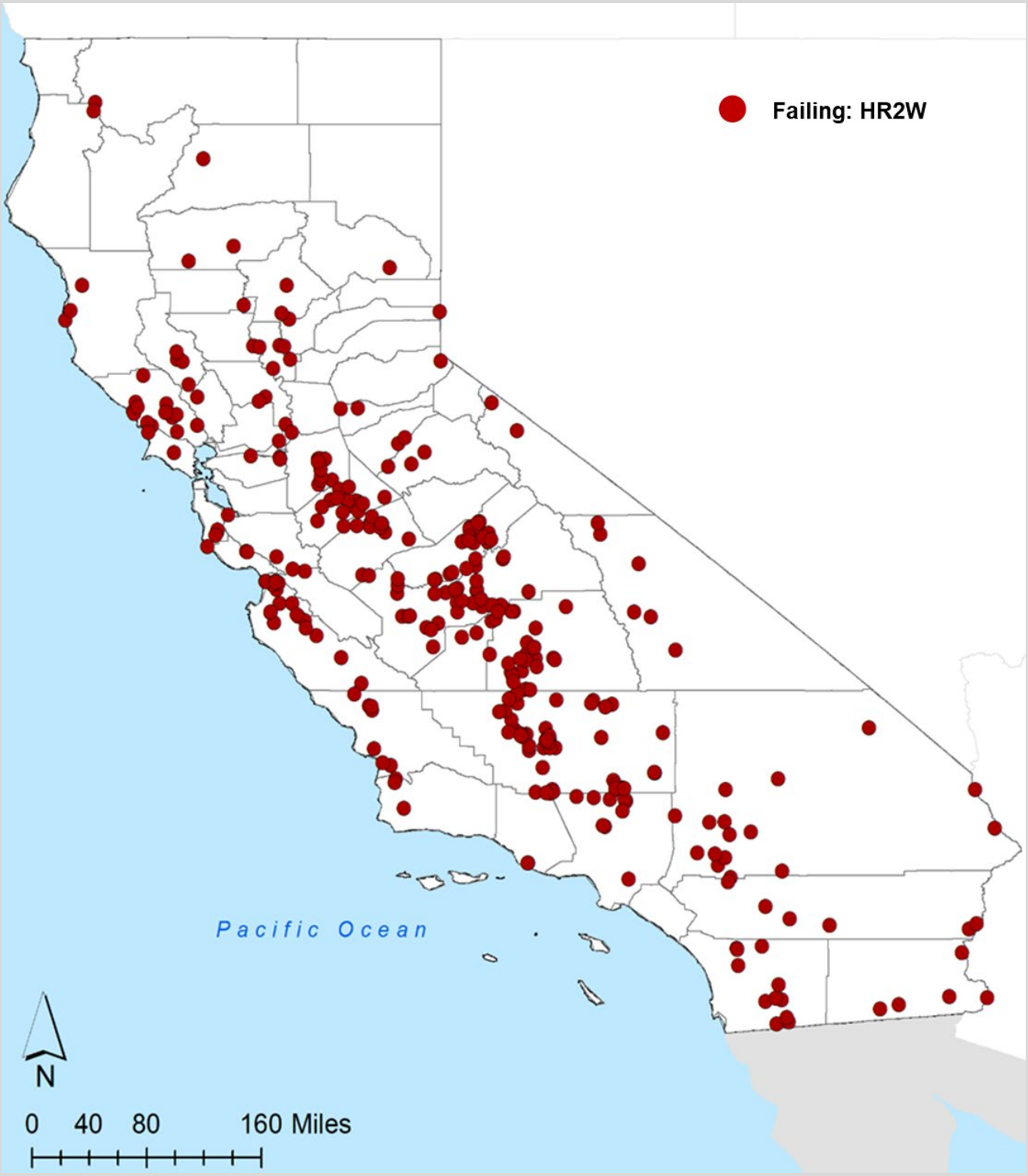


Multiple components of the Needs Assessment rely on the Failing: HR2W list of systems. For the purposes of the Risk Assessment, Failing: HR2W list systems are excluded from the Assessment's results, except for comparison purposes. If a water system meets one or more of the Failing: HR2W list criteria, then that system is considered a failing water system and cannot be considered "at-risk" of failing. However, once a water system is removed from the Failing: HR2W list, it may be added to the At-Risk list of water systems if it meets the Risk Assessment criteria. On the other hand, Failing: HR2W list systems are included in the Cost Assessment and Affordability Assessment results.

The Failing: HR2W list is refreshed on an ongoing basis and updated quarterly on the State Water Board website.[30] The Needs Assessment represents an analysis of data at a snapshot in time. For purposes of the 2022 Needs Assessment, the State Water Board utilized the Failing: HR2W list as of January 3, 2022. As shown in Figure 6 below, the Failing: HR2W list from January 3, 2022 had 347 water systems, serving 846,853 people.

[30] State Water Resources Control Board, Human Right to Water Portal
https://www.waterboards.ca.gov/water_issues/programs/hr2w/

Figure 6: Map of HR2W Systems on 01.03.2022 Utilized in the 2022 Needs Assessment



2021 RETROSPECTIVE

The SAFER Program uses a set of tools, funding sources, and regulatory authorities to ensure California communities develop local compacity to ensure access to safe and affordable drinking water. Informed by Drinking Water Needs Assessment, State Water Board staff and SAFER partners proactively identify and reach out to water systems that are on the Failing: HR2W list or At-Risk list to walk them through the SAFER application process and to collaborate on short- and long-term solutions, which are developed with input from the community. The following provides a high-level summary of the tools and resources employed by the SAFER Program in 2021 and the systems that were prioritized for State Water Board engagement and support.

2021 FAILING: HR2W LIST SYSTEMS

The State Water Board tracks community water systems and K-12 schools that meet the Failing: HR2W list criteria and when they removed from the list. In 2021 there were 416 unique water systems on the Failing: HR2W list at one point throughout the year (Table 10). This includes systems that were on the Failing: HR2W list prior to 2021 but had yet to come off.

Table 10: 2021 Failing: HR2W List Systems

Water Systems	Number of Unique Systems	Total Population Served	Average Number of Service Connections	# of Systems on List Greater than 3-Yrs.
Small Water Systems[31]	396 (95%)	305,303 (28%)	210	170
Medium Water Systems[32]	22 (5%)	779,639 (72%)	9,400	7
TOTAL:	**416**	**1,084,942**	**689**	**177**

[31] 3,000 service connections or less.

[32] Greater than 3,000 service connections. No system with greater than 30,000 service connections has been on the Failing: HR2W list since September 2019.

In 2021 there were 115 unique water systems that came onto the Failing: HR2W list, 38 of these systems were added in April 2021 due to the adoption of expanded Failing: HR2W list criteria. In 2021, 48 unique water systems were removed from the Failing: HR2W list.

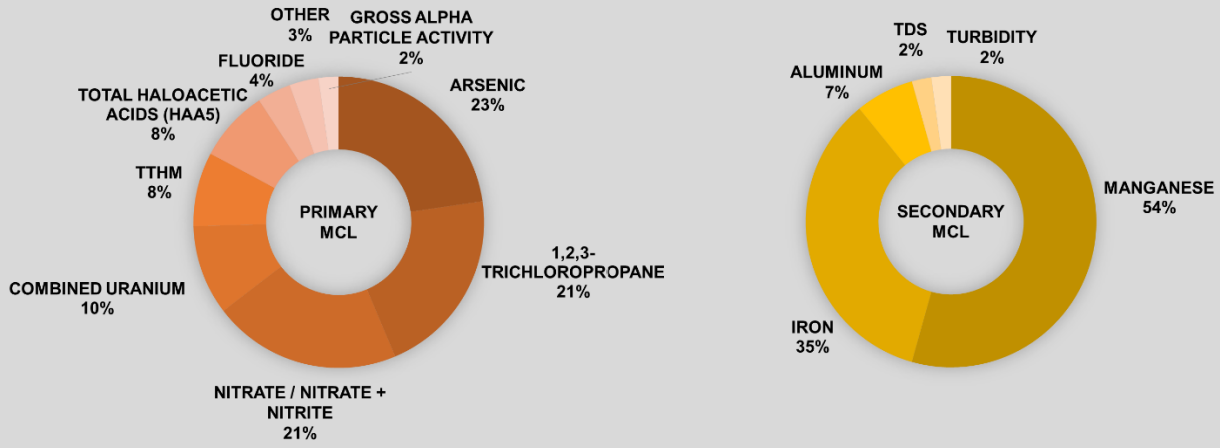
Table 11 summarizes the Failing: HR2W list criteria met by water systems that were on the list in 2021. Approximately 37 water systems were meeting more than one criteria.

Table 11: Number of Instances of Failing: HR2W List Criteria Met in 2021

Water Systems	Primary MCL Violation	Secondary MCL Violation	*E. coli* Violation	Treatment Technique Violation	Monitoring & Reporting Violations
Small Water Systems	308	28	9	27	60
Medium Water Systems	20	1	0	3	1
TOTAL:	**328**	**29**	**9**	**30**	**61**

Statewide, the top contaminants that contributed to higher proportion of systems on the Failing: HR2W list in 2021 was arsenic, 1,2,3-trichloropropane, and nitrate / nitrate + nitrite for primary MCL violations and manganese and iron for secondary MCL violations.

Figure 7: Primary and Secondary MCL Violation Contaminants



ENHANCING WATER SYSTEM CAPACITY

The goal of the SAFER Program is to help address Failing and At-Risk systems – building local capacity through consolidations, administrators, or technical assistance to ensure systems are able to operate sustainably and achieve the HR2W. The State Water Board utilizes a diverse set of programs and tools to help support water system capacity. The following sections summarize how they were utilized in 2021 to support California water systems.

WATER SYSTEM PARTNERSHIPS & CONSOLIDATIONS

Small water systems often are less resilient to natural disasters, such as drought and fire, have more difficulty adjusting to regulatory changes, and struggle to fund infrastructure maintenance and replacement due to poor economies of scale and lack of staff. As a result, the State Water Board supports consolidations and water partnerships. This support includes financial aid from the SAFER funds to help pay for consolidations of small water systems wherever feasible, and consolidation incentives for larger water systems agreeing to take in small water systems. The State Water Board recognizes that consolidations typically require community engagement, water system governance changes, and complex agreements and engineering between multiple parties. The State Water Board's SAFER Engagement staff assist in initiating discussions between parties, outreaching to other agencies with jurisdiction and helping to conceptually design possible consolidation alternatives.

In 2021, the State Water Board developed a Drinking Water System Outreach Tool[33] (Outreach Tool). The Outreach Tool shows the locations of public water systems, state small water systems, and domestic well density. The Outreach Tool also indicates what systems are failing or at-risk, as well as disadvantaged block groups. This tool allows public stakeholders to evaluate their own potential for consolidation with nearby water systems and allows larger water systems to investigate the potential for regional projects. In addition to the Outreach Tool, the California Water Partnerships Tool[34] (Partnership Tool) was created to highlight water the approximately 200 water partnerships and consolidations that have been completed since 2016. The Partnership Tool provides a visual method to highlight for residents where other consolidations and/or partnerships have recently taken place near their community. These tools combined with the results of the 2020-2021 risk assessment results and input from local Division of Drinking Water staff was utilized to outreach to water systems where physical consolidation appeared to be a good alternative.

In 2021, the State Water Board's Engagement staff sent out approximately 1,100 letters to water systems recommending consolidation and hosted 12 Water Partnership Training events

[33] Drinking Water Outreach Tool
https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=70d27423735e45d6b037b7fbaea9a6a6

[34] California Water Partnerships Tool
https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=fabf64fbe50343219a5d34765eb7daad

across the state. In 2021, 27 water systems were consolidated, serving a population of 13,651 (Table 12). A full list of the systems is available on the State Water Board's website.[35]

Table 12: 2021 Consolidated Water Systems

2021 SAFER Status	Number of Systems	Population Served	# Funded by State Water Board
Failing: HR2W list	3	759	2
At-Risk	2	183	1
Potentially At-Risk	3	2,551	1
Not At-Risk or Not Assessed	19	10,158	2
TOTAL:	**27**	**13,651**	**6**

In addition to the water systems consolidated in 2021, the State Water Board's has approximately 170 active consolidations either in early stages of development or in the funding processes. Approximately 30% of water systems on the Failing: HR2W list are considering consolidation or in full development of the consolidation alternative and progressing forward. For Failing: HR2W list systems where consolidation is a potential alternative or in development, monthly meetings are held with State Water Board staff and the involved water systems to ensure that the project progresses and to provide additional support, as appropriate. Additionally, the State Water Board initiated two new mandatory consolidation actions in 2021:

- NorCal Water Works with Del Oro Water Company (Tehama County) and
- Tooleville Mutual Non-Profit Association with the City of Exeter (Tulare County).

ADMINISTRATORS

In September 2019, the State Water Board adopted an Administrator Policy Handbook[36] to provide direction regarding the appointment of administrators by the State Water Board of designated water systems, as authorized by Health and Safety Code section 116686.

Administrators may be individual persons, businesses, non-profit organizations, local agencies including counties or nearby larger utilities, and other entities. Administrators may be assigned broad duties such as acting as general manager for the designated water system, or specific duties, such as managing an infrastructure improvement project on behalf of a designated water system.

The appointment of an administrator is an authority that the State Water Board will consider when necessary to provide an adequate supply of affordable, safe drinking water. Water

[35] List of consolidated water systems
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/dashboard.html

[36] Administrator Policy Handbook
https://www.waterboards.ca.gov/board_info/agendas/2019/sept/091719_6_cs1_cleanversion.pdf

systems in need of an administrator are identified based on the Needs Assessment, the prioritization process outlined in Section III, and the direct local knowledge and expertise of State Water Board District Office staff. The State Water Board recognizes the significance and, in some cases, potentially disruptive effect of ordering a designated water system to accept an administrator and therefore intends to use its authority carefully and incorporate significant community engagement as outlined in the Administrator Policy Handbook.

At present, qualified administrators include:

- non-profit technical assistance providers (e.g., California Rural Water Association)
- counties (e.g., Sonoma and Tulare)
- for-profit water systems (e.g., Russian River Utilities), and
- engineering services providers (e.g., Provost and Prichard, Stantec)

Since obtaining a list of qualified administrators in 2020, the State Water Board has designated 13 public water systems[37] in need of an administrator and held public meetings for all the impacted communities. This represents approximately 3,300 people and 900 service connections in seven counties. One administrator has currently been ordered to a system, North Edwards Water District, and the State Water Board approved $309,457 in fiscal year 2021 for the California Rural Water Association to fund their administrator appointment to this system. The other twelve water systems are awaiting completion of executed funding agreements and/or working through liability concerns prior to being ordered an administrator.

The State Water Board is currently working with some administrators that are likely to have multiple administrator projects over the years to develop administrator master agreements for multiple water systems to expedite future administrator appointments. In 2021, the State Water Board worked on developing administrator master agreements with two engineering firms. Provost & Pritchard Consulting Group's contract in the amount of $1,000,000 was executed in 2022. More information about the administrator program can be found on the State Water Board's administrator webpage.[38]

FUNDING

In 2021, the SAFER Program provided short-term solutions, such as emergency well repairs, and bottled and hauled water provision to nearly 28,000 individuals. Long-term solutions, such as construction and consolidation, was completed for 81 communities, including nearly 200,000 individuals. Planning assistance (towards construction of long-term solutions) was provided to 171 communities, including over 135,000 individuals.[39]

[37] Nine systems in 2020 and four were initiated in 2021.

[38] State Water Board Administrators
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/administrator.html

[39] Compilation of DFA Drinking Water Assistance since July 2019
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/2022/dfa-dw-compilation-2-17-2022.xlsx

The Budget Act of 2021[40], added funds that can benefit drinking water projects in small, disadvantaged communities, including $650 million for drinking water infrastructure projects, $16 million for interim or immediate solutions to drinking water drought emergencies, and $30 million for technical and financial assistance to drinking water systems to address Per- and Polyfluoroalkyl Substances (PFAS).[41] New federal infrastructure funds were also approved and will begin to be administered to projects in 2022. The State Water Board is implementing a County-wide and Regional Funding Program[42], intended to assist counties in developing programs for communities and households served by state small water systems and domestic wells to address both drought and water quality issues. The goal is to expand geographically on an already robust program being implemented in eight counties in the San Joaquin Valley.

The State Water Board worked on several funding process improvements that are currently being implemented. These are described further in the 2021/22 Safe and Affordable Drinking Water FEP,[43] which was adopted by the Board October 19, 2021. In 2021, the FEP for the first-time included data on racial and other demographics, and in future iterations staff will be further evaluating racial equity in the program.

2021 DRINKING WATER ARREARAGE PAYMENT PROGRAM

In 2021 the State Water Board received $985 million for a Water and Wastewater Arrearage Payment Program to address community water system residential and commercial customer water debt that accrued during the COVID-19 pandemic (March 4, 2020 through June 15, 2021). The Program was designed to be a one-time payment to community water systems to forgive outstanding, eligible customer arrearages. Legislation required the State Water Board to survey eligible community water systems, prior to opening the official application window, to determine statewide drinking water arrearage needs. The initial arrearage survey opened for 30 days in July 2021 and the results indicated that 100% of reported arrearages could be supported by the Program. Based on the results of the survey, the State Water Board finalized the Program Guidelines and opened the application window on October 5, 2021 through January 15, 2022.

The Program received 668 applications,[44] from 871 water systems serving more than 80% of the state's population. Thus far, the State Water Board has issued $301 million in arrearage funding to 582 water systems. Funding from the Program has benefited approximately 504,000 residential accounts and 31,000 commercial accounts.

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[40] Budget Act of 2021 – Drinking Water Infrastructure Appropriation
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/2021/dw-infrastructure-appropriation-fact-sheet.pdf

[41] Per- and Polyfluoroalkyl Substances (PFAS) Funding
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/pfas.html

[42] County-wide and Regional Funding Programs
https://www.waterboards.ca.gov/safer/funding_solicitation.html

[43] 2021/22 Safe and Affordable Drinking Water Fund Expenditure plan
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/2021/draft-final-2021-22-sadwfep-clean.pdf

[44] Applicants were able to submit aggregated applications for multiple water systems.

Data from the initial survey and applications was utilized in the Risk and Affordability Assessments to calculate the new affordability indicators. It is important to note that some community water systems choose not to participate in the initial survey or Program. Therefore, this dataset may not represent the total amount of outstanding arrearages statewide.

TECHNICAL ASSISTANCE

In 2021 the State Water Board funded technical assistance for 554 water systems through agreements with several technical assistance providers. This information is summarized in Table 13. Table 14 summarizes the amount of funding provided to support technical assistance in 2021.

Table 13: Number of SAFER Systems that Received Technical Assistance in 2021

2021 SAFER Status	Number of Systems
Failing: HR2W list	164
At-Risk	94
Potentially At-Risk	65
Not At-Risk or Not Assessed	231
TOTAL:	**554**

Table 14: Technical Assistance Funding in 2021

Funding Sources	Funding Provided
Drinking Water State Revolving Fund Set-Aside	$ 1,343,205
Prop 1	$ 546,585
Safe and Affordable Drinking Water Fund	$ 11,180,377
TOTAL:	**$13,070,168**

Under the SAFER Program new types of services and pilot programs are being provided and will continue to be developed. New services include providing 0% interest revolving bridge loans (via a third-party provider) for interim construction financing, and emergency fund grants. Pilot programs under development funded by the SADW Fund include offering O&M bridge loans for eligible water systems that are experiencing revenue shortfalls due to COVID-19. Technical Assistance (TA) providers will also be partnering with small water systems and providing assistance through technical experts who will assist by providing mutual aid and assistance, leveraging their expertise to assist in consolidation efforts with larger entities when feasible. These services will be provided consistent with the scope of work that is developed

for each program, and the capabilities of the current TA providers, and may not be available at the statewide level. DFA plans to expand access to these programs by continuing to work with and provide funding to new and existing TA providers.

The State Water Board continues to expand investments in the TA program, with a focus on small, disadvantaged communities and consolidations. Legislation enacted in Fall 2021 added qualified 'Technical Assistance Providers' as a new eligible funding recipient for monies from the Safe and Affordable Drinking Water Fund. The State Water Board developed a Request for Qualifications (RFQ) process to identify qualified TA Providers,[45] including for-profit entities. An expanded list of qualified TA Providers will potentially allow for new types of and a greater volume of services to be available to communities and public water systems as well as expansion of services to other areas of the state.

In order to accelerate the implementation of long-term solutions, the State Water Board will use TA providers to accelerate the planning efforts for small systems prioritizing those serving small DACs or low-income households by providing planning through TA to support the submittal of a complete application for construction funding. Consistent with the priorities established in the DWSRF IUP,[46] planning through TA may be provided for systems out of compliance and consolidation projects. Additionally, now equipped with the results of the 2021 Needs Assessment, TA will also be utilized to accelerate planning for At-Risk systems. In general, planning tasks will include development of an engineering report, a cost estimate, plans and specifications, and necessary environmental documentation for the most feasible solution.

In addition, for greater efficiency under the SAFER Program, the State Water Board may use a regional approach where appropriate and provide pooled services to multiple systems within an area to reduce costs.[47] In all cases, DFA staff will be assigned to oversee and manage the scope, cost, and progress of all TA work, with increased attention given to new types of services that have been approved under the SAFER Program.

SANITARY SURVEYS

A sanitary survey is a comprehensive inspection to evaluate water system potential to provide safe drinking water to their customers and to ensure compliance with the federal Safe Drinking Water Act (SDWA). The evaluation includes a data verification and review of all monitoring and reporting files in office. Also, a physical site visit to the field. An inspection must include all aspects of the water system including water source, treatment facilities, distribution system, water storage, pumps, pump facilities, and controls, monitoring, reporting, and data

[45] Drinking Water Technical Assistance Provider Request For Qualifications Guidelines
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/2022/rfq-guidelines.pdf

[46] Drinking Water State Revolving Fund (DWSRF) Intended Use Plan
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final2.pdf

[47] Policy for Developing the Fund Expenditure Plan
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/2021/final_policy_for_dev_fep_sadwf_1221.pdf

verification, system management and operation, and operator compliance with State requirements.

U.S. EPA requires that community water systems be inspected every three years. The State Water Board's Division of Drinking Water (DDW) usually conducts inspections and documents the findings in sanitary survey reports. However, in some counties, authority has been delegated to Local Primacy Agency (LPA) staff conduct those inspections.

On March 4, 2020, Governor Newsom declared a State of Emergency in California as a result of the threat of COVID-19.[1] Shortly after, State Water Board staff transitioned to telework to protect staff and decrease the potential spread of the disease. Protective measures were implemented, and some sanitary surveys delayed ensuring the continuity of operations and water supplies by protecting the safety of water treatment operators and State Water Board staff.

The State Water Board tracks the numbers of sanitary surveys completed annually. Table 15 and Table 16 shows the number of sanitary surveys completed in 2021, and the number of surveys completed during the required time frame of 3 years for community water systems and 5 years for non-community water systems.

Significant Deficiencies are identified by State Water Board staff or LPA staff during a Sanitary Survey and other water system inspections. Significant Deficiencies include, but are not limited to, significant defects in the design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that U.S. EPA determines to be causing or have the potential for causing the introduction of contamination into the water delivered to consumers. Significant Deficiencies can be identified for both groundwater and surface water systems, although the compliance deadlines and requirements differ depending on the applicable rule (Groundwater Rule vs. Long Term 2 Enhanced Surface Water Treatment [LT2] Rule.

Table 15: Community Water System Sanitary Surveys

Regulating Agency	# of Systems	2021 Inspections	Sig. Def. Identified in 2021	# of Inspections 2019-2021	# Sig. Def. Identified 2019-2021
State Water Board	1,985	523 (26%)	20	1,429 (72%)	201
LPAs	882	363 (41%)	0	775 (88%)	8
TOTAL:	**2,867**	**886 (31%)**	20	**2,204 (77%)**	209

Table 16: Non-Community Water System Sanitary Surveys

Regulating Agency	# of Systems	2021 Inspections	Sig. Def. Identified in 2021	# of Inspections 2017-2021	# Sig. Def. Identified 2017-2021
State Water Board	2,077	320 (16%)	2	1,671 (80%)	112
LPAs	2,381	585 (25%)	0	2,188 (92%)	18
TOTAL:	**4,458**	**909 (20%)**	2	**3,859 (87%)**	130

NEW PROGRAMS & TOOLS

NEW LEGISLATION

Senate Bill 403

On September 23, 2021, the California legislature passed Senate Bill 403[48] (SB 403) authorizing the State Water Board to conduct mandatory consolidation of At-Risk water systems that serve disadvantaged communities or where a disadvantaged community is substantially reliant on At-Risk state small water systems or domestic wells.

Senate Bill 552

On September 23, 2021, the California legislature passed Senate Bill 552[49] (SB 552) to support planning and implementation of drought resiliency measures by counties and small water systems. SB 552 has four main resiliency areas:

- Implementation of water shortage contingency plans,
- Infrastructural resiliency implementation for small community water systems and K-12 schools that are non-community water systems,
- County planning requirements for domestic wells and state small water systems, and
- State Water Board and Department of Water Resource Tool development and coordination activities.

Under the infrastructure resiliency implementation, SB 552 specifically requires small water suppliers, defined as community water systems (CWS) serving 15 to 2,999 service

[48] Senate Bill No. 403
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB403

[49] Senate Bill No. 552
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB552

connections and non-transient, non-community water systems that are K-12 schools, to implement the following drought resiliency measures, subject to funding availability:

- No later than January 1, 2023, implement **monitoring systems** sufficient to detect **production well groundwater levels**.
- Beginning no later than January 1, 2023, **maintain membership in the California Water/Wastewater Agency Response Network (CalWARN)** or similar mutual aid organization.
- No later than January 1, 2024, to ensure continuous operations during power failures, provide adequate **backup electrical supply**.
- No later than January 1, 2027, have at least **one backup source** of water supply, **or a water system intertie**, that meets current water quality requirements and is sufficient to meet average daily demand.
- No later than January 1, 2032, **meter each service connection** and monitor for water loss due to leakages.
- No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet **fire flow** requirements.

In response to stakeholder feedback and the need to support SB 552 planning, the State Water Board conducted a targeted Drought Infrastructure Cost Assessment for the 2022 Needs Assessment which covers the infrastructure resiliency implementation portion of this legislation.

NEW TOOLS AND DATA

The State Water Board has been making great progress in improving data collection, data quality, and access to data analysis. Below is a highlight of new and ongoing activities that support the SAFER Program.

Electronic Annual Report (EAR)

The Electronic Annual Report (EAR)[50] is a required annual survey of public water system that collects critical water system information intended to assess the status of compliance with specific regulatory requirements, provide updated contact and inventory information (such as population served and number of service connections), and provide information that is used to assess the financial capacity of water systems, among other information reported. Data collected through the EAR is utilized throughout the Needs Assessment and supports many other State Water Board and external programs.

In 2020, the State Water Board began a multi-year effort to improve the EAR survey to provide additional functionality, improve data validations, and enhance the EAR user experience. This new EAR survey was released in 2021 to collect 2020 calendar-year data from water systems. The 2020 EAR reporting year marked the first-time customer charges and financial data was

[50] Electronic Annual Report (EAR) | California State Water Resources Control Board https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

required reporting. This data was incorporated into the both the 2022 Risk and Affordability Assessments.

There will be continued advancements to the EAR to improve data collection, data quality, and enhance the user experience. The EAR will continue to be a valuable source of data to support the SAFER Program and the Needs Assessment.

System Area Boundary Layer (SABL)

The State Water Board maintains a geospatial dataset of water service area boundaries for California public water systems, known as System Area Boundary Layer (SABL).[51] To provide an accurate data set of service area boundaries for California drinking water systems, the state Water Board has undertaken a project to vet and verify the data collected by the Tracking California's Water Boundary Tool.[52] In 2021, the State Water Board added 90 new public water system boundaries, for total of 4,935. Furthermore, nearly 120 existing boundaries were verified (versus pending or not verified). SABL is an essential dataset utilized in the Needs Assessment to calculate risk indicator datapoints for water systems such as median household income, location in critically overdrafted groundwater basin, etc. SABL is also used to determine potential consolidation or intertie projects. Accurate system boundaries improve the results of the Needs Assessment.

State Small Water Systems & Domestic Well Data

SB 200 (Health and Safety Code § 116772) requires county local health officers and other relevant local agencies to electronically submit to the State Water Board state small water system and domestic well inventories and water quality testing results (performed by accredited laboratories). The collection and submittal of water quality testing and associated data for state small water systems and domestic wells has, historically, been performed at the county level with little to no oversight or support from the State Water Board. In 2021, the State Water Board developed and shared with counties, a guidance document on how to comply with SB 200 reporting requirements.[53]

In 2021, the State Water Board focused its efforts on supporting counties in submitting inventory data related to state small water systems and domestic wells. It is important for an inventory record to exist in order to associate water quality data to a system or well location. The State Water Board hosted webinar workshops and released data templates to support counties with this effort.[54]

Since 2021, 57 (98%) counties provided information for approximately 1,300 active state small water systems to the State Water Board. Table 17 provides a summary of the counties that

[51] California Drinking Water System Boundaries
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=fbba842bf134497c9d611ad506ec48cc

[52] Water Boundary Tool
https://trackingcalifornia.org/water-boundary-tool/water-boundary-tool-landing

[53] State Small Water System and Domestic Well Water Quality Data Submission Guidance for Counties
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/ssws_dw_data_submittal_guidance.pdf

[54] State Small Water Systems and Domestic Well Water Quality Data Website
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/small_water_system_quality_data.html

have submitted state small water systems data and the total number of active systems that have been reported.

Table 17: Submitted State Small Water Systems Inventory by County

County	# of Systems	County	# of Systems	County	# of Systems
Alameda	1	**Marin**	4	**San Luis Obispo**	27
Alpine	1	**Mariposa**	7	**San Mateo**	9
Amador	6	**Mendocino**	26	**Santa Barbara**	41
Butte	11	**Merced**	18	**Santa Clara**	65
Calaveras	0	**Modoc**	*Missing*	**Santa Cruz**	29
Colusa	6	**Mono**	5	**Shasta**	14
Contra Costa	15	**Monterey**	282	**Sierra**	7
Del Norte	0	**Napa**	7	**Siskiyou**	19
El Dorado	17	**Nevada**	5	**Solano**	8
Fresno	22	**Orange**	0	**Sonoma**	50
Glenn	3	**Placer**	7	**Stanislaus**	20
Humboldt	15	**Plumas**	34	**Sutter**	13
Imperial	1	**Riverside**	93	**Tehama**	15
Inyo	14	**Sacramento**	5	**Trinity**	24
Kern	119	**San Benito**	13	**Tulare**	28
Kings	5	**San Bernardino**	26	**Tuolumne**	7
Lake	17	**San Diego**	17	**Ventura**	25
Lassen	4	**San Francisco**	0	**Yolo**	4
Los Angeles	8	**San Joaquin**	27	**Yuba**	15
Madera	15				
				TOTAL:	**1,316**

Since 2021, 15 (26%) counties provided approximately 36,000 domestic well inventory records to the State Water Board. Table 18 provides a summary of the counties that have submitted domestic well data and the total number of wells that have been reported. The State Water Board estimates there may be more than 350,000 domestic wells in California. The State Water Board will continue to support counties in providing this information.

Table 18: Submitted Domestic Well Inventory by County

County	# of Domestic Wells	County	# of Domestic Wells	County	# of Domestic Wells
Alameda	*Missing*	**Marin**	*Missing*	**San Luis Obispo**	320
Alpine	*Missing*	**Mariposa**	*Missing*	**San Mateo**	*Missing*
Amador	282	**Mendocino**	4,092	**Santa Barbara**	79
Butte	*Missing*	**Merced**	*Missing*	**Santa Clara**	*Missing*
Calaveras	*Missing*	**Modoc**	*Missing*	**Santa Cruz**	*Missing*
Colusa	145	**Mono**	*Missing*	**Shasta**	*Missing*
Contra Costa	*Missing*	**Monterey**	*Missing*	**Sierra**	*Missing*
Del Norte	*Missing*	**Napa**	1,239	**Siskiyou**	*Missing*
El Dorado	3,632	**Nevada**	5,480	**Solano**	*Missing*
Fresno	*Missing*	**Orange**	80	**Sonoma**	*Missing*
Glenn	*Missing*	**Placer**	*Missing*	**Stanislaus**	*Missing*
Humboldt	754	**Plumas**	187	**Sutter**	*Missing*
Imperial	*Missing*	**Riverside**	*Missing*	**Tehama**	*Missing*
Inyo	*Missing*	**Sacramento**	18,266	**Trinity**	*Missing*
Kern	*Missing*	**San Benito**	Missing	**Tulare**	*Missing*
Kings	*Missing*	**San Bernardino**	504	**Tuolumne**	*Missing*
Lake	*Missing*	**San Diego**	29	**Ventura**	*Missing*
Lassen	*Missing*	**San Francisco**	*Missing*	**Yolo**	986
Los Angeles	*Missing*	**San Joaquin**	*Missing*	**Yuba**	*Missing*
Madera	*Missing*				
				TOTAL:	**36,075**

In 2021, the State Water Board made enhancements to its California Laboratory Intake Portal (CLIP)[55] to begin collecting state small water system and domestic well water quality data electronically in 2022. The State Water Board will continue to support counties to comply with SB 200 reporting requirements.

SAFER Clearinghouse

Since 2020, the State Water Board has been developing a database system, known as the SAFER Clearinghouse. The purpose of the SAFER Clearinghouse is to assist with the implementation, management, and tracking of the SAFER Program. The SAFER

[55] California Laboratory Intake Portal (CLIP)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/clip.html

Clearinghouse will pull data from SDWIS, the EAR, DFA's databases, and other data sources to assist the State Water Board in analyzing water system performance, quickly assess water system needs, track State Water Board engagement with water systems, facilitate consolidation and administrator projects, etc. The SAFER Clearinghouse is also the database of record for state small water system and domestic well data collected from counties.

In 2021, the State Water Board began developing a new drought reporting portal for water systems which is housed in the SAFER Clearinghouse. The State Water Board also uploaded and validated the state small water systems and domestic well inventories in the SAFER Clearinghouse. In the future, data collected from this portal will be incorporated into the Needs Assessment. Ultimately, the SAFER Clearinghouse will be publicly available, allowing water systems and communities to explore water system performance and track State Water Board engagement and funding activities. The State Water Board anticipates a multiphase, multi-year development process.

RISK ASSESSMENT RESULTS FOR PUBLIC WATER SYSTEMS

OVERVIEW

The purpose of the Risk Assessment for public water systems is to identify systems at risk or potentially at risk of failing to meet one or more key Human Right to Water goals: (1) providing safe drinking water; (2) accessible drinking water; (3) affordable drinking water; and/or (4) maintaining a sustainable water system. Data on performance and risk is most readily available for public water systems and thus the Risk Assessment methodology for public water systems allows for a multi-faceted examination across four risk indicator categories: Water Quality, Accessibility, Affordability; and TMF (technical, managerial, and financial) Capacity.

KEY 2022 RISK ASSESSMENT METHODOLOGY UPDATES

The following summarizes the enhancements the State Water Board has made to the Risk Assessment methodology for public water systems. See Appendix A for more information:

Expanded the inventory of water systems assessed to include some medium-size community water systems. Only community water systems and K-12 schools with 3,300 connections or less were included in 2021 Risk Assessment. In 2022, the State Water Board expanded the inventory to include medium-size community water systems with 30,000 service connections or less; and serving a population of 100,000 or less. Community water systems that serve more than 30,000 service connections or serve a population greater than 100,000 continue to be excluded from the Risk Assessment.

Removed five risk indicators from the Risk Assessment. These risk indicators include: Maximum Duration of High Potential Exposure; Water Source Types; Percent Shut-Offs for Non-Payment; Number of Service Connections, and Extensive Treatment Installed. Learn more in Appendix A.

Incorporated eight new risk indicators into the Risk Assessment. These new risk indicators include: Constituents of Emerging Concern; Source Capacity Violations; Bottled or Hauled Water Reliance; Percentage of Residential Arrearages; Residential Arrearage Burden; Days Cash on Hand; Operating Ratio; and Total Annual Income.

Learn more in Appendix A.

Updated the risk indicator calculation methodology for Critically Overdrafted Groundwater Basin, Absence of an Intertie, % Median Household Income (MHI), Extreme Water Bill, Past Presence on the Failing: HR2W List, Increasing Presence of Water Quality Trends Towards MCL, and Percentage of Sources Exceeding an MCL. Learn more in Appendix A.

Adjusted the At-Risk and Potentially At-Risk thresholds to adjust for changes in the total aggregated risk scores statewide. Learn more in Appendix A.

PUBLIC WATER SYSTEMS ASSESSED

In 2021, the Risk Assessment for public water systems was conducted for community water systems with 3,300 service connections or less and all non-transient non-community water systems which serve K-12 schools. The 2022 Risk Assessment was expanded to include medium-size community water systems. The expansion of the Risk Assessment to include medium-size community water systems allows the State Water Board to more thoroughly track the performance and capacity of community water systems, especially the medium-size water systems that are or have been on the Failing: HR2W list. Furthermore, the State Water Board has expanding funding eligibilities within its 2021-22 Intended Use Plan to medium disadvantaged community water systems.[56]

The 2022 Risk Assessment excludes 70 wholesalers because they do not provide direct service to residential customers. Some water system types have also been excluded from certain risk categories or specific risk indicators. Please refer to Table 19 for details.

Table 19: Public Water Systems Analyzed in the 2022 Risk Assessment

Water System Type[57]	Number	Water Quality	Accessibility	Affordability	TMF Capacity
Community Water Systems[58]	2,692	Yes	Yes	Yes	Yes[59]
K-12 Schools[60]	374	Yes	Yes	No[61]	Yes
TOTAL ANALYZED:	**3,066**				

[56] Drinking Water State Revolving Fund (DWSRF) Intended Use Plan https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final2.pdf

[57] Systems on the Failing: HR2W list were included in the Risk Assessment analysis, however, they were excluded from the final Risk Assessment results.

[58] Wholesalers were excluded.

[59] Military bases were excluded from the financial risk indicators: Days Cash on Hand, Operating Ratio, and Income.

[60] These systems were manually identified by the State Water Board.

[61] Schools do not typically charge for water; therefore, schools received a risk score of zero in the Affordability category for the Risk Assessment.

RISK ASSESSMENT METHODOLOGY

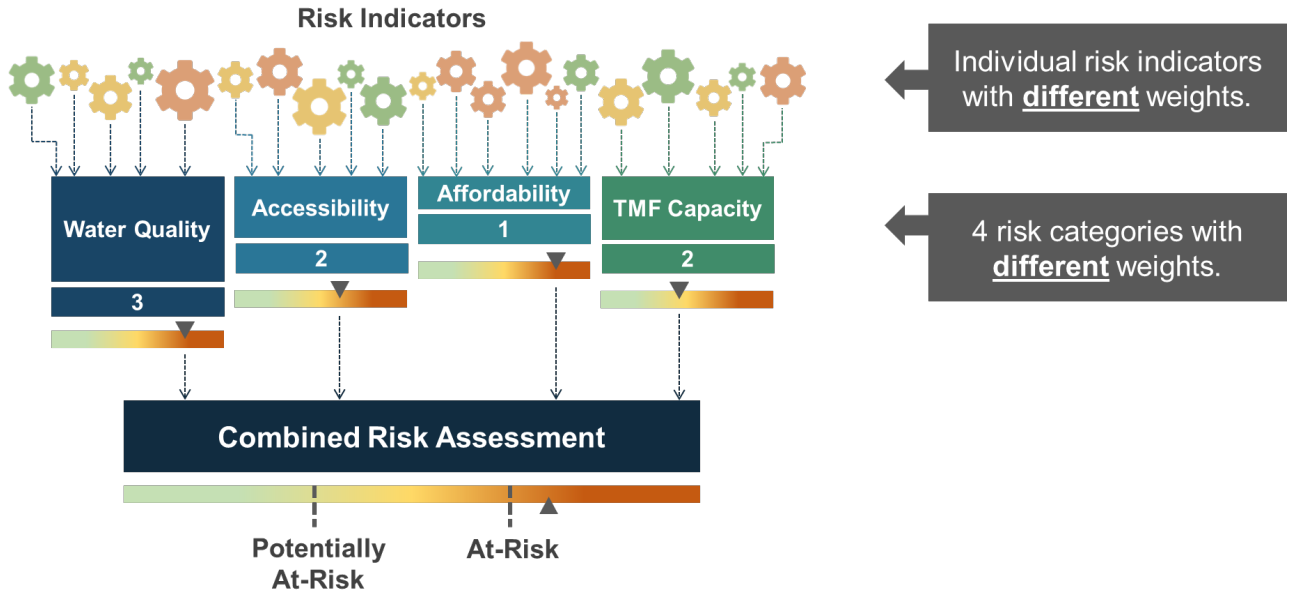
The State Water Board and UCLA developed the 2021 Risk Assessment methodology though a phased public process from January 2019 through January 2021. One in-person and four public webinar workshops were hosted to solicit public feedback. The State Water Board hosted a public webinar workshop in February 2022 to solicit feedback on adjustments to the Risk Assessment methodology. The Risk Assessment methodology relies on three core elements which are utilized to calculate an aggregated risk score for the public water system assessed (Figure 8):

Risk Indicators: quantifiable measurements of key data points that allow the State Water Board to assess the potential for a water system to fail to sustainably provide an adequate supply of safe drinking water due to water quality, water quantity, infrastructure, and/or institutional issues.

Risk Indicator Thresholds: the levels, points, or values associated with an individual risk indicator that delineates when a water system is more at-risk of failing, typically based on regulatory requirements or industry standards.

Scores & Weights: the application of a multiplying value or weight to each risk indicator and risk category, as certain risk indicators and categories may be deemed more critical than others and/or some may be out of the control of the water system.

Figure 8: Illustration of the Risk Assessment Methodology



RISK INDICATORS

The 2021 Risk Assessment utilized 19 risk indicators. These risk indicators were identified and developed from 2019-2021 in partnership between the State Water Board and UCLA and with

public feedback.[62] A concerted effort was made to select a range of risk indicators that measure water quality, accessibility, affordability, and TMF capacity based on their criticality as it relates to a water system's ability to remain in compliance with safe drinking water standards. In response to public feedback after the 2021 release of the Risk Assessment results, the State Water Board has removed five of the original risk indicators and added eight new risk indicators (Table 20) in the 2022 analysis. Information on each risk indicator calculation methodology, thresholds, scores, and weights can be found in Appendix A.

Table 20: Risk Indicators

Category	2021 Risk Indicators	2022 Risk Indicators
Water Quality	History of *E. coli* Presence	History of *E. coli* Presence
	Increasing Presence of Water Quality Trends Toward MCL	Increasing Presence of Water Quality Trends Toward MCL
	Treatment Technique Violations	Treatment Technique Violations
	Past Presence on the HR2W List	Past Presence on the HR2W List
	Maximum Duration of High Potential Exposure (HPE) (**Removed 2022**)	Percentage of Sources Exceeding an MCL
	Percentage of Sources Exceeding an MCL	**NEW**: Constituents of Emerging Concern
Accessibility	Number of Sources	Number of Sources
	Absence of Interties	Absence of Interties
	Water Source Types (**Removed 2022**)	DWR – Drought & Water Shortage Risk Assessment Results
	DWR – Drought & Water Shortage Risk Assessment Results	Critically Overdrafted Groundwater Basin
	Critically Overdrafted Groundwater Basin	**NEW**: Bottled or Hauled Water Reliance
		NEW: Source Capacity Violations
Affordability	Percent of Median Household Income (%MHI)	Percent of Median Household Income (%MHI)
	Extreme Water Bill	Extreme Water Bill

[62] The effort to identify and select the initial 2021 risk indicators included full consideration of indicators identified in efforts conducted by the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Water Resources (DWR), and the California Public Utilities Commission. Risk indicators were also assessed based on the availability of quality statewide data. Information on how the 19 risk indicators were selected from a list of 129 potential risk indicators is detailed in the October 7, 2020 white paper: Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

Category	2021 Risk Indicators	2022 Risk Indicators
	% Shut-Offs (**Removed 2022**)	**NEW**: Residential Arrearage Burden
		NEW: Percentage of Residential Arrearages
TMF Capacity	Number of Service Connections (**Removed 2022**)	Operator Certification Violations
	Operator Certification Violations	Monitoring and Reporting Violations
	Monitoring and Reporting Violations	Significant Deficiencies
	Significant Deficiencies	**NEW**: Days Cash on Hand
	Extensive Treatment Installed (**Removed 2022**)	**NEW**: Operating Ratio
		NEW: Net Annual Income

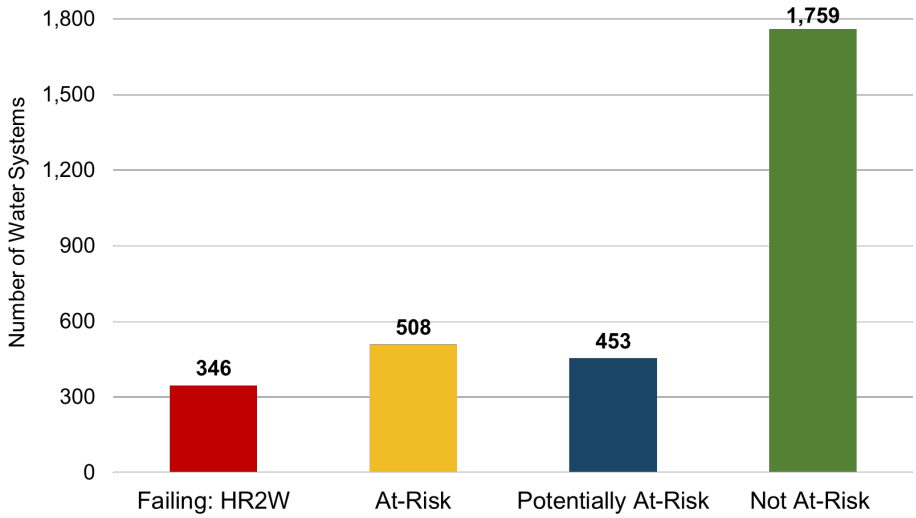
RISK ASSESSMENT RESULTS

AT-RISK WATER SYSTEMS

The 2022 Risk Assessment was conducted for 3,066 public water systems. Due to the enhancements made to the selection of risk indicators included, better data coverage, and corrections made to data calculations, there was a statewide drop in total average risk scores from 0.82 in 2021 to 0.59 in 2022. The drop in total scores reflects the methodology and calculation changes, rather than water system performance improvements. The State Water Board needed to adjust the At-Risk and Potentially At-Risk thresholds to align with the drop in total risk scores. To do this, the State Water Board analyzed the results of the 2022 Risk Assessment and selected a new threshold that achieved the same predicative power of the 2021 Risk Assessment in identifying Failing: HR2W list water systems (77%).

Utilizing the new thresholds and after removing the 346 Failing: HR2W list systems, the 2022 Risk Assessment results identified 508 (19%) At-Risk water systems, 453 (17%) Potentially At-Risk water systems, and 1,759 (65%) Not At-Risk water systems (Figure 9). Compared to the 2021 Risk Assessment results, the 2022 Assessment identifies fewer At-Risk water systems, but maintains the same predictive power of identifying Failing: HR2W list systems as the 2021 Assessment.

Figure 9: Number of Community Water Systems and K-12 Schools At-Risk and Potentially At-Risk (n=3,066)



Access the Current List of At-Risk and Potentially At-Risk Water Systems:

The full list of At-Risk and Potentially At-Risk water systems is available in Attachment A1.[63] The State Water Board will be maintaining this list as data changes occur. Therefore, the list of water systems designated At-Risk and Potentially At-Risk in this Attachment may have evolved from the aggregated assessment results summarized in this report.

The Risk Assessment results for public water systems indicated that systems on the Failing: HR2W list had more than double the average risk score (1.1 vs.0.5) when compared to non-Failing: HR2W list systems. Furthermore, 277 (80%) Failing: HR2W list systems exceeded the At-Risk threshold compared to 508 (19%) non-Failing: HR2W list systems (2,720) (Figure 10).

[63] 2022 Risk Assessment Results: Attachment A1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022risk.xlsx

Figure 10: Distribution of Total Risk Score for Water Systems (n=3,066)

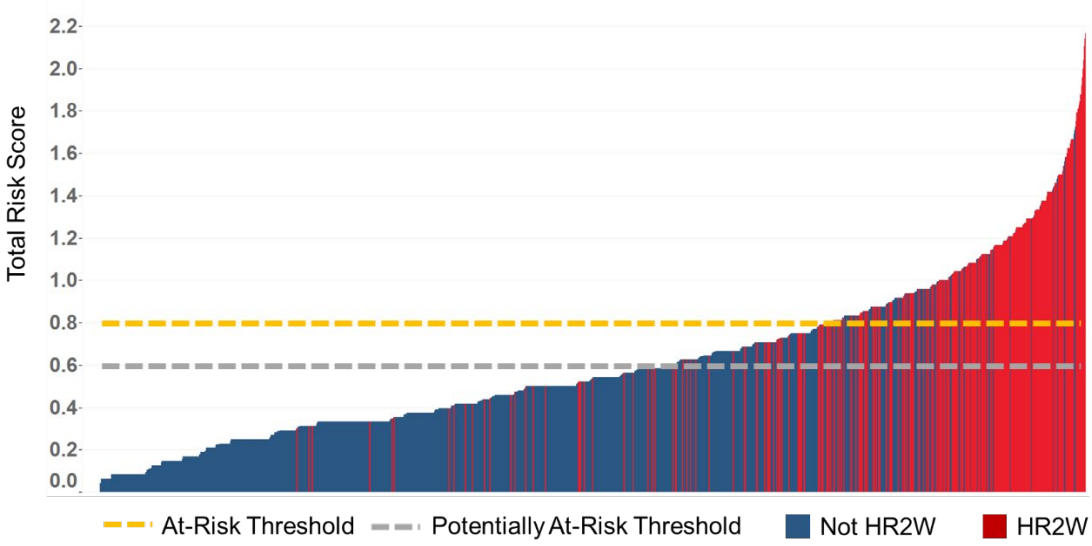
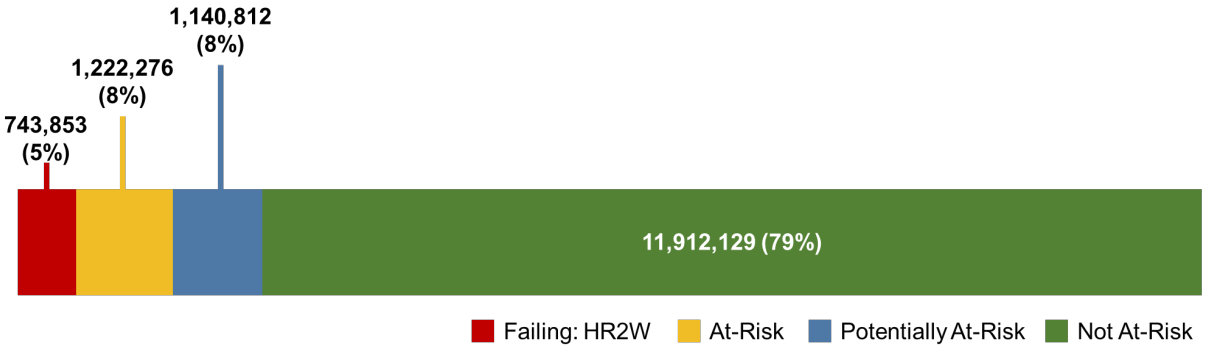


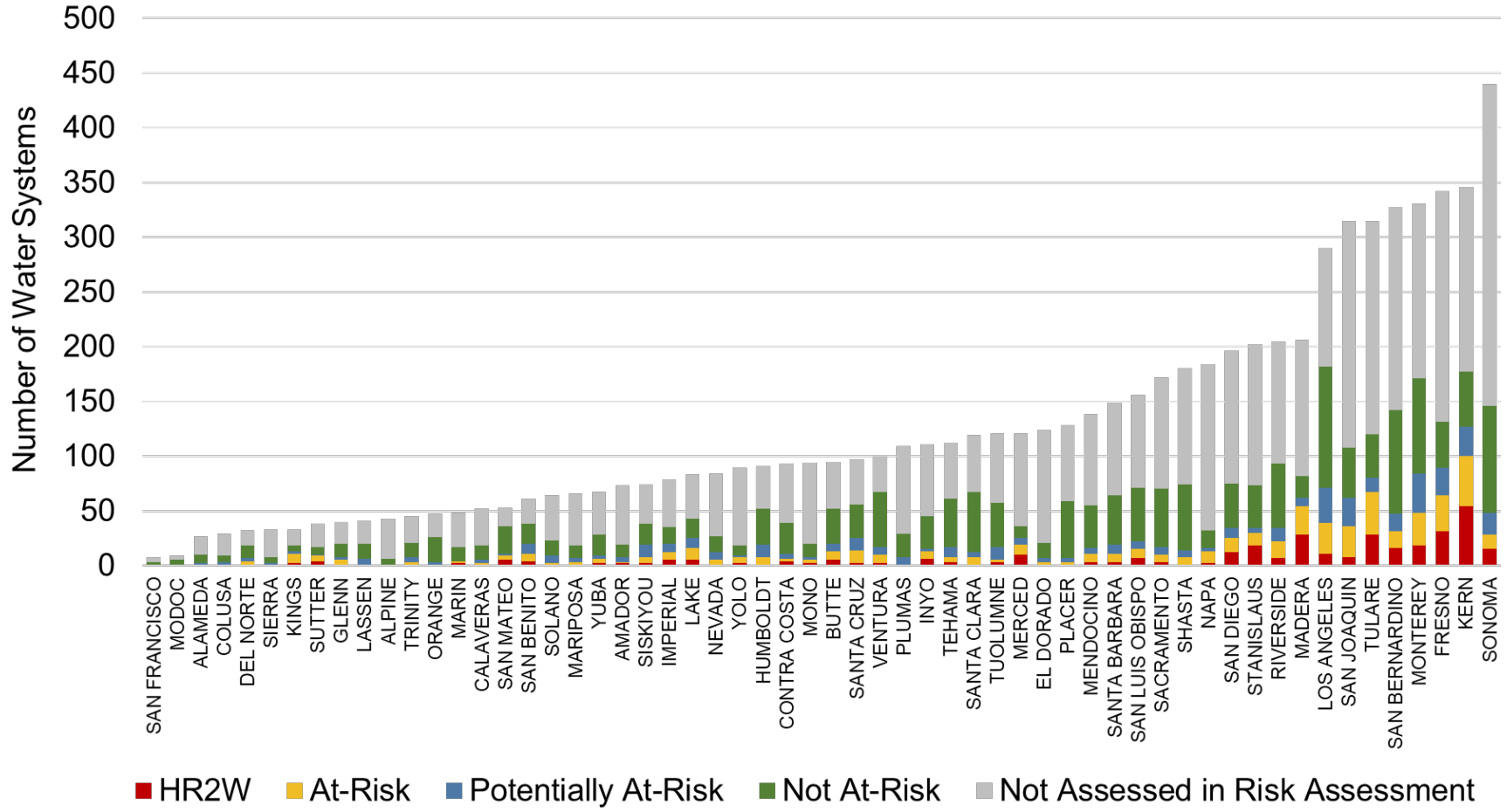
Figure 11 shows the proportion of population served by SAFER status of water systems included in the Risk Assessment. The majority of the population, approximately 79%, is served by Not At-Risk water systems. Both A-Risk and Potentially At-Risk water systems serve approximately 8% of the population served compared to systems included in the Risk Assessment and Failing: HR2W list systems serve 5%.

Figure 11: Population of At-Risk and Potentially At-Risk Communities



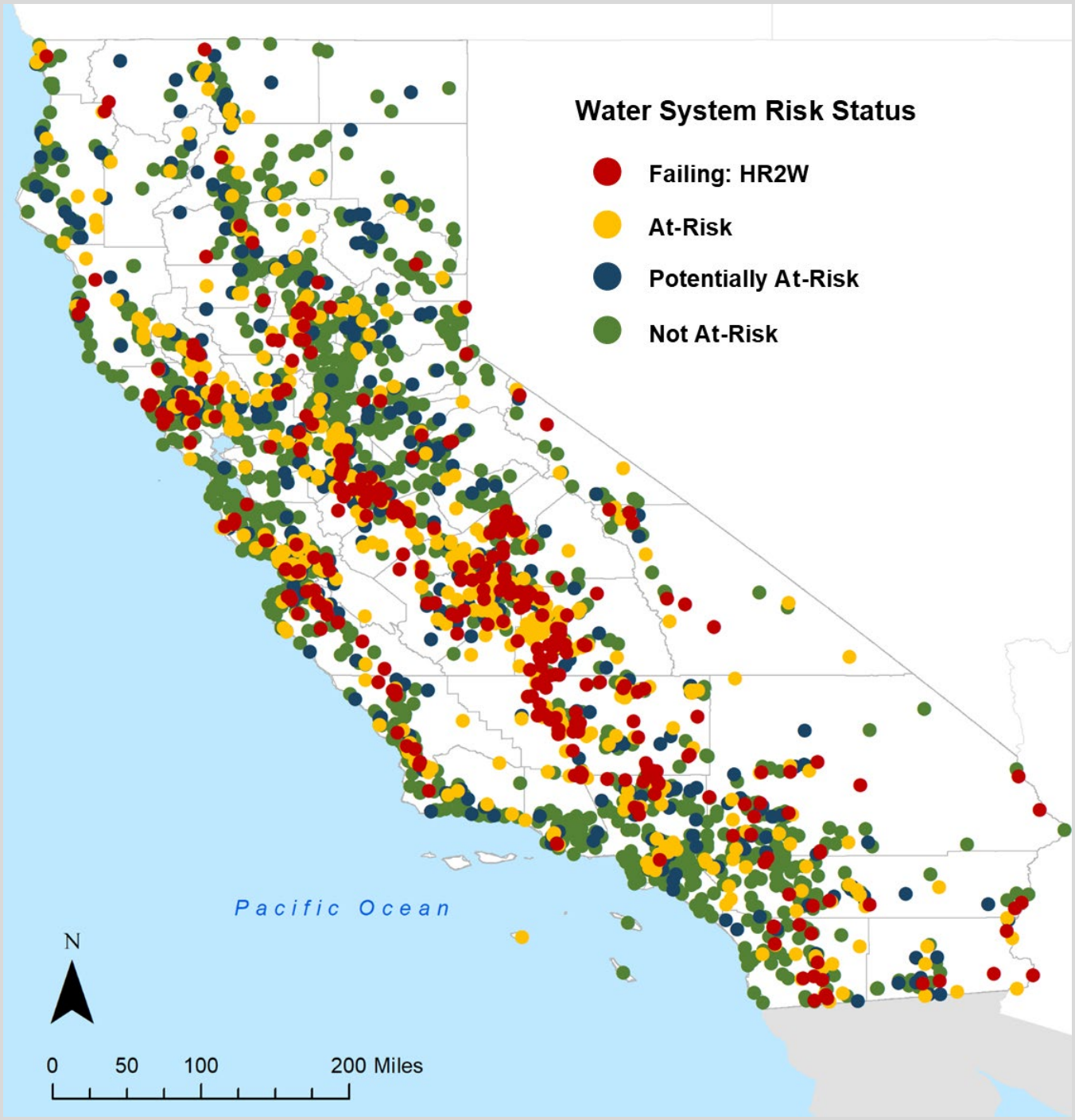
The distribution of At-Risk and Potentially At-Risk systems also varies substantially across the state, as shown in Figure 12 and Figure 13. For instance, Madera County has the highest proportion of At-Risk systems (59%), whereas Modoc County, Orange County, and San Francisco County have the lowest proportion of At-Risk systems (0%).

Figure 12: Proportion of HR2W List and At-Risk Water Systems in Each County[64]



[64] 2022 Risk Assessment Results: Attachment A1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022risk.xlsx

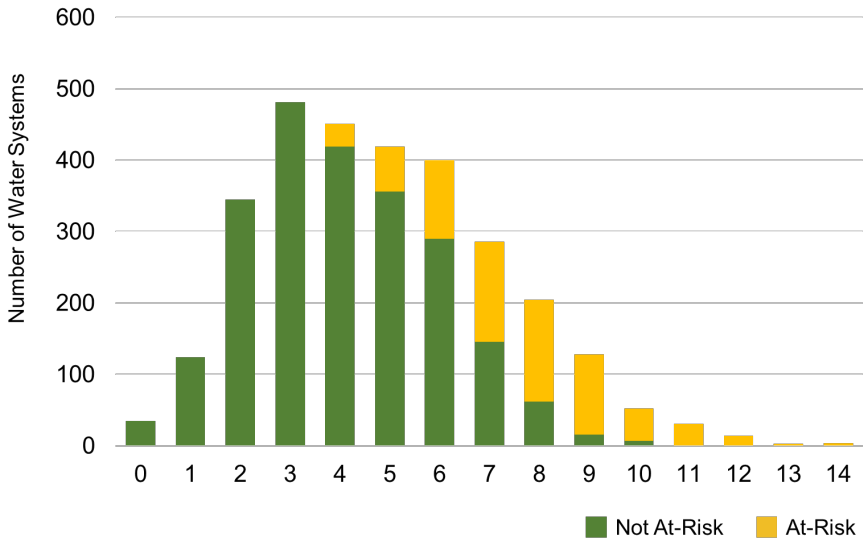
Figure 13: Map of Public Water Systems Evaluated for the Risk Assessment (n=3,088)



RISK DRIVERS

As Figure 14 below shows, all At-Risk systems exceed a threshold of concern for at least four risk indicators, with the average At-Risk system exceeding more than seven risk indicator thresholds of concern. This means that systems were not designated as At-Risk based on a single or even a handful of risk indicators. Moreover, At-Risk systems tended to have many more indicator concerns than Not At-Risk systems.

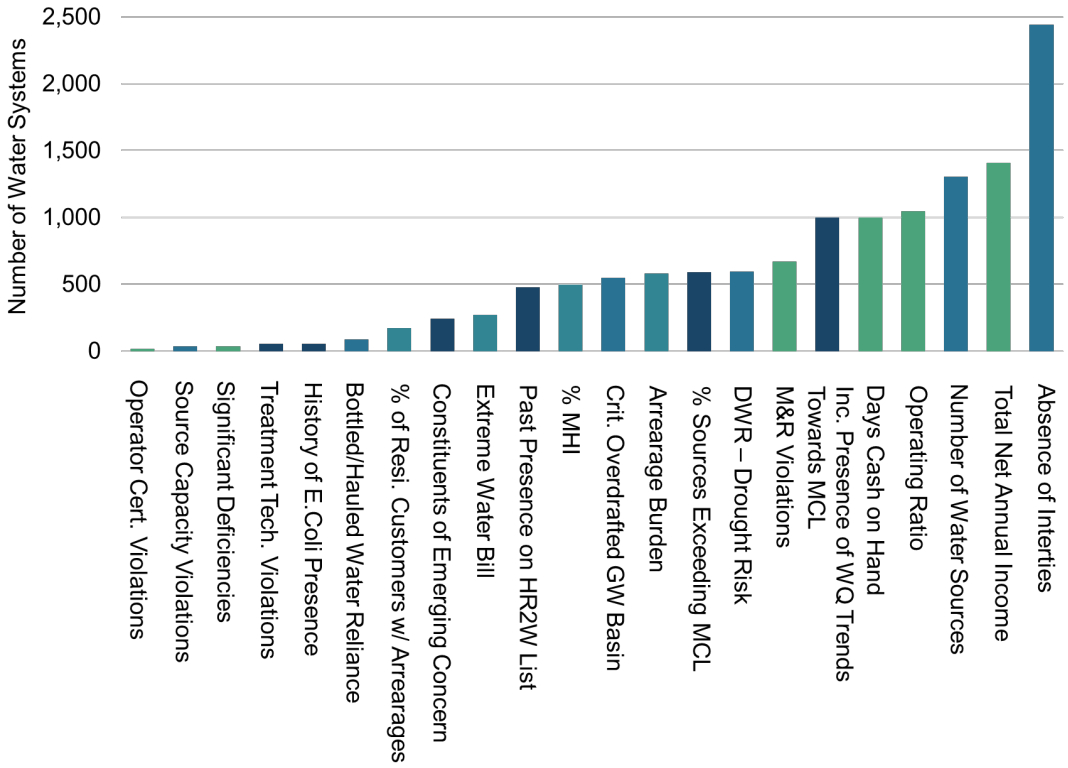
Figure 14: Distribution of the Number of Risk Indicator Thresholds Exceeded by At-Risk and Not At-Risk Water Systems (n=2,978)[65]



An analysis was also conducted to identify which risk indicator minimum thresholds were exceeded the most. As shown in Figure 15, the 'Absence of Interties', 'Total Net Annual Income', 'Number of Water Sources', 'Operating Ratio', and 'Days Cash on Hand' are the five risk indicators that the majority of water systems were exceeding the minimum risk threshold for. Two of these risk indicators fall into the Accessibility category, and three are in the TMF Capacity category.

[65] Systems that were automatically At-Risk for meeting the risk thresholds for "Number of Water Sources" and/or "Bottled or Hauled Water Reliance" were excluded from this analysis.

Figure 15: Risk Indicators Ranked by Number of Systems Exceeding Min. Risk Threshold



Based on the Risk Assessment methodology, individual risk indicators are assigned weights between one and three depending on how critical they are for a water system to meet the goals of the HR2W. To better understand which risk indicators are contributing the most towards a water system's total risk score, the average weighted scores for each risk indicator were calculated for At-Risk water systems. Table 21 shows in descending order the most influential risk indicators which contributed the most weighted points to the final risk scoring for all At-Risk systems.

Table 21: Risk Indicators Ranked by their Contribution to Total Risk Scores for At-Risk Water Systems

Category	Risk Indicator	Max Possible Weighted Risk Score	Avg. Weighted Score	Percent Contributing to Total Risk Score
Accessibility	Number of Water Sources	3	1.78	15.6%
Water Quality	Percentage of Sources Exceeding an MCL	3	1.77	15.5%
Accessibility	Absence of Interties	1	0.94	8.2%

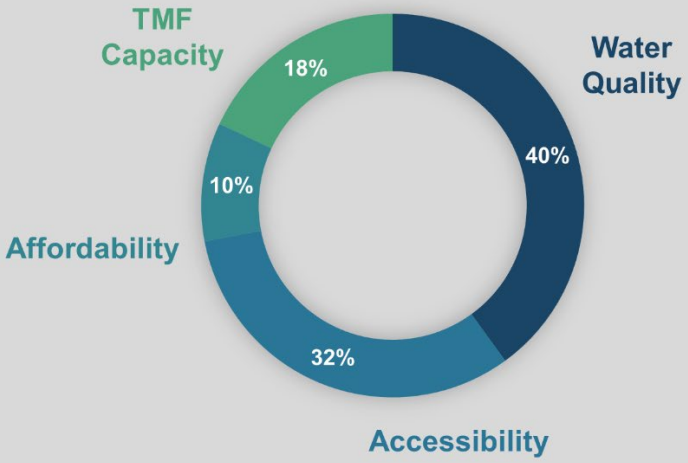
Category	Risk Indicator	Max Possible Weighted Risk Score	Avg. Weighted Score	Percent Contributing to Total Risk Score
TMF Capacity	Monitoring & Reporting Violations	2	0.79	7.0%
Water Quality	Increasing Presence of Water Quality Trends Toward MCL	2	0.71	6.2%
Accessibility	Critically Overdrafted Groundwater Basin	2	0.71	6.2%
Affordability	Percent of Median Household Income	3	0.84	6.1%
TMF Capacity	Total Net Annual Income	1	0.49	4.2%
TMF Capacity	Operating Ratio	1	0.47	4.0%
Water Quality	Past Presence on the HR2W List	2	0.46	4.0%
Accessibility	DWR – Drought & Water Shortage Risk Assessment Results	2	0.42	3.7%
Affordability	Arrearage Burden	2	0.49	3.6%
TMF Capacity	Days Cash on Hand	1	0.42	3.5%
Water Quality	Constituents of Emerging Concern	3	0.39	3.4%
Accessibility	Bottled Water or Hauled Water Reliance	3	0.34	2.9%
Water Quality	History of *E. coli* Presence	3	0.17	1.5%
Affordability	Percent of Residential Customers with Arrearages	2	0.20	1.5%
Affordability	Extreme Water Bill	1	0.12	0.9%
Accessibility	Source Capacity Violations	3	0.08	0.7%
TMF Capacity	Significant Deficiencies	3	0.08	0.7%
TMF Capacity	Operator Certification Violations	3	0.05	0.5%

Category	Risk Indicator	Max Possible Weighted Risk Score	Avg. Weighted Score	Percent Contributing to Total Risk Score
Water Quality	Treatment Technique Violations	1	0.04	0.4%

RISK INDICATOR CATEGORY RESULTS

The performance of At-Risk water systems across all individual risk indicators shows that the Water Quality category contributes the most weighted risk points to At-Risk scoring (40%), with Accessibility coming second (32%) and the TMF Capacity (18%) and Affordability (10%) categories contributing distant third and fourth highest shares of risk points.

Figure 16: Share of Each Risk Indicator Category in Calculating the Total Risk Score for Systems Meeting At-Risk Threshold (n=785)



SOCIOECONOMIC ANALYSIS OF FAILING & AT-RISK PUBLIC WATER SYSTEMS

Results for the 2022 Risk Assessment for public water systems can be combined with demographic data to better understand the populations most at-risk. However, there are several limitations to this demographic analysis. Demographic data is collected at the census block group or census tract level, and current census surveys do not indicate household drinking water source type. Therefore, the demographic information presented in the tables below may not represent the actual population served by public water systems. Any interpretation of these results should keep in mind the limitations of the analysis.

Demographic data (household size, linguistic isolation, poverty, median household income, and race/ethnicity) was taken from the 2019 American Community Survey. CalEnviroScreen

4.0 data is from OEHHA.[66] The CalEnviroScreen 4.0 data is displayed as percentiles, with higher percentiles indicating areas that are most affected by pollution and where people are especially vulnerable to the effects of pollution. The socioeconomic analysis was calculated using water service area boundaries, area-weighted census tract data where appropriate, and calculating weighted averages. This methodology means that there may be a bias towards demographic data from larger, rural tracts/block groups as these areas are often larger than smaller, urban tracts/block groups.

When compared with not at-risk water systems, Failing: HR2W list and At-Risk public water systems areas tend to have higher CalEnviroScreen scores, a higher percentage of households in poverty, a higher percentage of limited English speaking households, a larger household size, non-white communities, and are equally likely to be in a DAC or SDAC area.

Table 22: Socioeconomic Analysis for At-Risk and Failing: HR2W List Systems

	Statewide (all areas)	Not At-Risk	Potentially At-Risk	At-Risk	Failing: HR2W
Total Count of Systems	**3,066**	**1,759**	**453**	**503**	**346**
Average CalEnviroScreen 4.0 Percentile	43.1	37.6	45.6	51.5	54.6
Average CalEnviroScreen 4.0 Population Characteristics Percentile	44.5	40.4	47.0	50.5	53.0
Average CalEnviroScreen 4.0 Pollution Burden Percentile	42.7	37.9	43.9	50.8	53.7
Average percentage of households 2x below federal poverty	31.9%	29.2%	33.1%	35.5%	38.4%
Average percentage of households with limited English speaking	6.31%	4.81%	6.65%	8.21%	10.6%
Average household size	2.82	2.74	2.83	2.95	3.02
Percent of systems in DAC/SDAC areas	44.6% (1,367)	38.3% (673)	51.7% (234)	54.3% (276)	53.2% (184)
Percent of non-white customers served	42.5%	38.7%	44.2%	48.3%	51.1%

[66] OEHHA CalEnviroScreen https://oehha.ca.gov/calenviroscreen

Figure 17: Distribution of Failing: HR2W List Water Systems by Majority Race/Ethnicity of Census Tract

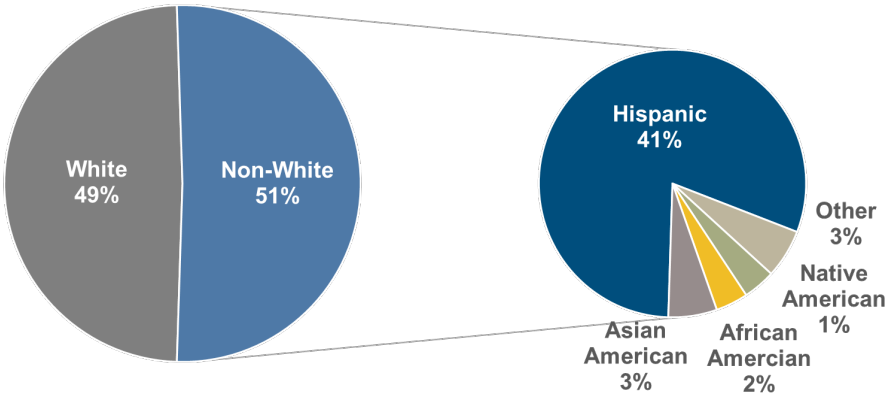
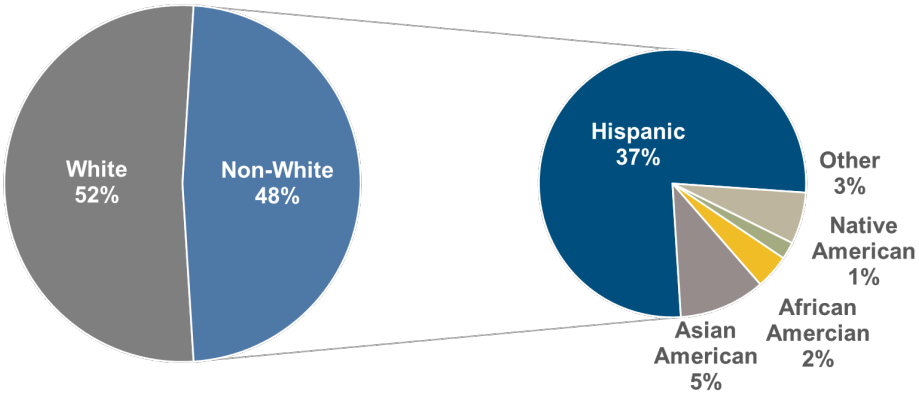


Figure 18: Distribution of At-Risk Public Water Systems by Majority Race/Ethnicity of Census Tract



LIMITATIONS OF THE RISK ASSESSMENT FOR PUBLIC WATER SYSTEMS

The Risk Assessment for public water systems is an important endeavor in assessing water system performance and risk. While the State Water Board has worked to advance the methodology since the first iteration of the Risk Assessment in 2021, the following limitations exist in the current methodology and approach:

Water Systems Not Assessed

Three types of systems were not able to be incorporated in the 2021 and 2022 Risk Assessment. First, federally recognized tribal systems were originally envisioned to be included in the same risk assessment as public water systems and attempts were made to gather data to this end, but ultimately tribal systems had to be excluded from the assessment

due to missing data. Instead, State Water Board is working with U.S. EPA and Indian Health Service to merge and compare existing risk/need assessments for tribal water systems. Second, public water systems with greater than 30,000 service connections or more than 100,000 population served were not included, but these larger systems may be included in future iterations of the Risk Assessment. Finally, wholesalers were also excluded from the 2021 and 2022 Risk Assessment. To evaluate the performance risk of wholesalers, the State Water Board may need to develop an alternative approach to assessing these systems than the methodology developed for other public water systems as there are not always direct correlations on risk indicators.

Data Quality

In 2021 the State Water Board expanded the Electronical Annual Report (EAR) to require the submission of income data for the first time. Many water systems struggled to provide this information. Many water systems may have provided inaccurate data which may explain why three of the top five risk indicators with thresholds exceeded are the new financial risk indicators utilizing this data in the TMF Capacity category. The State Water Board has provided additional guidance for water systems completing the EAR to assist systems in providing accurate information. Updates to the EAR, including improved data validation checks and warning messages, will also improve data quality for future years.

Database and Data Collection Limitations

The State Water Board's primary violation, enforcement and regulatory tracking database, Safe Drinking Water Information Systems (SDWIS), was designed for reporting compliance to the U.S. EPA for national tracking purposes. The database was not designed for the type of complex risk assessments being done in California or tailored to California's specific water quality regulations or drought-monitoring needs. SDWIS is limited in its ability to store technical, managerial and financial data and currently does not separate out other key system-level data components, such as source capacity enforcement actions, boil water notices, how water system connections are utilized, water quality trends, etc. Several efforts to augment this data collection and management have been made by the State Water Board through project-specific efforts, such as the Modified Drinking Water Watch,[67] the EAR[68] and the creation of the SAFER Clearinghouse. The ideal solution would likely entail the creation of a comprehensive data management system to fully support the transparent and data driven work required for this program.

RISK ASSESSMENT REFINEMENT OPPORTUNITIES

The Risk Assessment methodology will evolve over time to incorporate additional and better-quality data; evidence from targeted research to support existing and new risk indicators and thresholds; experience from implementing the SAFER Program; and further input from the

[67] Drinking Water Watch
https://sdwis.waterboards.ca.gov/PDWW/

[68] Electronic Annual Report (EAR) | California State Water Resources Control Board
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

State Water Board and public. The following highlights are near-term opportunities for Risk Assessment refinement:

Outreach to Tribal Water Systems
Concerted outreach to Tribal water systems was conducted in 2021 by the State Water Board and the Department of Water Resources (DWR). These outreach efforts were centered on informing tribal government and their representatives about the purpose of the SAFER Program and informing them on the benefits of sharing information so that they may be included in future Risk Assessments. In the interim, SAFER Program staff will implement the SAFER Tribal Drinking Water Outreach Plan[69] and work with individual tribes, as requested by tribal governments or in response to drinking water needs identified through coordination with the U.S. EPA and DWR.

Mid-Sized Urban Disadvantaged Water Systems
Mid-sized urban disadvantaged water systems, like those in Los Angeles County, in some cases appear to be ranking lower on the At-Risk list than expected. This may be attributed to the fact that many of the risk indicators in the Water Quality category do not score issues related to secondary standards as high compared to primary standards. Regulations for compliance for secondary standards typically require sampling at the source, rather than the distribution system. Furthermore, many of these systems have interties and multiple sources, which means they do not score as many risk points in the Accessibility category. The limitations of the TMF Capacity category discussed above also contribute to the lower risk scores for some of these systems. Thus, the State Water Board will be both working internally and partnering with the Water Replenishment District of Southern California (WRD) on their Needs Assessment efforts to help find ways to refine statewide data collection to ensure that more representative results are seen within these mid-sized systems.[70]

Expanded Data Collection Efforts
The State Water Board has already begun taking steps necessary to improve data coverage and accuracy for the Risk Assessment. Improvements to the EAR include new requirements for completing survey questions related to the Needs Assessment.[71] EAR functionality has been developed that will help auto-calculate certain datapoints like average customer charges for six HCF. This helps reduce data errors. The 2021 EAR also has a new and improved section that collects annual revenues and incurred expenses data from community water systems. This data will continue to be integrated into future iterations of the Risk Assessment to better assess water system financial risk.

The State Water Board will also begin developing new strategies to collect data related to drought resiliency, asset management and TMF Capacity for future iterations of the Needs Assessment. Recommendations on potential asset management and TMF Capacity risk

[69] SAFER 2022 Tribal Outreach Plan
https://www.waterboards.ca.gov/safer/docs/2022/SAFER-Tribal-Outreach-Plan-ENG-03242022.pdf

[70] Draft State Water Resources Control Board, Resolution No. 2020-
https://www.waterboards.ca.gov/board_info/agendas/2020/jul/072120_4_drftreso.pdf

[71] Electronic Annual Report (EAR) | California State Water Resources Control Board
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

indicators identified through the Risk Assessment methodology development process[72] will serve as a starting point for this effort.

Refinement of Risk Indicators and Thresholds

During the Risk Assessment methodology development process, three additional Affordability risk indicators were recommended for inclusion in future iterations of the Risk Assessment:[73] 'Household Burden Indicator,' 'Poverty Prevalence Indicator,' and 'Housing Burden.'[74] The State Water Board has partnered with the Office of Environmental Health Hazard Assessment (OEHHA) to develop potential affordability indicators and will begin stakeholder engagement needed to develop the appropriate affordability thresholds necessary for inclusion in the Risk Assessment and Affordability Assessment.

Furthermore, as data on water system risk indicators and failures is tracked consistently over time going forward, future versions of the Risk Assessment will be able to more fully evaluate data-driven weighting and scoring approaches to characterizing water system risk. This may lead to dropping risk indicators from the assessment which demonstrate less relationship to risk than expected, and adding others which reflect new, or previously underestimated dimensions of risk.

The intent of the State Water Board going forward is to update the Risk Assessment annually, and in so doing, enhance the accuracy and inclusiveness of the assessment via an iterative, engaged process. Accordingly, future versions of the Risk Assessment will continue to incorporate new data and enhance existing data quality.

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[72] October 7, 2020 White Paper:
Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems
https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[73] October 7, 2020 White Paper:
Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems
https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[74] *Household Burden Indicator*: This indicator measures the economic burden that relatively low-income households face in paying their water service costs by focusing on the percent of these costs to the 20th percentile income (i.e., the Lowest Quintile of Income (LQI) for the service area). This indicator is calculated by adding the average drinking water customer charges, dividing them by the 20th Percentile income in a community water system, and multiplying this by one hundred.

Poverty Prevalence Indicator: This indicator measures the percentage of population served by a community water system that lives at or below 200% the Federal Poverty Level. This measurement indicates the degree to which relative poverty is prevalent in the community.

Housing Burden: This indicator measures the percent of households in a water system's service area that are both low-income and severely burdened by housing costs (paying greater than 50% of their income for housing costs). This metric is intended to serve as an indicator of the affordability challenges low-income households face with respect to other non-discretionary expenses, which may impact their ability to pay for drinking water services.

RISK ASSESSMENT RESULTS FOR STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

OVERVIEW

The Risk Assessment methodology developed for state small water systems and domestic wells is focused on identifying areas where groundwater is at high-risk of containing contaminants that exceed safe drinking water standards and is at high-risk of water shortage for areas where groundwater is used or likely to be used as a drinking water source. This information is presented as an online map tool.[75] Water quality risk data is from the State Water Board's Aquifer Risk Map,[76] and water shortage risk data is from the Department of Water Resources Water Shortage Vulnerability Tool for Self-Supplied Communities.[77] Previous work is available on the State Water Board's Needs Assessment webpage.[78]

RISK ASSESSMENT METHODOLOGY

The State Water Board has limited water quality, water shortage, and location data for state small water systems and domestic wells, as these systems are not regulated by the state nor

[75] Combined Risk for State Small Water Systems and Domestic Wells (Needs Assessment) https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=122823a570424891986ff72846b37b83

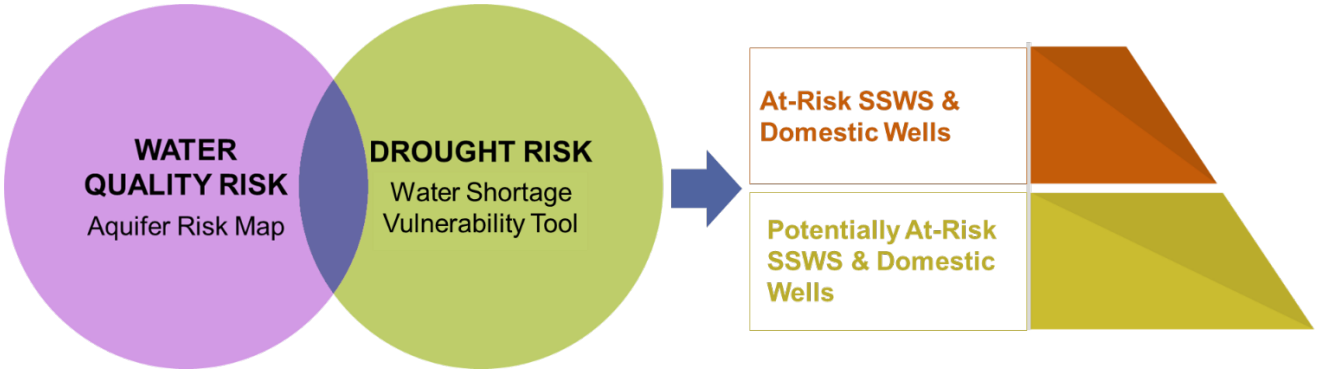
[76] Aquifer Risk Map Webtool https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=17825b2b791d4004b547d316af7ac5cb

[77] Drought and Water Shortage Risk for Self-Supplied Communities https://tableau.cnra.ca.gov/t/DWR_IntegratedDataAnalysisBranch/views/DWRDroughtRiskExplorer-RuralCommunitesMarch2021/Dashboard?%3AshowAppBanner=false&%3Adisplay_count=n&%3AshowVizHome=n&%3Aorigin=viz_share_link&%3AisGuestRedirectFromVizportal=y&%3Aembed=y

[78] Drinking Water Needs Assessment Page https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html

are maximum contaminant levels directly applicable to domestic wells.[79] Therefore, a very different approach for conducting a Risk Assessment for these systems was developed in comparison with the Risk Assessment for public water systems. The risk assessment for state small water systems and domestic wells uses modeled and estimated data to assess risk, because data directly from these systems is unavailable in most cases. Water quality risk is based on data from nearby wells of similar depth, and water shortage information is based on multiple indicators from the surrounding area including climate change, current conditions, physical and socioeconomic vulnerability, and shortage record. This section provides an overview of the methods used to assess risk for state small water systems and domestic wells. A more detailed discussion of this methodology is included in Appendix B.

Figure 19: Combined Risk Assessment for State Small Water Systems and Domestic Wells



The Risk Assessment for domestic wells and state small systems involved the following steps:

STEP 1: Use State Water Board's 2022 Aquifer Risk Map data to identify water quality risk to state small water systems and domestic wells. The Aquifer Risk Map identifies areas where long-term average or recent water quality results are above the Maximum Contaminant Limit (MCL). A normalized water quality score is calculated for each square mile section.

STEP 2: Use the DWR Water Shortage Vulnerability Tool for Self-Supplied Communities to identify drought/water shortage risk to domestic wells and state small water systems. This tool calculates water shortage risk based on a suite of factors including exposure to hazard, climate change, current conditions, physical and socioeconomic vulnerability, and record of shortage. A normalized drought/water shortage score is calculated for each square mile section.

STEP 3: Use the DWR Online System for Well Completion Reports and State Water Board's state small water system location data to identify areas where groundwater is

[79] State small water systems are typically required to conduct minimal monitoring. If water quality exceeds an MCL, corrective action is required only if specified by the Local Health Officer. State small water systems provide an annual notification to customers indicating the water is not monitored to the same extent as public water systems.

accessed by state small water systems or domestic wells. The count of state small water systems and domestic well records is reported by per square mile section.

STEP 4: Calculate the combined risk score for each square mile section by adding the normalized water quality and water shortage scores and dividing by two. An Overlay of the state small water systems and domestic well location data is used to determine how many systems and wells are in each risk category.

Combined risk scores are calculated for all areas of the state, but the risk assessment is only intended for areas with a state small water system or domestic well record. The online webtool includes a filter that only shows the risk scores for areas of the state with at least one domestic well or state small water system, although this filter can be turned off to see the risk scores for all areas.

RISK ASSESSMENT RESULTS

Due to the lack of data from actual state small water systems and domestic wells, it is difficult to precisely determine the count of systems and wells at-risk. The risk analysis described above uses proxy groundwater quality data to identify areas where shallow groundwater quality may exceed primary drinking water standards, and a suite of risk indicators to indicate where state small water systems and domestic wells may experience water shortage issues. *These proxy data do not assess the compliance or water shortage status of any individual well or system.* As a result, the presence of a given state small water system or domestic well within an “at-risk” area does not signify that they are accessing groundwater above primary drinking water standards or that the well has gone dry. Conversely, a state small water system or domestic well mapped in a “not at-risk” area may be accessing groundwater above primary drinking water standards or be experiencing water shortage issues. Physical monitoring and testing of state small water systems and individual domestic well water is needed to determine if those systems are unable to access safe drinking water.

Table 23 shows the approximate counts of state small water systems and domestic wells[80] statewide located in different risk areas based on data from the 2022 Needs Assessment. Based on the 2022 analysis there are 631 state small water systems At-Risk for water quality and 321 At-Risk for drought respectively. When analyzed, using the Combined Risk Assessment method, there are 797 state small water systems at-risk for water quality or water shortage. Of these systems, there are 265 unique systems that are at-risk for water quality only and 154 unique systems that are at-risk for water shortage only. There are 378 state small water systems that are at-risk for both water quality and water shortage. These are the most vulnerable At-Risk state small water systems.

[80] Domestic well locations are approximated using the OSWCR domestic well completion records. Learn more in Appendix B.

Table 23: State Small Water System Results (Statewide)

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Water Quality Risk Only	631 (50%)	75 (6%)	426 (33%)	141 (11%)
Drought Risk Only	321 (25%)	411 (32%)	535 (42%)	6 (0%)
Combined Risk Assessment	**378 (30%)**	**438 (34%)**	**455 (36%)**	**2 (0%)**

Figure 20: At-Risk State Small Water Systems

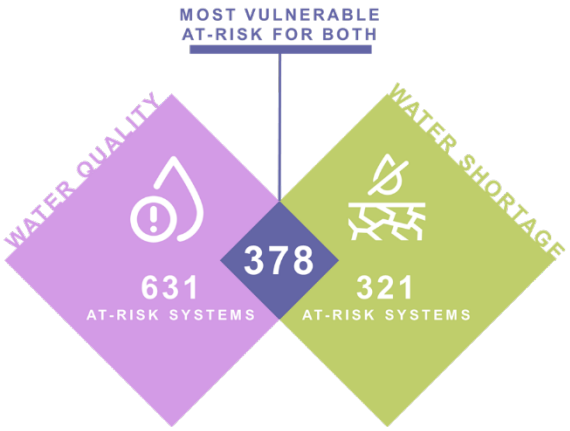


Table 24 shows the approximate counts of At-Risk domestic wells[81] statewide located in different risk areas based on data from the 2022 Needs Assessment. Based on the 2022 analysis there are approximately 93,635 domestic wells At-Risk for water quality and 90,974 At-Risk for drought respectively. When analyzed, using the Combined Risk Assessment method, there approximately 64,176 domestic wells that are At-Risk for both water quality and drought risk. These domestic wells can be viewed as the most vulnerable of the At-Risk wells identified.

Table 24: Domestic Well Results (Statewide)

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Water Quality Risk Only	92,635 (30%)	17,078 (5%)	134,282 (43%)	68,192 (22%)
Drought Risk Only	90,974 (29%)	88,340 (28%)	132,709 (43%)	164 (0%)

[81] Domestic well locations are approximated using the OSWCR domestic well completion records. Learn more in Appendix B.

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Combined Risk Assessment	**64,176 (21%)**	**90,840 (29%)**	**157,146 (50%)**	**25 (0%)**

Figure 21: At-Risk Domestic Wells

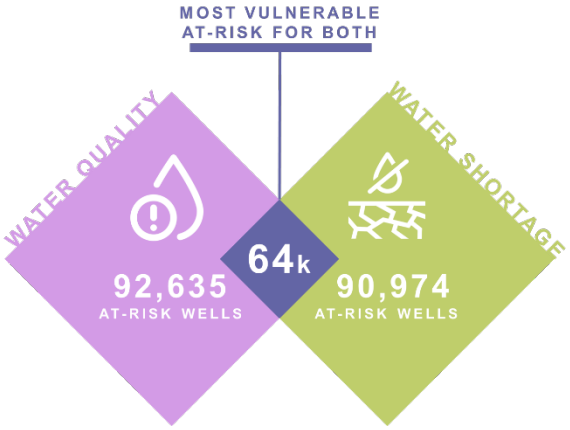


Figure 22 shows the count of domestic wells in each risk designation per county. Figure 23 shows the count of state small systems in each risk designation per county. For more detail about the Section Risk Designations, please refer to Appendix B. Figure 24 is a map that shows the combined risk for areas of the state with a domestic well or state small water system.

Figure 22: Domestic Well Records by Combined Risk (By County)

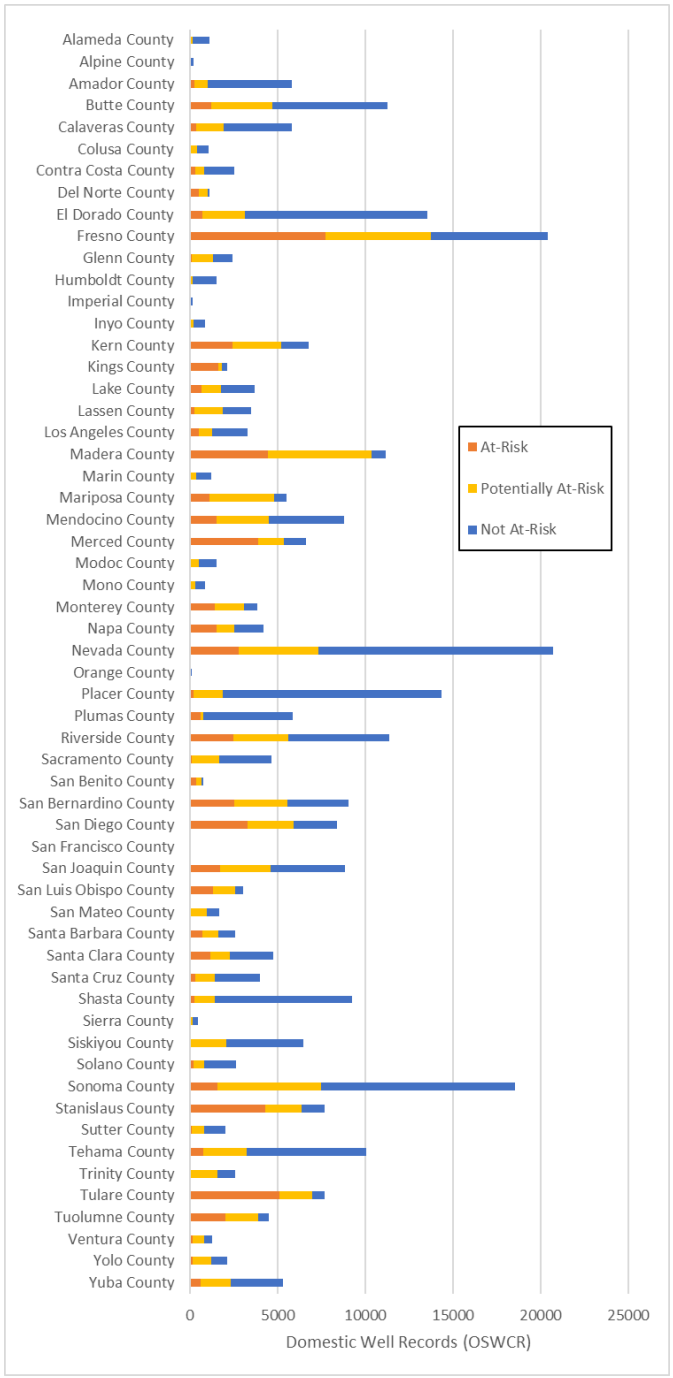


Figure 23: State Small Water Systems by Combined Risk (By County)

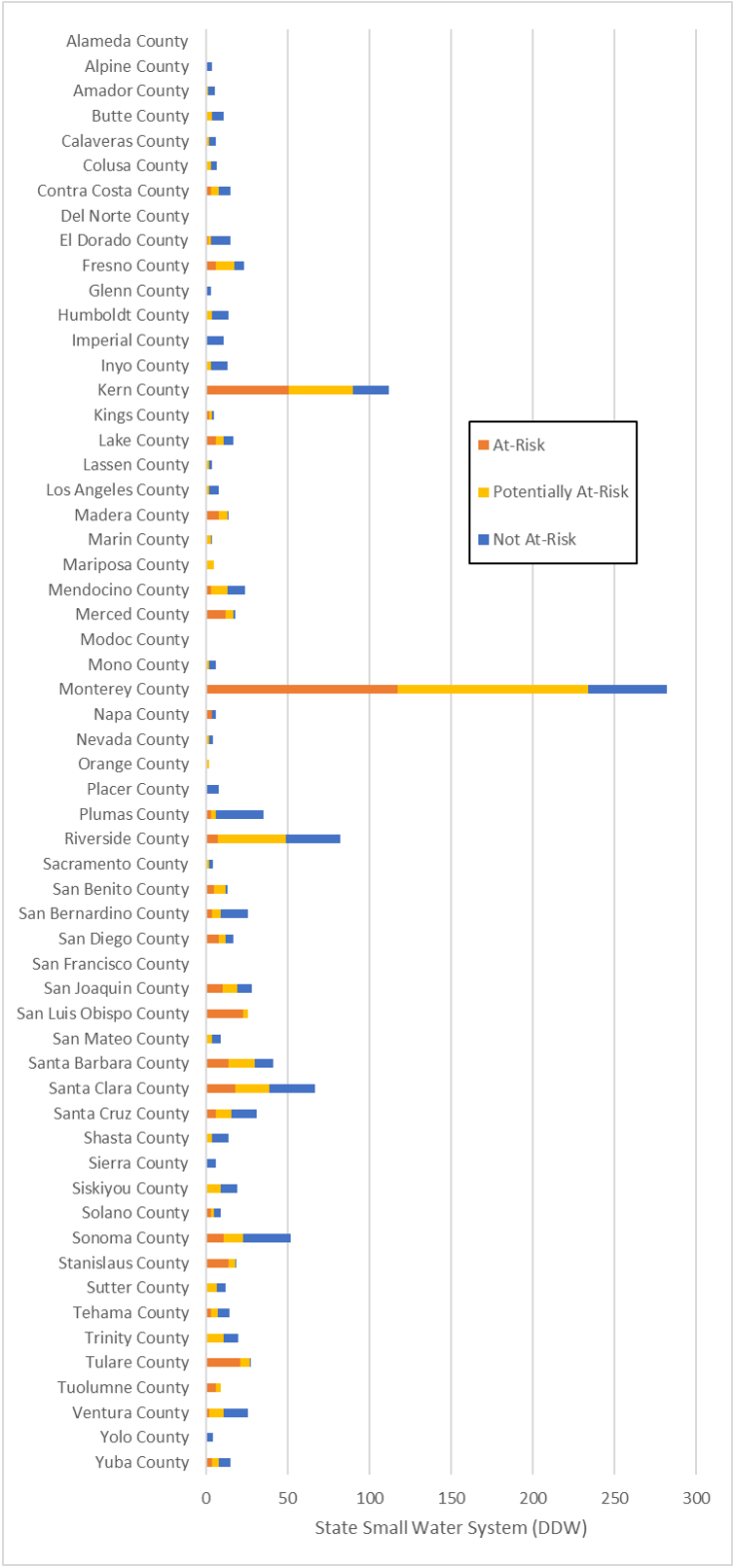
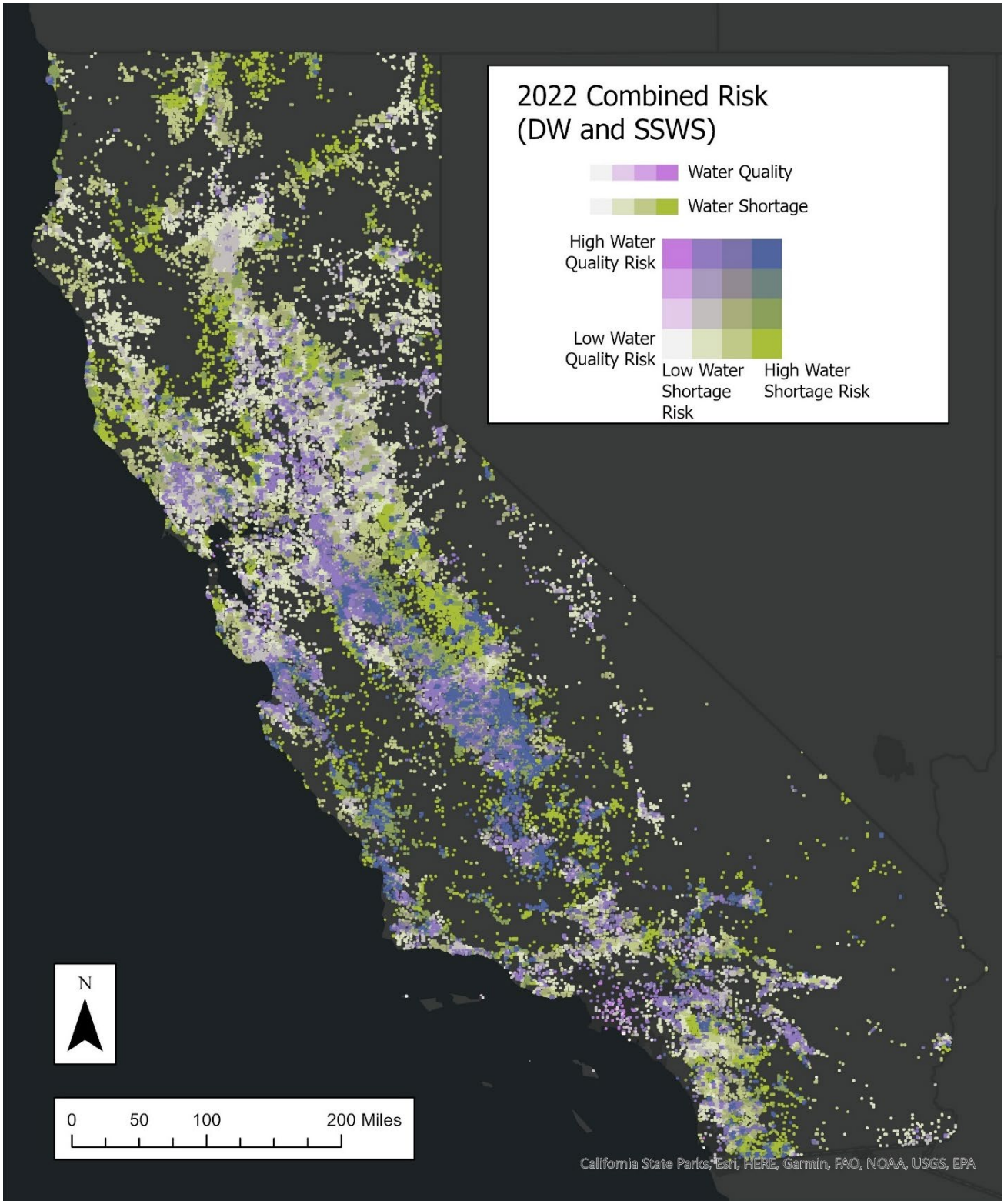
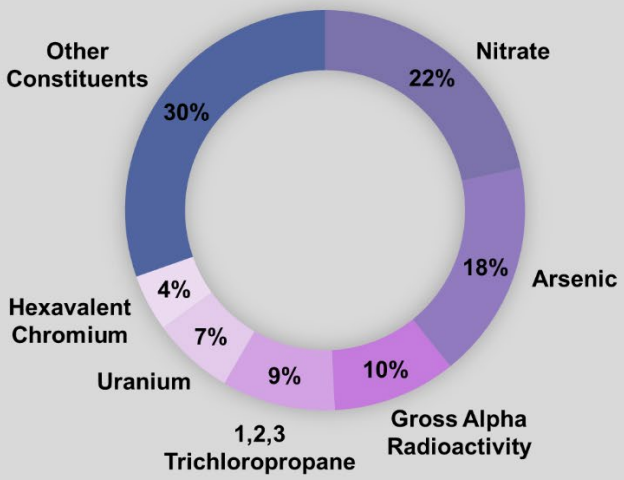


Figure 24: Combined Risk for State Small Water Systems (SSWS) and Domestic Wells (DW)



Statewide, the top contaminants that contributed to higher risk designations in domestic wells and state small water systems are nitrate, arsenic, 1,2,3-trichloropropane, gross alpha, uranium, and hexavalent chromium. Figure 25 shows the proportion of domestic wells in high water quality risk areas where the contaminant may exceed drinking water standards. Note that multiple contaminants may exceed drinking water standards at a single location.

Figure 25: Constituents Contributing to Shallow Water Quality Risk



SOCIOECONOMIC ANALYSIS OF AT-RISK STATE SMALL WATER SYSTEMS AND DOMESTIC WELL AREAS

Results for the 2022 Risk Assessment for state small water systems and domestic wells can be combined with demographic data to better understand the populations most at-risk for water shortage and water quality issues. However, there are several limitations to this demographic analysis. Demographic data is collected at the census block group or census tract level, and current census surveys do not indicate household drinking water source type. Therefore, the demographic information presented in the tables below may not represent the population served by state small water systems or domestic wells. Any interpretation of these results should keep in mind the limitations of the analysis.

Demographic data (household size, linguistic isolation, poverty, median household income, and race/ethnicity) is from the 2019 American Community Survey. CalEnviroScreen 4.0 data is from OEHHA[82]. The CalEnviroScreen 4.0 data is displayed as percentiles, with higher percentiles indicating areas that are most affected by pollution and where people are especially vulnerable to the effects of pollution. The socioeconomic analysis was calculated by assigning data to square mile sections, grouping sections by 2022 combined risk scores, and

[82] OEHHA CalEnviroScreen
https://oehha.ca.gov/calenviroscreen

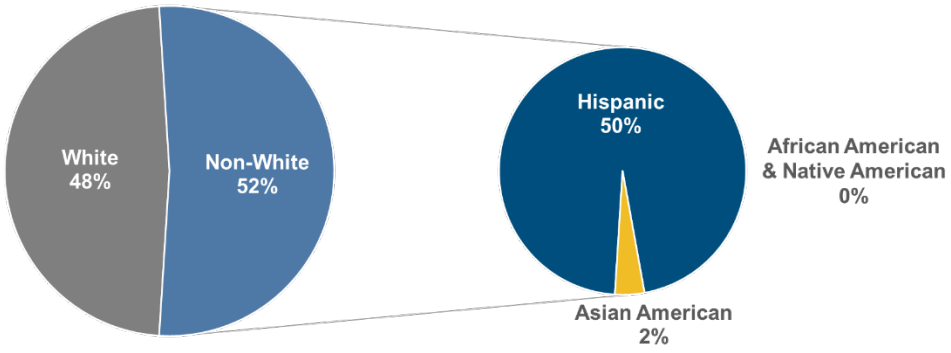
calculating averages. This methodology means that there may be a bias towards demographic data from larger, rural tracts/block groups as these areas contain more square mile sections than smaller, urban tracts/block groups.

When compared with not at-risk state small water systems areas, at-risk state small water system areas tend to have higher CalEnviroScreen scores, a higher percentage of households in poverty, a higher percentage of limited English speaking households, a larger household size, and are equally likely to be in a DAC or SDAC area. Regardless of risk, areas with domestic wells have similar CalEnvironScreen scores to areas of the state without state small water systems.

Table 25: Socioeconomic Analysis for Areas with Combined At-Risk State Small Water Systems

	Statewide (all areas)	Statewide (SSWS areas only)	Not At-Risk	Potentially At-Risk	At-Risk
Total Count of SSWS	**1,273**	**1,273**	**455**	**438**	**378**
Average CalEnviroScreen 4.0 Percentile	42.2	40.4	34.8	40.0	48.5
Average CalEnviroScreen 4.0 Population Characteristics Percentile	46.0	42.0	39.5	41.4	46.1
Average CalEnviroScreen 4.0 Pollution Burden Percentile	38.8	40.5	32.8	40.2	51.8
Average percentage of households 2x below federal poverty	36.2%	31.5%	30.0%	32.0%	33.1%
Average percentage of households with limited English speaking	5.21%	7.84%	6.19%	8.47%	9.24%
Average household size	2.51	2.78	2.59	2.79	3.02
Percent of SSWS in DAC/SDAC areas	34% (427)	34% (427)	32% (146)	36% (159)	32% (121)
Percent of SSWS in majority non-white areas	38% (487)	38% (487)	31% (140)	34% (148)	52% (198)

Figure 26: Distribution of At-Risk State Small Water Systems by Majority Race/Ethnicity of Census Tract



When compared with not at-risk domestic well areas, at-risk domestic well areas tend to have higher CalEnviroScreen scores, a higher percentage of household poverty, a higher percentage of households with limited English speaking, larger household size, and are more likely to be in a DAC or SDAC area. Regardless of risk, areas with domestic wells have similar CalEnvironScreen scores to areas of the state without domestic wells.

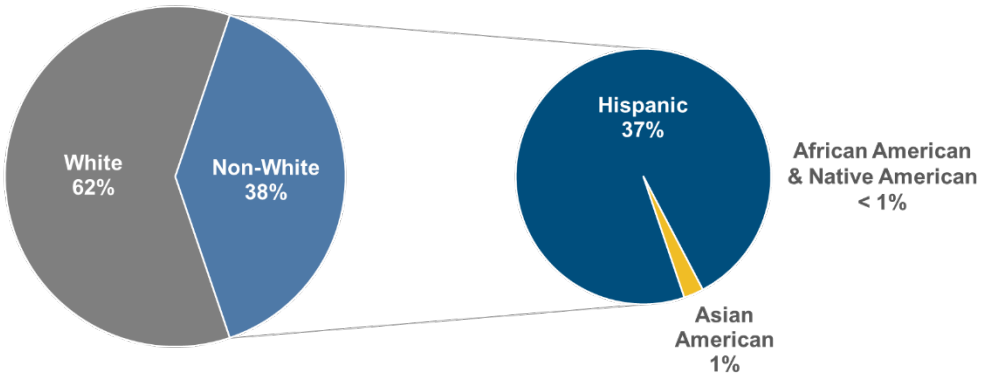
Table 26: Socioeconomic Analysis for Areas with Combined At-Risk Domestic Wells

	Statewide (all areas)	Statewide (domestic well areas only)	Not At-Risk	Potentially At-Risk	At-Risk
Total Count of Domestic Wells	**312,187**	**312,187**	**157,146**	**90,840**	**64,176**
Average CalEnviroScreen 4.0 Percentile	42.2	41.6	34.5	44.0	56.5
Average CalEnviroScreen 4.0 Population Characteristics Percentile	46.0	43.7	39.0	45.1	53.8
Average CalEnviroScreen 4.0 Pollution Burden Percentile	38.8	40.7	33.0	43.3	56.7
Average percentage of households 2x below federal poverty[83]	36.2%	32.7%	30.0%	34.3%	37.6%

[83] The DWR Water Shortage Vulnerability Tool (one component of the combined risk scoring) uses poverty as one indicator of social vulnerability (QPoverty; RC4). For more information, please refer to the Water Shortage Vulnerability Tool methodology.

	Statewide (all areas)	Statewide (domestic well areas only)	Not At-Risk	Potentially At-Risk	At-Risk
Average percentage of households with limited English speaking[84]	5.21%	5.46%	3.68%	5.92%	9.43%
Average household size	2.51	2.72	2.62	2.72	3.00
Percent of domestic wells in DAC/SDAC areas[85,86]	33% (102,166)	33% (102,166)	24% (38,326)	40% (36,246)	43% (27,591)
Percent of domestic wells in majority non-white areas	20% (61,604)	20% (61,604)	11% (17,722)	21% (19,424)	38% (24,448)

Figure 27: Distribution of At-Risk Domestic Wells by Majority Race/Ethnicity of Census Tract



[84] The DWR Water Shortage Vulnerability Tool (one component of the combined risk scoring) uses linguistic isolation as one indicator of social vulnerability (Qlang; RC4). For more information, please refer to the Water Shortage Vulnerability Tool methodology.

[85] DAC/SDAC stand for "disadvantaged communities" and "severely disadvantaged communities" and include census block groups with a Median Household Income less than 80% of the California Median Household Income ($60,188; DAC) or less than 60% of the California Median Household Income ($45,141; SDAC).

[86] The DWR Water Shortage Vulnerability Tool (one component of the combined risk scoring) uses median household income as one indicator of social vulnerability (MHI; RC4). For more information, please refer to the Water Shortage Vulnerability Tool methodology.

LIMITATIONS OF THE RISK ASSESSMENT FOR STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

The state small water system and domestic well risk ranking developed using this methodology is not intended to depict actual groundwater quality conditions at any given domestic supply well or small water system location. The purpose of this risk map analysis is to prioritize areas that may not meet primary drinking water standards or have water shortage risk to inform additional investigation and sampling efforts. The current lack of available state small water system and domestic well water quality data makes it impossible to characterize the actual water quality for any individual state small water system or domestic well. The analysis described here thus represents a good faith effort at using readily available data to estimate water quality and water shortage risk for state small water systems and domestic wells.

REFINEMENT OPPORTUNITIES

Provisions under SB 200 require counties to provide location and any available water quality data for state small water systems and domestic wells. The State Water Board is assisting counties in complying with these provisions and is developing a new database to collect and validate this data as it is submitted.[87] Future iterations of the Aquifer Risk Map and Risk Assessment for state small water systems and domestic wells will incorporate the locational and water quality data collected through this effort. When sufficient information becomes available, it may be possible to expand the Risk Assessment methodology for state small water systems and domestic wells to better align with the approach employed by the Risk Assessment for public water systems. This can only be achieved if specific, rather than proxy, state small water system and domestic well water quality data are available.

State Water Board staff are partnering with OEHHA to explore additional metrics that may be incorporated into future iterations of the Risk Assessment for state small water systems and domestic wells. In particular, the group will be exploring data availability of metrics that align with the risk indicator categories employed by the Risk Assessment for public water systems: Water Quality, Accessibility, Affordability, and TMF Capacity.

[87] State Small Water System and Domestic Well Water Quality Data
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/small_water_system_quality_data.html

DROUGHT INFRASTRUCTURE COST ASSESSMENT RESULTS

OVERVIEW

In 2021, the State Water Board conducted a Cost Assessment to estimate the cost of implementing interim and long-term solutions for Failing: HR2W list systems, At-Risk public water systems, state small water systems, and domestic wells. Due to minor changes to the number of Failing: HR2W and At-Risk systems in 2022, the State Water Board has not updated the Cost Assessment estimates this year. However, in September 2021 the Governor approved Senate Bill (SB) 552[88] which requires small water systems (15 – 2,999 connections) and K-12 schools to meet new drought infrastructure resiliency measures. In response to stakeholder feedback for better drought-related cost estimates and the need to support SB 552 planning, the State Water Board has conducted a targeted Drought Infrastructure Cost Assessment for the 2022 Needs Assessment.

The State Water Board will be updating the full Cost Assessment for Failing: HR2W list and At-Risk public water systems, state small water systems, and domestic wells in the 2023 Needs Assessment. The State Water Board will also be refining future iterations of the Cost Assessment model to incorporate the cost assumptions employed in the Drought Infrastructure Cost Assessment to better estimate long-term solutions.

SB 552 REQUIREMENTS

On September 23, 2021, the California legislature passed Senate Bill 552[89] (SB 552) to support planning and implementation of drought resiliency measures by counties and small water systems. SB 552 has four main resiliency areas:

[88] Senate Bill No. 552, section 10609.62, Chapter 245
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB552

[89] Senate Bill No. 552
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB552

- Implementation of water shortage contingency plans,
- Implement resiliency infrastructure for small community water systems and K-12 schools that are non-community water systems,
- County planning requirements for domestic wells and state small water systems, and
- State Water Board and Department of Water Resource Tool development and coordination activities.

Under the infrastructure resiliency implementation, SB 552 specifically requires small water suppliers, defined as community water systems (CWS) serving 15 to 2,999 service connections and non-transient, non-community water systems that are K-12 schools, to implement the following drought resiliency measures, subject to funding availability:

1. **No later than January 1, 2023, implement monitoring systems sufficient to detect production well groundwater levels:** Drought and other weather-related conditions can influence well water levels. It is important to monitor and measure well water levels regularly to identify and diagnose well capacity issues before they result in a water outage or pump damage. There are many ways to measure static well levels. Systems may use electric sounders, an electric depth gauge, wetted tape, an airline method, etc.

2. **Beginning no later than January 1, 2023, maintain membership in the California Water/Wastewater Agency Response Network (CalWARN)[90] or similar mutual aid organization:** Mutual aid organizations, like CalWARN, usually provide assistance to water suppliers by responding and preparing for an emergency disaster. Failure to have mutual aid agreements prior to an emergency may make it difficult to obtain reimbursement for some types of emergency response activities. CalWARN membership is provided at no cost and members benefit from a variety of services, such as:
    - A standard omnibus mutual assistance agreement and process for sharing emergency resources among signatories statewide.
    - The resources to respond and recover more quickly from a disaster.
    - A mutual assistance program consistent with other statewide mutual aid programs and the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).
    - A forum for developing and maintaining emergency contacts and relationships.
    - New ideas from lessons learned in disasters.

3. **No later than January 1, 2024, to ensure continuous operations during power failures, provide adequate backup electrical supply:** a reliable backup generator is required for any water system, without one, the system will be at risk of interrupted water supply for the customers during an unplanned power outage. Water suppliers need to be prepared for emergency power shutoffs by having a backup generator sized to fit their source capacity needs that is installed properly and maintained effectively.

[90] CalWARN Members Dashboard: https://www.calwarn.org/

4. **No later than January 1, 2027, have at least one backup source of water supply, or a water system intertie, that meets current water quality requirements and is sufficient to meet average daily demand:** Water systems dependent on a single source to meet their maximum day demand, need to have another source to provide emergency supply and ensure system redundancy during an emergency. Reliance on a single source to meet customer demand is an accessibility risk for a water system. The water system is at a higher risk of failure if their single source were to become contaminated, dry, collapses, or is taken out of service (i.e., for maintenance etc.).

5. **No later than January 1, 2032, meter each service connection and monitor for water loss due to leakages:** Metering service connections at individual households is an important drought mitigation measure because it allows a water system to monitor water usage, identify potential water loss (repair and replacement needs), and may also help customers reduce demand when needed.

6. **No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet fire flow requirements (*excluded from the Cost Assessment*)[91]:** An essential element to control and extinguish a fire is having an adequate water supply, storage capacity, and hydraulic pipeline network. A water system must explicitly consider fire flow requirements when sizing pipes, pumps, and storage tanks. For larger water systems, fire protection may have a marginal effect on sizing decisions, but for smaller water systems these requirements can correspond to a significant increase in the size of many essential water infrastructure components.[92]

KEY 2021 AND 2022 COST ASSESSMENT DIFFERENCES

Table 27 summarizes the important differences between the 2021 Cost Assessment and the 2022 Drought Infrastructure Cost Assessment. There are some overlapping cost estimates that span the two Cost Assessments; therefore, it is not advised for the 2022 Drought Cost Assessment results to be *added* to the 2021 Cost Assessment results. The 2022 Drought Infrastructure Cost Assessment results should be considered separately as a targeted cost estimate for SB 552 requirements. These estimates also do not include costs related to other non-infrastructure portions of SB 552, such as planning and technical assistance.

[91] Due to the lack of available and machine-readable asset inventory and local fire protection requirements, the State Water Board excluded this requirement from the analysis.

[92] AWWA Distribution System Requirements for Fire Protection
https://www.awwa.org/portals/0/files/publications/documents/m31lookinside.pdf

Table 27: Key 2021 and 2022 Cost Assessment Differences

	2021 Cost Assessment	2022 Drought Cost Assessment
Systems Included	• Failing: HR2W list systems • At-Risk public water systems • At-Risk state small water systems & domestic wells	• Small community water systems (15 to 2,999 connections) • K-12 schools[93]
Long-Term Cost Estimate Infrastructure/Activity	• Treatment • Physical consolidation • POU/POE[94] • Other Essential Infrastructure (OEI): storage tanks, new wells, well replacement, upgraded electrical, backup power, distribution replacement, additional meters, etc. • Technical assistance	• Monitor static well levels • Mutual aid participation • Backup electrical supply • Back-up source: new well or intertie • Meter all service connections • Excluded: Fire flow requirements
Interim Cost Estimate	• POU • POE • Bottled Water	• Excluded
20-Year Operation & Maintenance Costs	• Included	• Excluded

WATER SYSTEMS ASSESSED

The State Water Board used water system self-reported data from the 2020 Electronic Annual Report (EAR) and basic inventory information to determine which water systems are not currently meeting each SB 552 requirement. It is important to note that many of the datapoints utilized from the 2020 EAR were not required to be submitted by water systems. Therefore, data was missing for many water systems and several assumptions had to be made as to which systems may not be meeting SB 552 requirements. The data points, data sources, and assumptions made for the inventory of systems not meeting SB 552 requirements are detailed on Appendix C. The State Water Board is developing a strategy to collect the required data in the future to improve the identification of systems in need. Figure 28 summarizes the

[93] Community and non-community K-12 schools are included.

[94] Point-of-use (POU) is a water treatment device that treats water at the location of the customer. Point-of-entry (POE) application is a water treatment device that is located at the inlet to an entire building or facility.

estimated number of K-12 schools and small community water systems (15 – 2,999 service connections) that may not be meeting SB 552 requirements.

Figure 28: Estimated Number of Systems that Do Not Meet SB 552 Requirements

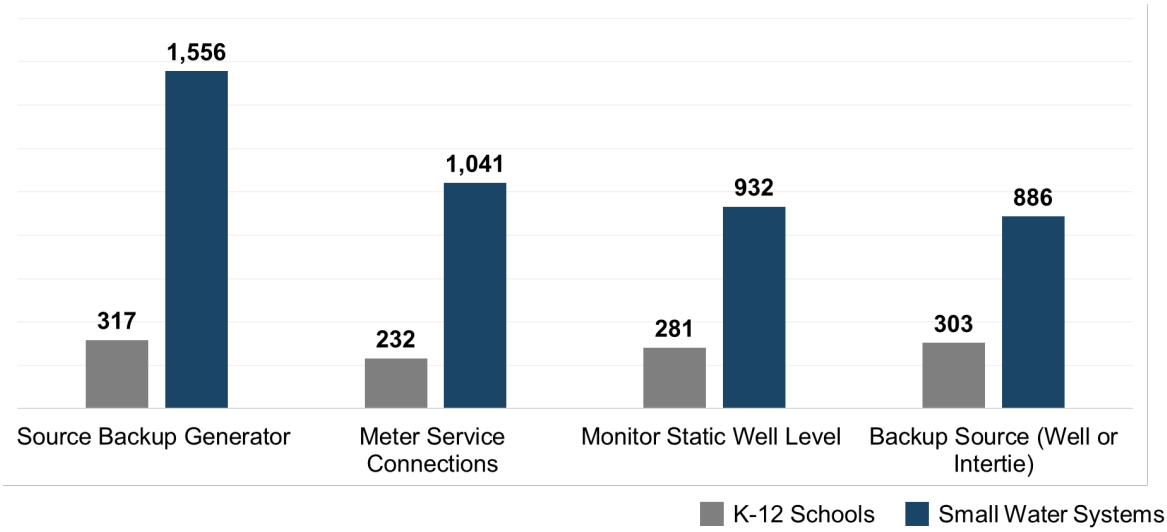


Table 28 summarizes the estimated number of unique systems not meeting SB 552 requirements by their SAFER and disadvantage community status. The analysis estimates there are 1,781 (68%) K-12 schools and small water systems not currently meeting all of the SB 552 requirements (excluding fire flow requirement).

Table 28: Number of K-12 & Small Systems Not Meeting SB 552 Requirements by SAFER Status

SAFER Program Status	Total Systems	Missing All Reqs.	Missing 3 Reqs.	Missing 2 Reqs.	Missing 1 Reqs.	Meeting All Reqs.
Failing: HR2W Systems	**309**	**55 (17%)**	**102 (33%)**	**73 (24%)**	**67 (22%)**	**12 (4%)**
DAC/SDAC	161	24	48	47	35	7
Not DAC/SDAC	83	11	25	20	23	4
Missing DAC Status	65	20	29	6	9	1
At-Risk Systems	**440**	**102 (23%)**	**125 (29%)**	**116 (26%)**	**75 (17%)**	**22 (5%)**
DAC/SDAC	240	50	62	65	47	16
Not DAC/SDAC	128	29	33	36	25	5
Missing DAC Status	72	23	30	15	3	1
Potentially At-Risk	**395**	**73 (18%)**	**118 (30%)**	**112 (28%)**	**81 (21%)**	**11 (3%)**
DAC/SDAC	214	41	57	66	42	8
Not DAC/SDAC	131	22	33	38	35	3
Missing DAC Status	50	10	28	8	4	0
Not At-Risk Systems	**1,490**	**141 (9%)**	**369 (25%)**	**462 (31%)**	**410 (28%)**	**108 (7%)**
DAC/SDAC	597	44	143	174	180	56
Not DAC/ SDAC	580	30	93	206	205	46
Missing DAC Status	313	67	133	82	25	6
TOTAL:	**2,634**	**371 (14%)**	**714 (27%)**	**763 (29%)**	**633 (24%)**	**153 (6%)**

ASSESSMENT COSTED SOLUTIONS & ADJUSTMENTS

COSTED SOLUTIONS PER SB 552 REQUIREMENT

The State Water Board utilized cost assumptions that were in the 2021 Cost Assessment and developed new cost assumptions as needed to conduct the Drought Infrastructure Cost Assessment. New cost data and information were collected from projects funded by the State Water Board as well as cost estimates from external manufacturing venders and consulting firms. Table 29 includes an overview of the infrastructure solutions and additional costs included in the cost estimate for each SB 552 requirement (excluding fire flow). Refer to Appendix C for a more detailed overview of the Drought Infrastructure Cost Assessment assumptions and calculation methodologies.

Table 29: Summary of Costed Solutions per SB 552 Requirement

Drought Requirement	Costed Solution
Monitor Static Well Levels	Sounder equipment
Membership CalWARN / Mutual Aid	None, membership is free
Back-up electrical supply	Emergency power source generator
Back-up source	New Well (For systems with a single source that is a well). Cost includes: • Well drilling • Well development • Well pump and motor • Electrical and SCADA • CEQA Or Intertie (For a system with a single source that is not an intertie). Cost includes: • Pipeline cost • Service line • Connection fees • Admin/legal/CEQA
Meter all service connections	• Meter cost • Software upgrades

The State Water Board conducted a cost assessment for all SB 552, Water Code section 10609.62, requirements except for the requirements for adequate fire flow capacity. The State Water Board does not have authority to develop or enforce requirements regarding fire flow.

Fire flow responsibility and jurisdiction falls to local fire officials. Thus, the State Water Board does not have a machine-readable asset inventory, asset condition data and local fire protection requirements, which would be necessary to develop a cost estimate. The State Water Board will contact the Office of the State Fire Marshall to develop collaborative approaches for determining appropriate fire protection requirements for future iterations of the Needs Assessment.

COST ESTIMATE ADJUSTMENTS

All cost estimates presented in the subsequent sections were adjusted to account for the following elements:

Inflation
To acknowledge the recent escalation in construction industry prices, and based on public feedback, the State Water Board factored in a 4.7% inflation rate which was applied to all costed requirements.

Regional Cost Adjustments
Cost estimates were regionally adjusted to account for varied construction and service costs across the state. Water systems in rural counties did not require a price adjustment; however, water systems in urban and suburban counties had a price multiplier of +32% and +30% subsequently applied to their cost estimates.

Other Adjustments
Many of the requirements needed a specific multiplier to account for additional associated costs. For example, a 5% multiplier was applied to backup generators to account for air pollution permitting fees; a 25% multiplier was applied to new wells and interties; and an additional 20% contingency multiplier was applied to intertie costs.

COST ESTIMATION LEVEL OF ACCURACY

It is important to note that the Drought Infrastructure Cost Assessment results summarized in the subsequent section correspond with a Class 5 Cost estimate as defined by Association for the Advancement of Cost Engineering (AACE) International[95]. Class 5 cost estimates are considered appropriate for screening level efforts, such as the Cost Assessment, and have a level of accuracy ranging from -20% to -50% on the low end and +30% to +100% on the high end. The full range of estimate is thus -50% to +100%. A Class 5 cost estimate is standard for screening construction project concepts. These costs are for budgetary purposes only. A more site specific and detailed assessment will be needed to refine the costs and select a local solution that is most appropriate.

For the recommended drought infrastructure measures, a point estimate is shown, however the reader will be able to view each value within the accuracy range. For example, if a cost of $100 is presented, the corresponding range of anticipated costs is $50 to $200. For more

[95] ACE International Recommended Practice No.17R-97 Cost estimate Classification System, TCM Framework: 7.3 -Cost Estimating and Budgeting, Rev. August 7, 2020.

information regarding cost assumptions and methodology see Appendix C.

DROUGHT COST ASSESSMENT RESULTS

STATEWIDE COST ESTIMATE

Table 30 and Figure 29 summarizes the Drought Infrastructure Cost Assessment results per SB 552 requirement. Local solutions and actual costs will vary from system to system and will depend on site-specific details. Therefore, the Cost Assessment should not be used to inform site-specific decisions but rather should be viewed as an informative statewide estimate of need. The full results of the Drought Infrastructure Cost Assessment are in Supplemental Attachment C1 available on the State Water Board's website.[96]

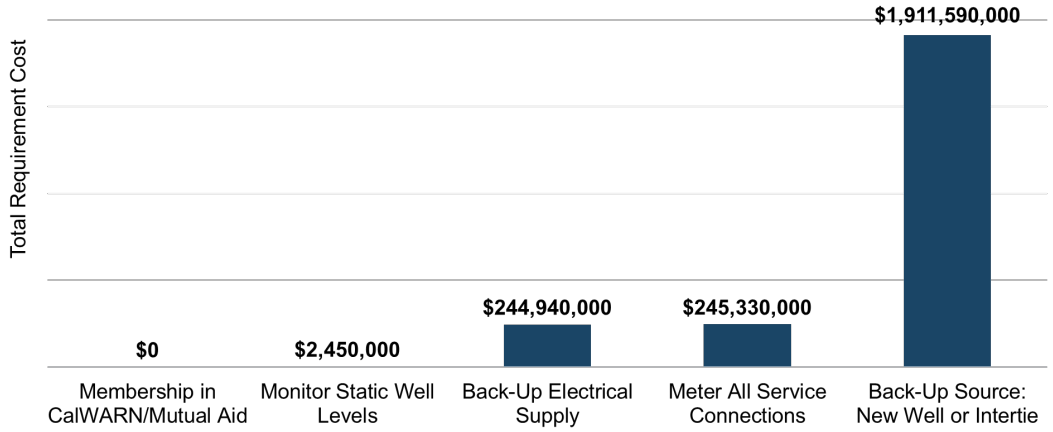
Table 30: Drought Cost Assessment Results for Small Water Systems

Drought Requirement	# Small CWS	Point Est. Total	Range Total in $ Millions
Monitor Static Well Levels	1,213 (46%)	$2,450,000	$1 M - $5 M
Membership CalWARN / Mutual Aid	2,634 (100%)[97]	$0	$0
Back-up electrical supply	1,872 (71%)	$244,940,000	$122 M - $490 M
Back-up source: new well	753 (29%)	$1,651,620,000	$826 M - $3,303 M
Back-up source: intertie	142 (5%)	$259,970,000	$130 M - $520 M
Meter all service connections	1,275 (48%)	$245,330,000	$123 M - $491 M
TOTAL:	**2,634**	**$2,404,320,000**	**$1,202 M - $4,809 M**

[96] Drought Infrastructure Cost Assessment Data and Results: Attachment C1 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022cost.xlsx

[97] Membership for CalWARN[97] is currently free, therefore no cost estimate was developed for this SB 552 requirement. The State Water Board is unable to determine how many community water systems are members of CalWARN or other mutual aid organizations currently. However, the State Water Board has included a new question in the 2021 EAR to begin collecting this information.

Figure 29: Cost Assessment Results for K-12 Schools & Small Water Systems



ESTIMATED AVERAGE COST PER CONNECTION

The cost per connection of a solution is an important consideration for state funding eligibility. Generally, the State Water Board can more easily fund grant projects for small, economically disadvantaged systems. The project funding range cap is often approximately $60,000 per connection, depending on the type of project. Table 31 summarizes the cost per connection for each SB 552 requirement. Water systems have been categorized by the number of connections they serve, from smaller to larger systems. This display of results illustrates the relatively higher per connection cost of bringing small systems into compliance, and thus the advantages of economies of scale.

Table 31: Average Cost by Number of Connections

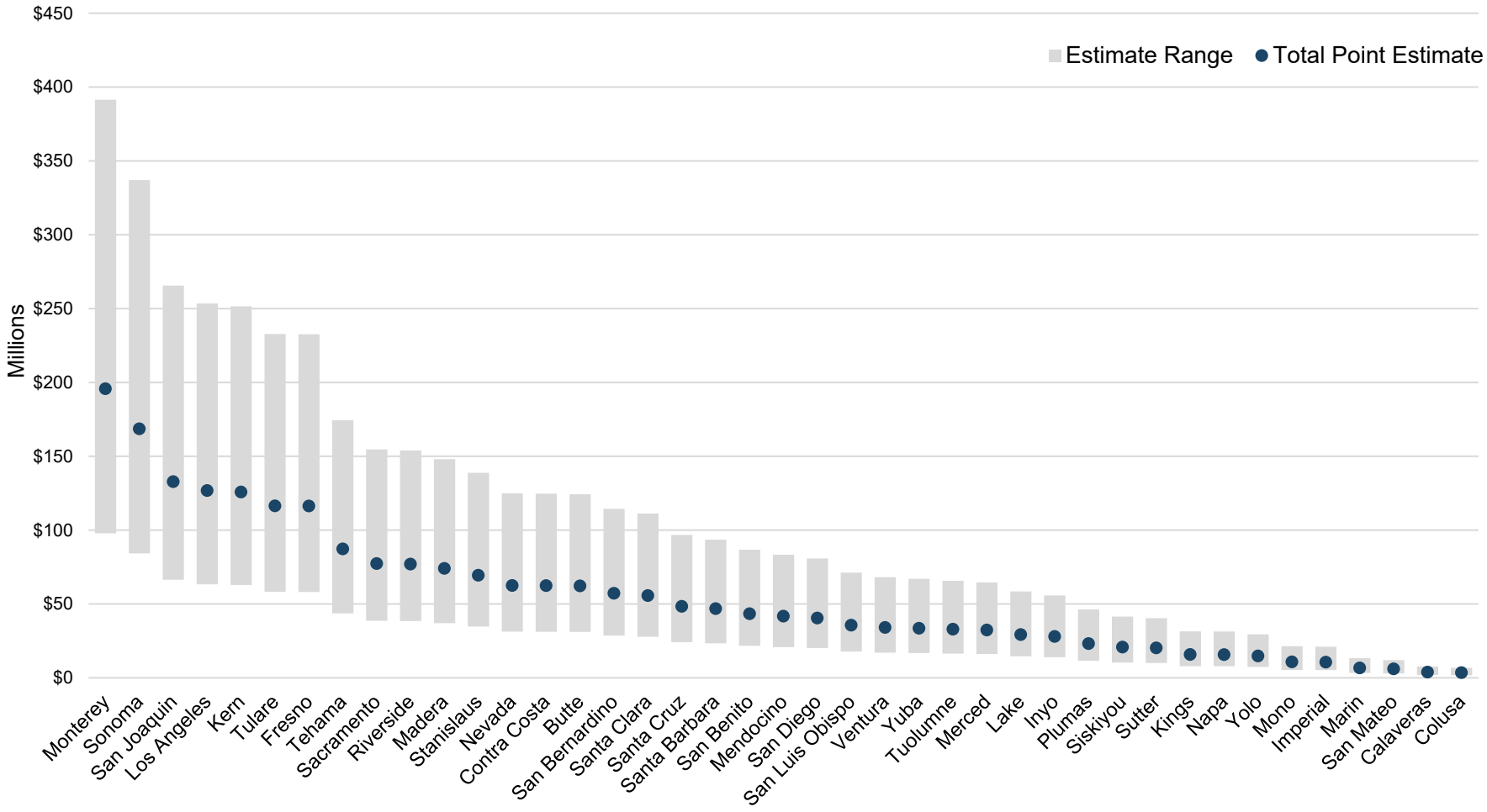
SB 552 Requirement	1 - 100	101 - 500	501 - 1,000	1,001 - 2,999
Number of Systems	**1,642**	**586**	**135**	**268**
Monitor static well levels	$314	$13	$3	$1
Membership CalWARN / Mutual Aid	$0	$0	$0	$0
Backup electrical supply	$8,620	$516	$370	$397
Back-up source: new well	$526,000[98]	$15,259	N/A	$1,817
Back-up source: intertie	$61,897	$15,701	$11,097	$10,425
Meter all service connections	$5,201	$1,366	$834	$914

[98] This high cost is driven by K-12 schools. Schools often have few service connections and when costs are spread out, it can drive up the cost per connection. The cost for small community water systems only, excluding K-12 schools for systems with 15 – 100 connections is $77,000.

ESTIMATED COST PER COUNTY

Figure 30 shows the total cost by County for small community water systems and schools not meeting SB 552 requirements. As illustrated, some counties have more systems struggling to comply with these drought requirements and thus have the highest costs. For example: Monterey County has the highest point estimate cost due to the high counts of systems in need and due to the implemented regional cost adjustments.

Figure 30: Total Estimated Costs by County for Small Community Water Systems and K-12 Schools



DROUGHT INFRASTRUCTURE COST ASSESSMENT LIMITATIONS

The cost estimates developed for the 2022 Needs Assessment have several limitations and opportunities for improvement in future iterations. The Drought Infrastructure Cost Assessment will thus not be used to inform site-specific decisions but rather give an informative analysis on a statewide basis.

Water System Data Availability & Accuracy
A lack of inventoried data on water system assets and their condition for small community water systems and K-12 schools, led to the application of general assumptions around replacement and/or upgrade needs. Many of the datapoints utilized to determine the inventory of water systems that may not be meeting SB 552 requirements were based on voluntary and incomplete responses to the 2020 Electronic Annual Report (EAR). For example, many systems did not indicate clearly if they monitor their static well levels or if they have back-up power. Furthermore, the cost estimate utilized an estimated maximum day demand rather than actual figures per water system. Production and delivery data collected in the 2020 EAR was not accurately reported and unusable. Some of the information about existing infrastructure and asset condition, water production, and use rates is recorded in system-level sanitary surveys but is not in a database where it can be obtained for aggregated purposes such as the Needs Assessment.

Cost Data Quality
Cost estimates are based on consultant estimates and vender quotes, rather than historical cost data, especially work funded by the State Water Board, which would incorporate prevailing wage and have other administrative costs. Currently, the State Water Board captures funding agreement costs in the aggregate, but costs are not captured at the granular detail needed to directly inform the modeling for the long-term component of the Cost Assessment. For example, land acquisition costs for new wells are difficult to identify in the current State Water Board data and for this reason, it was excluded from this cost assessment.

Fire Flow Data
The State Water Board conducted a cost assessment for all SB 552, section 10609.62, requirements except for the final requirement for fire flow. The State Water Board does not have authority to develop or enforce requirements regarding fire flow. Fire flow responsibility and jurisdiction falls to local fire officials. Thus, the State Water Board does not have machine-readable asset inventory, asset condition data and local fire protection requirements, which would be necessary to develop a cost estimate. The State Water Board recognizes the significant need for adequate fire flow for the protection of communities and public safety, particularly considering climate change impacts. The State Water Board will contact the Office of the State Fire Marshall to develop collaborative approaches for determining appropriate fire protection requirements, identify data collection needs and investigate funding alternatives for fire capacity.

Regional Cost Differences
Regional differences in California may have significant impacts on costs, e.g., the cost to replace a pipeline in a downtown portion of the Bay Area is significantly different than the cost to replace the same length of pipe in a rural Central Valley area. The baseline cost estimates obtained from the subcontractors for this analysis were more focused on rural areas. A

standard factor was utilized to attempt to correlate between urban and rural areas to the extent possible. However, those correlations were based on broad assumptions of land use in various counties. Review of future projects funded by the State Water Board's Division of Financial Assistance may allow for more detailed information in future iterations.

DROUGHT INFRASTRUCTURE COST ASSESSMENT REFINEMENT OPPORTUNITIES

Future iterations of the Cost Assessment for Failing: HR2W list and At-Risk systems will incorporate elements of the drought infrastructure cost methodology detailed here. The Cost Assessment methodology will evolve over time to incorporate additional and better-quality data; better approaches modeling potential solutions for At-Risk water systems and domestic wells; and further input from the State Water Board and public.

Asset Data Collection
The State Water Board will begin developing strategies for collecting additional data to improve both the accuracy of the identification of water systems not meeting SB 552 requirements and the total cost estimate for each requirement. For example, machine-readable asset inventory, asset condition data and local fire protection requirements are needed for the State Water Board to estimate fire flow requirement costs. Additionally, there are data points that have recently been voluntary reporting in the EAR (i.e., back-up power) that will be refined, and the questions will be mandatory in the future. Moreover, the State Water Board collects water production data from water systems through EAR, but many data quality issues related to inaccurate units of measure have been identified. The State Water Board will work on enhancing data collection accuracy to make this data usable in future iterations of the Cost Assessment.

Cost Data Collection
The State Water Board's Division of Financial Assistance has begun developing a strategy to capture more detailed cost data. Adjustments to State Water Board managed databases will be made to better capture project and technical assistance cost data, especially for State Water Board funded projects through the SAFER Program.

Water System Boundaries
Improvement of water system boundary data statewide will enhance the accuracy of the Cost Assessment's modeling of potential interties for systems in needs of a back-up source. The State Water Board is evaluating how to best enhance System Area Boundary Layer (SABL) Admin App to allow District Offices, Local Primacy Agencies, and public water system staff to upload and verify water system area boundaries Concurrently, State Water Board has developed a new SABL-Look up Application that will combine the SABL, other reference geographical information systems (GIS) layers and analysis tools, and water system data.

AFFORDABILITY ASSESSMENT RESULTS

OVERVIEW

Ensuring drinking water is affordable is key to meeting California's Human Right to Water mandate.[99] The COVID-related economic crisis has served to further highlight the need to address affordability, both to ensure that households can afford the water that they drink as well as to support drinking water systems in maintaining enough financial viability to provide safe reliable drinking water.[100]

The purpose of the Affordability Assessment is to identify disadvantaged community water systems that have instituted customer charges that exceed the "Affordability Threshold" established by the State Water Board in order to provide drinking water that meets state and federal standards.[101] Legislation does not define what the Affordability Threshold should be. Nor is there specific guidance on the perspective in which the State Water Board should be assessing the Affordability Threshold. Figure 31 illustrates the nexus of affordability definitions that exist.

Figure 31: Nexus of Affordability Definitions

[99] State Water Board Resolution No. 2016-0010
https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf

[100] Drinking Water COVID-19 Financial Impacts Survey | California State Water Resources Control Board
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/covid-19watersystemsurvey.html

[101] California Health and Safety Code, section 116769, subd. (a)(2)(B)

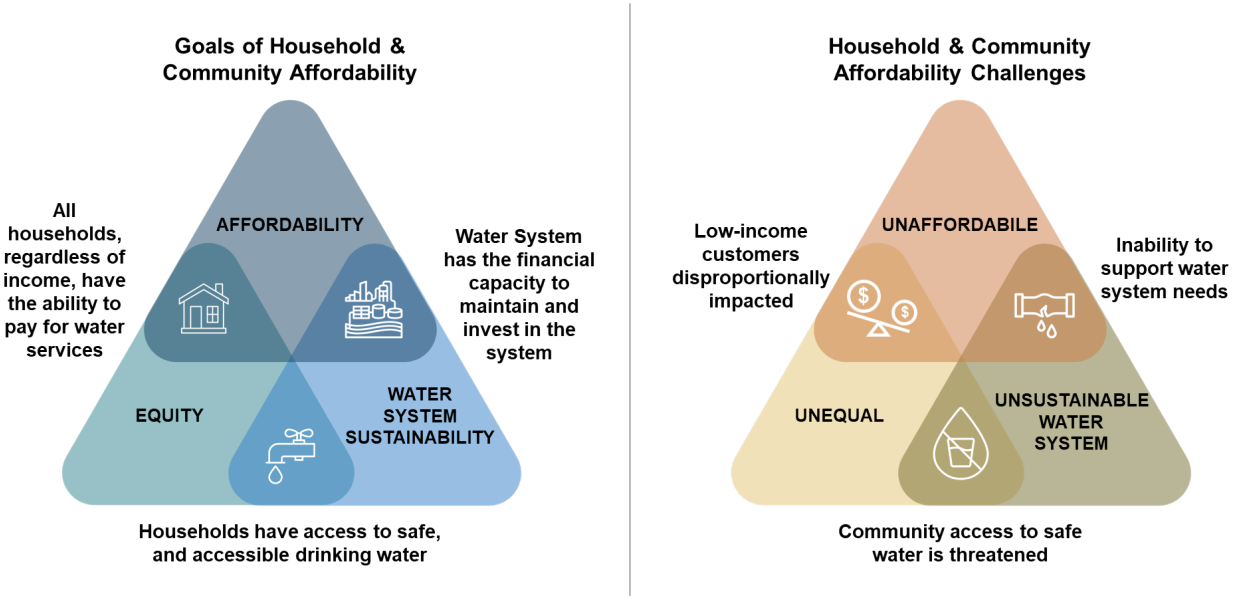
1) **Household Affordability**: The ability of individual households to pay for an adequate supply of water.

2) **Community Affordability**: The ability of households within a community to pay for water services to financially support a resilient water system.

3) **& (4) Water System Financial Capacity:** The ability of the water system to financially meet current and future operation and infrastructure needs to deliver safe drinking water. The financial capacity of water systems affects future rate impacts on households. The inability to provide adequate services may lead households served by the system to rely on expensive alternatives such as bottled water.

Affordability of drinking water services is an important challenge to assess because issues surrounding equity and water system sustainability overlap in numerous aspects of addressing affordability challenges and ensuring that all Californians have safe drinking water. Figure 32 illustrates this relationship and the potential consequences of inaction.

Figure 32: The Relationship Between Affordability, Equity and Water System Sustainability



AFFORDABILITY ASSESSMENT METHODOLOGY

The Affordability Assessment is conducted annually for all California community water systems. It is worth noting that, while there is some overlap, the systems included in the Affordability Assessment differ from the list of water systems analyzed in the Risk Assessment for public water systems. The Affordability Assessment includes all large and small community water systems (including above 30,000 service connections) and excludes non-transient, non-community water systems, like schools. The Risk Assessment, on the other hand, analyzed small and medium-size public water systems with less than 30,000 service connections or those that serve a population of less than 100,000 people and non-transient, non-community

K-12 schools were included. Table 32 provides an overview of the systems included in the Affordability Assessment.

Table 32: Systems Included in the Affordability Assessment

SAFER Program Status	Risk Assessment	Affordability Assessment
Failing: HR2W List Systems	346	295
At-Risk Systems	508	459
Potentially At-Risk and Not At-Risk Systems	2,212	1,946
Not Assessed	N/A	168
TOTAL:	**3,066**	**2,868**

Affordability Indicators

In 2020, the State Water Board conducted an Affordability Assessment for community water systems, which analyzed one affordability indicator, water charges as a percent of median household income (%MHI), for the fiscal year (FY) 2020-21 Safe and Affordable Drinking Water Fund Expenditure Plan.[102] In the 2021 Needs Assessment, the State Water Board incorporated two new affordability indicators, 'Extreme Water Bill' and '% Shut-offs,' to identify disadvantaged communities (DAC)[103] and Severely Disadvantaged Communities (SDAC)[104] that may be experiencing affordability challenges.[105]

For the 2022 Needs Assessment, the State Water Board had to remove '% Shut-offs' from the Affordability Assessment. In 2020 Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021.[106] This

[102] The Fund Expenditure Plan used an affordability threshold of 1.5% MHI to identify DAC water systems that may have customer charges that are unaffordable: FY 2020-21 Fund Expenditure Plan https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf

[103] Disadvantaged Community or DAC means the entire service area of a community water system, or a community therein, in which the median household income is less than 80 percent of the statewide annual median household income level.

[104] Severely Disadvantaged Community or SDAC means the entire service area of a community water system in which the median household income is less than sixty percent of the statewide median household income.

[105] The identification of additional affordability indicators was undertaken in conjunction with the identification of possible affordability risk indicators for the Risk Assessment. A full list of potential affordability indicators considered can be found in the white paper *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems:* October 7, 2020 White Paper: Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[106] Governor Newsom Executive Order: https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/

information was therefore unavailable for the majority of 2020 and was not collected from water systems in the 2020 Electronic Annual Report (EAR). The State Water Board has replaced '% Shut-offs' with two new affordability indicators: 'Percentage of Residential Arrearages' and 'Residential Arrearage Burden.' These new risk indicators are meant to identify water systems that have a community that is experiencing household affordability challenges and are a direct measure of household drinking water affordability.

Table 33: Affordability Indicators 2020 - 2022

2020	2021	2022
Percent of Median Household Income (%MHI)	Percent of Median Household Income (%MHI)	Percent of Median Household Income (%MHI)
	Extreme Water Bill	Extreme Water Bill
	% Shut-Offs (**Removed 2022**)	**NEW**: Percentage of Residential Arrearages
		NEW: Residential Arrearage Burden

The following are brief descriptions of the affordability indicators utilized in the 2022 Affordability Assessment. Additional details on data sources, calculation methodologies, thresholds, and scoring approach are detailed in Appendix D.

% Median Household Income
This indicator measures annual system-wide average residential customer charges for six Hundred Cubic Feet (HCF) per month relative to the annual Median Household Income (MHI) within a water system's service area. Six HCF indoor water usage per month is roughly equivalent to 50 gallons per person per day for a three-person household for 30 days.

Percent median household income (%MHI) is commonly used by state and federal regulatory agencies and by water industry stakeholders for assessing community-wide water charges affordability for decades. The State Water Board uses MHI to determine DAC status[107] and has for some time used the 1.5% MHI threshold in the Drinking Water State Revolving Fund (DWSRF) program as a metric for determining whether a small DAC will receive repayable (loan) or non-repayable (e.g., grant or non-repayable) funding.

Extreme Water Bill
This indicator measures drinking water customer charges that meet or exceed 150% and 200% of statewide average drinking water customer charges at the six HCF level of

[107] It is important to note that the estimated designation of community economic status is for the purposes of the Affordability Assessment only and will not be used by the State Water Board's Division of Financial Assistance (DFA) to make funding decisions. Further MHI analysis on a per system basis will be conducted by DFA when a system seeks State Water Board assistance.
AB 401 Final Report
https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

consumption. The State Water Board's AB 401 report[108] recommended statewide low-income rate assistance program elements which utilize the two recommended tiered indicator thresholds of 150% and 200% of the state average drinking water bill for six HCF.

NEW: Percent of Residential Arrearages
This risk indicator identifies water systems that have a high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due.

NEW: Residential Arrearage Burden
This risk indicator identifies water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's full residential customer base.

2021 Drinking Water Arrearage Payment Program[109]

The initial data used for the two new arrearage affordability indicators comes from the State Water Board's 2021 Drinking Water Arrearage Payment Program. The State Water Board received $985 million to address community water system residential and commercial customer water debt that accrued during the COVID-19 pandemic (March 4, 2020 through June 15, 2021). The State Water Board collected residential arrearage information from an initial survey on outstanding debt and during the Program's application period. This data was utilized to calculate the new arrearage affordability indicators. It is important to note that some community water systems chose not to participate in the initial survey or Program. Therefore, this dataset may not represent the total amount of outstanding arrearages statewide. Moving forward, additional State assistance programs and datasets may be used to supplement this dataset as they become available.

Drinking Water Customer Charges

The Affordability Assessment relies on four affordability indicators that are either directly or indirectly related to drinking water customer charges for drinking water services. Therefore, it is important to consider the average monthly customer charges for 6 HCF across the different water systems analyzed in the Affordability Assessment. Table 34 and Table 35 summarize the 2020 average customer charges collected from water systems in the 2020 EAR. The 2020 EAR was the first reporting year that required community water systems to report their water rates and other customer charges.

[108] AB 401 Final Report:
Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program
https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

[109] California Water and Wastewater Arrearage Payment Program
https://www.waterboards.ca.gov/arrearage_payment_program/

Table 34: Average Monthly Residential Customer Charges for 6 HCF by DAC/SDAC Status

Community Status	Total Systems	Average Customer Charges for 6 HCF
DAC/SDAC	**836**	$59.43
Non-DAC	**917**	$68.63
Missing DAC Status[110]	**61**	$64.98
TOTAL:	**1,814**	**$64.27**
Systems that Do Not Charge for Water or Missing Charge Data	*1,054*	

Table 35: Average Monthly Residential Customer Charges for 6 HCF by SAFER Status

SAFER Program Status[111]	Total Systems	Average Customer Charges for 6 HCF
Failing: HR2W Systems	**181**	**$67.98**
HR2W DAC/SDAC	116	$58.64
At-Risk Systems	**258**	**$83.62**
At-Risk DAC/SDAC	152	$79.08
Potentially At-Risk Systems	**252**	**$75.14**
Potentially At-Risk DAC/SDAC	132	$69.07
Not At-Risk System	**1,123**	**$51.36**
DAC/SDAC	436	$49.89
TOTAL:	**1,814**	**$64.27**
Systems that Do Not Charge for Water or Missing Charge Data	*1,054*	

AFFORDABILITY INDICATOR ANALYSIS

The State Water Board analyzed all four affordability indicators for the 2022 Affordability Assessment and applied the same thresholds as utilized in the Risk Assessment for public

[110] Missing DAC Status refers to the list of systems that were included in the affordability assessment but lacked data necessary to calculate their MHI to determine their DAC status.

[111] Water systems that are not DAC/SDAC or are missing DAC status designations are excluded from sub-categories within this table.

water systems. The prevalence of community water systems that meet these thresholds, and are DAC or SDAC systems, are summarized below.

Additional analysis was conducted to identify the DAC and SDAC water systems that met more than one affordability indicator threshold. Scores of 0 (no threshold met), 1 (lower "minimum" threshold met), and 1.5 (higher "maximum" threshold met) were applied to each affordability indicator threshold and tallied across the four indicators for each system to identify which systems may be facing the greatest affordability challenges.

AGGREGATED AFFORDABILITY ASSESSMENT RESULTS

AFFORDABILITY RESULTS BY COMMUNITY ECONOMIC STATUS

For the 2022 Affordability Assessment, State Water Board staff analyzed 2,868 community water systems, of which, approximately 32 water systems lacked the data necessary to calculate any of the four affordability indicators. Water systems that had partial data for some, but not all, of the affordability indicators were included in the analysis and are summarized in Table 36.

Overall, comparing the four indicators in cases where data was available, more community water systems exceed the affordability threshold for 'Residential Arrearage Burden' (22%) than the affordability threshold for '%MHI' (17%). However, more DAC and SDAC community water systems exceeded the '%MHI' affordability threshold (27%) than 'Residential Arrearage Burden' affordability threshold (21%). Table 36 summarizes the number of water systems, by their community economic status, that exceeded the minimum affordability threshold for each indicator assessed.

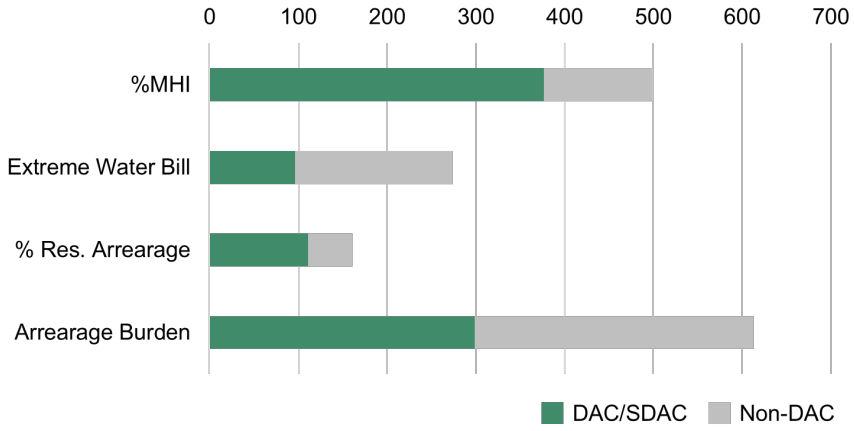
Table 36: Total Number of Systems that Exceed a Minimum Risk Indicator Affordability Threshold

Community Status	Total Systems	% MHI	Extreme Water Bill	% Res. Arrearages	Res. Arrearage Burden
DAC/SDAC	1,408	377 (27%)	96 (7%)	111 (8%)	299 (21%)
Non-DAC	1,287	122 (9%)	178 (14%)	50 (4%)	314 (24%)
Missing DAC Status[112]	173	0 (0%)	0 (0%)	6 (3%)	13 (8%)
TOTAL:	**2,868**	**499 (17%)**	**274 (10%)**	**167 (6%)**	**626 (22%)**

[112] Missing DAC Status refers to the list of systems that were included in the affordability assessment but lacked data necessary to calculate their MHI to determine their DAC status.

Community Status	Total Systems	% MHI	Extreme Water Bill	% Res. Arrearages	Res. Arrearage Burden
Missing Data[113]		*263 (9%)*	*524 (18%)*	*442 (15%)*	*442 (15%)*
Not Applicable[114]		869 (30%)	608 (21%)	879 (31%)	879 (31%)

Figure 33: Number of Water Systems, by Community Economic Status, that Exceeded Each Minimum Affordability Indicator Threshold



To assess which systems may be facing the greatest affordability burden, State Water Board further analyzed how many water systems exceeded thresholds for multiple affordability indicators. Affordability burden is ranked from low (only one affordability indicator threshold exceeded), medium, (two affordability indicator thresholds exceeded), or high (three or four affordability indicator thresholds exceeded) (Table 37). Of the 2,868 community water systems analyzed, most resulted in a low affordability burden (21%) followed by a medium affordability burden (11%) and a high affordability burden (3%). It is worth noting, there are no clear trends across community economic status and affordability burdens.

The State Water Board identified 69 (5%) DAC/SDAC water systems that had a high affordability burden, 175 (12%) with a medium affordability burden, and 311 (22%) with a low affordability burden.

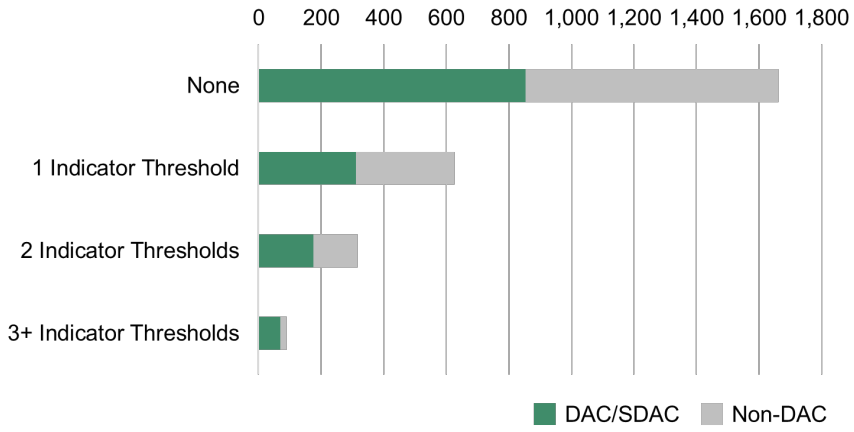
[113] Missing data: %MHI; lacked water rates data, lacked data to calculate MHI; Extreme Water Rates, lacked data on water rate charges, water rate was outside of $5-$500 range; Percent of Residential Arrearages/Residential Arrearage Burden, no arrearage survey data was submitted.

[114] Not applicable refers to systems who did not qualify to meet an indicator threshold: % MHI, systems who did not charge for water; Extreme Water Bill, systems that did not charge for water; % Residential Arrearages/ Residential Arrearage Burden, systems that did not charge for water, claimed no arrearages, or did not have residential arrearages.

Table 37: Affordability Assessment Results

Community Status	Total Systems Assessed	High Affordability Burden[115]	Medium Affordability Burden[116]	Low Affordability Burden[117]
DAC/SDAC	1,408	69 (5%)	175 (12%)	311 (22%)
Non-DAC	1,287	20 (2%)	142 (11%)	315 (23%)
Missing DAC Status	173	0 (0%)	6 (3%)	7 (10%)
TOTAL:	**2,868**	**89 (3%)**	**323 (11%)**	**633 (21%)**

Figure 34: Total Number of Systems, by Community Economic Status, that Exceeded an Affordability Indicator Threshold



[115] Community water system met the minimum threshold for 3 or 4 of the affordability indicators.

[116] Community water system met the minimum threshold for 2 of the affordability indicators.

[117] Community water system met the minimum threshold for 1 of the affordability indicators.

Figure 35: All Water Systems that Exceeded an Affordability Indicator Threshold (n=2,868)

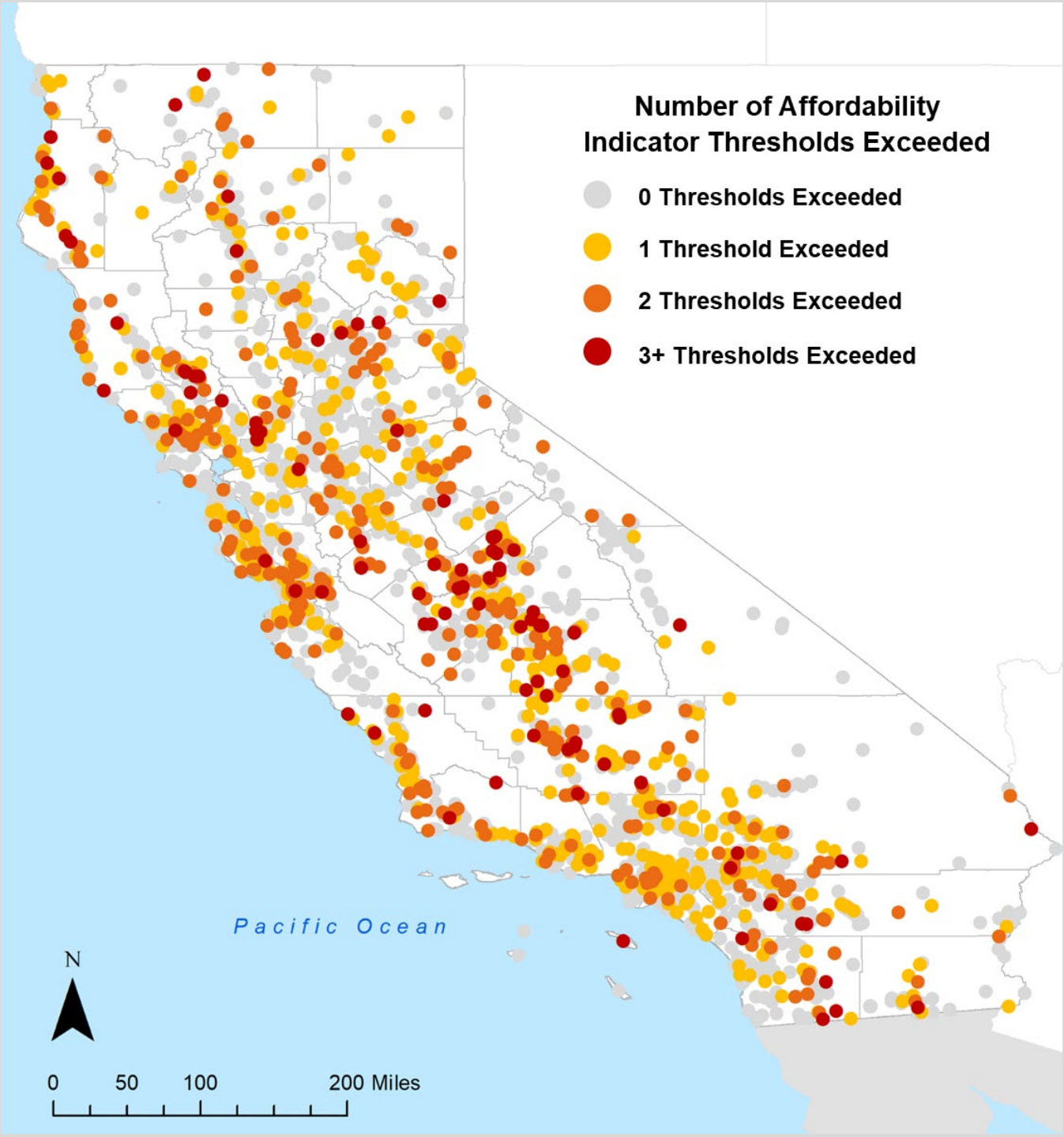
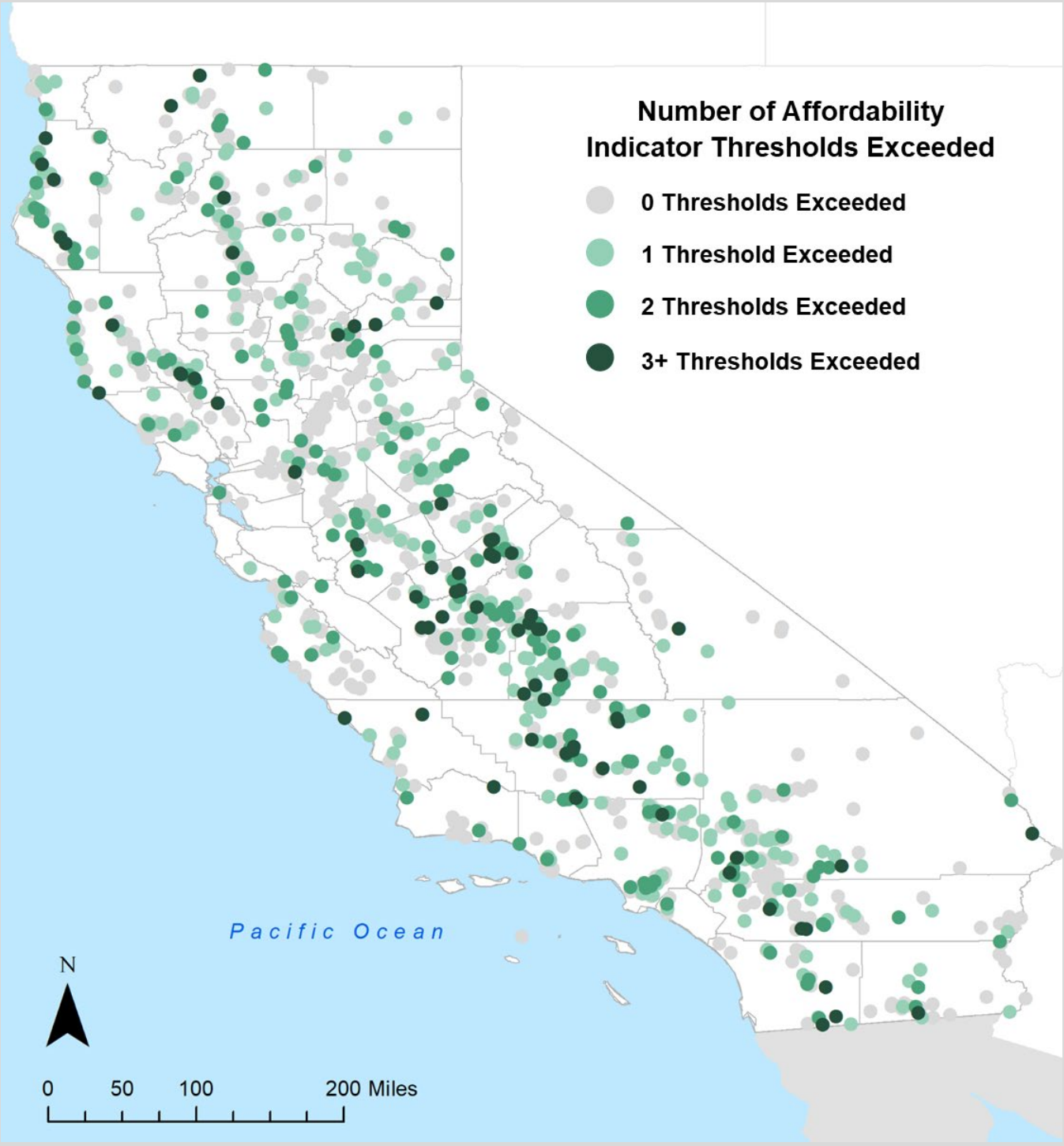


Figure 36: DAC and SDAC Water Systems that Exceeded an Affordability Indicator Threshold (n=1,367)



AFFORDABILITY RESULTS BY WATER SYSTEM SAFER PROGRAM STATUS

While SB 200 only mandates the identification of DAC/SDAC water systems that have customer charges that exceed affordability thresholds, the 2022 Affordability Assessment also identified the number of Failing: HR2W list and At-Risk public water systems exceeding affordability thresholds as well. Table 38 and the section below summarizes the number of Failing: HR2W list and At-Risk water systems, by their community economic status, that exceeded the minimum affordability threshold for each affordability indicator assessed.

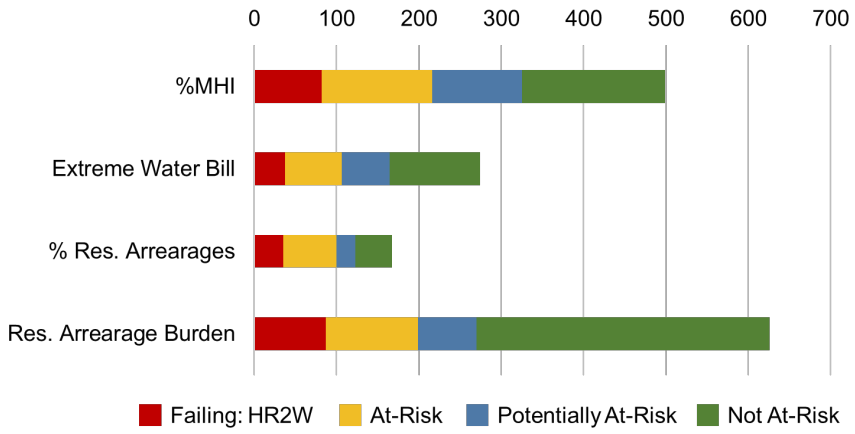
According to the analysis, Failing: HR2W list systems and At-Risk systems exceeded the affordability thresholds for more affordability indicators when compared to Potentially At-Risk and Not At-Risk systems. The full results of this analysis, by affordability indicator, are detailed in Appendix D.

Table 38: Aggregated Affordability Assessment Results by Water System SAFER Program Status

SAFER Program Status[118]	Total Systems	% MHI Min. Threshold Met	Extreme Water Bill Min. Threshold Met	% Res. Arrearages	Res. Arrearage Burden
Failing: HR2W Systems	**295**	**82 (28%)**	**37 (13%)**	**35 (10%)**	**87 (29%)**
HR2W DAC/SDAC	184	66 (36%)	15 (8%)	29 (16%)	65 (35%)
At-Risk Systems	**459**	**134 (29%)**	**69 (15%)**	**65 (14%)**	**112 (24%)**
At-Risk DAC/SDAC	276	102 (37%)	33 (12%)	45 (16%)	73 (26%)
Potentially At-Risk Systems	**418**	**109 (26%)**	**58 (14%)**	**23 (6%)**	**71 (17%)**
Potentially At-Risk DAC/SDAC	234	81 (35%)	23 (10%)	13 (6%)	39 (17%)
Not At-Risk System	**1,696**	**174 (10%)**	**110 (6%)**	**44 (3%)**	**356 (21%)**
DAC/SDAC	714	128 (18%)	25 (4%)	24 (3%)	122 (17%)
TOTAL:	**2,868**	**499 (17%)**	**274 (10%)**	**167 (6%)**	**626 (22%)**
Missing Data		*263 (13%)*	*524 (18%)*	*442 (15%)*	*429 (15%)*
Not Applicable	*168 (6%)*	*869 (30%)*	*608 (21%)*	*879 (31%)*	*788 (27%)*

[118] Water systems that are not DAC/SDAC or are missing DAC status designations are excluded from sub-categories within this table.

Figure 37: Total Number of Failing: HR2W List and At-Risk Water Systems that Exceeded Each Minimum Affordability Indicator Threshold



To assess which systems may be facing the greatest affordability burden, State Water Board further analyzed how water systems, by SAFER status, exceeded thresholds for multiple affordability indicators. Affordability burden is ranked from low (only one affordability indicator threshold exceeded), medium, (two affordability indicator thresholds exceeded), or high (three or four affordability indicator thresholds exceeded). As summarized in Table 39, a relatively higher percentage of Failing: HR2W list systems and At-Risk water systems had Higher Affordability Burden when compared to Potentially At-Risk and Not At-Risk water systems.

Table 39: Affordability Assessment Results by SAFER Program Status

SAFER Program Status	Total Systems Assessed	High Affordability Burden[119]	Medium Affordability Burden[120]	Low Affordability Burden[121]
Failing: HR2W Systems	**295**	**21 (7%)**	**52 (17%)**	**70 (24%)**
HR2W DAC/SDAC	184	19 (10%)	34 (18%)	48 (26%)
At-Risk Systems	**459**	**40 (9%)**	**87 (19%)**	**74 (16%)**
At-Risk DAC/SDAC	276	32 (12%)	46 (17%)	55 (20%)
Potentially At-Risk Systems	**418**	**12 (3%)**	**67 (16%)**	**89 (21%)**

[119] Community water system met the minimum threshold for 3 or 4 of the affordability indicators.

[120] Community water system met the minimum threshold for 2 of the affordability indicators.

[121] Community water system met the minimum threshold for 1 of the affordability indicators.

SAFER Program Status	Total Systems Assessed	High Affordability Burden[119]	Medium Affordability Burden[120]	Low Affordability Burden[121]
Potentially At-Risk DAC/SDAC	234	8 (3%)	36 (15%)	59 (25%)
Not At-Risk System	**1,696**	**16 (1%)**	**117 (7%)**	**400 (23%)**
DAC/SDAC	714	10 (1%)	59 (8%)	149 (21%)
TOTAL:	**2,868**	**89 (3%)**	**323 (11%)**	**633 (22%)**

Figure 38: Total Number of Failing: HR2W List and At-Risk Systems that Exceeded an Affordability Indicator Threshold

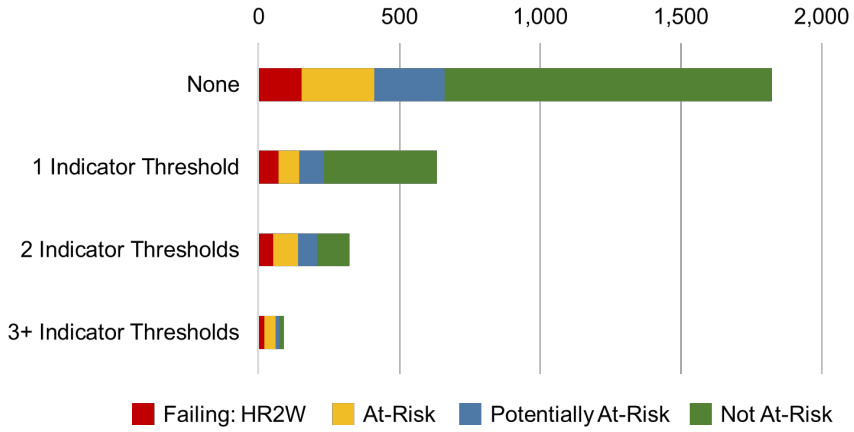
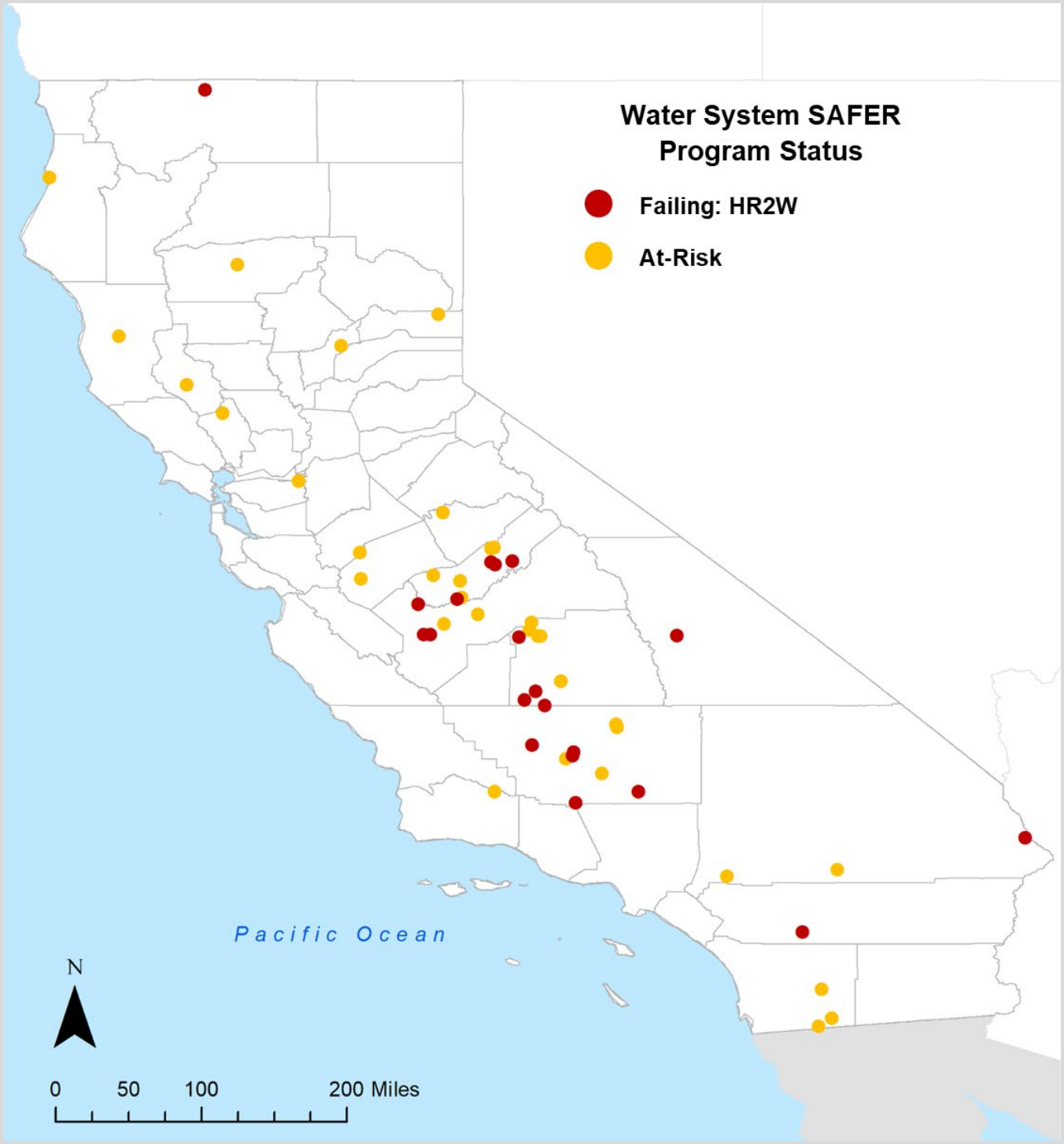


Figure 39: High Affordability Burden DAC/SDAC Failing: HR2W List and At-Risk Systems



SOCIOECONOMIC ANALYSIS OF COMMUNITY WATER SYSTEMS

Results for the 2022 Affordability Assessment for community water systems can be combined with demographic data to better understand the populations most at-risk. However, there are several limitations to this demographic analysis. Demographic data is collected at the census block group or census tract level, and current census surveys do not indicate household drinking water source type. Therefore, the demographic information presented in the tables below may not represent the actual population served by public water systems. Any interpretation of these results should keep in mind the limitations of the analysis.

Demographic data (household size, linguistic isolation, poverty, median household income, and race/ethnicity) was taken from the 2019 American Community Survey. CalEnviroScreen 4.0 data is from OEHHA.[122] The CalEnviroScreen 4.0 data is displayed as percentiles, with higher percentiles indicating areas that are most affected by pollution and where people are especially vulnerable to the effects of pollution. The socioeconomic analysis was calculated using water service area boundaries, area-weighted census tract data where appropriate, and calculating weighted averages. This methodology means that there may be a bias towards demographic data from larger, rural tracts/block groups as these areas are often larger than smaller, urban tracts/block groups.

When compared with Non-DAC/SDAC water systems, DAC/SDAC water system service areas tend to have higher CalEnviroScreen scores, a higher percentage of households in poverty, a higher percentage of limited English-speaking households, non-white communities. Systems with high affordability burden have higher CalEnviroScreen scores, percentages of households that are less than two times the federal poverty level, and greater linguistic isolation than medium and low affordability burden systems (Table 40).

[122] OEHHA CalEnviroScreen
https://oehha.ca.gov/calenviroscreen

Table 40: Socioeconomic Analysis for Community Water Systems (CWSs)

	Statewide (all CWS)	Non-DAC/SDAC CWSs	DAC/SDAC CWSs	No Afford. Burden CWSs	Low Afford. Burden CWSs	Medium Afford. Burden CWSs	High Afford. Burden CWSs
Total Count of Systems	**2,868**	**1,186**	**1,367**	**1,823**	**633**	**323**	**89**
Average CalEnviroScreen 4.0 Percentile	42.8	32.3	50.8	41.6	44.6	43.2	50.1
Average CalEnviroScreen 4.0 Population Characteristics Percentile	44.3	30.6	55	42.9	46.3	44.9	51.9
Average CalEnviroScreen 4.0 Pollution Burden Percentile	42.5	40.1	43.9	41.7	43.7	42.8	46.7
Average percentage of households 2x below federal poverty	31.6%	21.4%	39.8%	30.9%	32%	32.5%	38.2%
Average percentage of households with limited English speaking	6.29%	4.36%	7.6%	5.8%	7.1%	6.3%	9.0%
Average household size	2.82	2.85	2.8	2.8	2.9	2.8	2.8
Percent of non-white customers served	43.1%	39.8%	44.6%	41.7%	46.3%	43.9%	42%

AFFORDABILITY ASSESSMENT LIMITATIONS

The 2022 Affordability Assessment makes progress in identifying communities that may be struggling with water affordability challenges; however, the State Water Board has identified the following limitations that are worth noting:

Affordability Assessment Scope
As described above, there are multiple lenses through which to assess water "affordability." SB 200 does not define how the State Water Board should measure affordability. Nor does it specify if the "Affordability Threshold" is meant to assess household affordability, community affordability, and/or a water system's financial capacity. All three aspects of affordability are interrelated, but metrics or indicators that measure each can differ greatly. More engagement with the public, water systems, and stakeholders is needed to better define the scope of the Affordability Assessment and how its results will be utilized.

Affordability Indicator Data
The State Water Board acknowledges that there are some data coverage issues and data quality uncertainties for all the affordability indicators utilized in the Affordability Assessment. Customer charges, MHI, and/or residential arrearage data are not available for some water systems included in this assessment. Water system customer charge and residential arrearage data is self-reported and is difficult to verify its quality. Finally, water system boundaries, which are used to calculate MHI, may not be accurate. In some cases, they reflect a water system's jurisdiction boundary rather than their service area boundary.

An additional consideration that may be impacting the results of the Affordability Assessment is that water system customer charges may not reflect the full cost water systems face in order to meet current and future operations and infrastructure needs to deliver safe drinking water. For example, many small water systems lack asset management plans, capital improvement plans, and financial plans to assist them in setting customer charges appropriately. This may result in customer charges that are lower than what is needed to support resilient water systems. If more systems were to implement full-cost pricing of their customer charges, the Affordability Assessment results may be different.

Affordability Indicators
There has been criticism of %MHI by academics, water system associations, and the broader water sector mostly around its accuracy in measuring household affordability for those truly in need and the setting of arbitrary %MHI thresholds, limitations which the U.S. EPA has recently acknowledged. Furthermore, some affordability indicators may be more applicable to some governance types of systems than others. For instance, some of the feedback received on the affordability indicators from the Risk Assessment public engagement was that using rates-based indicators, like %MHI and Extreme Water Bill, does not capture the ways in which some systems' finance the full cost of service provision. Another point raised was that some individual water systems are connected to larger utility structures that help mitigate affordability challenges in ways that are not currently in the Affordability Assessment.

It is worth noting that water systems that do not charge customers directly for water are essentially excluded from the Affordability Assessment since all four indicators rely on data related to billing customers. For example, mobile home parks that include water services in

their rental charges, are not captured in the Assessment. The State Water Board is exploring new affordability indicators to better assess community water systems like these.

Currently, many other state agencies are developing and utilizing affordability indicators in similar complementary efforts. The selection of affordability indicators for the Needs Assessment fully considered affordability indicators used by the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Water Resources (DWR), and the California Public Utilities Commission (CPUC). However, many of the indicators selected for the Needs Assessment differ from those used by these other efforts. The use of different indicators, and corresponding thresholds, across state and federal agencies can lead to some confusion for water systems and communities. The State Water Board will continue to collaborate with other state agencies and work towards better alignment.

AFFORDABILITY ASSESSMENT REFINEMENT OPPORTUNITIES

The State Water Board will be conducting the Affordability Assessment on an annual basis as part of the Needs Assessment. To begin addressing the limitations highlighted above, the State Water Board will begin exploring new opportunities to refine the next iteration of the Affordability Assessment:

Better Define Affordability Scope
The State Water Board will begin conducting targeted stakeholder engagement to better define the scope of the Affordability Assessment.

Improved Data Collection Efforts
The State Water Board has already begun taking necessary steps to improve data coverage and accuracy for the Affordability Assessment. Improvements to the 2020 reporting year EAR include new requirements for completing survey questions focused on customer charges and affordability.[123] EAR functionality has been developed that will help auto-calculate average customer charges for six HCF, which will help reduce data errors. Furthermore, the EAR will be able to better distinguish between water systems that do not charge for water compared to those that do. The 2021 EAR includes enhancements to customer charges validations to ensure better data quality.

Refinement of Affordability Indicators and Thresholds
During the initial 2021 Needs Assessment methodology development process, three additional Affordability indicators were recommended for inclusion in future iterations of the Risk and Affordability Assessment:[124] 'Household Burden Indicator,' 'Poverty Prevalence Indicator,' and

[123] Electronic Annual Report (EAR) | California State Water Resources Control Board https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

[124] October 7, 2020 White Paper: Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

'Housing Burden.'[125] New affordability indicators that do not rely on customer charges data will better assess affordability burdens for water systems that do not charge customers directly for water services, i.e., mobile home parks. The State Water Board will begin conducting the proper research and stakeholder engagement needed to develop new affordability indicators and the appropriate affordability thresholds necessary for inclusion in the Risk and Affordability Assessment.

Improved Aggregated Assessment

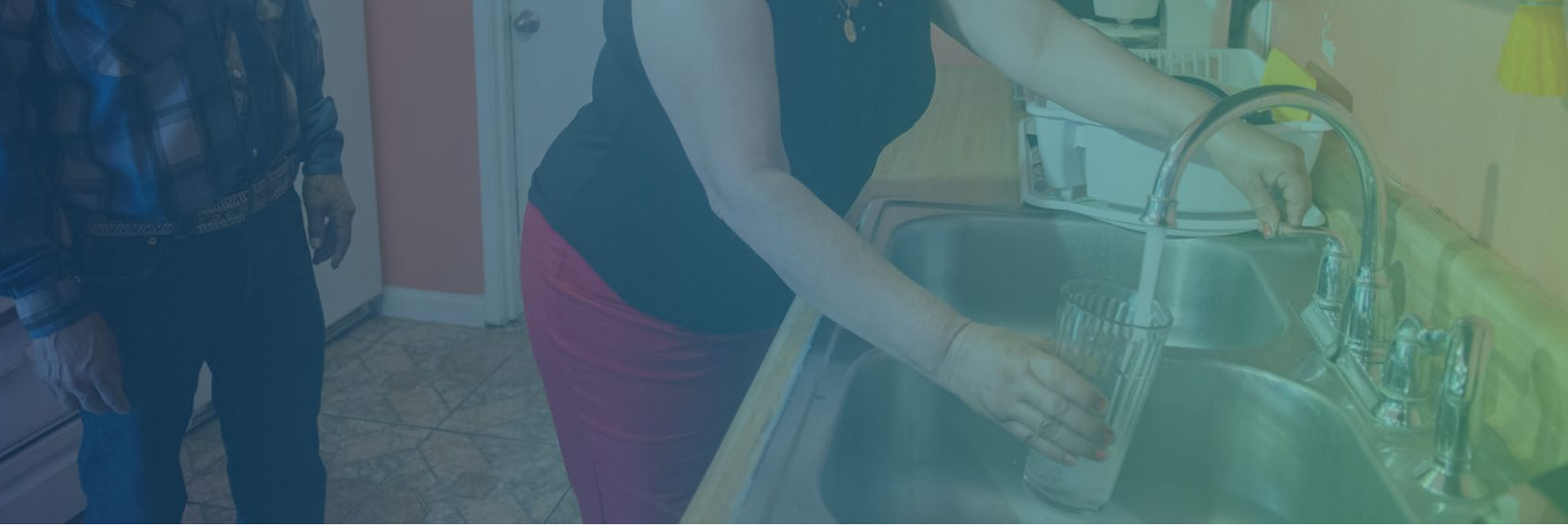
Moving forward, the State Water Board will explore the possibility of developing a singular Affordability Threshold that can then be applied to a combined assessment of the identified affordability indicators.

Further consideration will also be given to how systems that have extremely low customer charges or have not raised their rates within a certain time period should be assessed for affordability and more broadly for risk. These systems may be more at-risk for falling out of water quality compliance or may be imposing affordability burdens on their customers through other means other than customer charges.

[125] *Household Burden Indicator*: This indicator measures the economic burden that relatively low-income households face in paying their water service costs by focusing on the percent of these costs to the 20th percentile income (i.e., the Lowest Quintile of Income (LQI) for the service area). This indicator is calculated by adding the average drinking water customer charges, dividing them by the 20th Percentile income in a community water system, and multiplying this by one hundred.

Poverty Prevalence Indicator: This indicator measures the percentage of population served by a community water system that lives at or below 200% the Federal Poverty Level. This measurement indicates the degree to which relative poverty is prevalent in the community.

Housing Burden: This indicator measures the percent of households in a water system's service area that are both low-income and severely burdened by housing costs (paying greater than 50% of their income for housing costs). This metric is intended to serve as an indicator of the affordability challenges low-income households face with respect to other non-discretionary expenses, which may impact their ability to pay for drinking water services.



CONCLUSIONS

NEEDS ASSESSMENT OBSERVATIONS & FUTURE ITERATIONS

The State Water Board conducts the Needs Assessment annually to support the implementation of the SAFER Program. The results of the Needs Assessment will be used to prioritize public water systems, tribal water systems, state small water systems, and domestic wells for funding in each year's Safe and Affordable Drinking Water Fund Expenditure Plan; inform State Water Board technical assistance; and to develop strategies for implementing interim and long-term solutions. The State Water Board will also use the Needs Assessment results for targeted outreach on engagement and partnership activities.

The Needs Assessment methodology will be refined over time to incorporate additional and better-quality data; experience from implementation of the SAFER Program; and further input from the public and the SAFER Advisory Group. The following summarizes Needs Assessment refinement opportunities:

Improved Data
The State Water Board has already begun taking necessary steps to improve data coverage and accuracy for the Needs Assessment. Improvements to the 2020 and 2021 reporting year EAR include new requirements for public water systems in completing survey questions focused on income, customer charges and affordability.[126] EAR functionality has been developed that will help improve data accuracy as well. Additionally, the State Water Board's Division of Financial Assistance has begun developing a strategy to capture more detailed funded project and technical assistance cost data. Finally, the State Water Board is currently working on developing the System Area Boundary Layer Admin App (SABL Admin), an administrative tool that allows District Offices, Local Primacy Agencies and public water system staff to upload and verify water system area boundaries to a central database. Improvement of water system boundary data statewide will enhance the calculation of %MHI and other important data points for the Risk and Affordability Assessments, as well as increase the accuracy of the Cost Assessment's modeling of potential physical consolidation solutions.

[126] Electronic Annual Report (EAR) | California State Water Resources Control Board
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

Focused Scope
The 2022 Needs Assessment attempts to analyze the needs of public water systems, state small water systems, and individual domestic wells. It also attempts to analyze several different topics and stages of problem-solution development: the Risk Assessment, Drought Infrastructure Cost Assessment, and Affordability Assessment. Given the full breadth of this effort and decreased contractional support, additional input from SAFER Advisory Group members and stakeholders on future focus areas to help streamline the scope of the Needs Assessment may be warranted. For example, the 2023 Needs Assessment refinement period could prioritize the development of additional affordability indicators over additional water quality indicators. A more focused scope may result in a more useful analysis for the SAFER Program.

Expanded Outreach to Tribal Water Systems
Federally regulated California tribal water systems were originally envisioned to be included in both the 2021 and 2022 Needs Assessment, and concerted outreach to Tribal water systems was conducted in 2021 by the State Water Board and the Department of Water Resources (DWR), but ultimately tribal systems were not included in the Needs Assessment for public water systems due to missing data. In the interim, SAFER Program staff will implement the SAFER Tribal Drinking Water Outreach Plan[127] and work with individual tribes, as requested by tribal governments or in response to drinking water needs identified through coordination with the U.S. EPA and DWR.

Alignment with other State Efforts
Multiple other California state agencies have recently begun assessing different aspects of drinking water systems' risks and performance with respect to the Failing: HR2W list systems. These agencies include the Department of Water Resources (DWR), the Office of Environmental Health Hazard Assessment (OEHHA) and the California Public Utilities Commission (CPUC). The State Water Board continues to engage in discussions with staff from each of these agencies to try to avoid duplication of efforts and to ensure the most productive long-term statewide assessment of water system performance possible. Moving forward, the State Water Board will continue to pursue collaborative inter-agency opportunities to enhance the Needs Assessment.

The State Water Board is making the data from the Needs Assessment available to other state agencies and the public in an effort to encourage the utilization of its results into broader decision making. The State Water Board is partnering on the implementation of other statewide water program efforts that may impact drinking water, such as the Sustainable Groundwater Management Act (SGMA) and the Central Valley Salinity Alternatives for Long-Term Sustainability Initiative (CV-Salts). The State Water Board is seeking to ensure that core drinking water sustainability approaches, such as the importance of water partnerships and regionalization activities, are included in these discussions. For example, considerations of local solutions around new wells should include the results of the Risk Assessment, particularly

[127] SAFER 2022 Tribal Outreach Plan (English)
https://www.waterboards.ca.gov/safer/docs/2022/SAFER-Tribal-Outreach-Plan-ENG-03242022.pdf
SAFER 2022 Tribal Outreach Plan (Spanish)
https://www.waterboards.ca.gov/safer/docs/2022/SAFER-Tribal-Outreach-Plan-ESP-03242022.pdf

affordability and TMF capacity needs when deliberating between installing new wells and consolidation.

Enhancement of the Cost Assessment
Moving forward the results of the Needs Assessment will be fully utilized by the Cost Assessment model to estimate the funding needs more accurately for interim and long-term solutions. Modeled solutions for Failing: HR2W list systems, At-Risk systems and domestic wells will be based on the challenges identified within the Needs Assessment for these systems and locations. For example, water systems experiencing water quality risk may be costed out a treatment plant option, only if not currently available. However, if the system already has a treatment plant, then other solutions may be considered in the cost model, such as consolidation or the construction of a new source. Water systems facing TMF Capacity issues may have modeled solutions that are non-capital based, such as the assignment of an administrator or technical assistance. Moreover, the targeted drought infrastructure cost assumptions employed in the 2022 Cost Assessment will be incorporated into the full Cost Assessment for Failing: HR2W list and At-Risk systems in the future.

Refinement of the Affordability Assessment
The State Water Board will work with the public to further refine the affordability indicators and thresholds utilized in the Affordability Assessment. The State Water Board will continue to collaborate with other state agencies and work towards better alignment amongst complimentary affordability efforts. Affordability Assessment refinement efforts will also include the exploration of developing a singular Affordability Threshold that can then be applied to a combined assessment of affordability indicators.

Further consideration will also be given to how systems that do not charge for water services or have extremely low customer charges should be assessed for affordability and more broadly for risk. These systems may be more at-risk for falling out of water quality compliance or may be imposing affordability burdens on their customers through other means other than customer charges.

Learning by Doing – SAFER Program Maturation
This is the second iteration of the Needs Assessment. While every effort was made to make it comprehensive, this assessment is designed to be an annual, iterative process and it is the State Water Board's expectation that it will continue to improve over time. As the State Water Board's SAFER Program matures, better tracking of systems that come on and off the Failing: HR2W and At-Risk lists will occur within the State Water Board's new SAFER Clearinghouse database. These improvements along with reflection and deeper investigation into areas where results did not fully reflect the breadth or depth of staff or community experiences (e.g., complexity of urban areas, asset management principals, and self-supplied homes using unfiltered surface water) will be incorporated into future efforts.

It is difficult to compare the results of the 2021 Needs Assessment to the 2022 results due to the enhancements made to the assessment methodologies. To better track water system performance in the Risk Assessment over time for example, there will need to be a period of time where the methodology stays consistent for multiple years. Since the Risk Assessment and the other components of the Needs Assessment are still in their infancy, it may be a few years before this can be achieved.

Continued Public Engagement
The State Water Board is committed to engaging the public and key stakeholder groups to solicit feedback and recommendations as it refines its Needs Assessment methodologies. The State Water Board will continue to host public workshops to provide opportunities for stakeholders to learn about and contribute to the refinement process. Stakeholders are encouraged to sign-up for the SAFER Program's email list-serve to receive notifications of when these public workshops are scheduled to occur.[128]

NEEDS ASSESSMENT NEXT STEPS

WATER SYSTEM REQUESTS FOR DATA UPDATES

The State Water Board is accepting inquiries related to underlying data change requests for the 2022 Needs Assessment. The data used for both Assessments are drawn from multiple sources and are detailed in Appendices below. Water systems are encouraged to reach out via the online webform below:

Water System Data Change Request Webform: https://forms.office.com/g/BtPunTA0Qh

The State Water Board will be updating the Risk Assessment results in Attachment A1 as data changes occur.[129] Therefore, the list of water systems designated At-Risk and Potentially At-Risk in this Attachment will evolve from the aggregated assessment results summarized in this report over time.

2022-23 SAFE AND AFFORDABLE DRINKING WATER FUND EXPENDITURE PLAN

The results of the 2022 Needs Assessment will be utilized by the State Water Board and the SAFER Advisory Group[130] to inform the prioritization of funding and technical assistance within the Safe and Affordable Drinking Water Fund Expenditure Plan.[131] The SAFER Advisory Group is composed of 20 appointed members that represent public water systems, technical assistance providers, local agencies, nongovernmental organizations, the public and residents served by community water systems in disadvantaged communities, state small water systems, and domestic wells.

The SAFER Advisory Group meets up to four times a year at locations throughout California to provide many opportunities for public and community input. All meetings are widely publicized,

[128] SAFER Program Email List-Serve (bottom of webpage)
https://www.waterboards.ca.gov/safer/

[129] 2022 Risk Assessment Results: Attachment A1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022risk.xlsx

[130] SAFER Advisory Group
https://www.waterboards.ca.gov/safer/advisory_group.html

[131] Safe and Affordable Drinking Water Fund
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/safer.html

open to the public, and offer language translation services. The State Water Board will also be hosting a series of workshops between April and June 2022 to inform the Fund Expenditure Plan.

APPENDIX A:
RISK ASSESSMENT METHODOLOGY FOR PUBLIC WATER SYSTEMS

INTRODUCTION

The purpose of the Risk Assessment for public water systems is to identify systems at-risk or potentially at-risk of failing to meet one or more key Human Right to Water goals: (1) providing safe drinking water; (2) accessible drinking water; (3) affordable drinking water; and/or (4) maintaining a sustainable and resilient water system. Data on performance and risk is most readily available for public water systems and thus the risk assessment methodology for public water systems allows for a multi-faceted examination across four risk indicator categories: Water Quality, Accessibility, Affordability; and TMF (technical, managerial, and financial) Capacity.

PUBLIC WATER SYSTEMS ASSESSED

The 2021 Risk Assessment for public water systems was conducted for community water systems with 3,300 service connections or less and all non-transient non-community water systems which serve K-12 schools. The 2022 Risk Assessment was expanded to include medium-sized community water systems. The expansion of the Risk Assessment to include larger community water systems allows the State Water Board to more thoroughly track the performance and capacity of community water systems, especially the larger water systems that are or have been on the Failing: HR2W list.

The 2022 Risk Assessment excludes 70 wholesalers because they do not provide direct service to residential customers. Some water system types have also been excluded from certain risk categories or specific risk indicators See Table A1 for details.

Table A1: Public Water Systems Analyzed in the 2022 Risk Assessment

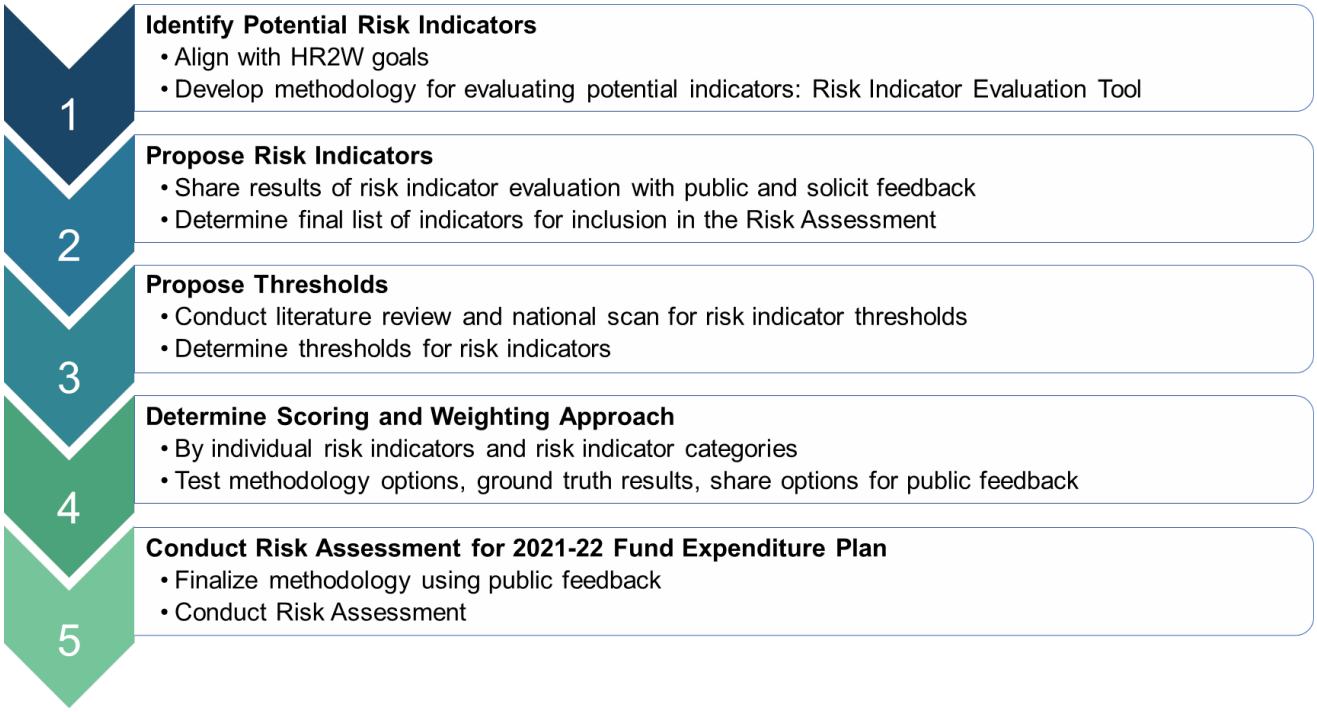
Water System Type	Number	Water Quality	Accessibility	Affordability	TMF Capacity
Community Water Systems	2,692	Yes	Yes	Yes	Yes
K-12 Schools	374	Yes	Yes	No	Yes
TOTAL ANALYZED:	**3,066**				

RISK ASSESSMENT METHODOLOGY DEVELOPMENT PROCESS

The initial draft Risk Assessment methodology was developed by UCLA from September 2019 to March 2020 and incorporated 14 risk indicators. Details on the initial draft Risk Assessment methodology and results are provided in the July 22, 2020 white paper *Identification of Risk Assessment 2.0 Indicators for Public Water Systems.*[132]

The State Water Board and UCLA refined the initial draft Risk Assessment methodology through multiple stages of development between April 2020 and March 2021. This effort was designed to encourage public and stakeholder participation, providing opportunities for feedback and recommendations throughout the methodology development process. Figure A1 provides an overview of the Risk Assessment development phases. Each of these development phases were detailed in publicly available white papers, presented at public webinars, and the public feedback received was incorporated into the final Risk Assessment methodology and results.

Figure A1: Phases of 2021 Risk Assessment Development



[132] July 16, 2020 White Paper: Identification of Risk Assessment 2.0 Indicators for Public Water Systems https://www.waterboards.ca.gov/drinking_water/programs/safer_drinking_water/docs/draft_white_paper_indicators_for_risk_assessment_07_15_2020_final.pdf

July 22, 2020 Webinar Presentation https://www.waterboards.ca.gov/drinking_water/programs/safer_drinking_water/docs/july22_risk_assessment_slides.pdf

July 22, 2020 Webinar Recording https://www.youtube.com/embed/H57wBnWij1Y?modestbranding=1&rel=0&autoplay=1

The State Water Board and UCLA hosted four public webinar workshops in 2020 to solicit feedback and recommendations on the development of the Risk Assessment. Approximately 683 individuals[133] participated in these workshops through either Zoom or CalEPA's live webcast.

In 2021, the State Water Board responded to feedback received with the release of the 2021 Risk Assessment to refine the methodology to include a larger inventory of water systems, incorporate better risk indicators that identify source capacity challenges, and add new risk indicators to assess water systems financial capacity. The State Water Board hosted a public webinar workshop in February 2022 to solicit feedback on the recommended changes to the Risk Assessment.[134] The State Water Board incorporated many suggested changes submitted during the feedback period and are reflected in the current methodology.

RISK ASSESSMENT METHODOLOGY

The Risk Assessment methodology relies on three core elements which are utilized to calculate an aggregated risk score for the public water system assessed:

Risk Indicators: quantifiable measurements of key data points that allow the State Water Board to assess the probability of a water system's failure to deliver safe drinking water or other infrastructure and institutional failures. Risk indicators that measure water quality, accessibility, affordability, and TMF capacity are incorporated based on their criticality as it relates to a system's ability to remain in compliance with safe drinking water standards and their data availability and quality across the state.

Risk Indicator Thresholds: the levels, points, or values associated with an individual risk indicator that delineates when a water system is more at-risk of failing.

Scores & Weights: the application of a multiplying value or weight to each risk indicator and risk category, as certain risk indicators and categories may be deemed more critical than others and/or some may be out of the control of the water system. The application of weights to risk indicators and risk categories allows the State Water Board multiple ways to assess all risk indicators within each category together in a combined Risk Assessment score.

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[133] Individuals that participated in more than webinar workshop are double counted in this figure.

[134] July 28, 2022 White Paper: Proposed Changes for the 2022 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/needs-assessment-white-paper-draft.pdf

February 2, 2022 Webinar Presentation
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/proposed-changes-drinking-water-needs-assessment.pdf

February 2, 2022 Webinar Recording (English)
https://www.youtube.com/watch?v=a-KJxB0YII8

February 2, 2022 Webinar Recording (Spanish)
https://www.youtube.com/watch?v=nPwx23GOHCY

RISK INDICATORS

INITIAL 2020 RISK INDICATORS

The State Water Board, in partnership with UCLA, began an effort in April 2020 to identify potential risk indicators to be considered for inclusion in the Risk Assessment for public water systems. The initial version of the draft Risk Assessment utilized 14 risk indicators.[135] In response to public feedback from its April 17, 2020 webinar workshop, the State Water Board and UCLA expanded the Risk Assessment scope to evaluate a much broader number of risk indicators. The State Water Board, UCLA, and the public identified 129 potential risk indicators, several from other complementary state agency efforts, to help predict the probability of a water system's failure to deliver safe drinking water. A concerted effort was made to identify potential risk indicators that measure water quality, accessibility, affordability, and TMF capacity based on their criticality as it relates to a system's ability to remain in compliance with safe drinking water standards. This effort included full consideration of risk indicators identified in efforts conducted by the Office of Environmental Health Hazard Assessment (OEHHA),[136] the Department of Water Resources (DWR),[137] and the California Public Utilities Commission.[138]

To facilitate the selection of the final indicators for the Risk Assessment, the State Water Board and UCLA conducted an extensive potential risk indicator evaluation process (Figure A2) with internal and external feedback to refine the list of 129 potential risk indicators to a recommend list of 22 risk indicators for the Risk Assessment. Learn more about the risk indicator identification, refinement, and selection process in the October 7, 2020 white paper *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems.*[139]

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[135] July 16, 2020 White Paper:
Identification of Risk Assessment 2.0 Indicators for Public Water Systems
https://www.waterboards.ca.gov/drinking_water/programs/safer_drinking_water/docs/draft_white_paper_indicators_for_risk_assessment_07_15_2020_final.pdf

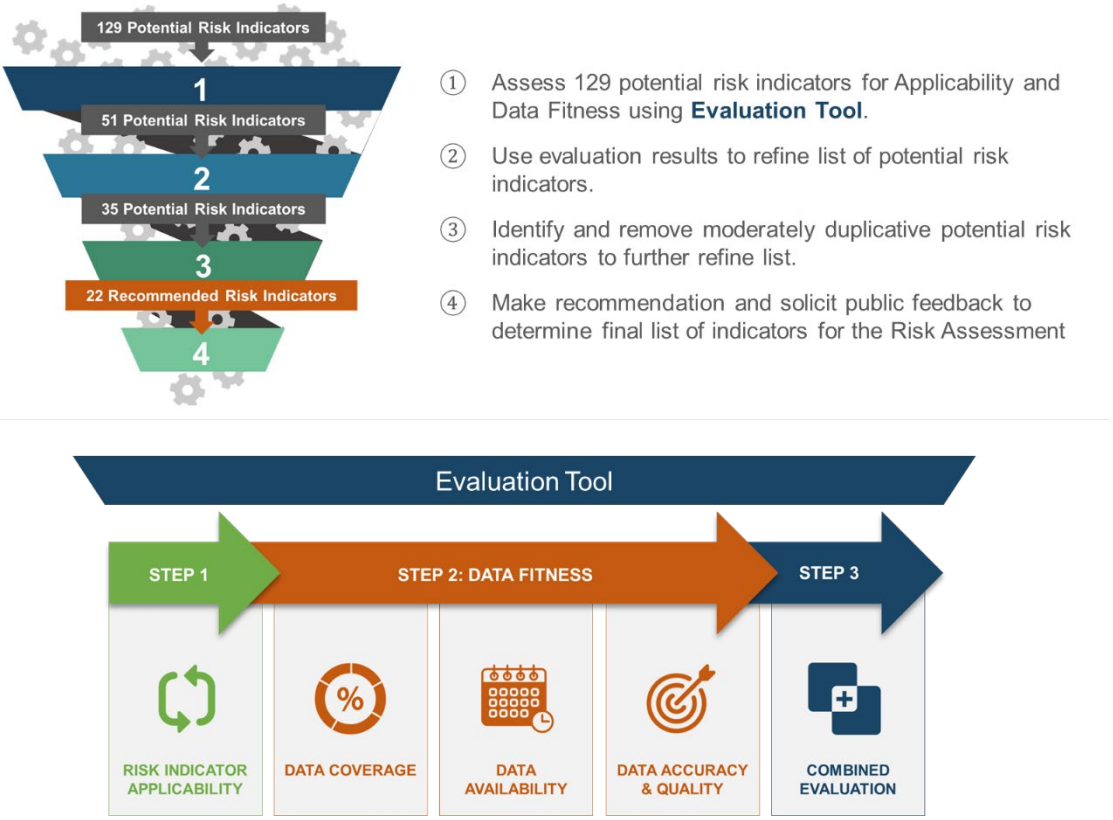
[136] The Human Right to Water in California | OEHHA
https://oehha.ca.gov/water/report/human-right-water-california

[137] Countywide Drought and Water Shortage Contingency Plans | DWR
https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/County-Drought-Planning

[138] California Public Utilities Commission
https://www.cpuc.ca.gov/

[139] October 7, 2020 White Paper:
Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems
https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

Figure A2: Potential Risk Indicator Evaluation Process



The 2019-2020 potential risk indicator evaluation process yielded a recommended list of 22 risk indicators, but three of these are affordability risk indicators that need to be further refined and verified in terms of determining important thresholds of risk before they can be incorporated into the Risk Assessment. Table A2 provides a summary of the selected 19 risk indicators utilized in the 2021 Risk Assessment and the new list for the 2022 Risk Assessment. Sections below provide details on each individual risk indicator including definitions, required datapoints, and calculation methodologies.

2022 NEW AND REMOVED RISK INDICATORS

To respond to stakeholder feedback, the State Water Board has removed five risk indicators and added eight new risk indicators to the 2022 Risk Assessment.

Removed Risk Indicators

Maximum Duration of High Potential Exposure (HPE)
The purpose of this risk indicator is to identify systems that experience an ongoing contamination problem. The calculation for this indicator is twofold. It first identifies the contaminants with high potential exposure level by estimating the average annual

concentration of delivered water for each of 19 selected contaminants and assessing whether the average annual concentration is greater than the MCL. The duration of high potential exposure is calculated by summing the number of years for which each contaminant had high potential exposure. The indicator score is based on the maximum duration of high potential exposure across all contaminants during the nine-year period to capture recurring exposure. Capturing this recurring exposure may be important, especially when such exposure involves contaminants whose health effects are associated with chronic exposure. However, the complicated nature of how this risk indicator is calculated and determined was difficult for stakeholders, water systems, and State Water Board staff to understand. Therefore, the State Water Board has removed this indicator from the Risk Assessment. The State Water Board may develop new indicators in the future to better assess how long a water system is out of compliance.

Water Source Types

This risk indicator analyzes the diversity of water source types utilized by a water system, e.g. groundwater, surface water, etc. However, it is strongly correlated with another risk indicator in the Accessibility category of the Risk Assessment: Number of Water Sources. Therefore, the State Water Board has removed this indicator from the Risk Assessment.

Percent Shut-Offs for Non-Payment

The purpose if this risk indicator is to identify water systems that have residential customers struggling to pay their water bills due to affordability challenges. The 2021 Risk Assessment and Affordability Assessment utilized 2019 data from the Electronic Annual Report (EAR). However, Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021.[140] This information was therefore unavailable for the majority of 2020 and will not be collected in the 2021 EAR. Thus, the State Water Board has removed this indicator from the Risk Assessment.

Number of Service Connections

This risk indicator measures the total number of customer service connections a water system serves and was utilized in the 2021 Risk Assessment as a proxy measure of a water system's financial capacity to support staff and budget. The State Water Board required new financial reporting in the 2020 EAR to collect data to better analyze the financial capacity of water systems. The addition of new financial capacity risk indicators in the Risk Assessment eliminates the need for this risk indicator. Therefore, the State Water Board has removed this indicator from the Risk Assessment.

Extensive Treatment Installed

The purpose of this risk indicator was to identify water systems requiring extensive treatment due to poor source water quality and treatment complexity. The State Water Board removed this risk indicator because of the expansion of the water systems included in the Risk Assessment. The inclusion of medium-sized water systems would result in many of these systems receiving risk points due to the calculation methodology of this risk indicator. For example, 157 (40%) of large and medium-sized water systems with more than 3,300 service

[140] Governor Newsom Executive Order https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/

connections would receive risk points. The inherent bias of this risk indicator, without any additional analysis of the system's technical capacity, led the State Water Board to remove it from the Risk Assessment.

New Risk Indicators

The State Water has added 8 new risk indicators to the Risk Assessment. Table A2 provides a summary of the 22 risk indicators utilized in the 2022 Risk Assessment. Sections below provide details on each individual risk indicator including definitions, required datapoints, calculation methodologies, thresholds, scores, and weights.

Water Quality
The State Water Board added one new risk indicator to the Water Quality category of the Risk Assessment:

- **Constituents of Emerging Concern**: The purpose of this risk indicator is to identify water systems that could potentially come out of compliance if certain constituents of emerging concern (CECs) were to be regulated by a primary and/or secondary maximum contaminant level (MCL). While there are many CECs, the State Water Board is proposing a limited list of CECs for inclusion in the calculation of this risk indicator based on the likelihood that an MCL will be developed. This risk indicator would only assess water systems that have water quality sample results associated with hexavalent chromium (CrVI), 1,4-dioxane, and/or the 18 chemicals associated with per- and polyfluoroalkyl substances (PFAS). More chemicals may be included in future iterations of the Risk Assessment.

Accessibility
The State Water Board has added two new risk indicators to the Accessibility category of the Risk Assessment. These new risk indicators are meant to identify water systems that may be experiencing source capacity challenges. Stakeholder feedback on the 2021 Risk Assessment called for the inclusion of additional risk indicators that better assess water system source capacity and their ability to meet customer demand.

Section 64602 of the California Code of Regulations requires water systems to maintain a minimum level of service during normal (non-emergency) operating conditions. Consumers have a reasonable expectation to an adequate supply of water not just during average conditions but also during high demand periods. Source capacity and reliability have a significant effect on the ability of the water system to meet sanitation needs, future regulatory obligations and consumer expectations.

- **Source Capacity Violations**: The purpose of this risk indicator is to identify water systems that have violated source capacity standards as required in California Waterworks Standards[141] within the last three years. This violation criteria includes:
    - Failure to maintain adequate source capacity (may include curtailment order and/or service connection moratorium).

[141] California Code of Regulations Title 22 Division 4 Chapter 16
https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I437FD430D4BA11DE8879F88E8B0DAAAE&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

    - Failure to maintain adequate pressure leading to a water outage.
    - Failure to complete a required source capacity planning study.
- **Bottled or Hauled Water Reliance**: The purpose of this risk indicator is to identify water systems that have had to supplement or replace their source supply to meet customer demand with bottled water, and/or hauled water at any point within the past three years. A water system that is unable to meet the demand with their available sources due to water quality issues or source capacity challenges is at-risk of failing to provide water to the customers. Water systems that meet this threshold criteria are automatically added to the At-Risk list.

Affordability
The State Water Board has added two new risk indicators to the Affordability Capacity category of the Risk Assessment. These new risk indicators are meant to identify water systems that have a community that is experiencing household affordability challenges. The two risk indicators are direct measures of household drinking water affordability.

- **Percentage of Residential Arrearages:** The purpose of this risk indicator is to identify water systems that have a high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due.
- **Residential Arrearage Burden**: The purpose of this risk indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

2021 Drinking Water Arrearage Payment Program[142]

The initial data used for the two new arrearage affordability indicators comes from the State Water Board's 2021 Drinking Water Arrearage Payment Program. The State Water Board received $985 million to address community water system residential and commercial customer water debt that accrued during the COVID-19 pandemic (March 4, 2020 through June 15, 2021). The State Water Board collected residential arrearage information from an initial survey on outstanding debt and during the Program's application period. This data was utilized to calculate the new arrearage affordability indicators. It is important to note that some community water systems choose not to participate in the initial survey or Program. Therefore, this dataset may not represent the total amount of outstanding arrearages statewide. Moving forward, additional State assistance programs and datasets may be used to supplement this dataset as they become available.

TMF Capacity
The State Water Board has added three new risk indicators to the TMF Capacity category of the Risk Assessment. These new risk indicators are meant to assess risk related to the

[142] California Water and Wastewater Arrearage Payment Program
https://www.waterboards.ca.gov/arrearage_payment_program/

financial capacity of water systems. Financial capacity refers to a water system's ability to balance its budget on an annual basis, maintain cash reserves for emergencies, and maintain sufficient cash to pay its bills on a timely basis.

- **Operating Ratio**: The purpose of this risk indicator is to identify water systems that do not have sufficient revenues to cover their costs of operating and maintaining their system. Specifically, "Operating Ratio" is a ratio of annual revenues compared to annual operating expenses. To be a self-supporting, a water system should strive to have at least as much annual revenue as it has operating expenses. In general, a water system should collect revenues greater than expenses in order to accommodate for future investments.
- **Total Annual Income**: The purpose of this risk indicator is to identify water systems whose total annual revenue is unable to cover their total annual expenses. A water system should generate enough revenue to cover all incurred expenses (including operational expenses) throughout the year. Total Net Annual Income of a water system should be a positive (+) value. If more money is spent than is brought in, then the water system will have to make adjustments in order to maintain operations. If the expenditures are outpacing revenue too quickly, then the water system may have to cut costs or decrease its level of service.
- **Days Cash on Hand**: The purpose of this risk indicator is to approximate the number of days a water system can cover its daily operations and maintenance costs, relying only on their current cash or liquid reserves, before running out of cash. It is a helpful measure of how long a system can operate if it has a sudden and dramatic reduction in operating income, perhaps from a large customer leaving or an environmental emergency (fire, drought restrictions, etc.).

Table A2: Risk Indicators

Category	2021 Risk Indicators	2022 Risk Indicators
Water Quality	History of *E. coli* Presence	History of *E. coli* Presence
	Increasing Presence of Water Quality Trends Toward MCL	Increasing Presence of Water Quality Trends Toward MCL
	Treatment Technique Violations	Treatment Technique Violations
	Past Presence on the HR2W List	Past Presence on the HR2W List
	Maximum Duration of High Potential Exposure (HPE) (**Removed 2022**)	Percentage of Sources Exceeding an MCL
	Percentage of Sources Exceeding an MCL	**NEW**: Constituents of Emerging Concern
Accessibility	Number of Sources	Number of Sources
	Absence of Interties	Absence of Interties

Category	2021 Risk Indicators	2022 Risk Indicators
	Water Source Types (**Removed 2022**)	DWR – Drought & Water Shortage Risk Assessment Results
	DWR – Drought & Water Shortage Risk Assessment Results	Critically Overdrafted Groundwater Basin
	Critically Overdrafted Groundwater Basin	**NEW**: Bottled or Hauled Water Reliance
		NEW: Source Capacity Violations
Affordability	Percent of Median Household Income (%MHI)	Percent of Median Household Income (%MHI)
	Extreme Water Bill	Extreme Water Bill
	% Shut-Offs (**Removed 2022**)	**NEW**: Residential Arrearage Burden
		NEW: Percentage of Residential Arrearages
TMF Capacity	Number of Service Connections (**Removed 2022**)	Operator Certification Violations
	Operator Certification Violations	Monitoring and Reporting Violations
	Monitoring and Reporting Violations	Significant Deficiencies
	Significant Deficiencies	**NEW**: Days Cash on Hand
	Extensive Treatment Installed (**Removed 2022**)	**NEW**: Operating Ratio
		NEW: Net Annual Income

RISK INDICATOR THRESHOLDS, SCORES, & WEIGHTS

THRESHOLDS

To develop thresholds for the risk indicators in the Risk Assessment, the State Water Board reviewed multiple available types of evidence, looking both within California, across other state agencies nation-wide, and at the U.S. EPA's standards. Few exact risk indicator thresholds relating to water system failure were derived from sources beyond California legislative and regulatory definitions, given both the unique definition of water system failure employed in this assessment and the unique access to indicator data which this assessment enabled. However, similar indicators and associated thresholds to inform this process were also identified across other sources.

Based on the research conducted, most risk indicators did not have regulatorily-defined thresholds. For binary risk indicators (*e.g.,* operator certification violations), the process of setting thresholds was straightforward because it is either present or absent. For other risk indicators with continuous or categorical data, thresholds were derived using cut points in the distribution of a given risk indicator, where Failing: HR2W list systems started to cluster, as well as the professional opinion of external stakeholders, State Water Board staff, as well as an internal advisory group of District Engineers. Where possible, tiered thresholds were determined to capture more nuanced degrees of risk within indicators. Sections below provide more details about the rationale for the thresholds developed for each indicator.

Moving forward, the State Water Board will continue to refine the risk indicator thresholds as data availability improves and the SAFER Program matures. The process may include refining thresholds by analyzing historical data trends such as looking at the relationship between historical thresholds and the likelihood that systems came out of compliance.

SCORES

To enable the evaluation and comparison of risk indicators, a standardized score between 0 and 1 has been applied to each developed risk indicator threshold. This is important since many of the risk indicators are measured in different units and scales. The score normalizes the thresholds and allows the Risk Assessment to assess water system performance across all risk indicators. The scores assigned to the risk indicator thresholds were developed with the professional opinion of external stakeholders, State Water Board staff, as well as an internal advisory group of District Engineers (Table A3).

WEIGHTS

When evaluating the risk indicators, the Risk Assessment methodology can either apply the same “weight” to each risk indicator or apply different weights (see Figure A3). Public feedback during four public workshops indicated that the Risk Assessment should weight some risk indicators higher than others because they may be more “critical” as they relate to a water system’s ability to stay in compliance. Weights between 1 and 3 were applied to individual risk indicators (see Table A3, with a weight of 3 indicating the highest level of criticality). The individual risk indicator weights were developed with the professional opinion of external stakeholders, State Water Board staff, as well as an internal advisory group of District Engineers. In 2020, an analysis of how the application of risk indicator weights impacts the performance of Failing: HR2W list systems was shared with the public for feedback with white paper *Recommendations for Risk Assessment 2.0 Thresholds, Scores, & Weights for Public*

Water Systems[143] and a December 14, 2020 webinar,[144] which ultimately supported the final inclusion decision regarding individual risk indicator weights in the Risk Assessment.

[143] December 14, 2020 White Paper:
Recommendations for Risk Assessment 2.0 Thresholds, Scores, & Weights for Public Water Systems
https://www.waterboards.ca.gov/safer/docs/draft_white_paper.pdf

[144] December 14, 2020 Webinar Presentation
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/safer_risk_assessment_webinar_accessible.pdf

December 14, 2020 Webinar Recording
https://www.youtube.com/embed/6XDak8R5lDk?cc_load_policy=1&modestbranding=1&rel=0&autoplay=1

Table A3: Individual Risk Indicator Thresholds, Scores, and Weights

Risk Indicator	Thresholds	Score		Weight	Max Score
History of *E. coli* Presence	**Threshold 0** = **No** history of *E. coli* presence within the last three years.	0		N/A	0
	Threshold 1 = **Yes** history of *E. coli* presence (*E. coli* violation and/or Level 2 Assessment) within the last three years.	1		3	3
Increasing Presence of Water Quality Trends Toward MCL	**Threshold 0** = **Less than 25%** of sources have increasing presence of water quality trends toward MCL.	0	Average across all contaminated sources (0 ≤ score ≤ 1)	2	2
	Threshold 1 = **Secondary Contaminants**: 25% or greater of sources have 9-year average of running annual averages at or greater than 80% of MCL and the running annual average has increased by 20% or more.	0.25 per source			
	Threshold 2 = **Primary Non-Acute Contaminants**: 25% or greater of sources have 9-year average of running annual averages at or greater than 80% of MCL and the running annual average has increased by 5% or more.	0.5 per source			
	Threshold 3 = **Acute Contaminants**: 25% or greater of sources have: • 9-year average (no running annual average) is at or greater than 80% of MCL; or • 24-month average is at or greater than 80% of MCL; or • Any one sample over the MCL.	1 per source			

Risk Indicator	Thresholds	Score		Weight	Max Score
Treatment Technique Violations	**Threshold 0** = **0** Treatment technique violations over the last three years.	0		N/A	0
	Threshold 1 = **1 or more** Treatment technique violations over the last three years.	1		1	1
Past Presence on the Failing: HR2W List	**Threshold 0** = **0** Failing: HR2W list occurrence over the last three years.	0		N/A	0
	Threshold 1 = **1** Failing: HR2W list occurrence over the last three years.	0.5		2	1
	Threshold 2 = **2 or more** Failing: HR2W list occurrences over the last three years.	1		2	2
Percentage of Sources Exceeding an MCL	**Threshold 0** = **less than 50%** of sources exceed an MCL.	0		N/A	0
	Threshold 1 = **50% or greater** of sources exceed an MCL.	1		3	3
Constituents of Emerging Concern	**Threshold 0** = **Less than 25%** of sources are meeting the criteria for Thresholds 1 and 2.	0	Average across all contaminated sources (0 ≤ score ≤ 1)	3	3
	Threshold 1 = **25% or greater** of sources are meeting the following criteria: • **CrVI: 1 or more** calculated RAA(s) over 5-year period are at or above 80% of the former MCL and below the former MCL (8 µg/L ≤ RAA < 10 µg/L); or • **PFAS: 2 or more** samples over 5-year period are positive; this criterion applies to all 18 chemicals.	0.5 per source			

Risk Indicator	Thresholds	Score		Weight	Max Score
	Threshold 2 = **25% or greater** of sources are meeting the following criteria: • **CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above the former MCL (10 µg/L ≤ RAA); or • **PFAS: 2 or more** samples, over 5-year period, are at or above the notification level; this criterion only applies to 3 chemicals that have notification level; or • **1,4-Dioxane: 1 or more** calculated RAA(s), over 5-year period, are at or above the notification level (1 µg/L ≤ RAA).	1 per source			
Number of Sources	**Threshold X** = **0** sources.	Automatically At-Risk		N/A	Automatically At-Risk
	Threshold 0 = **multiple** sources.	0		N/A	0
	Threshold 1 = **1** source only.	1		3	3
Absence of Interties	**Threshold 0** = **1 or more** interties.	0		N/A	0
	Threshold 1 = **0** interties.[145]	1		1	1

[145] All water systems with 10,000 service connections or greater, that have more than one source are excluded and risk scores of 0 are assigned. If a water system with 10,000 service connections or more has only one source and it is not an intertie, they receive a risk score of 1.

Risk Indicator	Thresholds	Score	Weight	Max Score
DWR – Drought & Water Shortage Risk Assessment Results	**Threshold 0** = **Below top 25%** of systems most at risk of drought and water shortage.	0	N/A	0
	Threshold 1 = **Between top 25% - 10.01%** of systems most at risk of drought and water shortage.	0.25	2	0.5
	Threshold 2 = **Top 10%** of systems most at risk of drought and water shortage.	1	2	2
Critically Overdrafted Groundwater Basin	**Threshold 0** = **Less than 25%** of system's wells are located within a critically overdrafted basin.	0	N/A	0
	Threshold 1 = **25% or greater** of system's wells are located within a critically overdrafted basin.	1	2	2
Source Capacity Violations	**Threshold 0 = 0** source capacity violations or service connection moratoriums within the past 3 years.	0	N/A	0
	Threshold 1 = 1 or more source capacity violation or service connection moratorium within the past 3 years.	1	3	3
Bottled or Hauled Water Reliance	**Threshold 0 = 0** occurrences of bottled or hauled water reliance within the past 3 years.	0	N/A	0
	Threshold 1 = 1 or more occurrences of bottled or hauled water reliance within the past 3 years.	Automatically At-Risk	N/A	Automatically At-Risk

Risk Indicator	Thresholds	Score	Weight	Max Score
Percent of Median Household Income (%MHI)	**Threshold 0** = **Less than 1.49%**	0	N/A	0
	Threshold 1 = **1.5% - 2.49%**	0.75	3	2.25
	Threshold 2 = **2.5% or greater**	1	3	3
Extreme Water Bill	**Threshold 0** = **Below 149.99%** of the statewide average.	0	N/A	0
	Threshold 1 = **150% - 199.99%** of the statewide average.	0.5	1	0.5
	Threshold 2 = **200% or greater** of the statewide average.	1	1	1
Percentage of Residential Arrearages	**Threshold 0** = **0% to 9%** residential arrearages.	0	N/A	0
	Threshold 1 = **10% to 29%** residential arrearages.	0.5	2	1
	Threshold 2 = **30% to 100%** residential arrearages**.**	1	2	2
Residential Arrearage Burden	**Threshold 0** = **Below top 40%** of systems with residential arrearage burden.	0	N/A	0
	Threshold 1 = **Top 40%** of systems with residential arrearage burden.	0.5	2	1
	Threshold 2 = **Top 20%** of systems with residential arrearage burden.	1	2	2

Risk Indicator	Thresholds	Score	Weight	Max Score
Operator Certification Violations	**Threshold 0** = **0** Operator Certification violations over the last three years.	0	N/A	0
	Threshold 1 = **1 or more** Operator Certification violations over the last three years.	1	3	3
Monitoring & Reporting Violations	**Threshold 0** = **1 or less** Monitoring & Reporting violations over the last three years.	0	N/A	0
	Threshold 1 = **2 or more** Monitoring & Reporting violations over the last three years.	1	2	2
Significant Deficiencies	**Threshold 0** = **0** Significant Deficiencies over the last three years.	0	N/A	0
	Threshold 1 = **1 or more** Significant Deficiencies over the last three years.	1	3	3
Operating Ratio	**Threshold 0** = **1 or greater**	0	N/A	0
	Threshold 1 = **Less than 1**	1	1	1
Total Annual Income	**Threshold 0** = **Greater than $0** total annual income.	0	N/A	0
	Threshold 1 = $0 total annual income.	0.5	1	0.5
	Threshold 2 = **Less than $0** total annual income.	1	1	1

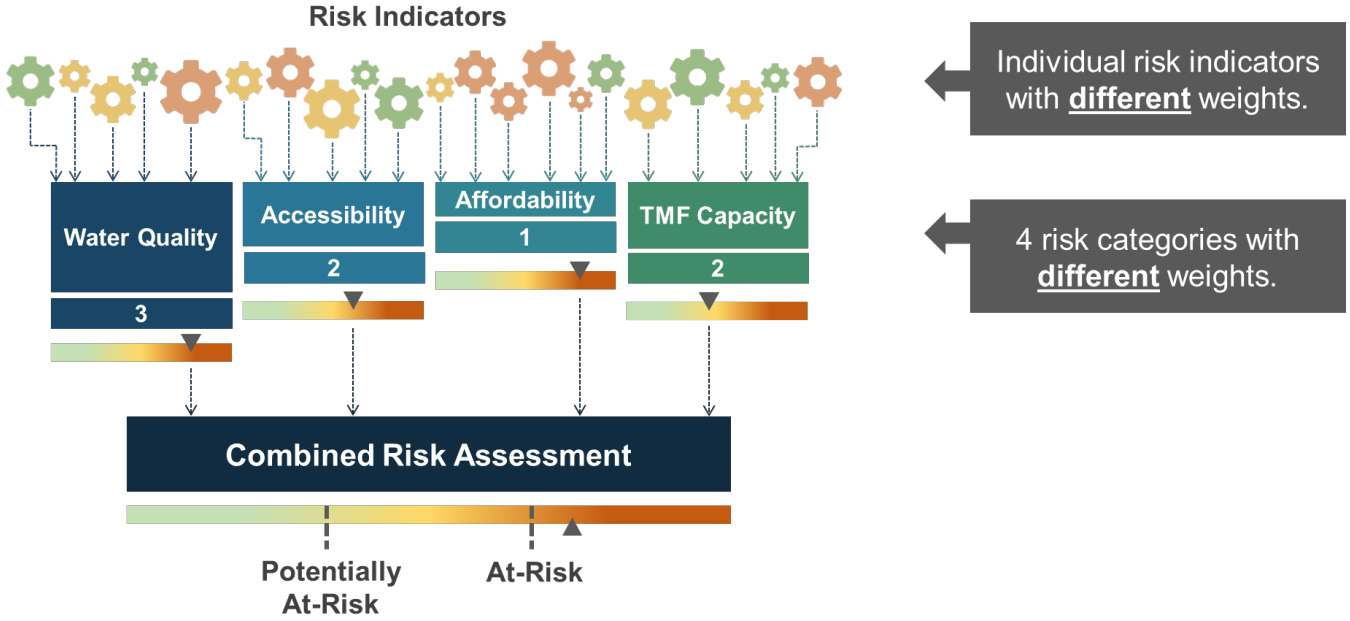
Risk Indicator	Thresholds	Score	Weight	Max Score
Days Cash on Hand	**Threshold 0** = **90 days or more** cash on hand.	0	N/A	0
	Threshold 1 = **30 days or greater** and **Less than 90 days** cash on hand.	0.5	1	0.5
	Threshold 2 = **Less than 30 days** cash on hand.	1	1	1

RISK INDICATOR CATEGORY WEIGHTS

Public feedback during the initial Risk Assessment methodology development workshops indicated that the Risk Assessment should include risk indicator category weights. An analysis of how the application of risk indicator category weights impacts the performance of Failing: HR2W list systems was shared with the public for feedback with white paper *Recommendations for Risk Assessment 2.0 Thresholds, Scores, & Weights for Public Water Systems* [146] and a December 14, 2021 webinar,[147] which ultimately supported the final inclusion category weights in the Risk Assessment.

Weights between 1 and 3 were applied to each risk indicator category, with a weight of 3 indicating the highest level of criticality (Figure A3). Risk indicator category weights were developed with the professional opinion of the broader research team contracted through UCLA during the development of the 2021 Risk Assessment, State Water Board staff, as well as an internal advisory group of District Engineers.

Figure A3: Aggregated Risk Assessment Methodology with Category Weights



[146] December 14, 2020 White Paper:
Recommendations for Risk Assessment 2.0 Thresholds, Scores, & Weights for Public Water Systems
https://www.waterboards.ca.gov/safer/docs/draft_white_paper.pdf

[147] December 14, 2020 Webinar Presentation
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/safer_risk_assessment_webinar_accessible.pdf

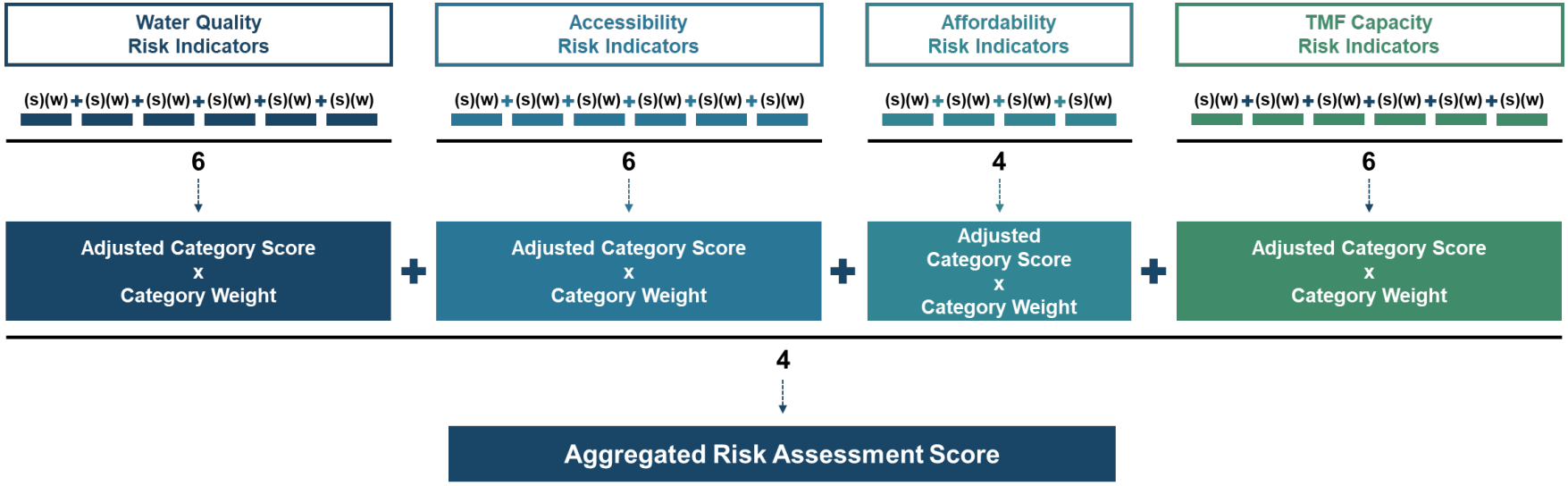
December 14, 2020 Webinar Recording
https://www.youtube.com/embed/6XDak8R5lDk?cc_load_policy=1&modestbranding=1&rel=0&autoplay=1

AGGREGATED RISK ASSESSMENT CALCULATION METHODOLOGY

The assessment of individual risk indicators within each category and for the aggregated risk assessment relies on: (1) the amount of risk scores or points each system accrues per indicator, (2) the number of indicators that system is assessed for in each category, and (3) the weights applied to individual risk indicators and categories. Figure A4 provides an illustration of the aggregated Risk Assessment calculation method.

The aggregated Risk Assessment methodology takes the standardized score, between 0 and 1, for each risk indicator and applies a criticality weight to each indicator, between 1 and 3. Then a criticality weight is also applied to each risk indicator category (*e.g.,* Water Quality, Accessibility, *etc.*), between 1 and 3. The final score is an average of the weighted category scores.

Figure A4: Illustration of the Risk Assessment Calculation Methodology with Risk Indicator Scores (s) and Risk Indicator and Categories Weights (w)



ADJUSTING FOR MISSING DATA

It is important that the Risk Assessment methodology adapt for where data may be missing for certain water systems, either because a system failed to report necessary data or because the system may not have data to report. For example, some water systems do not charge for water. Therefore, those systems do not have the necessary data (*i.e.,* customer charges) for two of the three risk indicators in the Affordability category.

Multiple different methods for handling missing data, including DWR and OEHHA's methods, as well as statistical imputation methods, were considered for the Risk Assessment.[148] [149] Ultimately, the strategy that was chosen for the Risk Assessment was to omit any value for a missing risk indicator and to instead re-distribute the weights/scores to risk indicators within the same category which did have valid values (Figure A5). In future versions of the Risk Assessment, however, systems with considerable missing data due to non-reporting of required data may be assessed negative points in a new indicator developed in the TMF Capacity category.

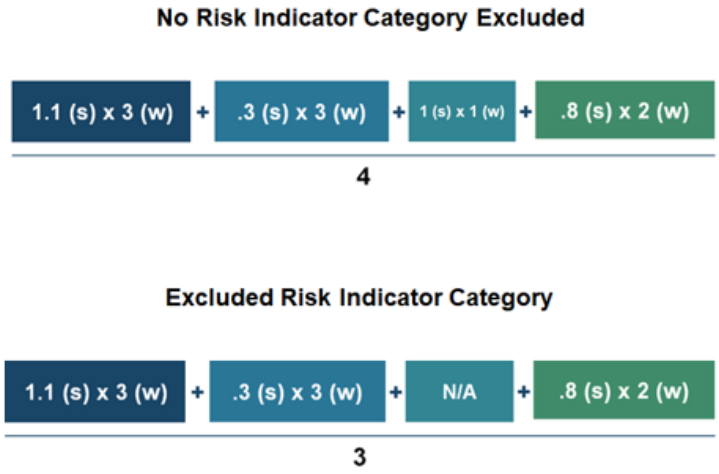
Figure A5: Example of How the Aggregated Risk Assessment Adjusts for Missing Risk Indicator Data

There were some cases where risk indicator data for a whole category, particularly the Affordability category, were missing. However, many of these systems were unconventional community water systems in the sense that they had a stable population base, but no ratepayer base (for example, schools, prisons, parks). These systems, where identifiable, were excluded from the Affordability category of the Risk Assessment altogether and given a risk score of 0 for this category. The Risk Assessment redistributes the weights/score of a missing risk indicator category to the other categories when an entire category is excluded from the assessment, as illustrated in Figure A6.

[148] For instance, see Rubin, D. B. (1976). Inference and missing data. Biometrika, 63(3), 581-592. doi:10.1093/biomet/63.3.581; Little, R. J. (1998). A Test of Missing Completely at Random for Multivariate Data with Missing Values. Journal of the American Statistical Association, 83(404), dec, 1198-1292. doi:10.2307/2290157; Rhoads, C. H. (2012). Problems with Tests of the Missingness Mechanism in Quantitative Policy Studies. Statistics, Politics, and Policy, 3(1). doi:10.1515/2151-7509.1012

[149] OECD (2008) Handbook on Constructing Composite Indicators: Methodology and User Guide https://www.oecd.org/sdd/42495745.pdf

Figure A6: How the Aggregated Risk Assessment Adjusts for a Missing Risk Indicator Category



AGGREGATED RISK ASSESSMENT THRESHOLDS

Due to the enhancements made to the selection of risk indicators included, better data coverage, and corrections made to data calculations, there was a statewide drop in total average risk scores from 0.82 in 2021 to 0.59 in 2022. The drop in total scores reflects the methodology and calculation changes, rather than water system performance improvements. The State Water Board adjusted the At-Risk and Potentially At-Risk thresholds to align with the drop in total risk scores. To do this, the State Water Board analyzed the results of the 2022 Risk Assessment and selected a new threshold that achieved the same predicative power of the 2021 Risk Assessment in identifying Failing: HR2W list water systems (77%).[150]

The 2022 Risk Assessment thresholds are 0.8 for At-Risk water systems and 0.6 for Potentially At-Risk water systems. Compared to the 2021 Risk Assessment results, the 2022 Assessment identifies fewer At-Risk water systems, but maintains the same predictive power of identifying Failing: HR2W list systems as the 2021 Assessment.

[150] The State Water Board used the unique water systems that were on the Failing: HR2W list in 2021 to conduct the predictive power analysis using the 2021 and 2022 Risk Assessment results.

Figure A7: Distribution of 2021 Total Risk Scores for Water Systems (n=2,779)

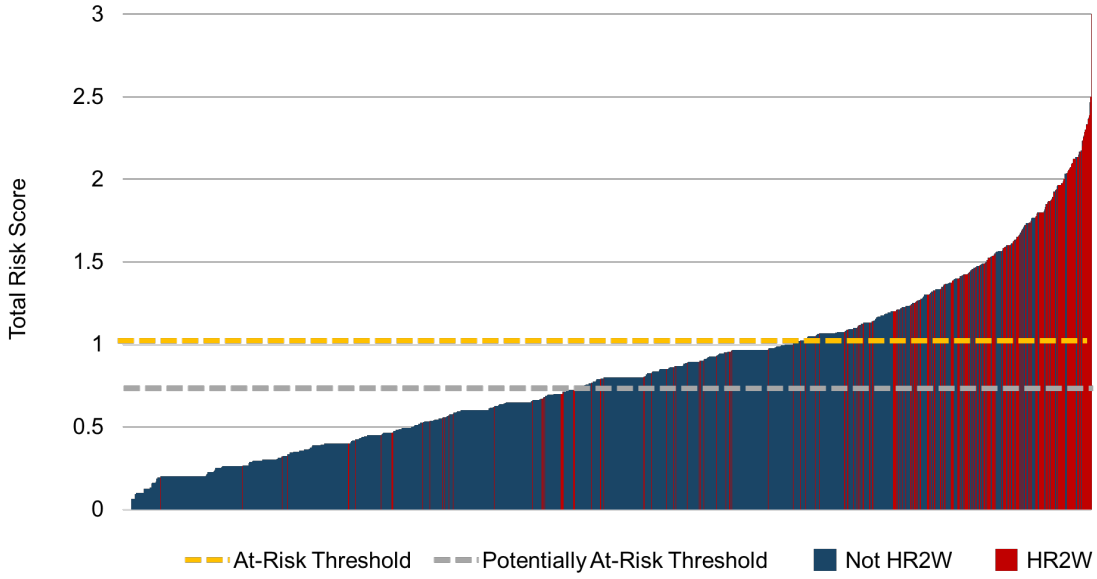
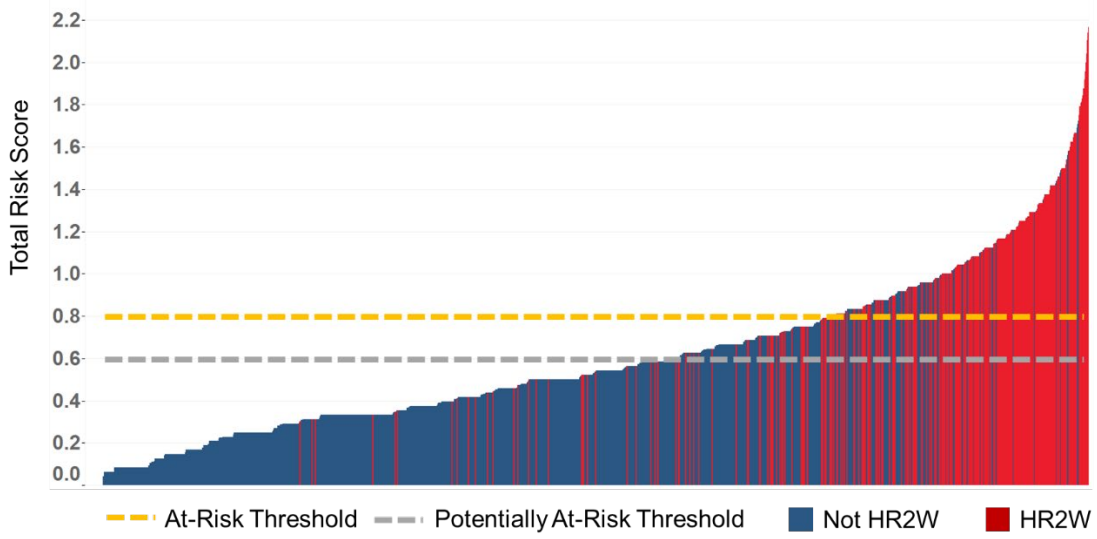


Figure A8: Distribution of 2022 Total Risk Scores for Water Systems (n=3,066)



RISK INDICATOR DETAILS

IDENTIFICATION OF WATER SYSTEMS ASSESSED

The State Water Board conducts the Risk Assessment for a specific inventory of drinking water systems determined annually. In 2021, the State Water Board conduced a Risk Assessment for K-12 schools and community water systems with 3,300 service connections or less. In 2022, the inventory of system included in the Assessment expanded to include systems with 30,000 service connections or less and less than 100,000 population served.

The following section summarizes the methodology employed to identify which water systems are included in the Risk Assessment using SDWIS data:

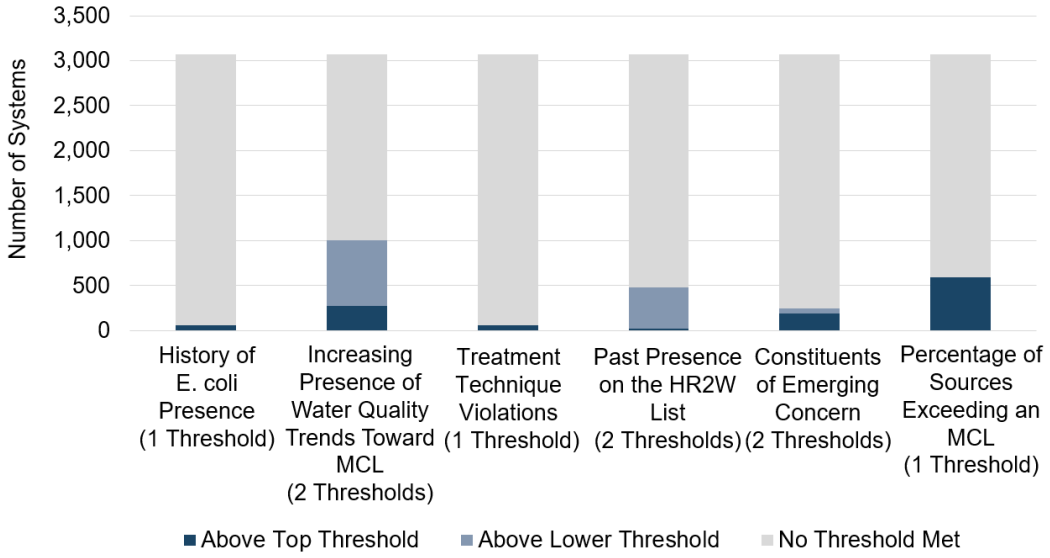
- Identify all active[151] water systems with a Federal Water System Type of "Community" and exclude systems with a primary service area of "Wholesaler." Does not exclude systems with multiple service areas and one of the non-primary service areas are designated as "Wholesaler." Some schools will be included in this category if they are designated as "Community" type.
- Identify all active water systems with a Federal Water System Type of "Non-Transient Non-Community" and with a primary service area of either "Daycare" or "School." Exclude schools that are not K-12 (i.e., colleges and pre-schools).
- Remove water systems that are larger than the determined service connection and population cutoffs for the Risk Assessment.

WATER QUALITY RISK INDICATORS

This section provides full details on each Water Quality risk indicator used in the Risk Assessment. Water Quality risk indicators measure current water quality and trends to identify compliance with regulatory requirements, as well as frequency of exposure to drinking water contaminants. Figure A9 illustrates the number of water systems that exceeded the risk indicator thresholds within the Water Quality category. The range of potential thresholds for each risk indicator are summarized in the respective risk indicator label and detailed below.

[151] "Active" means the water system was active at the time the data was pulled.

Figure A9: Number of Systems Exceeding Thresholds for Each Water Quality Risk Indicator



HISTORY OF E. COLI PRESENCE

The presence of *E. coli* in drinking water suggests that water supply may be contaminated with human or animal waste, and in turn, that other pathogens could be present. The presence of this contaminant could also suggest that water treatment is inadequate, interrupted, or intermittent. Water systems are required to conduct a Level 1 and/or a Level 2 Assessment if conditions indicate they might be vulnerable to bacteriological contamination.

A Level 1 Assessment is performed by a water system owner or operator when laboratory results indicate that bacteriological threats may exist, an assessment form must be filled and submitted to the state within 30 days. A Level 1 Assessment is triggered by any of the following conditions.[152]

- A public water system collecting fewer than 40 samples per month has two or more total coliform positive routine/repeat samples in the same month.
- A public water system collecting at least 40 samples per month has greater than 5.0 percent of the routine/repeat samples in the same month that are total coliform positive.
- A public water system fails to take every required repeat sample after any single total coliform positive sample.

A Level 2 Assessment is performed by the state or state-approved entity, but the water system is responsible for ensuring the completion of the assessment regardless of the entity

[152] Level 1 Assessment: A Quick Reference Guide
https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule

conducting it. Once Level 2 is triggered an assessment form must be completed and submitted to the state within 30 days. A Level 2 Assessment is triggered by the following conditions:[153]

- A water system incurs an *E. coli* MCL violation.
- A water system has a second Level 1 Assessment within a rolling 12-month period.

Water systems must fix any sanitary defects within a required timeframe.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- *E. coli* violations – Analyte Code 3014: Safe Drinking Water Information System (SDWIS).
  - Query systems that only have *E. coli* related treatment technique and/or MCL violations. See list of violation codes below:

Table A4: Identified Violation Types Related to *E. coli*

Violation Number	Violation Type	Description
01*	**MCL, Single Sample**	MCL violation based on a single sample, or an organic analyte that is 10X the MCL.
1A	**MCL, *E. coli*, Positive *E. coli* (RTCR)**	*E. coli* MCL violation based on a single sample.
02*	**MCL, Numeric Average of Samples Taken**	A violation for an inorganic, organic, or radiological constituent where compliance is based on a running annual average or more monitoring period average.
T1*	**State Violation – Treatment Technique**	A violation where the water system failed to treat water using the treatment process the state has primacy to regulate (*i.e.,* treatment failed per the system's permit).

*These violations were inadvertently used to record an *E. coli* violation and therefore are being shown in this Table. Violation Number 1A is the code that should be used to record these violations.

- Level 2 Assessments
  - Violation Type Code (2B): SDWIS.
  - Level 2 Assessment Activities Spreadsheet: Maintained by State Water Board's Program Liaison Unit (PLU).

[153] Level 2 Assessment: A Quick Reference Guide
https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100K9MP.txt

Risk Indicator Calculation Methodology:

- Determine which systems have had *E. coli* violations within the last three years with a SOX (State Compliance Achieved) Enforcement Action.
- Determine which systems have had a Level 2 Assessment over the last three years.

Threshold Determination
The State Water Board has adopted a threshold for *E. coli* violations for the expanded Failing: HR2W list criteria which relies on whether the water system has an open enforcement action for the violation.[154] For the Risk Assessment, a modified version of the expanded Failing: HR2W list criteria threshold was developed for the "History of *E. coli* Presence" risk indicator. Systems that have had an *E. coli* violation or Level 2 Assessment within the last three years are considered more at risk than systems that have not.

Correlational and regression analysis between the risk indicator as defined with this threshold and water system failure to deliver safe drinking water as defined in the Failing: HR2W list shows a statistically significant relationship.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "History of *E. Coli* Presence" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A5 summarizes the thresholds, scores, and weight for this risk indicator.

Table A5: "History of *E. coli* Presence" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**No** history of *E. coli* presence over the last three years.	0	N/A	0	None
1	**Yes**, history of *E. coli* presence (*E. coli* violation and/or Level 2 Assessment) over the last three years.	1	3	3	High

INCREASING PRESENCE OF WATER QUALITY TRENDS TOWARD MCL

This risk indicator identifies sources with an increasing presence of one or more regulated contaminants, especially those attributable to anthropogenic causes, that are detected at or greater than 80% of the MCL within the past nine years. Water systems with 25% of their sources or more experiencing upwards trends in contaminant concentrations are at-risk of

[154] Systems that meet the Failing: HR2W list criteria will not be included in the Risk Assessment.

exceeding regulatory water quality requirements and are therefore assigned risk points in the Risk Assessment.

Calculation Methodology

Important Note: *The State Water Board has adjusted the calculation of this risk indicator from the approach used in the 2021 Needs Assessment to account for the inclusion of medium-size water systems that have many sources.*

Required Risk Indicator Data Points & Sources:

- Dataset - SDWIS:
  - Data Point(s) - Water System Inventory
    - Active Source Water Facilities including[155]
      - Consecutive Connection (CC)
      - Infiltration Gallery (IG)
      - IN – Intake (IN)
      - Roof Catchment (RC)
      - Spring (SP)
      - WL Well (WL)
    - Active Water System Sampling Points for above Source Water Facilities[156]
  - Data point(s) - Water System Water Quality[157]
    - Water Quality Monitoring Sample Results and Dates for above sample points.
    - Water Quality Contaminants for Sample Results for above sample point.
    - List of eligible contaminants described below in Table A6, Table A7, and Table A8.

- Dataset – Water Quality Inquiry Replacement (WQIR):
  - Data point(s) for Contaminant Information:
    - Regulatory threshold information including:
      - Maximum Contaminant Levels (MCL)
      - Detection Limits for purposes of Reporting (DLR)
      - Notification Levels (NL)

Analyte names and codes for the contaminants of interest per contaminant category in SDWIS are listed in Table A6, Table A7, and Table A8.

[155] Source Water Facility Types not included in the list are excluded from analysis (ex. hauled water).

[156] Source Water Facility Types with no active sample points are excluded from analyses.

[157] Water Quality Data that is flagged as False Positive (FP), Invalid (IV), or Questionable (QQ) is excluded from the analysis. Water Quality Data that was also outside of the desired time frame is excluded.

Acute Contaminants[158] – Per the Tier 1 public notification rule[159]

Table A6: Acute Contaminants with a Primary MCL

Contaminant	SDWIS Analyte Code
Nitrate	1040
Nitrate-Nitrite	1038
Nitrite	1041
Perchlorate	1039
Chlorite	1009
Chlorine Dioxide	1008

Non-Acute Primary Contaminants

Table A7: Non-Acute Constituents that have a Primary MCL

Contaminant	SDWIS Analyte Code
Aluminum	1002
Antimony, Total	1074
Arsenic	1005
Asbestos	1094
Barium	1010
Beryllium	1075
Cadmium	1015
Chromium	1020
Cyanide	1024
Fluoride	1025
Mercury	1035
Nickel	1036
Selenium	1045
Thallium, Total	1085
Benzene	2990
Carbon Tetrachloride	2982
O-Dichlorobenzene	2968
P-Dichlorobenzene	2969
1,1-Dichloroethane	2978

[158] CCR section 64400. Acute Risk. "Acute risk" means the potential for a contaminant or disinfectant residual to cause acute health effects, *i.e.,* death, damage or illness, as a result of a single period of exposure of a duration measured in seconds, minutes, hours, or days.

[159] CCR section 64463.1. Tier 1 Public Notice

Contaminant	SDWIS Analyte Code
1,2-Dichloroethane	2980
1,1-Dichloroethylene	2977
cis-1,2-Dichloroethylene	2380
trans-1,2-Dichloroethylene	2979
Dichloromethane	2964
1,2-Dichloropropane	2983
1,3-Dichloropropene	2413
Ethylbenzene	2992
Methyl-tert-butyl ether	2251
Chlorobenzene	2989
Styrene	2996
1,1,2,2-Tetrachloroethane	2988
Tetrachloroethylene	2987
Toluene	2991
1,2,4-Trichlorobenzene	2378
1,1,1-Trichloroethane	2981
1,1,2-Trichloroethane	2985
Trichloroethylene	2984
Trichlorofluoromethane	2218
Vinyl Chloride	2976
Xylenes, Total	2955
Lasso (Alachlor)	2051
Atrazine	2050
Bentazon	2625
Benzo(a)pyrene	2306
Carbofuran	2046
Chlordane	2959
2,4-D	2105
Dalapon	2031
1,2-dibromo-3-chloropropane	2931
Di(2-ethylhexyl)adipate	2035
Di(2-ethylhexyl)phthalate	2039
Dinoseb	2041
Diquat	2032
Endothall	2033
Endrin	2005
Ethylene Dibromide	2946

Contaminant	SDWIS Analyte Code
Glyphosate	2034
Heptachlor	2065
Heptachlor Epoxide	2067
Hexachlorobenzene	2274
Hexachlorocyclopentadiene	2042
BHC-GAMMA	2010
Methoxychlor	2015
Molinate	2626
Oxamyl	2036
Pentachlorophenol	2326
Picloram	2040
Total Polychlorinated Biphenyls (PCB)	2383
Simazine	2037
Thiobencarb (Bolero)	2727
Toxaphene	2020
1,2,3-Trichloropropane	2414
2,3,7,8-TCDD	2063
2,4,5-TP	2110
Combined Radium (–228 & –226)	4010
Gross Alpha particle Activity	4109
Combined Uranium	4006
Gross Beta particle activity	4100
38-Strontium-90	4174
Tritium	4102

Secondary Contaminants

Table A8: Constituents that have a Secondary MCL*

Contaminant	SDWIS Analyte Code
Aluminum	1002
Color	1905
Copper, Free	1022
Foaming Agent (Surfactants)	2905
Iron	1028
Manganese	1032
Methyl tert-butyl ether (MTBE)	2251
Odor	1920

Contaminant	SDWIS Analyte Code
Silver	1050
Thiobencarb (Bolero)	2727
Turbidity	0100
Turbidity, Field	C254
Zinc	1095

*Total Dissolved Solids, Specific Conductance, Chloride, and Sulfate are excluded.

Prepare Primary and Secondary Data:

Compliance for non-acute contaminants are typically based on calculations of the Running Annual Average (RAA) because they are focused on long-term health risks over time. Therefore, to assess the risk for potential failure of a maximum contaminant for non-acute primary and secondary contaminants calculations of the RAAs are needed.

Below is how the Running Annual Average is calculated for the purposes for the Needs Assessment:

- Step 1 - Calculate RAA for each sample point:
  - Define a search period that eligible sample results dates must occur in.
  - Calculate all quarters between the start and end date of the search period.
    - Example:
      - Start Date: 1/1/2012 - End Date: 1/1/2021
      - Number of Years = 9 Years = 36 Quarters
        - 2012-Quarter 1, 2012-Quarter 2, 2012-Quarter 3, 2012-Quarter 4, 2013-Quarter 1, etc.
  - For every sample result date, determine what quarter it falls in and assign that a sample result value. If there are multiple sample result dates per quarter, then those sample results will be averaged so that only one sample result value per quarter exists.

- Step 2 - RAA Periods are calculated by averaging four consecutive quarters of data.
  - Example: (2012-Quarter 2 + 2012-Quarter 3 + 2012-Quarter4 + 2013-Quarter 1)/4
  - Some water systems do not always have four quarters of data in every RAA period. Therefore, the number of quarters used in each RAA calculation is based on the data available during that RAA period. For example, if only three quarters of data are available during a particular RAA period, then only those three quarters will be used to calculate the RAA.
    - Example: (2012-1 + MISSING + 2012-3 + 2012-4)/3

Threshold Determination
The increasing presence of water quality trends toward an MCL violation, as defined here or a similar measure, has not been assessed in other previous studies as related to water system failure or employed by other regulatory agencies or stakeholders as a threshold of concern.

The State Water Board's workgroup of district engineers determined the draft tiered thresholds for this risk indicator based on their experience working with water systems throughout the state. These draft thresholds were shared with the public through workshops and white papers in 2020 and ultimately incorporated into the Risk Assessment.

Risk Indicator Scoring & Weighting
As stated above, either RAAs or counts are calculated per each contaminant group and at each water system's sample point. Table A9 describes how each contaminant group is initially scored.

Table A9: "Increasing Presence of Water Quality Trends Toward MCL" Thresholds & Scores Per Source

Threshold Number	Threshold	Score per Active Source
0	**Less than 25%** of sources have increasing presence of water quality trends toward MCL.	0
1	**Secondary Contaminants**: 25% or greater of sources have 9-year average of running annual averages at or greater than 80% of MCL and the running annual average has increased by 20% or more.	0.25
2	**Primary Non-Acute Contaminants**: 25% or greater of sources have 9-year average of running annual averages at or greater than 80% of MCL and the running annual average has increased by 5% or more.	0.5
3	**Acute Contaminants**: 25% or greater of sources have: • 9-year average (no running annual average) is at or greater than 80% of MCL; or • most recent 24-month average is at or greater than 80% of MCL; or • Any one sample over the MCL.	1

After initial scoring, each contaminant group is checked to see if 25% or more of the water system's sources are impaired. If it is, then the score remains. If it is not, then the score for that RAA period or count is reset to zero. See acute contaminant example in Table A10:

Table A10: Example of Source Scoring

Contaminant Group	Source	Exceedance	Score	Impaired (Y/N)	Impaired Count
Acute	Well 01	9-year Average ≥ 80% MCL	1	Yes	1
Acute	Well 02	N/A	0	No	0
Acute	Well 03	N/A	0	No	0
Acute	Well 04	One sample over MCL	1	Yes	1

Contaminant Group	Source	Exceedance	Score	Impaired (Y/N)	Impaired Count
Acute	Well 05	24-month Average ≥ 80% MCL	1	Yes	1

In this example, the score for the Acute containment group would NOT be reset to zero. This occurs because of the following calculation:

- # of impaired Source Water Facilities = 3
- Total Number of Source Water Facilities = 5
- (3/5) * 100 = 60%
- 60% > 25% = Score remains

Water systems with less than 25% of their sources impaired per contaminant will have their assigned scores reset to 0. Sources will be assigned the maximum score per source if the source has multiple contaminates meeting the determined thresholds. See example in Table A11.

Table A11: Selection of Max Score Per Source

	Well 01	Well 02	Well 03	Well 04	Well 05	Well 06
Acute Risk Score	1.0	1.0	1.0	0	0	0
Non-Acute Risk Score	0.5	0.5	0.5	0.5	0	0
Secondary Risk Score	0	0	0.25	0.25	0.25	0
Max Score Per Source	1	1	1	0.5	0.25	0

After selecting the maximum score for each source, an average of al the non-zero risk scores will be calculated. See example below:

$$\frac{1+1+1+0.5+0.25}{5} = \mathbf{0.75}$$

Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's internal stakeholder group, the weight of 2 is applied to the "Increasing Presence of Water Quality Trends Toward MCL" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 2. Table A12 summarizes the total risk score ranges and weights applied to this risk indicator.

Table A12: "Increasing Presence of Water Quality Trends Toward MCL" Total Risk Scores & Weights

Total Score Range	Weight	Max Risk Score	Risk Level
0	0	0	None

Total Score Range	Weight	Max Risk Score	Risk Level
0 < n ≤ 0.5	2	1	Medium
0.5 < n ≤ 1	2	2	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Increasing Presence of Water Quality Trends Toward MCL: https://tabsoft.co/3DhDhrC

TREATMENT TECHNIQUE VIOLATIONS

According to U.S. EPA and State Water Board regulations, systems must carry out specified treatment when there is no reliable or feasible method to measure the concentration of a contaminant to determine if there is a public health concern. A treatment technique is an enforceable procedure or level of technological performance, which public water systems must follow to ensure control of a contaminant. The treatment technique rules also list the best available technology for meeting the standard, and the compliance technologies available for small systems. Some examples of treatment technique rules are the following:

- Surface Water Treatment Rule[160] (disinfection and filtration)
- Ground Water Rule[161]
- Lead and Copper Rule (optimized corrosion control)
- Acrylamide and Epichlorohydrin Rules (purity of treatment chemicals)

This type of violation (which is distinct from more commonly known MCL or monitoring and reporting violations) is incurred when a water system does not follow required treatment techniques to reduce the risk from contaminants, *e.g.,* exceeding the maximum allowable turbidity or flow rate of a surface water treatment plant.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Treatment Technique violations: SDWIS

[160] Title 22 CCR, Division. 4, Chapter 17 Surface Water Treatment
https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I501543B0D4BA11DE8879F88E8B0DAAAE&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

[161] Title 22 CCR, Division 4, Chapter 15, Article 3.5 Groundwater Rule
https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I729BEDE0B98711E0B493EB23F8012672&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

Table A13: Treatment Technique Violation Codes

Violation Type Code	SDWIS Violation Name
07	Treatment Techniques (Other)
12	Qualified Operator Failure
33	Failure to Submit Treatment Requirement Report
37	Treatment Tech. No Prior State Approval
40	Treatment Technique (FBRR)
41	Failure to Maintain Microbial Treatment
42	Failure to Provide Treatment
43	Single Turbidity Exceed (Enhanced SWTR)
44	Monthly Turbidity Exceed (Enhanced SWTR)
45	Failure to Address a Deficiency
46	Treatment Technique Precursor Removal
47	Treatment Technique Uncovered Reservoir
48	Failure to Address Contamination
57	OCCT/SOWT Recommendation
58	OCCT/SOWT Install Demonstration
59	WQP Level Non-Compliance
63	MPL Level Non-Compliance
64	Lead Service Line Replacement (LSLR)
65	Public Education
2A	Level 1 Assessment Treatment Technique
2B	Level 2 Assessment Treatment Technique
2C	Corrective Actions/Expedited Actions TT
2D	Start-up Procedures Treatment Technique
T1	State Violation-Treatment Technique

Risk Indicator Calculation Methodology:

- Determine which systems have had one or more Treatment Technique violations within the last three years using the Treatment Technique violation codes listed in Table A13 and excluding the following scenarios below:
  - Systems with an open Enforcement Action are excluded from the Risk Assessment because they meet the criteria for the expanded Failing: HR2W list.
  - Systems that have had three or more Treatment Technique violations within the last three years are also excluded from the Risk Assessment because they meet the criteria for the Failing: HR2W list.

Threshold Determination
The State Water Board has developed a threshold for Treatment Technique violations (in lieu

of an MCL) for the expanded Failing: HR2W list criteria that relies on: (1) whether the water system has an open enforcement action for the violation or (2) the system has had three or more Treatment Technique violations in the past three years.[162] For the Risk Assessment, a modified version of the expanded Failing: HR2W list criteria threshold was developed for the "Treatment Technique Violations" risk indicator. Systems that have one or more treatment technique violations within the last three years are considered more at risk than systems that have not.

Correlational and regression analysis between the risk indicator as defined with this threshold and water system failure to deliver safe drinking water as defined in the Failing: HR2W list shows a statistically significant relationship.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 1 is applied to the "Treatment Technique Violations" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 1. Table A14 summarizes the thresholds, scores, and weight for this risk indicator.

Table A14: "Treatment Technique Violations" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0** Treatment Technique violation over the last three years.	0	N/A	0	None
1	**1 or more** Treatment Technique violations over the last three years.	1	1	1	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Treatment Technique Violations: https://tabsoft.co/3NwYgLx

PAST PRESENCE ON THE FAILING: HR2W LIST

This indicator reflects past presence on the Failing: HR2W list within the last three years. The expanded Failing: HR2W list includes systems that have an open enforcement action for a

[162] Systems that meet the HR2W list criteria will not be included in the Risk Assessment.

primary MCL violation, secondary MCL violation, *E. coli* violation, monitoring and reporting violation (15 months or more), a current treatment technique violation, and/or systems that have had three of more treatment technique violations in the past 3 years. A system is removed from the Failing: HR2W list after they have come back into compliance and a return to compliance enforcement action has been issued and/or the system has less than three treatment technique violations or monitoring and reporting violations over the last three years.

Calculation Methodology
Required Risk Indicator Data Point & Source:

- Violation Data: SDWIS
- Enforcement Action Data: SDWIS

Refer to State Water Board's Failing: HR2W website[163] for detailed criteria and methodology for the HR2W list.

> ***Important Note***: In 2021, the State Water Board corrected to the historical Failing: HR2W list using a new and improved query methodology to analyze historical violation and enforcement data to better identify Failing: HR2W list occurrence start and end dates.

Threshold Determination
In 2020, data on Past Presence of the Failing: HR2W list was available for all 2,850 water systems. 2,393 water systems (82%) had zero Failing: HR2W list occurrences over the past three years. There are 457 (16%) water systems with one or more occurrence in the past three years. Of these systems the minimum occurrence was once, the maximum was 3. Peer-reviewed studies suggest that past presence of drinking water quality violations is associated with subsequent present-day violations.[164] Therefore, tiered thresholds were developed, where more occurrences on the Failing: HR2W list is associated with greater risk.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 2 is applied to the "Past Presence on the Failing: HR2W List" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 2. Table A15 summarizes the thresholds, scores, and weight for this risk indicator.

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[163] Human Right to Water | California State Water Resources Control Board
https://www.waterboards.ca.gov/water_issues/programs/hr2w/

[164] See McDonald, Yolanda J., and Nicole E. Jones. "Drinking water violations and environmental justice in the United States, 2011–2015." *American journal of public health* 108.10 (2018): 1401-1407.

Table A15: "Past Presence on the Failing: HR2W List" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score	Risk Level
0	**0** Failing: HR2W list occurrence over the last three years.	0	N/A	0	None
1	**1** Failing: HR2W list occurrence over the last three years.	0.5	2	1	Medium
2	**2** or more Failing: HR2W list occurrences over the last three years.	1	2	2	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Past Presence on the Failing: HR2W List: https://tabsoft.co/3IGSLGJ

PERCENTAGE OF SOURCES EXCEEDING AN MCL

Percentage of sources that exceed any primary drinking water MCL within the past three years. Water systems with impaired water sources make it more difficult to provide safe drinking water, particularly in the event of a drought or treatment failure.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Dataset - SDWIS:
  - Data Point(s) - Water System Inventory
    - Active Source Water Facilities including[165]
      - Consecutive Connection (CC)
      - Infiltration Gallery (IG)
      - IN – Intake (IN)
      - Roof Catchment (RC)
      - Spring (SP)
      - WL Well (WL)
    - Active Water System Sampling Points for above Source Water Facilities[166]

[165] Source Water Facility Types not included in the list is excluded from analysis (ex. hauled water).

[166] Source Water Facility types with no active sample points is excluded from analyses.

- Data point(s) - Water System Water Quality[167]
  - Water Quality Monitoring Sample Results and Dates for above sample points.
  - Water Quality Contaminants for Sample Results for above sample point.
    - List of eligible contaminants described below in Table A16.

- Dataset – Water Quality Inquiry Replacement (WQIR):
  - Data point(s) for Contaminant Information:
    - Regulatory threshold information including:
      - Maximum Contaminant Levels (MCL)
      - Detection Limits for purposes of Reporting (DLR)
      - Notification Levels (NL)

Table A16: Analytes in WQIr Chemical Table

Analyte Name	SDWIS Analyte Code
1,1,1-Trichloroethane	2981
1,1,2,2-Tetrachloroethane	2988
Trichlorofluoromethane	2218
1,1,2-Trichloroethane	2985
1,1-Dichloroethane	2978
1,1-Dichloroethylene	2977
1,2,3-Trichloropropane	2414
1,2,4-Trichlorobenzene	2378
O-Dichlorobenzene	2968
1,2-Dichloroethane	2980
1,2-Dichloropropane	2983
1,3-Dichloropropene	2413
P-Dichlorobenzene	2969
2,3,7,8-TCDD	2063
2,4,5-TP	2110
2,4-D	2105
Lasso (Alachlor)	2051
Aluminum	1002
Antimony, Total	1074
Arsenic	1005
Asbestos	1094
Atrazine	2050
Barium	1010
Bentazon	2625
Benzene	2990

[167] Water Quality Data that is flagged as False Positive (FP), Invalid (IV), or Questionable (QQ) is excluded from the analysis. Water Quality Data that was also outside of the desired time frame is excluded.

Analyte Name	SDWIS Analyte Code
Benzo(a)pyrene	2306
Beryllium, Total	1075
Bromate	1011
Cadmium	1015
Carbofuran	2046
Carbon Tetrachloride	2982
Chlordane	2959
Chlorite	1009
Chromium (Total)	1020
CIS-1,2-Dichloroethylene	2380
CIS-1,3-Dichloropropene	2228
Combined Radium (-226 & -228)	4010
Cyanide	1024
Dalapon	2031
Di(2-Ethylhexyl)Phthalate	2039
1,2-Dibromo-3-Chloropropane	2931
Dichloromethane	2964
Dinoseb	2041
Diquat	2032
Endothall	2033
Endrin	2005
Ethylbenzene	2992
Ethylene Dibromide	2946
Fluoride	1025
Glyphosate	2034
Gross Alpha Particle Activity	4109
Gross Beta Particle Activity	4100
Total Haloacetic Acids (HAA5)	2456
Heptachlor	2065
Heptachlor Epoxide	2067
Hexachlororobenzene	2274
Hexachlorocyclopentadiene	2042
BHC-Gamma	2010
Manganese, Dissolved	1034
Mercury	1035
Methoxychlor	2015
Methyl-tert-butyl ether	2251
Molinate	2626
Chlorobenzene	2989
Nickel	1036
Nitrate	1040
Nitrate-Nitrite	1038
Nitrite	1041

Analyte Name	SDWIS Analyte Code
Oxamyl	2036
Pentachlorophenol	2326
Perchlorate	1039
Picloram	2040
Total Polychlorinated Biphenyls (PCB)	2383
Selenium	1045
Simazine	2037
38-Strontium-90	4174
Styrene	2996
Tetrachloroethylene	2987
Thallium, Total	1085
Thiobencarb (Bolero)	2727
Toluene	2991
Trihalomethanes (TTHM)	2950
Toxaphene	2020
Trans-1,2-Dichloroethylene	2979
Trans-1,3-Dicholropropene	2224
Tricholoroethylene	2984
Trichlorofluoromethane	2218
Tritium	4102
Combined Uranium	4006
Vinyl Chloride	2976
Xylenes, Total	2955

Risk Indicator Calculation Methodology:

- Determine the number of impaired sources. Impaired sources with any sample results above their perspective MCL for the chemicals listed above.
- Determine the total number of sources. Based on the source types listed above.
- Calculate the percentage of impaired sources by dividing the total number of sources with MCL exceedances by the total number of sources and then multiply that number by 100.

Threshold Determination

The percentage of sources exceeding an MCL, as defined here or a similar measure, has not been assessed in other previous studies as related to water system failure or employed by other regulatory agencies or stakeholders as a threshold of concern. However, this lack of precedent likely reflects that this indicator threshold is hard to obtain and analyze without significant expertise and experience with source water quality data and data processing capability. The State Water Board's workgroup of district engineers determined the draft tiered

thresholds for this risk indicator based on their experience working with water systems throughout the state. These draft thresholds were shared with the public in 2020 and ultimately incorporated into the Risk Assessment.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "Percentage of Sources Exceeding MCL" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A17 summarizes the thresholds, scores, and weight for this risk indicator.

Table A17: "Percentage of Sources Exceeding MCL" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**less than 50%** of sources exceed an MCL.	0	N/A	0	None
1	**50% or greater** of sources exceed an MCL.	1	3	3	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Percentage of Sources Exceeding MCL: https://tabsoft.co/3DgkcWJ

CONSTITUENTS OF EMERGING CONCERN

Constituents of emerging concern (CEC) are unregulated chemicals[168] that are potentially imposing adverse health effects and are likely present (i.e., known or anticipated to occur) at public water systems or in groundwater sources. The purpose of this risk indicator is to identify water systems that could potentially come out of compliance if certain constituents of emerging concern (CECs) were to be regulated by a primary and/or secondary maximum contaminant level (MCL).

While there are many CECs, the State Water Board is proposing a limited list of CECs for inclusion in the calculation of this risk indicator based on the likelihood that an MCL will be developed. This risk indicator would only assess water systems that have water quality sample results associated with hexavalent chromium (CrVI), 1,4-dioxane, and/or the 18 chemicals

[168] Chemicals that are not regulated by the National/State Primary & Secondary Drinking Water Regulations.

pertaining to per- and polyfluoroalkyl substances (PFAS) chemical group. The selection of these chemicals was influenced by monitoring data coverage and current regulatory priorities. More chemicals may be included in future iterations of the Risk Assessment.

Hexavalent chromium (CrVI): Chromium is a heavy metal that occurs throughout the environment. The Trivalent form is a required nutrient and has very low toxicity. The hexavalent form, also commonly known as Chromium-6, is more toxic and has been known to cause cancer when inhaled. In recent scientific studies in laboratory animals, CrVI has also been linked to cancer when ingested. Much of the low level CrVI found in drinking water is naturally occurring, reflecting its presence in geological formations throughout the state. However, there are areas of contamination in California from historic industrial use, such as the manufacturing of textile dyes, wood preservation, leather tanning, and anti-corrosion coatings, where CrVI contaminated waste has migrated into the underlying groundwater.

1,4-Dioxane: 1,4-dioxane has been used as a solvent and stabilizer for other solvents in a number of industrial and commercial applications. In 1988, 1,4-dioxane was added to the list of chemicals known to the state to cause cancer[169] and is also considered to pose a cancer risk by U.S. EPA. Over the past decade, 1,4-dioxane has been found in a number of wells, mostly in southern California. The drinking water notification level for 1,4-dioxane is 1 microgram per liter (µg/L). More information can be found at the State Water Board webpage.[170]

Per- and polyfluoroalkyl substances (PFAS): PFAS are a large group of synthetic fluorinated chemicals widely used in industrial processes and consumer products. These synthetic compounds are very persistent in the environment. People are exposed to these compounds through food, food packaging, textiles, electronics, personal hygiene products, consumer products, air, soils, and drinking water. PFAS contamination is typically localized and associated with an industrial facility that manufactured these chemicals or an airfield at which they were used. Studies indicate that continued exposure to low levels of PFAS may result in adverse health effects.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Dataset - SDWIS:
  - Data Point(s) - Water System Inventory
    - Active Source Water Facilities Including[171]
      - Consecutive Connection (CC)
      - Infiltration Gallery (IG)
      - IN – Intake (IN)
      - Roof Catchment (RC)

[169] Office of Environmental Health Hazard Assessment - Proposition 65 (California Code of Regulations, Title 27, § 27001): https://oehha.ca.gov/proposition-65

[170] California State Water Resources Control Board - 1,4-Dioxane https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/14-Dioxane.html

[171] Source Water Facility Types not included in the list are excluded from analysis (e.g., hauled water).

        - Spring (SP)
        - WL Well (WL)
    - Active Water System Sampling Points for above Source Water Facilities[172]
  - Data Point(s) - Water System Water Quality[173]
    - Water Quality Monitoring Sample Results and Dates for above sample points.
    - Water Quality Contaminants for Sample Results for above sample point.
    - List of eligible contaminants described below in Table A18.

- Dataset – Water Quality Inquiry Replacement (WQIR):
  - Data point(s) for Contaminant Information:
    - Regulatory thresholds information including:
      - Maximum Contaminant Levels (MCL)
      - Detection Limits for purposes of Reporting (DLR)
      - Notification Levels (NL)

Analyte names and codes for the contaminants of interest in SDWIS are listed in Table A18.

Table A18: Analyte Names and Codes for CrVI, 1,4-Dioxane & PFAS

Analyte Name	SDWIS Analyte Code
Hexavalent Chromium (CrVI)	1080
1,4-Dioxane	2049
Per- and polyfluoroalkyl substances (PFAS)	
Perfluorobutanesulfonic Acid (PFBS)	2801
Perfluoroheptanoic Acid (PFHpA)	2802
Perfluorohexane Sulfonic Acid (PFHxS)	2803
Perfluorononanoic Acid (PFNA)	2804
Perfluoroctane Sulfonic Acid (PFOS)	2805
Perfluoroctanoic Acid (PFOA)	2806
Perfluorodecanoic Acid (PFDA)	2807
Perfluorododecanoic Acid (PFDoA)	2808
Perfluorohexanoic Acid (PFHxA)	2809
Perfluorotetradecanoic Acid (PFTA)	2810
Perfluorotridecanoic Acid (PFTrDA)	2811
Perfluoroundecanoic Acid (PFUnA)	2812
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	2813

[172] Source Water Facility Types with no active sample points are excluded from analyses.

[173] Water Quality Data that is flagged as False Positive (FP), Invalid (IV), or Questionable (QQ) is excluded from the analysis. Water Quality Data that was also outside of the desired time frame is excluded.

Analyte Name	SDWIS Analyte Code
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	2814
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	2815
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	2816
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2817
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2818

Risk Indicator Calculation Methodology:

Compliance for non-acute contaminants are typically based on calculations of the Running Annual Average (RAA) because they are focused on long-term health risks over time. Therefore, to assess risk for potential failure of a maximum contaminant for non-acute primary and secondary contaminants RAAs are needed.

Below is how the Running Annual Average is calculated for the purposes for the Needs Assessment:

Prepare CrVI Data:

- Step 1 - Calculate RAA for each sample point:
  - Define a search period that eligible sample results dates must occur in.
  - Calculate all quarters between the start and end date of the search period.
    - Example:
      - Start Date: 1/1/2012 - End Date: 1/1/2021
      - Number of Years = 9 Years = 36 Quarters
        - 2012-Quarter 1, 2012-Quarter 2, 2012-Quarter 3, 2012-Quarter 4, 2013-Quarter 1, etc.
  - For every sample result date, determine what quarter it falls in and assign that sample result value. If there are multiple sample result dates per quarter, then those sample results will be averaged so that only one sample result value per quarter exists.

- Step 2 - RAA Periods are calculated by averaging four consecutive quarters of data.
  - Example:(2012-Quarter 2 + 2012-Quarter 3 + 2012-Quarter4 + 2013-Quarter 1)/4
  - Some water systems do not always have four quarters of data in every RAA period. Therefore, the number of quarters used in each RAA calculation is based on the data available during that RAA period. For example, if only three quarters of data are available during a particular RAA period, then only those three quarters will be used to calculate the RAA.
    - Example: (2012-1 + MISSING + 2012-3 + 2012-4)/3

Prepare PFAS Data:

- Define a search period that eligible sample results dates must occur in.
- Count the number of positive sample results (greater than detection limit) per PFAS chemical results during the search period for each water system.
- Count sample results above the Notification Level (NL) for chemicals that have an NL during the search period for each water system.
- Count the total number of positive sample results (greater than detection limit) over the search period for each water.

Table A19: PFAS Notification Levels

Analyte Name	Notification Level (NL)
PFOS	0.0065 µg/L
PFOA	0.0051 µg/L
PFBS	0.5 µg/L

Prepare 1,4-Dioxane Data:

- Step 1 - Calculate RAA for each sample point:
  - Define a search period that eligible sample results dates must occur in.
  - Calculate all quarters between the start and end date of the search period.
    - Example:
      - Start Date: 1/1/2012 - End Date: 1/1/2021
      - Number of Years = 9 Years = 36 Quarters
        - 2012-Quarter 1, 2012-Quarter 2, 2012-Quarter 3, 2012-Quarter 4, 2013-Quarter 1, etc.
  - For every sample result date, determine what quarter it falls in and assign that sample result value. If there are multiple sample result dates per quarter, then those sample results will be averaged so that only one sample result value per quarter exists.

- Step 2 - RAA Periods are calculated by averaging four consecutive quarters of data.
  - Example:(2012-Quarter 2 + 2012-Quarter 3 + 2012-Quarter4 + 2013-Quarter 1)/4
  - Some water systems do not always have four quarters of data in every RAA period. Therefore, the number of quarters used in each RAA calculation is based on the data available during that RAA period. For example, if only three quarters of data are available during a particular RAA period, then only those three quarters will be used to calculate the RAA.
    - Example: (2012-1 + MISSING + 2012-3 + 2012-4)/3

Threshold Determination

CrVI: On July 1, 2014, an MCL of 10 µg/L CrVI was approved by the Office of Administrative Law. On May 31, 2017, the Superior Court of Sacramento County issued

a judgment invalidating the MCL on the basis that the state had not properly considered the economic feasibility of complying with the MCL. The State Water Board is currently working on the development of a new MCL for CrVI.[174] Until a new MCL is developed, the State Water Board is recommending using the previous MCL as part of a tiered threshold for this risk indicator. Water systems with one or more RAA over a 5-year period are at or above 80% of the former MCL are considered medium risk and any RAA over a 5-year at or above the former MCL is considered high risk.

PFAS: Due to the ubiquitous nature of these contaminants, two positive samples are suggested as part of the tiered threshold to ensure that the water quality sample was not compromised. Since the risk related to each of the PFAS chemicals is not fully known, water quality is noted as a medium risk for any two positive samples of any PFAS contaminant. Three of the 18 PFAS chemicals have a notification level.[175] When two or more samples for these three PFAS chemicals are at or above their notification levels, they are considered to be at high risk for this indicator threshold.

1,4-Dioxane: The State Water Board is recommending a binary threshold for 1,4-Dioxane. The drinking water notification level for 1,4-dioxane is 1 microgram per liter (µg/L).[176] In January 2019, the State Water Board requested for the Office of Environmental Health Hazard Assessment (OEHHA) to establish a public health goal for 1,4-dioxane.[177] When one or more samples are detected at or above their notification level, they are considered to be at high risk for this indicator threshold.

Risk Indicator Scoring & Weighting

As stated above, either RAAs or counts are calculated per each contaminant group and at each water system's sample point. The below table describes how each contaminant group is initially scored.

Table A20: "Constituents of Emerging Concern" Thresholds & Scores per Source

Threshold Number	Threshold	Score per Active Source
0	**CrVI: All** calculated RAA(s), over 5-year period, are below 80% of the former MCL (RAA < 8 µg/L); and	0

[174] Hexavalent Chromium Drinking Water MCL
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.html

[175] The State Water Board recognizes that more work is being done in this area and that the presence of any PFAS in drinking water may pose a public health risk. Notification levels are nonregulatory, health-based advisory levels established for contaminants in drinking water for which MCL have not been established. A notification level may be considered a candidate for the establishment of an MCL in the future, but it has not completed going through the regulatory standard setting process.

[176] 1,4-Dioxane
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/14-Dioxane.html

[177] Public Health Goals (PHGs) - OEHHA
https://oehha.ca.gov/water/public-health-goals-phgs

Threshold Number	Threshold	Score per Active Source
	PFAS: Less than 2 samples, over 5-year period, are positive; and **1,4-Dioxane: 0** calculated RAA(s), over 5-year period, are at or above the notification level.	
1	**CrVI: 1 or more** calculated RAA(s) over 5-year period are at or above 80% of the former MCL and below the former MCL (8 µg/L ≤ RAA < 10 µg/L); or **PFAS: 2 or more** samples over 5-year period are positive; this criterion applies to all 18 chemicals.	0.5
2	**CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above the former MCL (10 µg/L ≤ RAA); or **PFAS: 2 or more** samples, over 5-year period, are at or above the notification level; this criterion only applies to 3 chemicals that have notification level; or **1,4-Dioxane: 1 or more** calculated RAA(s), over 5-year period, are at or above the notification level (1 µg/L ≤ RAA).	1

After initial scoring, each contaminant group is checked to see if 25% or more of the water system's sources are impaired. If it is, then the score remains. If it is not, then the score for that RAA period or count is reset to zero. See CrVI example in Table A21:

Table A21: Example of Source Scoring

RAA Period	Source	Contaminant	Score	Impaired (Y/N)	Impaired Count
2012-1 -- 2012-4	Well 01	CrVI	0.0	No	0
2012-1 -- 2012-4	Well 02	CrVI	1.0	Yes	1
2012-1 -- 2012-4	Well 03	CrVI	0.0	No	0
2012-1 -- 2012-4	Well 04	CrVI	0.0	No	0
2012-1 -- 2012-4	Well 05	CrVI	0.0	No	0

In this example, the score for the CrVI contaminant group would be reset to zero. This occurs because of the following calculation:

- # of impaired Source Water Facilities = 1
- Total Number of Source Water Facilities = 5
- (1/5) * 100 = 20%
- 20% < 25% = Score is reset to 0

Water systems with 25% or more of their sources impaired per contaminant will be assigned their initial scores. Sources will be assigned the maximum score per source if the source has multiple contaminants meeting the determined thresholds. See example below.

Table A22: Selection of Max Score Per Source

	Well 01	Well 02	Well 03	Well 04	Well 05	Well 06
CrVI Risk Score	0.5	1	0.5	0	0	0
PFAS Risk Score	0.5	0.5	1	0.5	0	0
1,4-Dioxane Risk Score	1	1	1	0	0	0
Max Score Per source	1	1	1	0.5	0	0

After selecting the maximum score for each source, an average of al the non-zero risk scores will be calculated. See example below:

$$\frac{1+1+1+0.5}{4} = \mathbf{0.875}$$

Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "Constituents of Emerging Concern" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 3. Table A23 summarizes the total risk score ranges and weights applied to this risk indicator.

Table A23: "Constituents of Emerging Concern" Total Risk Scores & Weights

Total Score Range	Weight	Max Risk Score	Risk Level
0	0	0	None
0 < n ≤ 0.5	3	1.5	Medium
0.5 < n ≤ 1	3	3	High

Explore Water System Risk Indicator Performance

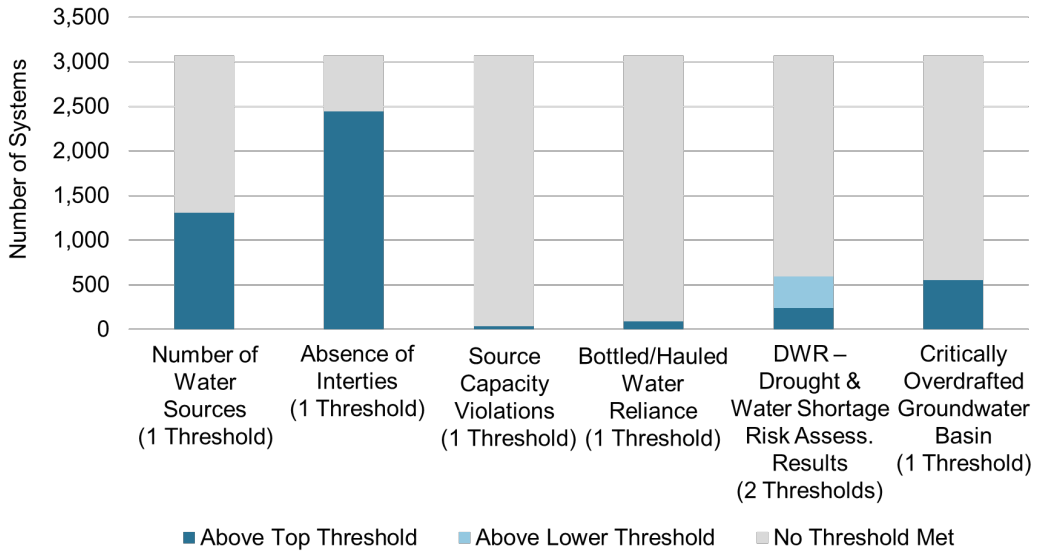
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Constituents of Emerging Concern: https://tabsoft.co/3ItssDK

ACCESSIBILITY RISK INDICATORS

This section provides full details on each Accessibility risk indicator used in the Risk Assessment. Accessibility risk indicators measure a system's ability to deliver safe, sufficient, and continuous drinking water to meet public health needs. Figure A10 illustrates the number of water systems that exceeded the risk indicator thresholds within the Accessibility category. The range of potential thresholds for each risk indicator are summarized in the respective risk indicator label and detailed below.

Figure A10: Number of Systems Exceeding Thresholds for Each Accessibility Risk Indicator



NUMBER OF SOURCES

Total number of available water sources including surface water, wells, and imported/purchased water.

Calculation Methodology
Required Risk Indicator Data Point & Source:

- Water Source Facility Type: SDWIS
    a. CC – Consecutive Connection
    b. IG – Infiltration Gallery
    c. IN – Intake
    d. RC – Roof Catchment
    e. SP – Spring
    f. WL – Well
    g. ST – Storage Tank

Risk Indicator Calculation Methodology:

- Prepare data
    a. Combine two SDWIS tables (the Water System table and Water System Facility table).
        i. Apply filters to prepared data and get counts of the total number of Water System Facilities for each Water System.
            - Filters applied
                a. Active Water Systems Only
                b. Active Water System Facilities Only
                c. Water System Facilities with a facility type of CC, IG, IN, RC, SP, and WL

Threshold Determination
The threshold developed for the number of sources risk indicator mostly aligns with the thresholds used by DWR's Drought & Water Shortage Risk Assessment. Peer-reviewed studies also suggest that single source reliance is associated with water system failure.[178] Moreover, Section 64554(c) of the California Code of Regulations (CCR) requires new community water systems using only groundwater sources to have a minimum of two approved sources capable to meet the maximum day demand of the water system.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "Number of Sources" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A24 summarizes the thresholds, scores, and weight for this risk indicator.

Table A24: "Number of Sources" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
X	**0** source (automatically At-Risk).	N/A	N/A	N/A	Very High
0	**2 or more** sources.	0	N/A	0	None
1	**1** source.	1	3	3	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using

[178] See Mullin, M. (2020). The effects of drinking water service fragmentation on drought-related water security. *Science, 368*(6488), 274-277.

the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Number of Sources: https://tabsoft.co/3iFgoF3

ABSENCE OF INTERTIES

An intertie or interconnection is a connection between one or more water systems where systems can either supply or receive water from each other. Presence of interties is assumed to reduce the risk of a water outage by allowing water systems to switch sources and even governance structure support, if needed.

Calculation Methodology

Important Note: *The State Water Board has adjusted the calculation of this risk indicator from the approach used in the 2021 Needs Assessment to account for the inclusion of medium-size water systems that have many sources.*

Required Risk Indicator Data Points & Source:

In SDWIS, this type of data is stored as a water system facility with a consecutive connection designation. Additionally, these types of water system facilities can be described in terms of their availability of use. According to internal SDWIS procedure documents, only the receiving facility should have a consecutive connection (CC) water system facility represented in SDWIS. The procedure document does not indicate whether emergency or seasonal CCs should be entered. The purpose of this metric is to capture the number of interties per water system entered in SDWIS, regardless of availability.

- Water source facility type and availability: SDWIS
    a. CC – Consecutive Connection
        i. Availability:
            - I – Interim
            - E – Emergency
            - O – Other
            - P – Permanent
            - S – Seasonal

Risk Indicator Calculation Methodology:

- Prepare data:
    - Combine two SDWIS tables (the Water System table and Water System Facility table).
- Apply filters to prepared data and get counts for each Water Source Type per Water System.
    - Filters applied:

- Active Water Systems Only
- Active Water System Facilities Only
- Water System Facilities with a facility type of CC

Threshold Determination

Interties can be a critical lifeline for water systems, especially when faced with an emergency. A water system is at a higher risk of failure if their sources were to become contaminated, dry, collapse, or be taken out of service (i.e., for maintenance etc.), without an intertie to a nearby system for back-up supply. The State Water Board has adopted a binary threshold for "Absence of Intertie." Water systems without an intertie are assigned risk scores and those with an intertie receive 0 risk score. The developed threshold aligns with DWR's Drought & Water Shortage Risk Assessment.[179] All water systems with 10,000 service connections or greater, that have more than one source are excluded and risk scores of 0 are assigned. If a water system with 10,000 service connections or more has only one source and it is not an intertie, they receive a risk score of 1. Water systems with 10 or more water sources are also excluded and risk scores of 0 are assigned.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 1 is applied to the "Absence of Interties" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 1. Table A25 summarizes the thresholds, scores, and weight for this risk indicator.

Table A25: "Absence of Interties" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**1 or more** interties.	0	N/A	0	None
1	**0** interties.	1	1	1	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Absence of Interties: https://tabsoft.co/3ILZhfo

[179] Countywide Drought and Water Shortage Contingency Plans | DWR https://water.ca.gov/Programs/Water-Use-And-Efficiency/Making-Conservation-a-California-Way-of-Life/CountyDrought-Planning

DWR – DROUGHT & WATER SHORTAGE RISK ASSESSMENT RESULTS

This indicator utilizes DWR's Drought and Water Shortage Risk Scoring Tool[180] results which identify small water suppliers and rural communities (defined as *Self-Supplied Communities* in the tool) that are potentially at-risk of drought and vulnerable to water shortages. For this tool, small water suppliers are considered publicly regulated systems with fewer than 3,000 service connections and using fewer than 3,000 acre-feet per year. Self-supplied communities are water systems with fewer than 15 service connections, which covers state small water systems (5 to 14 connections), local small water systems (2 to 4 connections), and domestic wells. This tool creates an aggregated, comparative risk score for each water system and community derived from a set of indicators that capture different dimensions of exposure to hazards, physical/social vulnerability, and observed supply shortages (29 indicators for small water suppliers and 29 indicators for self-supplied communities).

Calculation Methodology
For the *small water suppliers*, the 29 risk indicators utilized by DWR were categorized and scored according to three components:

- Exposure:
  - Climate change impacts (weighted: 0.25)
  - Recent or current hazardous conditions and events (weighted: 0.75)
- Vulnerability:
  - Infrastructure vulnerability (system connectivity and other factors) (weighted: 4 connectivity indicators at 0.67 plus 4 other factor indicators at 0.33)
  - Organizational vulnerability (demographic and socioeconomic characteristics) (weighted: 0.33)
- Observed Water Shortage:
  - Experienced drought impacts or shortage records (weighted: 0.33)

For *self-supplied communities*, the 29 similar risk indicators were categorized and scored according to the same three components:

- Exposure:
  - Climate change impacts (weighted: 0.25)
  - Recent or current hazardous conditions and events (weighted: 1.0)
- Vulnerability
  - Physical vulnerability (weighted: 0.25)
  - Socioeconomic vulnerability (weighted: 0.75)
- Observed Water Shortage
  - Water outage records (weighted: 0.5)

For both the *small water suppliers* and *self-supplied communities* scoring, the risk indicator variables were all rescaled 0-1 numbers (1 is high and 0 is low) and combined with the other variables in their respective component. A simple calculation that weights each variable (noted

[180] Drought and Water Shortage Risk Explorer Tool for Small Water Suppliers and Rural Communities https://dwr.maps.arcgis.com/apps/MapSeries/index.html?appid=3353b370f7844f468ca16b8316fa3c7b

above) within its given component was applied, and then the weighted component scores were aggregated.

Each group of variables is then combined with the other group scores for each component (Exposure, Vulnerability, and Observed Water Shortage). Finally, the raw risk score from each component is summed and rescaled from 0 to 100 using a min-max scaling technique to calculate the final risk score.

The draft drought scoring for the small water suppliers and self-supplied communities can be found in the Drought and Water Shortage Risk Explorer Tool for Small Water Suppliers and Rural Communities.[181] Additional information is available on the DWR Countywide Drought and Water Shortage Contingency Plans website.[182]

Threshold Determination
The thresholds for this indicator (the top 10% and 25% of systems analyzed) are based on the illustrative cutoff provided by DWR in its presentation of Drought & Water Shortage Risk Assessment Results.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 2 is applied to the "DWR Assessment Results" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 2. Table A26 summarizes the thresholds, scores, and weight for this risk indicator.

Table A26: "DWR Assessment Results" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Below top 25%** of systems most at risk of drought and water shortage.	0	N/A	0	None
1	**Top 25%** of systems most at risk of drought and water shortage.	0.25	2	0.5	Low

[181] Drought and Water Shortage Risk Explorer Tool for Small Water Suppliers and Rural Communities https://dwr.maps.arcgis.com/apps/MapSeries/index.html?appid=3353b370f7844f468ca16b8316fa3c7b

[182] Countywide Drought and Water Shortage Contingency Plans | DWR https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/County-Drought-Planning

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
2	**Top 10%** of systems most at risk of drought and water shortage.	1	2	2	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

DWR Assessment Results: https://tabsoft.co/3tIFusS

CRITICALLY OVERDRAFTED GROUNDWATER BASIN

Water systems reliant on groundwater wells in basins considered to be in Critical Overdraft per DWR's Bulletin 118 may be at greater risk of meeting demand, especially during drought conditions. A basin is subject to critical conditions of overdraft when continuation of current water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts.

Calculation Methodology

Important Note: *The State Water Board has adjusted the calculation of this risk indicator from the approach used in the 2021 Needs Assessment to account for the inclusion of medium-size water systems that have many sources.*

Required Risk Indicator Data Points & Sources:

- SGMA Basin Prioritization Statewide Summary Table:[183] DWR
- Water System Boundaries: State Water Board Service Area Boundary Layer (SABL)
- Water Type Code: SDWIS
  - GW – Groundwater
  - SW – Surface Water
  - Both – GW and SW

Risk Indicator Methodology:

- Water System Boundaries – SABL – Water systems boundaries are overlaid with the critically overdrafted groundwater basins.

[183] SGMA Basin Prioritization Statewide Summary Table
https://data.cnra.ca.gov/dataset/13ebd2d3-4e62-4fee-9342-d7c3ef3e0079/resource/6347629e-340d-4faf-ae7f-159efbfbcdc9/download/final-515-table.xlsx

- Water System Source Water Identification – SDWIS – Water systems screened for source water (groundwater/surface water) to determine reliance on groundwater.

Threshold Determination
In the 2021 Risk Assessment, the State Water Board used 75% threshold of water system service area intersecting with a critically overdrafted groundwater basin. However, due to the data availability of system well locations and source types, the thresholds for this risk indicator have been updated for the 2022 Needs Assessment to reflect the percentage of a water system's groundwater source wells within a critically overdrafted groundwater basin. A binary threshold is still utilized where a system that has at least 25% or more of its ground water source wells within a critically overdrafted basin are assigned a risk score of 1 and those with less than 25% of their total sources within a critically overdrafted basin receiving a risk score of 0.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 2 is applied to the "Critically Overdrafted Groundwater Basin" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 2. Table A27 summarizes the thresholds, scores, and weight for this risk indicator.

Table A27: "Critically Overdrafted Groundwater Basin" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Less than 25%** of system's wells are located within a critically overdrafted basin.	0	N/A	0	None
1	**More than 25%** of system's wells are located within a critically overdrafted basin.	1	2	2	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Critically Overdrafted Groundwater Basin: https://tabsoft.co/3wKIiYn

SOURCE CAPACITY VIOLATIONS

The purpose of this risk indicator is to identify water systems that have violated source capacity standards as required in California Waterworks Standards[184] within the last three years. This violation criteria includes:

- Failure to maintain adequate source capacity (may include curtailment order and/or service connection moratorium).
- Failure to maintain adequate pressure leading to a water outage.
- Failure to complete a required source capacity planning study.

The State Water Board developed new source capacity violation codes in 2021 to better track and identify water systems failing to meet source capacity standards. Historically, the State Water Board has responded to source capacity violations with targeted citations, curtailment orders, and service connection moratoriums. Since the new source capacity violations only reflect recent actions, this risk indicator will also include water systems that have had active connection moratoriums within the last three years.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Service Connection Moratoriums: SDWIS
- Source Capacity Violations: Violation Type Code in SDWIS (Table A28): WW – Waterworks Standards

Table A28: Source Capacity Violation Analyte Codes

Violation Criteria	Analyte Code	Description
Failure to Maintain Adequate Source Capacity	C277 – CCR section 64554 – SRC CAPACITY	If a water system fails to have adequate source capacity pursuant to CCR section 64554[185]
Failure to Maintain Adequate Source Capacity	C278 – CCR section 64554 – SRC CAPACITY (CURTAILMENT)	If a water system fails to have adequate source capacity pursuant to CCR section 64554 AND a curtailment order has been issued (i.e., the failure is directly related to curtailments)

[184] California Code of Regulations Title 22 Division 4 Chapter 16 https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I437FD430D4BA11DE8879F88E8B0DAAAE&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

[185] At all times, public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD).

1. ≥ 1,000 service connections – source capacity, storage capacity, and/or emergency source connections must meet 4 hours of peak hourly demand (PHD)
2. < 1,000 service connections – storage capacity ≥ MDD

Violation Criteria	Analyte Code	Description
Failure to Maintain Adequate Pressure Leading to a Water Outage[186]	C279 – CCR section 64602 – WATER OUTAGE	If a water system fails to maintain the minimum required pressure of 20 pounds per square inch in its distribution system due to inadequate capacity
Failure to Complete A Source Capacity Planning Study	C280 – CCR section 64558 – SRC CAPACITY STUDY FAILURE	If a water system fails to complete a source capacity planning study required as part of an enforcement action

Risk Indicator Calculation Methodology:

- Source capacity violations - Identify systems that have had one or more source capacity violations within the past three years using the violation type code and analyte codes listed in Table A28.
- Service connection moratoriums (SCM) - Identify water systems that have had one or more SCM, based on referrals from State Water Board District staff, within the past three years.
    - Start Date & End Date
        - Historical SCM – have both the Start Date & End Date
        - Current (Active) SCM – have only Start Date

Threshold Determination

The State Water Board has developed a binary threshold for the Source Capacity Violations risk indicator. Any water systems that have not been able to meet source capacity water works standards within the last three years should receive risk points.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is suggested for the "Source Capacity Violations" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 3. Table A29 summarizes the thresholds, score, and weights for Source Capacity Violations.

[186] This violation criterion is used for repeated, long-term water outages, consistent, repeated low-pressure event. This is not for routine main breaks or short-term outages

Table A29: "Source Capacity Violations" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0** source capacity violations within the past 3 years; and **0** service connection moratoriums within the past 3 years.	0	N/A	0	None
1	**1 or more** source capacity violations within the past 3 years; or **1 or more** service connection moratoriums within the past 3 years.	1	3	3	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Source Capacity Violations: https://tabsoft.co/3NgCawF

BOTTLED OR HAULED WATER RELIANCE

The purpose of this risk indicator is to identify water systems that have had to supplement or replace their source supply to meet customer demand with bottled water, and/or hauled water at any point within the past three years. A water system that is unable to meet the demand with their available sources due to water quality issues or source capacity challenges is at-risk of failing to provide water to the customers.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

To identify water systems that have had reliance on bottled water and/or hauled water at any point within the past 3 years, the following data points from multiple sources were used.

- Internal State Water Board Interim Solution Data Spreadsheet: Division of Financial Assistance (DFA)
  - Type of Assistance in "Regional Project" tab
    - Bottled Water
    - Hauled Water
  - Category in "All other funding" tab
    - Bottled Water
    - Hauled Water

- Water Source Facility: SDWIS
  - Water Source Facility Name – any facility names containing "Hauled"; or

    - Water Source Facility Type Code
        - NN – Non-Piped, Non-Purchased
        - NP – Non-Piped, Purchased

- Drought Report Data Spreadsheet: Division of Drinking Water (DDW)
    - Actions taken in response to water outage or shortage
        - Bottled Water
        - Hauling Water

- Drought Projects Funding Commitments Data Spreadsheet[187]: Department of Water Resources (DWR)
    - Project Type - any project types containing "Bottled" and/or "Hauled"

Risk Indicator Calculation Methodology:

- Prepare DFA data – Identify water systems that have had one or more enrollments for receiving assistance of bottled water and/or hauled water. Some water systems may have multiple enrollments across different assistance types, funding sources and communities served.

- Prepare SDWIS data
    - Availability Codes reflect the availability for NN and NP facilities.
        - P – Permanent (the source is used all year round)
        - I – Interim (the source is used partly during the year)
        - E - Emergency (the source is used only during emergencies)

Table A30: Preparation of SDWIS Hauled Water Data

Availability Code	Rely on hauled water only?	Include in the dataset?
P – Permanent	Yes	Include
P – Permanent	No	Include if system has been under hauled water reliance within the past 3 years.
I – Interim	Yes	Include
I – Interim	No	Include if system has been under hauled water reliance within the past 3 years.
E – Emergency	Yes or No	Include if system is listed in DFA Interim Solution Data and DDW Drought Report

[187] DWR's funding commitments up to December 2021 were provided to the State Water Board. Any projects with a county applicant were excluded from the analysis because these projects are typically designed to support private domestic wells, not public water systems. It is important to note that after applying this filter only one applicant appeared to be a public water system; however, confirmation of its identity was not available because the applicant name did not closely align with any public water system in the State Water Board's databases. DWR does not track public water system applicants by PWSID, which is a unique identifier used by the State Water Board.

- Prepare DDW Drought Report Data – Identify water systems that have had bottled/hauled water in response to water outage or shortage due to drought.
- Combine two DFA spreadsheet tabs, SDWIS data and DDW Drought Report data.
- Remove any duplicate of the water systems to identify unique systems.

Threshold Determination

The State Water Board analyzed how water systems performed for this risk indicator by 2021 SAFER status: Failing: HR2W, At-Risk, Potentially At-Risk, and Not At-Risk. This analysis concluded that the majority of water systems that have relied on bottled water or hauled water over the last three years are either currently failing or at risk of failing (Table A31). Since there is a strong correlation between this risk indicator and failing, the State Water Board has developed a binary threshold of at least one or more occurrences.

Table A31: 2021 SAFER Status of Systems that Have Bottled Water or Hauled Water Reliance

TOTAL	Failing: HR2W List[188]	At-Risk	Potentially At-Risk	Not At-Risk
88	57 (65%)	18 (20%)	9 (10%)	4 (5%)

Risk Indicator Scoring & Weighting

Due the strong correlation between this risk indicator and failing, the State Water Board has determined that any water systems that has relied on bottled or hauled water over the last three years to supplement their sources should **automatically be classified as At-Risk** if they are not currently on the Failing: HR2W list.

Table A32: "Bottled or Hauled Water Reliance" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0** occurrences of bottled water or hauled water reliance within the last three years.	0	N/A	0	None
1	**1 or more** occurrences of bottled water or hauled water reliance within the last three years.	Automatically At-Risk	N/A	N/A	Very High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using

[188] Failing: HR2W List retrieved from the State Water Board SAFER Clearinghouse database on January 3, 2022

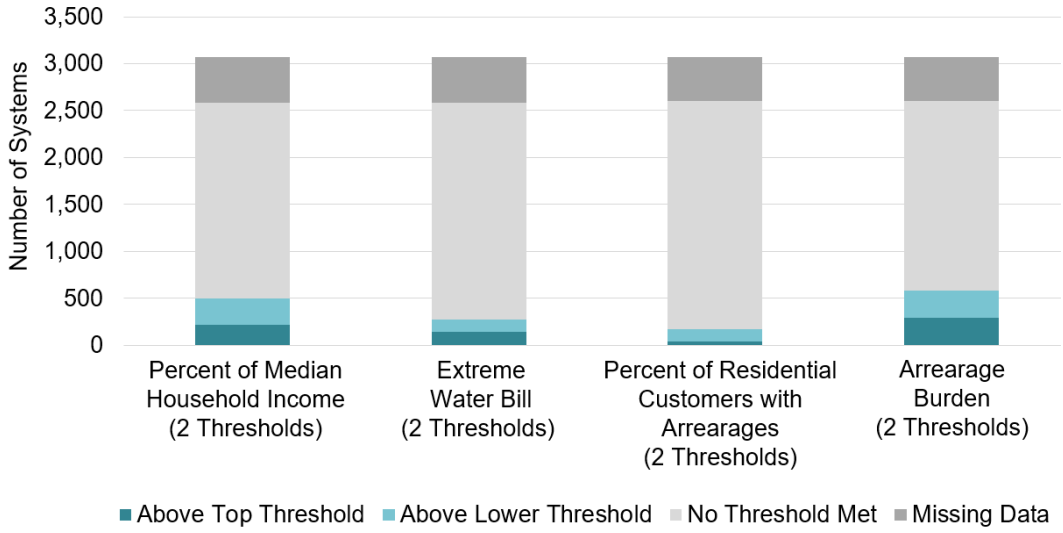
the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Bottled or Hauled Water Reliance: https://tabsoft.co/3qvb8It

AFFORDABILITY RISK INDICATORS

This section provides full details on each Affordability risk indicator used in the Risk Assessment. Affordability risk indicators measure the capacity of households and the customer base as a whole to supply the revenue necessary for a water system to pay for necessary capital, operations, and maintenance expenses. Figure A11 illustrates the number of water systems that exceeded the risk indicator thresholds within the Affordability category. The range of potential thresholds for each risk indicator are summarized in the respective risk indicator label and detailed below.

Figure A11: Number of Systems Exceeding Thresholds for Each Affordability Risk Indicator



PERCENT OF MEDIAN HOUSEHOLD INCOME (%MHI)

This indicator measures the annual system-wide average residential water bill for six hundred cubic feet (HCF) per month relative to the annual Median Household Income (MHI) within a water system's service area.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Water system service area boundaries: SABL

- Block group-Income in the Past 12 Months: 2019 U.S. Census Bureau's American Community Survey
- Drinking Water Customer Charges: 2020 Electronic Annual Report (EAR)
- Other Customer Charges: 2020 EAR

Average monthly drinking water customer charges are collected through the EAR. Historically this data has not been required for reporting leading to poor data coverage and accuracy issues. Extensive changes have been made to the 2020 Electronic Annual Report making reporting customer charges mandatory with checks in place to improve the data quality. In addition to the changes made to the EAR, over 600 water systems' customer charges were reviewed and edited manually by State Water Board staff.

Risk Indicator Calculation Methodology:
Median household income (MHI) is determined for a water system using American Community Survey data for household income. Community water system boundaries typically do not align with census boundaries where per capita income data is regularly collected. To assign an average median household income to a community water system spatially weighted income data is aggregated by census block group within the water system service area.

The methodology for this indicator was based on the Division of Financial Assistance (DFA) MHI methodology. While the MHI calculation methodology for the Affordability Assessment generally aligns with DFA's MHI determination methodologies, there are slight differences. The differences found in the calculation of MHI's for cities and census designated places and in the application of the Margin of Error (MOE).

The DFA methodology dictates that when it is determined that a system boundary exactly matches city boundaries or closely matches a census designated place boundary, the MHI for the entire city or census designated place should be directly applied to the system rather than using areally-interpolated block group data. This likely leads to more accurate MHI estimation in these cases. However, this method was not used in the Needs Assessment given that a case-by-case determination of matching of cities and census designated places to system boundaries was not feasible for the entire state. The MHI for each water system is a population weighted MHI, using census block group area and population data. A population factor is generated based on the area of each census block group that falls within the water system boundary. The water system MHI is then calculated using population adjusted MHIs for each census block group that falls within the water system boundary using the formula below:

Equation A1: MHI Calculation

$$\sum \frac{(Block\ Group\ MHI) \times (Adjusted\ Block\ Group\ Population)}{(Total\ Adjusted\ Block\ Groups\ Population)}$$

MOE for MHI American Community Survey data is also included in the MHI calculation. A population adjusted MOE is found using the same methodology described for MHI. The lower range of the MOE will be applied to a community's estimated MHI up to a maximum MOE value of $7,500 for communities with more than 500 people and $15,000 for communities with 500 or fewer people. The MOE will be subtracted from the estimated MHI.

The DFA methodology uses a lower bound MHI by subtracting the block group MOE from the block group MHI, with limits based on community size prior to applying the population factor to MHI and MOE. The methodology applied in the Needs Assessment set margin of error limits and then applied them to population adjusted MHI figures, resulting in slightly different community water system MHI calculations than the DFA methodology.

As a result of these slight variations and the changing nature of household income, all funding related financial assessments must be completed by the DFA as their assessments are water system specific as opposed to the aggregated analysis done for the purposes of the Needs Assessment.

Average monthly drinking water customer charges are calculated using:

- Drinking water service costs estimated at six HCF Feet per month. This level of consumption is in line with statewide conservation goals of 55 gallons per capita per day, in an average 3-person household.
- When data becomes available, additional approximated customer charges (not collected through a customer's bill) will be added to this figure to calculate Total Drinking Water Customer Charges.

%MHI = [Average Monthly Drinking Water Changes] / [MHI]

Threshold Determination
%MHI is commonly used by state and federal regulatory agencies and by water industry stakeholders for assessing community-wide water charges affordability for decades. %MHI is utilized by the State Water Board (at 1.5% threshold) and the U.S. EPA (at 2.5% threshold) for assessing affordability. The State Water Board and DWR use %MHI to determine Disadvantaged Community (DAC) status, among other income-related metrics. DAC status is often used to inform funding eligibilities for different financial programs offered by the State and other agencies. OEHHA's Human Right to Water (HR2W) Tool also utilizes[189] the thresholds determined by the State Water Board for this indicator.[190] Other states, including North Carolina,[191] presently or have recently used 1.5% of MHI spent on water and sewer costs as a threshold for water system funding decisions.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk

[189] There has been criticism of this metric by academics, water system associations, and the broader water sector mostly around its accuracy in measuring household affordability for those truly in need and the setting of arbitrary %MHI thresholds, limitations which the U.S. EPA has recently acknowledged.

[190] Arkansas Natural Resources Commission (2020). Safe Drinking Water Fund Intended Use Plan SFY 2019 https://www.agriculture.arkansas.gov/wp-content/uploads/2020/05/0_-_2019_DWSRF_IUP_-_AMENDED_January_2019_01082019_1156hrs.pdf

[191] North Carolina Department of Environmental Quality. Joint Legislative Economic Development and Global Engagement Oversight Committee (March 17, 2016) https://www.ncleg.gov/DocumentSites/Committees/JLEDGEOC/2015-2016/Meeting%20Documents/3%20-%20March%2017,%202016/2%20%20DEQ_Kim%20Colson%20Water%20Infrastructure%20JLOC%20EDGE%20160317.pdf

Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "Percent Median Household Income" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A33 summarizes the thresholds, scores, and weight for this risk indicator.

Table A33: "Percent Median Household Income" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Less than 1.5%**	0	N/A	0	None
1	**1.5% or greater**	0.75	3	2.25	Medium
2	**2.5% or greater**	1	3	3	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Percent Median Household Income: https://tabsoft.co/3tO05Mc

EXTREME WATER BILL

This indicator measures drinking water customer charges that meet or exceed 150% of statewide average drinking water customer charges at the six hundred cubic feet (HCF) level of consumption.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Drinking Water Customer Charges: 2020 EAR
- Other Customer Charges: 2020 EAR

Risk Indicator Calculation Methodology:

Extreme Water Bill for a water system is determined using Average Monthly six HCF Drinking Water Customer Charges and Other Customer Charges divided by the State's Monthly Average Drinking Water Charges. The Risk Assessment is applied to water systems with less than 3,300 service connections; however, this methodology utilizes the statewide average customer charges to calculate extreme water bill, which includes systems with greater than 3,300 service connections. Due to data quality concerns, water systems that reported less than $5 or greater than $500 in monthly customer charges for six HCF were excluded from the analysis and the calculated statewide average.

Threshold Determination
The State Water Board's AB 401 report[192] recommended statewide low-income rate assistance program elements utilize the two recommended tiered indicator thresholds of 150% and 200% of the state average drinking water bill for six HCF.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 1 is applied to the "Extreme Water Bill" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 1. Table A34 summarizes the thresholds, scores, and weight for this risk indicator.

Table A34: "Extreme Water Bill" Thresholds, Weights & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Below 150%** of the statewide average.	0	N/A	0	None
1	**Greater than 150%** of the statewide average.	0.5	1	0.5	Medium
2	**Greater than 200%** of the statewide average.	1	1	1	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Extreme Water Bill: https://tabsoft.co/3iGW1XM

PERCENTAGE OF RESIDENTIAL ARREARAGES

The purpose of this risk indicator is to identify water systems that have a high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due. The higher the percentage of residential customers, the more vulnerable the community is to affordability challenges.

[192] AB 401 Final Report: https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Total number of residential accounts in arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Risk Indicator Calculation Methodology:

Equation A2: Percentage of Residential Arrearages

$$\frac{\textit{Total Number of Residential Accounts in Arrears}}{\textit{Total Number of Residential Accounts}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program, for example investor-owned utilities with multiple water systems, were excluded from the calculation of this risk indicator because the State Water Board is unable to disaggregate the number of residential accounts in arrears by individual public water system ID (PWSID).

Threshold Determination
An indicator threshold for the percent of residential arrearages, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board utilized a 10% threshold for the risk indicator "% Shut-Offs for Non-Payment" in the 2021 Risk Assessment.[193] This risk indicator is similar in that it measured residential customers that were unable to pay their water bills and had their water shut-off. Therefore, the State Water Board has developed a tiered threshold for this indicator, drawing upon the threshold developed for "% Shut-Offs for Non-Payment."

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from an internal State Water Board, Division of Drinking Water workgroup, the weight of 2 is applied to the "Percentage of Residential Arrearages" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 2. Table A35 summarizes the thresholds, score, and weights for Percentage of Residential Arrearages.

[193] The State Water Board is recommending the removal of the risk indicator "% Shut-Offs for Non-Payment" because there was an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021. This information was therefore unavailable for the majority of 2020 and will not be collected by the State Water Board for 2021 annual reporting.

Table A35: "Percentage of Residential Arrearages" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0% to 9%** residential arrearages.	0	N/A	0	None
1	**10% to 29%** residential arrearages.	0.5	2	1	Medium
2	**30% to 100%** residential arrearages.	1	2	2	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Percentage of Residential Arrearages: https://tabsoft.co/3uiHcQM

RESIDENTIAL ARREARAGE BURDEN

The purpose of this risk indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Total outstanding residential arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Risk Indicator Calculation Methodology:

Equation A3: Residential Arrearage Burden

$$\frac{\textit{Total Residential Arrearages } (\$)}{\textit{Total Number of Residential Accounts}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program were excluded from the calculation of this risk indicator because the State Water Board is unable to disaggregates total residential arrearages by individual PWSID.

Threshold Determination
An indicator threshold for residential arrearage burden, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board adopted a similar tiered threshold utilized for the "Extreme Water Bill" affordability risk indicator, which utilizes an approach that compares how individual water systems are scoring to their peers, where data is available.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from an internal State Water Board, Division of Drinking Water workgroup, the weight of 2 is applied to the "Residential Arrearage Burden" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 2. Table A36 summarizes the thresholds, score, and weights for Residential Arrearage Burden.

Table A36: "Residential Arrearage Burden" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Below top 40%** of systems with residential arrearage burden.	0	N/A	0	None
1	**Top 40%** of systems with residential arrearage burden.	0.5	2	1	Medium
2	**Top 20%** of systems with residential arrearage burden.	1	2	2	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

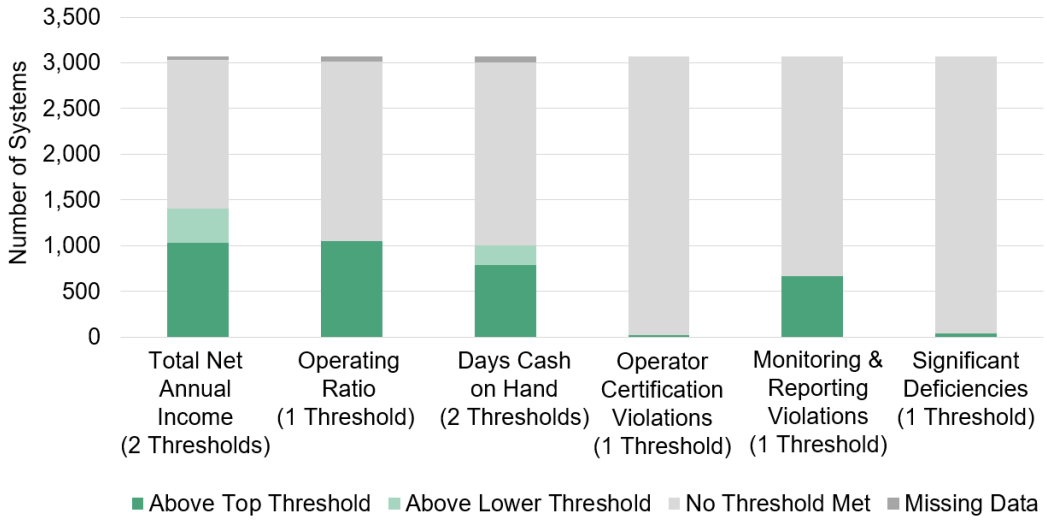
Residential Arrearage Burden: https://tabsoft.co/3wAoU07

TMF CAPACITY RISK INDICATORS

This section provides full details on each TMF Capacity risk indicator used in the Risk Assessment. TMF Capacity risk indicators measure a system's technical, managerial and financial (TMF) capacity to plan for, achieve, and maintain long term compliance with drinking water standards, thereby ensuring the quality and adequacy of the water supply. Figure A12 illustrates the number of water systems that exceeded the risk indicator thresholds within the

TMF Capacity category. The range of potential thresholds for each risk indicator are summarized in the respective risk indicator label and detailed below.

Figure A12: Number of Systems Exceeding Thresholds for Each TMF Capacity Risk Indicator



OPERATOR CERTIFICATION VIOLATIONS

Water systems that do not have an appropriately certified water treatment or distribution operator will receive an operator certification violation. A lack of adequately trained water treatment or distribution operators may be indicative of larger technical and managerial risks borne by the system. Research shows that poorly trained staff and managers working on water systems can result in avoidable waterborne disease outbreaks. Chief and shift operators must possess valid operator certificates pursuant to CCR sections 63765 and 63770.

Calculation Methodology
Required Risk Indicator Data Point & Source:

- Operator Certification Violations: SDWIS Violation Codes:
  - 12
  - OP

Risk Indicator Methodology:

- Determine which systems have had an Operator Certification Violation within the last three years.
  - Systems that are currently out of compliance or have returned to compliance are included.

Threshold Determination
Peer-reviewed studies suggest that the absence of a certified operator is associated with water

system failure.[194] Moreover, operator certification violations are an established threshold for additional regulatory oversight by states, such as Illinois.[195] Therefore, a threshold of 1 or more operator certification violations over the last three years was determined.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is applied to the "Operator Certification Violations" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A37 summarizes the thresholds, scores, and weight for this risk indicator.

Table A37: "Operator Certification Violations" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0** Operator Certification violations over the last three years.	0	N/A	0	None
1	**1 or more** Operator Certification violations over the last three years.	1	3	3	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Operator Certification Violations: https://tabsoft.co/36U2iNt

MONITORING & REPORTING VIOLATIONS

A water system is required to monitor and verify that the levels of contaminants present in the drinking water supplies do not exceed an MCL. A monitoring violation occurs when a water system fails to have its water tested as required within the legally prescribed time frame. A water system that fails to perform required monitoring for a group of chemicals (such as

[194] See Oxenford, J. L., & Barrett, J. M. (2016). Understanding small water system violations and deficiencies. *Journal-American Water Works Association, 108(3)*, 31-37.

[195] Office of the Illinois State Fire Marshal (2012.). "Notification of New NOV for Operator Certification Violations." Retrieved from: https://www2.illinois.gov/sites/sfm/SFMDocuments/Documents/NoticeRedTagOperators.pdf

synthetic organic chemicals or volatile organic chemicals) would incur a monitoring violation for each of the individual chemicals within the group.

A reporting violation occurs when a water system fails to report test results in a timely manner to the regulatory agency or fails to provide certification that mandated information was provided to the public, such as through the issuance of a public notice or the annual Consumer Confidence Report. A system may also receive a reporting violation for not submitting an Annual Report the State Water Board.

This indicator measures the total number of monitoring and reporting violations during a 3-year compliance cycle.

Calculation Methodology
Required Risk Indicator Data Point & Source:

- Monitoring and Reporting violations: SDWIS

Table A38: Monitoring & Reporting Violation Codes

Violation Type Code	SDWIS Violation Name
03	Monitoring, Regular
04	Monitoring, check, repeat, or confirmation
19	Failure to Conduct Assessment Monitoring
23	Monitoring, Routine Major (TCR)
24	Monitoring, Routine Minor (TCR)
25	Monitoring, Repeat Major (TCR)
26	Monitoring, Repeat Minor (TCR)
27	Monitoring, Routine (DBP)
29	Failure Submit Filter Profile/CPE Report
30	Monitoring, Routine (IDSE)
31	Monitoring of Treatment (SWTR-Unfilt/GWR)
32	Monitoring, Source Water (LT2)
34	Monitoring, Source Water (GWR)
35	Failure Submit IDSE/Subpart V Plan Rpt
36	Monitoring of Treatment (SWTR-Filter)
38	Monitoring, Turbidity (Enhanced SWTR)
39	Monitoring and Reporting (FBRR)
51	Initial Tap Sampling for Pb and CU
52	Follow-Up or Routine LCR Tap M/R
53	Water Quality Parameter M/R
56	Initial, Follow-Up, or Routine SOWT M/R
66	Lead Consumer Notification

Violation Type Code	SDWIS Violation Name
3A	Routine Monitoring
3B	Additional Routine Monitoring
3C	TC Samples (triggered by turbidity exceedance) Monitoring
3D	Monitoring, Lab Cert/Method Errors
4A	Assessment Forms Reporting
4B	Sample Result/Fail to Monitor Reporting
4C	Start-up Procedures Certification Form Reporting
4D	EC+ Notification Reporting
4E	*E. coli* MCL Reporting
4F	L1/L2 TT Vio or Correct Action Reporting
S1	State Violation-M&R (Major)
AR	Failure to Complete an Annual Report
RR	State Reporting Requirement Violation (review in one year for lead service line replacement)

Risk Indicator Methodology:

- Determine which systems have had Monitoring & Reporting violations over the last 3-year compliance period using the Monitoring & Reporting violation codes in Table A38. This excludes MCL and TT related Monitoring & Reporting violations described below that are included in the expanded HR2W list criteria:
  - Systems that have three or more Monitoring and Reporting violations within the last three years where at least one violation has an Enforcement Action that has been open for 15 months or greater.

Threshold Determination
The State Water Board has developed a threshold for Monitoring & Reporting violations (related to an MCL or Treatment Technique) as criteria for the Failing: HR2W list. The Failing: HR2W list criteria threshold is three or more MCL/TT-related Monitoring & Reporting violations within the last three years where at least one violation has an open enforcement action greater than 15 months. For the Risk Assessment, the State Water Board developed a slightly modified version of the Failing: HR2W list criteria threshold. Systems that have had two or more Monitoring & Reporting violations over the last three years are more at-risk.[196]

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to

[196] Systems that meet the Failing: HR2W list criteria are not included in the Risk Assessment results.

individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 2 is applied to the "Monitoring and Reporting Violations" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 2. Table A39 summarizes the thresholds, scores, and weight for this risk indicator.

Table A39: "Monitoring and Reporting Violations" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**1 or less** Monitoring & Reporting violations over the last three years.	0	N/A	0	None
1	**2 or more** Monitoring & Reporting violations over the last three years.	1	2	2	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Monitoring and Reporting Violations: https://tabsoft.co/3NwnaLe

SIGNIFICANT DEFICIENCIES

Significant Deficiencies are identified by State Water Board staff or a Local Primacy Agency (LPA) during a Sanitary Survey and other water system inspections. Significant Deficiencies include, but are not limited to, defects in the design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that U.S. EPA determines to be causing or have the potential for causing the introduction of contamination into the water delivered to consumers. Significant Deficiencies can be identified for both groundwater and surface water systems, although the compliance deadlines and requirements differ depending on the applicable rule (Groundwater Rule vs. Long Term 2 Enhanced Surface Water Treatment [LT2] Rule).

State Water Board and LPA staff must enter these deficiencies into SDWIS and must follow-up on the addressing actions taken by the water system to correct the deficiencies. The State Water Board and LPA must provide written notification of a Significant Deficiency within 30 days and require the water system to respond within 30 days with a corrective action plan. Scheduled return to compliance dates should be noted in the plan and approved by the State Water Board or LPA. The water system must implement the appropriate corrective action within 120 days of notification or be in compliance with a State-approved plan for correcting the deficiency at the end of the same 120-day period. The State Water Board and LPAs must then confirm that the deficiency has been addressed within 30 days after the scheduled date of correction.

A water system can incur a violation for failing to respond to or correct a Significant Deficiency (Title 22 CCR § 64430 and 40 CFR § 141.404 (s) for systems subject to the Groundwater Rule, or Title 22 CCR § 64650(f) and 40 CFR § 141.723 having for systems subject to LT2 Rule). The State Water Board and LPAs may take additional enforcement action as necessary to correct the deficiency.

Calculation Methodology
Required Risk Indicator Data Point & Source:

- Significant Deficiencies: Table in SDWIS with a SIG (Significant) severity designation.

Risk Indicator Calculation Methodology:

- Determine which systems have had a Significant Deficiency **within the last three years** using the visit date in SDWIS (date the State Water Board became aware of the Significant Deficiency).
  - Systems that are currently out of compliance or have returned to compliance are included.

Threshold Determination
As described above, the presence of Significant Deficiencies has already been defined as a threshold for State Water Board action. Moreover, peer-reviewed studies suggest that the presence of Significant Deficiencies is associated with water system failure.[197] Finally, similar measures of significant deficiencies are used as an established threshold of concern by states such as Alaska and Nevada,[198] Connecticut,[199] and New Mexico,[200] among others. Therefore, the threshold of one or more Significant Deficiencies within the last three years has been determined to be an appropriate threshold for risk.

Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Public feedback during the Risk Assessment methodology development process indicated that some risk indicators should be weighted higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. Risk indicator weights between 1 and 3 were applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the

[197] See Oxenford, J. L., & Barrett, J. M. (2016). Understanding small water system violations and deficiencies. Journal-American Water Works Association, 108(3), 31-37.

[198] State Strategies to Assist Public Water Systems in Acquiring and Maintaining Technical, Managerial, and Financial Capacity." Retrieved from: https://books.google.com/books?id=MK64VtYz-SsC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

[199] Systems that meet the HR2W criteria will not be included in the Risk Assessment. McPhee, Eric (n.d.). "Significant Deficiencies." Connecticut Department of Public Health: Drinking Water Division. Retrieved from: https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/drinking_water/pdf/CTAWWAGWRTraining2009SigDefpdf.pdf?la=en

[200] New Mexico Environment Department: Drinking Water Bureau (2016). "Surface Water Rule and Interim Enhanced Surface Water Treatment Rule: Significant Deficiency Policy." Retrieved from: https://www.env.nm.gov/wp-content/uploads/sites/5/2018/11/RE_Surface-Water-Rule-Significant-Deficiency_Policy_020816.pdf

maximum weight of 3 is applied to the "Significant Deficiencies" risk indicator. Therefore, the minimum risk score is 0 and the maximum risk score is 3. Table A40 summarizes the thresholds, scores, and weight for this risk indicator.

Table A40: "Significant Deficiencies" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**0** Significant Deficiencies over the last three years.	0	N/A	0	None
1	**1 or more** Significant Deficiencies over the last three years.	1	3	3	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Significant Deficiencies: https://tabsoft.co/3NqSqeJ

OPERATING RATIO

Operating Ratio is a measure of whether a water system's revenues are sufficient to cover the costs of operating the water system. Specifically, "Operating Ratio" is a ratio of the water system's annual revenues compared to annual operating expenses. To be self-supporting, a water system should have at least as much annual revenue as it has operating expenses, e.g., an operating ratio equal to or greater than 1.0. The operating ratio does not include planned investments in future years. Therefore, a water system should collect revenues greater than expenses to accommodate for future investments by building up their financial reserves.

Annual Revenue: includes total annual revenues generated from customer charges and fees (meter fees, base service charges, fixed charges, late fees, penalties, shutoff fees, reconnection fees, etc.); intergovernmental fund transfers (i.e., city or county tax revenues etc.); revenues generated through rent, land lease, or other revenue-generating activities.

Operations and Maintenance Expenses: expenses incurred during the system's normal operation during the reporting year. It may include salaries, benefits for employees, utility bills, system repair and maintenance, supplies (e.g., treatment chemicals), insurance, water purchased for resale, etc.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Total Annual Revenue – Section 8B1.8
- Total Annual Revenue for the Reporting Year = Residential Water Rate Revenue (B1.1) + Non-Residential Water Rate Revenue (B1.2) + Residential Fees and Charges Revenue (B1.3) + Non-Residential Fees and Charges Revenue (B1.4) + Interfund or Governmental Revenue (B1.5.2) – Interfund or Government Revenue Lost (B1.6) + Other Revenue (B1.7)
- 2020 Electronic Annual Report, Total Annual Operating Costs – Section 8B2.1

Risk Indicator Calculation Methodology:

Equation A4: Operating Ratio

$$\frac{Annual\ Revenue\ (\$)}{Annual\ Operating\ Expenses\ (\$)}$$

Threshold Determination

The threshold for this risk indicator was developed through an analysis of industry, academic, and state publications (Table A41). Feedback was also solicited from the Division of Drinking Water's internal stakeholder group. Many have suggested that a viable water system should have a current ratio of at least 1 or greater. An operating ratio of 1 is the lowest level for a self-supporting water system. A ratio below one means expenses are higher than revenues. If a water system has outstanding debt, an operating ratio above one is required. Usually, the higher the debt/equity ratio, the higher the operating ratio required.

Table A41: Industry Recommended Operating Ratio

Organization	Recommended Operating Ratio	Resources
Community Resource Group, Inc.	1	Small System Guide: Understanding Utility Financial Statements[201]
University of North Carolina Environmental Finance Center	≥ 1.2	California Small Water Systems Rates Dashboard[202]
Rural Community Assistance Partnership (RCAP)	≥ 1	Financial Management Guide[203]

[201] See Small System Guide: Understanding Utility Financial Statements (2011). Community Resource Group, Inc. https://www.in.gov/iurc/files/small_system_guide_to_understanding_financial_statments.pdf

[202] See California Small Water Systems Rates Dashboard (2021). Environmental Finance Center at the University of North Carolina, Chapel Hill. https://dashboards.efc.sog.unc.edu/ca

[203] The Basics of Financial Management for Small-community Utilities http://www.rcapsolutions.org/wp-content/uploads/2013/06/RCAP-Financial-Management-Guide.pdf

Organization	Recommended Operating Ratio	Resources
University of Georgia	≥ 1.2	Evaluating Water System Financial Performance and Financing Options[204]
Brookings	> 1	Appendix B: Investing in water: Comparing utility finances and economic concerns across U.S. cities[205]
Arizona Department of Environmental Quality	≥ 1	Capacity Development Application for a New Public Water System[206]
State of Florida Public Service Commission	≥ 1.25	Docket No. 20 180141-WS - Proposed adoption of Rule 25-30.4575, F.A.C., Operating Ratio Methodology[207]

Based on the industry standards summarized above, the State Water Board adopted a binary threshold for "Operating Ratio" as summarized in Table A42.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the minimum weight of 1 is suggested for the "Operating Ratio" risk indicator due to data quality concerns. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 1. Table A42 summarizes the thresholds, score, and weights for Operating Ratio.

[204] See Jeffrey L. Jordan. Issue 3: Evaluating Water System Financial Performance and Financing Options. University of Georgia Department of Agricultural & Applied Economics. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.4657&rep=rep1&type=pdf

[205] See Joseph W. Kane (2016). Investing in water: Comparing utility finances and economic concerns across U.S. cities. Brookings. https://www.brookings.edu/research/investing-in-water-comparing-utility-finances-and-economic-concerns-across-u-s-cities/

[206] See Capacity Development Application for a New Public Water System. Arizona Department of Environmental Quality. https://legacy.azdeq.gov/environ/water/dw/download/appe.pdf

[207] See Office of the General Counsel (Harper), Division of Accounting and Finance (Galloway), Division of Economics (Guffey) (2018). Docket No. 20 180141-WS - Proposed adoption of Rule 25-30.4575, F.A.C., Operating Ratio Methodology. State of Florida Public Service Commission http://www.psc.state.fl.us/library/filings/2018/06300-2018/06300-2018.pdf

Table A42: "Operating Ratio" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**1 or greater**	0	N/A	0	None
1	**Less than 1**	1	1	1	High

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Operating Ratio: https://tabsoft.co/3IBV2CW

TOTAL ANNUAL INCOME

The purpose of this risk indicator is to identify water systems whose total annual revenue is unable to cover their total annual expenses. A water system should generate enough revenue to cover all incurred expenses (including operational expenses) throughout the year. Total Net Annual Income of a water system should be a positive (+) value. If more money is spent than is brought in, then the water system will have to make adjustments in order to maintain operations. If the expenditures are outpacing revenue too quickly, then the water system may have to cut costs or decrease its level of service. Reserves or available cash savings allows for a financial cushion in times when expenses are greater than revenues.

A water system may generate enough revenue to cover their annual operating and maintenance costs (operating ratio = 1 or greater), but in some cases revenues may fall short in covering a water system's total annual expenses. These additional expenses that fall outside of general operating and maintenance costs typically include debt/loan repayments, new/upgraded infrastructure investments, unforeseen emergency costs, etc.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Total Annual Revenue - 8B1.8
- 2020 Electronic Annual Report, Total Annual Expenses - 8B2.5

Risk Indicator Calculation Methodology:

Equation A5: Total Annual Income

$$\boldsymbol{Total\ Annual\ Income = Total\ Annual\ Revenue - Total\ Annual\ Expenses}$$

Threshold Determination

Water systems may have emergencies they must respond to or a large capital investment that occurs within a year which may lead to negative total annual income. Based on industry standards and recommendations for State Water Board engineers, the tiered thresholds in Table A43 were developed for Total Annual Income.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the minimum weight of 1 is suggested for the "Total Annual Income" risk indicator due to data quality concerns. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 1. Table A43 summarizes the thresholds, score, and weights for Total Annual Income.

Table A43: "Total Annual Income" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**Greater than $0** total annual income	0	N/A	0	None
1	**$0** total annual income	0.5	1	0.5	Medium
2	**Less than $0** total annual income	1	1	1	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Total Annual Income: https://tabsoft.co/3801FCv

DAYS CASH ON HAND

Days cash on hand is the estimated number of days a water system can cover its daily operations and maintenance costs, relying only on their current cash or liquid reserves, before running out of cash. This metric measures a system's financial capacity and is an estimate of how long a system can operate *without* new revenues or additional funding. It is a helpful measure of how long a system can operate if it has a sudden and dramatic reduction in operating income, perhaps from a large customer leaving or an environmental emergency (fire, drought restrictions, etc.).[208]

[208] See Glenn Barnes (2015). Key Financial Indicators for Water and Wastewater Systems: Days of Cash on Hand. Environmental Finance Center at the University of North Carolina. https://efc.web.unc.edu/2015/06/24/days-cash-on-hand/

According to Moody's definition, "Cash is the most important resource utilities have to meet expenses, deal with emergencies, and survive temporary disruptions to cash flow without missing required payments."[209] Days cash on hand is a ratio that is calculated by dividing a water system's unrestricted cash by the system's estimated daily expenses. This calculation approach allows for the comparison of water systems of different sizes by accounting for differences in operational expenses (Table A44). The higher the number, the more days an organization can sustain its operations without any additional cash inflows.

Table A44: Comparison Example Between Large and Small Water System

Large Water System	Small Water System
$\frac{Unrestricted\ Cash: \$\mathbf{5,000,000}}{Average\ Daily\ Operation\ Expenses: \$\mathbf{100,000}}$	$\frac{Unrestricted\ Cash: \$\mathbf{20,000}}{Average\ Daily\ Operation\ Expenses: \$\mathbf{400}}$
Days Cash on Hand = **50 Days**	Days Cash on Hand = **50 Days**

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Section 8B.10

Risk Indicator Calculation Methodology:

- Risk indicator calculation formula (water system calculated and reported in 2020 Electronic Annual Report):
  - Calculate water system's **daily operating expenses**: [Annual Operating Expenses] / [365]
  - Calculate **days cash on hand**: [Total Unrestricted Cash] / [Daily Operating Expenses]

Equation A6: Days Cash on Hand

$$\frac{Unrestricted\ Cash\ (\$)}{Daily\ Operating\ Expenses\ (\$)}$$

Threshold Determination

The thresholds for the "Days Cash on Hand" risk indicator were developed by assessing peer-reviewed publications and soliciting feedback from the State Water Board's Division of Drinking Water internal stakeholder group. Table A45 and Table A46 summarize recommendations

[209] See Edward Damutz, Leonard Jones, (2017). Moody's Utility Revenue Bond Rating Methodology. Moody's Investors Services. https://www.moodys.com/research/Moodys-updates-its-methodology-for-rating-US-municipal-utility-revenue--PR_373942

made by industry groups and rating agencies for minimum days cash on hand.

Table A45: Industry Recommended Days Cash on Hand

Organization	Recommended Days Cash on Hand	Resources
University of North Carolina Environmental Finance Center	90+ days	California Small Water Systems Rates Dashboard[210]
Utility Financial Solutions, LLC	90+ days; Higher bond rating 200+ days	Managing Your Community's Stimulus Money[211]
International City/County Management Association (ICMA)	30 - 60 days	Capital Budgeting and Finance: A Guide for Local Governments[212]
Government Finance Officers Association	45+ days	Overview of GFOA's Best Practices in Budgeting[213]
American Water Works Association	270 - 365 days	Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector[214]

Table A46: Financial Scoring Criteria for Major Rating Agencies

Moody's[215]					
Aaa	Aa	A	Baa	Ba	B & Below
> 250 days	250 ≥ n > 150 days	250 ≥ n > 150 days	150 ≥ n > 35 days	35 ≥ n > 15 days	≤ 7 days

[210] See California Small Water Systems Rates Dashboard (2021). Environmental Finance Center at the University of North Carolina, Chapel Hill. https://dashboards.efc.sog.unc.edu/ca

[211] See Sally Duffy, P.E., Ian Robinson, Dawn Lund (2021). Managing Your Community's Stimulus Money. MI - AWWA, MWEA, and MRWA. https://cdn.ymaws.com/www.mi-water.org/resource/resmgr/docs/Managing_Stimulus_webinar_07.pdf

[212] See Robert L. (Bob) Bland, Michael R. Overton, (2019). A Budgeting Guide for Local Government, Fourth Edition. ICMA. https://icma.org/publications/budgeting-guide-local-government-fourth-edition

[213] See John Fishbein (2019). Overview of GFOA's Best Practices in Budgeting. Technical Services Center, Government Finance Officers Association (GFOA). https://nesgfoa.org/wp-content/uploads/2019/05/overview_of_gfoas_best_practices_in_budgeting_april_4_2019.pdf

[214] See R. Raucher, E. Rothstein, J. Mastracchio (2017): Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector. The American Water Works Association (AWWA). https://www.awwa.org/Portals/0/AWWA/Government/DevelopingNewFrameworkForAffordabilityReport.pdf

[215] See Moody's Investors Service, US Municipal Utility Revenue Debt. October 19, 2017. https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBM_1095545

S&P Global[216]					
1: Extremely Strong	2: Very Strong	3: Strong	4: Adequate	5: Vulnerable	6: Highly Vulnerable
> 150 days	150 ≥ n > 90 days	90 ≥ n > 60 days	60 ≥ n > 30 days	15 ≥ n > 30 days	≤ 15 days

Fitch[217] Liquidity Cushion		
Stronger	Neutral	Weaker
> 120 days	120 ≥ n > 90 days	< 90 days

Based on the industry standards summarized above, the State Water Board developed a tiered threshold for "Days Cash on Hand" as summarized in Table A47.

Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's Division of Drinking Water internal stakeholder group, the minimum weight of 1 is suggested for the "Days Cash on Hand" risk indicator. Table A47 summarizes the thresholds, score, and weights for Days Cash on Hand.

Table A47: "Days Cash on Hand" Thresholds, Weights, & Scores

Threshold Number	Threshold	Score	Weight	Max Risk Score	Risk Level
0	**90 days or more** cash on hand.	0	N/A	0	None
1	**Less than 90 days** cash on hand.	0.5	1	0.5	Medium
2	**Less than 30 days** cash on hand.	1	1	1	High

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e., number of service connections).

Day Cash on Hand: https://tabsoft.co/3JI5n1u

[216] S&P Global, Criteria | Governments | U.S. Public Finance: U.S. Public Finance Waterworks, Sanitary Sewer, And Drainage Utility Systems: Rating Methodology and Assumptions. January 19, 2016; last update October 11, 2021; Accessed December 30, 2021 at https://disclosure.spglobal.com/ratings/en/regulatory/article/-/view/type/HTML/id/2735324

[217] Fitch Ratings, U.S. Water and Sewer Rating Criteria, March 18, 2021. https://www.fitchratings.com/research/us-public-finance/us-water-sewer-rating-criteria-18-03-2021

APPENDIX B:
RISK ASSESSMENT METHODOLOGY FOR STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

INTRODUCTION

The 2022 Needs Assessment uses both water quality data (State Water Board's Aquifer Risk Map) and water shortage data (DWR Water Shortage Vulnerability Tool) to determine risk for state small water systems and domestic wells. The methodology for the Aquifer Risk Map[218] and the Water Shortage Vulnerability Tool[219] are explained in greater detail in their respective write-ups.

The 2021 Needs Assessment was based solely on data from the Aquifer Risk Map. In response to stakeholder feedback, the State Water Board has incorporated an additional risk indicator for water shortage to the 2022 Needs Assessment for state small water systems and domestic wells.

RISK ASSESSMENT METHODOLOGY DEVELOPMENT PROCESS

The Aquifer Risk Map was developed from 2019-2020 with stakeholder feedback, including three public webinars held by the State Water Board over the course of 2020 to solicit feedback on the development of the aquifer risk map. The Aquifer Risk Map work was influenced by previous work developing the Domestic Well Water Quality Tool, which provided an estimate of the number and location of domestic wells at-risk for water quality issues. Development of the Domestic Well Water Quality Tool involved a public workshop in 2019.

A public webinar was held in October 2021 to solicit feedback on updates to the 2022 Aquifer Risk Map. A public workshop was hosted on February 2, 2022 to present the new Combined Risk Assessment for State Small Water Systems and Domestic Wells. Recommendations and feedback from the public are used to refine the methodology and analysis for current and future iterations of the Risk Assessment.

[218] Methodology for 2022 Aquifer Risk Map
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=62b116bb7e824df098b871cbce73ce3b

[219] Methodology for DWR Water Shortage Vulnerability Tool
https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/CDAG/Part-2-Appendix-1-Scoring-Method-Final.pdf

INTENDED USE OF THIS ANALYSIS

The risk rankings developed using this methodology are not intended to depict actual groundwater quality conditions at any given domestic supply well or small water system location. The purpose of this risk map analysis is to prioritize areas that may not meet primary drinking water standards or may be at risk of water shortage to inform additional investigation and sampling efforts. The current lack of available domestic well and state small system water quality data, water shortage data, and locational data makes it impossible to characterize the risk for individual domestic wells and state small systems. The analysis described here thus represents a best effort at using the available data to estimate risk for domestic wells and state small systems in a square mile section.

METHODOLOGY

WATER QUALITY RISK (AQUIFER RISK MAP)

A complete description of the 2022 Aquifer Risk Map methodology is available online.[220] The Aquifer Risk Map uses previously collected water quality results from various datasets, including the Division of Drinking Water (DDW), the US Geological Survey (USGS)-Groundwater Ambient Monitoring and Assessment (GAMA) programs' Priority Basin and Domestic Well Projects, the USGS-National Water Information System dataset, the Department of Water Resources (DWR), local groundwater monitoring projects, the Irrigated Lands Regulatory Program (AGLAND), and monitoring/clean-up sites (GeoTracker). These water quality results are depth-filtered to only focus on data from groundwater depths accessed by domestic wells and state small water systems. Data from all chemical constituents with a Maximum Contaminant Level (MCL) are assessed, and several additional chemical constituents including hexavalent chromium, copper, lead, and N-Nitrosodimethylamine (NDMA) are included in the analysis as well[221]. Water quality results were converted to an MCL Index[222] to allow comparison between chemical constituents (Table B1) for chemical constituent codes and MCL values). The R script used to download, process, and filter the water quality data is available on GitHub.[223]

[220] Methodology for 2022 Aquifer Risk Map
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=62b116bb7e824df098b871cbce73ce3b

[221] The comparison concentration values for chemicals without an MCL are as follows: Hexavalent Chromium – 10 micrograms per liter (µG/L); Copper – 1.3 milligrams per liter (MG/L); Lead – 15 µG/L; N-Nitrosodimethylamine (NDMA) – 0.1 µG/L. For a complete list of contaminants and comparison levels please refer to Appendix A of the 2022 Aquifer Risk Map Methodology document.

[222] See page the 2022 Aquifer Risk Map Methodology for more details. The MCL index consists of the finding divided by the MCL, with a special consideration for non-detect results with a reporting limit above the MCL.

[223] Methodology script (GitHub)
https://github.com/EmilyHoulihan/Aquifer_Risk_Map

Table B1: Chemical Constituent Codes and Maximum Contaminant Values for Aquifer Risk Map Chemical Constituents

Chemical Abbreviation (Web Tool)	Chemical Name	Units	Comparison Concentration Value	Comparison Concentration Type
24D	2,4-Dichlorophenoxyacetic acid (2,4 D)	µg/L	70	MCL
AL	Aluminum	µg/L	1000	MCL
ALACL	Alachlor	µg/L	2	MCL
ALPHA	Gross Alpha radioactivity	pCi/L	15	MCL
AS	Arsenic	µg/L	10	MCL
ATRAZINE	Atrazine	µg/L	1	MCL
BA	Barium	mg/L	1	MCL
BDCME	Bromodichloromethane (THM)	µg/L	80	MCL
BE	Beryllium	µg/L	4	MCL
BETA	Gross beta	pCi/L	50	MCL
BHCGAMMA	Lindane (Gamma-BHC)	µg/L	0.2	MCL
BIS2EHP	Di(2-ethylhexyl)phthalate (DEHP)	µg/L	4	MCL
BRO3	Bromate	µg/L	10	MCL
BTZ	Bentazon	µg/L	18	MCL
BZ	Benzene	µg/L	1	MCL
BZAP	Benzo(a)pyrene	µg/L	0.2	MCL
BZME	Toluene	µg/L	150	MCL
CD	Cadmium	µg/L	5	MCL
CHLORDANE	Chlordane	µg/L	0.1	MCL
CHLORITE	Chlorite	mg/L	1	MCL
CLBZ	Chlorobenzene	µg/L	70	MCL
CN	Cyanide (CN)	µg/L	150	MCL
CR	Chromium	µg/L	50	MCL
CR6	Chromium, Hexavalent (Cr6)	µg/L	10	Temporary comparison level*
CRBFN	Carbofuran	µg/L	18	MCL
CTCL	Carbon Tetrachloride	µg/L	0.5	MCL
CU	Copper	mg/L	1.3	Action Level
DALAPON	Dalapon	µg/L	200	MCL

Chemical Abbreviation (Web Tool)	Chemical Name	Units	Comparison Concentration Value	Comparison Concentration Type
DBCME	Dibromochloromethane (THM)	µg/L	80	MCL
DBCP	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	MCL
DCA11	1,1-Dichloroethane (1,1 DCA)	µg/L	5	MCL
DCA12	1,2 Dichloroethane (1,2 DCA)	µg/L	0.5	MCL
DCBZ12	1,2 Dichlorobenzene (1,2-DCB)	µg/L	600	MCL
DCBZ14	1,4-Dichlorobenzene (p-DCB)	µg/L	5	MCL
DCE11	1,1 Dichloroethylene (1,1 DCE)	µg/L	6	MCL
DCE12C	cis-1,2 Dichloroethylene	µg/L	6	MCL
DCE12T	trans-1,2, Dichloroethylene	µg/L	10	MCL
DCMA	Dichloromethane (Methylene Chloride)	µg/L	5	MCL
DCP13	1,3 Dichloropropene	µg/L	0.5	MCL
DCPA12	1,2 Dichloropropane (1,2 DCP)	µg/L	5	MCL
DINOSEB	Dinoseb	µg/L	7	MCL
DIQUAT	Diquat	µg/L	20	MCL
DOA	Di(2-ethylhexyl)adipate	mg/L	0.4	MCL
EBZ	Ethylbenzene	µg/L	300	MCL
EDB	1,2 Dibromoethane (EDB)	µg/L	0.05	MCL
ENDOTHAL	Endothall	µg/L	100	MCL
ENDRIN	Endrin	µg/L	2	MCL
F	Fluoride	mg/L	2	MCL
FC11	Trichlorofluoromethane (Freon 11)	µg/L	150	MCL
FC113	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	mg/L	1.2	MCL
GLYP	Glyphosate (Round-up)	µg/L	700	MCL
H-3	Tritium	pCi/L	20000	MCL
HCCP	Hexachlorocyclopentadiene	µg/L	50	MCL
HCLBZ	Hexachlorobenzene (HCB)	µg/L	1	MCL

Chemical Abbreviation (Web Tool)	Chemical Name	Units	Comparison Concentration Value	Comparison Concentration Type
HEPTACHLOR	Heptachlor	µg/L	0.01	MCL
HEPT-EPOX	Heptachlor Epoxide	µg/L	0.01	MCL
HG	Mercury	µg/L	2	MCL
MOLINATE	Molinate	µg/L	20	MCL
MTBE	MTBE (Methyl-tert-butyl ether)	µg/L	13	MCL
MTXYCL	Methoxychlor	µg/L	30	MCL
NI	Nickel	µg/L	100	MCL
NNSM	N-Nitrosodimethylamine (NDMA)	µg/L	0.01	NL
NO2	Nitrite as N	MG/L	1	MCL
NO3N	Nitrate as N	mg/L	10	MCL
OXAMYL	Oxamyl	µg/L	50	MCL
PB	Lead	µg/L	15	Action Level
PCA	1,1,2,2 Tetrachloroethane (PCA)	µg/L	1	MCL
PCATE	Perchlorate	µg/L	6	MCL
PCB1016	Polychlorinated Biphenyls (PCBs)	µg/L	0.5	MCL
PCE	Tetrachloroethene (PCE)	µg/L	5	MCL
PCP	Pentachlorophenol (PCP)	µg/L	1	MCL
PICLORAM	Picloram	mg/L	0.5	MCL
RA-226	Radium 226	pCi/L	5	MCL
RA-228	Radium 228	pCi/L	5	MCL
SB	Antimony	µg/L	6	MCL
SE	Selenium	µg/L	50	MCL
SILVEX	2,4,5-TP (Silvex)	µg/L	50	MCL
SIMAZINE	Simazine	µg/L	4	MCL
SR-90	Strontium 90	pCi/L	8	MCL
STY	Styrene	µg/L	100	MCL
TBME	Bromoform (THM)	µg/L	80	MCL
TCA111	1,1,1-Trichloroethane	µg/L	200	MCL
TCA112	1,1,2-Trichloroethane	µg/L	5	MCL
TCB124	1,2,4- Trichlorobenzene (1,2,4 TCB)	µg/L	5	MCL

Chemical Abbreviation (Web Tool)	Chemical Name	Units	Comparison Concentration Value	Comparison Concentration Type
TCDD2378**	2,3,7,8-Tetrachlorodibenzodioxin (Dioxin)	µg/L	3.00E-05	MCL
TCE	Trichloroethene (TCE)	µg/L	5	MCL
TCLME	Chloroform (THM)	µg/L	80	MCL
TCPR123	1,2,3-Trichloropropane (1,2,3 TCP)	µg/L	0.005	MCL
THIOBENCARB	Thiobencarb	µg/L	70	MCL
THM	Total Trihalomethanes	µg/L	80	MCL
TL	Thallium	µg/L	2	MCL
TOXAP	Toxaphene	µg/L	3	MCL
U	Uranium	pCi/L	20	MCL
VC	Vinyl Chloride	µg/L	0.5	MCL
XYLENES	Xylenes (total)	µg/L	1750	MCL

*Since there is currently no MCL for Hexavalent Chromium (CrVI, a temporary comparison value was used to remain consistent with the risk assessment for public water systems.

**No data for 2,3,7,8-Tetrachlorodibenzodioxin (Dioxin) was available for this analysis, because there are no samples from wells that met our depth and time criteria.

DEPTH FILTER

Most available groundwater quality data is sourced from public (municipal) supply wells. This is a result of California's requirement for monitoring and reporting of groundwater from wells that are part of a public water system that supplies water to 15 or more service connections. In contrast, domestic wells (any system that serves less than 5 connections) and state small water systems (5 – 14 connections) are not regulated by the state and therefore lack comprehensive data.

For many regions, municipal supply wells access a deeper portion of the groundwater resource when compared with domestic wells. This deeper groundwater is typically less affected by contaminants introduced at the ground surface than shallower groundwater. As a result, use of data from municipal wells would likely result in a systematically low bias for an estimate of the shallower groundwater typically accessed by domestic wells.

Accordingly, staff developed a method to filter data that more likely represents shallower groundwater accessed by domestic wells, as summarized below.

Since well depth varies throughout the state, a domestic depth zone was defined numerically for each groundwater unit[224] based on Total Completed Depth statistics from the Online System of Well Completion Reports (OSWCR) database. Based on well depth data in the OSCWR database, a well depth interval per groundwater unit was determined for wells classified as domestic and for wells classified as public (Figure B1). These well depth statistics were then compared to assess whether domestic and public well depth intervals overlap, which indicates that they access the same groundwater source. For groundwater units where the depth interval for public and domestic wells overlapped (or the public interval was shallower) water quality data from public wells was included in the analysis. For groundwater units where the depth interval for public wells was deeper than the depth interval for domestic wells, water quality data from public wells was screened out of the analysis. For details on the maximum domestic well depth and the comparison of public and domestic wells for each groundwater unit, see Attachment B1.[225]

Figure B1 illustrates the numeric depth filter which is based on the average of section maximum/minimum well depths per Groundwater Unit. Wells with a known depth that fall within the "domestic well depth interval" are included in the analysis. Wells with a known depth that fall outside the "domestic well depth interval" are screened out of the analysis. For wells without a known depth - if the "public bottom" depth of a Groundwater Unit is shallower or within 10% of the "domestic bottom" depth, then wells classified as public are included in the analysis. If the "public bottom" depth of a Groundwater Unit is more than 10% deeper than the "domestic bottom" depth, then wells classified as public are screened out of the analysis.

[224] This project uses Groundwater Units as areas of analysis. Groundwater Units consist of groundwater basins as defined by DWR Bulletin 118 (https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/B118-Interim-Update-2016.pdf), and the connecting upland areas associated with each of these basins as delineated by the USGS (https://www.sciencedirect.com/science/article/pii/S2214581814000305?via%3Dihub). Use of Groundwater Units results in coverage of the entire state. Averaging of well depths and groundwater quality within a Groundwater Unit was considered reasonable based on the assumed relative consistency of hydrogeologic conditions within each Unit.

[225] Attachment B1 lists the depth filter output for each groundwater unit in California. The table shows the ID, name, maximum domestic depth (in feet) and whether that groundwater unit has domestic and public wells at similar depths. The numeric value in the third column indicates the domestic depth maximum cutoff – only wells with shallower depths are used to estimate domestic/state small water quality. A "no" in the final column indicates that domestic and public wells are accessing different groundwater depths, and public wells are not used to estimate domestic/state small water quality when well depth is unknown. A "yes" in the final column indicates that domestic and public wells are accessing similar groundwater depths, and public wells are used to estimated domestic/state small water quality when well depth is unknown.
Depth filtered by groundwater unit arm
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=55258176731a4cefb24fc571d8136276

Figure B1: Numeric Depth Filter

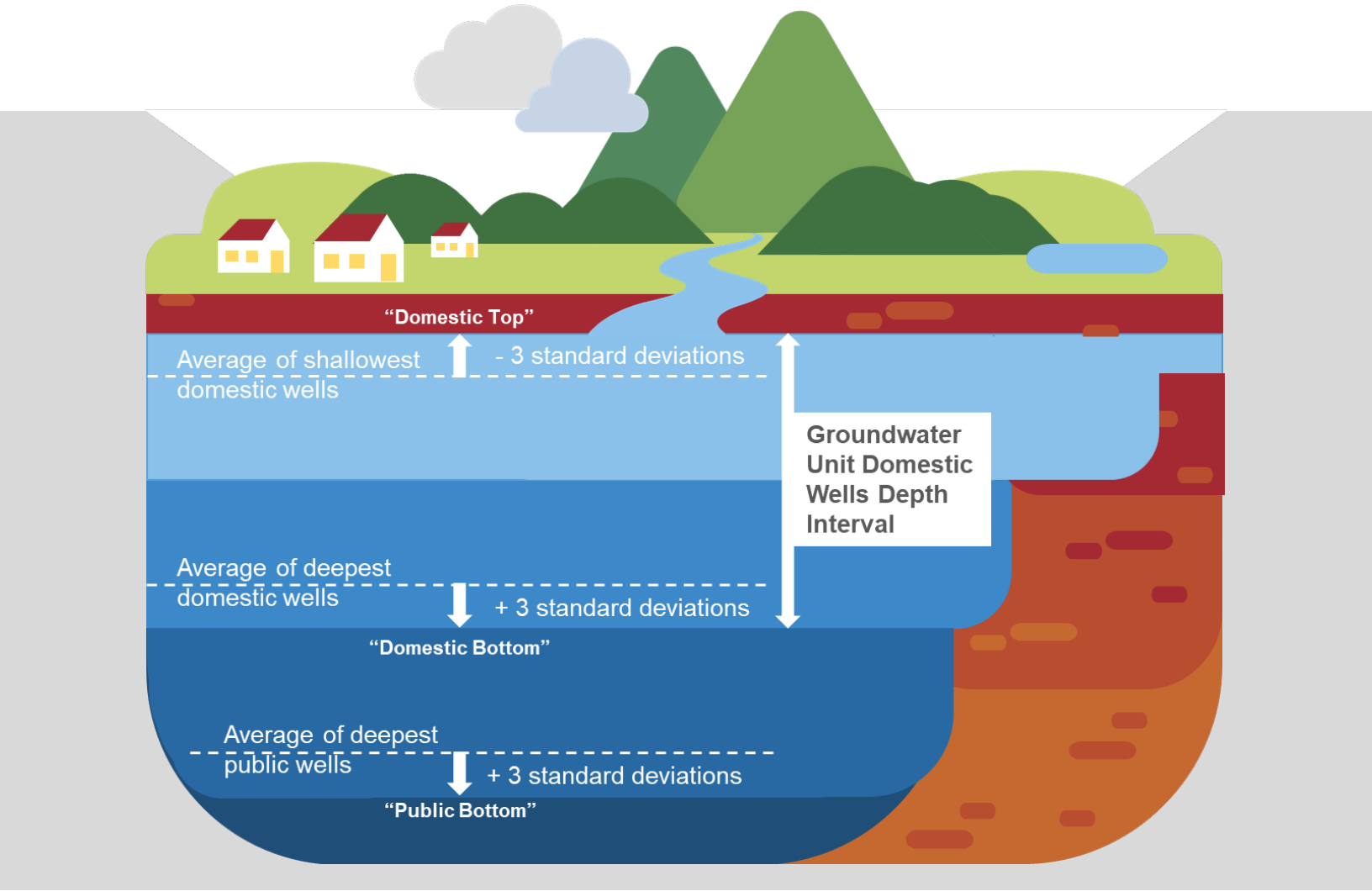
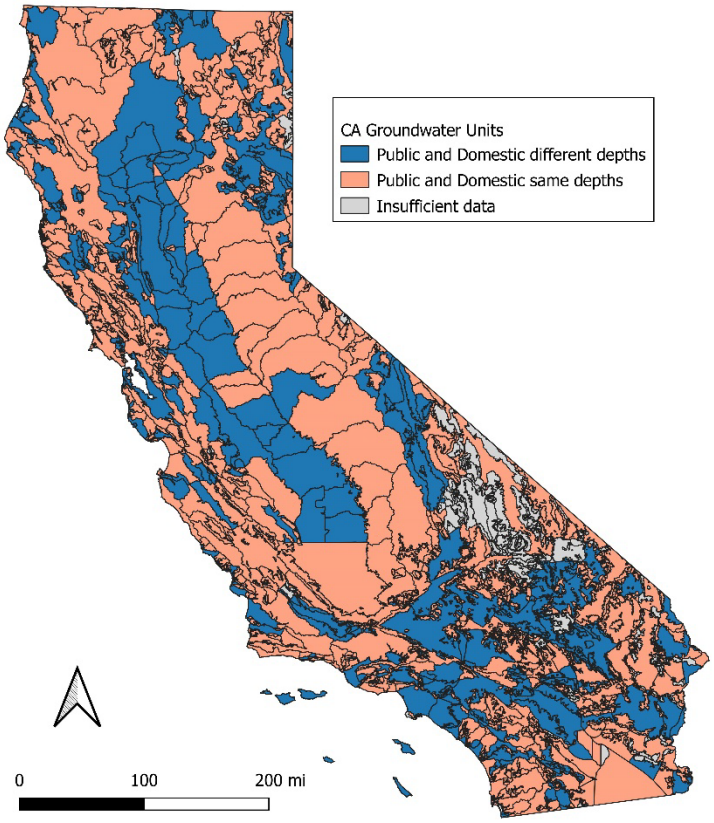


Figure B2 illustrates the depth filter by well type (for wells with unknown depth) in California. This map shows basins where domestic wells and public wells may be accessing similar groundwater depths (pink) and basins where domestic wells and public wells are accessing different groundwater depths (blue). For the basins show in pink, public wells were used as a proxy for domestic depth water quality.

Figure B2: Depth by Well Type



Most wells with water quality data do not have well construction data (indicating the depth of well or screen interval). Wells with depth data were filtered based on their numeric well construction; wells without numeric construction data were filtered by well type.

Wells with Known Numeric Depths

Staff used OSWCR Total Completed Depth section summary statistics to determine a "Domestic Bottom" and "Domestic Top" depth for each Groundwater Unit. The domestic well depth zone was defined as the range between "Domestic Bottom" depth[226] and "Domestic Top" depth[227]. For Group 1 wells, if the given depth of the well fell between the "Domestic Top" depth and the "Domestic Bottom" depth, water quality data from that well was included in the analysis.

[226] Domestic Bottom = average of section maximum domestic well depths (from OSWCR) plus 3 standard deviations of section maximum well depths for each groundwater unit.

[227] Domestic Top = average of section minimum domestic well depths (from OSWCR) minus 3 standard deviations of section minimum well depths for groundwater unit.

Wells with Unknown Numeric Depths

Staff used OSWCR well depth information to compare "Domestic Bottom" depth (defined above) to "Public Bottom" depth[228] (defined below). If the "Public Bottom" depth for a given Groundwater Unit was shallower than the "Domestic Bottom" depth, or within 10% of "Domestic Bottom" depth (shallower or deeper), then it was considered reasonable to include data from public wells into the analysis for that Groundwater Unit. If the "Public Bottom" depth for a given Groundwater Unit was more than 10% deeper than the "Domestic Bottom" depth, water quality data from public wells was screened out of the analysis for that Groundwater Unit.

DE-CLUSTERING

Available water quality results were spatially and temporally de-clustered to square mile sections to account for differences in data sampling density within each section over space and time. This was conducted to prevent certain areas with a high density of wells and frequent sampling to achieve a disproportionate weighting to the overall risk characterization of an area. To expand the coverage of the water quality risk map, averaged, de-clustered data from sections that contain a well(s) that provide water quality data ("source sections") are projected onto neighboring sections that do not include a well providing water quality data.

Water quality data is assessed using two metrics - the long-term (20 year) average and all recent results (within 5 years). The temporal and spatial de-clustering methodology for each metric is outlined below.

Long-Term Average

- Water quality results from each well for each chemical constituent are averaged per year (for the past 20 years).
- The results from step one are averaged per well.
- The results from step two are averaged for all the wells that lie within a section.
- For sections that do not contain a well with water quality data, the de-clustered data from step three are projected onto adjacent sections.

Recent Results

- All recent (within the past 5 years) results in a section are categorized as "under" (less than 80 percent of MCL), "close" (80 percent – 100 percent of MCL), or "over" (greater than MCL).
- The count of recent results in each category are summarized per square mile section for each constituent.
- For square mile sections that do not contain a well with recent water quality data, the results from step two is averaged for all adjacent sections.

[228] Public Bottom = average of section maximum public well depths (from OSWCR) plus 3 standard deviations of section maximum well depths for groundwater units.

NORMALIZING WATER QUALITY RISK DATA

In summary, the Aquifer Risk Map uses available raw source groundwater quality data to estimate the water quality risk to state small water systems and domestic wells. For the combined Risk Assessment for state small water systems and domestic wells, the 2022 Aquifer Risk Map data is normalized into four risk bins summarized in Table B2.

Table B2: Normalizing Aquifer Risk Map Results

Aquifer Risk Map Result	Normalized Risk Score	Risk Level
No nearby water quality data available for any contaminants.	N/A	Unknown Risk
Water quality estimates for all measured contaminants is below 80% of the MCL.	0	Low Risk
Water quality estimates for one or more contaminants is between 80% - 100% of the MCL.	0.25	Medium Risk
Water quality estimates for one or more contaminants is above the MCL.	1	High Risk

Since the water quality risk estimates are limited to areas within ~2 miles of a well with water quality data, much of the state is assigned the “unknown risk”. However, there majority of state small water systems and domestic well locations do have water quality data (89% of state small water systems and 78% of domestic wells have known water quality risk estimates).

WATER SHORTAGE (DWR WATER SHORTAGE VULNERABILITY TOOL)

The drought and water shortage risk scores are from the DWR’s Drought Risk Vulnerability Tool for Self-Supplied Communities. The complete methodology for this analysis is available online.[229] In summary, the DWR assessment utilizes a suite of risk factors to assess drought and water shortage risk for census block groups with self-supplied communities (reliant on domestic wells), including exposure to hazard, climate change, physical vulnerability, socioeconomic vulnerability, and record of outages. For the combined Risk Assessment for state small water systems and domestic wells, the DWR drought and water shortage risk scores were normalized into four risk bins summarized in Table B3.

Table B3: Normalizing DWR Water Shortage Vulnerability Results

DWR Drought Assessment Result	Normalized Risk Score	Risk Level
No drought and water shortage risk scores are available for this area.	N/A	Unknown Risk

[229] Methodology for DWR Water Shortage Vulnerability Tool
https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/CDAG/Part-2-Appendix-1-Scoring-Method-Final.pdf

DWR Drought Assessment Result	Normalized Risk Score	Risk Level
Below top 25% of block groups most at risk for drought and water shortage.	0	Low Risk
Top 25% of block groups most at risk for drought and water shortage.	0.25	Medium Risk
Top 10% of block groups most at risk for drought and water shortage.	1	High Risk

The DWR drought and water risk assessment for self-supplied communities used census block groups as the area of analysis. In order to accurately combine this data with the Aquifer Risk Map results and overlay with the count of state small water systems and domestic wells at high- risk for both variables, the drought and water shortage risk scores were converted to public land survey system (PLSS) square mile sections. To do this, the risk score for each block group was assigned to every PLSS section within the block group. For sections that overlapped one or more block groups, the highest overlapping water shortage risk score was assigned to the section.

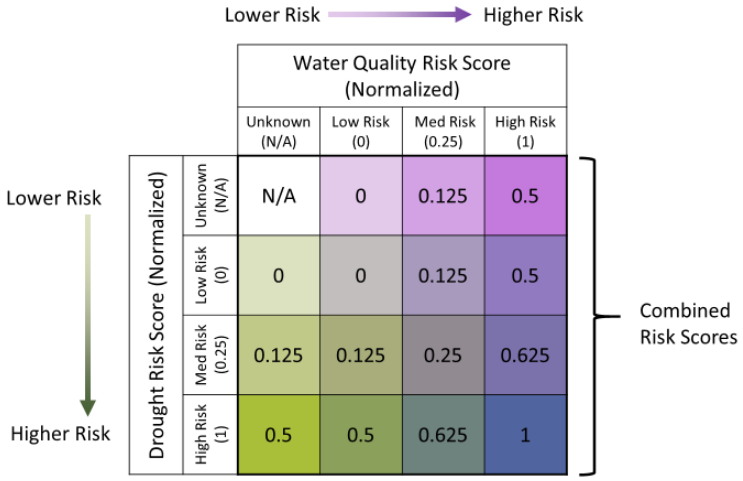
COMBINED RISK

The two variables of drought risk and water quality risk were combined following a similar methodology as the combined Risk Assessment for public water systems. The normalized scores for water quality and drought risk for each PLSS section were added together and divided by the number of variables (two). Unlike the Risk Assessment for public water systems, the calculation does not adjust the denominator for missing data. This approach is recommended to reduce the bias (higher risk score) for locations that are missing data.

Equation B1: Combined Risk Score Calculation Method

$$\text{Combined Risk Score} = \frac{\text{Normalized Water Quality Risk Score} + \text{Normalized Drought Risk Score}}{2}$$

Figure B3: Example of Combined Risk Scores for each PLSS Section



These combined risk scores are converted into risk designations, as shown in Table B4.

Table B4: Combined Risk Scores and Designations

Combined Risk Score	Combined Risk Designation
N/A (-99)	Not Assessed
0	Not At-Risk
0.125	Not At-Risk
0.25	Potentially At-Risk
0.5	Potentially At-Risk
0.625	At-Risk
1	At-Risk

The 2022 combined Risk Assessment assessed 1,273 state small water systems and 312,187 domestic wells. State small water system locations were provided to the State Water Board through county reporting required through SB 200. Domestic well locations were sourced from the Online System for Well Completion Records[230] (managed by DWR) and consist of "domestic" type well records, excluding those drilled prior to 1970 and excluding any destruction records. To calculate the state small water system and domestic well statewide results the total number of system and well records in each combined risk designation bin were summed. To calculate the county results the square mile section boundaries were intersected with county boundaries and the count of wells and systems were apportioned to each county based on intersecting area.

[230] The Department of Water Resources Online System for Well Completion Reports (OSWCR) https://data.ca.gov/dataset/well-completion-reports

The socioeconomic analysis for areas with a domestic well or state small water system was calculated by assigning demographic and CalEnviroScreen 4.0 data to all intersecting square mile sections, then grouping the sections by their 2022 Needs Assessment Combined Risk category and calculating averages or counts for each risk bin. For square mile sections that overlapped more than one census tract/block group, the data from the maximum overlapping tract/block group was used. For the domestic well analysis, only square miles sections with at least one domestic well record were used to calculate the averages. For the state small water system analysis, only square mile sections with at least one state small water system location were used to calculate the averages. The number of domestic well records or state small water systems was not used to weight the socioeconomic data, meaning that this analysis is just of *areas* with domestic wells or state small water systems, not a socioeconomic analysis for these systems specifically. This methodology also means that socioeconomic data was area-weighted, because final numbers were calculated by assigning data to square mile sections and then calculating averages. Also, note that several socioeconomic data points used in this analysis (poverty, MHI, and limited English-speaking households) were also used as risk factors in the Water Shortage Vulnerability Tool, which was used to calculate the combined risk score.

APPENDIX C:
DROUGHT INFRASTRUCTURE COST ASSESSMENT

INTRODUCTION

On September 23, 2021, the California legislature passed Senate Bill 552[231] which has requirements for counties and small water systems around drought planning activities. A key requirement of SB 522 is for small water suppliers, defined as community water system (CWS) serving 15 to 2,999 service connections and non-transient, non-community water systems that are K-12 schools, is to implement the following drought resiliency measures (subject to funding availability):

1. No later than January 1, 2023, implement **monitoring systems** sufficient to detect **production well groundwater levels**.
2. Beginning no later than January 1, 2023, **maintain membership in the California Water/Wastewater Agency Response Network (CalWARN)** or similar mutual aid organization.
3. No later than January 1, 2024, to ensure continuous operations during power failures, provide adequate **backup electrical supply**.
4. No later than January 1, 2027, have at least **one backup source** of water supply, **or a water system intertie**, that meets current water quality requirements and is sufficient to meet average daily demand.
5. No later than January 1, 2032, **meter each service connection** and monitor for water loss due to leakages.
6. No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet **fire flow** requirements.

In response to stakeholder feedback and the need to support SB 552 planning, the State Water Board has conducted a targeted Drought Cost Assessment for the 2022 Needs Assessment. The following sections detail the assessment's underlying assumptions and calculation methods. For the purpose of this Cost Assessment, small water systems are CWSs with 15 – 2,999 service connections.

For all requirements, excluding fire flow, K-12 schools and small CWS needs were assessed and matched to their SAFER status. For example: lacking a source backup power was estimated for 274 Failing: HR2W list systems, 387 At-Risk systems and 371 Potentially At-Risk systems.

[231] Senate Bill No. 552, section 10609.62, Chapter 245: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB552

REGIONAL COST ADJUSTMENT

The cost estimates were adjusted for regional cost variance using RSMeans City Cost Index (CCI).[232] The CCI was used to compare and adjust costs between locations. The California CCI shown in Table C1 were applied based on each system's location (Table C2).

Table C1: RSMeans CCI Selected for Locational Cost Estimating

Location	RSMeans CCI	Percent Adjustment
Rural	+ 3.0	0%
Suburban	+ 3.97	+ 32%
Urban	+ 3.89	+ 30%

Table C2: California Counties Categorized by Generalized Model Location

Generalized Model Location	Counties
Rural	Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Madera, Mariposa, Mendocino, Merced, Modoc, Mono, Nevada, Placer, Plumas, San Joaquin, Shasta, Sierra, Siskiyou, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, Yuba
Suburban	Alameda, Contra Costa, El Dorado, Marin, Monterey, Napa, Orange, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Cruz, Solano, Sonoma
Urban	Los Angeles, Riverside, Sacramento, San Diego, San Francisco, San Mateo, Santa Clara, Ventura

INFLATION COST ADJUSTMENT

Current inflation in the construction industry can be attributed to many factors: the increase in demand pulls, increasing raw material cost from suppliers, and rising wage cost in labor market.[233] The increase in inflation can drive-up construction project costs and should be considered when developing cost estimates. The State Water Board applied a 4.7%[234] inflation multiplier to all costed requirements to conservatively adjust for rising inflation.

[232] RSMeans City Cost Index: https://www.rsmeans.com/rsmeans-city-cost-index

[233] Impact of inflation rate on construction projects budget: A review: https://www.sciencedirect.com/science/article/pii/S2090447920300939

[234] Consumer Price Index Data for 2021: https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/

COST ASSESSMENT METHOD PER REQUIREMENT

STATIC WELL LEVEL MONITORING

It is important to measure and monitor static well levels on a regular basis to diagnose well production or capacity issues before problems occur. The estimated inventory of systems that may require a sounder, which is a device that measures water levels without wellhead modifications, was identified based on water system responses to an optional question in the 2020 EAR, Section 5 (Source Inventory) regarding monitoring water level in wells. Water systems with wells that did not respond to this question or responded with "No" were assumed to lack equipment to be in compliance with this SB 552 requirements and were included in this cost estimate.

Cost Assumptions:

- Sounder cost estimate = $1,700[235]
- No well modification costs are assumed to be needed; the device uses sound waves to detect water level.[236]
- Total Cost = Sounder Cost + Regional Multiplier + 4.7% Total Cost Inflation

Table C3: K-12 Schools and Small CWS Monitor Well Level EAR Response by Count

2020 EAR Response	System Count	Failing: HR2W List Systems
No	866	115
Blank or NULL or N/A	347	38
Yes	1,020	136
TOTAL:	**2,233**	**289**

Table C4: K-12 Schools and Small CWS Sounder Cost

Service Connection Range	System Count	Estimated Cost ($)
< 500	1181	$2,390,000
500 - 1,000	13	$26,000
1,001 - 2,999	19	$37,000

[235] The base price is $1,245, the additional cost is shipping, handling and warranty.
Eno Scientific Well Sounder 2010 PRO Water Level Meter: https://www.fondriest.com/eno-scientific-2010p.htm

[236] Well Sounder WS2010 Pro / WS2010 Pro User Manual: https://www.geotechenv.com/Manuals/Eno_Scientific_Manuals/Eno_Scientific_Well_Sounder_2010_User_Manual.pdf

[237] Responding to this question is voluntary in the EAR, so systems may choose to leave it "Blank", or if they did not complete the EAR survey a "NULL" response might populate. Other systems might mistakenly choose N/A, even though they have a well as one of their sources.

Service Connection Range	System Count	Estimated Cost ($)
TOTAL:	**1,213**	**$2,450,000**

MEMBERSHIP WITH CALWARN OR OTHER MUTUAL AID

Membership for CalWARN[238] is currently free, therefore no cost estimate was developed for this SB 552 requirement. The State Water Board is unable to determine how many CWSs are members of CalWARN or other mutual aid organizations currently. However, the State Water Board has included a new question in the 2021 to begin tracking this information.

BACKUP ELECTRICAL SUPPLY

To sustain operations during possible power outages, an onsite backup generator is necessary. The estimated inventory of systems requiring backup power was identified by analyzing 2020 EAR responses to a non-mandatory question in Section 16.A about source auxiliary power supply. Since responses to this question are limited, the State Water Board utilized all (none), (blank), (some) and (null) responses within this analysis. Table C5 summarizes the reported 2020 EAR responses for small CWSs and K-12 schools.

Table C5: Backup Power EAR Response by CWS Count

Response	K-12 Schools and Small CWS Count
None	1,018
Some	402
Blank	392
NULL	60
TOTAL:	**1,872**

Cost Assumptions:

- The cost for each system was identified based on their maximum day demand[239] (MDD), which is based on estimated average daily demand (ADD) of 150 gallon per day, served population, and a peaking factor of 2.25.
- Account for 5% permitting multiplier.

[238] CalWARN Website: https://www.calwarn.org/

[239] Maximum day demand definition in Title 22: “Maximum day demand (MDD) means the amount of water utilized by consumers during the highest day of use (midnight to midnight), excluding fire flow, as determined pursuant to Section 64554.

- The calculated MDD is then used in the equation below to calculate the cost per system.
- Total Cost Estimate ($)[240] = $30,134 + ($341 x MDD) + Regional Multiplier + 5% Total Cost Permitting + 4.7% Total Cost Inflation

Table C6 shows the cost of generators per systems size and the count of systems falling under each range size:

Table C6: K-12 Schools and Small CWS Generators Cost Per Service Connection Range

Connection Range	System Count	Estimated Cost ($)
< 500	1,639	$110,040,000
500 - 1,000	72	$19,510,000
1,001 - 2,999	161	$115,390,000
TOTAL:	**1,872**	**$244,940,000**

BACKUP SOURCE: NEW WELL OR INTERTIE

The estimated inventory of systems was determined by analyzing SDWIS data for the number of active sources per CWS. Any CWS with a single groundwater (well) water source was included in the cost estimate.

- Identified water systems with one active source.
- If a system's one active source is a well, they were included in the analysis.
- If the one active source is an intertie, the water system was excluded from the analysis due to lack of information on whether a new well is feasible in the water system's area.
- If a system's one active source is surface water, they were excluded from this cost estimate because no information is available to estimate water rights costs and availability.

The analysis first looked at the potential feasibility of an intertie. If an intertie is not potentially feasible, then a cost estimate for a new well was calculated.

[240] This equation was developed by Corona Environmental to estimate backup power cost in the 2021 Needs Assessment. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Estimating New Intertie Costs

A spatial analysis was conducted to identify water systems where an intertie with a nearby water system may be feasible:

- Joining systems:[241] using the service area boundaries, a GIS layer was created based on the criteria: any CWS with a single source.
- Receiving systems: using the service area boundaries, a GIS layer was created based on the criteria: any CWS with 3,000 or more service connections.
- Identify joining systems that intersect a receiving system.
- Exclude any joining systems that already have an intertie as their only water source.

Cost Assumptions:[242]

- Buffer for intersects (added pipeline) = 1,000 ft
- Pipeline Cost per ft = $155
- Service line (system connection) =$5,000
- Connection fee ($/connection) = $6,600
- Admin/Legal $200,000
- Apply a 20% contingency = 20% of total cost estimate
- Apply 25% of total cost estimate for planning costs
- Total Cost Estimate = Pipeline cost + Service line cost + Connection fees + Admin/legal fees + 20% Total Cost Contingency + 25% Total Cost Planning + Regional Multiplier + 4.7% Total Cost inflation

Table C7: Estimated K-12 Schools and Small CWS Intertie Costs

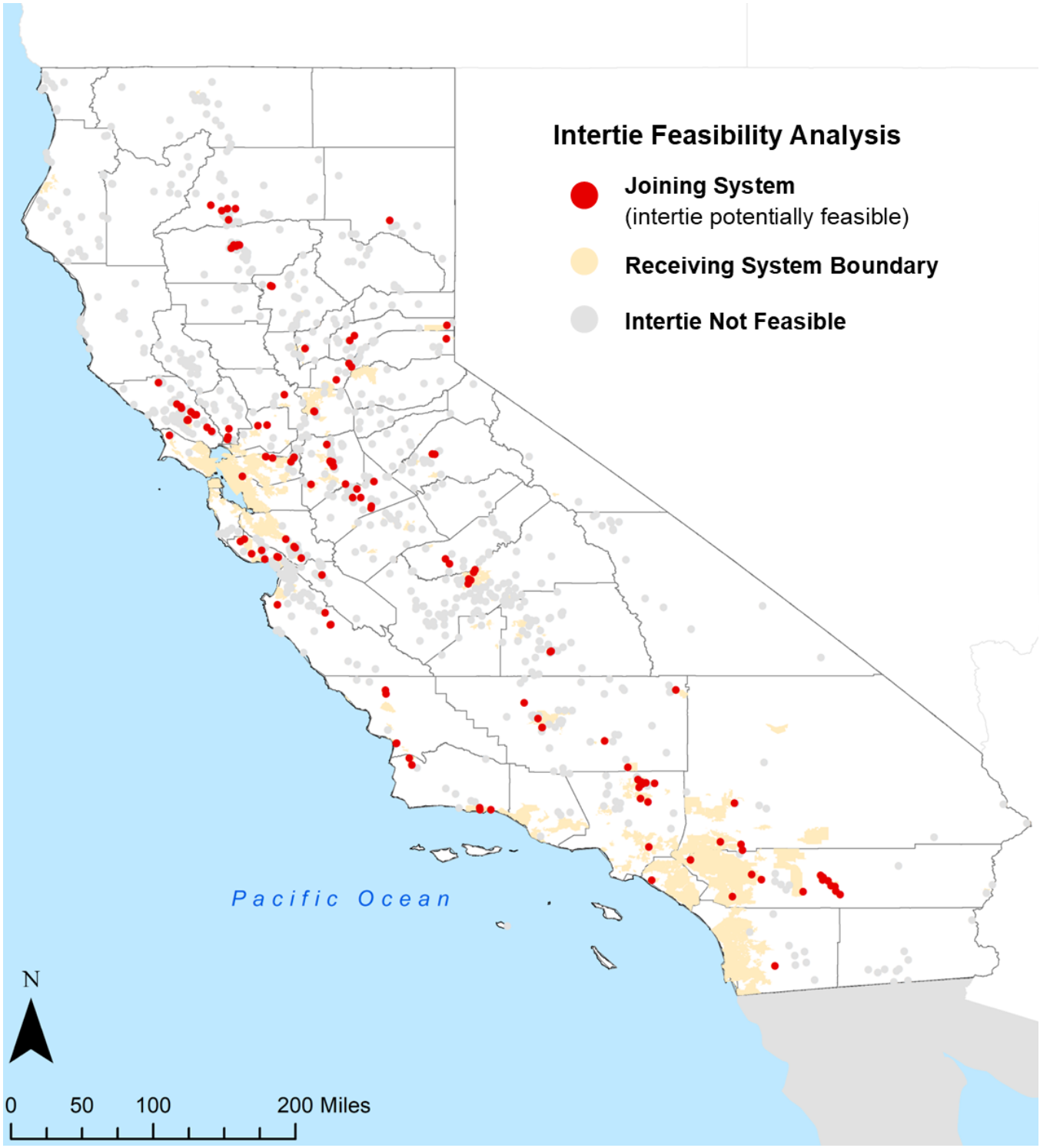
Service Connection Range	System Count	Estimated Cost ($)
< 500	139	$214,210,000
500 - 1,000	1	$6,960,000
1,001 - 2,999	2	$38,810,000
TOTAL:	**142**	**$259,970,000**

[241] Not all joining and/or receiving systems have boundaries, so the number of mapped systems is less than the actual number.

[242] The cost assumptions are based on Corona Environmental physical consolidation estimates used in the 2021 Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

The map below (Figure C1) shows the point locations (red dots) for systems where intertie was a feasible option and point locations (grey dots) where systems did not intersect a larger system, so intertie was not considered feasible.

Figure C1: Map of Feasible Intertie Locations



Estimating New Well Costs

If the construction of an intertie was not determined to be feasible using the methodology described above, the State Water Board estimated the cost of constructing a new well.

Cost Assumptions:

- Well drilling assumed to be for 1,000 ft depth at $1,200,000.[243]
- Required well production equals the Maximum Day Demand (MDD), which is calculated based on an average daily demand of 150 gpm and peaking factor of 2.25.
- $85,000 for CEQA[244]
- $100,000 for SCADA[245]
- Apply 25% of total cost estimate for planning costs.
- Well development Cost =[246] ($145.01 x Well Production (MDD)) + $32,268
- Well Pump and Motor Cost[247] = ($136.73 x Well Production (MDD)) + $116,448
- Total Cost ($) = Well drilling + CEQA+SCADA + Well Development+ Well Pump and Motor + 25% Total Cost Planning and Construction + Regional Multiplier + 4.7% Total Cost Inflation

As illustrated in Table C8, many systems that rely on a single source are systems with 500 service connections or less.

Table C8: Estimated K-12 Schools and Small CWS New Well Costs

Service Connection Range	System Count	Estimated Cost ($)
< 500	752	$1,649,610,000
500 – 1,000	0	$0
1,001 – 2,999	1	$2,010,000
TOTAL:	**753**	**$1,651,620,000**

[243] This cost estimate was developed based on internal and external feedback, also reviewing well installation cost data from various engineering reports.

[244] This cost was developed by Corona Environmental and used in the 2021 Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

[245] Based on vendors recommendations and pricing.

[246]This equation was developed by Corona Environmental and used in the 2021 Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

68: This equation was developed by Corona Environmental and used in the 2021 Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

METER ALL SERVICE CONNECTIONS

Metering service connections at individual households is an important drought mitigation measure because it allows a water system to monitor water usage, identify potential water loss, and may also help customers reduce demand when needed. The inventory of systems lacking meters for some, or all their service connections was identified by analyzing EAR responses to Section 4, specifically the question about the count of un-metered service connections. The highest number of un-metered service connection is attributed to smaller systems with less than 500 service connections.

Cost Assumptions:

Table C9 details the cost estimates for new meters.

- Table C10 summarize the costs estimates for residential water meters by system size.
- Total Cost = Meter Cost + Software + Regional Multiplier + 4.7% Total Cost Inflation

Table C9: Residential Meters Cost Assumptions

Equipment and Software (drive by[248])	1" Meters (drive by)
$29,000[249]	$1,200[250]

Table C10: K-12 Schools and Small CWS Residential Meters Cost Per Service Connection Range

Service Connection Range	System Count	Un-Metered Connections Count	Estimated Cost ($)
< 500	1,189	70,457	$138,990,000
500 – 1,000	31	13,022	$18,880,000
1,001 – 2,999	55	60,525	$87,460,000
TOTAL:	**1,275**	**144,004**	**$245,330,000**

FIRE FLOW

The State Water Board does not have authority to develop or enforce requirements regarding fire flow. Fire flow responsibility and jurisdiction falls to local fire officials. Thus, the State Water Board does not generally collect extensive information regarding fire flow in its standard data

[248] This type of meter allows the meter reader to drive by and take an automated reading, as opposed to a manual reading.

[249] This cost was used by Corona Environmental and utilized in the 2021 Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

[250] Based on public feedback, vendors recommendations, and pricing.

collection processes, such as the electronic annual report. However, the State Water Board recognizes the significant need for adequate fire flow for the protection of communities and public safety, particularly considering climate change impacts.

Due to the lack of available and machine-readable asset inventory, asset condition data and local fire protection requirements, the State Water Board is unable to develop a cost estimate for this SB 552 requirement at this time. The State Water Board will contact the Office of the State Fire Marshall to develop collaborative approaches for determining appropriate fire protection requirements. The State Water Board will explore strategies to collect this information in the future to better identify systems unable to meet fire flow requirements. It is important to note that cost sharing may be appropriate to consider for the fire flow costs given that they are not directly related to drinking water but may still benefit the water system's day to day operations.

APPENDIX D:
AFFORDABILITY ASSESSMENT METHODOLOGY

INTRODUCTION

The purpose of the Affordability Assessment is to identify disadvantaged community (DAC) and severely disadvantages community (SDAC) water systems, that have instituted customer charges that exceed the "Affordability Threshold" established by the State Water Board in order to provide drinking water that meets state and federal standards.[251]

The Affordability Assessment is conducted annually for all California community water systems. It is worth noting that, while there is some overlap, the systems included in the Affordability Assessment differ from the list of water systems analyzed in the Risk Assessment for public water systems. The Affordability Assessment includes large and small community water systems but excludes non-transient, non-community water systems, like schools. The Risk Assessment, on the other hand, analyzed smaller public water systems with less than 30,000 service connections or that served a population of less than 100,000 people and non-transient non-community K-12 schools were included. Both assessments exclude all community water system wholesalers, transient water systems, state small water systems and domestic wells. Table D1 provides an overview of the systems included in the Affordability Assessment.

Table D1: Systems Included in the Affordability Assessment

SAFER Program Status	Risk Assessment	Affordability Assessment
HR2W List Systems	346	295
At-Risk Systems	785	459
Not HR2W or At-Risk System	2,212	1,946
Not Assessed	N/A	168
TOTAL:	**3,066**	**2,868**

The difference in the number of Failing: HR2W list systems and At-Risk systems between the Risk Assessment and Affordability Assessment in Table D1 can be attributed to the exclusion of K-12 schools in the Affordability Assessment. K-12 schools do not typically charge customers for water. Since all four of the affordability indicators utilized in the Affordability

[251] California Health and Safety Code, section 116769, subd. (a)(2)(B).

Assessment as associated with customer charges data, they needed to be excluded.

AFFORDABILITY INDICATORS

In 2020, the State Water Board conducted an Affordability Assessment for community water systems, which analyzed one affordability indicator, water charges as a percent of median household income (%MHI), for the FY 2020-21 Safe and Affordable Drinking Water Fund Expenditure Plan.[252] From April through October 2020, the State Water Board and UCLA conducted extensive research and public engagement to identify potential affordability indicators that could be used to identify disadvantaged communities (DAC)[253] and Severely Disadvantaged Communities (SDAC)[254] that may be experiencing affordability challenges.[255] This effort identified 23 potential affordability indicators (white paper, Table 10). [256] In 2021, the State Water Board selected two new affordability indicators from the list of 23 to incorporate into the 2021 Risk Assessment and 2021 Affordability Assessment. These two indicators were: 'Extreme Water Bill' and '% Shut-offs.'

In 2020 Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021.[257] Therefore, data for '% Shut-offs' was unavailable for the majority of 2020 and was not collected from water systems in the 2020 Electronic Annual Report (EAR). Thus, the State Water Board has removed this affordability indicator from the 2022 Needs Assessment.

The State Water Board has replaced '% Shut-offs' with two new affordability indicators: 'Percentage of Residential Arrearages' and 'Residential Arrearage Burden.' These new risk

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[252] The Fund Expenditure Plan used an affordability threshold of 1.5% MHI to identify DAC water systems that may have customer charges that are unaffordable: FY 2020-21 Fund Expenditure Plan https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf

[253] Disadvantaged Community or DAC mean the entire service area of a community water system, or a community therein, in which the median household income is less than 80 percent of the statewide annual median household income level.

[254] Severely Disadvantaged Community or SDAC means the entire service area of a community water system in which the median household income is less than sixty percent of the statewide median household income.

[255] The identification of additional affordability indicators was undertaken in conjunction with the identification of possible affordability risk indicators for the Risk Assessment. A full list of potential affordability indicators considered can be found in the white paper *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems:* October 7, 2020 White Paper: Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[256] October 7, 2020 White Paper: Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[257] Governor Newsom Executive Order https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/

indicators are meant to identify water systems that have a community that is experiencing household affordability challenges and are a direct measure of household drinking water affordability.

Table D2: Recommended Affordability Indicators

Affordability Indicator	Affordability Assessment
Percent of Median Household Income (%MHI)	2020, 2021, 2022
Extreme Water Bill	2021, 2022
% Shut-Offs	2021, removed for 2022
% of Residential Arrearages	2022
Residential Arrearage Burden	2022
Household Burden Indicator (HBI)	*Future*
Poverty Prevalence Indicator (PPI)	*Future*

AFFORDABILITY ASSESSMENT METHODOLOGY

DAC & SDAC DETERMINATION

SB 200 requires the identification of DAC and SDAC systems that meet the Affordability Threshold. For the purposes of the Affordability Assessment, the State Water Board determined DAC and SDAC economic status for water systems using available data.

> **Disadvantaged Community** or DAC means the entire service area of a community water system, or a community therein, in which the MHI is less than 80% of the statewide annual MHI level.
>
> **Severely Disadvantaged Community** or SDAC means the entire service area of a community water system in which the MHI is less than 60% of the statewide MHI.

The State Water Board used the methodology detailed below to estimate MHI. **It is important to note that the estimated designation of community economic status is for the purposes of the Affordability Assessment only and will not be used by the State Water Board's Division of Financial Assistance (DFA) to make funding decisions.** Further MHI analysis on a per system basis will be conducted by DFA when a system seeks State Water Board assistance.

Table D3: Water System Community Economic Status for the Affordability Assessment

Community Economic Status	Total Systems	HR2W List Systems	At-Risk Systems
DAC	565	54	101
SDAC	843	130	175

Community Economic Status	Total Systems	HR2W List Systems	At-Risk Systems
Non-DAC	1,287	94	154
Missing DAC Status	173	17	29
TOTAL:	**2,868**	**295**	**459**

AFFORDABILITY INDICATOR CALCULATIONS

PERCENT OF MEDIAN HOUSEHOLD INCOME (%MHI)

This indicator measures the annual system-wide average residential water bill for six hundred cubic feet (HCF) per month relative to the annual Median Household Income (MHI) within a water system's service area.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Water system service area boundaries: SABL
- Block group-Income in the Past 12 Months: 2019 U.S. Census Bureau's American Community Survey
- Drinking Water Customer Charges: 2020 Electronic Annual Report (EAR)
- Other Customer Charges: 2020 EAR

Average monthly drinking water customer charges is collected through the EAR. Historically this data has not been required for reporting leading to poor data coverage and accuracy issues. Extensive changes have been made to the 2020 Electronic Annual Report making reporting customer charges mandatory with checks in place to improve the data quality. In addition to the changes made to the EAR, over 600 water systems' customer charges were reviewed and edited manually by State Water Board staff.

Risk Indicator Calculation Methodology:

Median household income (MHI) is determined for a water system using American Community Survey data for household income. Community water system boundaries typically do not align with census boundaries where per capita income data is regularly collected. To assign an average median household income to a community water system spatially weighted income data is aggregated by census block group within the water system service area.

The methodology for this indicator was based on the Division of Financial Assistance (DFA) MHI methodology. While the MHI calculation methodology for the Affordability Assessment generally aligns with the Division of Financial Assistance's (DFA) MHI determination methodologies, there are slight differences. The differences found in the calculation of MHI's for cities and census designated places and in the application of the Margin of Error (MOE).

The DFA methodology dictates that when it is determined that a system boundary exactly matches city boundaries or closely matches a census designated place boundary, the MHI for the entire city or census designated place should be directly applied to the system rather than using areally-interpolated block group data. This likely leads to more accurate MHI estimation in these cases. However, this method was not used in the Needs Assessment given that a case-by-case determination of matching of cities and census designated places to system boundaries was not feasible for the entire state. The MHI for each water system is a population weighted MHI, using census block group area and population data. A population factor is generated based on the area of each census block group that falls within the water system boundary. The water system MHI is then calculated using population adjusted MHIs for each census block group that falls within the water system boundary using the formula below:

Equation D1: MHI Calculation

$$\sum \frac{(Block\ Group\ MHI) \times (Adjusted\ Block\ Group\ Population)}{(Total\ Adjusted\ Block\ Groups\ Population)}$$

MOE for MHI American Community Survey data is also included in the MHI calculation. A population adjusted MOE is found using the same methodology described for MHI. The lower range of the MOE will be applied to a community's estimated MHI up to a maximum MOE value of $7,500 for communities with more than 500 people and $15,000 for communities with 500 or fewer people. The MOE will be subtracted from the estimated MHI.

The DFA methodology uses a lower bound MHI by subtracting the block group MOE from the block group MHI, with limits based on community size prior to applying the population factor to MHI and MOE. The methodology applied in the Needs Assessment set margin of error limits and then applied them to population adjusted MHI figures, resulting in slightly different community water system MHI calculations than the DFA methodology.

As a result of these slight variations and the changing nature of household income, all funding related financial assessments must be completed by the DFA as their assessments are water system specific as opposed to the aggregated analysis done for the purposes of the Needs Assessment.

Average monthly drinking water customer charges are calculated using:

- Drinking water service costs estimated at six HCF Feet per month. This level of consumption is in line with statewide conservation goals of 55 gallons per capita per day, in an average 3-person household.
- When data becomes available, additional approximated customer charges (not collected through a customer's bill) will be added to this figure to calculate Total Drinking Water Customer Charges.

%MHI = [Average Monthly Drinking Water Changes] / [MHI]

Threshold Determination
%MHI is commonly used by state and federal regulatory agencies and by water industry

stakeholders for assessing community-wide water charges affordability for decades. %MHI is utilized by the State Water Board (at 1.5% threshold) and the U.S. EPA (at 2.5% threshold) for assessing affordability. The State Water Board and DWR use %MHI to determine Disadvantaged Community (DAC) status, among other income-related metrics. DAC status is often used to inform funding eligibilities for different financial programs offered by the State and other agencies. OEHHA's Human Right to Water (HR2W) Tool also utilizes[258] the thresholds determined by the State Water Board for this indicator.[259] Other states, including North Carolina,[260] presently or have recently used 1.5% of MHI spent on water and sewer costs as a threshold for water system funding decisions.

Indicator Scoring & Weighting

To enable the evaluation and comparison of affordability indicators, a standardized scale between 0 and 1.5 for affordability scores has been applied to each affordability indicator threshold. Table D4 summarizes the thresholds and scores for this affordability indicator.

Table D4: %MHI Affordability Thresholds & Scores

Threshold Number	Threshold	Score
0	**Below 1.5%** MHI	0
1	**1.5% to 2.49%** MHI	1
2	**2.5% MHI or greater**	1.5

Indicator Analysis

State Water Board staff analyzed 2,868 community water systems, of which approximately 263 systems lacked the data necessary to calculate %MHI. Of the 2,605 water systems with sufficient data, 285 (10%) water systems exceeded the minimum 1.5% MHI affordability threshold, 214 (7%) of which exceeded the maximum 2.5% threshold. Of those, 377 systems were identified that serve DAC/SDACs. Table D5 and Table D6Table D6 summarize the full results of this indicator analysis. The full results from the affordability threshold calculations are included in Attachment D1.[261]

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[258] There has been criticism of this metric by academics, water system associations, and the broader water sector mostly around its accuracy in measuring household affordability for those truly in need and the setting of arbitrary %MHI thresholds, limitations which the U.S. EPA has recently acknowledged.

[259] Arkansas Natural Resources Commission (2020). Safe Drinking Water Fund Intended Use Plan SFY 2019: https://www.agriculture.arkansas.gov/wp-content/uploads/2020/05/0_-_2019_DWSRF_IUP_-_AMENDED_January_2019_01082019_1156hrs.pdf

[260] North Carolina Department of Environmental Quality, Joint Legislative Economic Development and Global Engagement Oversight Committee (March 17, 2016) https://www.ncleg.gov/DocumentSites/Committees/JLEDGEOC/2015-2016/Meeting%20Documents/3%20-%20March%2017,%202016/2%20%20DEQ_Kim%20Colson%20Water%20Infrastructure%20JLOC%20EDGE%20160317.pdf

[261] 2022 Affordability Assessment Data and Results: Attachment D1 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022affordability.xlsx

Table D5: % MHI Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (1.5%)	Threshold 2 Met (2.5%)
DAC/SDAC	1,408	62 (4%)	523 (37%)	446 (32%)	201 (14%)	176 (13%)
Non-DAC	1,287	28 (2%)	346 (27%)	791 (61%)	84 (7%)	38 (3%)
TOTAL:	**2,868**	**263 (9%)**	**869 (47%)**	**1,237 (43%)**	**285 (10%)**	**214 (7%)**
Missing DAC Status	*173*					

Table D6: %MHI Assessment Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (1.5%)	Threshold 2 Met (2.5%)
Failing: HR2W Systems	**295**	**25 (8%)**	**97 (33%)**	**91 (24%)**	**43 (10%)**	**39 (25%)**
HR2W DAC/SDAC	184	6	65	47	32	34
At-Risk Systems	**459**	**52 (11%)**	**163 (36%)**	**110 (24%)**	**64 (14%)**	**70 (15%)**
At-Risk DAC/SDAC	276	16	110	48	44	58
Not HR2W or At-Risk System	**1,946**	**159 (8%)**	**567 (29%)**	**941 (48%)**	**176 (9%)**	**103 (5%)**
DAC/SDAC	907	39	334	329	123	82
TOTAL:	**2,868**	**263 (9%)**	**869 (30%)**	**1,237 (43%)**	**285 (10%)**	**214 (7%)**
Missing SAFER Status:	*168*					

EXTREME WATER BILL

This indicator measures drinking water customer charges that meet or exceed 150% of statewide average drinking water customer charges at the six hundred cubic feet (HCF) level of consumption.

Calculation Methodology
Required Indicator Data Points & Sources:

- Drinking Water Customer Charges: 2020 EAR
- Other Customer Charges: 2020 EAR

Indicator Calculation Methodology:

Extreme Water Bill for a water system is determined using Average Monthly six HCF Drinking Water Customer Charges and Other Customer Charges divided by the State's Monthly Average Drinking Water Charges. The Risk Assessment is applied to water systems with less than 3,300 service connections; however, this methodology utilizes the statewide average customer charges to calculate extreme water bill, which includes systems with greater than 3,300 service connections. Due to data quality concerns, water systems that reported less than $5 or greater than $500 in monthly customer charges for six HCF were excluded from the analysis and the calculated statewide average.

Threshold Determination
The State Water Board's AB 401 report[262] recommended statewide low-income rate assistance program elements utilize the two recommended tiered indicator thresholds of 150% and 200% of the state average drinking water bill for six HCF.

Indicator Scoring & Weighting
To enable the evaluation and comparison of affordability indicators, a standardized scale between 0 and 1.5 for affordability scores has been applied to each affordability indicator threshold. Table D7 summarizes the thresholds and scores for this affordability indicator.

Table D7: Extreme Water Bill Affordability Thresholds & Scores

Threshold Number	Threshold	Score
0	**Below 150%** of the statewide average.	0
1	**Greater than 150%** of the statewide average.	1
2	**Greater than 200%** of the statewide average.	1.5

Indicator Analysis
State Water Board staff analyzed 2,868 community water systems, of which approximately 524 water systems lacked the data necessary to estimate water rates. Of the 2,344 water systems with sufficient data, 127 (4%) systems exceeded the minimum 150% extreme water bill affordability threshold and 147 (5%) exceeded the maximum 200% threshold. Of those that

[262] AB 401 Final Report: https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

exceeded the 150% extreme water bill affordability threshold, 96 systems serve DAC/SDACs. Table D8 and Table D9 summarize the full results of this indicator analysis. The tables of the full results from the affordability threshold calculations are included in Attachment D1.[263]

Table D8: Extreme Water Bill Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (150%)	Threshold 2 Met (200%)
DAC/SDAC	1,408	191 (14%)	394 (28%)	727 (51%)	44 (3%)	52(4%)
Non-DAC	1,287	160 (12%)	214 (17%)	735 (57%)	83 (6%)	95 (7%)
TOTAL:	**2,868**	**524 (18%)**	**608 (21%)**	**1,462 (51%)**	**127 (4%)**	**147 (5%)**
Missing DAC Status	*173*					

Table D9: Extreme Water Bill Assessment Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	N/A	Missing	Threshold Not Met	Threshold 1 Met (150%)	Threshold 2 Met (200%)
Failing: HR2W Systems	**295**	**73 (25%)**	**49 (17%)**	**136 (46%)**	**19 (6%)**	**18 (6%)**
HR2W DAC/SDAC	184	52	19	98	8	7
At-Risk Systems	**459**	**126 (27%)**	**89 (19%)**	**175 (38%)**	**28 (6%)**	**41 (9%)**
At-Risk DAC/SDAC	276	86	40	117	15	18
Not HR2W or At-Risk System	**1,946**	**389 (20%)**	**337 (17%)**	**1,054 (54%)**	**80 (4%)**	**86 (4%)**
DAC/SDAC	907	250	123	488	21	25
TOTAL:	**2,868**	**608 (21%)**	**524 (18%)**	**1,462 (51%)**	**127 (4%)**	**147 (5%)**
Missing SAFER Status:	*168*					

[263] 2022 Affordability Assessment Results and Data: Attachment D1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022affordability.xlsx

PERCENTAGE OF RESIDENTIAL ARREARAGES

The purpose of this indicator is to identify water systems that have high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due. The higher the percentage of residential customers, the more vulnerable the community is to affordability challenges.

Calculation Methodology

Required Indicator Data Points & Sources:

- Total number of residential accounts in arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Indicator Calculation Methodology:

Equation D2: Percentage of Residential Arrearages

$$\frac{\textit{Total Number of Residential Accounts in Arrears}}{\textit{Total Number of Residential Accounts}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program, for example investor-owned utilities with multiple water systems, were excluded from the calculation of this affordability indicator because the State Water Board is unable to disaggregate the number of residential accounts in arrears by individual public water system ID (PWSID).

Threshold Determination

An indicator threshold for the percent of residential arrearages, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board utilized a 10% threshold for the risk indicator "% Shut-offs for Non-Payment" in the 2021 Risk Assessment.[264] This risk indicator is similar in that it measured residential customers that were unable to pay their water bills and had their water shut-off. Therefore, the State Water Board has developed a tiered threshold for this indicator, drawing upon the threshold developed for "% Shut-offs for Non-Payment."

Indicator Scoring & Weighting

To enable the evaluation and comparison of affordability indicators, a standardized scale

[264] The State Water Board is recommending the removal of the risk indicator "% Shut-Offs for Non-Payment" because there was an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021. This information was therefore unavailable for the majority of 2020 and will not be collected by the State Water Board for 2021 annual reporting.

between 0 and 1 for affordability scores has been applied to each affordability indicator threshold. Table D10 summarizes the thresholds and scores for this affordability indicator.

Table D10: Percentage of Residential Arrearages Thresholds & Scores

Threshold Number	Threshold	Score
0	**0% to 9%** residential arrearages.	0
1	**10% to 29%** residential arrearages.	0.5
2	**30% to 100%** residential arrearages.	1

Indicator Analysis

State Water Board staff analyzed 2,868 community water systems, of which approximately 442 water systems lacked necessary data. Of the 2,426 water systems with sufficient data, 129 (4%) systems exceeded the Percentage of Residential Arrearages 10% to 29% affordability threshold and 38 (0.1%) systems exceeded the maximum 30% to 100% threshold. Of those that exceeded the minimum threshold, 83 are DAC/SDAC systems. Table D11 and Table D12 summarize the full results of this indicator analysis. The tables of the full results from the affordability threshold calculations are included in Attachment D1.[265]

Table D11: Percentage of Residential Arrearages Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (10%-29%)	Threshold 2 Met (30%-100%)
DAC/SDAC	1,408	215 (15%)	491 (35%)	591 (42%)	83 (6%)	28 (2%)
Non-DAC	1,287	208 (16%)	292 (23%)	737 (57%)	41 (3%)	9 (0.6%)
TOTAL:	**2,868**	**442 (15%)**	**879 (31%)**	**1,380 (48%)**	**129 (4%)**	**38 (0.1%)**
***Missing* DAC Status**	*173*					

[265] 2022 Affordability Assessment Data and Results: Attachment D1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022affordability.xlsx

Table D12: Percentage of Residential Arrearages Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (10%-29%)	Threshold 2 Met (30%-100%)
Failing: HR2W Systems	**295**	**39 (13%)**	**87 (29%)**	**134 (45%)**	**20 (7%)**	**15 (5%)**
HR2W DAC/SDAC	184	27	54	74	16	13
At-Risk Systems	**459**	**87 (19%)**	**159 (35%)**	**148 (32%)**	**51 (11%)**	**14 (3%)**
At-Risk DAC/SDAC	276	48	101	82	34	11
Not HR2W or At-Risk System	**1,946**	**303 (16%)**	**542 (28%)**	**1,038 (53%)**	**54 (3%)**	**9 (0.04%)**
DAC/SDAC	907	137	307	426	33	4
TOTAL:	**2,868**	**442 (15%)**	**879 (31%)**	**1,380 (48%)**	**129 (5%)**	**38 (1%)**
Missing SAFER Status:	*168*					

RESIDENTIAL ARREARAGE BURDEN

The purpose of this indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

Calculation Methodology

Required Indicator Data Points & Sources:

- Total outstanding residential arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Indicator Calculation Methodology:

Equation D3: Residential Arrearage Burden

$$\frac{\textit{Total Residential Arrearages } (\$)}{\textit{Total Number of Residential Accounts}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program were excluded from the calculation of this affordability indicator because the State Water Board is unable to disaggregates total residential arrearages by individual PWSID.

Threshold Determination

An indicator threshold for residential arrearage burden, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board adopted a similar tiered threshold utilized for the "Extreme Water Bill" affordability risk indicator, which utilizes an approach that compares how individual water systems are scoring to their peers, where data is available.

Indicator Scoring & Weighting

To enable the evaluation and comparison of affordability indicators, a standardized scale between 0 and 1 for affordability scores has been applied to each affordability indicator threshold. Table D13 summarizes the thresholds and scores for this affordability indicator.

Table D13: Residential Arrearage Burden Thresholds & Scores

Threshold Number	Threshold	Score
0	**Below top 40%** of systems with residential arrearage burden.	0
1	**Top 40%** of systems with residential arrearage burden.	0.5
2	**Top 20%** of systems with residential arrearage burden.	1

Indicator Analysis

State Water Board staff analyzed 2,868 community water systems, of which approximately 442 water systems lacked the data necessary to estimate water rates. Of the 2,426 water systems with sufficient data, staff identified 316 (11%) systems exceeded the minimum Top 40% Residential Arrearage Burden affordability threshold and 310 (11%) exceeded the maximum Top 20% threshold. Of those that exceeded the minimum threshold, 299 systems were identified that serve DAC/SDACs. Table D14 and Table D15 summarize the full results of this indicator analysis. The tables of the full results from the affordability threshold calculations are included in Attachment E1.[266]

[266] Affordability Assessment Data: Attachment E1
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/e1.xlsx

Table D14: Residential Arrearage Burden Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (Top 40%)	Threshold 2 Met (Top 20%)
DAC/SDAC	1,408	215 (15%)	491 (35%)	403 (29%)	137 (10%)	162 (12%)
Non-DAC	1,287	208 (16%)	292 (23%)	473 (37%)	176 (14%)	138 (11%)
TOTAL:	**2,868**	**442 (15%)**	**879 (31%)**	**921 (32%)**	**316 (11%)**	**310 (11%)**
Missing DAC Status	*173*					

Table D15: Residential Arrearage Burden Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold 1 Met (Top 40%)	Threshold 2 Met (Top 20%)
Failing: HR2W Systems	**295**	**39 (13%)**	**87 (29%)**	**82 (28%)**	**29 (10%)**	**58 (20%)**
HR2W DAC/SDAC	184	27	54	38	21	44
At-Risk Systems	**459**	**87 (19%)**	**159 (35%)**	**101 (22%)**	**34 (7%)**	**78 (17%)**
At-Risk DAC/SDAC	276	48	101	54	26	47
Not HR2W or At-Risk System	**1,946**	**303 (16%)**	**542 (28%)**	**730 (38%)**	**225 (12%)**	**146 (8%)**
DAC/SDAC	907	137	307	307	89	67
TOTAL:	**2,868**	**442 (15%)**	**879 (31%)**	**921 (32%)**	**316 (11%)**	**310 (11%)**
Missing SAFER Status:	*168*					