Draft White Paper Discussion On:

Recommendations for Risk Assessment 2.0 Thresholds, Scores, & Weights for Public Water Systems

December 14, 2020

Table of Contents

Executive Summary

The California State Water Resources Control Board (State Water Board) is developing Risk Assessment methodologies for identifying "At-Risk" public water systems (3,300 or less service connections), tribal water systems, state small water systems, and domestic wells in order to assist with prioritization of Safe and Affordable Drinking Water Fund allocations in the State Water Board's annual Fund Expenditure Plan.

The purpose of this white paper is to provide:

(1) an overview of proposed expanded criteria for including systems on the Human Right to Water (HR2W) list that are out of compliance or consistently failing,

(2) a description of how systems perform with respect to the 18 risk indicators identified in the previous draft Risk Assessment white paper associated with the October 13, 2020 webinar,

(3) to propose and illustrate the impacts of setting thresholds of concern and criticality weighting each risk indicator,

(4) to propose and illustrate multiple "At-Risk" scoring methodologies and ultimately recommend a single method subject to public feedback to inform the 2021-22 Fund Expenditure Plan.

The State Water Board is seeking stakeholder feedback on the following:

1. Proposed Expanded Criteria for the Human Right to Water List

The potential risk indicator evaluation and selection process resulted in the recommendation of adding four additional violation types to the HR2W criteria: Presence of E. coli (E. coli violations); Treatment Technique Violations; extensive Monitoring & Reporting Violations; and Operator Certification Violations.

Further consideration was given to define what it means for a water system to "consistently fail" or be "at-risk." Safety Code (CHSC) Section 116275(c) states that "primary drinking water standards" 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 subdivision (j) of Section 116365.
3. The monitoring and reporting requirements as specified in regulations adopted by the state board that pertain to maximum contaminant levels.

The State Water Board used this definition to consider how to most appropriately expand the criteria for systems that are added to the HR2W list to ensure all aspects of public health were incorporated. The following Table and sections summarize the

recommended criteria. The expanded criteria would result in approximately 40 water systems added to the HR2W list.

Table 1: Proposed Expanded Criteria for the Human Right to Water (HR2W) List

Criteria	Before 3.2021	After 3.2021
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): • 3 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**

2. Water System Risk Indicator Performance

The State Water Board and the University of California, Los Angeles (UCLA) pulled risk indicator data for the 2,850 community water systems with 3,300 service connections or less and K-12 schools (Non-Transient, Non-Community) which will eventually be subject to the Risk Assessment for the 2021-22 Fund Expenditure Plan. Systems that are currently on the HR2W list were included in the risk indicator assessment to assist in calibrating the Risk Assessment and verifying that the risk assessment outcomes were in alignment with known outcomes. Water system risk indicator performance is detailed in Appendix B. Limited data availability for some risk indicators, especially the Affordability indicators, has been mitigated by redistributing risk indicator weights within the risk indicator category.

3. Recommending Risk Indicator Thresholds, Scores, and Weighting Options

To develop proposed thresholds for the 18 risk indicators, the State Water Board and UCLA reviewed multiple available types of evidence, looking both within California,

across other state agencies nation-wide,[1] and at the U.S. EPA's standards. Additionally, the distribution of water system performance for each risk indicator was also analyzed to inform the proposed thresholds (Table 5).

The proposed thresholds were then assigned a score from 0 to 1 in order to create a standardize scale to enable the evaluation and comparison of risk indicator performance. Suggested individual risk indicator threshold scores are in Table 6 and Appendix B. A proposed weight of 1 indicates a lower relative criticality compared to a weight of 3 which is the highest criticality.

Proposed weighing options for both individual risk indicators and risk indicator categories were also developed because public feedback has indicated that some risk indicators and categories may be more "critical" as they relate to a water system's ability to stay in compliance. For the analysis conducted for this white paper, proposed weights between 1 and 3 were applied to individual risk indicators and risk indicator categories (Tables 6 and 7).

4. Aggregated Risk Assessment Options and Recommendations

The State Water Board and UCLA developed three aggregated Risk Assessment options that incorporated a variety of weighting approaches:

- **Option 1**: No Weights
- **Option 2**: Risk Indicator Weights Only
- **Option 3**: Risk Indicatory and Category Weights

The results of the analysis of these three options are depicted in Figures 15 - 17. The water systems that are on the current HR2W list and those that would be added from the Expanded HR2W criteria were highlighted in these results in order to demonstrate the correlation between systems that are out of compliance or consistently failing and the proposed Risk Assessment scoring options.

Based on the distribution of the HR2W systems, the State Water Board recommends Option 3 for Risk Assessment 2.0 with a "Potentially At-Risk" threshold of .75 and an "At-Risk" threshold of 1 for public consideration. Excluding the systems that are currently on the HR2W list and those that may be added due to the expanded HR2W criteria, at these proposed thresholds, 584 water systems would meet the Potentially At-Risk criteria and 707 water systems would meet the At-Risk criteria.

The State Water Board is committed to continuing to engage the public and key stakeholder groups to solicit feedback and recommendations as it develops its Needs Assessment methodologies, including the Risk Assessment, Affordability Assessment, and Cost Assessment components. The State Water Board will continue to host public webinar workshops to provide opportunities for stakeholders to learn about and

[1] States directly reviewed included Idaho, Washington, Michigan, New Jersey, Texas, New York, Nevada, North Carolina and Oregon. States selected for review were based on their similarity or proximity to California, their identification in U.S. EPA reviews of state level risk assessment, or their known activity on water system risk assessment methodologies by the State Water Board or UCLA.

contribute to the State Water Board's efforts to develop a more robust Risk Assessments for public water systems, tribal water systems, state small water systems, and domestic wells. The Risk Assessment is in its first year of an iterative process. It is anticipated that future iterations, better data collection, and continued public input will further refine the Needs Assessment as it develops.

Introduction

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. 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. Foremost among the tools created under SB 200 is the Safe and Affordable Drinking Water 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 annual Fund Expenditure Plan prioritizes projects for funding, documents past and planned expenditures, and is "based on data and analysis drawn from the drinking water Needs Assessment", per CHSC Section 116769.

FY 2020-21 Fund Expenditure Plan

The FY 2020-21 Fund Expenditure Plan does not utilize the Risk Assessment methodologies or results from the efforts detailed in this white paper. After the Needs Assessment methodologies have been more fully developed through a stakeholder-driven process, the State Water Board intends to incorporate the results of this effort into the next iteration of the Fund Expenditure Plan for FY 2021-22.

About the Needs Assessment

The State Water Board's Needs Assessment consists of three core components: the Affordability Assessment, Risk Assessment, and Cost Assessment (Figure 1). The State Water Board's Needs Analysis Unit in the Division of Drinking Water (DDW) is leading the implementation of the Needs Assessment in coordination with the Division of Water Quality (DWQ) and Division of Financial Assistance (DFA). The University of California, Los Angeles (UCLA) was contracted (agreement term: 09.01.2019 through

03.31.2021)[2] to support the initial development of Needs Assessment methodologies for the Risk Assessment and Cost Assessment.

Figure 1: Needs Assessment Components

- **Risk Assessment**: Identifying public water systems, tribal water systems, state small water systems, and regions where domestic wells consistently fail or are at-risk of failing to provide adequate safe drinking water.

- **Cost Assessment**: Determining the costs related to the implementation of interim and/or emergency measures and longer-term solutions for failing systems and at-risk systems. Solutions may include, but are not limited to, water partnerships, physical and managerial consolidations, administrators, treatment facility additions or upgrades, distribution system repairs or replacement, and/or point of use/point of entry treatment. The cost assessment also includes the identification of available funding sources and the funding gaps that may exist to support interim and long-term solutions.

- **Affordability Assessment**: Identifying community water systems that serve disadvantaged communities that must charge their customers' fees which exceed the affordability threshold established by the State Water Board in order to provide adequate safe drinking water.

The State Water Board's Needs Analysis Unit will be conducting 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 the Safe and Affordable Drinking Water Fund Expenditure Plan; direct State Water Board technical assistance; and to develop strategies for implementing interim and long-term solutions.

[2] The contract with UCLA was written and scoped prior to passage of SB 200 and was originally designed to conduct a one-time Needs Assessment. Three State Water Board workshops hosted in early 2019 informed the original scope of the UCLA contract.

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

Risk Assessment Components

The goal of the Risk Assessment component of the Needs Assessment is to identify public water systems, tribal water systems, state small water systems and domestic wells in need of potential assistance or intervention before they fail to provide adequate and safe drinking water. The Risk Assessment methodology for public water systems with 3,300 or less service connections, currently under development, incorporates three critical components as follows:

- **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.

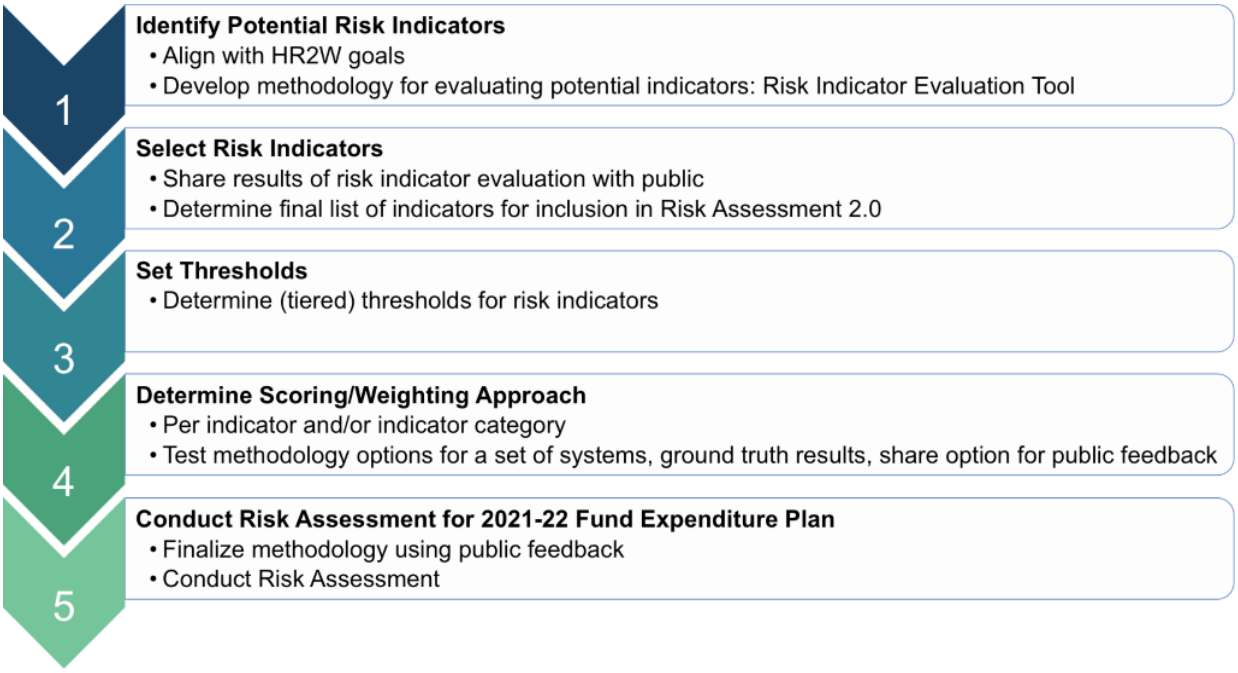
- **Risk Thresholds**: the levels, points, or values associated with an individual risk indicator that delineates when a water system is more at-risk of failing.

- **Weighting and/or Scoring**: the application of a multiplying value or weight to each risk indicator, as certain risk indicators 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 allows the State Water Board multiple ways to assess all risk indicators together in a combined Risk Assessment score.

Risk Assessment 2.0 Development Process

The State Water Board and UCLA are developing the Risk Assessment 2.0 methodology through a phased public process from April 2020 through January 2021. This effort is designed to encourage public and stakeholder participation, providing opportunities for feedback and recommendations throughout the methodology development process. Figure 2 provides an overview of the Risk Assessment 2.0 development phases and the following sections summarize previous 2020 webinar workshops associated with this effort.

Figure 2: Phases of Risk Assessment 2.0 Development



The State Water Board and UCLA have hosted three public webinar workshops to solicit feedback and recommendations on the development of the Risk Assessment. Details about those workshops and feedback received are in Appendix A.

Proposed Expanded Criteria for the Human Right to Water (HR2W) List

The effort to identify potential risk indicators for public water systems highlighted the need for expanded criteria for the HR2W list that more closely aligns with the goals of the HR2W. Since a number of the recommended risk indicators selected for Risk Assessment 2.0 are associated with non-MCL violations, further consideration was given to define what it means for a water system to "consistently fail" or be "At-Risk." CHSC Section 116275(c) states that "primary drinking water standards" means:

- Maximum levels of contaminants that, in the judgment of the state board, may have an adverse effect on the health of persons.
- Specific treatment techniques adopted by the state board in lieu of maximum contaminant levels pursuant to subdivision (j) of Section 116365.
- The monitoring and reporting requirements as specified in regulations adopted by the state board that pertain to maximum contaminant levels.

The State Water Board used this definition to consider how to most appropriately expand the criteria for systems that are added to the HR2W list (refer to Appendix C for more details). The potential expanded HR2W criteria were considered when determining the recommended thresholds for some of the overlapping indicators that

are included in the Risk Assessment. The Risk Assessment thresholds must be lower or less stringent than the HR2W criteria.

The expansion of the HR2W criteria will be incorporated into the Cost Assessment, after public feedback is received. Inclusion on the State Water Board's HR2W website will not occur until at least March 2021 to allow for needed database modifications. The expanded criteria would result in approximately 40 water systems added to the HR2W list.

Table 3: Proposed Expanded Criteria for the Human Right to Water (HR2W) List

Criteria	Before 3.2021	After 3.2021
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): • 3 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**

Final Risk Assessment 2.0 Risk Indicators

The State Water Board, in partnership with UCLA, and extensive feedback and support from the public, have identified 22 risk indicators that measure accessibility, affordability, and TMF capacity (technical, managerial, and financial) based on their criticality as it relates to a system's ability to remain in compliance with safe drinking water standards. As previously discussed, this effort included full consideration of risk indicators identified in complementary efforts conducted by the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Water Resources (DWR), and the California Public Utilities Commission. Learn more about the risk indicator identification and selection process in the October 7, 2020 white paper *Evaluation of*

Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems.[3]

Table 2 provides a summary of the 22 risk indicators selected for Risk Assessment 2.0. Four of the risk indicators are pending additional data or analysis and thus will be used in future iterations of the Needs Assessment. The pending risk indicators are marked for 2022-2023 in Table 2. Appendix B provides a detailed overview of the risk indicators including required datapoints and calculation methodologies.

Table 2: Risk Assessment 2.0 Risk Indicators

Risk Indicator Category	Risk Indicator
Water Quality	**History of E. coli Presence**
Water Quality	**Increasing Presence of Water Quality Trends Toward MCL** (2022-23 Needs Assessment)
Water Quality	**Treatment Technique Violations**
Water Quality	**Past Presence on the HR2W List**
Water Quality	**Maximum Duration of High Potential Exposure (HPE)**
Water Quality	**Percentage of Sources Exceeding an MCL**
Accessibility	**Number of Sources**
Accessibility	**Absence of Interties**
Accessibility	**Water Source Types**
Accessibility	**DWR – Drought & Water Shortage Risk Assessment Results**
Accessibility	**Critically Overdrafted Groundwater Basin**
Affordability	**Percent of Median Household Income (%MHI)** (2021-22 Needs Assessment Only)
Affordability	**Household Burden Indicator (HBI) for Drinking Water** (2022-23 Needs Assessment)
Affordability	**Poverty Prevalence Indicator (PPI)** (2022-23 Needs Assessment)
Affordability	**Housing Burden** (2022-23 Needs Assessment)
Affordability	**Extreme Water Bill** (2021-22 and 2022-23 Needs Assessment)

[3] Draft Final White Paper Discussion On: 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

Risk Indicator Category	Risk Indicator
Affordability	**% Shut-Offs** (2021-22 and 2022-23 Needs Assessment)
TMF Capacity	**Number of Service Connections**
TMF Capacity	**Operator Certification Violations**
TMF Capacity	**Monitoring and Reporting Violations**
TMF Capacity	**Significant Deficiencies**
TMF Capacity	**Extensive Treatment Installed**

Proposed Thresholds for Risk Indicators

Review of Existing Possible Risk Indicator Thresholds

To develop proposed thresholds for the 18 risk indicators able to be incorporated in Risk Assessment 2.0, UCLA and the State Water Board reviewed multiple available types of evidence, looking both within California, across other state agencies nation-wide,[4] and at the U.S. EPA's standards. The literature review provided precedent for threshold setting and, in some cases, included thresholds:

- **Derived from Legislative or regulatory definitions**: Indicator threshold reflects performance standards for California public water systems monitored by the State Water Board.
- **Supported by empirical evidence**: Peer-reviewed studies demonstrate relationship between indicator threshold and water system failure, and/or correlation and regression analysis between the indicator and water system failure definitions employed in Risk Assessment 1.0 or 2.0 shows a statistically significant relationship.
- **Utilized by other California agencies, other state governments or the U.S. EPA**: Other governmental agency employs a threshold for an exact or a similar indicator as described here in evaluating water system performance for regulatory purposes.
- **Recognized by sector experience**: Other water sector stakeholders (*e.g.* agency associations, non-profits, or advocacy groups) use this exact or a similar threshold for an indicator in assessing water system performance.

[4] States directly reviewed included Idaho, Washington, Michigan, New Jersey, Texas, New York Nevada, North Carolina and Oregon. States selected for review were based on their similarity or proximity to California, their identification in U.S. EPA reviews of state level risk assessment, or their known activity on water system risk assessment methodologies by the State Water Board or UCLA.

Few exact 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.

A summary of findings is provided in Table 4 below and Appendix B provides more details about the rationale for proposed thresholds for each indicator.

Table 4: Possible Existing Thresholds for 2.0 Risk Indicators

	Risk Indicator	Leg/Reg. Threshold	Evidence-Based Study Threshold	Utilized by Gov. Agency	Sector Recognized Threshold	None
	History of E. coli Presence	X	X	X	X	
	Increasing Presence of Water Quality Trends Toward MCL (2022-23 Needs Assessment)					X
	Treatment Technique Violations	X	X			
	Past Presence on the HR2W List		X	X		
	Maximum Duration of High Potential Exposure (HPE)			X		
	Percentage of Sources Exceeding an MCL					X
	Number of Sources	X	X	X		
	Absence of Interties			X		
	Water Source Types		X	X		
	DWR – Drought & Water Shortage Risk Assessment Results			X		

	Risk Indicator	Leg/Reg. Threshold	Evidence-Based Study Threshold	Utilized by Gov. Agency	Sector Recognized Threshold	None
	Critically Overdrafted Groundwater Basin					X
	Percent of Median Household Income (%MHI) (2021-22 Needs Assessment Only)			X	X	
	Household Burden Indicator (HBI) for Drinking Water (2022-23 Needs Assessment)				X	
	Poverty Prevalence Indicator (PPI) (2022-23 Needs Assessment)				X	
	Housing Burden (2022-23 Needs Assessment)			X		
	Extreme Water Bill (2021-22 and 2022-23 Needs Assessment)			X		
	% Shut-Offs (2021-22 and 2022-23 Needs Assessment)					X
	Number of Service Connections		X	X		
	Operator Certification Violations	X	X	X		
	Monitoring and Reporting Violations	X	X	X		
	Significant Deficiencies	X	X	X		

	Risk Indicator	Leg/Reg. Threshold	Evidence-Based Study Threshold	Utilized by Gov. Agency	Sector Recognized Threshold	None
	Extensive Treatment Installed	X				

Methodology for Determining Proposed Risk Indicator Thresholds

Based on the research conducted, most risk indicators do not have regulatorily-defined thresholds. For binary risk indicators (*e.g.* operator certification violations), the process of setting thresholds is relatively simple because it is either present or absent. For other risk indicators with continuous or categorical data, threshold recommendations were derived using cut points in the distribution of a given variable, as well as the professional opinion of DDW staff, the broader research team contracted through UCLA, as well as an internal advisory group of District Engineers.

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

Proposed Risk Indicator Thresholds

Details about the selection process and methodology of the proposed thresholds for each risk indicator is provided in Appendix B. Table 5 summarizes the proposed thresholds for Risk Indicators. Where possible tiered thresholds are recommended to capture more nuanced degrees of risk within indicators.

Table 5: Proposed Thresholds for 2.0 Risk Indicators

	Risk Indicator	Proposed Thresholds
	History of E. coli Presence	• **Threshold 0** = **No** history of E. coli presence over the last three years. • **Threshold 1** = **Yes**, history of E. coli presence (E. coli violation and/or Level 2 Assessment) over the last three years.
	Increasing Presence of Water Quality Trends Toward MCL (2022-23 Needs Assessment – See Appendix B)	*To be further examined through a stakeholder driven process in 2021.*

Risk Indicator	Proposed Thresholds
Treatment Technique Violations	• **Threshold 0** = **0** Treatment Technique violations over the last three years. • **Threshold 1** = **1 or more** Treatment Technique violations over the last three years.
Past Presence on the HR2W List	• **Threshold 0** = **0** HR2W list occurrence over the last three years. • **Threshold 1** = **1** HR2W list occurrence over the last three years. • **Threshold 2** = **2 or more** HR2W list occurrences over the last three years.
Maximum Duration of High Potential Exposure (HPE)	• **Threshold 0** = **0** years of HPE over the last nine years. • **Threshold 1** = **1** year of HPE over the last nine years. • **Threshold 2** = **2** years of HPE over the last nine years. • **Threshold 3** = **3 or more** years of HPE over the last nine years.
Percentage of Sources Exceeding an MCL	• **Threshold 0** = **less than 49.9%** of sources exceed an MCL. • **Threshold 1** = **greater than 49.9%** or sources exceed an MCL.
Number of Sources	• **Threshold X** = **0** sources (automatically At-Risk) • **Threshold 0** = **multiple** sources. • **Threshold 1** = **1** source only.
Absence of Interties	• **Threshold 0** = **1 or more** interties. • **Threshold 1** = **0** interties.
Water Source Types	• **Threshold 0** = **2 or more** water source types. • **Threshold 1** = **1** water source type and that source is **purchased** water. • **Threshold 2** = **1** water source type and that source is either **groundwater or surface water**.
DWR – Drought & Water Shortage Risk Assessment Results	• **Threshold 0** = **Below top 25%** of systems most at risk of drought and water shortage. • **Threshold 1** = **Top 25%** of systems most at risk of drought and water shortage.

	Risk Indicator	Proposed Thresholds
		• **Threshold 2** = **Top 10%** of systems most at risk of drought and water shortage.
	Critically Overdrafted Groundwater Basin	• **Threshold 0** = **Less than 75%** of system's service area boundary is within a critically overdrafted basin. • **Threshold 1** = **75% or greater** of systems service area boundary is within a critically overdrafted basin.
	Percent of Median Household Income (%MHI) (2021-22 Needs Assessment Only)	• **Threshold 0** = **Less than 1.5%** • **Threshold 1** = **1.5% or greater** • **Threshold 2** = **2.5% or greater**
	Household Burden Indicator (HBI) for Drinking Water (2022-23 Needs Assessment)	*To be determined through a stakeholder driven process in 2021.*
	Poverty Prevalence Indicator (PPI) (2022-23 Needs Assessment)	*To be determined through a stakeholder driven process in 2021.*
	Housing Burden (2022-23 Needs Assessment)	*To be determined through a stakeholder driven process in 2021.*
	Extreme Water Bill (2021-22 and 2022-23 Needs Assessment)	• **Threshold 0** = **Below 150%** of the statewide average. • **Threshold 1** = **Greater than 150%** of the statewide average. • **Threshold 2** = **Greater than 200%** of the statewide average.
	% Shut-Offs (2021-22 and 2022-23 Needs Assessment)	• **Threshold 0** = **less than 10%** customer shut-offs over the last calendar year. • **Threshold 1** = **10% or greater** customer shut-offs over the last calendar year.
	Number of Service Connections	• **Threshold 0** = **greater than 500** service connections. • **Threshold 1** = **500 or less** service connections.
	Operator Certification Violations	• **Threshold 0** = **0** Operator Certification violations over the last three years. • **Threshold 1** = **1 or more** Operator Certification violations over the last three years.

	Risk Indicator	Proposed Thresholds
	Monitoring & Reporting Violations	• **Threshold 0** = **1 or less** Monitoring & Reporting violations over the last three years. • **Threshold 1** = **2 or more** Monitoring & Reporting violations over the last three years.
	Significant Deficiencies	• **Threshold 0** = **0** Significant Deficiencies over the last three years. • **Threshold 1** = **1 or more** Significant Deficiencies over the last three years.
	Extensive Treatment Installed	• **Threshold 0** = **No** extensive treatment installed. • **Threshold 1** = **Yes**, extensive treatment is installed.

Scoring and Weighting Methodology Options

In cases where the outcome of interest, in this case water system failure, is known and defined, most academic literature would suggest a pure data-driven regression approach to determine individual indicator and category scores and weights based on the indicator coefficient relationships to failing status.[5] Typically expert opinion input into scoring and weighting of individual indicators and categories to predict risk are only used when the true outcome of interest is unknown or unobserved.[6]

However, given the desire to incorporate practical experience and external stakeholder feedback and the short-time frames to incorporate this data into the next Fund Expenditure Plan, data-driven weights (*e.g.* comparing weights to the distribution of systems impacted) were considered alongside weights derived from other sources for Risk Assessment 2.0. Moreover, given the aim of developing individual category scores where the outcome of interest is not fully-defined by regulation, composite weighting methodologies were deemed necessary. Future versions of the Risk Assessment will be able to more fully evaluate pure data-driven weighting and scoring approaches.

UCLA and the State Water Board explored many different options around:

- Individual Risk Indicator Scores and Weights
- Risk Indicator Category Weights

[5] Cui, C., & Wang, D. (2016). High dimensional data regression using Lasso model and neural networks with random weights. *Information Sciences*, *372*, 505-517; Huang, J., Ma, S., & Zhang, C. H. (2008). Adaptive Lasso for sparse high-dimensional regression models. *Statistica Sinica*, 1603-1618.

[6] See Ayyub, B. M. (2001). *Elicitation of expert opinions for uncertainty and risks*. CRC press; O'Hagan, Anthony, Caitlin E. Buck, Alireza Daneshkhah, J. Richard Eiser, Paul H. Garthwaite, David J. Jenkinson, Jeremy E. Oakley, and Tim Rakow. *Uncertain judgements: eliciting experts' probabilities*. John Wiley & Sons, 2006.

- Aggregated Risk Assessment Scoring Threshold(s)

Individual Risk Indicator Scoring and Weighting Methodology Options

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk points across risk indicators has been applied to each proposed threshold. This is important since many of the risk indicators are measured in different units and scales. Suggested individual risk indicator threshold scores are in Appendix B and Table 6.

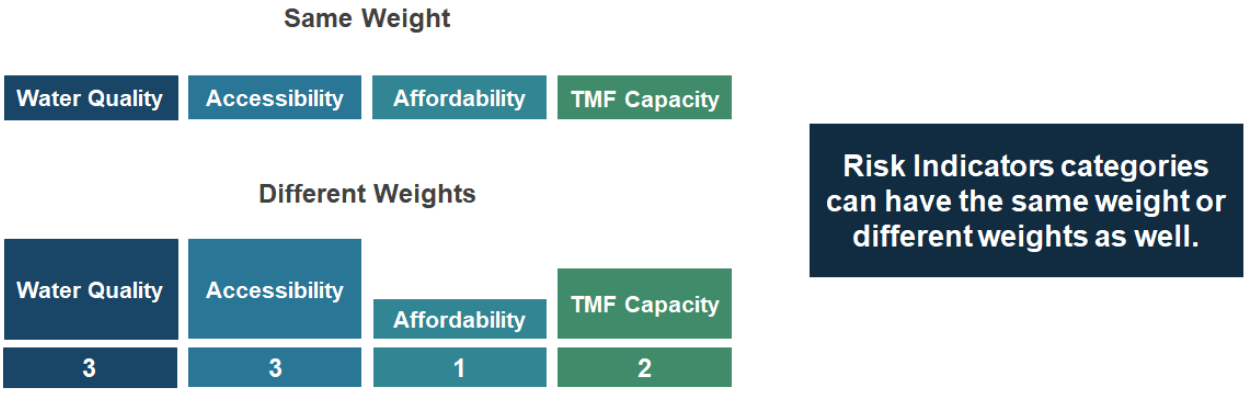
When evaluating the risk indicators, the assessment methodology can either apply the same "weight" to each risk indicator or apply different weights (see Figure 3). Public feedback (refer to Appendix A) indicated that Risk Assessment 2.0 should weight some indicators higher than others because they may be more "critical" as they relate to a water system's ability to stay in compliance. For the analysis conducted for this white paper, proposed weights between 1 and 3 were applied to individual risk indicators (see Table 6, with a weight of 3 indicating the highest level of criticality.

Figure 3: Individual Risk Indicator Weight Options

Risk Indicator Category Scoring Methodology Options

Another methodology option is to weight the aggregated categories of the Risk Assessment (*i.e.* Water Quality, Accessibility, Affordability and TMF Capacity). The assessment methodology can either apply the same "weight" to each risk indicator category or apply different weights (see Figure 4). Public feedback (refer to Appendix A) indicated that Risk Assessment 2.0 a weighted approach based on criticality is preferred. For the analysis conducted for this white paper, proposed weights between 1 and 3 were applied to the risk indicator categories (see Table 7). Again, a weight of 3 was associated with the highest level of criticality.

Figure 4: Risk Indicator Category Weight Options



Aggregated Risk Assessment 2.0 Methodology Options

When conducting an aggregated Risk Assessment, there are a number of approaches or permutations available for consideration:

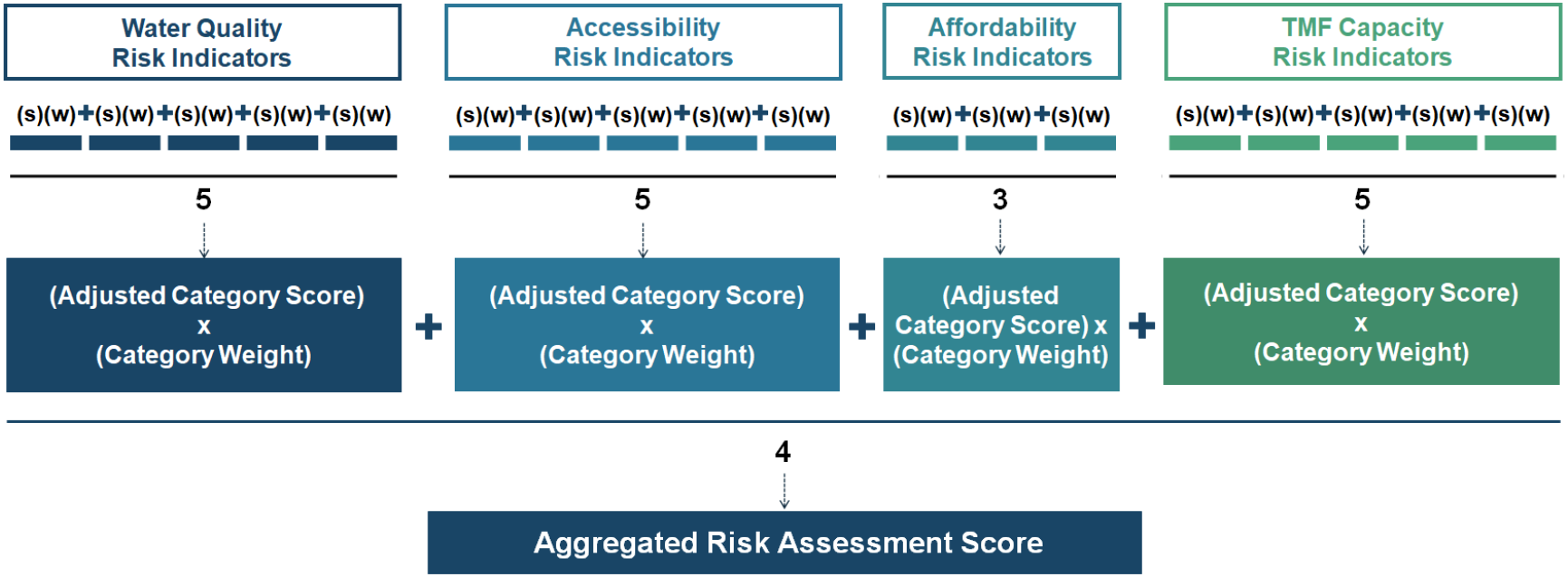
- **Approach 1**: At-Risk if a particular threshold for an individual risk indicator is achieved.
- **Approach 2**: At-Risk if a system reaches a particular score within one or more of the four risk indicator categories.
- **Approach 3**: At-Risk if the system reaches a combined threshold score across all of the risk indicator categories.

An assessment methodology may also have a combined approach across all three alternatives discussed above. For these purposes of the analysis conducted for this white paper, the State Water Board and UCLA employed Approaches 1 and 3. Approach 1 was only suggested for one risk indicator, “Number of Sources.” There are six water systems that have 0 active sources and rely on hauled water. These systems are automatically deemed “At-Risk.” Approach 2 was not incorporated due to the distribution of system performance across the risk indicator categories.

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 systems 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/or categories. Figure 5 provides an illustration of the calculation method.

Figure 5: Illustration of the Risk Assessment Calculation Methodology With Risk Indicator Scores (s) and 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 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 affordability risk indicators.

Multiple different methods for handling missing data, including DWR and OEHHA's methods, as well as statistical imputation methods, were considered.[7] [8] Ultimately, the strategy that was chosen for Risk Assessment 2.0 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 6). In future versions of this 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.

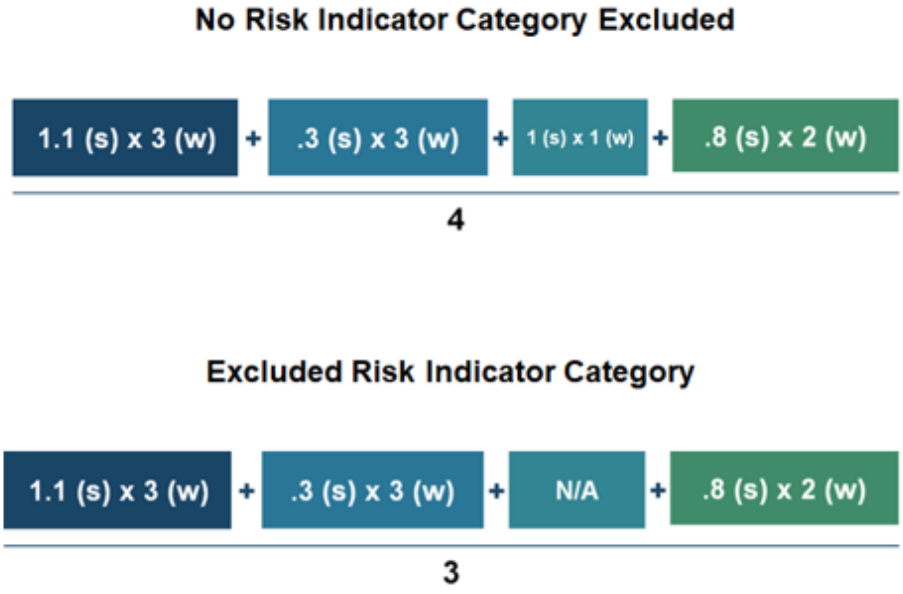
Figure 6: Example of How the Aggregated Risk Assessment Adjusts for Missing Risk Indicator Data

There were some cases where 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 have 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. The Risk Assessment will redistribute 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 7.

[7] 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

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

Figure 7: How the Aggregated Risk Assessment Adjusts for a Missing Risk Indicator Category



Risk Assessment 2.0 Options

To determine the best combination of methods described in the section above, the State Water Board and UCLA co-developed a number of Risk Assessment 2.0 options that incorporated different approaches and criteria for the risk indicators, categories, and aggregated assessment. These options also drew on existing California and other state agency risk assessment weighting and scoring efforts. Within California, these included draft versions of the methodologies employed DWR's Drought & Water Shortage Risk Assessment and OEHHA's HR2W Tool.

Outside of California, the U.S. EPA developed an Enforcement Targeting Tool[9] which has been used by several states, including Virginia,[10] Texas,[11] Nevada,[12] and Alaska,[13]

[9] Giles, Cynthia (2009). "Memorandum: Drinking Water Enforcement Response Policy." *United States Environmental Protection Agency*. Retrieved from https://www.epa.gov/sites/production/files/documents/drinking_water_erp_2009.pdf

[10] Virginia Department of Health (2020). "EPA List of Serious Violators (Waterworks) - Enforcement Targeting." Retrieved from: https://www.vdh.virginia.gov/drinking-water/office-of-drinking-water/compliance/epa-list-of-significant-non-compliers-waterworks-enforcement-targeting/

[11] Texas Commission on Environmental Quality (2020). "EPA Drinking Water Enforcement Response Policy." Retrieved from: https://www.tceq.texas.gov/drinkingwater/enforcement-response-policy

[12] Hecht, Hillary (2018). "Overview of U.S. EPA Enforcement under the Safe Drinking Water Act (SDWA)" March 2018 Presentation. Retrieved from: https://ndep.nv.gov/uploads/water-opcert-dw-training-docs/2018_FNvRWA_ACpresF.pdf

[13] Division of Environmental Health: Drinking Water Program (2020). "Enforcement Targeting Tool." Retrieved from: https://dec.alaska.gov/eh/dw/ett/

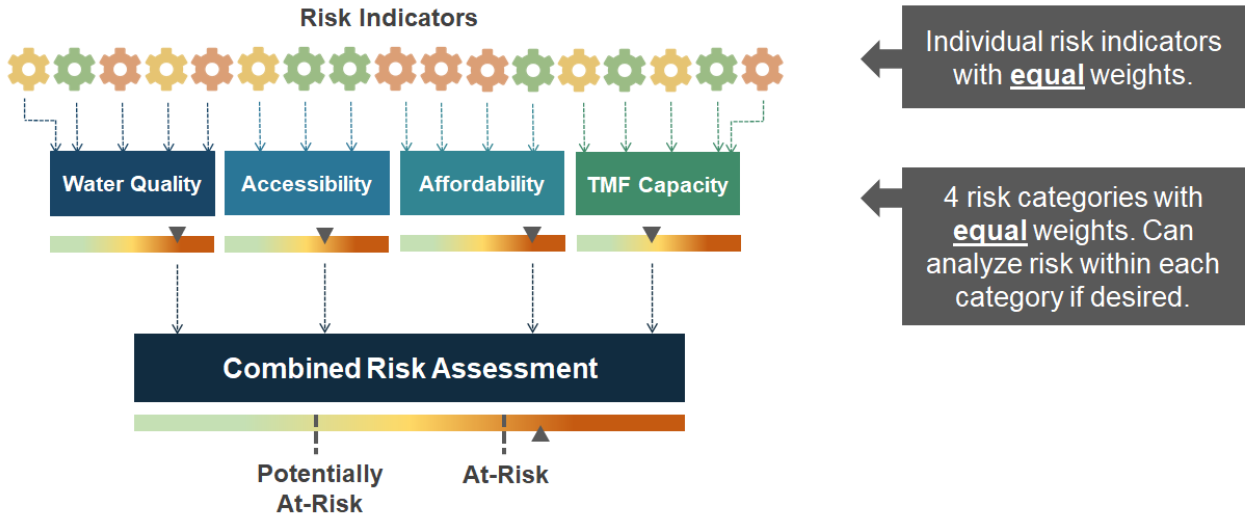
to help target the public water systems most in need of assistance to comply with the Safe Drinking Water Act (SDWA). The tool scores systems based on the severity, frequency, and recency of various SDWA violation types.

The following summarizes the three scoring options and Tables 6 and 7 provide more details on the implications of the different approaches.

Option 1: No Weights (Raw)

- The first scoring approach simply sums up the standardized score, between 0 and 1, for each risk indicator in each category. The final score is an average of category scores, with no indicator or category weights applied based on criticality.

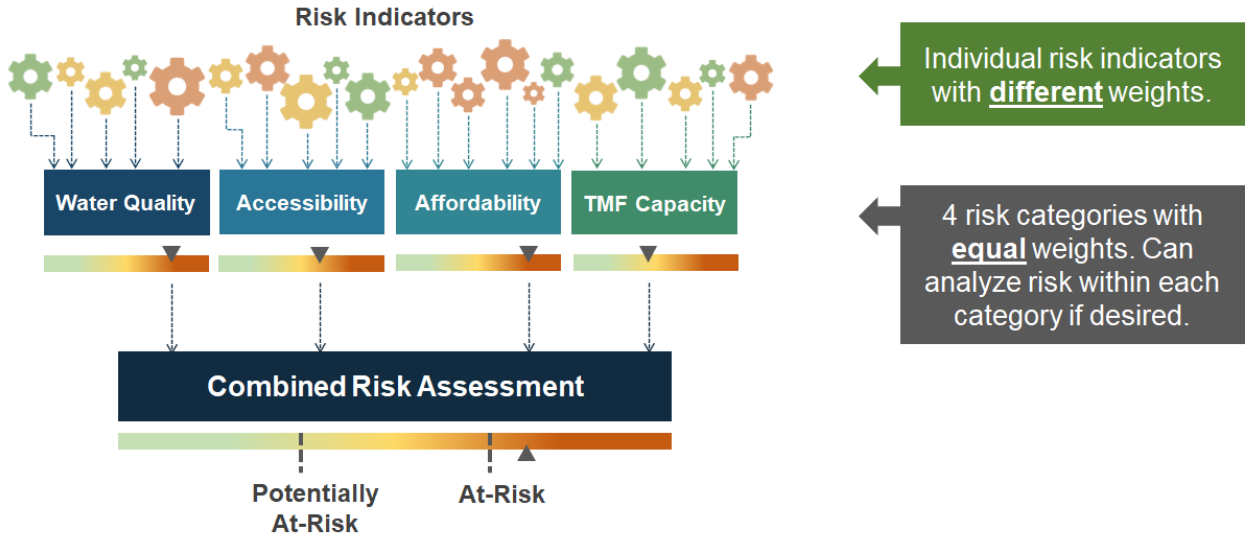
Figure 8: Option 1



Option 2: Indicator Weights Only

- The second scoring approach takes the standardized score, between 0 and 1, for each risk indicator and applies a criticality weight to each risk indicator, between 1 and 3. The final score is an average of category scores, with no additional category weights applied based on criticality.

Figure 9: Option 2



Option 3: Indicator and Category Weights

- The third and final Risk Assessment option 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 category (*e.g.* Water Quality, Accessibility, *etc.*), between 1 and 3. The final score is an average of the weighted category scores.

Figure 10: Option 3

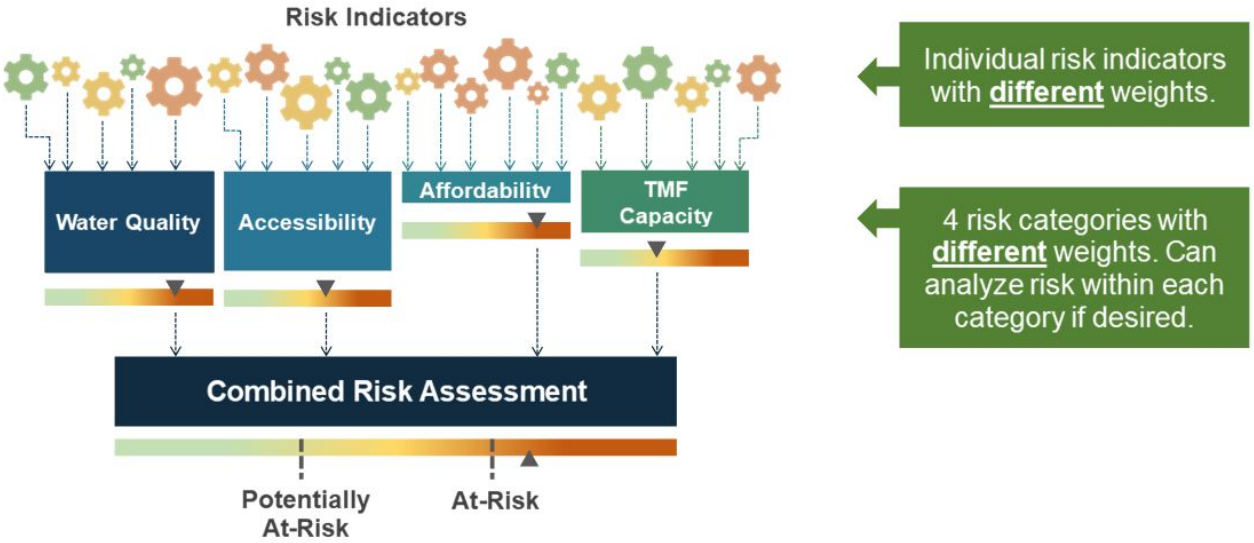


Table 6: Proposed Risk Indicator Scoring Options

Risk Indicator	Proposed Thresholds & Scores	Option 1 Risk Indicator Weights	Option 2 & 3 Risk Indicator Weights
History of E. coli Presence	• Threshold 0 = No **(0)** • Threshold 1 = Yes **(1)**	1	3
Treatment Technique Violations	• Threshold 0 = 0 **(0)** • Threshold 1 = 1 or more **(1)**	1	1
Past Presence on the HR2W List	• Threshold 0 = 0 **(0)** • Threshold 1 = 1 **(.5)** • Threshold 2 = 2 or more **(1)**	1	2
Maximum Duration of High Potential Exposure (HPE)	• Threshold 0 = 0 **(0)** • Threshold 1 = 1 **(.25)** • Threshold 2 = 2 **(.5)** • Threshold 3 = 3 or more **(1)**	1	3
Percentage of Sources Exceeding an MCL	• Threshold 0 = less than 49.9% **(0)** • Threshold 1 = greater than 49.9% **(1)**	1	3
Number of Sources	• Threshold X = 0 **(automatically At-Risk)** • Threshold 0 = Multiple **(0)** • Threshold 1 = 1 only **(1)**	1	3
Absence of Interties	• Threshold 0 = 1 or more **(0)** • Threshold 1 = 0 **(1)**	1	1
Water Source Types	• Threshold 0 = 2 or more **(0)** • Threshold 1 = 1 that is purchased **(.5)**	1	1

	Risk Indicator	Proposed Thresholds & Scores	Option 1 Risk Indicator Weights	Option 2 & 3 Risk Indicator Weights
		• Threshold 2 = 1 that is GW or SW **(1)**		
	DWR – Drought & Water Shortage Risk Assessment Results	• Threshold 0 = Below top 25% **(0)** • Threshold 1 = Top 25% **(.25)** • Threshold 2 = Top 10% **(1)**	1	2
	Critically Overdrafted Groundwater Basin	• Threshold 0 = Less than 75% **(0)** • Threshold 1 = 75% or greater **(1)**	1	2
	Percent of Median Household Income (%MHI) (2021-22 Needs Assessment Only)	• Threshold 0 = Less than 1.5% **(0)** • Threshold 1 = 1.5% or greater **(.75)** • Threshold 2 = 2.5% or greater **(1)**	1	3
	Extreme Water Bill (2021-22 and 2022-23 Needs Assessment)	• Threshold 0 = Below 150% **(0)** • Threshold 1 = greater than 150% **(.5)** • Threshold 2 = greater than 200% **(1)**	1	1
	% Shut-Offs (2021-22 and 2022-23 Needs Assessment)	• Threshold 0 = less than 10% **(0)** • Threshold 1 = 10% or greater **(1)**	1	2
	Number of Service Connections	• Threshold 0 = greater than 500 **(0)** • Threshold 1 = 500 or less **(1)**	1	1
	Operator Certification Violations	• Threshold 0 = 0 **(0)** • Threshold 1 = 1 or more **(1)**	1	3

	Risk Indicator	Proposed Thresholds & Scores	Option 1 Risk Indicator Weights	Option 2 & 3 Risk Indicator Weights
	Monitoring & Reporting Violations	• Threshold 0 = 1 or less **(0)** • Threshold 1 = 2 or more **(1)**	1	2
	Significant Deficiencies	• Threshold 0 = 0 **(0)** • Threshold 1 = 1 or more **(1)**	1	3
	Extensive Treatment Installed	• Threshold 0 = No **(0)** • Threshold 1 = Yes **(1)**	1	2

Table 7: Risk Assessment 2.0 Options' Category Weights

	Water Quality	Accessibility	Affordability	TMF Capacity
Option 1 & 2	1	1	1	1
Option 3	3	3	1	2

Risk Assessment 2.0 Options Analysis Distribution

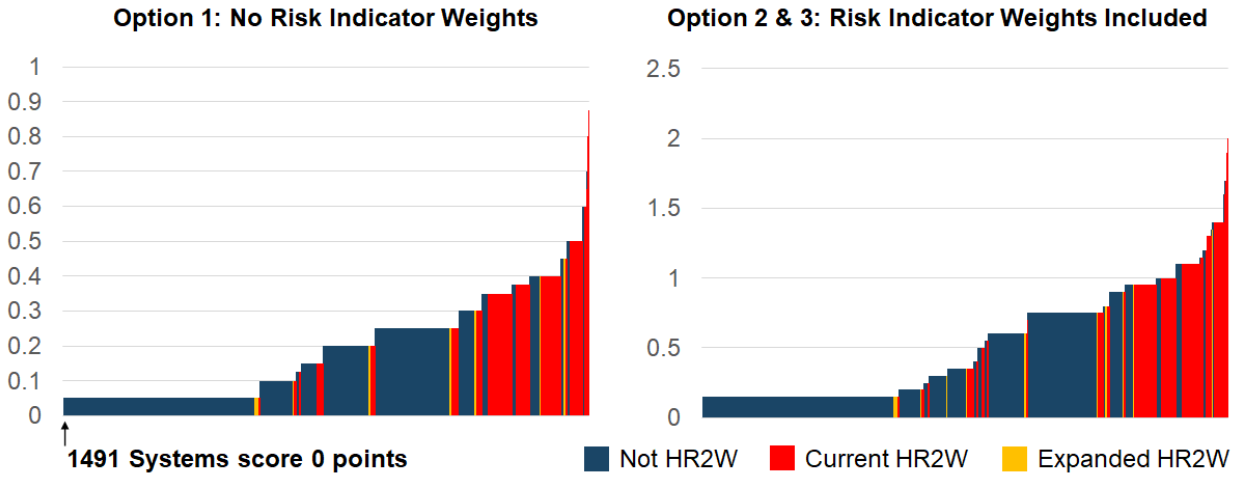
Risk Indicator Category Distribution

The State Water Board and UCLA evaluated the individual risk indicators across all four risk indicator categories (*i.e.* Water Quality, Accessibility, Affordability, TMF Capacity). The aggregated individual risk indicator performance per category is detailed below for both risk indicator weighting options, un-weighted (Option 1) and weighted (Option 2 & 3). The HR2W systems and the expanded HR2W criteria systems are highlighted in the assessment below in order to illustrate how systems that are known to be out of compliance or consistently failing perform using the risk assessment criteria.

Water Quality

Figure 11 shows how those water systems currently on the HR2W list and those systems that may be added due to the expanded HR2W criteria perform in the Water Quality risk category. The category scoring approaches illustrated in Figure 11 depict the category results using both unweighted and weighed water quality indicators. Using both approaches, about 52% (n=1491) of systems score 0 points. Both options show that current HR2W list systems and, to a lesser extent, potentially-expanded HR2W systems score significantly higher in this category than systems that are not on the HR2W list.

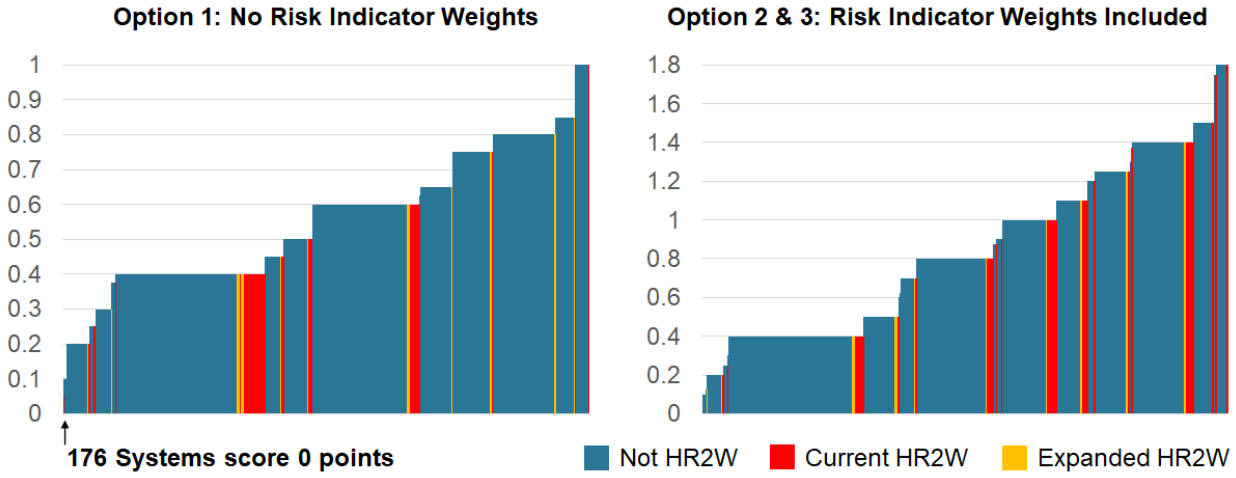
Figure 11: Water Quality Category Results With and Without Risk Indicator Weights



Accessibility

Figure 12 shows how those water systems currently on the HR2W list and those systems that may be added due to the expanded HR2W criteria perform in the Accessibility risk category. The category scoring approaches illustrated in Figure 12 depict the category results using both unweighted and weighed water quality indicators. Using both approaches, only 6% (n=176) of systems score 0 points in this category. The unweighted category approach shows a weak relationship to presence especially on the current HR2W list and to a lesser extent potentially-expanded HR2W systems. The weighted approach suggests that HR2W systems score higher in this category than systems that are not HR2W, but the relationship is not very strong. The State Water Board believes that this may be due to the HR2W systems currently under representing source capacity violations. It is anticipated that future iterations will attempt to address this deficiency.

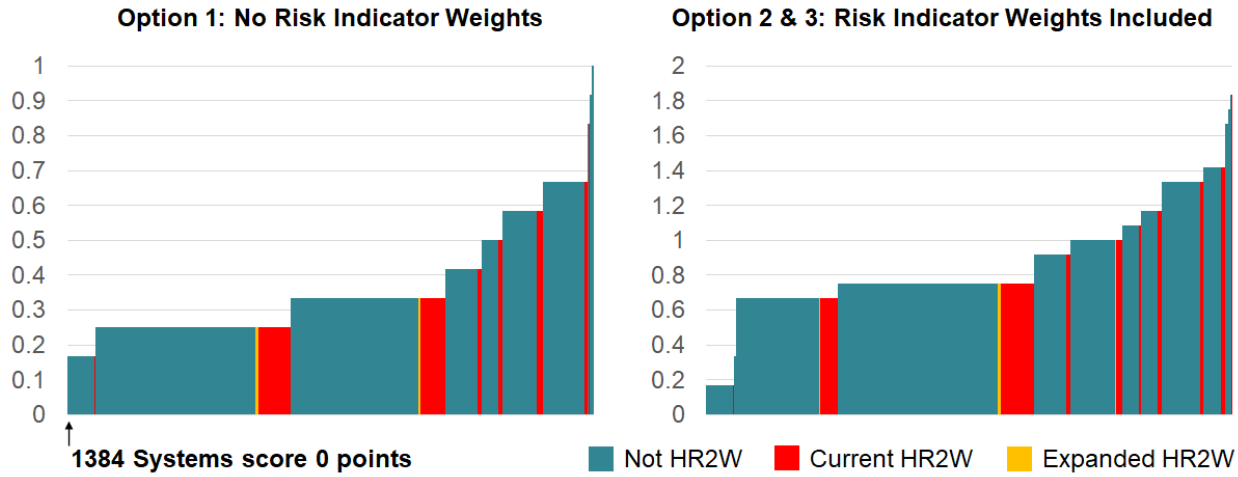
Figure 12: Accessibility Category Results With and Without Risk Indicator Weights



Affordability

Figure 13 shows how those water systems currently on the HR2W list and those systems that may be added due to the expanded HR2W criteria perform in the Affordability risk category. The category scoring approaches illustrated in Figure 13 depict the category results using both unweighted and weighed water quality indicators. Using both approaches, about 49% (n=1384) of systems score 0 points in this category. Both approaches suggest that HR2W systems are not markedly different from non-HR2W systems in their Affordability category scores, although their scores are higher in each approach. The State Water Board also recognizes that water systems with unsafe water may pay lower water rates because the capital costs and necessary maintenance associated with treatment are not fully covered by the system's service charges.

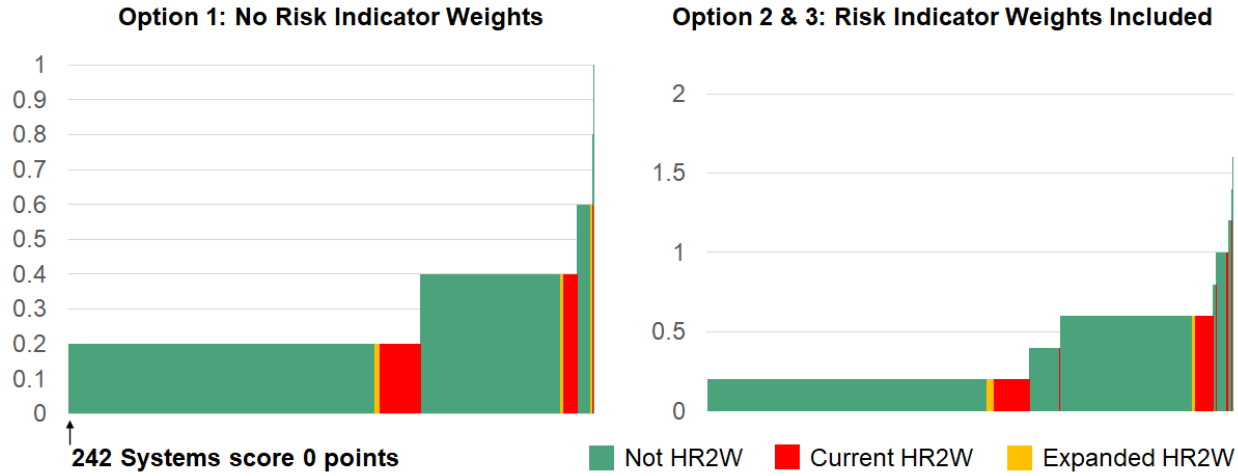
Figure 13: Affordability Category Results With and Without Risk Indicator Weights



TMF Capacity

Figure 14 shows how those water systems currently on the HR2W list and those systems that may be added due to the expanded HR2W criteria perform in the TMF Capacity risk category. The category scoring approaches illustrated in Figure 14 depict the category results using both unweighted and weighed water quality indicators. Using both approaches, about 8% (n=242) of systems score 0 points in this category. Both approaches suggest that HR2W systems are not markedly different from non-HR2W systems in their TMF Capacity category scores. The lack of a strong correlation of this data suggests that addition collection of TMF Capacity data is needed and/or additional analysis of TMF relationships to the HR2W list is needed for future iterations of the Risk Assessment.

Figure 14: TMF Capacity Category Results With and Without Risk Indicator Weights

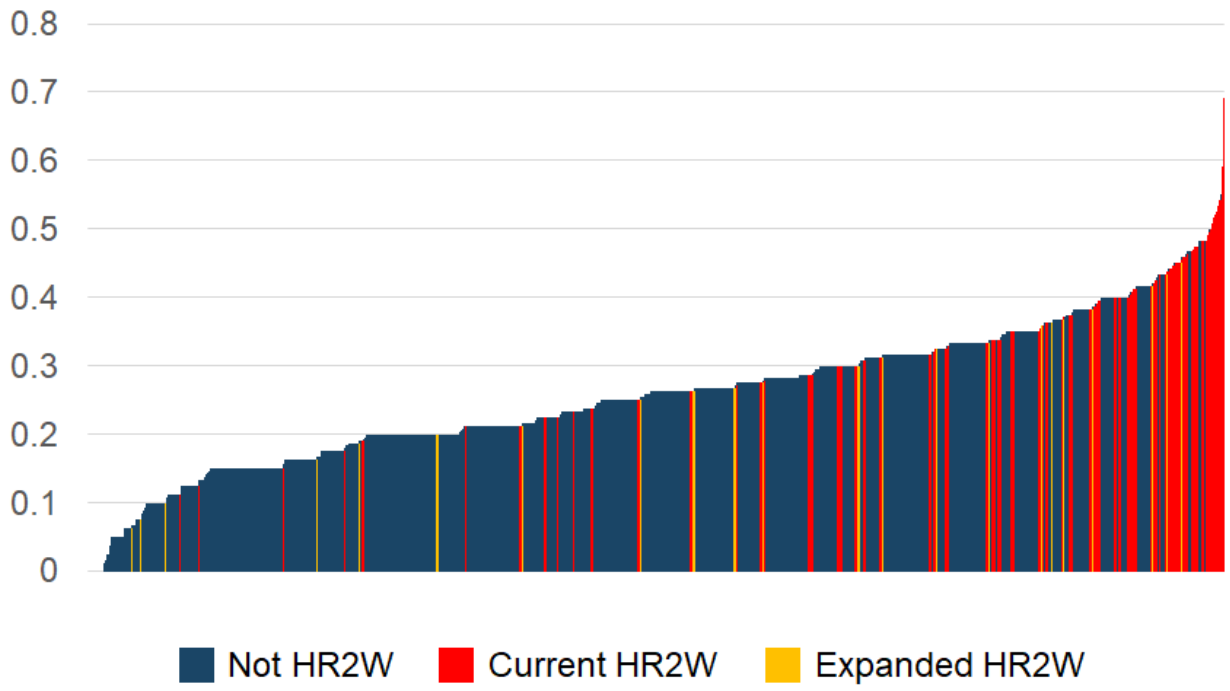


Aggregated Assessment Results

Option 1- No Weights (Raw)

The average risk score using this method is 0.26 points (Median 0.26), with a minimum score of 0 points and a maximum score of 0.69 points.

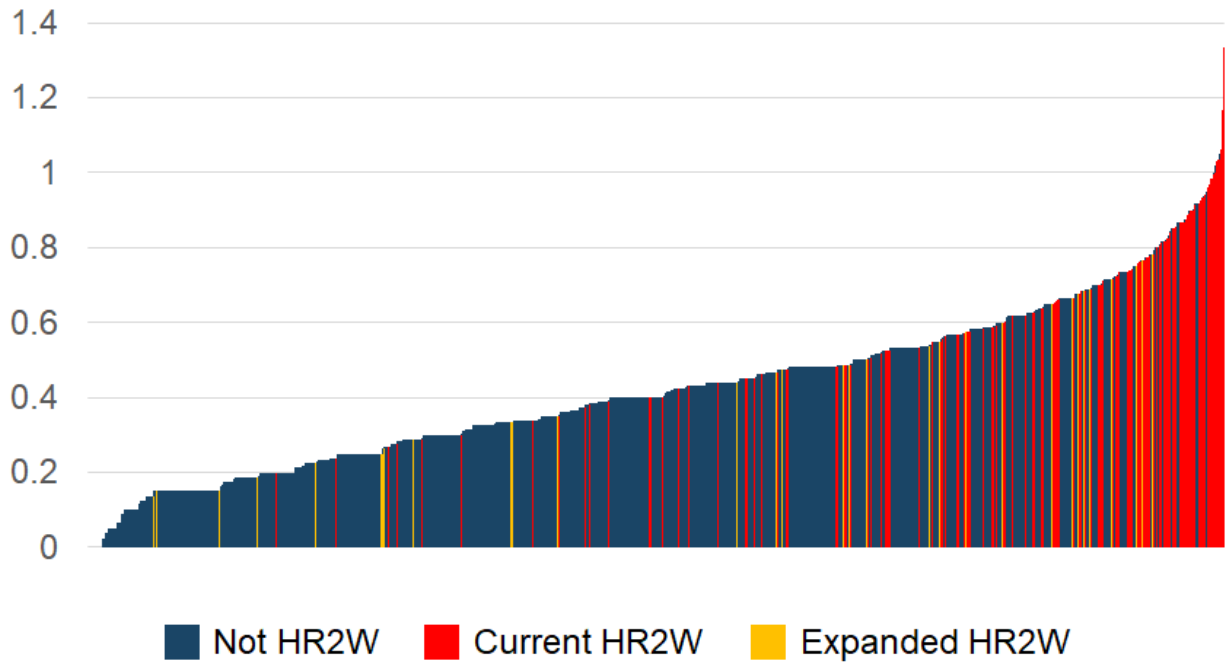
Figure 15: Option 1 Aggregated Risk Assessment with No Weights Applied



Option 2- Risk Indicator Weights Only

The average risk score using this method is 0.42 points (Median 0.40), with a minimum score of 0 points and a maximum score of 1.33 points.

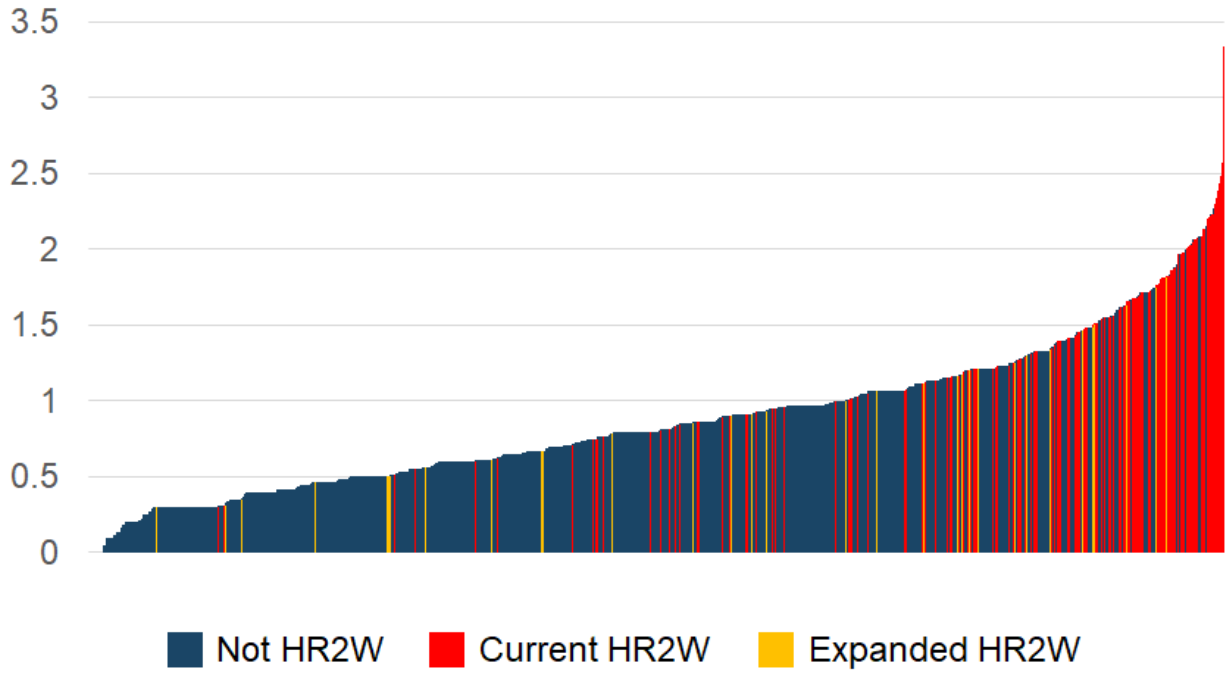
Figure 16: Option 2 Aggregated Risk Assessment with Indicator Weights Only



Option 3- Risk Indicator Weights and Category Weights

The average risk score using this method is 0.88 points (Median 0.80), with a minimum score of 0 points and a maximum score of 3.33 points.

Figure 17: Option 3 Aggregated Risk Assessment with Risk Indicator Weights and Category Weights



Risk Assessment 2.0 Recommendations

Based on the distribution of the HR2W systems, the State Water Board recommends Option 3 for Risk Assessment 2.0. This option is recommended due to the distribution of the current and expanded HR2W systems. The State Water Board recommends for Risk Assessment 2.0 a “Potentially At-Risk" threshold of 0.75 and an “At-Risk” threshold of 1.0 for public consideration. These thresholds were determined based on where the current and expanded HR2W systems started to cluster.

Excluding the systems that are currently on the HR2W list and those that may be added due to the expanded HR2W criteria, at these proposed thresholds, 584 water systems would meet the Potentially At-Risk criteria and 702 water systems would meet the At-Risk criteria.

Table 8: Option 3 Aggregated Risk Assessment with Indicator and Category Weights (n = number of water systems)

Risk Scoring Option 3	At Risk (>=1)	Potentially At Risk (>=.75 & <1)	Not At Risk (<0.75)
Current HR2W	88.9% (n=256)	7.3% (n=21)	3.8% (n=11)
Expanded HR2W	48.7% (n=19)	12.8% (n=5)	38.5% (n=15)
Not HR2W	27.8 % (n=702)	23.2% (n=584)	49.0% (n=1237)
All Systems	34.3% (n=977)	21.4% (n=610)	44.3% (n=1263)

Next Steps

December 14, 2020 Public Webinar Workshop

The State Water Board will be hosting a public webinar workshop on December 14, 2020 to solicit stakeholder feedback and recommendations on:

- Proposed expanded criteria for the HR2W list.
- Proposed thresholds for risk indicators and weighting and scoring recommendations for Risk Assessment 2.0

Registration for webinar workshop:
SAFER Webinar: IDENTIFYING AT-RISK PUBLIC WATER SYSTEMS – SELECTING THRESHOLDS, SCORES & WEIGHTS (Part 4):
https://waterboards.zoom.us/webinar/register/WN_79-XOhPpTCyINEm_5DDMBg

Materials on past Risk Assessment workshops can be found at SAFER website:
https://www.waterboards.ca.gov/safer/calendar.html

Determine Final Risk Assessment 2.0 Methodology

The State Water Board and UCLA will review and consider public and stakeholder feedback on the recommended risk indicators received from **December 14, 2020 through January 6, 2021** to determine the final Risk Assessment 2.0 methodology.

Public feedback and recommendations should be submitted:

- In person during the December 14, 2020 webinar workshop; or
- By email: SAFER@waterboards.ca.gov

Phase 5 of Risk Assessment 2.0 Development

The State Water Board and UCLA will finalize the Risk Assessment 2.0 methodology using public feedback and continued efforts to refine the risk indicator and category scores/weights. The Risk Assessment 2.0 methodology and results must be completed in early January in order to conduct the Cost Assessment prior to the Spring release of

the draft 2021-22 Fund Expenditure Plan. The Cost Assessment will be conducted using the results of the Risk Assessment and the expanded HR2W list. The final Risk Assessment 2.0 methodology and results will be made available to the public in the Spring of 2021.

Appendix A: Stakeholder Feedback

Public Webinar Workshop – April 17, 2020

On April 17, 2020, the State Water Board and UCLA hosted a public webinar workshop to introduce the results of Risk Assessment 1.0 and solicit public feedback and recommendations for the next version (Version 2.0) of the Risk Assessment. Feedback from this workshop led the State Water Board and UCLA to identify additional potential risk indicators that align with the three fundamental components of the HR2W (*i.e.* water quality, accessibility, and affordability), and extended its search to incorporate technical, managerial, and financial (TMF) capacity indicators as well. More information about this webinar workshop can be accessed on State Water Board's SAFER webpage: https://www.waterboards.ca.gov/safer/calendar.html.

Public Webinar Workshop – July 22, 2020

On July 16, 2020, the State Water Board made publicly available a white paper on the *Identification of Risk Assessment 2.0 Indicators for Public Water Systems.*[14] On July 22, 2020, the State Water Board and UCLA, hosted a webinar workshop to solicit stakeholder feedback and recommendations on:

- Draft definitions of the four risk indicator categories: Water Quality, Accessibility, Affordability, and TMF Capacity.
- Expanded list of 118 potential risk indicators to be considered for inclusion in Risk Assessment Version 2.0. This effort included full consideration of risk indicators identified in complementary efforts conducted by the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Water Resources (DWR), and the California Public Utilities Commission (CPUC), as well as additional indicators that are recognized by the water sector and its advocates to be key measures of water system resiliency.
- Draft Risk Indicator Evaluation Tool used to assess the Applicability and Data Fitness of the identified potential risk indicators.

Stakeholder feedback and recommendations provided through the public webinar, written comments, and continued dialogue during the feedback period (07.16.2020 - 08.21.2020) are detailed in Appendix A. The following is a brief summary of incorporated feedback:

- 11 new potential risk indicators were identified for consideration and added to the list of indicators to be evaluated. Three potential risk indicators were removed from the list due to redundancy.

[14] Draft Final White Paper Discussion On: 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

- Step 3 of the Risk Indicator Evaluation Tool was modified to strengthen the criteria for "Maybe": changing from "Step 1 results may be Good or Fair" to "Step 1 results ***must*** be Good."
- Specific comments regarding the applicability of individual potential risk indicators were considered when determining Step 1 evaluation scores (Supplemental Appendices D.1 through D.4).

Public Webinar Workshop – October 13, 2020

On October 7, 2020, the State Water Board made publicly available a white paper on the *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems.*[15] On October 13, 2020, the State Water Board and UCLA, hosted a webinar workshop to solicit stakeholder feedback and recommendations on:

- Evaluation results of 129 potential risk indicators using the Evaluation Tool.
- The State Water Board and UCLA's recommendation 22 risk indicators for inclusion in Risk Assessment Version 2.0 for public water systems.
- How the State Water Board should utilize a number of the potential risk indicators that are non-MCL violations. Specifically, how these metrics should be assessed for systems that "consistently fail" or are "At-Risk."
- Initial considerations on scoring and weighting options for individual risk indicators and risk indicator categories.

Stakeholder feedback and recommendations provided through the public webinar, written comments, and continued dialogue during the feedback period (10.07.2020 - 10.30.2020) are detailed in Appendix A. The following is a brief summary of incorporated feedback:

- Based on feedback and further assessment of the proposed risk indicator "Increasing Presence of Water Quality Trends Towards MCL," the State Water Board is proposing removing this risk indicator from the Risk Assessment for the 2021-22 Fund Expenditure Plan so that more time can be dedicated to setting more appropriate thresholds, scores, and weight (Appendix B).
- In most cases, the State Water Board and UCLA proposed higher risk indicator and category weights for indicators that may be influenced by water system management and lower weights for those that are outside a water system's sphere of influence.
- The State Water Board explored and proposed expanded "failing" criteria for the HR2W list (Appendix C).

Input During the October 13th Webinar

During the public webinar (10.13.2020), a total of six audience poll questions and three discussion topics were used to assist public participation in providing their input. A total

[15] Draft Final White Paper Discussion On: 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

of 97 people participated in the webinar through either Zoom or CalEPA's live webcast and nearly 50% of the Zoom participants competed the polls. The poll results and discussion comments on three main topics of the webinar are summarized below.

Evaluation Results of Potential Risk Indicators
129 potential risk indicators were assessed for the applicability and data fitness utilizing the Evaluation Tool developed through a stakeholder-driven process. The evaluation results were presented in the webinar to solicit public feedback.

Audience Poll Question 3:
Do these evaluation results align with what you expected?

- Yes, I expected these results (23%)
- Maybe, I haven't had a chance to review the potential risk indicator evaluations (58%)
- Maybe, there are some potential risk indicators evaluations I don't agree with (18%)
- No, I disagree with a majority of the potential risk indicator evaluations, the results do not align with my expectations (3%)

Poll Result: The majority of participants indicated they needed more time to review the potential risk indicators evaluations. However, nearly a quarter of participants indicated the results matched their expectations.

Refine the List of Potential Risk Indicators & Make Recommendations for Risk Assessment 2.0
Based on the evaluation results, 129 potential risk indicators proposed were initially narrowed down to 51 and further refined to obtain the list of recommended risk indicators by excluding the moderately duplicative potential risk indicators. The *draft* final list of 22 recommended risk indicators were presented in the webinar to solicit public feedback.

Audience Poll Question 4:
Do you support this list of recommended indicators for Risk Assessment 2.0?

- Yes, I support this list of risk indicators (28%)
- Maybe, there are some risk indicator recommendations I don't agree with (20%)
- No, I do not support the majority of the recommended risk indicators (3%)
- I need more time to review before I provide feedback (50%)

Poll Result: The majority of participants indicated they needed more time to review the recommended list of risk indicators for Risk Assessment 2.0.

Violation-Type Risk Indicators
In relation to the recommended risk indicators that are associated with non-MCL violations, such as treatment technique violations, operator certification violations, and monitoring/reporting violations, the following discussion topic was introduced to solicit public input.

Discussion Topic: What is Failure?
How should the State Water Board define "failing"?

Public Comments: The following discussion was noted in relation to the topic "What is Failure?"

- State Water Board should adhere to what statutory/regulatory standards require for the public water system to achieve compliance. Failure means consistently failing in reference to compliance with the standards. The focus was on where their chronic violations of the standards are so the system has failed to comply. At-risk, on the other hand, indicates the situations where the system is on the edge of failing to meet the standards.
    - ***State Water Board response during webinar***: We appreciate the comment and we hope our Risk Assessment will be able to identify those systems that are most at-risk of failing.

- Suggestion to include failure to complete regulatory requirements in defining the term "Failing," such as, but not limited to:
    - Failure to complete annual regulatory reporting (*e.g.* Consumer Confidence Reports [CCR] or Electronic Annual Reports [eAR]) accurately and correctly. As an example, a water system with no rate structure correctly reported can be flagged as an at-risk system. The eAR is a huge source of information if they are completed correctly. Some data gaps could be as a direct result of lack of required reporting and communication from operators and/or system managers to DDW. Some efforts should be put toward assisting systems with completing the eARs to help to fill in data gaps.
    - Failure to provide proper notification to DDW for water quality violations, low/no pressure events, treatment plant upset/failures, or any other operational events that must be reported to customers and DDW. These items are very much in the Technical and Managerial realms of water system operation.
    - ***State Water Board response during webinar***: Some of the recommendations made are currently captured in either Treatment Technique violations or Monitoring & Reporting violations. For the data points that are not currently captured, some improvements are being made to the eAR (*e.g.* moving to platform with the additional functionality to improve the user experience). In addition to this, the State Water Board supports a contract with technical assistance providers to support systems in completing the eAR. The new eAR will have a direct link to a technical assistance application.

Risk Assessment Thresholds and Weights/Scores
In relation to the application of weights to risk indicators and/or risk indicator categories to assess all the risk indicators together in a combined Risk Assessment score, two potential approaches, respectively, were introduced in the webinar:

- Individual risk indicators can have the same weight or different weights based on comparative criticality.
- Risk indicators categories can have the same weight or different weights.

Audience Poll Question 5:
Do you support different "weights" for **individual** risk indicators?
- Yes, I support different weights (67%)
- No, all risk indicators should have the same weight (3%)
- I need more time to review before I provide feedback (30%)

Poll Result: The majority of poll participants chose different weights for individual risk indicator (67%).

Audience Poll Question 6:
Do you support different "weights" for risk indicator **categories**?
- Yes, I support different weights (64%)
- No, all risk indicator categories should have the same weight (0%)
- I need more time to consider this question before I can provide feedback (36%)

Poll Result: The majority of poll participants chose different weights for risk indicator categories (64%).

Discussion Topic: Weights and Scores
Do you have any recommendations on how the State Water Board should set weights and scores for individual risk indicators and/or risk indicator categories?

Public Comments: The following discussion was noted in relation to the topic "Weights and Scores".

- Different Risk Indicators may point to potential water safety, affordability, and supply problems and vary tremendously by the circumstances of individual water systems. At some point State Water Board may end up having the different weights according to the specific facts at water system-level and need to be informed about what is going on at specific site. There is also a big difference between urban and rural DAC/SDAC systems. That might require different ranking for different problems relating to urban and rural status.

Discussion Topic: Open Q&A
Do you have any questions or comments about the development of the Risk Assessment methodology?

Public Comments Related to the Risk Assessment:

- It might be possible to combine water quality violations into violations of primary drinking water standards, which include MCL violations, Treatment Technique violations, and Monitoring & Reporting violations while Operator Certification violation would probably be excluded.

- ***State Water Board response during webinar***: Primary and secondary MCL violations are currently captured in the HR2W list criteria.[16] Systems on the HR2W list are the SAFER Program's highest priority for potential funding and technical assistance. These systems will not be part of the Risk Assessment.

- Concerns about how the data availability for tribal water systems (regulated by federal EPA) was factored into the State Water Board's decision process to select indicators (*e.g.* any of the data for affordability indicators might not be available for tribal water systems). If tribal data does not exist, how will the lack of data affect a system's score - will the tribal water systems be adversely affected by using a scoring system where tribal data is not available or does not exist? It's desirable that the disparities in data availability will not be held against tribes, and tribal water systems will be evaluated on equal footing and have equal access to resources.
  - **State Water Board response during webinar***:* The State Water Board recognizes that we will need to modify our Risk Assessment (for public water systems) to accommodate data availability for tribal water systems and does not anticipate that the exact same methodology we are currently developing for public water systems will be applied to tribal water systems. We are currently working with the State Water Board's Office of Public Participation (OPP) to reach out to tribal water systems to get their input and also reaching out to U.S. EPA to identify what data is available to us.

- It is understood that tribal water systems would be scored for risk differently than other public water systems. How will the separate scoring systems compare and how will tribal water systems compete for resources on level ground despite of being scored differently or is there a consideration of a tribal set-aside to handle this potential inequity?
  - ***State Water Board response during webinar***: The Risk Assessment for Tribal water systems, once completed, will put tribal systems on the same playing field for potential funding and technical assistance.

- Lack of qualified operators or managerial staff can be used to complete the Risk Assessment to its full potential.
  - ***State Water Board response during webinar***: We have Operator Certification violations as one of our TMF Capacity risk indicators. Having more Financial capacity indicators would be desirable, however, due to very limited data we have access to, it's currently not feasible. We anticipate incorporating more TMF capacity risk indicators in the future when we can collect better data.

- Is it relevant what the Step 2 results are in determining "Yes or No inclusion" in Step 3 when the Step 1 results are "Fair" or "Poor"? Tables in Appendix C shows potential risk indicators that were determined "No inclusion" in Risk Assessment

[16] See Appendix C to learn more about the HR2W criteria.

2.0, where Step 1 was “Fair” or “Poor,” but Step 2 was “Good” for all three criteria (*e.g.* Non-Compliance with Primary Drinking Water Standards, Frequency of Water Quality Near MCL, and Current Water Quality Greater than 50% for Acute Contaminants).
    - ***State Water Board response during webinar***: If applicability was neither “Excellent” or “Good”, even if the data fitness criteria scores are all “Good”, the Step 3 score will be “No.” The State Water Board doesn’t want to rely on risk indicators that internal and external stakeholders deem non-critical as it relates to a water system’s ability to stay in compliance, even if the data is available for those indicators.

- How are you addressing critical risk indicators with no or limited data availability? Are the financial capacity risk indicators simply not used for the Risk Assessment? How can this financial data be obtained?
    - ***State Water Board response during webinar***: The State Water Board’s Needs Analysis Unit (NAU), with the Office of Research, Planning, and Performance (ORPP), has been working with the eAR Input Forum to add additional questions to the eAR that will help us assess the financial stability of the water systems in future iterations of the Risk Assessment. We recognize that some water system financial data is reporting to other State agencies, we will explore how to streamline and share data more efficiently in the future.

Input through Written Comment After the October 13th Webinar

Additional stakeholder comments that were received through the SAFER email (safer@waterboards.ca.gov) within the open comment period (10.13.2020 – 10.30.2020) are detailed below. Several comment letters were received.

Western Growers Association / California Farm Bureau Federation

The State Water Board received two comment letters on the same topic, the first from the Western Growers Association dated October 29, 2020 and the second from the California Farm Bureau Federation dated October 30, 2020. Both letters provided specific comments regarding one potential water quality risk indicator: “Proximity of Public Water System’s Source Water to Septic System.” These comments noted that the State Water Board’s previous nitrate studies did not account for localized impacts from septic systems as a potential source of nitrate contamination to domestic wells and state small water systems. Both organizations noted that these studies focused more heavily on the impacts from agricultural fertilizers and animal wastes applied to cropland.

It was understood that, based on the Risk Indicator Evaluation Tool and lack of adequate data, this water quality indicator will not be considered for Risk Assessment 2.0. To help fill in the data gaps, it was recommended that the State Water Board and local agencies overseeing the Onsite Wastewater Treatment Systems (OWTS) policy prioritize a monitoring program geared towards a more comprehensive evaluation of septic system impacts to groundwater quality.

California Water Association
The California Water Association (CWA)'s October 30, 2020 comment letter indicated its support of the methods and recommendations the State Water Board has developed and described in the draft final white paper, especially about the addition of the TMF Capacity indicators. The CWA recommended that, with regard to the consideration of "the appropriate balance between risk indicators that may be influenced by water system management and risk indicators that are outside a water system's sphere of influence," the next stage of the process should include a weighting of water quality and TMF Capacity indicators which are at the center of water system's sphere of influence over customer economic factors. It was also noted that there needs to be consideration given to the small systems with relatively greater capacity which are part of a multi-system providers over those that are small independent systems with strongly constrained resources.

Clean Water Action
In its October 30, 2020 comment letter, the Clean Water Action, indicated that the State Water Board's recommended risk indicators are appropriate, as a general matter. However, it provided several recommendations including a simplified evaluation of risk status for small water systems serving disadvantaged communities - considering the overarching challenges to sustainable delivery of safe drinking water that these small water systems are facing (*e.g.* higher stats in drinking water violations and unaffordable drinking water charges), a complex analysis of the recommended indicators would be unnecessary in determining at-risk status. It was recommended that the State Water Board consider a two-tiered risk analysis that comprises of the initial simplified analysis identifying presumptively at-risk small water systems and a second-tier evaluation including a more complex analysis. The Clean Water Action also provided several suggestions for specific recommended risk indicators in each category as summarized below.

- Water Quality
    - Clean Water Action supports the inclusion of Water Quality indicators for Number of High Potential Exposure (HPE) Contaminants, Presence of HPE Acute Contaminants, and Maximum Duration of HPE.
    - Past Presence on the HR2W list indicator depends on the contaminant and whether a violation has been addressed. To improve this metric, the Clean Water Action suggests developing/implementing a standardized policy of issuing violations for secondary contaminants and updating the HR2W list accordingly.
    - Potential Contamination Hazards or Source Water Protection Zones should be included to meaningfully address the source water contamination. A pathway could be found, likely through the Sanitary Surveys and GAMA risk maps, for updating and tracking information about threats to source water.

- Accessibility

- Clean Water Action supports the metric for DWR - Drought and Water Shortage Risk Assessment Results for inclusion, as many small systems are vulnerable to water loss during droughts.

- Affordability
  - While appreciating the multiple indicators measuring affordability, Clean Water Action suggests the Socioeconomic Vulnerability Index as the best option for an equity indicator, despite receiving a "No" evaluation.
  - Clean Water Action supports the inclusion of risk indicators related to household-level affordability (*e.g.* service disconnections and access to hot/cold running water, and a sink with a faucet), which indicating both unaffordability and a disruption of access on a household level.

- TMF Capacity
  - Clean Water Action supports Maintaining a Full Board and Significant Deficiencies identified in Sanitary Surveys as appropriate indicators.
  - Clean Water Action agrees Monitoring and Reporting Violations is a key metric, particularly a continuing lack of reporting.
  - While appreciating the value of a Financial Audit indicator, the cost of auditing can be prohibitive for small water systems. For future version of Risk Assessment, development of a less expensive audit requirement for small systems is recommended before considering the inclusion of this indicator.
  - Presence/Absence of a Drought Preparedness Plan (Water Conservation Plan) should be considered as a future indicator, as the DWR drought shortage planning effort for small water systems moves forward.

Clean Water Action also provided comments related to the State Water Board's ongoing efforts to improve eAR data quality. It was specifically recommended that the State Water Board should make some of the eAR questions mandatory to obtain necessary information, such as Waterborne Illness: Historical and Current Customer Complaints and Unplanned Water Outage.

Association of California Water Agencies/California Municipal Utilities Association

In their October 30, 2020 comment letter, the Association of California Water Agencies (ACWA) and California Municipal Utilities Association (CMUA), provided a number of comments focusing on specific potential indicators as summarized below.

- Water Quality
  - MCL-related at-risk indicators – ACWA and CMUA suggest that the proposed "Increasing presence of Water Quality Trends Towards MCL" indicator be rejected.

- Accessibility
  - Number and Type of Sources – These number and type of water sources do not indicate whether a system is at risk of failing to provide an

adequate supply of safe drinking water. These two proposed indicators should be rejected.
    - Critically Overdrafted Groundwater Basin – This proposed indicator is overly broad. It does not indicate whether there is an adequate water supply.

- Affordability
    - % Median Household Income – ACWA and CMUA support the recommendation for use of this indicator in the 2021-22 Risk Assessment and Affordability Assessment. ACWA and CMUA also support use of this indicator in future fiscal years.
    - System Affordability – System affordability, not customer affordability, should influence whether a system is considered at-risk of failing to provide an adequate supply of a safe drinking water.
    - Household Burden Indicator (20th Percentile) – this proposed metric focuses on customer affordability as opposed to system affordability and should be rejected.
    - Poverty Prevalence – This proposed indicator is not a good indicator of whether a system is at-risk of failing to provide an adequate supply of safe drinking water due to system affordability.
    - Housing Burden – The at-risk indicators related to affordability should relate to drinking water, not the cost of housing. ACWA and CMUA recommend that this draft indicator be rejected.
    - Extreme Water Bill – Higher than average customer charges do not indicate that a water system is "at-risk" for failing to provide an adequate supply of safe drinking water. This indicator should be rejected.
    - Shut-Offs – The percentage of shut-offs due to nonpayment is not a good indicator of whether a system is at-risk of failing to provide an adequate supply of safe drinking water. This proposed indicator should be rejected.

- TMF Capacity
    - Current Ratio – ACWA and CMUA recommend the addition of the current ratio indicator in the final set of indicators.
    - Extensive Treatment Installed – Having extensive treatment does not mean a water system is at risk of failing to provide an adequate supply of safe drinking water. This potential indicator should be rejected.
    - Inconsistent Listing in Evaluation Tool – "Customers Metered" and "Absence of Customer-Level Meters" should not be listed as "Maybe" for potential inclusion in the risk assessment.

ACWA and CMUA also provided feedback requested at the October 13, 2020 webinar on defining the terms "fail" and "at-risk" in the SB 200[17] context as follows:

[17] Senate Bill 200 (Monning, 2019)
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB200

- “Fail” – The enacted version of SB 200 clearly defines the term “consistently fail.” The State Water Board should implement the term as the Legislature defined it. The SB 200 statute is clear that “fail” under SB 200 is “solely” the failure to provide an adequate supply of safe drinking water. It does not, for example, include failure to submit reports or certification failure. Failure in the SB 200 context is specifically defined. The State Water Board must act consistent with the statute that defines the term.

- “At-Risk” – ACWA and CMUA recommend that the State Water Board not go beyond the scope of what the Legislature intended for SB 200 in interpreting “at risk” in the SB 200 context. In the legislative process, this term was explained as systems that were right on the edge of failure (to provide an adequate supply of safe drinking water). It was not intended to capture any level of hypothetical risk. Rather, it was intended to fund situations where there was a significant risk of failure – situations that would warrant state funding in addition to SB 200 funding for systems with known MCL violations (*i.e.* where failure to provide an adequate supply of safe drinking water had occurred).

Appendix B: 2.0 Risk Indicators

The State Water Board, in partnership with the University of California, Los Angeles (UCLA), began an effort in April 2020 to identify potential risk indicators to be considered for inclusion in Version 2.0 of the Risk Assessment for public water systems. Version 1.0 of the Risk Assessment utilized 14 risk indicators. 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 evaluated 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 indicators that measure water quality, accessibility, affordability, and TMF capacity (technical, managerial, and financial) 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), the Department of Water Resources (DWR), and the California Public Utilities Commission.

To facilitate the selection of the final indicators for Risk Assessment 2.0, the State Water Board and UCLA conducted an extensive potential risk indicator evaluation with internal and external feedback to refine the list of 129 risk indicators to a recommend list of 22 risk indicators for Risk Assessment 2.0. Learn more about the risk indicator identification and selection process in the October 7, 2020 white paper *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems.*[18] Table B1 below provides a summary of the selected risk factors and, in some cases, the year that the risk factor is expected to be included. Not all of the 22 risk factors will be utilized this year, due to current year's data limitations, additional analysis that may be needed, or a desire for additional stakeholder outreach anticipated in subsequent years (*e.g.* affordability).

Table B1: Risk Assessment 2.0 Risk Indicators

Risk Indicator Category	Risk Indicator
Water Quality	**History of E. coli Presence**
Water Quality	**Increasing Presence of Water Quality Trends Toward MCL** (2022-23 Needs Assessment)
Water Quality	**Treatment Technique Violations**
Water Quality	**Past Presence on the HR2W List**

[18] Draft Final White Paper Discussion On: 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

Water Quality	**Maximum Duration of High Potential Exposure (HPE)**
Water Quality	**Percentage of Sources Exceeding an MCL**
Accessibility	**Number of Sources**
Accessibility	**Absence of Interties**
Accessibility	**Water Source Types**
Accessibility	**DWR – Drought & Water Shortage Risk Assessment Results**
Accessibility	**Critically Overdrafted Groundwater Basin**
Affordability	**Percent of Median Household Income (%MHI)** (2021-22 Needs Assessment Only)
Affordability	**Household Burden Indicator (HBI) for Drinking Water** (2022-23 Needs Assessment)
Affordability	**Poverty Prevalence Indicator (PPI)** (2022-23 Needs Assessment)
Affordability	**Housing Burden** (2022-23 Needs Assessment)
Affordability	**Extreme Water Bill** (2021-22 and 2022-23 Needs Assessment)
Affordability	**% Shut-Offs** (2021-22 and 2022-23 Needs Assessment)
TMF Capacity	**Number of Service Connections**
TMF Capacity	**Operator Certification Violations**
TMF Capacity	**Monitoring and Reporting Violations**
TMF Capacity	**Significant Deficiencies**
TMF Capacity	**Extensive Treatment Installed**

The following provides a detailed overview of the final risk indicators included in Risk Assessment 2.0, as well as recommended thresholds and scores for consideration in the final assessment.

RISK INDICATORS FOR THE WATER QUALITY CATEGORY

History of E. coli Presence

Definition

The presence of E. coli in drinking water suggests that the supply has fecal contamination, and in turn, that other pathogens could be present. The presence of these contaminants 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 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. Level 1 Assessment is triggered by any of the following conditions.[19]

- A public water system collecting fewer than 40 samples per month has 2 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 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[20]:

- A water system incurs an E. coli MCL violation.
- A water system has a second Level 1 Assessment within a rolling 12 months period.
- A water system on State-approved annual monitoring has a Level 1 Assessment trigger in two consecutive years.

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:

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

[20] Level 2 Assessment: A Quick Reference Guide: https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule

Table B2: 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).

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 Recommendation

The State Water Board has proposed a threshold for E. coli violations (see Appendix C) for the expanded HR2W list which relies on whether the water system has an open enforcement action for the violation. For Risk Assessment 2.0, the State Water Board and UCLA propose a slightly modified version of the expanded HR2W threshold for "Presence of E. coli" where systems that have had an E. coli violation or Level 2 Assessment within the last three years are considered more at risk.[21]

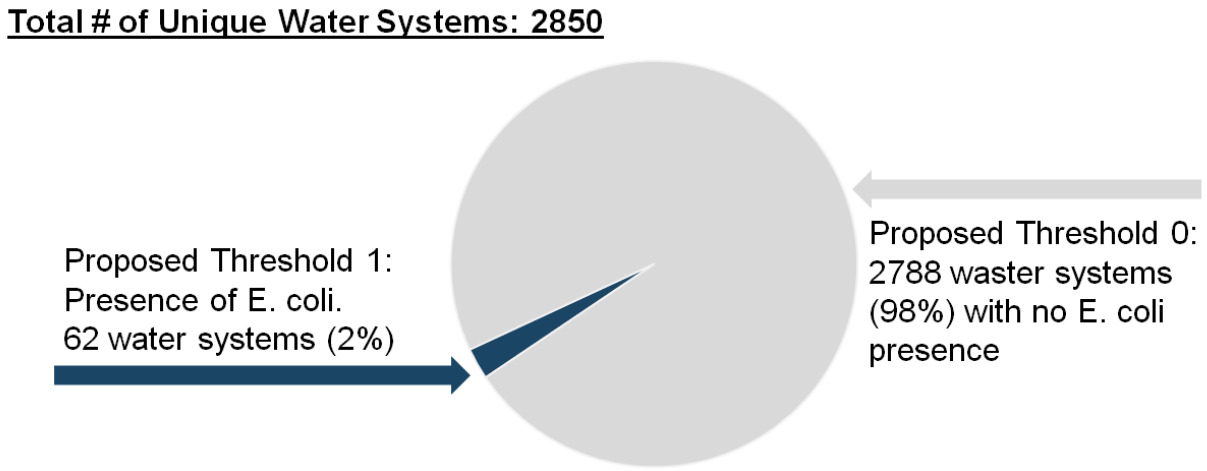
[21] Systems that meet the HR2W criteria will not be included in the Risk Assessment.

Correlation and regression analysis between the proposed risk indicator threshold and water system failure definition employed in Risk Assessment 1.0 shows a statistically significant relationship.

Proposed Thresholds:

- **Threshold 0** = **No** history of E. coli presence over the last three years.
- **Threshold 1** = **Yes**, history of E. coli presence (E. coli violation and/or Level 2 Assessment) over the last three years.

Figure B1: Water Systems (3,300 service connections or less) with a History of E. coli Presence Within the Last 3 Years



Presence of E. coli was found by analyzing E. coli violation and Level 2 Assessment (L2) data for all 2850 water systems. Presence of E coli was determined for any system identified with either an E. coli violation or L2. 51 water systems had no E. coli violation but did have an L2. Five systems had an E. coli violation but no L2. Six systems had both. The average number of violations per water system is 0.01, the minimum 0, and the maximum 4. 62 water systems (2%) meet Proposed Threshold 1 having a presence of E. coli. 2,788 water systems (98%) meet Threshold 0 having no E. coli presence.

Scoring Recommendation

Table B3 summarizes the scores recommended per threshold.

Table B3: "History of E. coli Presence" Threshold Scores

Threshold Number	Threshold	Score
0	**No** history of E. coli presence over the last three years.	0
1	**Yes**, history of E. coli presence (E. coli violation and/or Level 2 Assessment) over the last three years.	1

Increasing Presence of Water Quality Trends Toward MCL

Definition

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. This risk indicator will not be utilized in the 2021-2022 Risk Assessment after review of the impact the data had on the HR2W list distribution. Additional discussion is provided below. The risk indicator may be utilized in future a Risk Assessment after additional analysis are included.

Calculation Methodology

Required Risk Indicator Data Points & Source:

WQIr chemical table[22] for the following:

Acute Contaminants[23] – Per the Tier 1 public notification rule[24]

Table B4: Acute Contaminants with a Primary MCL

Contaminant	Analyte Number
Nitrate (as Nitrogen)	00618
Nitrate + Nitrite (as Nitrogen)	A-029
Nitrite (as Nitrogen)	00620
Perchlorate	A-031
Chlorite	50074
Chlorine Dioxide (MRDL instead of MCL)	50070

[22] Bacteriological constituents are excluded from this risk indicator.

[23] CCR § 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.

[24] CCR § 64463.1. Tier 1 Public Notice.

Non-Acute Primary Contaminants

Table B5: Non-Acute Constituents that have a Primary MCL

Contaminant	Analyte Number
Aluminum	01105
Antimony	01097
Arsenic	01002
Asbestos	81855
Barium	01007
Cadmium	01027
Chromium	01034
Cyanide	01291
Fluoride	00951
Mercury	71900
Nickel	01067
Selenium	01147
Thallium	01059
Benzene	34030
Carbon Tetrachloride	32102
1,2-Dichlorobenzene	34536
1,4-Dichlorobenzene	34571
1,1-Dichloroethane	34496
1,2-Dichloroethane	34531
1,1-Dichloroethylene	34501
cis-1,2-Dichloroethylene	77093
trans-1,2-Dichloroethylene	34545
Dichloromethane	34423
1,2-Dichloropropane	34541
1,3-Dichloropropene	77173
Ethylbenzene	34371
Methyl-tert-butyl ether	46491
Monochlorobenzene	34301
Styrene	77128
1,1,2,2-Tetrachloroethane	34516
Tetrachloroethylene	34475
Toluene	34010
1,2,4-Trichlorobenzene	34551
1,1,1-Trichloroethane	34506
1,1,2-Trichloroethane	34511

Contaminant	Analyte Number
Trichloroethylene	39180
Trichlorofluoromethane	34488
1,1,2-Trichloro-1,2,2-Trifluoroethane	34511
Vinyl Chloride	39175
Xylenes	81551
Alachlor	77825
Atrazine	39033
Bentazon	38710
Benzo(a)pyrene	34247
Carbofuran	81405
Chlordane	39350
2,4-D	39730
Dalapon	38432
Dibromochloropropane	38761
Di(2-ethylhexyl)adipate	A-026
Di(2-ethylhexyl)phthalate	39100
Dinoseb	81287
Diquat	78885
Endothall	38926
Endrin	39390
Ethylene Dibromide	77651
Glyphosate	79743
Heptachlor	39410
Heptachlor Epoxide	39420
Hexachlorobenzene	39700
Hexachlorocyclopentadiene	34386
Lindane	39340
Methoxychlor	39480
Molinate	82199
Oxamyl	38865
Pentachlorophenol	390032
Picloram	39720
Polychlorinated Biphenyls	39516
Simazine	39055
Thiobencarb	A-001
Toxaphene	39400
1,2,3-Trichloropropane (1,2,3-tcp)	77443
2,3,7,8-TCDD (Dioxin)	34676

Contaminant	Analyte Number
2,4,5-TP (Silvex)	39045
Radium-226	A-074
Radium–228	A-075
Gross Alpha particle (excluding radon/uranium)	01501
Uranium	28012
Beta/photon emitters	03501
Strontium-90	13501
Tritium	07000

Secondary Contaminants

Table B6: Constituents that have a Secondary MCL*

Contaminant	Analyte Number
Aluminum	01105
Color	00081
Copper	01042
Foaming Agent (MBAS)	38260
Iron	01045
Manganese	01056
Methyl-*tert*-butyl ether (MTBE)	46491
Odor	00086
Silver	01077
Thiobencarb	A-001
Turbidity	82078
Zinc	01092

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

Threshold Recommendation

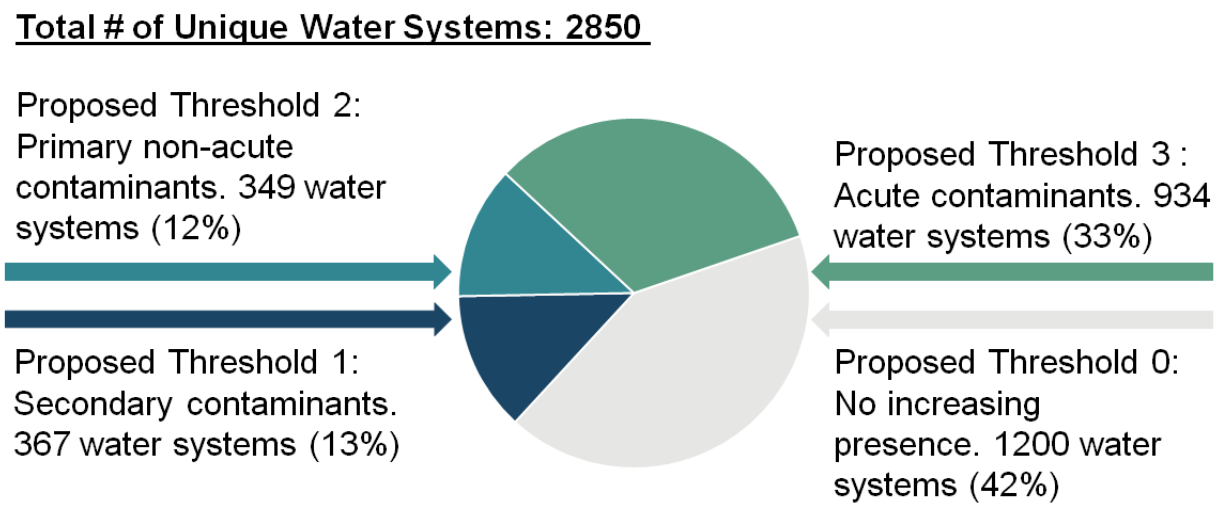
The increasing presence of water quality trends toward an MCL violation, as defined here or a similar measure, has not been assessed in other previous studies as related to water system failure or employed by other regulatory agencies or stakeholders as a threshold of concern. However, this lack of precedent 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 following threshold criteria are proposed for this risk indicator:

Proposed Thresholds:

- **Threshold 0** = **No** increasing presence of water quality trends toward MCL
- **Threshold 1** = **Secondary Contaminants**
  - 9-year average of running annual average is at or greater than 80% of MCL and running annual average has increased by 20% or more.
- **Threshold 2** = **Non-Acute Primary Contaminants**
  - 9-year average of running annual average is at or greater than 80% of MCL and running annual average has increased by 5% or more.
- **Threshold 3** = **Acute Contaminants**
  - 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.

Figure B2: Increasing Presence of Water Quality Trends Toward MCL



Scoring Recommendation

Table B7 summarizes the scores recommended per threshold.

Table B7: Increasing Presence of Water Quality Trends Toward MCL Threshold Scores

Threshold Number	Threshold	Score
0	**No** Increasing Presence of Water Quality Trends Toward MCL	0

Threshold Number	Threshold	Score
1	**Secondary Contaminants**: 9-year average of running annual average is at or greater than 80% of MCL and running annual average has increased by 20% or more.	0.25
2	**Primary Non-Acute Contaminants**: 9-year average of running annual average is at or greater than 80% of MCL and running annual average has increased by 5% or more.	0.5
3	**Acute Contaminants**: • 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

Risk Assessment Exclusion

Once this risk indicator water added to the aggregated Water Quality category assessment and overall aggregated Risk Assessment Options, with and without the indicator weights, it became apparent that the effect it had on the distribution of systems did not meet the expectations the State Water Board and UCLA had for its inclusion (See Figures B3 and B4). With the inclusion of this risk indicator, fewer HR2W systems ranked at the highest risk levels. As HR2W list systems, by definition, illustrate water systems with known contaminant issues, therefore a decrease in their risk score was concerning.

Therefore, the State Water Board is proposing removing this risk indicator from the Risk Assessment for the 2021-22 Fund Expenditure Plan so that more time can be dedicated to understanding the impact and setting more appropriate thresholds, scores, and weights.

Figure B3: Water Quality Category Results with Increasing Presence of Water Quality Trends Toward MCL Risk Indicator Included

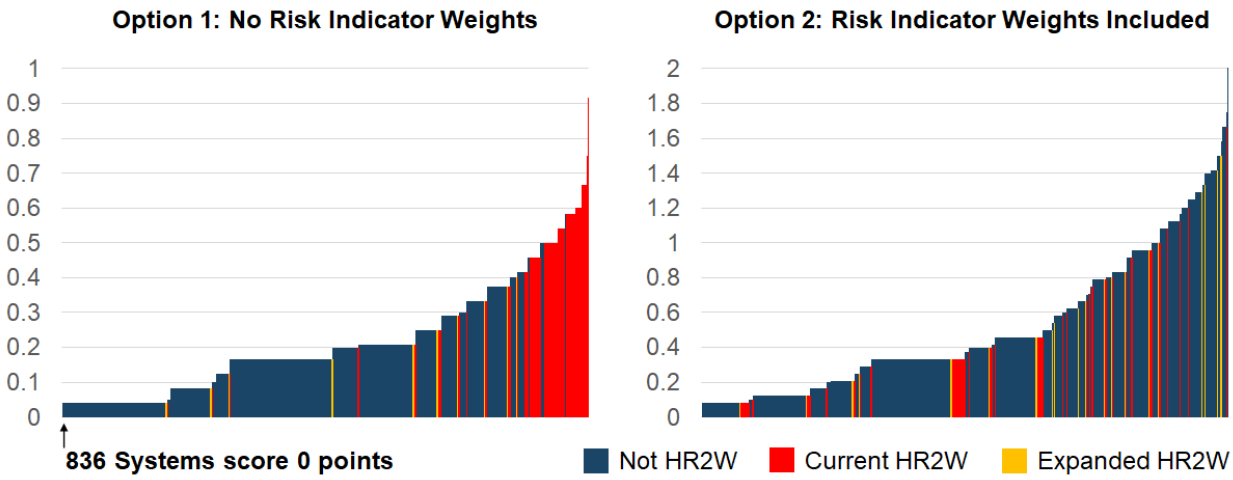
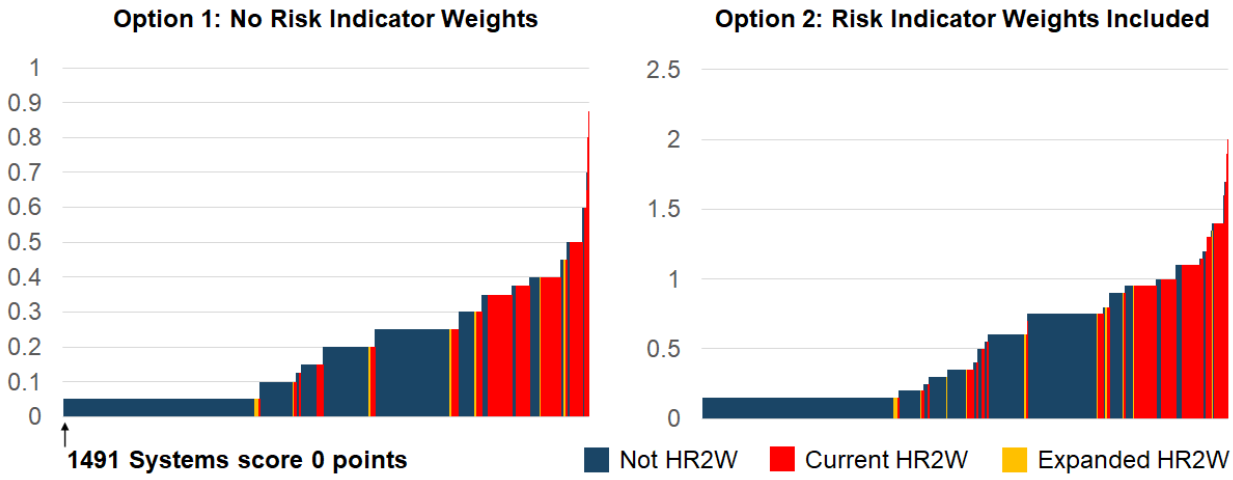


Figure B4: Water Quality Category Results with Increasing Presence of Water Quality Trends Toward MCL Risk Indicator Excluded



Treatment Technique Violations

Definition

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[25] (disinfection and filtration)
- Ground Water Rule[26]
- 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

Table B8: Treatment Technique Violation Codes

Violation Type Code	SDWIS Violation Name
07	Treatment Techniques (Other)
12	Qualified Operator Failure
33	Failure Submit Treatment Requirement Rpt
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

[25] 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)

[26] 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)

Violation Type Code	SDWIS Violation Name
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

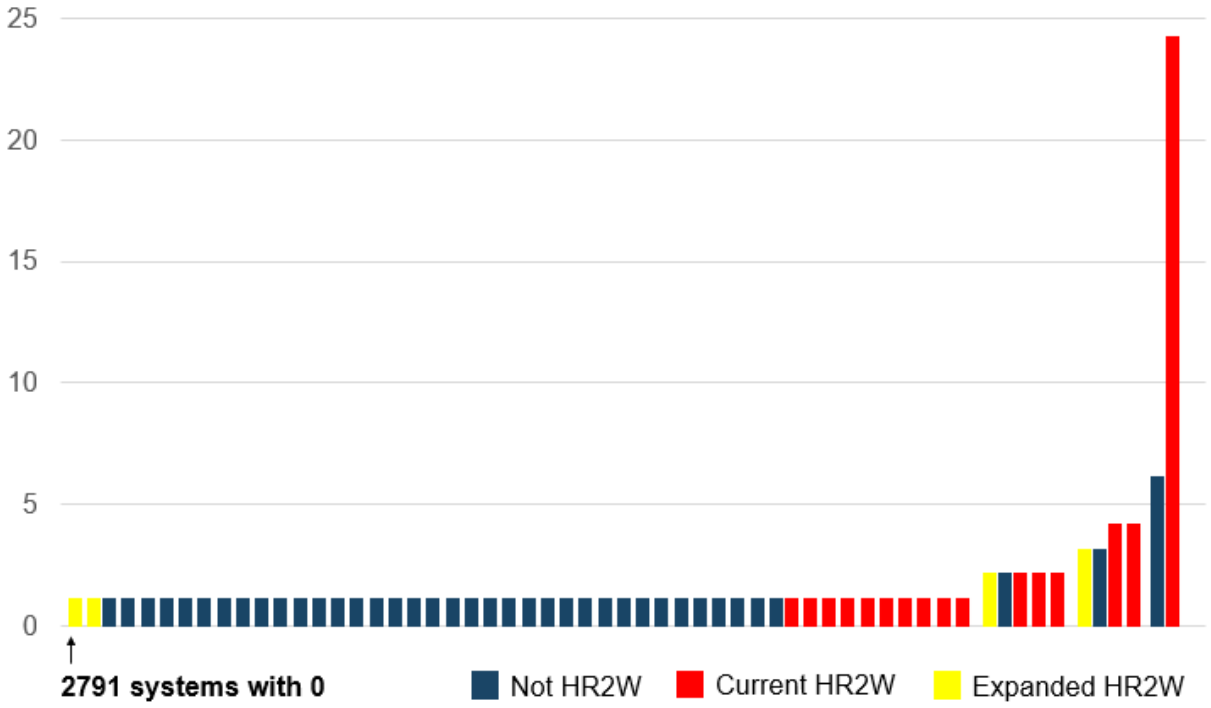
Risk Indicator Calculation Methodology:

- 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 B8, 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 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 HR2W list.

Threshold Recommendation

Treatment Technique violation data was analyzed for 2,850 water systems (Figure B5). The minimum number of violations found was 0, the maximum for one water system was 24 violations in the last 3 years, and the average violation count was 0.04 per system. 2,791 water systems had 0 violations, 48 water systems had 1 violation, 5 water systems had 2 violations, 2 water systems, had 3 violations, 2 water systems had 4 violations, 1 water system had 6 violations, and 1 water system had 24 violations.

Figure B5: Treatment Technique Violations Over the Last 3 Years



The State Water Board has proposed a threshold for Treatment Technique violations (in lieu of an MCL) (see Appendix C) for the HR2W list 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. For Risk Assessment 2.0, the State Water Board and UCLA propose a slightly modified version of the HR2W threshold[27].

Bivariate correlation between the indicator threshold and the water system failure definition employed in Risk Assessment 1.0 shows a statistically significant relationship.

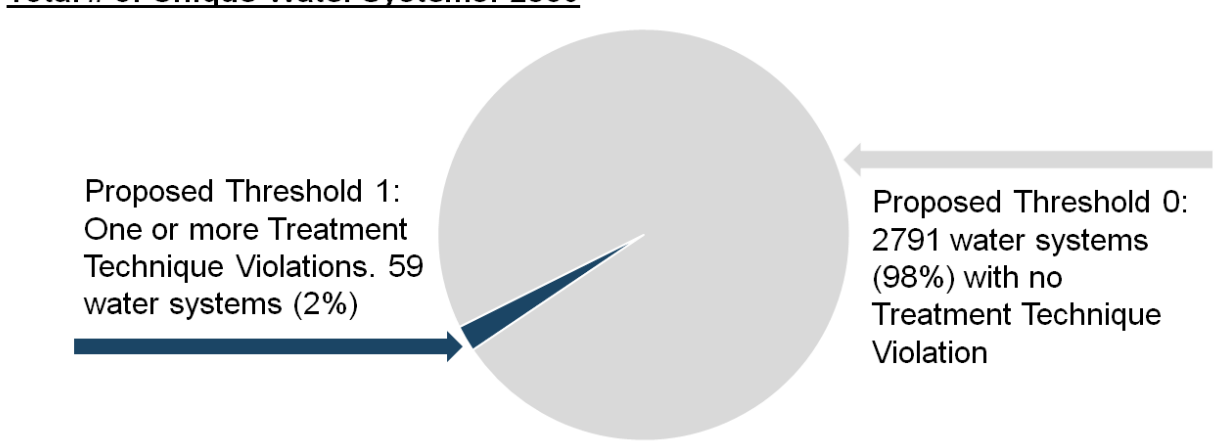
Proposed Thresholds:

- **Threshold 0** = **0** Treatment Technique violation over the last three years.
- **Threshold 1** = **1 or more** Treatment Technique violations over the last three years.

59 water systems meet proposed Threshold 1, having one or more treatment technique violations within that last three years. The remaining 2,791 water systems (98%) have no treatment technique violations within the last three years.

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

Figure B6: Water Systems with Treatment Technique Violations within the Last 3 Years



Scoring Recommendation

Table B9 summarizes the scores recommended per threshold.

Table B9: "Treatment Technique Violation" Threshold Scores

Threshold Number	Threshold	Score
0	**0** Treatment Technique violation over the last three years.	0
1	**1 or more** Treatment Technique violations over the last three years.	1

Past Presence on the HR2W List

Definition

The expanded HR2W list is proposed to include systems that have an open enforcement action for a primary MCL violation, secondary MCL violation, E. coli violation, monitoring and reporting violation (15 months or more), treatment technique violation, and/or systems that have had three of more treatment technique violations. A system is removed from the 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 3 treatment technique violations over the last three years. This indicator reflects past presence on the HR2W list within the last three years.

Calculation Methodology

Required Risk Indicator Data Point & Source:

- Violation Data: SDWIS

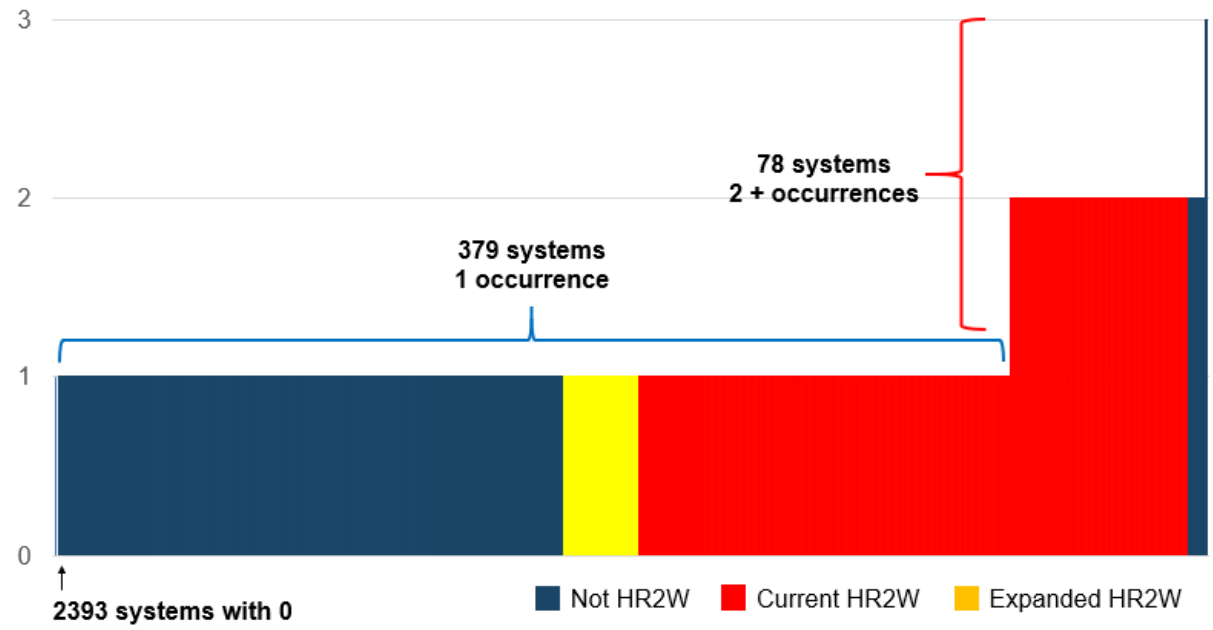
- Enforcement Action Data: SDWIS

Refer to Appendix C for detailed criteria and methodology for the HR2W list.

Threshold Recommendation

Data on Past Presence of the HR2W list was available for all 2,850 water systems. 2,393 water systems (82%) have zero HR2W 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.

Figure B7: HR2W Occurrences Over the Last 3 Years



Peer-reviewed studies suggest that past presence of drinking water quality violations is associated with subsequent present-day violations.[28] Therefore the State Water Board and UCLA propose the following tiered thresholds, where more occurrences on the HR2W list is associated with greater risk.

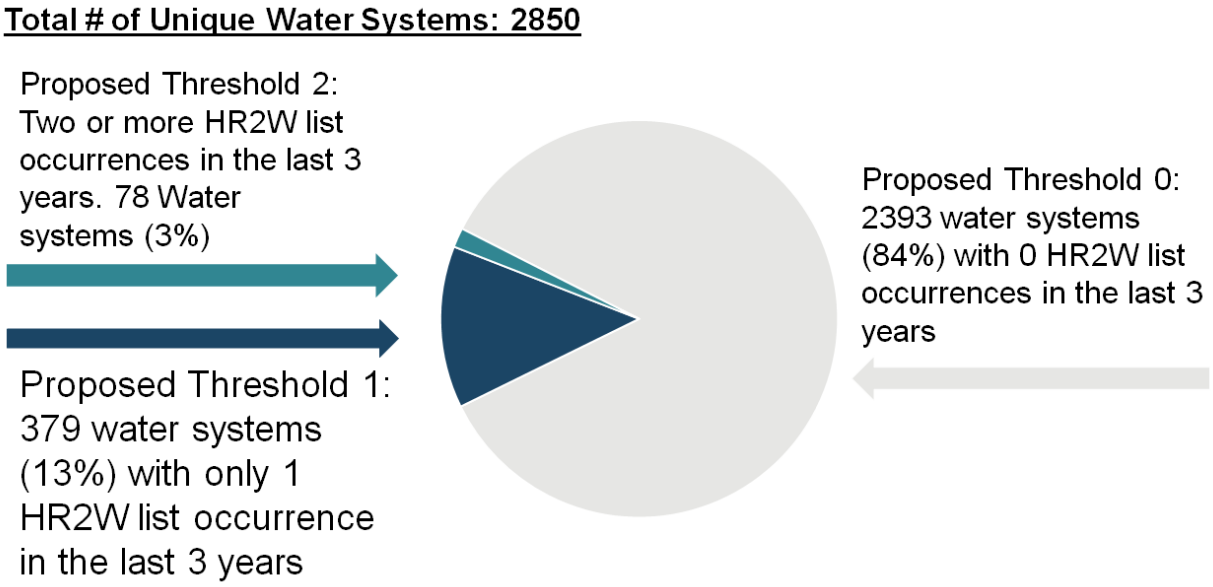
Proposed Thresholds:

- **Threshold 0** = **0** HR2W list occurrence over the last three years.
- **Threshold 1** = **1** HR2W list occurrence over the last three years.
- **Threshold 2** = **2** or more HR2W list occurrences over the last three years.

[28] 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.

379 of those systems (13%) meet Proposed Threshold 1 with only one occurrence over the last three years. 78 water systems (3%) meet Proposed Threshold 2 having two or more occurrences over the last three years.

Figure B8: Past Presence on the HR2W List over the Last 3 Years



Scoring Recommendation

Table B10 summarizes the scores recommended per threshold.

Table B10: "Past Presence on the HR2W List" Threshold Scores

Threshold Number	Threshold	Score
0	**0** HR2W list occurrence over the last three years.	0
1	**1** HR2W list occurrence over the last three years.	0.5
2	**2** or more HR2W list occurrences over the last three years.	1

Maximum Duration of High Potential Exposure (HPE)

Definition

Maximum Duration of HPE is developed and utilized by OEHHA in their HR2W Tool. This indicator first measures the duration of HPE for each of 19 selected contaminants and selects the maximum duration across all contaminants. This indicator focuses on the recurring nature of contamination. Accordingly, it highlights systems that show an ongoing contamination problem. Capturing this recurring exposure may be important, especially when such exposure involves contaminants whose health effects are

associated with chronic exposure. A long duration of high potential exposure can also signal that a system may need additional resources or support to remedy contamination.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Water Quality Monitoring database (WQM) between 2011 and 2019: Water quality sampling data for the list of chemicals housed in WQIr chemical table (see below).
- MCL violations Total Coliform Rule (TCR) and Revised Total Coliform Rule (RTCR) from SDWIS.
- Lead Sampling Analyte results from SDWIS.[29]

Table B11: Contaminants Utilized by OEHHA for HPE*

Analyte Name	Analyte Number (in WQIr)
Arsenic	01002
Barium	01007
Benzene	34030
Cadmium	01027
Carbon Tetrachloride	32102
Mercury	71900
Methyl Tertiary Butyl Ether (MTBE)	46491 (A-030)
1,2,3-trichloropropane (1,2,3-TCP)	77443/7744x
Nitrate as Nitrogen	00618
Perchloroethylene (PCE)	34475
Perchlorate	A-031
Trichloroethylene (TCE)	39180
Toluene	34010
Xylene	81551
1,2-dibromo-3-chloropropane (DBCP)	38761
Total trihalomethanes (TTHM)	82080
Gross Alpha	01501

*Lead and TCR/RTCR are excluded from this table

Risk Indicator Calculation Methodology

[29] Action Level (0.015 mg/L) exceedance at ”90th percentile“ lead level.

To create the indicator OEHHA:[30]

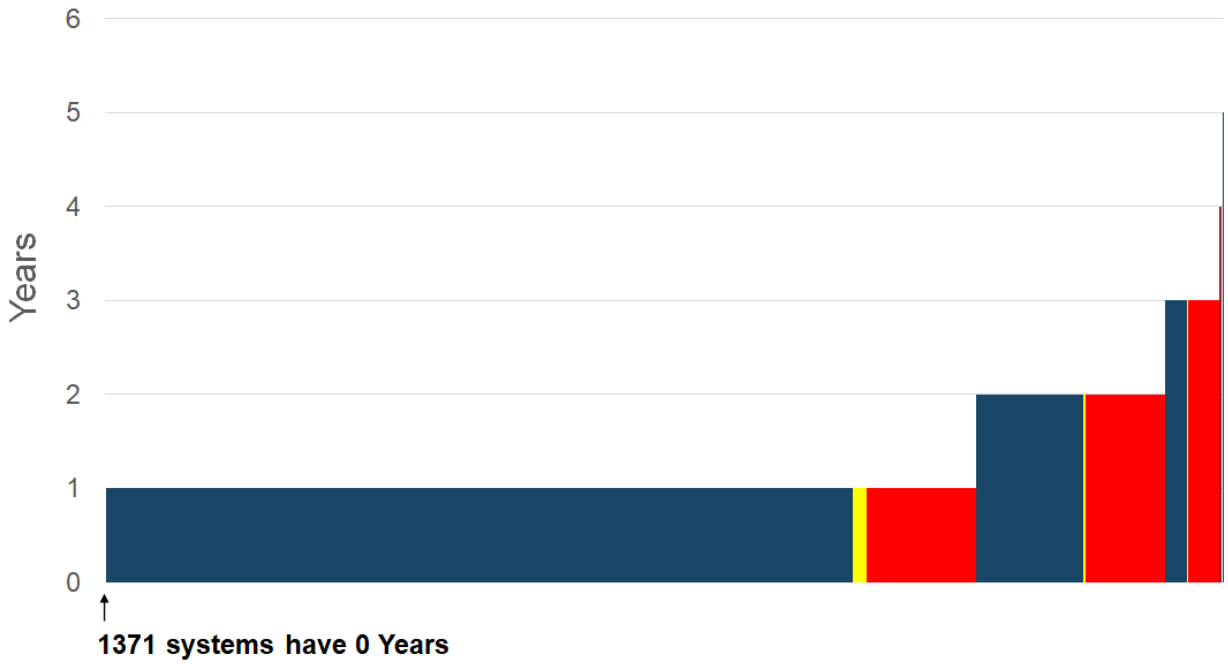
- Estimated average annual concentration for each contaminant (except for TCR).
- Summed the number of years (within 9-year compliance cycle) for which any contaminant's annual average concentrations was greater than the MCL (or Action Level for lead) for each contaminant and summed the total years of TCR MCL violations.
- Select the maximum duration across the 19 contaminants.

Threshold Recommendation

Data coverage for Maximum Duration of High Potential Exposure (HPE) is 85% with data available for 2,415 water systems. The minimum years of HPE in the data set is 0 years, the maximum is 9 years, and the average is 1.12 years. 1,371 water systems (56%) had zero years HPE.

100% data coverage was not available because the inventory of water systems assessed by OEHHA for HPE only includes community water systems. The inventory of systems assessed by the State Water Board's Risk Assessment also includes non-transient, non-community systems, specifically schools K-12. HPE data is not available for these systems.

Figure B9: Max Duration of HPE over the Last 9 Years



[30] From Page 21 in OEHHA's *Achieving the Human Right to Water in California: An Assessment of the State's Community Water Systems*.

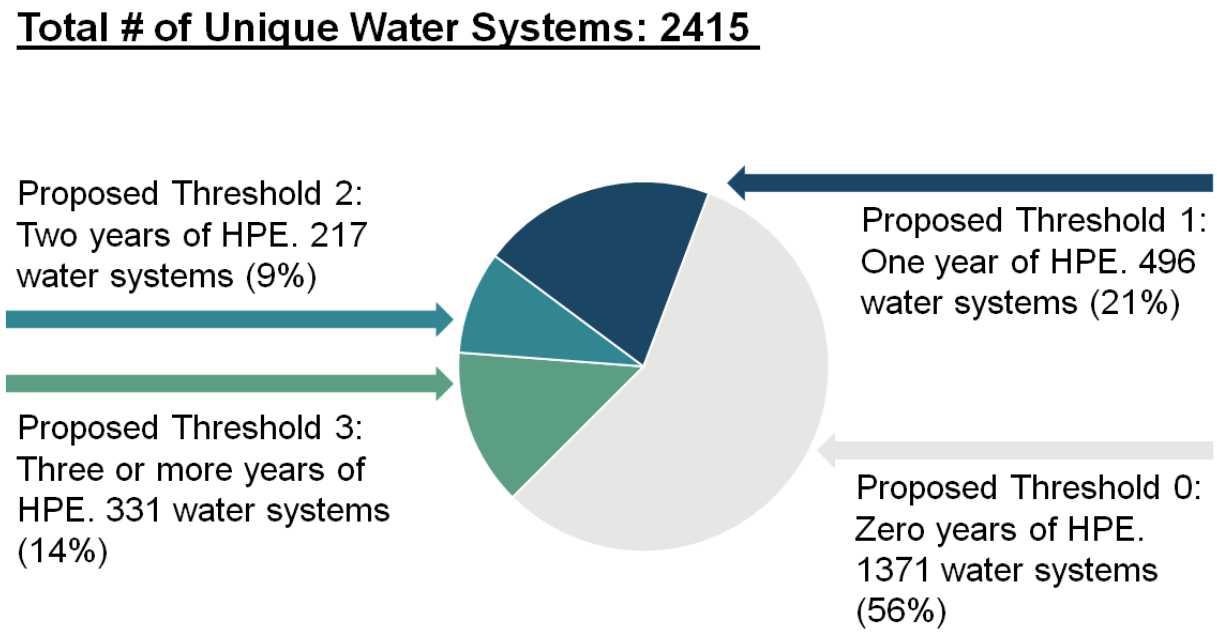
As described above, the Maximum Duration of HPE is developed and utilized by OEHHA in their HR2W Tool. OEHHA set different thresholds of concern for HPE at each of 0, 1, 2 to 3, 4 to 5, and 6+ years with score values ranging from 0 to 4. The State Water Board will be coordinating with OEHHA to better align thresholds and scores for this risk indicator before the Risk Assessment is finalized.

Proposed Thresholds:

- **Threshold 0** = **0** year of HPE over the last nine years.
- **Threshold 1** = **1** year of HPE over the last nine years.
- **Threshold 2** = **2** years of HPE over the last nine years.
- **Threshold 3** = **3 or more** years of HPE over the last nine years.

496 water systems (21%) meet Proposed Threshold 1 having one-year HPE. 17 water systems (9%) meet Proposed Threshold 2 having two years of HPE. 331 water systems (14%) meet Proposed Threshold 3 having three or more years of HPE.

Figure B10: Maximum Duration of High Potential Exposure (HPE)



Scoring Recommendation

Table B12 summarizes the scores recommended per threshold.

Table B12: "Maximum Duration of High Potential Exposure (HPE)" Threshold Scores

Threshold Number	Threshold	Score
0	**0** year of HPE over the last nine years.	0
1	**1** year of HPE over the last nine years.	0.25
2	**2** years of HPE over the last nine years.	0.5
3	**3 or more** years of HPE over the last nine years.	1

Percentage of Sources Exceeding an MCL

Definition

Percent of the number of sources that exceed any MCL in the table below. The number includes water systems sources with an exceedance of any primary chemical contaminant within the past three years. This indicator assumes that the water system is not in violation overall.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Water source facility type from SDWIS:
  - CC – Consecutive Connection
  - IG – Infiltration Gallery
  - IN – Intake
  - RC – Roof Catchment
  - SP – Spring
  - WL – Well
- WQIr chemical table:

Table B13: Analytes in WQIr Chemical Table

Analyte Name	Analyte Number (in WQIr)
1,1,1-Trichloroethane	34506
1,1,2,2-Tetrachloroethane	34516
Trichlorotrifluoroethane	81611
1,1,2-Trichloroethane	34511
1,1-Dichloroethane	34496
1,1-Dichloroethylene	34501
1,2,3-Trichloropropane (1,2,3-TCP)	77443
1,2,4-Trichlorobenzene	34551
1,2-Dichlorobenzene	34536
1,2-Dichloroethane	34531
1,2-Dichloropropane	34541

Analyte Name	Analyte Number (in WQIr)
1,3-Dichloropropane (TOTAL)	34561
1,4-Dichlorobenzene	34571
2,3,7,8-TCDD (Dioxin)	34676
2,4,5-TP (Silvex)	39045
2,4-D	39730
Alachlor	77825
Aluminum	01105
Antimony	01097
Arsenic	01002
Asbestos	81855
Atrazine	39033
Barium	01007
Bentazon	38710
Benzene	34030
Benzo (A) Pyrene	34247
Beryllium	01012
Bromate	A-027
Cadmium	01027
Carbofuran	81405
Carbon Tetrachloride	32102
Chlordane	39350
Chlorite	50074
Chromium (Total)	01034
CIS-1,2-Dichloroethylene	77093
CIS-1,3-Dichloropropene	34704
Combined RA 226 + RA 228	11503
Cyanide	01291
Dalapon	38432
Di(2-Ethylhexyl)Phthalate	39100
Dibromochloropropane (DBCP)	38761
Dichloromethane	34423
Dinoseb	81287
Diquat	78885
Endothall	38926
Endrin	39390
Ethylbenzene	34371
Ethylene Dibromide (EDB)	77651
Fluoride (F) (Natural-Source)	00951
Glyphosate	79743
Gross Alpha	01501
Gross Beta	03501
Haloacetic Acids (5) (HAA5)	A-049
Heptachlor	39410

Analyte Name	Analyte Number (in WQIr)
Heptachlor Epoxide	39420
Hexachlororobenzene	39700
Hexachlorocyclopentadiene	34386
Lindane	39340
Manganese, Dissolved	01056
Mercury	71900
Methoxychlor	39480
Methyl Tertiary Butyl Ether (MTBE)	46491
Molinate	82199
Monochlorobenzene	34301
Nickel	01067
Nitrate as Nitrogen	00618
Nitrate + Nitrite (As N)	A-029
Nitrite (As N)	00620
Oxamyl	38865
Pentachlorophenol	390032
Perchlorate	A-031
Picloram	39720
Polychlorinated Biphenyls, Total, As DCB	39516
Selenium	01147
Simazine	39055
Strontium-90	13501
Styrene	77128
Tetrachloroethylene	34475
Thallium	01059
Thiobencarb	A-001
Toluene	34010
Total Trihalomethanes	82080
Toxaphene	39400
Trans-1,2-Dichloroethylene	34545
Trans-1,2-Dicholropropene	34546
Tricholoroethylene	39180
Trichlorofluoromethane Freon 11	34488
Tritium	07000
Uranium (PCI/L)	28012
Vinyl Chloride	39175
Xylene (Total)	81551

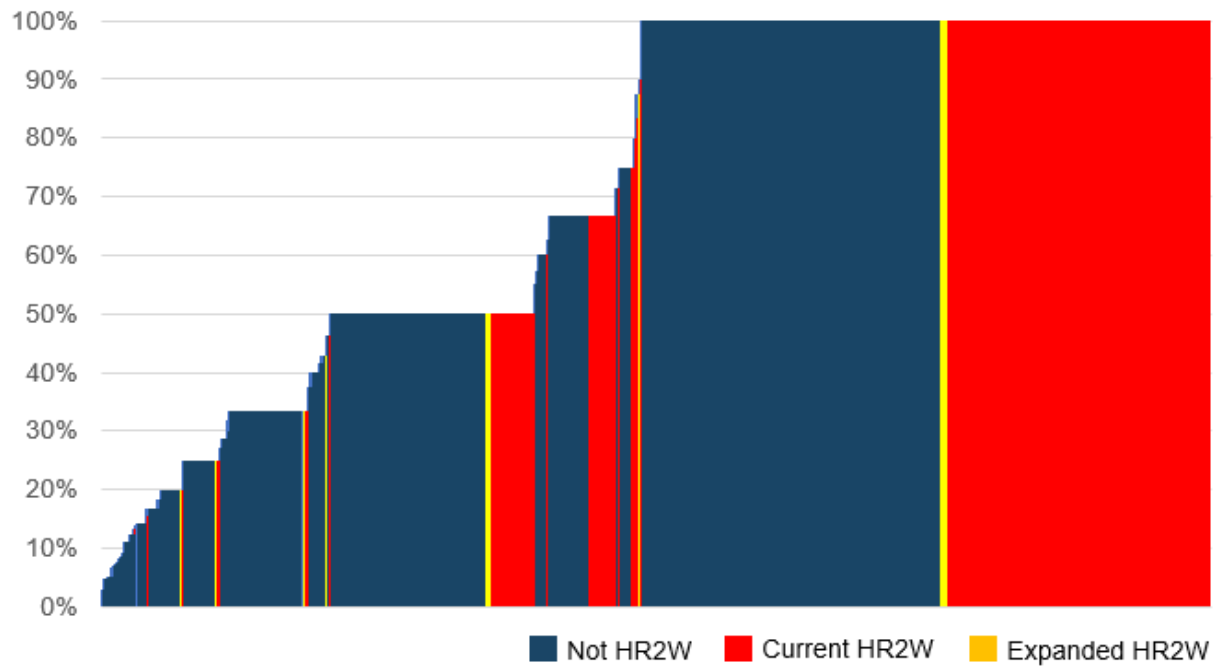
Risk Indicator Calculation Methodology:

- Prepare SDWIS data
    - Combine two SDWIS tables (the Water System table and Water System Facility table).
    - Apply filters to prepared data and get counts of the total number of Water System Facilities for each Water System.
        - Filters applied
            - Active Water Systems Only
            - Active Water System Facilities Only
            - Water System Facilities with a facility type of CC, IG, IN, RC, SP, and WL
- Prepare WQI data
    - Combine three WQI tables (the Findings, Chemicals (Storets), and Chemical Levels).
    - Apply filters to prepared data and get counts of MCL exceedances for each source
        - Filters applied:
            - Primary contaminants only
            - Primary contaminants with an MCL exceedance
- Combine filtered SDWIS and WQI data
- Calculate the percentage of impaired sources by dividing the total number of sources with MCL exceedances (From WQI) by the total number of sources (From SDWIS) and then multiply that number by 100.

Threshold Recommendation

Data for all 2,850 water systems was available to analyze the Percentage of Sources Exceeding MCL indicator. The minimum percentage found is zero, the maximum percentage found is 100%, and the average percentage found is 18%.

Figure B11: Percentage of Sources Exceeding an MCL



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.

Proposed Thresholds:

- **Threshold 0** = **less than 49.9%** of sources exceed an MCL.
- **Threshold 1** = **greater than 49.9%** or sources exceed an MCL.

2,296 water systems (89.6%) have less than 49.9% of their water sources exceeding an MCL. 554 water systems (19.4%) meet Proposed Threshold 1 having greater than 49.9% of their water sources exceeding an MCL.

Figure 12: Percentage of Sources Exceeding an MCL

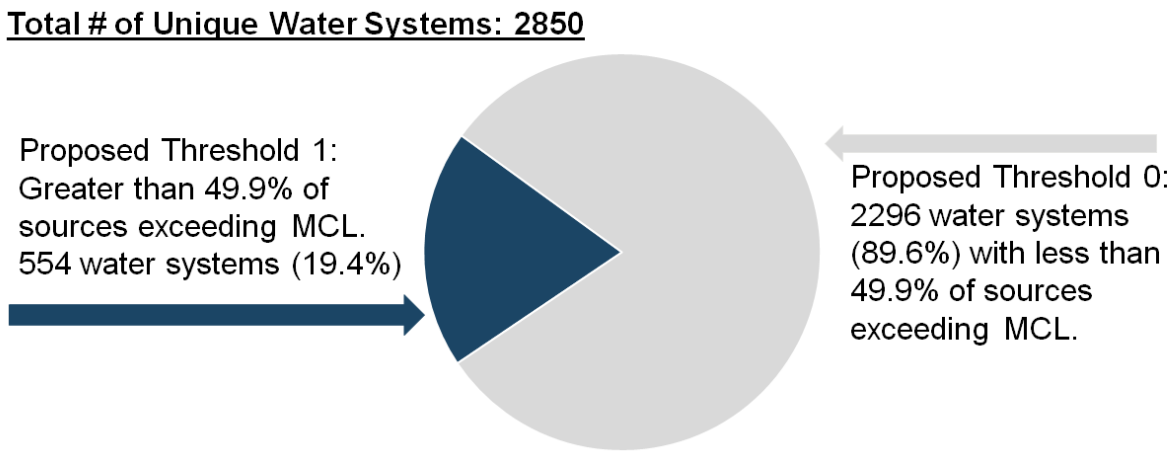
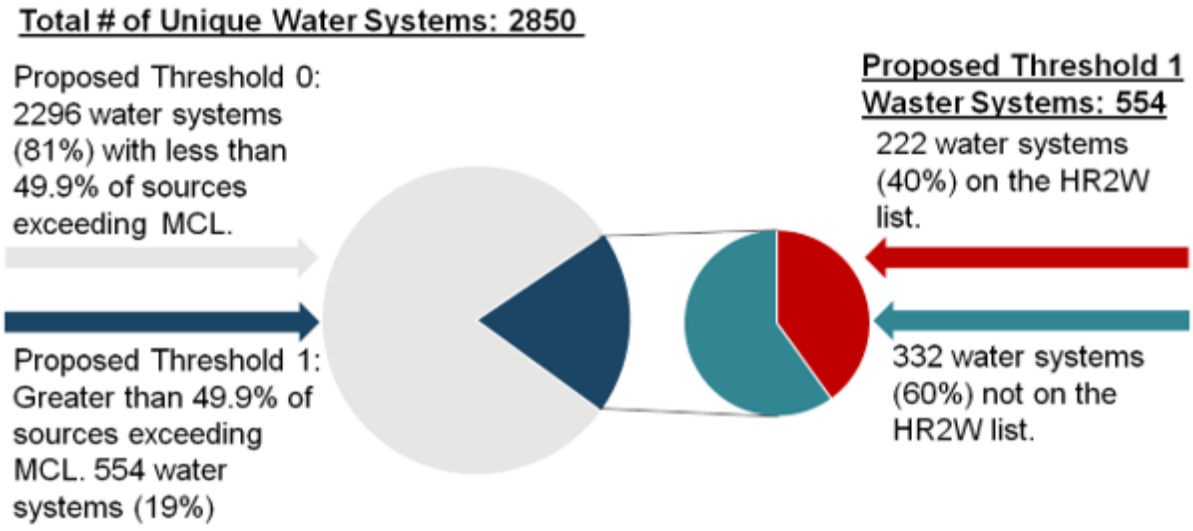


Figure 13 indicates 222 HR2W water systems (77%) meet Proposed Threshold 1 having greater than 49.9% of their water sources exceeding an MCL. 66 of HR2W water systems (23%) have less than 49.9% of their water sources exceeding an MCL.

Figure 13: HR2W System's Percentage of Sources Exceeding an MCL



Scoring Recommendation

Table B13 summarizes the scores recommended per threshold.

Table B13: "Percentage of Sources Exceeding an MCL" Threshold Scores

Threshold Number	Threshold	Score
0	**less than 49.9%** of sources exceed an MCL.	0
1	**greater than 49.9%** or sources exceed an MCL.	1

RISK INDICATORS FOR THE ACCESSIBILITY CATEGORY

Number of Sources

Definition

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
    - CC – Consecutive Connection
    - IG – Infiltration Gallery
    - IN – Intake
    - RC – Roof Catchment
    - SP – Spring
    - WL – Well
    - ST – Storage Tank

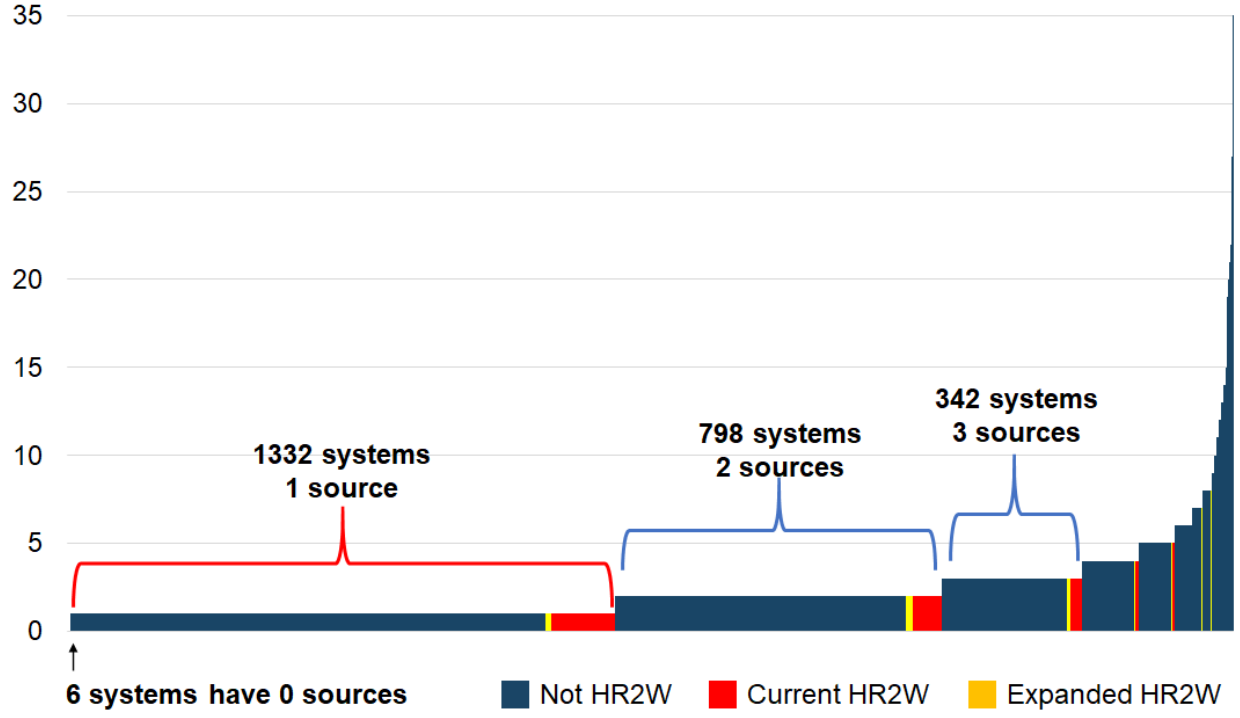
Risk Indicator Calculation Methodology:

- Prepare data
    - Combine two SDWIS tables (the Water System table and Water System Facility table).
    - Apply filters to prepared data and get counts of the total number of Water System Facilities for each Water System.
        - Filters applied
            - Active Water Systems Only
            - Active Water System Facilities Only
            - Water System Facilities with a facility type of CC, IG, IN, RC, SP, and WL

Threshold Recommendation

Data on the number of water sources is available for 2,849 water systems. The minimum number of sources found was 0, the maximum number of sources found was 35, and the average number of sources found was 2.2.

Figure B14: Number of Sources



The recommended threshold 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.[31] 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 each capable to meet the maximum day demand of the water system.

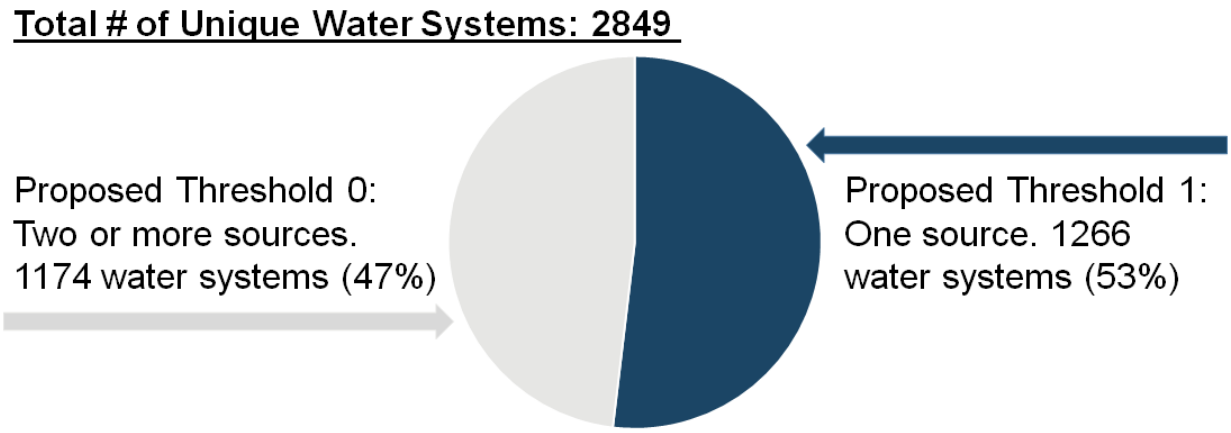
Proposed Thresholds:

- **Threshold X** = **0** sources (automatically At-Risk).
- **Threshold 0** = **2 or more** sources.
- **Threshold 1** = **1** source.

6 water systems have 0 water sources and would be considered automatically "At-Risk". 1,174 water systems (47%) meet Proposed Threshold 0 having two or more water sources. 1,266 water systems (53%) meet Proposed Threshold 1 have only one water source.

[31] See Mullin, M. (2020). The effects of drinking water service fragmentation on drought-related water security. *Science, 368*(6488), 274-277.

Figure B15: Number of Sources



Scoring Recommendation

Table B14 summarizes the scores recommended per threshold.

Table B14: "Number of Sources" Threshold Scores

Threshold Number	Threshold	Score
X	**0** source (automatically At-Risk).	N/A
0	**2 or more** sources.	0
1	**1** source.	1

Absence of Interties

Definition

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

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 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
    - CC – Consecutive Connection
    - 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 Recommendation

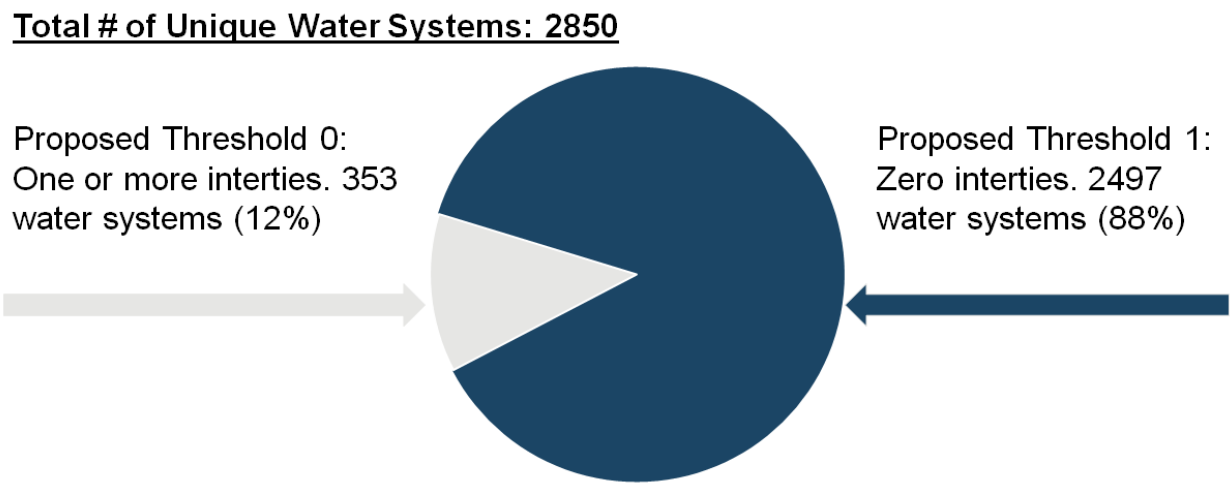
Absence of Intertie data is available for all 2,850 water systems. The minimum number of interties found is zero and the maximum presence of interties is 1. The recommended threshold aligns with DWR's Drought & Water Shortage Risk Assessment.

Proposed Thresholds:

- **Threshold 0** = **1 or more** interties.
- **Threshold 1** = **0** interties.

353 water systems (12%) have one or more interties. 2,497 water systems (88%) meet Proposed Threshold 1 of having zero interties.

Figure B16: Absence of Interties



Scoring Recommendation

Table B15 summarizes the scores recommended per threshold.

Table B15: "Absence of Interties" Threshold Scores

Threshold Number	Threshold	Score
0	**1 or more** interties.	0
1	**0** interties.	1

Water Source Types

Definition

Total number of water source types.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

Both of the following data points for this indicator are required and collected through the initial water system permitting process and entered into SDWIS by State Water Board staff. This data is verified through Sanitary Surveys and necessary updates are made in SDWIS.

- Water Source Facility Type: SDWIS
  - CC – Consecutive Connection
  - IG – Infiltration Gallery
  - IN – Intake
  - RC – Roof Catchment
  - SP – Spring

    - WL – Well
    - ST – Storage Tank

- Water Source Facility Water Type Code: SDWIS
    - GW – Groundwater
    - GU – Ground water under direct influence of surface water (Consider to be ground water)
    - SW – Surface Water
    - Both – GW and SW

Risk Indicator Calculation Methodology:

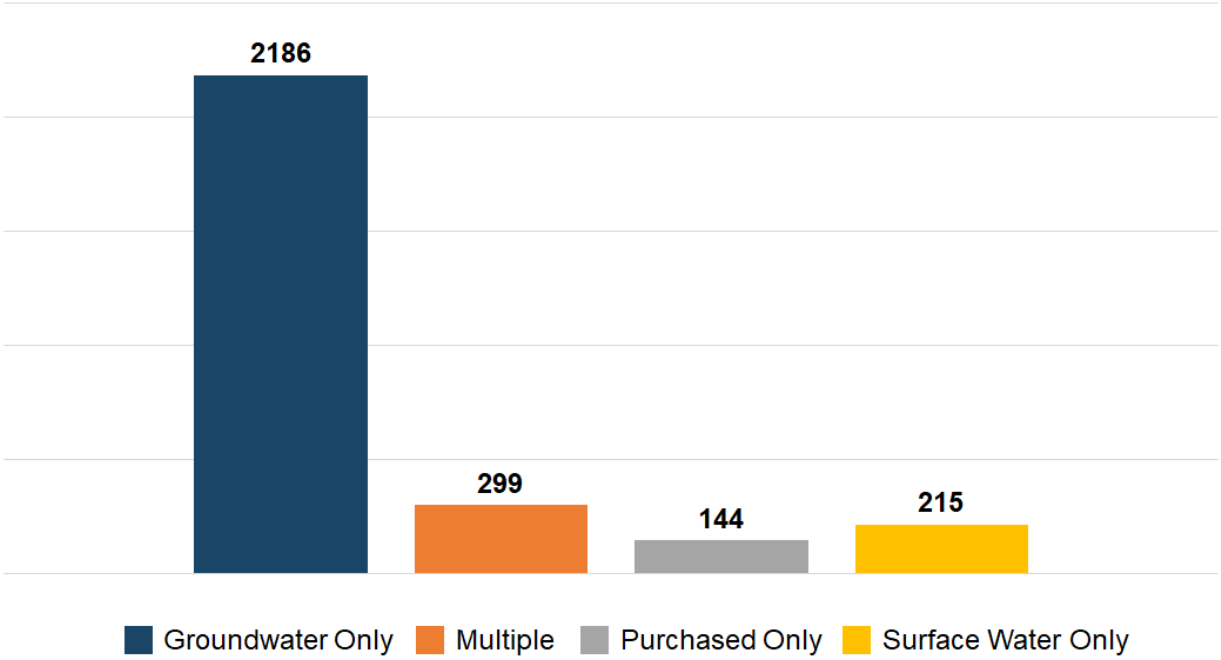
- Prepare data
    - Combine two SDWIS tables (the Water System table and Water system Facility table)

- Apply filters to prepared data and get counts for each Water Source Type per Water System
    - Filters applied for Groundwater Counts:
        - Active Water Systems Only
        - Active Water System Facilities Only
        - Water System Facilities with a facility type of IG, RS, RC, SP, or WL
        - Water System Facilities with a Water Type Code of GW or GU
    - Filters applied for Purchased Water Counts:
        - Active Water Systems Only
        - Active Water System Facilities Only
        - Water System Facilities with a facility type of CC
    - Filters applied for Surface Water Counts:
        - Active Water Systems Only
        - Active Water System Facilities Only
        - Water System Facilities with a facility type of IG, IN, RC, or SP
        - Water System Facilities with a Water Type Code of SW

Threshold Recommendation

Water Source Type data is available for all 2,850 water systems. The minimum number of source types found was 0, the maximum number of source types found was 3, and the average number of source types found was 1.1.

Figure B17: Water Source Types



Peer-reviewed studies suggest that water source type, particularly single-source groundwater reliance, is associated with water system failure.[32] The recommended threshold for the type of sources risk indicator is similar to that used in DWR's Drought & Water Shortage Risk Assessment.

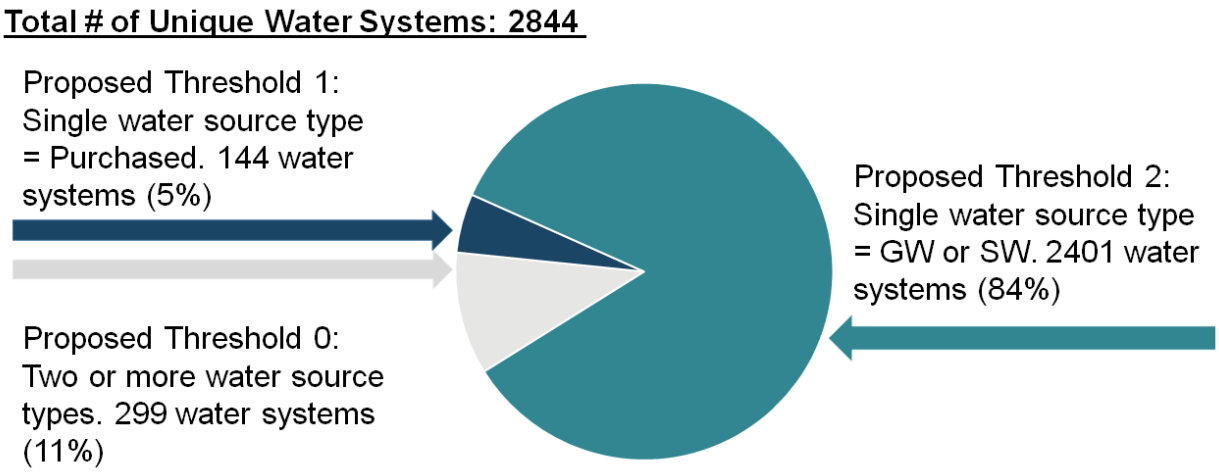
Proposed Thresholds:

- **Threshold 0** = **2 or more** water source types.
- **Threshold 1** = **1** water source type and that source is **purchased** water.
- **Threshold 2** = **1** water source types and that source is either **groundwater** or **surface water**.

There are 299 water systems (11%) with two or more water source types, meeting Proposed Threshold 0. There are 2,545 water systems (89%) with a single water source type. Of those water systems 144 systems (5%) meet Proposed Threshold 1 with "Purchased" as their source type. The remaining 2,401 water systems (84%) meet Proposed Threshold 2 with a groundwater or surface water source type.

[32] See Pennino, M. J., Compton, J. E., & Leibowitz, S. G. (2017). Trends in drinking water nitrate violations across the United States. *Environmental science & technology, 51*(22), 13450-13460.

Figure B18: Water Source Types



Scoring Recommendation

Table B16 summarizes the scores recommended per threshold.

Table B16: "Water Source Types" Threshold Scores

Threshold Number	Threshold	Score
0	**2 or more** water source types.	0
1	**1** water source type and that source is **purchased** water.	0.5
2	**1** water source types and that source is either **groundwater** or **surface water**.	1

DWR – Drought & Water Shortage Risk Assessment Results

Definition

This indicator utilizes DWR's Drought and Water Shortage Risk Scoring Tool[5] results which identifies 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 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 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.[33]

Additional information is available on the DWR Countywide Drought and Water Shortage Contingency Plans website.[34]

Threshold Recommendation

DWR Assessment Results were available for 2,420 water systems. The minimum score found was 0.2, the maximum score found was 100.3, and the average score was 54. The proposed 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.

Proposed Thresholds:

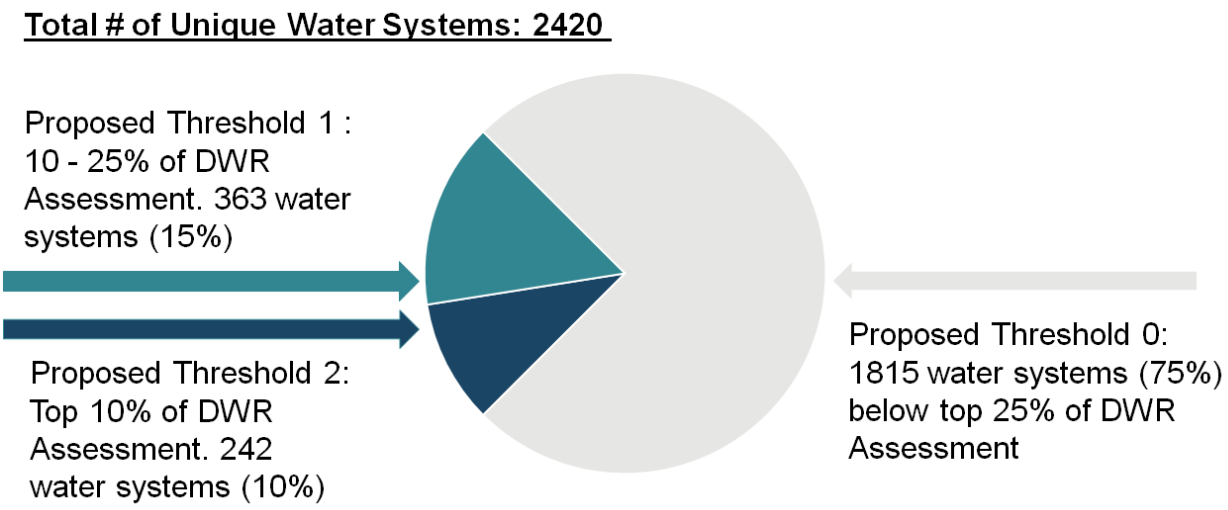
- **Threshold 0** = **Below top 25%** of systems most at risk of drought and water shortage.
- **Threshold 1** = **Top 25%** of systems most at risk of drought and water shortage.
- **Threshold 2** = **Top 10%** of systems most at risk of drought and water shortage.

1,815 water systems (75%) scored below the top 25% in the DWR assessment. 363 water systems (15%) meet Proposed Threshold 1 falling within the top 10% - 25% of the DWR assessment. 242 water systems (10%) meet Proposed Threshold 2 falling within the top 10% of the DWR assessment.

[33] 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

[34] DWR Countywide Drought and Water Shortage Contingency Plans website
https://water.ca.gov/Programs/Water-Use-And-Efficiency/Making-Conservation-a-California-Way-of-Life/County-Drought-Planning

Figure B19: Water System DWR Assessment Results



Scoring Recommendation

Table B17 summarizes the scores recommended per threshold.

Table B17: "DWR – Drought & Water Shortage Risk Assessment Results" Threshold Scores

Threshold Number	Threshold	Score
0	**Below top 25%** of systems most at risk of drought and water shortage.	0
1	**Top 25%** of systems most at risk of drought and water shortage.	0.25
2	**Top 10%** of systems most at risk of drought and water shortage.	1

Critically Overdrafted Groundwater Basin

Definition

Water systems in basins considered to be in Critical Overdraft per DWR's Bulletin 118. 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

Required Risk Indicator Data Points & Sources:

- SGMA Basin Prioritization Statewide Summary Table[35]: 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:

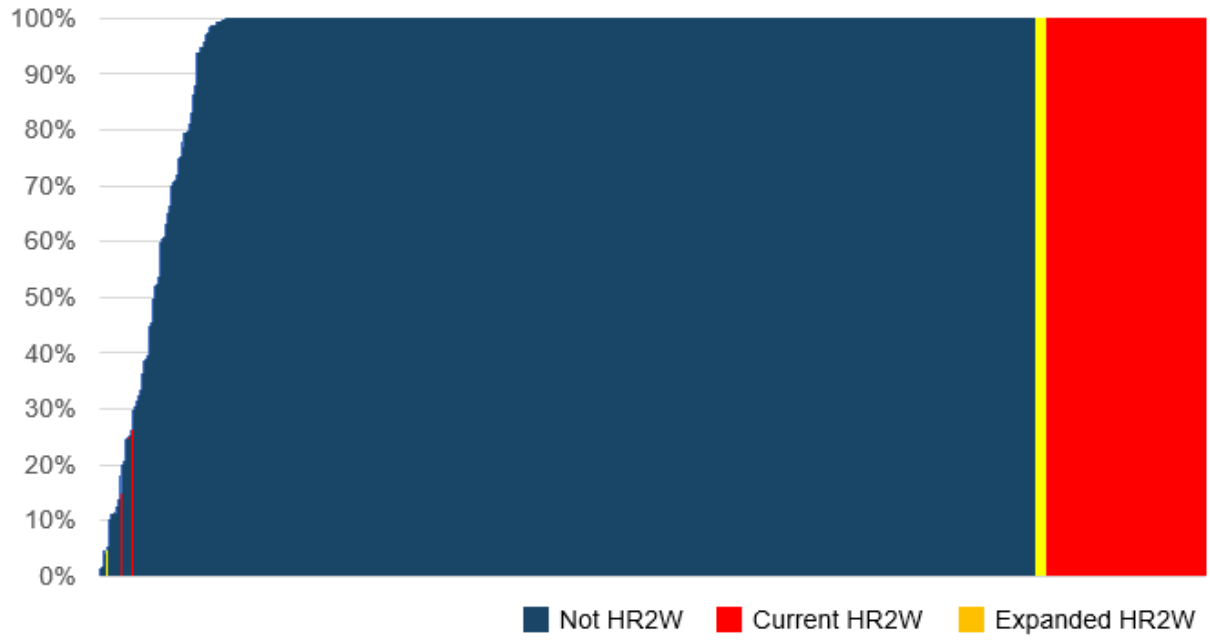
- Water System Boundaries – SABL – Water systems boundaries are overlaid with the critically overdrafted groundwater basins.
- Water System Source Water Identification – SDWIS – Water systems screened for source water (groundwater/surface water) to determine reliance on groundwater.

Threshold Recommendation

Data on the location of water systems in critically overdrafted groundwater basins is available for all 2,850 water systems. The minimum percentage of service area within a critically overdrafted groundwater basin is 0%, the maximum percentage is 100%, and the average percentage is 27%.

[35] 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

Figure B20: Percent of Water System Boundary within an Overdrafted Groundwater Basin



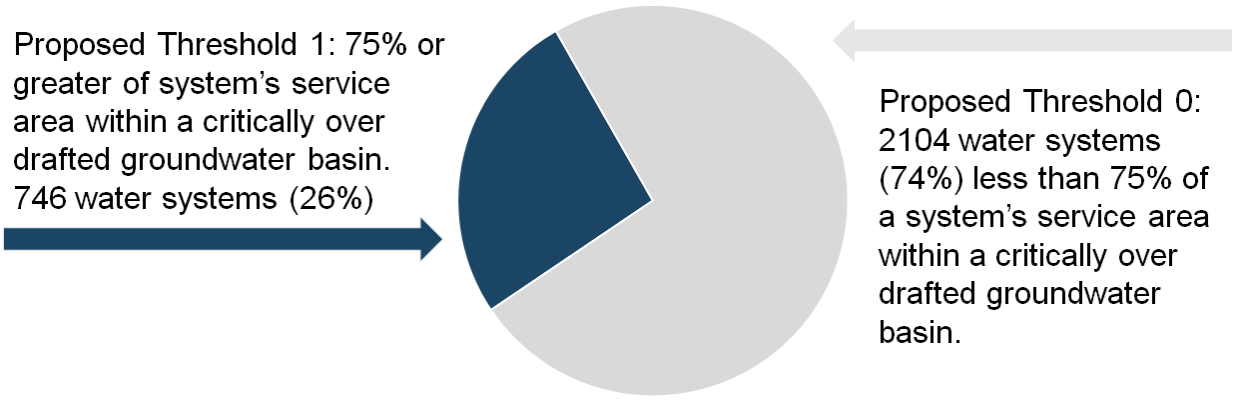
The percentage of a water system's boundary overlapping with a critically over-drafted groundwater basin, as defined here or a similar measure, has only been assessed in DWR Assessment Results as a binary factor, likely reflecting the relatively recent nature of SGMA. Moreover, the determination of a numerical threshold between 1-100% (as opposed to 0%) leads to little difference in the number of systems deemed as above the threshold for this indicator.

Proposed Thresholds:

- **Threshold 0** = **Less than 75%** of system's service area boundary is within a critically overdrafted basin.
- **Threshold 1** = **75% or greater** of systems service area boundary is within a critically overdrafted basin.

2,104 water systems (74%) have less than 75% of their service area within a critically endangered overdrafted groundwater basin. 746 water systems (26%) meet Proposed Threshold 1 with 75% of greater of the service area within a critically overdrafted groundwater basin.

Figure B21: Water Systems in Critically Overdrafted Groundwater Basins



Scoring Recommendation

Table B18 summarizes the scores recommended per threshold.

Table B18: "Critically Overdrafted Groundwater Basin" Threshold Scores

Threshold Number	Threshold	Score
0	**Less than 75%** of system's service area boundary is within a critically overdrafted basin.	0
1	**75% or greater** of systems service area boundary is within a critically overdrafted basin.	1

RISK INDICATORS FOR THE AFFORDABILITY CATEGORY

Percent of Median Household Income (%MHI)

(2021-22 Needs Assessment)

Definition

This indicator measures the annual system-wide average residential water bill for 6 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: U.S. Census Bureau's American Community Survey.
- Drinking Water Customer Charges: Electronic Annual Report (eAR).

Risk Indicator Calculation Methodology:

Median household income 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. In order to assign an average median household income to a community water system spatially weighted income data is aggregated by census block within the water system service area.

The Division of Financial Assistance (DFA) MHI methodology is used for this risk indicator. The MHI for each water system is a population-weighted MHI, using census block area and population data. A population factor is generated based on the area of each census block that falls within the water system boundary. The water system MHI is then calculated using population-adjusted MHIs for each census block that falls within the water system boundary using the formula below:

$$\sum \frac{(Block\ Group\ MHI) \times (Adjusted\ Block\ Group\ Population)}{(Total\ Adjusted\ Block\ Groups\ Population)}$$

The Margin of Error (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. While the MHI calculation methodology for the Risk Assessment aligns with the Division of Financial Assistance's (DFA) MHI determination methodologies, 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:

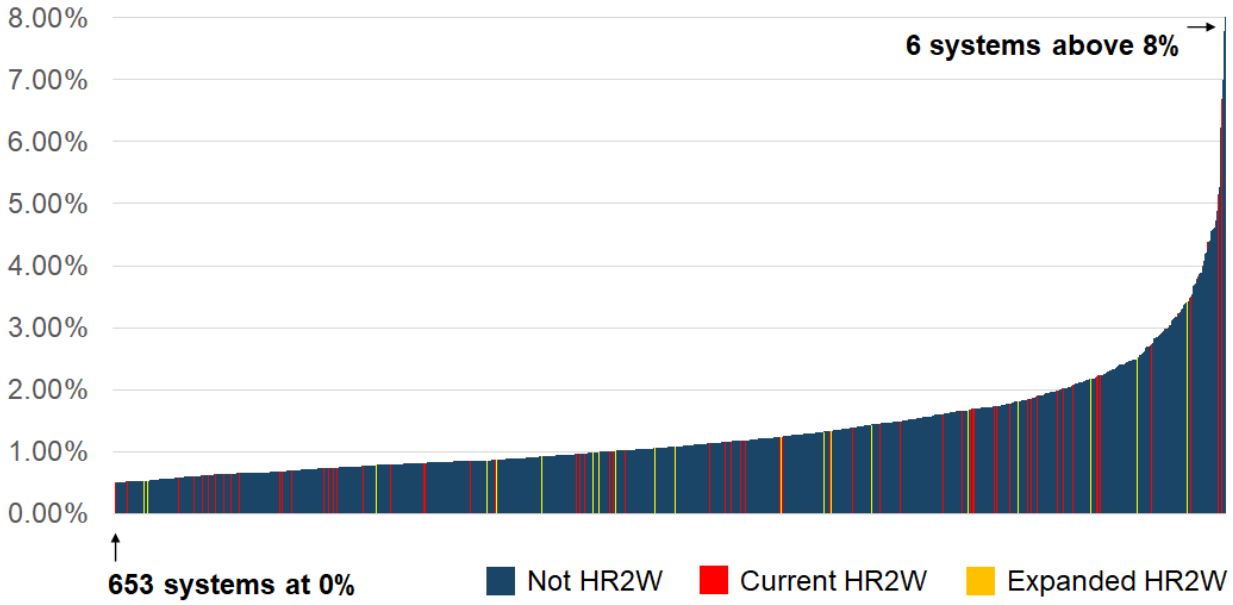
- Drinking water service costs estimated at 6 Hundred Cubic Feet per month. This level of consumption is in line with statewide conservation goals of 55 gallons per capita per day, in an average 3-person household.
- When data becomes available, additional approximated customer charges (not collected 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 Recommendation

Data on %MHI is available for 1,957 of the water systems in the data set. The minimum %MHI found was 0%, the maximum %MHI found was 46.3%, and the average %MHI found was 1.01%. The State Water Board recognizes that customer charges data collected through the eAR may have data quality issues. The Needs Analysis Unit directly contacted some water systems to confirm their water rates and charges data submitted through the 2019 eAR.

Figure B22: %MHI Distribution



%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[36] the thresholds suggested by the State Water Board for this indicator.[37] Other states, including and North Carolina,[38] presently or have recently used

[36] On the other hand, 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.

[37] 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

[38] North Carolina Department of Environmental Quality, Joint Legislative Economic Development and Global Engagement Oversight Committee (March 17, 2016):

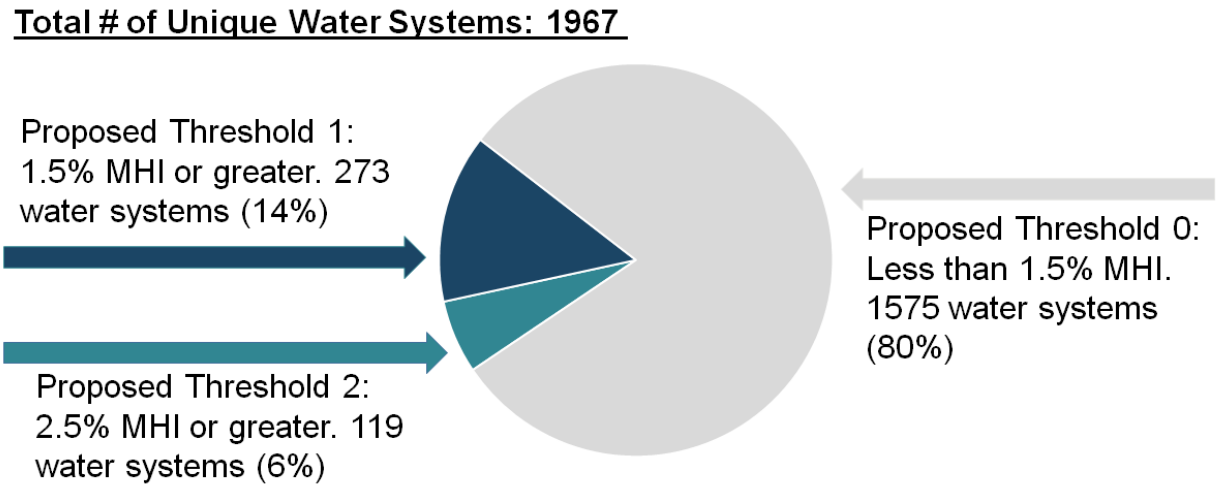
1.5% of MHI spent on water and sewer costs as a threshold for water system funding decisions.

Proposed Thresholds:

- **Threshold 0** = **Less than 1.5%**
- **Threshold 1** = **1.5% or greater**
- **Threshold 2** = **2.5% or greater**

1,575 water systems (80%) have an average water charge less than 1.5% MHI. 273 water systems (14%) meet Proposed Threshold 1 having an average water charge at 1.5% MHI or greater. 119 water systems (6%) meet Proposed Threshold 2 having an average water charge at 2.5% MHI or greater.

Figure B23: Percent of Median Household Income (%MHI)



Scoring Recommendation

Table B19 summarizes the scores recommended per threshold.

Table B19: "% MHI" Threshold Scores

Threshold Number	Threshold	Score
0	**Less than 1.5%**	0

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%2020160317.pdf

Threshold Number	Threshold	Score
1	**1.5% or greater**	0.75
2	**2.5% or greater**	1

Household Burden Indicator (HBI) for Drinking Water

(Proposed for 2022-23 Needs Assessment, pending further stakeholder engagement)

Definition

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.

Calculation Methodology

To be determined though a stakeholder-driven process in 2021.

Threshold Recommendation

To be determined though a stakeholder-driven process in 2021.

Scoring Recommendation

To be determined though a stakeholder-driven process in 2021.

Poverty Prevalence Indicator (PPI)

(Proposed for 2022-23 Needs Assessment, pending further stakeholder engagement)

Definition

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

Calculation Methodology

To be determined though a stakeholder-driven process in 2021.

Threshold Recommendation

To be determined though a stakeholder-driven process in 2021.

Scoring Recommendation

To be determined though a stakeholder-driven process in 2021.

Housing Burden

(Proposed for 2022-23 Needs Assessment, pending further stakeholder engagement)

Definition

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.

Calculation Methodology

To be determined though a stakeholder-driven process in 2021.

Threshold Recommendation

To be determined though a stakeholder-driven process in 2021.

Scoring Recommendation

To be determined though a stakeholder-driven process in 2021.

Extreme Water Bill

(2021-22 and 2022-23 Needs Assessment)

Definition

This indicator measures drinking water customer charges that meet or exceed 150% of statewide average drinking water customer charges at the 6 Hundred Cubic Feet (HCF) level of consumption.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Drinking Water Customer Charges: eAR
- Other Customer Charges: eAR

Risk Indicator Calculation Methodology:

Extreme Water Bill for a water system is determined using Average Monthly 6 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 connections.

Threshold Recommendation

Data on Extreme Water Bill is available for 2,176 water systems. 1,649 water systems (75%) had an average monthly water bill greater than $0. The minimum average monthly water bill found was $0.06, the maximum average monthly water bill found was $615.98, and the average water bill found was $61.37.

Figure B24: Average Monthly Water Bill

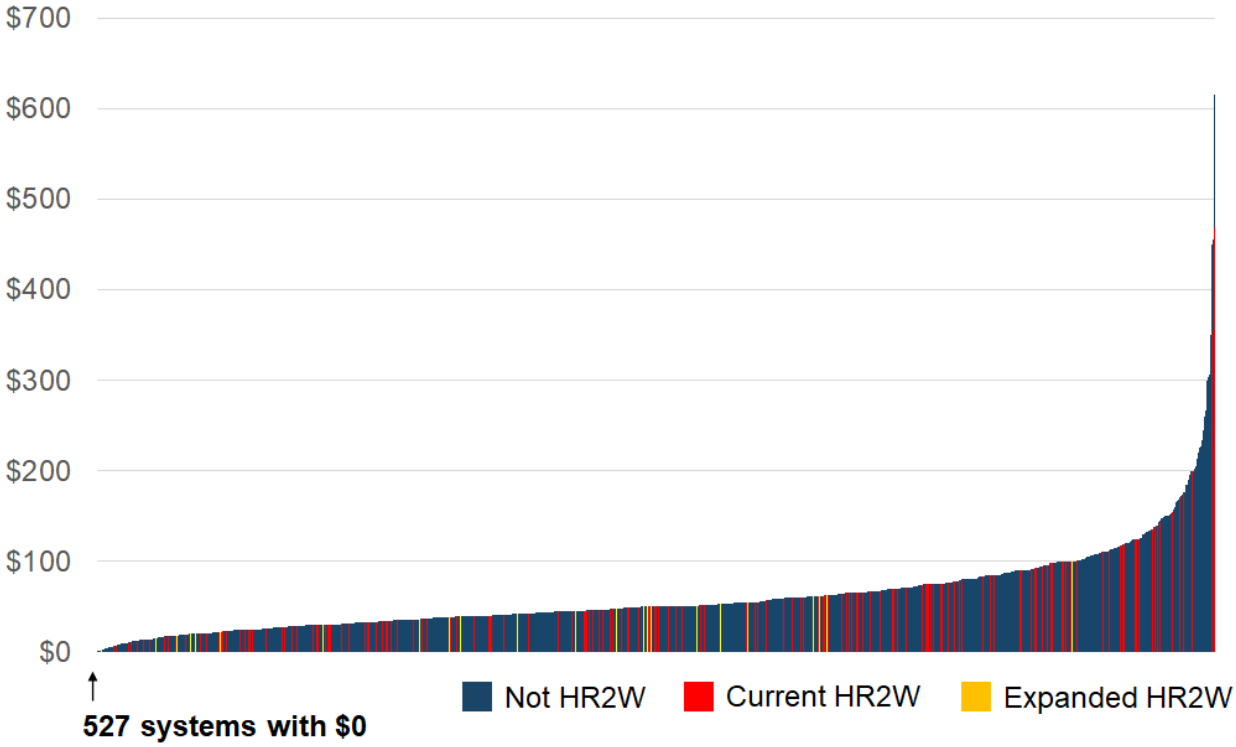
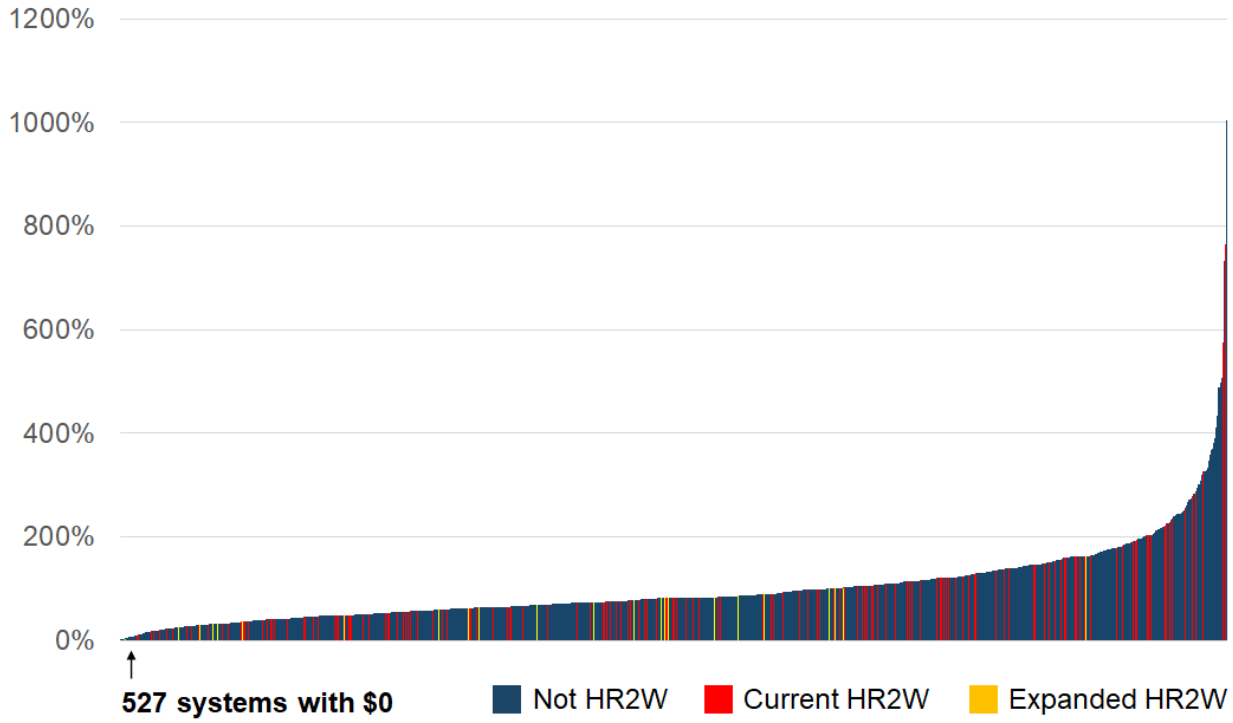


Figure B25: Average Monthly Water Bill as a Percent of the Statewide Average



The State Water Board's AB 401 report[39] 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 6 CCF of service.

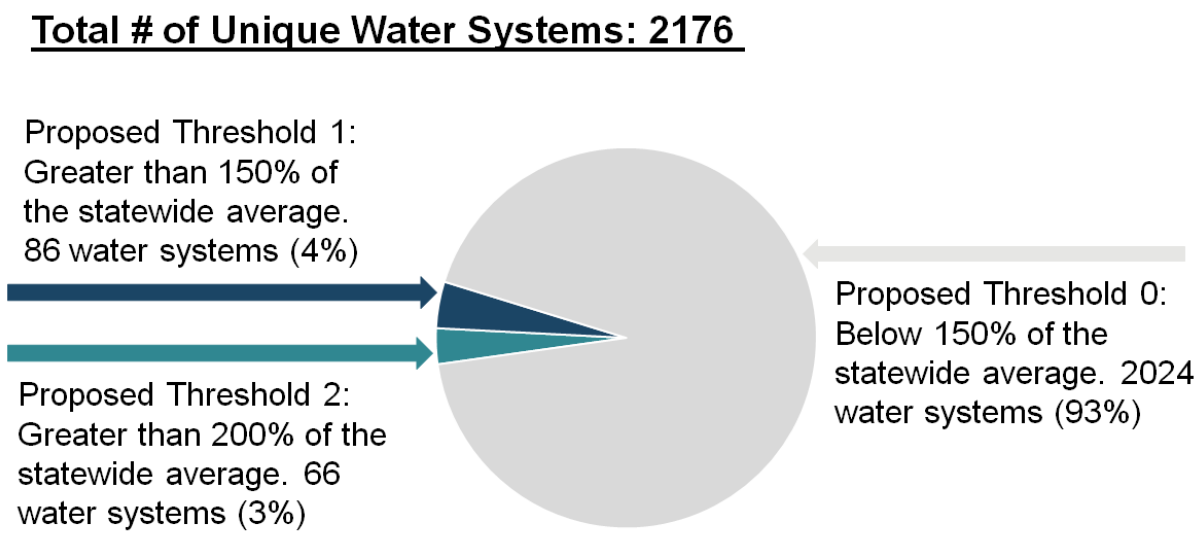
Proposed Thresholds:

- **Threshold 0** = **Below 150%** of the statewide average.
- **Threshold 1** = **Greater than 150%** of the statewide average.
- **Threshold 2** = **Greater than 200%** of the statewide average.

2,024 water systems (93%) have an average water bill below 150% the statewide average. 86 water systems (4%) meet Proposed Threshold 1 with an average water bill greater than 150% of the statewide average. 66 water systems meet Proposed Threshold 2 with an average water bill greater than 200% the statewide average.

[39] 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

Figure B26: Extreme Water Bill



Scoring Recommendation

Table B20 summarizes the scores recommended per threshold.

Table B20: "Extreme Water Bill" Threshold Scores

Threshold Number	Threshold	Score
0	**Below 150%** of the statewide average.	0
1	**Greater than 150%** of the statewide average.	0.5
2	**Greater than 200%** of the statewide average.	1

% Shut-Offs

(2021-22 Needs Assessment, and proposed for the 2022-23 Needs Assessment pending further engagement and available data)

Definition

Percentage of residential customer base with service shut-offs due to non-payment in a given year.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Number of residential service connections with water shut-off more than once due to failure to pay: eAR
    - Total Single-Family Shut-offs

    - Total Multi-Family Shut-offs
- Total Number of Service Connections: eAR

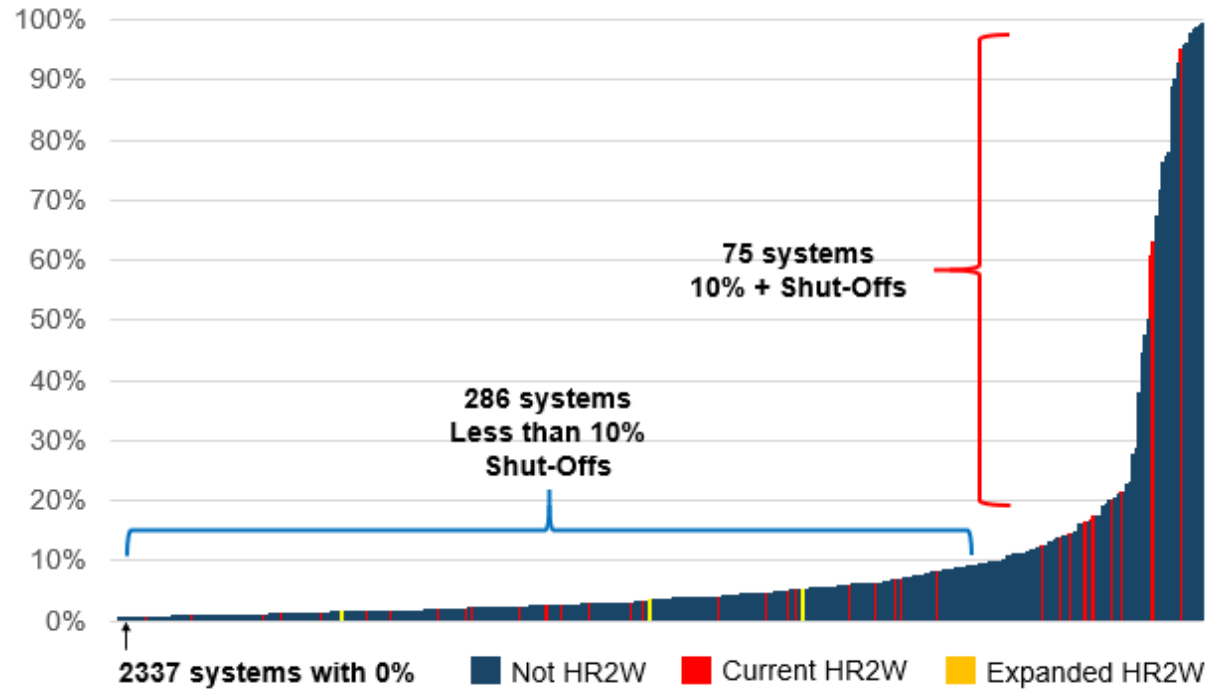
Risk Indicator Calculation Methodology:

- % Shut-Offs = ([Total Single-Family Shut-offs + Total Multi-Family Shut-offs] / Total Number of Service Connections) X 100

Threshold Recommendation

Data on the percent of customer accounts shut-off is available for 1,967 water systems. The minimum percentage of customer accounts shut-off was 0%, the maximum was 99%, and the average was 1.3%.

Figure B27: Percent Shut-Offs



An indicator threshold for the percent of residential service connections shut-off due to non-payment, 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, a standard of zero has been employed by the State,[40] other regulatory agencies and stakeholders as a threshold of concern particularly during the COVID-19 pandemic. In addition to affordability concerns, high percentages of shut-offs may also negatively impact a water system's financial capacity.

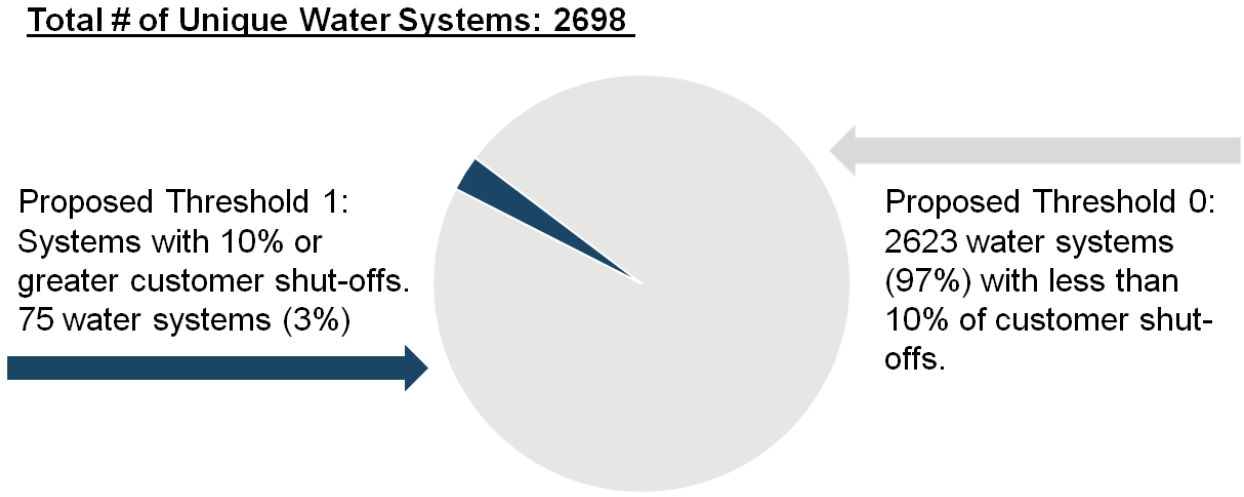
[40] Executive Order N-42-20
https://www.gov.ca.gov/wp-content/uploads/2020/04/4.2.20-EO-N-42-20-text.pdf

Proposed Thresholds:

- **Threshold 0** = **less than 10%** customer shut-offs over the last calendar year.
- **Threshold 1** =**10% or greater** customer shut-offs over the last calendar year.

2,623 water systems (97%) had less than 10% of their customer account shut-off due to non-payment. 75 water systems (3%) meet Proposed Threshold 1 with 10% or greater customer accounts experiencing a shut-off due to non-payment.

Figure B28: 2019 Percent Shut-Offs



Scoring Recommendation

Table B21 summarizes the scores recommended per threshold.

Table B21: "% Shut-Offs" Threshold Scores

Threshold Number	Threshold	Score
0	**less than 10%** customer shut-offs over the last calendar year.	0
1	**10% or greater** customer shut-offs over the last calendar year.	1

RISK INDICATORS FOR THE TMF CAPACITY CATEGORY

Number of Service Connections

Definition

This indicator measures the total number of customer service connections of the water system. Number of service connections may be used as a proxy to assess whether a water system has adequate financial capacity to support staff and budget.

Calculation Methodology

Required Risk Indicator Data Point & Source:

- Water System Details – Service Connection Count: SDWIS

Threshold Recommendation

Data for all 2,850 water systems was available to analyze Number of Service Connections. The minimum number of service connections found was one, the maximum number of service connections found was 3,300, and the average number of service connections found was 238.6.

Figure B29: Number of Service Connections (0 – 100): 1,856 systems

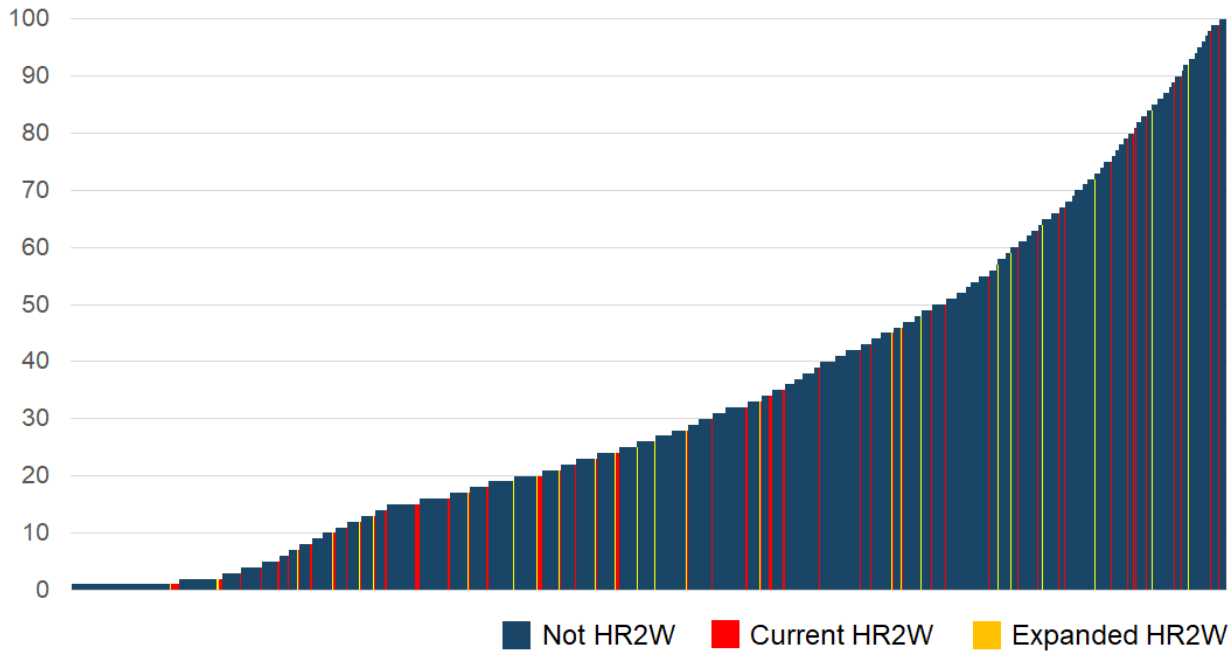


Figure B30: Number of Service Connections (100 – 1,000): 737 systems

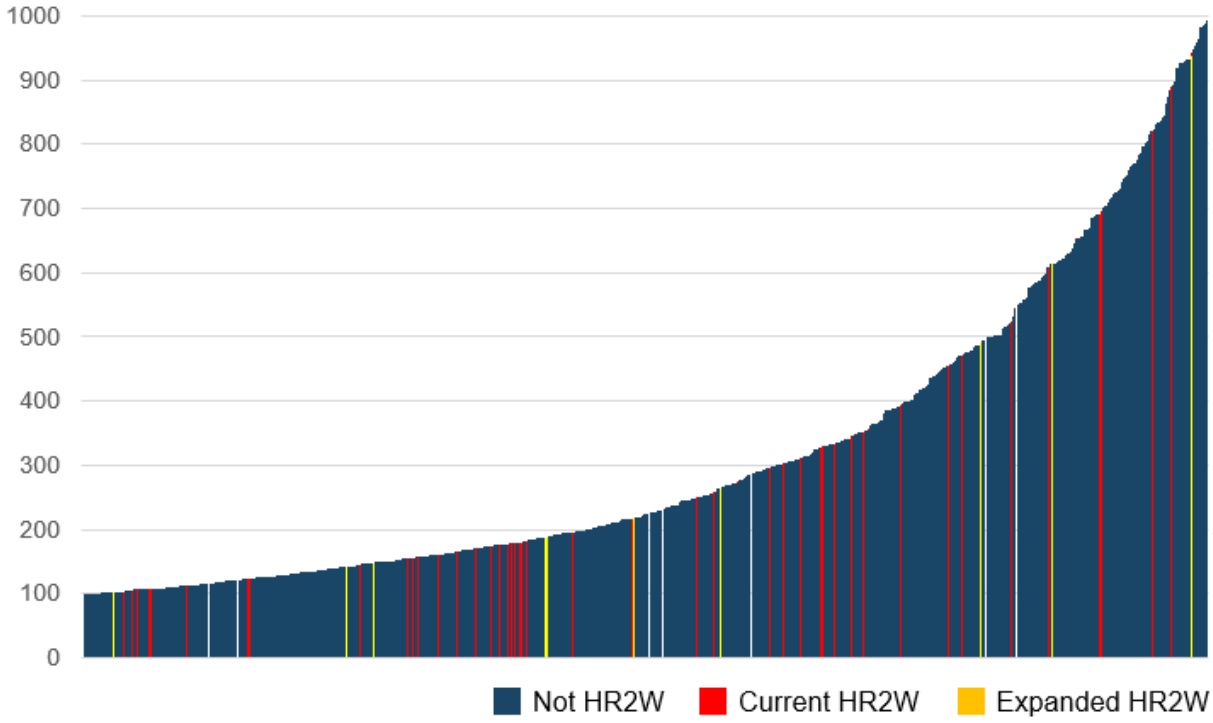
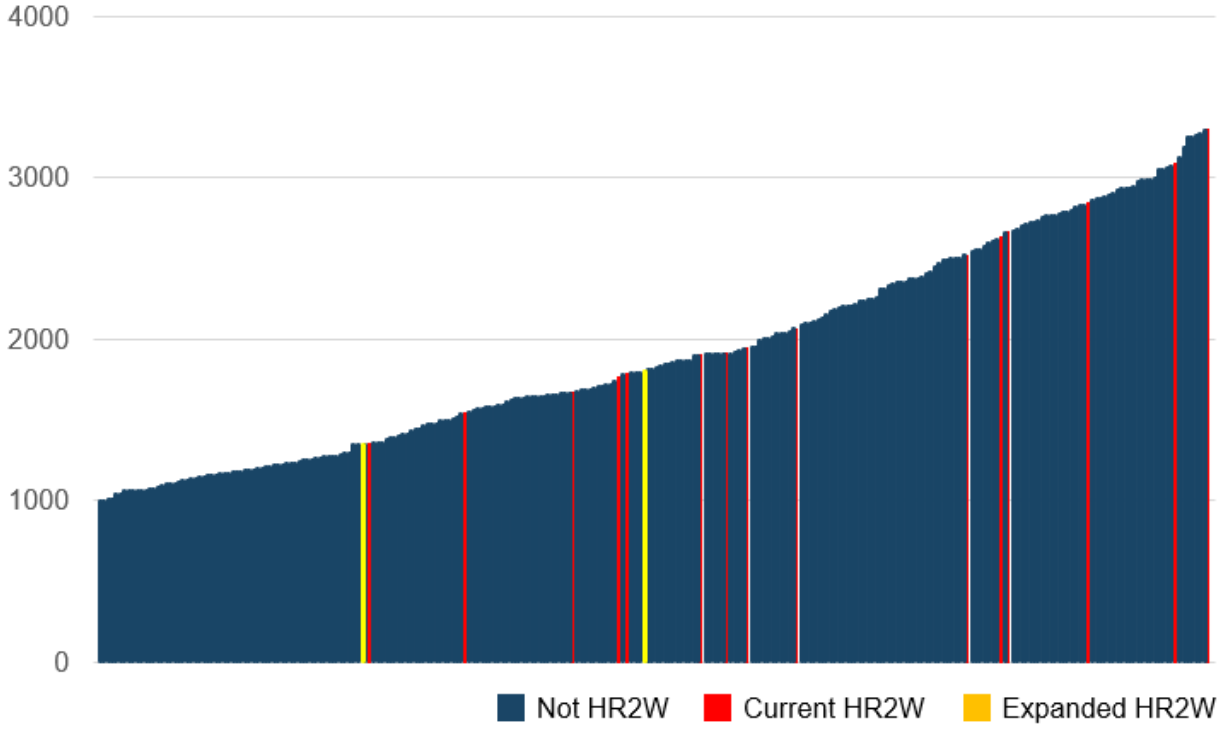


Figure B31: Number of Service Connections (1,000 – 3,300): 268 systems



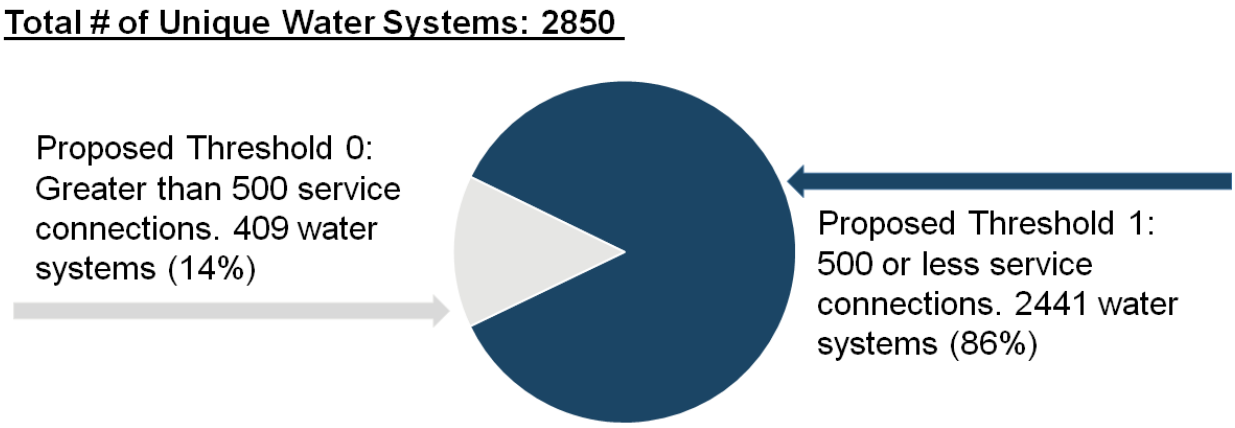
Several peer-reviewed studies suggest that a threshold of 500 connections for system connections is associated with water system failure.[41]

Proposed Thresholds:

- **Threshold 0** = **greater than 500** service connections.
- **Threshold 1** = **500 or less** service connections.

2,441 water systems (86%) meet Proposed Threshold 1 having 500 or fewer service connections. 409 water systems (14%) meet Proposed Threshold 0 having greater than 500 service connections.

Figure B32: Number of Service Connections



Scoring Recommendation

Table B22 summarizes the scores recommended per threshold.

Table B22: "Number of Service Connections" Threshold Scores

Threshold Number	Threshold	Score
0	**greater than 500** service connections.	0
1	**500 or less** service connections.	1

[41] See Michielssen, S., Vedrin, M. C., & Guikema, S. D. (2020). Trends in microbiological drinking water quality violations across the United States. *Environmental Science: Water Research & Technology, 6*(11), 3091-3105; Oxenford, J. L., & Barrett, J. M. (2016). Understanding small water system violations and deficiencies. *Journal-American Water Works Association, 108*(3), 31-37.

Operator Certification Violations

Definition

Failure to have an appropriately certified water treatment or distribution operator. 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 Recommendation

Data on operator certification violations is available for 2,850 water systems. An analysis of the counts of operator certification violations over the last three years finds no violations when an open enforcement action. The systems that have had an operator certification violation over the last three years have only had one violation each during this time period.

Peer-reviewed studies suggest that the absence of a certified operator is associated with water system failure[42] Moreover, operator certification violations are an established threshold for additional regulatory oversight by states such as Illinois.[43]

Proposed Thresholds:

- **Threshold 0** = **0** Operator Certification violations over the last three years.

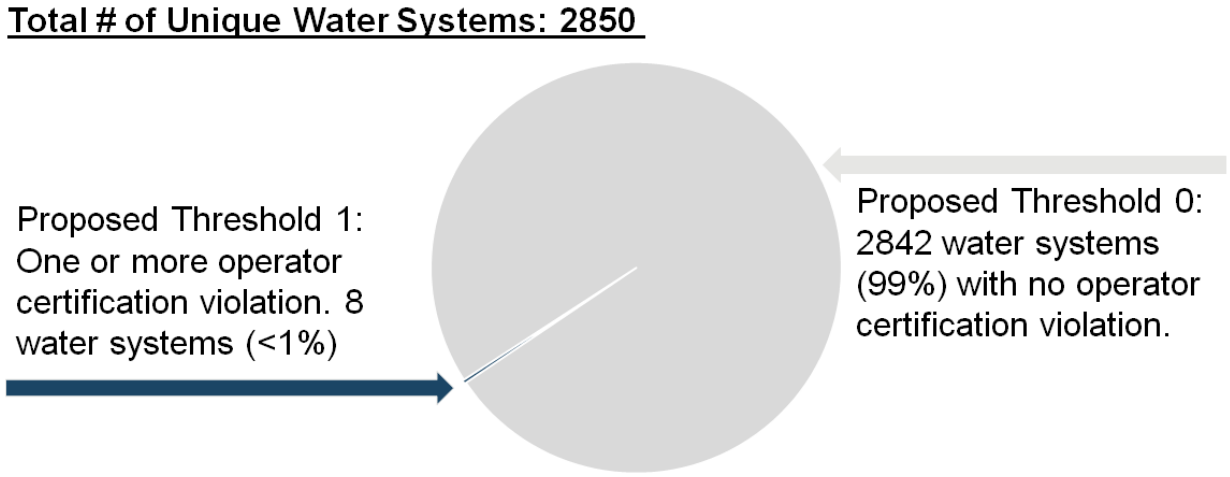
[42] See Oxenford, J. L., & Barrett, J. M. (2016). Understanding small water system violations and deficiencies. *Journal-American Water Works Association, 108*(3), 31-37.

[43] 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

- **Threshold 1** = **1 or more** Operator Certification violations over the last three years.

There are 2,842 water systems (99%) have had 0 operator certification violations over the last three years. There are 8 water systems (<1%) that meet Proposed Threshold 1 for having one or more violations in the last three years.

Figure B33: Operator Certification Violations



Scoring Recommendation

Table B23 summarizes the scores recommended per threshold.

Table B23: "Operator Certification Violations" Threshold Scores

Threshold Number	Threshold	Score
0	**0** Operator Certification violations over the last three years.	0
1	**1 or more** Operator Certification violations over the last three years.	1

Monitoring & Reporting Violations

Definition

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 required time frame. A water system that fails to perform required monitoring for a group of chemicals

(such as 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 9-year compliance cycle.

Calculation Methodology

Required Risk Indicator Data Point & Source:

- Monitoring and Reporting violations: SDWIS

Table B24: 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)

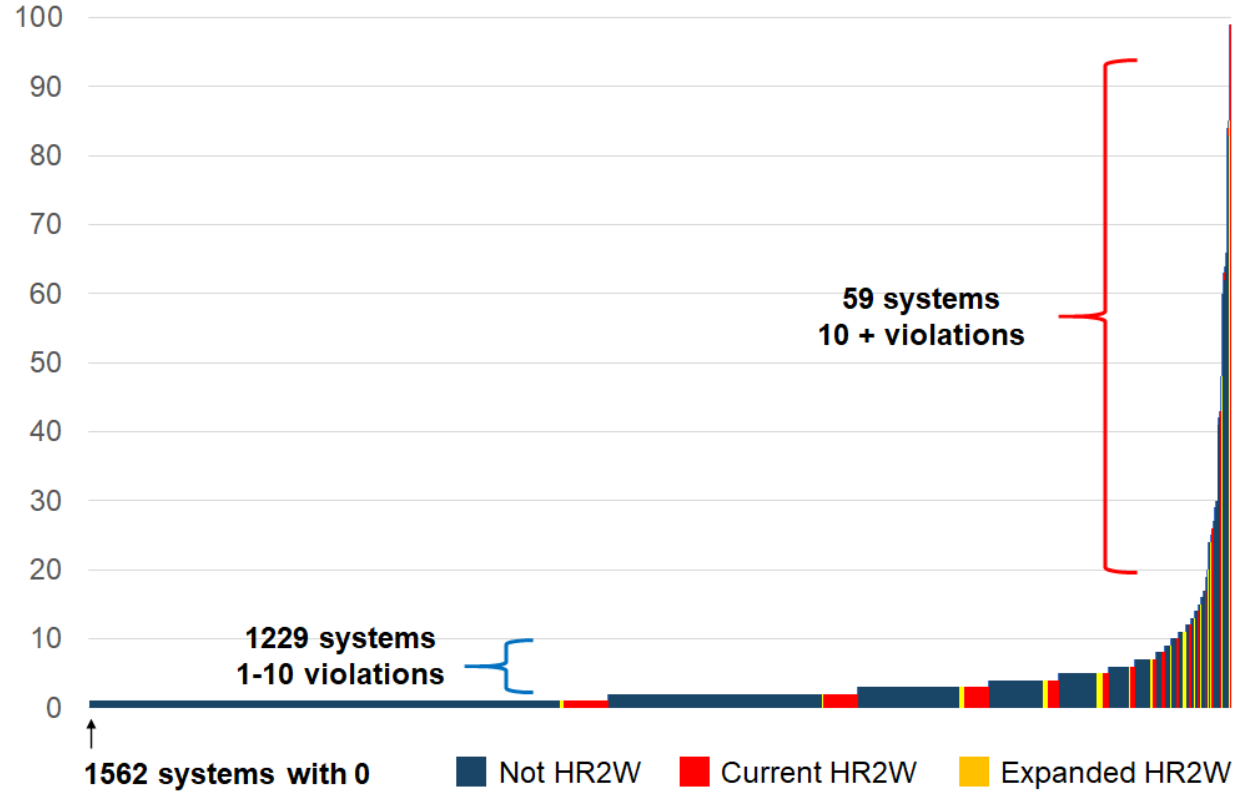
Risk Indicator Methodology:

- Determine which systems have had Monitoring & Reporting violations over the last 3-year compliance period using the Monitoring & Reporting violation codes in Table B24. This excludes MCL and TT related Monitoring & Reporting violations described below that are included in the expanded HR2W list criteria:
    - System 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 Recommendation

Data on Monitoring and Reporting violations is available for 2,850 water systems. An analysis of the counts of Monitoring & Reporting violations over the last three years finds the minimum number of Monitoring & Reporting violations as 0, the maximum as 99, and the average of 1.54 per system.

Figure B34: Monitoring & Reporting Violations Over the Last 3 Years



The State Water Board has proposed a threshold for Monitoring & Reporting violations (related to an MCL or Treatment Technique) (see Appendix C) for the HR2W list. The HR2W 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 Risk Assessment 2.0, the State Water Board and UCLA propose a slightly modified version of the HR2W threshold. Systems that have had two or more Monitoring & Reporting violations over the last three years are more at-risk.[44]

Moreover, correlation and regression analysis between the indicator threshold and water system failure definition employed in Risk Assessment 1.0 shows a statistically significant relationship.

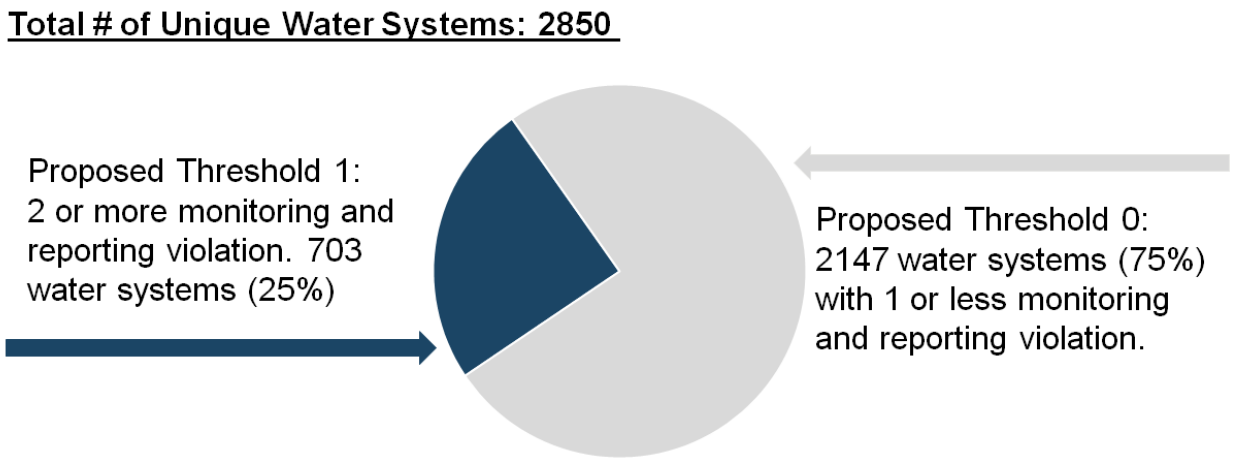
Proposed Thresholds:

- **Threshold 0** = **1 or less** Monitoring & Reporting violations over the last three years.
- **Threshold 1** = **2 or more** Monitoring & Reporting violations over the last three years.

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

2,147 water systems (75%) have had 1 or fewer Monitoring & Reporting violations. 703 water systems (25%) meet Proposed Threshold 1 with 2 or more Monitoring & Reporting violations.

Figure B35: Monitoring and Reporting Violations



Scoring Recommendation

Table B25 summarizes the scores recommended per threshold.

Table B25: "Monitoring & Reporting Violations" Threshold Scores

Threshold Number	Threshold	Score
0	**1 or less** Monitoring & Reporting violations over the last three years.	0
1	**2 or more** Monitoring & Reporting violations over the last three years.	1

Significant Deficiencies

Definition

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 correction 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 or 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(c) 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

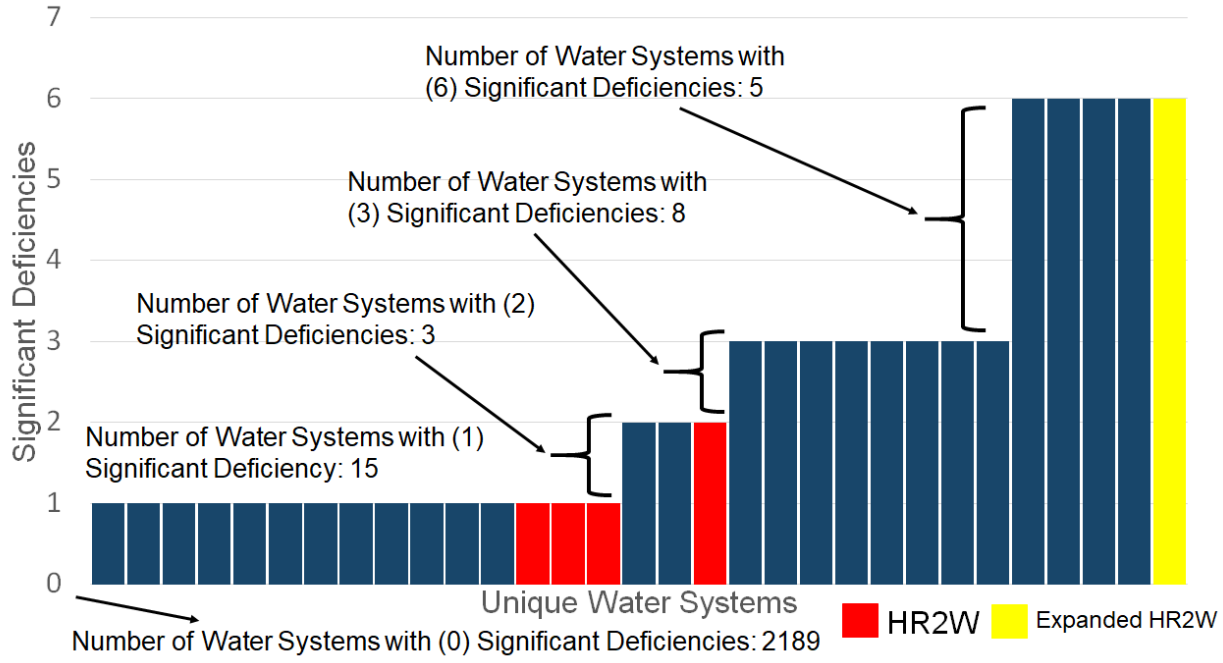
Risk Indicator Calculation Methodology:

- 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 Recommendation

Data on Significant Deficiencies is available for 2,850 water systems. The minimum number of Significant Deficiencies found is 0, the maximum number found is 6, and the average number of Significant Deficiencies found is 0.03.

Figure B36: Significant Deficiencies Over the Last 3 Years



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.[45] Finally, similar measures of significant deficiencies are used as an established threshold of concern by states such as Alaska and Nevada,[46] Connecticut,[47] and New Mexico,[48] among others.

[45] See Oxenford, J. L., & Barrett, J. M. (2016). Understanding small water system violations and deficiencies. Journal-American Water Works Association, 108(3), 31-37.

[46] 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

[47] 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

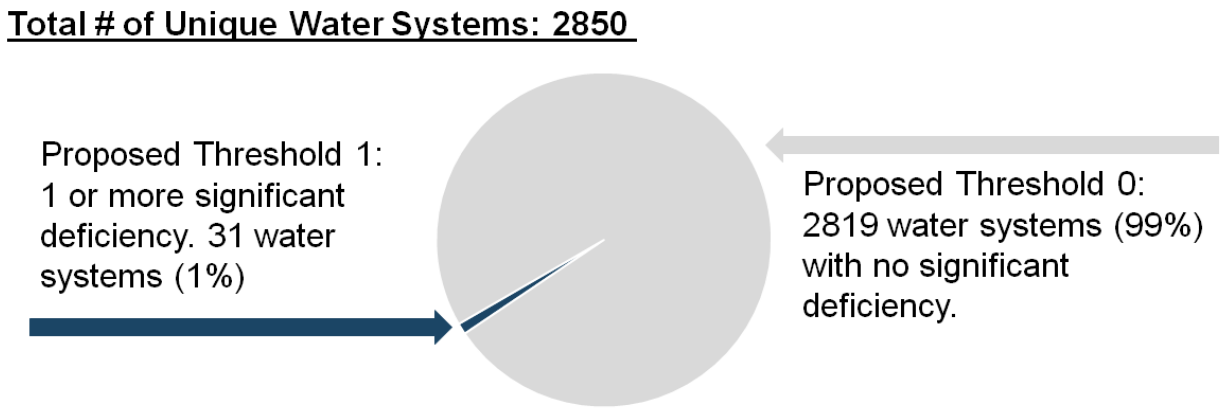
[48] New Mexico Environment Department: Drinking Water Bureau (2016). "Surface Water Rule and Interim Enhanced Surface Water Treatment Rule: Significant Deficiency Policy." Retrieved from: https://www.env.nm.gov/wp-content/uploads/sites/5/2018/11/RE_Surface-Water-Rule-Significant-Deficiency_Policy_020816.pdf

Proposed Thresholds:

- **Threshold 0** = **0** Significant Deficiencies over the last three years.
- **Threshold 1** = **1** or more Significant Deficiencies over the last three years.

2,819 water systems (99%) have had no Significant Deficiencies in the last three years. 31 water systems (1%) meet Proposed Threshold 1 having 1 or more Significant Deficiencies in the last three years.

Figure B37: Significant Deficiencies



Scoring Recommendation

Table B26 summarizes the scores recommended per threshold.

Table B26: "Significant Deficiencies" Threshold Scores

Threshold Number	Threshold	Score
0	**0** Significant Deficiencies over the last three years.	0
1	**1** or more Significant Deficiencies over the last three years.	1

Extensive Treatment Installed

Definition

Extensive Treatment Installed is when one or more of the following conditions are met:

- Groundwater source(s) necessitating the use of a treatment plant that has a treatment facility classification of T3 or higher.
- Surface water quality necessitating a surface water treatment plant.

In accordance with CCR Section 64413.1, water treatment facility operator certification grades are based on a classification system that stresses influent water quality (e.g. influent turbidity, microbial quality and MCL compliance), treatment complexity, and the population supplied by the treatment plant based on facility flows greater than 2 million gallons per day. Water systems serving less than 3,300 connections are unlikely to have water treatment plants that exceed 2 million gallons per day. Therefore, facility certification level at this size range focuses on the risks associated with poor raw water quality and treatment complexity. Water treatment facilities with operator certification grades T3, T4, and T5 are also relatively expensive compared to lower certification facilities, particularly when there is a small rate base to distribute the cost of treatment. Furthermore, the threat to customers if failure occurs is greater if the source water is significantly impaired and required extensive treatment.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Federal Primary Source Type: SDWIS
    - GW – Groundwater
    - GU – Ground water under direct influence of surface water (Consider to be ground water)
    - GWP – Purchased Ground water under direct influence of surface water (Consider to be ground water)
    - SW – Surface Water
    - SWP – Purchased Surface Water

- Operating Category Code: SDWIS
    - T3: Treatment plants requiring a Treatment Operator Certification Grade 3
    - T4: Treatment plants requiring a Treatment Operator Certification Grade 4
    - T5: Treatment plants requiring a Treatment Operator Certification Grade 5

Risk Indicator Calculation Methodology:

- Water Systems where split into two groups based on their Federal Primary Source Type:
    - Group 1 - Groundwater systems - included the following SDWIS categories: GU, GW, and GWP.
    - Group 2 - Surface water systems - included the following SDWIS categories: SW and SWP.

- For groundwater systems, the maximum treatment classification was identified and any systems with T3, T4, or T5 treatment plants were considered as having extensive treatment.
    - There were also 14 systems that were found to have missing treatment classifications associated with their treatment plants and a system represented was contacted to get those missing classifications. In the end only one additional system was identified as having a level T3 treatment plant.

- For surface water systems, several methods were implored to determine if the systems had extensive treatment installed.
    - Surface water systems with intakes were considered to have extensive treatment installed.
    - Surface water systems that had no intakes but received raw surface water from an intertie were identified and considered to have extensive treatment installed. Some interties were incorrectly identified as not receiving treatment, but after further review were found to have extensive treatment installed.

Threshold Recommendation

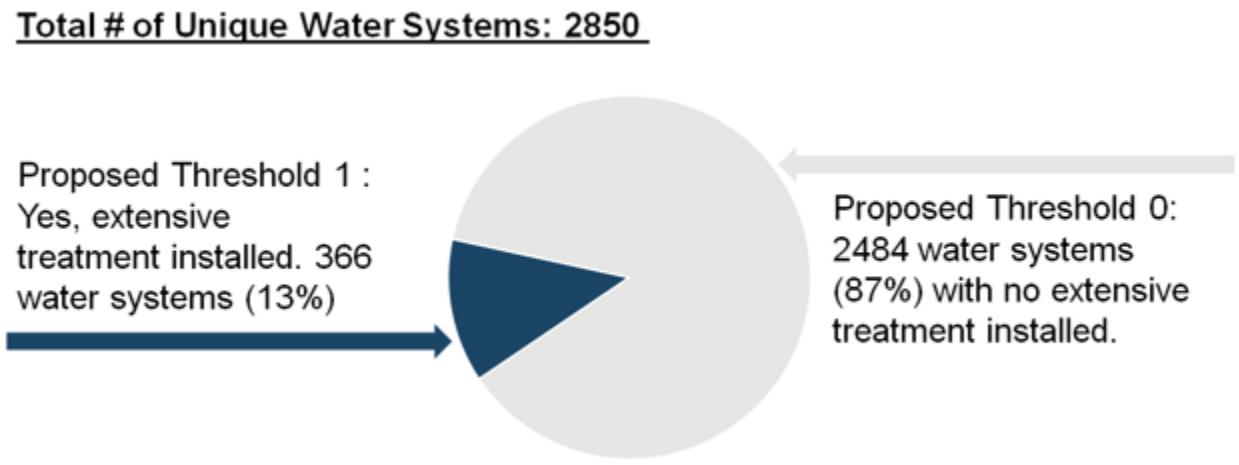
Data on extensive treatment installed is available for 2,850 water systems. There is a minimum of 0 extensive treatment installed, a maximum of 1 extensive treatment installed, and an average of 0 across the data set.

Proposed Thresholds:

- **Threshold 0** = **No** extensive treatment installed.
- **Threshold 1** = **Yes,** extensive treatment is installed.

2,484 water systems (87%) have no extensive treatment installed. 366 water systems (13%) meet Proposed Threshold 1 by having extensive treatment installed.

Figure B38: Extensive Treatment Installed



Scoring Recommendation

Table B27 summarizes the scores recommended per threshold.

Table B27: "Extensive Treatment Installed" Threshold Scores

Threshold Number	Threshold	Score
0	**No** extensive treatment installed.	0
1	**Yes,** extensive treatment is installed.	1

Appendix C: HR2W List Criteria

Background

On September 25, 2012, Governor Edmund G. Brown Jr. signed Assembly Bill (AB) 685, making California the first state in the nation to legislatively recognize the human right to water (HR2W). Now in the Water Code as Section 106.3, the state statutorily recognizes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." The HR2W extends to all Californians, including disadvantaged individuals and groups and communities in rural and urban areas.

On February 16, 2016, the State Water Board adopted a resolution identifying the human right to water as a top priority and core value of the State Water Board and Regional Water Quality Control Boards (collectively the Water Boards). The resolution stated the Water Boards will work "to preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations."

HR2W Systems

The State Water Board assesses water systems that fail to meet the HR2W and maintains a list and map of these systems on its website. Systems that are on the HR2W list are those that are out of compliance or consistently fail. Systems that are assessed for meeting the HR2W criteria include Community Water Systems (CWSs) and Non-Community Water Systems (NCWSs) that serve schools and daycares. The current HR2W criteria are summarized in Table C1 and detailed in the following sections. The current criteria includes federal and state primary and secondary Maximum Contaminant Levels (MCLs) violations and certain Treatment Technique (TT) violations, with open associated Enforcement Actions, related to requirements of the following: the Surface Water Treatment Rule (SWTR) and its amendments and revisions; and the Groundwater Rule (GWR). The current criteria do not include the following:

- Violations of monitoring data not being reported, such that actual exceedance/compliance status is unknown at this time.
- An exceedance of federal or state drinking water standard for which no enforcement action has been taken.
- A total coliform violation and revised total coliform violation. These violations included in the dataset when the State.

During the potential risk indicator evaluation process for the Risk Assessment, it became apparent that certain indicators reflect water system violations as defined by CHSC Section 116275. For example, a single missed monitoring and reporting violation over a period of three years may be a general indicator of risk, while an ongoing

significant number of monitoring and reporting violations over the same time period could fail to identify potential water quality violations.

Since a number of the recommended risk indicators were associated with non-MCL violations, further consideration was given to define what it means for a water system to "consistently fail" or be "At-Risk." CHSC Section 116275(c) states that "Primary drinking water standards" means:

4. Maximum levels of contaminants that, in the judgment of the state board, may have an adverse effect on the health of persons.
5. Specific treatment techniques adopted by the state board in lieu of maximum contaminant levels pursuant to subdivision (j) of Section 116365.
6. The monitoring and reporting requirements as specified in regulations adopted by the state board that pertain to maximum contaminant levels.

The State Water Board used this definition to consider how to most appropriately expand the criteria for systems that are added to the HR2W list to ensure all aspects of public health were incorporated. The Table C1 and sections summarize the recommended criteria. The expanded criteria would result in approximately 40 water systems added to the HR2W list.

Table C1: Proposed Expanded Criteria for the Human Right to Water (HR2W) List

Criteria	Before 3.2021	After 3.2021
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)	**Partially**	**Expanded**
Monitoring and Reporting Violations (related to an MCL or TT)	**No**	**Yes**

Primary MCL Violation with an Open Enforcement Action

In accordance with federal regulations, California requires public water systems to sample their sources and have the samples analyzed for inorganic and organic substances in order to determine compliance with drinking water standards, also known as maximum contaminant levels (MCLs). Primary MCLs are based on health protection, technical feasibility, and costs. The water system must notify the State Water Board and the public when a primary MCL has been violated and take appropriate action.

HR2W Criteria

- At least one Primary MCL Violation with an associated open Enforcement Action.

Methodology

- **Step 1**: Determine which systems have incurred a Primary MCL Violation using the SDWIS database.
    - Query systems that only have MCL violations. See list of violation codes below.
    - Search violations in SDWIS for all associated with primary contaminants – see table below for the analyte codes.

Table C2: Violation Types Related to a Primary MCL

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.
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.
MB	**Primary State MCL**	An MCL violation of State regulated contaminants.

Table C3: Analytes with a Primary MCL in SDWIS

Analyte Name	Analyte Code
1,1,1 -Trichloroethane	34506
1,1,2,2-Tetrachloroethane	34516
1,1,2-Trichloroethane	34511
1,1-Dichloroethane	34496
1,1-Dichloroethylene	34501
1,2,3-Trichloropropane (1,2,3-TCP)	77443
1,2,4-Trichlorobenzene	34551
1,2-Dichlorobenzene	34536
1,2-Dichloroethane	34531
1,2-Dichloropropane	34541
1,3-Dichloropropane (TOTAL)	34561
1,4-Dichlorobenzene	34571
2,3,7,8-TCDD (Dioxin)	34676
2,4,5-TP (Silvex)	39045
2,4-D	39730

Analyte Name	Analyte Code
Alachlor	77825
Aluminum	01105
Aluminum, Dissolved	01106
Antimony	01097
Arsenic	01002
Asbestos	81855
Atrazine	39033
Barium	01007
Bentazon	38710
Benzene	34030
Benzo (A) Pyrene	34247
Beryllium	01012
Bromate	A-027
Cadmium	01027
Carbofuran	81405
Carbon Tetrachloride	32102
Chlorate	A-037
Chlorite	50074
Chlorodibromomethane	34307
Chromium (Total)	01034
CIS-1,2-Dichloroethylene	77093
CIS-1,3-Dichloropropene	34704
Combined RA 226 + RA 228	11503
Combined RA 226 + RA 228 MDA95	A-076
Cyanide	01291
Dalapon	38432
Di(2-Ethylhexyl)Adipate	A-026
Di(2-Ethylhexyl)Phthalate	39100
Dibromochloropropane (DBCP)	38761
Dichloromethane	34423
Diquat	78885
Endothall	38926
Endrin	39390
Ethylbenzene	34371
Ethylene Dibromide (EDB)	77651
Fluoride (F) (Natural-Source)	00951
Glyphosate	79743

Analyte Name	Analyte Code
Gross Alpha	01501
Gross Alpha MDA95	A-072
Gross Beta	03501
Gross Beta MDA95	A-077
Haloacetic Acids (5) (HAA5)	A-049
Heptachlor	39410
Heptachlor Epoxide	39420
Hexachlororobenzene	39700
Hexachlorocyclopentadiene	34386
Lindane	39340
Manganese, Dissolved	01056
Mercury	71900
Methoxychlor	39480
Methyl Tertiary Butyl Ether (MTBE)	46491 (A-030)
Molinate	82199
Monochlorobenzene	34301
Nickel	01067
Nitrate as Nitrogen	00618
Nitrate + Nitrite (As N)	A-029
Nitrite (As N)	00620
Oxamyl	38865
Pentachlorophenol	390032
Perchlorate	A-031
Picloram	39720
Polychlorinated Biphenyls, Total, As DCB	39516
Radium 226 MDA95	A-074
Radium 228 MDA95	A-075
Selenium	01147
Simazine	39055
Strontium-90	13501
Strontium-90 MDA95	A-078
Styrene	77128
Tetrachloroethylene	34475
Thallium	0159
Thiobencarb	A-001
Toluene	34010

Analyte Name	Analyte Code
Total Radium for NTNC per § 64442(b)(3)	A-080
Total Radium for NTNC per § 64442(b)(3) MDA95	A-082
Total Trihalomethanes	82080
Toxaphene	34900
Trans-1,2-Dichloroethylene	34545
Trans-1,2-Dicholropropene	34546
Tricholoroethylene	39180
Trichlorofluoromethane Freon 11	34488
Trichlorotrifluoroethane (Freon 113)	81611
Tritium	07000
Tritium MDA95	A-079
Turbidity, Field	82078
Uranium (PCI/L)	28012
Uranium MDA95	A-073
Vinyl Chloride	39175
Xylene (Total)	81551

- **Step 2**: Determine which systems have an Enforcement Action associated with those Violations.

- **Step 3**: Determine which systems **do not have a SOX (State Compliance Achieved) Enforcement Action** associated with the Enforcement Action. A SOX Enforcement Action indicates when the system has returned to compliance or met the obligations of the Enforcement Action.
    - These systems meet the failing criteria and are added to the HR2W list.

- **Step 4**: A system will no longer meet the Primary MCL Violation HR2W criteria once a SOX Enforcement Action associated with the open Primary MCL Violation has been entered into SDWIS.
    - Per U.S. EPA guidance:
        - A new permitted source with contaminant levels below the MCL will automatically qualify the water system to return to compliance and a SOX Enforcement Action will be issued.
        - Installation of treatment requires a running annual average less than an MCL before a SOX Enforcement Action is issued.

Secondary MCL Violation with an Open Enforcement Action

In accordance with federal regulations, California requires public water systems to sample their sources and have the samples analyzed for inorganic and organic substances in order to determine compliance with drinking water standards, also known as MCLs. Secondary MCLs are based on consumer acceptance, using parameters such as odor, taste, and appearance as measures of acceptability. The water system must notify the State Water Board and the public when a secondary MCL has been violated and take appropriate action.

HR2W Criteria

- At least one Secondary MCL Violation with an associated open Enforcement Action.

Methodology

- **Step 1**: Determine which systems have incurred a Secondary MCL Violation using the SDWIS database.
    - Query systems that only have MCL violations. See list of violation codes below.
    - Search violations in SDWIS for all associated with secondary contaminants: Analyte Codes: 1080, 1039, 1032, 1028, 1002, 1905, 1022, 2905, C030, 1920, 1050, 2727, 0100, 1095, 2978, 2413, 2251, 2625, and/or 2626.

Table C4: Violation Types Related to a Secondary MCL

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.
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.

- **Step 2**: Determine which systems have an Enforcement Action associated with those Violations.

- **Step 3**: Determine which systems **do not have a SOX Enforcement Action** associated with the Enforcement Action. A SOX Enforcement Action indicates when the system has returned to compliance or met the obligations of the Enforcement Action.
    - These systems meet the failing criteria and are added to the HR2W list.

- **Step 4**: A system will no longer meet the Secondary MCL Violation HR2W criteria once a SOX Enforcement Action associated with the open Secondary MCL Violation has been entered into SDWIS.

E. coli Violation with an Open Enforcement Action

Total coliform, fecal coliform, and E. coli are all indicators of drinking water quality. The total coliform group is a large collection of different kinds of bacteria. Fecal coliforms are types of total coliform that mostly exist in feces. E. coli is a sub-group of fecal coliforms. When a water sample is sent to a lab, it is tested for total coliform. If total coliform is present, the sample will also be tested for either fecal coliform or E. coli, depending on the lab testing method. The presence of E. coli in a drinking water sample almost always indicates recent fecal contamination, meaning there is a greater risk that pathogens are present.

If a system incurs an E. coli MCL violation, it must perform a Level 2 assessment and provide Tier 1 public notification to its customers. RTCR requires public notice within 24 hours after receiving confirmation of an E. coli MCL violation. There are four ways a water system can have an E. coli MCL violation:

- A total coliform-present repeat sample follows an E. coli-present routine sample.
- An E. Coli-present repeat sample follows a total coliform-present routine sample.
- There is a failure to test a total coliform-present repeat sample for E. coli.
- The system fails to take all required repeat samples following an E. coli-present routine sample.

A system that incurs an E. coli Treatment Technique Violation occurs when a system:

- Fails to conduct or fully complete a required Level 1 or Level 2 Assessment within 30 days of the regulatory trigger.
- Fails to correct any sanitary defect by taking required corrective action within the required timeframe.

HR2W Criteria

- At least one E. coli Violation with an open associated Enforcement Action.

Methodology

- **Step 1**: Determine which systems have incurred E. coli Violations using the SDWIS database.
    - Search violations in SDWIS for all associated with E. coli Analyte Code: 3014
    - Query systems that only have E. coli related treatment technique and/or MCL violations. See list of violation codes below:

Table C5: 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.

- **Step 2**: Determine which systems have an Enforcement Action associated with those Violations.
- **Step 3**: Determine which systems **do not have a SOX Enforcement Action** associated with the Enforcement Action. A SOX Enforcement Action indicates when the system has returned to compliance or met the obligations of the Enforcement Action.
    - These systems meet the failing criteria and are added to the HR2W list.
- **Step 4**: A system will no longer meet the E. coli Violation HR2W criteria once a SOX Enforcement Action associated with the E. coli Violation has been entered into SDWIS.

Treatment Technique Violations (in lieu of an MCL)

Primary drinking water standards, as defined in Section 116275 of the CHSC, includes specific treatment techniques adopted by the state board in lieu of maximum contaminant levels. Treatment technique violations in these cases have similar potential for adverse public health effects as maximum contaminant levels. Systems must carry out specified treatment when there is no economically and technically 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 and affordable for small systems. Some examples of treatment technique rules are the:

- Surface Water Treatment Rule[49] (disinfection and filtration)
- Ground Water Rule[50]
- Lead and Copper Rule (optimized corrosion control)
- Acrylamide and Epichlorohydrin Rules (purity of treatment chemicals)

This type of violation is incurred when a water system does not follow required treatment techniques to reduce the risk from contaminants, *e.g.* exceeding turbidity performance requirements at a surface water treatment plant, failing to provide required disinfection, *etc.*

HR2W Criteria

- One or more Treatment Technique violations (in lieu of an MCL), for primary contaminants, with an open Enforcement Action; and/or
- Three or more Treatment Technique violations (in lieu of an MCL), for primary contaminants, within the last three years.
    a. *This criterion is being added because treatment technique violations are often associated with a violation for a single month. Therefore, a series of treatment technique violations is assumed to be indicative of a larger treatment issue.*

Methodology

- **Step 1**: Determine how many Treatment Technique violations (in lieu of an MCL), for primary contaminants, water systems have incurred over the last three years.

Table C6: Treatment Technique Violations in Lieu of an MCL

Violation Number	Treatment Technique Violation Type	Description
07	**Treatment Techniques (Other)**	A violation where the water system failed to treat water using acrylamide and/or epichlorohydrin as part of their treatment process.

[49] 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)

[50] 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)

Violation Number	Treatment Technique Violation Type	Description
41*	**Failure to Maintain Microbial Treatment**	A violation where water system that provides treatment failed to maintain 4-log virus removal and/or did not restore proper operation within hours of becoming aware of the problem; or where the system failed to take actions specific by the state to address the contamination of cryptosporidium 40 CFR 141.711(d); or where a water system using surface water failed to achieve a combined filter effluent turbidity level of 0.5 NTU in 95% of the monthly measurements for conventional or direct filtration or failed to achieve a combined filter turbidity level that at no time exceeded 1.0 NTU for conventional or direct filtration, or does not meet the residual disinfectant concentration level for longer than the specified period of time.
42*	**Failure to Provide Treatment**	A violation where a water system using surface water fails to install filtration and the system does not meet filtration avoidance criteria; or where a multiple source water system fails to install treatment in response to a positive source sample; or where a filtered water system fails to achieve treatment credit requirements according to the stated provision for one month, failure to provide LT2 treatment.
43*	**Single Turbidity Exceedance (Enhanced SWTR)**	A violation where a water system using filtered surface water failed to achieve a combined filter turbidity level that at no time exceeded 1.0 NTU for conventional or direct filtration or failed to achieve combined filter turbidity level that at no time exceeded the primary agency set maximum performance standard for alternative filtration technology.
44*	**Monthly Turbidity Exceedance (Enhanced SWTR)**	A violation where a water system using filtered surface water failed to achieve a combined filter effluent turbidity level of 0.3 NTU in 95% of the monthly measurements for conventional or direct filtration or failed to achieve a combined filtration effluent

Violation Number	Treatment Technique Violation Type	Description
		turbidity level performance standard set by the primacy agency in 95% of the monthly measurements for alternative filtration technology.
45	**Failure to Address a Deficiency**	A violation where a water system fails to respond in writing to Significant Deficiency how and on what schedule the system will address deficiency within 45 days of report receipt; or where a water system failed to meet approved corrective action schedule, or the schedule contained in the system's response; or where a water system failed to address a Significant Deficiency within the State or County's specified schedule or 120 days from the date of notification of Significant Deficiency.
47	**Uncovered Reservoir**	A violation where a water system constructed an uncovered finished water storage reservoir facility on or after 02.16.1999; or where a water system fails to cover any uncovered finished water storage facility or fails to treat the discharge from the uncovered finished water storage facility to the distribution system.
48	**Failure to Address Contamination**	A violation where a water system failed to take corrective action in response to a positive fecal indicator sample within 120 days, including failure to satisfy a State/County specified schedule.
57	**OCCT/SOWT Recommendation (Lead and Copper)**	A violation where a water system failed to submit an optimal corrosion control treatment (OCCT) study/recommendation.
58	**OCCT/SOWT Install Demonstration (Lead and Copper)**	A violation where a water system failed to install/demonstrate optimal corrosion control treatment (OCCT) or source water treatment (SOWT).
59	**WQP Level Non-Compliance (Lead and Copper)**	A violation where a water system failed to maintain optimal water quality parameters (OWQP) minimum or ranges or meets daily values for more than 9 days in a 6-month

Violation Number	Treatment Technique Violation Type	Description
		monitoring period for entry point and tap sampling.
63	**MPL Level Non-Compliance (Lead and Copper)**	A violation where a water system failed to meet the maximum permissible level (MPL).
64	**Lead Service Line Replacement**	A violation where a water system failed to replace the requirement amount of lead service line (LSL) by the annual deadline. Provide PN, report information, collect TAP samples, and/or mail/post results.
65	**Public Education**	A violation where a water system failed to provide public education that meets the lead content, reporting, and delivery requirements.
2B	**Level 2 Assessment**	A violation where a water system fails to conduct a Level 2 Assessment or complete the form; or where the Level 2 Assessment is inadequate, or the content is insufficient; or where the Level 2 Assessment assessor is not State-approved.
2C	**Corrective Actions/Expedited Action**	A violation where a water system fails to complete corrective actions within the required timeframe when a Level 1 or Level 2 Assessment is triggered; or failure to comply with State-required expedited/additional actions when an E. coli MCL happens.

*Violation codes 41 through 44 are included in the current HR2W criteria.

- **Step 2**: Determine which systems have had three or more Treatment Technique violations (in lieu of an MCL) within the last three years.
    - These systems meet the failing criteria and are added to the HR2W list.

- **Step 3**: Determine which systems have an open Enforcement Action related to one or more Treatment Technique violation in SDWIS.
    - These systems meet the failing criteria and are added to the HR2W list.

- **Step 4**: A system will no longer meet the Treatment Technique Violation HR2W criteria once:

- SOX Enforcement Actions associated with all Treatment Technique violations have been entered into SDWIS; and
- The water system has less than three Treatment Technique violations within the last three years.

Monitoring & Reporting Violations (related to an MCL or TT)

Water systems must meet health-based federal standards for contaminants, including performing regular monitoring and reporting. The State Water Board's primary means of monitoring water system compliance with the Safe Drinking Water Act (SDWA) and its implementing regulations is the review and evaluation of analytical results of water samples collected by public water systems. These reports provide the water systems and regulators with the data they need to ensure that drinking water monitoring is ongoing and that the drinking water standards are being met.

When results indicate that a contaminant is present at a level that exceeds standards, the State Water Board works with water systems to take steps to prevent or remove the contaminants. Under the SDWA, water systems are also required to inform their customers of any violations of the state's drinking water standards. In the absence of adequate data, serious health violations may be obscured from regulatory oversight.

A Monitoring & Reporting Violations as discussed in this section occurs when a water system fails to conduct regular monitoring of drinking water quality or to submit monitoring results in a timely fashion to the primacy agency or the State Water Board. Monitoring and reporting violations are included in the definition of primary drinking water standards in CHSC Section 116275(c). The State Water Board recognizes that there are various types of monitoring and reporting violations. Only those violations related directly to a contaminant associated with a primary drinking water standard, *e.g.* MCLs or treatment techniques, are being included.

The State Water Board also recognizes that a single monitoring and reporting violation may not represent a failing condition. However, multiple monitoring and reporting violations, particularly those that remain unaddressed, do represent a condition where significant water quality violations may go undetected and unaddressed.

HR2W Criteria

- Three or more Monitoring and Reporting violations (related to an MCL or TT) within the last three years where at least one violation has an open Enforcement Action that has been open for 15 months or greater.

Methodology

- **Step 1**: Determine how many Monitoring & Reporting violations (related to an MCL or TT) each water system has incurred over the last three years.

Table C7: Monitoring & Reporting Violations Related to an MCL or TT

Violation Number	Monitoring & Reporting Violation Type	Description
03	**Regular Monitoring**	A violation for inorganic, organic, or radiological constituent where compliance is based on routine samples.
04	**Monitoring, Check, Repeat, or Confirmation**	A violation for an inorganic, organic, or radiological constituent where compliance is based on repeat or confirmation samples.
27	**Routine Monitoring (DBP)**	A violation where the water system failed to have a DBP Monitoring Plan, failed to comply with monitoring and reporting requirements, or failed to monitor and report the DBP samples in accordance with their DBP Monitoring Plan.
31	**Monitoring of Treatment (Surface Water Treatment Rule – Unfiltered/GWR)**	A violation where a water system using unfiltered surface water failed to perform and/or repeat monitoring for TC/FC and turbidity; A violation where a water system that is implementing 4-LOG removal treatment for viruses failed to monitor or report compliance monitoring; A violation for LT2 where an unfiltered water system fails to monitor according to 40 CFR 141.701(a)(2)
34	**Source Water Monitoring (Groundwater Rule)**	A violation where a water system failed to conduct surface water monitoring for either – triggered, additional monitoring, or for assessment purposes (PWS's without 4-log removal treatment must perform source water monitoring when a TCR monitoring results on a Total Coliform-positive).
36	**Monitoring of Treatment (Surface Water Treatment Rule – Filter)**	A violation where a water system using filtered surface water failed to perform routine and/or repeat monitoring for filtration or disinfection process.
38	**Turbidity (Enhanced Surface Water**	A violation where a water system using filtered surface water failed to monitor and

	Treatment Rule) Monitoring	report the required combined filter effluent samples or individual filter effluent sample.
51	**Initial Tap Sampling for Lead and Copper**	A violation where a water system failed to monitor and report the initial lead and copper TAP samples (this violation type is no longer applicable for most water systems and now only applies to new water systems or systems that were not previously required to conduct lead and copper tap monitoring).
52	**Follow-Up or Routine Lead and Copper Tap Monitoring & Reporting**	A violation where a water system failed to monitor and report the routine or follow-up lead and copper tap samples.
66	**Lead Consumer Notification**	A violation where a water system failed to provide a lead consumer notice.
3A	**Routine Monitoring (RTCR)**	A violation where the water system fails to collect routine samples at the appropriate site or frequency.
3B	**Additional Routine Monitoring**	A violation where a water system that is required to conduct monitoring less than monthly (*e.g.* quarterly, annually, or twice a year) fails to collect at least three routine samples (during the month following one or more TC+ (routine or repeat) sample the month following a TC+ sample results) AND does not meet all the criteria listed in 141.854(j)(1),(2), or (3) and 141.855(f)(1)(2), or (3) to be exempt from additional routine monitoring.
3C	**TC Samples (triggered by turbidity exceedance) Monitoring**	A violation where a water system that uses GWUDI, SW, or GWUDI/SW blended sources and does not practice filtration in compliance with Subparts H, P, T and W fails to collect at least one total coliform sample near the first service connection each day the turbidity level of the source water exceeds 1 NTU, where turbidity is measured as specified in 141.74(b)(2).

4D	**EC+ Notification Reporting**	A violation where a water system has an E. coli positive routine or repeat sample and fails to notify the State by the end of the day when the system is notified of the test result, unless the system is notified of the result after the State office is closed and the State does not have either an after-hours phone line or alternative notification procedure, in which case the system must notify the State before the end of the next business day.
4E	**E. coli MCL Reporting**	A violation where a water system fails to notify the State by the end of the day when the system incurs an E. coli MCL violation, unless the system learns of the violation after the State office is closed and the State does not have either an after-hours phone line or an alternative notification procedure, in which case the water system must notify the State before the end of the next business day.
4F	**Level 1 or Level 2 Treatment Technique Violation or Corrective Action Reporting**	A violation when a water system fails to notify the State by the end of the day when the system incurs a RTCR Treatment Technique violation for failure to complete the assessment/assessment form or failure to conduct corrective actions as described in 141.859. 141.861(a)(2); or when a system fails to notify the State in accordance with 141.859 when each scheduled corrective action is completed for corrections not completed by the time of submission of the assessment form. 141.861(a)(3)
S1/S2	**State Violation – Monitoring & Reporting (Major)**	A violation for an inorganic, organic, or radiological constituent where compliance is based on routine, repeat, or confirmation samples.

- **Step 2**: Determine which systems have had three or more Monitoring & Reporting Violations (related to an MCL or TT) within the last three years.

- **Step 3**: Determine which systems have an open Enforcement Action related to one or more of the identified Monitoring & Reporting Violations in SDWIS.

- **Step 4**: Determine if any of these systems has an open associated Enforcement Action have been open for 15 months or greater.
    - These systems meet the failing criteria and are added to the HR2W list.

- **Step 5**: A system will no longer meet the Monitoring & Reporting Violation HR2W criteria once:
    - SOX Enforcement Actions associated with all open Monitoring & Reporting violations, greater than 15 months, have been entered into SDWIS.