Draft White Paper Discussion On:

Proposed Changes for the Cost Assessment

August 4, 2022

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Executive Summary

The State Water Resources Control Board (State Water Board) is proposing an updated, streamlined methodology for estimating potential modeled solution costs for Failing public water systems, At-Risk public water systems, state small water systems and domestic wells. The proposed changes to the Cost Assessment Model include:

- Determine if physical consolidation is a viable model solution at the beginning of the Assessment, rather than the end. Therefore, physical consolidation will not be assessed against other potential treatment-based model solutions. This ensures physical consolidation is not overlooked by the model due to higher estimated costs compared to other solution types, i.e., Point of Use/Point of Entry (POU/POE) devices.
- Utilize additional information about each water system or domestic well to better identify potential modeled solutions. For example, systems that are failing for multiple monitoring and reporting violations will not have treatment costed out as a potential solution. The 2022 Risk Assessment for state small water systems and domestic wells identifies locations at risk for water quality and/or drought. The updated Model will better match potential solutions based on identified risk drivers.
- The sustainability and resiliency assessment will be removed from the Model to accommodate the new approach for matching potential model solutions to each system based on their challenges identified by the Failing criteria or Risk Assessment results.
- Use system and location-specific information to determine additional other essential infrastructure (OEI) needed, rather than relying on statewide assumptions applied proportionally to all water systems.
- OEI will be aligned with the Senate Bill 552 drought resiliency infrastructure requirements, utilizing the cost assumptions developed for the 2022 Cost Assessment.

The focus of this white paper is to provide an overview of these proposed high-level Cost Assessment Model enhancements and solicit public feedback. It is important to note that the sole purpose of the Cost Assessment Model is to assist the State Water Board in making budget decisions for the Safe and Affordable Drinking Water Fund and informing other policy matters. The Cost Assessment Model will not be used to inform system or community-level decisions around drinking water solution implementation or funding allocations. The State Water Board recognizes that the ultimate solution in each case will involve more detailed investigation of each water system and should include the input of the community and other stakeholders.

The State Water Board will continue to host public workshops to provide opportunities for stakeholders to learn about and contribute to the State Water Board's efforts to develop a more robust Cost Assessment Model for public water systems, state small water systems, and domestic wells. Future workshops will explore underlying cost assumptions associated with each potential model solution included in the Cost Assessment Model.

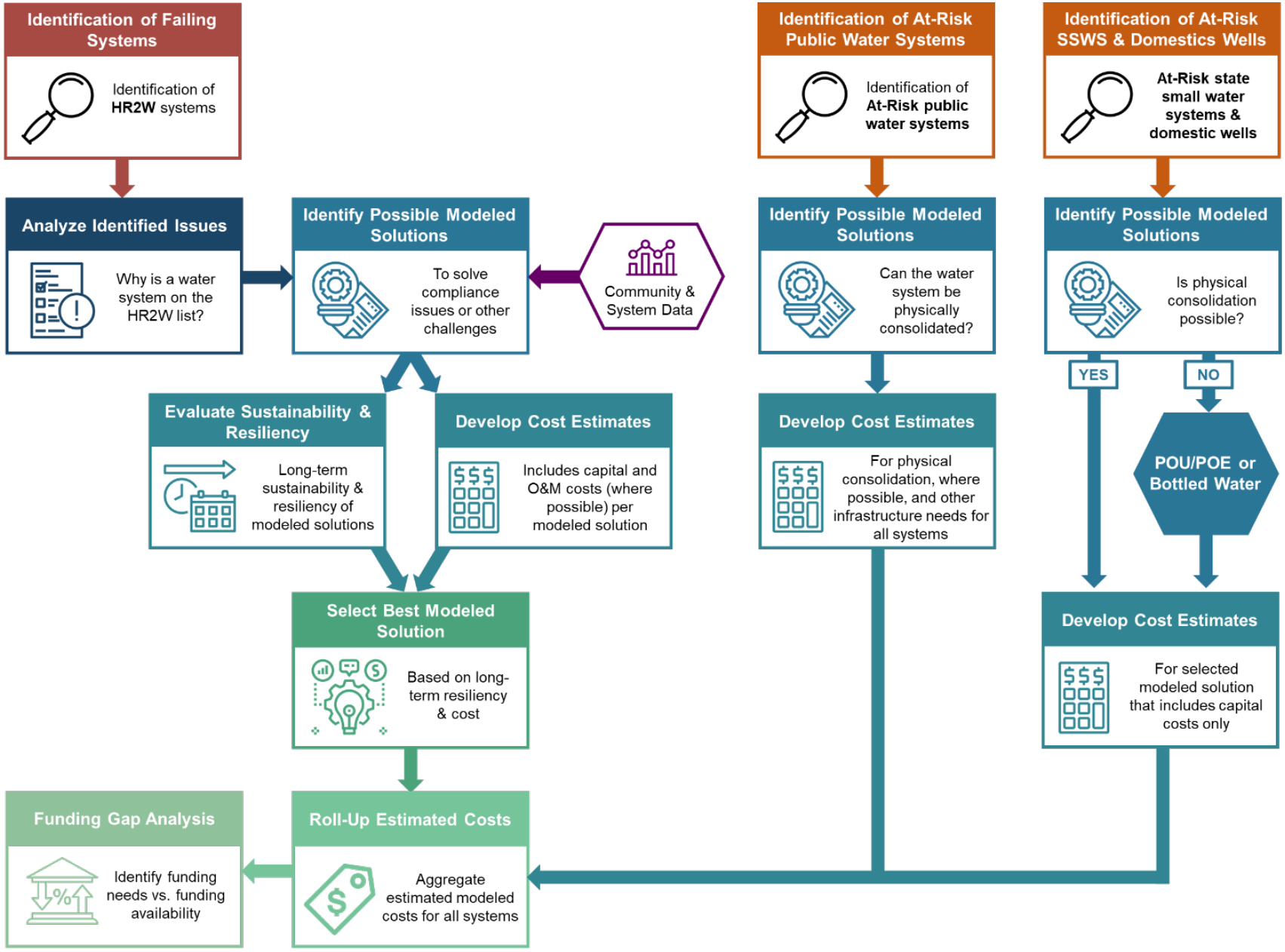
Overview of Proposed Changes

The original Cost Assessment Model, utilized in the 2021 Drinking Water Needs Assessment, analyzed different modeled solutions, including physical consolidation and treatment, for Failing public water systems (Figure 1). The model evaluated the potential solutions and identified the top two based on how they scored using a sustainability and resiliency assessment (SRA).[1] The model selected the best modeled solution using a set of cost and resiliency criteria. Additional infrastructure costs were estimated for a proportion of all analyzed systems and added to the total statewide estimate using assumptions derived from a case study of Failing system in Kern County.

The original Cost Assessment Model (Figure 1) explored physical consolidation as a long-term solution for At-Risk public water systems, along with addressing needed infrastructure to enhance system's sustainability. The Cost Assessment Model explored both physical consolidation and POU/POE devices as long-term solutions for At-Risk state small water systems and domestic wells.

[1] Sustainability and Resiliency Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/c4.pdf

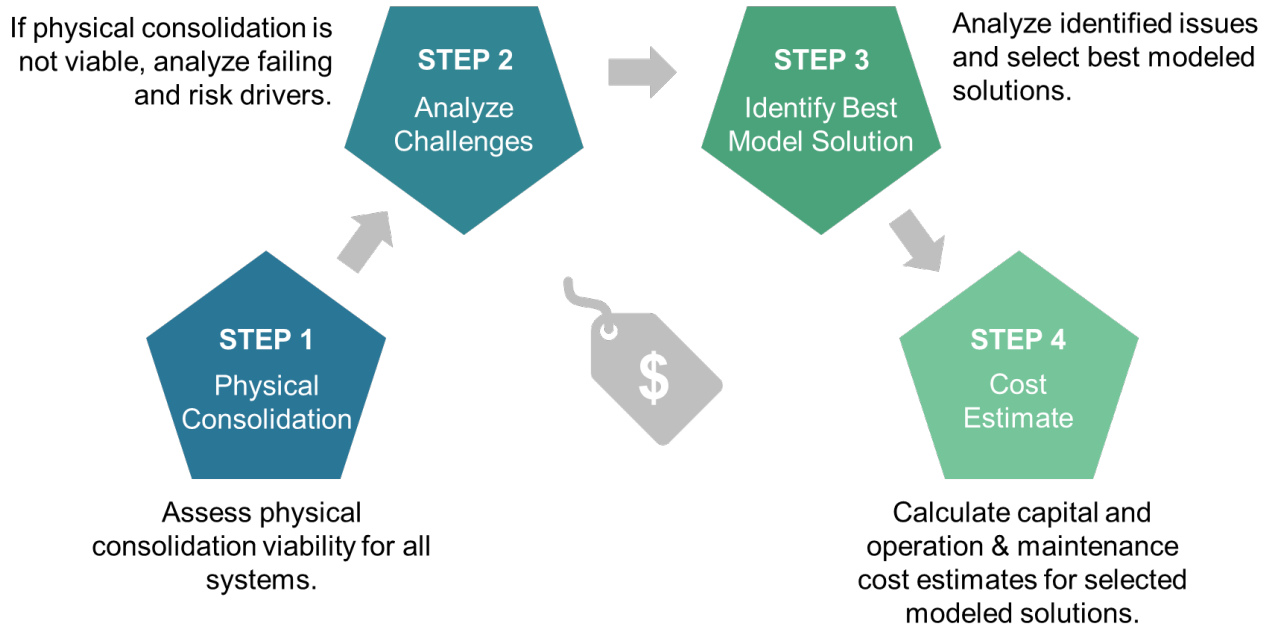
Figure 1: 2021 Cost Assessment Model Process



Due to minor changes to the number of Failing and At-Risk systems in 2022, the State Water Board did not conduct a full Cost Assessment for the 2022 Needs Assessment. However, in September 2021 the Governor approved Senate Bill (SB) 552[2] which requires small water systems (15 – 2,999 connections) and public Non-Transient Non-Community K-12 schools to meet new drought infrastructure resiliency measures. In response to stakeholder feedback for better drought-related cost estimates and the need to support SB 552 planning, the State Water Board conducted a targeted Drought Infrastructure Cost Assessment for the 2022 Needs Assessment.[3]

In response to stakeholder feedback after the release of the 2021 Cost Assessment and 2022 Drought Infrastructure Cost Assessment, the State Water Board is proposing an updated, streamlined Cost Assessment Model for estimating potential modeled solution costs for Failing public water systems, At-Risk public water systems, At-Risk state small water systems and domestic wells. The proposed updated methodology first explores physical consolidation as a potential modeled solution and if the model suggests it may not be viable, other modeled solutions will be examined and matched to the system's identified challenges, (Figure 2) below describes the proposed Cost Assessment Model flow process.

Figure 2: Proposed Updated Cost Assessment Model Process



[2] September 2021 the Governor approved Senate Bill (SB) 552 which requires small water systems (15 – 2,999 connections) and K-12 schools to meet new drought infrastructure resiliency measures

[3] 2022 Drinking Water Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

The State Water Board is seeking stakeholder feedback on the following proposed changes to the Cost Assessment Model.

Table 1 summarizes the key differences between the original and updated Cost Assessment Model. The sections below provide more details about the proposed changes and how they would be incorporated into the updated Cost Assessment Model.

Cost Assessment Changes for Public Water Systems

- All Failing and At-Risk public water systems will be evaluated to determine if physical consolidation is a viable modeled solution.
- The Cost Assessment Model will no longer assume all Failing systems are failing due to water quality issues. The Model will utilize the documented failing criteria met by each system to better identify the best long-term modeled solution.
- The sustainability and resiliency assessment will not be utilized to determine the best modeled solution. Alternatively, clear selection criteria will be utilized to better identify the best long-term and interim solution per water system based on the failing criteria they are meeting.
- When a physical consolidation includes a receiving water system that is Failing due to water quality and is viable based on the Cost Assessment Model, the Failing water system will be included in a modeled treatment cost estimate.
- At-Risk water systems will have a broader set of potential long-term solutions included in the model.
- The Model will use system and location-specific information to determine additional other essential infrastructure (OEI) needed for Failing and At-Risk systems, rather than relying on statewide assumptions applied proportionally to all water systems.
- OEI will be aligned with the SB 552 drought resiliency infrastructure requirements, utilizing the cost assumptions developed for the 2022 Cost Assessment.
- Estimated Administrator costs will be separated from estimated Technical Assistance costs as a stand-alone modeled solution for public water systems. Different criteria will be utilized to determine which systems are included in the cost estimate for each.

Cost Assessment Changes for At-Risk State Small Water Systems and Domestic Wells

- In addition to physical consolidation, expanded long-term modeled solutions will be included and matched to each individual state small water system and domestic well utilizing the risk drivers determined by the Risk Assessment.
    - Water quality risk
        i. Bottled water

ii. POU[4] / POE[5]
- Drought risk
  i. New Well
  ii. Bottled Water

Table 1: Key Differences Between the Original and Proposed Updated Cost Assessment Model

	2021 Cost Assessment	Proposed Cost Assessment
Systems Included	• Failing systems • At-Risk public water systems • At-Risk state small water systems and domestic wells	No Change
Proposed Change: Long-Term Cost Estimates	• Physical consolidation • Treatment • POU/POE • Technical Assistance • Other Essential Infrastructure (OEI): storage tanks, new wells, well replacement, upgraded electrical, backup power, distribution replacement, additional meters, etc.	• Physical Consolidation • Treatment • POU/POE • Technical Assistance • *Added*: Administrator • *Added*: Bottled Water • Other Essential Infrastructure (OEI): monitor static well levels (*added*), backup electrical supply, back-up source (new well or intertie), meter all service connections, storage tanks, upgraded electrical, and distribution replacement • New well[6]
Interim Cost Estimate[7]	• POU/POE • Bottled Water	No Change

[4] Point of use treatment devices or POU is a treatment device applied to a single tap for the purpose of reducing contaminant levels in drinking water at that tap (Title 22 CCR § 64417).

[5] Point of entry treatment devices or POE is a treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminant levels in the drinking water distributed throughout the house or building (Title 22 CCR § 64419).

[6] For state small water systems and domestic wells.

[7] Interim solutions are for public water systems only. No interim solutions are considered for state small water systems and domestic wells since long term solutions are nearly the same.

	2021 Cost Assessment	Proposed Cost Assessment
20-Year Operations & Maintenance Costs	Included	No Change
Proposed Change: Sustainability and Resiliency Assessment	Included	*Excluded*

Proposed Updated Cost Assessment Model

Systems Identification

The purpose of the Cost Assessment is to develop a statewide cost estimate to estimate the cost of implementing interim and long-term solutions for Failing systems, At-Risk public water systems, state small water systems, and domestic wells.

Failing water systems are determined using the most up-to-date criteria utilized by the State Water Board.[8] The current list of Failing systems can be accessed through the SAFER Dashboard.[9] The Risk Assessment results are used to determine At-Risk public water systems, state small water systems and domestic wells. The Risk Assessment methodology is updated regularly through a stakeholder driven process. The current Risk Assessment methodology can be accessed on the State Water Board's Drinking Water Needs Assessment website.[10] The current list of At-Risk public water systems can be access through the SAFER Dashboard and the locations of At-Risk state small water systems and domestic wells can be accessed through an online map.[11]

Long-Term Modeled Solutions

State Water Board is working towards developing a more streamlined cost model that better identifies long-term solutions for Failing systems, leverages the results of the Risk Assessment to improve model solution mapping, and incorporates drought infrastructure cost estimate needs.

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[8] HR2W Criteria
https://www.waterboards.ca.gov/water_issues/programs/hr2w/docs/hr2w_expanded_criteria.pdf

[9] SAFER Dashboard
https://www.waterboards.ca.gov/safer/safer_data.html

[10] Needs Assessment Website
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html

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

At the time the original 2021 Cost Assessment Model was developed, the Failing criteria for public water systems only included primary and secondary MCL violations. Therefore, the original Cost Assessment modeled treatment solutions for all Failing systems. However, in April 2021 the State Water Board expanded the Failing criteria to include unresolved *E. coli* violations, treatment technique violations, a history of repeated treatment technique violations, and repeated, unresolved monitoring and reporting violations. These changes require an update to the Cost Assessment Model, ensuring better solutions are mapped to the criteria Failing water systems are meeting.

Figure 3: Possible Long-Term Modeled Solutions for Failing Systems[12]

	Primary or Secondary MCL Violations	E.coli Violations	Treatment Technique Violations	Monitoring & Reporting Violations
Physical Consolidation	✓	✓	✓	✓
Treatment	✓	✓	✓	
POU/POE	✓			
Other Essential Infrastructure	✓	✓	✓	✓
Technical Assistance	✓	✓	✓	✓
Administrator	✓	✓		
Long-Term O&M	✓	✓	✓	
Bottled Water	✓	✓		

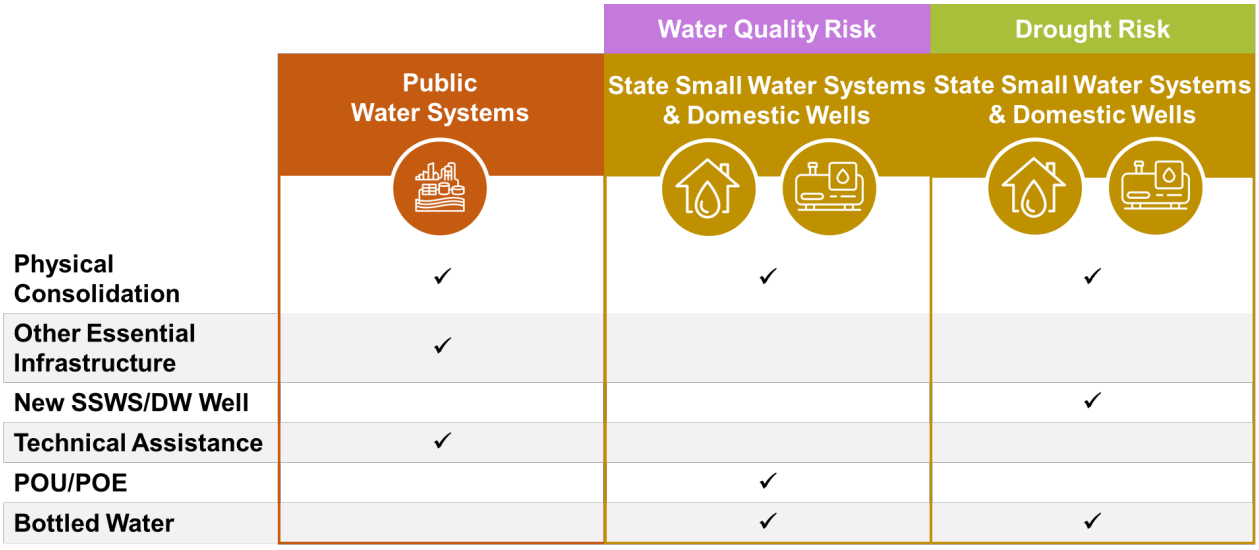
Lack of data on asset inventories, source capacity, source production, and treatment plant details would necessitate multiple assumptions to be made about infrastructure upgrades for At-Risk public water systems facing water quality and accessibility risks. Therefore, At-Risk public water systems do not have treatment costs estimated in the Model. The Model does include cost estimates for Technical Assistance and Administrators where appropriate; as well as other essential infrastructure addressing drought resiliency needs.

The 2021 Risk Assessment for state small water systems and domestic wells only utilized water quality risk. Therefore, the original Cost Assessment Model only modeled physical consolidation and POU/POE devices as possible long-term solutions. In 2022, the Risk Assessment for state small water systems and domestic wells was expanded to include drought risk. Therefore, the State water Board is proposing to expand the

[12] Bottled water modeled solution will be provided to Failing water systems due to primary MCL or *E. coli* violations only. It will not be supported for Failing systems due to secondary MCL violations.

Cost Assessment Model to include additional long-term solutions to target locations with drought risk and/or water quality risk.

Figure 4: Proposed Long-Term Modeled Solutions for At-Risk Systems



The following sections describe the modeled long-term solutions and their assumptions in more detail:

Physical Consolidation

Physical consolidation modeling in the Cost Assessment is the joining of the actual infrastructure of two water systems, and it is the first potential modeled solution analyzed for all Failing and At-Risk water systems and domestic wells.

Table 2: Criteria for Systems Included in the Physical Consolidation Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems*	• Primary MCL Violation • Secondary MCL Violation • *E. coli* Violation • Treatment Technique Violation, 3 or more Treatment Technique Violations • Monitoring & Reporting Violations	None
At-Risk Public Water Systems	• Water Quality Risk • Accessibility Risk	None

System Type	Identified Challenges	Additional Criteria
	• Affordability Risk • TMF[13] Capacity Risk	
At-Risk State Small Water Systems	• Water Quality Risk • Drought Risk	None
At-Risk Domestic Wells	• Water Quality Risk • Drought Risk	None

Methodology:

1. Perform GIS network analysis to identify the shortest path between a receiving community water system's service area boundary and joining water systems (max. 3 miles), and for both state small water systems and domestic wells (max. 0.25 miles)[14] to the merger route.

2. Identify joining water systems and domestic wells that are located within a potential receiving community water system's service area.

Physical Consolidation Cost Assumptions

- One water system (joining systems) is dissolved into another existing water system (receiving system).[15]
- Receiving systems must have 1,000 service connections or more.
- For joining systems intersecting a receiving system, assume a pipeline length of 1,000 ft is needed. The Model assumes no additional pipeline length is needed for state small water systems and domestic wells.
- Treatment costs will be estimated for Failing receiving systems that are failing for water quality issues.
- A cost estimate for an additional source will be included for receiving systems that have a single source.

Modeled Physical Consolidation Viability Determination

Physical consolidation will not be considered a viable modeled solution if:

[13] TMF is Technical Managerial and Financial Capacity.

[14] In the 2021 Cost Assessment Model, the maximum distance to merger route was 0.38 miles.

[15]. This analysis is proposing system-to-system physical consolidation rather than either managerial or regional consolidation due to data limitations. However, previous preliminary analysis of modeled costs for regional consolidation suggests significant cost savings for consolidations can be achieved through a regional approach. Long Term Solutions Cost Methodology for Public Water Systems and Domestic Wells: https://www.waterboards.ca.gov/safer/docs/draft_whitepaper_lt_solutions_cost_methd_pws_dom_wells.pdf

- There are no viable receiving water systems with at least 1,000 service connections within 3 miles of a Failing or At-Risk public water system's boundary; or within 0.25 miles for At-Risk state small water systems and domestic wells; or
- The estimated physical consolidation costs exceed the thresholds below:
  - Cost per connection is greater than $80,000; or
  - Total project capital cost is greater than $6 million[16]

If physical consolidation is not a viable modeled solution, the Cost Assessment Model will then identify an alternative long-term modeled solution. Depending on the Failing criteria met or At-Risk water system's characteristics, the Cost Assessment Model may assess treatment, POU/POE, or other solutions for the community.

Model Limitations

- Water system boundary layers often show where a water system is currently serving or is allowed to serve, rather than where pipeline infrastructure ends. The potential inconsistency or accuracy of this data makes the physical consolidation analysis component of the Cost Assessment less precise. In such cases, physical consolidation costs may be higher than modeled costs for systems that currently show an allowed service area boundary.
- Consolidation costs do not take into account where water rights or supply limitations may prevent consolidations.
- Consolidation viability does not consider barriers that may exist with regulatory requirements, jurisdictional boundaries, and Local Area Formation Commission (LAFCO) sphere of influence.
- Inadequate data is available to determine source capacity for water systems. If available, this information would help better refine the cost estimate for physical consolidation. This information would be used to determine if the potential receiving system has enough source capacity to supply both their existing service area and the joining system's customers.

Treatment[17]

If the Cost Assessment Model indicates that physical consolidation may not be viable, cost estimates for a new treatment plant will be estimated for certain systems (Table 3). Information regarding water quality violations and associated contaminants for Failing systems will be utilized to identify potential treatment solutions. Best Available Technologies (BAT) will be identified by the model that can reduce contaminants concentration that exceeded the Maximum Contaminant Level (MCL).

[16] Drinking Water State Revolving Fund (DWSRF) Program Fact Sheet
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/docs/dw-grant-fact-sheet.pdf

[17] Attachment C3 Treatment Cost Methodology Details
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/c3.pdf

Table 3: Criteria for Systems Included in the Physical Consolidation Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	• Primary MCL Violation • Secondary MCL Violation • *E. coli* Violation • Treatment Technique Violation, 3 or more Treatment Technique Violations	Exclude systems only meeting the Monitoring & Reporting Violations criteria.
At-Risk Public Water Systems	*Excluded*	N/A
At-Risk State Small Water Systems	*Excluded*	N/A
At-Risk Domestic Wells	*Excluded*	N/A

Methodology

1. Analyze violation data to identify contaminants associated with the Failing water system's violation(s).
2. Calculate source and system water production based on estimated average daily demand of 150 gallon per day (gpd).
3. Apply BAT, following same methodology adapted in 2021 Cost Assessment.[18]
4. Use capital and operational formulas developed in 2021 Cost Assessment to estimate capital costs and long-term operations and maintenance (O&M) costs.[19]
5. Calibrate O&M cost using data collected from Division of Financial Assistance (DFA) projects.

The 2021 Cost Assessment Model included multiple appropriate modeled treatment solutions that have been identified based on Title 22 California Code of Regulations.[20] Title 22 defines applicable BATs as the technologies identified by the State Water Board as the best available technology, treatment techniques, or other means available for

[18] 2021 Drinking Water Needs Assessment Report, Summary of Best Available Technologies for Groundwater Violations(BATs), Page 256: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[19] 2021 Drinking Water Needs Assessment Report, Page 257: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[20] Title 22, Article 12, Table 64447.2-A: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dwregulations-2017-04-10.pdf

achieving compliance with MCLs. While selecting BATs for contaminants of concern, many factors should be taken into consideration such as feasibility, availability, economic viability, and environmental wastes or impacts.

Due to the high expenses associated with waste disposal for certain types of contaminants, the 2021 Cost Assessment Model assumed that liquid stream residuals disposal is not available on-site for systems included in the analysis. This assumption eliminated processes like reverse osmosis and electrodialysis because the residuals volume requiring disposal would be physically and cost- prohibitive. Further, while processes like lime softening may be effective for some contaminants, they are rarely implemented for impacted systems. Therefore, capital and operation costs were developed for the bolded technologies in Table 4. Table 4 summarizes the drinking water BATs applied for each violation type:

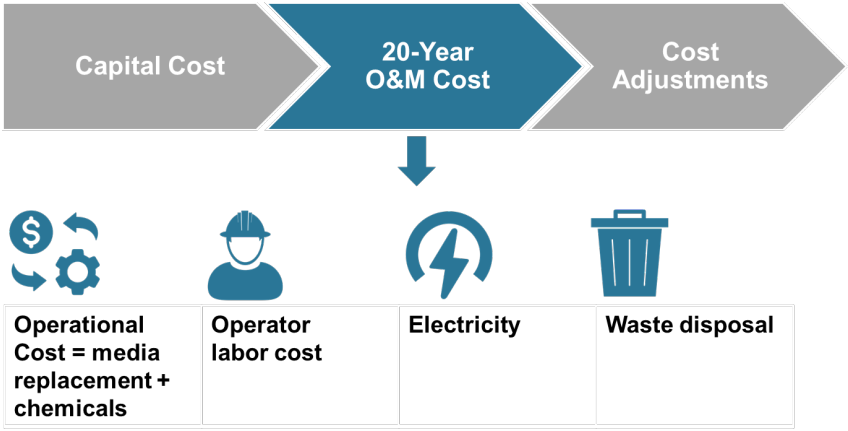
Table 4: Summary of Drinking Water Best Available Technologies (BATs) for Common Groundwater Violations[21]

Violation Type	Chemical Class	Best Available Technology (BAT)
Arsenic	Inorganic	• Activated Alumina • **Coagulation/Filtration[22]** • Lime Softening • Reverse Osmosis • Electrodialysis • Oxidation Filtration
1,2,3-trichloropropane (1,2,3-TCP)	Organic	• **Granular Activated Carbon (GAC)**
Nitrate	Inorganic	• **Ion Exchange** • Reverse Osmosis • Electrodialysis
Uranium (Combined)	Radionuclides	• **Ion Exchange** • Reverse Osmosis • Lime Softening • Coagulation/Filtration
Fluoride	Inorganic	• **Activated Alumina**

[21] Contaminants listed in this table do reflect a narrowed list of selected contaminates that were analyzed in the 2021 Cost Assessment Model. The State Water Board will explore adding additional contaminants and match them to the appropriate treatment methods.

[22] Adsorption was assumed for systems with less than 500 service connections due the relatively simple operations when compared to coagulation/filtration.

Figure 5: Treatment Cost Components



O&M cost estimates[23] associated with the modeled treatment solution are derived using a formula that accounts for:

- Consumables
  - Chemicals used
  - Media replacement[24]
- Water residual disposal
- Electricity
- Labor costs
- Additional operational monitoring and reporting

Assumptions

- Due to the lack of pre-constructed treatment systems data, assume new treatment is needed.
- Assume treatment capacity for the contaminated source is equal to the system capacity multiplied by the fraction number of active sources.
- Capital costs will be updated and adjusted with an inflation multiplier.
- O&M costs will be estimated depending on the technology used and will account for (consumables, waste disposal, electricity, and operator salary).

Modeled Treatment Technology Viability Determination

Modeled treatment will not be provided for small water systems with service connections less than 200 due to operational and maintenance complexity. Also, the

[23] Cost Assessment Methodology, Appendix C https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[24] Media replacement can include Granular activated carbon (GAC), ion exchange resin, green sand, activated alumina, other adsorbents.

cost savings achieved through selective treatment (POU/POE) may enable some systems to provide more protection to their consumers than they might otherwise be able to afford.[25]

Model Limitations

- Due to data limitations, the Cost Assessment Model assumes new treatment is needed rather than modifications or maintenance for existing treatment plant systems.
- Assuming contaminated source production and Maximum Day Demand (MDD)[26] can lead to inaccurate estimation of the size and cost of the provided treatment and annual O&M costs.

Other Essential Infrastructure

Other Essential Infrastructure (OEI), for purposes of the Cost Assessment Mode, is infrastructure needs to be installed or replaced to make a system more sustainable. To continuously support SB 552 planning and implementation, and to focus on addressing aging drought-related infrastructure issues, the State Water Board is proposing to align other OEI needs with SB 552 requirements as modeled long-term solutions provided to public water systems. OEI needs include:

- Metering all un-metered service connections.
- Backup source of water supply (new well or intertie) for systems with a single source.
- Backup power to ensure continuous operation during power failure.
- Sounder device to measure static well levels.

Table 5: Criteria for Systems Included in the OEI Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	• Primary MCL Violation • Secondary MCL Violation • *E. coli* Violation • Treatment Technique Violation, 3 or more Treatment Technique Violations • Monitoring and Reporting Violations	None

[25] United States Environmental Protection Agency, Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems: https://www.epa.gov/sites/default/files/2015-09/documents/guide_smallsystems_pou-poe_june6-2006.pdf

[26] Maximum day demand definition in Title 22: “Maximum day demand (MDD) means the amount of water utilized by consumers during the highest day of use (midnight to midnight), excluding fire flow, as determined pursuant to Section 64554.

System Type	Identified Challenges	Additional Criteria
At-Risk Public Water Systems	• Water Quality Risk • Accessibility Risk • Affordability Risk • TMF Capacity Risk	None
At-Risk State Small Water Systems	*Excluded*	N/A
At-Risk Domestic Wells	*Excluded*	N/A

Methodology

Follow the methodology developed for the 2022 Drought Infrastructure Cost Assessment. Below is a summary, the full methodology can be accessed in the published report.[27]

1. Analyze water systems response to related Electronic Annual Report (EAR) questions for the following modeled cost estimation:
    i. Meter
    ii. Backup power
    iii. Sounder
2. Analyze available water system inventory data to identify water systems with a single groundwater (well) source for the backup source modeled cost estimation.
3. Use formulas developed in 2021 Cost Assessment Model as related to other essential infrastructure.

Assumptions

- Apply all cost assumptions as adapted in the 2022 Drought Infrastructure Cost Assessment[28] and adjust for recent inflation.

Model Limitations

- There are several limitations associated with the water system data availability and accuracy. For example, many of the datapoints utilized to determine the inventory of water systems that may need OEI are based on voluntary and incomplete responses to EAR questions.

[27] 2022 Drinking Water Needs Assessment Drought Infrastructure Cost Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022costassessment.pdf

[28] 2022 Drinking Water Needs Assessment Drought Infrastructure Cost Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022costassessment.pdf

- Due to lack of inventoried data on water system assets and their condition, general assumptions will be made around replacement and upgrade needs.

Administrator[29]

An Administrator is the appointment of an individual or an entity with the necessary qualifications to carry out the operational and managerial responsibilities required for a specific designated water system. It is a new tool developed to help systems that are disadvantaged and struggling with their technical, managerial, and financial (TMF) capacity issues.

The criteria utilized below are for purposes of the Cost Assessment Model and do not reflect Administrator appointment eligibilities or criteria.

Table 6: Criteria for Systems Included in the Administrator Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	• Primary MCL Violation • Secondary MCL Violation • *E. coli* Violation	• Disadvantaged communities (DAC)[30] or severely disadvantaged communities (SDAC)[31]; and • Small water systems with ≤ 500 service connections; and • High TMF Capacity Risk Score.
At-Risk Public Water Systems[32]	• High TMF Capacity Risk Score[33]	• DAC or SDAC; and • Small water systems with ≤ 200 service connections.

[29] Water System Administrator: General Information
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/administrator.html

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

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

[32] SB-1254 Drinking water: administrator: managerial and other services
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB1254

[33] TMF capacity risk score ranging from 0.64 to 1. This is aligned with the threshold for high TMF capacity risk in the SAFER Dashboard:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/2022.html

System Type	Identified Challenges	Additional Criteria
At-Risk State Small Water Systems	*Excluded*	N/A
At-Risk Domestic Wells	*Excluded*	N/A

Methodology

1. Apply Administrator cost estimates derived from DFA to applicable water systems.
2. Multiply annual amount by estimated years of contract.

Assumptions

- Administrator service time: 3-year contract.

Model Limitations

- The appointment of Administrators to water systems is a relatively new tool for the State Water Board; therefore, there is limited data available on actual Administrator costs to inform the cost assumptions in the Cost Assessment Model. Therefore, the cost and timing assumptions will be based on estimates, not actual case studies.
- The State Water Board intends to carefully use its authority to order a designated water system to accept an Administrator and incorporate significant community engagement as outlined in the Administrator Policy Handbook.[34]

Technical Assistance

Providing managerial support to water systems to enhance their technical, managerial, and financial capacity. It includes a broad menu of assistance services including, but not limited to, planning, construction project funding applications, rate studies, asset management planning, etc.

Table 7: Criteria for Systems Included in the Technical Assistance Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	• Primary MCL Violation • Secondary MCL Violation • *E. coli* Violation • Treatment Technique Violations	• Planning Technical Assistance and Consolidation (model-selected) is only provided to DAC or SDAC systems; and Non-Disadvantaged Community

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

System Type	Identified Challenges	Additional Criteria
	• 3 or more Treatment Technique Violations • Monitoring and Reporting Violations	(Non-DAC) up to 150% Statewide Median Household Income (MHI).[35] • Only for small systems: 15 - 3,300 service connections; and expanded small water systems up to 6,600 service connections.
At-Risk Public Water Systems	• Water Quality Risk • Accessibility Risk • Affordability Risk • TMF Capacity Risk	• Consolidation (model-selected) is only provided to DAC or SDAC system; and Non-Disadvantaged Community (Non-DAC) up to 150% Statewide MHI. • General Technical Assistance is only for small systems: 15 - 3,300 connections; and expanded small water systems up to 6,600 service connections.
At-Risk State Small Water Systems	*Excluded*	N/A
At-Risk Domestic Wells	*Excluded*	N/A

Methodology

1. Apply annual cost for Technical Assistance needs as listed in Table 8.

Table 8: Annual Cost for Technical Assistance (TA) breakdown by At-Risk and Failing Public Water System

Annual TA Cost for At-Risk Public Water Systems	Annual TA Cost for Failing Public Water Systems
$12,000 ($60,000 for five years)	$60,000 ($300,000 for five years)

[35] MHI" means the household income that represents the median or middle value for the community.

Assumptions

- Technical Assistance will be modeled for systems that are included in the Administrator analysis.

Model Limitations

- Lack of detailed technical assistance cost data is available to refine cost estimates.
- Potential underestimation of needed technical assistance for small systems with fewer than 200 service connections.

Point of Use (POU) / Point of Entry (POE)

POU and POE are the treatment devices that can be used for the purpose of reducing contaminant levels in drinking water on the customer's property. POU devices can be applied to a single tap to treat the drinking water at that tap. It is important to note that the installation of POU devices in a home are typically installed on a limited number of taps. Therefore, some water in the residence may not be treated. POE devices can be applied to the drinking water entering a house and being distributed throughout the house. In the proposed Cost Assessment Model, POU and POE modeled solutions are used to address contaminants that exceed water quality standards when other solutions are infeasible. POU/POE is only considered in the Cost Assessment Model as a potential solution for systems with 200 service connections or less. This threshold has been identified by State Water Board staff and external experts as being the maximum connection limit practical for device monitoring purposes.

Table 9: Criteria for Systems Included in the POU/POE Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	• Primary MCL Violation • Secondary MCL Violation	• When physical consolidation and new treatment is not viable. • Small water systems with ≤ 200 service connections.
At-Risk Public Water Systems	*Excluded*	N/A
At-Risk State Small Water Systems	Water Quality Risk	None
At-Risk Domestic Wells	Water Quality Risk	None

Methodology

1. Identify the contaminant of concern and match it with the viable solution summarized in the table below.

Table 9 lists the contaminants that require treatment of this type, as determined in consultation with State Water Board staff.[36]

Table 9: POU and POE Treatment based on Contaminant of Concern[37]

Point of Use (POU) Filtration	Point of Entry (POE) Filtration
Aluminum	1, 2 Dibromoethane (EDB)
Arsenic	1, 2-Dibromo-3-chloropropane (DBCP)
Antimony	1,2,3-Trichloropropane
Barium	Benzene
Cadmium	Benzo(a)pyrene
Chromium	Carbon Tetrachloride
Chromium Hexavalent	Chloroform
Copper	Di(2-ethylhexyl)phthalate (DEHP)
Fluoride	Dichloromethane (Methylene Chloride)
Gross Alpha radioactivity	MTBE (Methyl-tert-butyl ether)
Gross Beta radioactivity	N-Nitrosodimethylamine
Lead	Pentachlorophenol
Mercury	Tetrachloroethene
Nickel	Total Trihalomethanes
Nitrate	Trichloroethene
Nitrite	Vinyl Chloride
Perchlorate	
Radium 228	
Thallium	
Uranium	

[36] State Water Boards (2021), 2021 Drinking Water Needs Assessment, Point-of-Use (POU) or Point-of-Entry (POE) Treatment, Table C4, pg. 246: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[37] Contaminants listed in this table do reflect narrowed list of dominated contaminates that were analyzed in the 2021 Cost Assessment Model. The State Water Board will explore adding additional contaminants and match them to the appropriate treatment.

2. The costs of POU and POE treatment have been developed based on projected costs detailed in Table 10.

Table 10: Estimated Capital Cost (per connection) for POU and POE Treatment[38]

Treatment	Capital Cost per Connection	Installation Labor cost per Unit ($100/hr)	Admin/Project Management	Communication Cost
POU Reverse Osmosis Treatment	$1,500	$200	$1,000	$300
POE GAC Treatment	$3,700	$1,000	$1,000	$300

3. The costs of POU and POE annual O&M costs per connection have been developed based on projected costs detailed in Table 11 and Table 12.

Table 11: Estimated Annual Operations and Maintenance (O&M) for POE Treatment[39]

POE GAC Annual O&M per Connection			
GAC replacement (2x/year)	**Labor ($100/hr)**	**Analytical ($125 2x/yr)**	**Total**
$410	$300	$250	$960

[38] State Water Boards (2021), 2021 Drinking Water Needs Assessment, Point-of-Use (POU) or Point-of-Entry (POE) Treatment, Table C13, pg. 263: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[39] State Water Boards (2021), 2021 Drinking Water Needs Assessment, Point-of-Use (POU) or Point-of-Entry (POE) Treatment, Table C14, pg. 263: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Table 12: Estimated Annual Operations and Maintenance (O&M) for POU Treatment[40]

POU RO Annual O&M per Connection			
Membrane replacement (2x/year)	**Labor ($100/hr)**	**Analytical ($20 - $55 2x/yr)**	**Annual Total**
$100	$300	$40- $110	$440 - $510

Assumptions

- POU treatment for most commonly occurring inorganic contaminants.[41]
- POE treatment for 1,2,3-TCP and other volatile organic compounds.[42]
- Full replacement of the POU or POE treatment unit at 10 years.

Modeled POU/POE Viability Determination

- From a treatment standpoint, POU/POE is not a technically viable modeled solution where nitrate levels exceed 25 mg/L as nitrogen. In this case, bottled water will be considered.

Model Limitations

- Long-term maintenance challenges may not make POU/POE the best long-term solution for some communities. Bacteriological growth, hard water, or the presence of iron or manganese may cause issues with POU membrane fouling.
- Bacteriological water quality in domestic wells may significantly alter the ability to use POU/POE but cannot be modeled due to its site specific and changing nature.
- POU/POE units are determined on a case-by-case basis and current regulations require long-term POU/POE installations to be re-assessed every three years.[43]

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[40] State Water Boards (2021), 2021 Drinking Water Needs Assessment, Point-of-Use (POU) or Point-of-Entry (POE) Treatment, Table C14, pg. 263: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[41] General Provisions for POU (Title 22 CCR § 64418) https://govt.westlaw.com/calregs/Document/IB682FC8B888F46CB9483C59AD294D1A5?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[42] General Provisions for POU (Title 22 CCR § 64420) https://govt.westlaw.com/calregs/Document/I00B1CDC8694441D6B984DAD82F307803?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[43] 2021 Needs Assessment Report, POU/POE, Page 253: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

New Well

The State Water Board partnered with California Office of Environmental Health Hazard Assessment (OEHHA) to analyze county permitting fees, drought risk, and socioeconomic vulnerability for state small water systems and domestic wells.

Well deepening is the second most common solution to a dry well. However, deepening wells is very uncommon in some counties (mentioned by: Marin, Merced, Kern, Madera, Sutter, Kings). Therefore, the State Water Board is proposing to model new well costs for state small water systems and domestic wells that are at high risk for drought. In some cases, a new well can successfully be installed to avoid the local contaminant of concern and the corresponding cost of treatment. However, newly drilled wells often face the same water quality issue or a different water quality issue requiring treatment. A new well, for the purpose of this methodology, is not assumed to alleviate the need for treatment.

Note: New wells are included in OEI for Failing and At-Risk public water systems with one source and when intertie is not possible.

Table 13: Criteria for Systems Included in the New Well Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems	*Excluded (included in OEI estimate where appropriate)*	N/A
At-Risk Public Water Systems	*Excluded (included in OEI estimate where appropriate)*	N/A
At-Risk State Small Water Systems	High Drought Risk	Systems that have only one source of water supply.
At-Risk Domestic Wells	High Drought Risk	None

Methodology

1. For state small water systems, new wells will be sized to meet estimated MDD.
2. A standard well[44] depth and size will be used for domestic wells.
3. Drilling costs will be estimated.
4. Well pump and motor costs will be estimated.
5. County permitting fees will be added.

[44] Standard wells for most households have a depth ranging from 100 – 800 ft, but very few go deeper than 1,000 ft. Determining the Depth of a Well: https://www.watersystemscouncil.org/download/wellcare_information_sheets/basic_well_information_sheets/DEPTH%20OF%20WELL_FINAL.pdf

Assumptions

- The State Water Board is developing cost assumptions for new state small water systems and domestic wells in consultation with the stakeholders.

Model Limitations

- New well permitting cost information is unavailable for a few counties.
- Drilling a new well does not guarantee that water quality issues can be avoided. In circumstances where the well in violation of a water quality standard is also at the end of the expected useful life, then this option certainly warrants further investigation.

Bottled Water

For the purpose of the Cost Assessment Model, bottled water is defined as an "any water that is placed in a sealed container at a water-bottling plant to be used for drinking, culinary, or other purposes involving a likelihood of the water being ingested by humans."[45] The majority of literature on the cost of bottled water focuses on costs of locally purchased bottled water by residential consumers. State and Federal emergency preparedness plans include bottled water as an emergency water source when traditional water sources are unusable or inaccessible.[46] Types of bottled water provided by the State Water Board are typically either 1-gallon or 5-gallon bottles.

Table 14: Criteria for Systems Included in the Bottled Water Analysis

System Type	Identified Challenges	Additional Criteria
Failing Public Water Systems[47]	• Primary MCL Violation • *E. coli* Violation	• Modeled solution considered when POU/POE is not technically viable. • Where nitrate level > 25 mg/L as nitrogen.
At-Risk Public Water Systems	*Excluded*	N/A
At-Risk State Small Water Systems	• High Water Quality Risk • High Drought Risk	• Modeled solution considered when POU/POE is not technically viable.

[45] California Health and Safety Code Section 111070

[46] United States Environmental Protection Agency, "Planning for an Emergency Drinking Water Supply." (2011); California Governor's Office of Emergency Services, "Emergency Drinking Water Procurement & Distribution Guidance." (2014)

[47] The additional criteria listed for Failing public water systems only apply to the systems that are failing for a primary MCL violation.

System Type	Identified Challenges	Additional Criteria
		• Where nitrate level > 25 mg/L as nitrogen. • Where drilling a new well may not be viable.
At-Risk Domestic Wells	• High Water Quality Risk • High Drought Risk	• Modeled solution considered when POU/POE is not technically viable. • Where nitrate level > 25 mg/L as nitrogen. • Where drilling a new well may not be viable.

Methodology

1. Determine a cost per gallon of bottled water utilizing the data on projects funded by the State Water Board.
2. Apply annual cost for bottled water per residential connection and per person in a school setting.

Assumptions

- Based on DFA guidelines, allocate a quantity of 60 gallons of bottled water per month per connection for public water systems and 0.25 gallons per school day per person for school populations.

Model Limitations

- There are potential variations in average bottled water cost across systems due to many factors (*e.g.*, system size, location, governance type, *etc.*), however the Cost Assessment Model does not account for those factors to model cost variation.

Emergency or Short-Term Modeled Solutions

The 2021 Cost Assessment recognized that it often takes months, if not years, to implement long-term solutions. Therefore, the model included cost estimates for emergency or interim short-term solutions. The 2021 Cost Assessment Model included cost estimates for all Failing systems for a six-year term and At-Risk state small water systems and domestic wells for a nine-year term. Due to data limitations for other potential interim solutions, only bottled water, and POU/POE interim treatment, including the O&M costs to maintain a temporary installation of POU/POE systems, were assessed. POU/POE was assigned in every case where it was feasible and has potential to be a long-term solution. The State Water Board is not proposing any

modifications to the cost estimation of short-term solutions. Table 15 summarizes the criteria for systems included in the interim solutions analysis.

Table 15: Criteria for Systems Included in the Interim Solutions Analysis

System Type	Interim Modeled Solution	Identified Challenges	Additional Criteria
Failing Public Water Systems	POU/POE	• Primary MCL Violation • Secondary MCL Violation	None
	Bottled Water[48]	• Primary MCL Violation • *E. coli* Violation	• Modeled solution considered when POU/POE is not technically viable. • Where nitrate level > 25 mg/L as nitrogen.
At-Risk Public Water Systems	*Excluded*	N/A	N/A
At-Risk State Small Water Systems	Bottled Water	High Drought Risk	Only where a new well is the long-term modeled solution.
At-Risk Domestic Wells	Bottled Water	High Drought Risk	Only where a new well is the long-term modeled solution.

For Failing water systems, the updated Cost Assessment Model, will continue to use the same interim modeled solutions (POU/POE and Bottled Water) and include estimated O&M costs to maintain the temporary installation of POU/POE devices. The Cost Assessment Model will limit analyzing these interim solutions to Failing systems that are meeting the specific criteria below. This step is necessary to account for the newly expanded failing criteria.

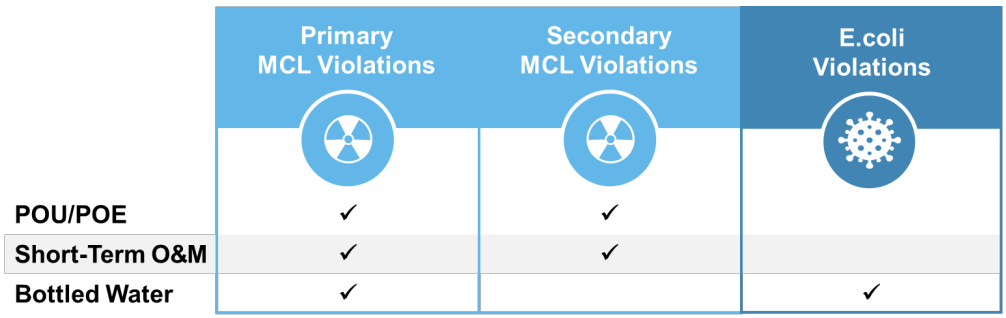
- POU/POE – Failing systems where failing is due to primary MCL or secondary MCL violations.
- Bottled Water – Failing systems where failing is due to primary MCL or *E. coli* violations, and POU or POE is not deemed viable from a treatment or monitoring standpoint (e.g., where nitrate levels exceed 25 mg/L as nitrogen).

The State Water Board is proposing to include bottled water as an interim solution for At-Risk state small water systems and domestic wells that have a high drought risk, and

[48] The additional criteria listed for Failing public water systems only apply to the systems that are failing for a primary MCL violation.

their long-term modeled solution is the construction of a new well. The model will utilize the cost assumptions for bottled water that are summarized in the section above.

Figure 6: Short-Term Solutions for Failing Systems



Model Cost Adjustments

All cost estimates developed in the updated Cost Assessment Model will be adjusted to account for the following elements:

Regional Cost Variance

The cost estimates will be regionally adjusted for varied construction and service costs across the state. In the 2021 Cost Assessment and 2022 Drought Infrastructure Cost Assessment model, RSMeans City Cost Index (CCI)[49] was used to compare and adjust costs between locations. For example, water systems in rural counties did not require a price adjustment; however, water systems in urban and suburban counties had a price multiplier of +32% and +30% subsequently applied to their cost estimates. The updated Cost Model will continue to use CCI for the regional cost adjustment.

Table 16 and Table 17 show the California CCI that was used in the 2021 and 2022 Cost Assessment model and the counties categorized by generalized model locations, respectively.

Table 16: RSMeans CCI Selected for Locational Cost Estimating

Location	RSMeans CCI	Percent Adjustment
Rural	+ 3.0	0%
Suburban	+ 3.89	+ 30%
Urban	+ 3.97	+ 32%

[49] RSMeans City Cost Index
https://www.rsmeans.com/rsmeans-city-cost-index

Table 17: California Counties Categorized by Generalized Model Location

Generalized Model Location	Counties
Rural	Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Madera, Mariposa, Mendocino, Merced, Modoc, Mono, Nevada, Placer, Plumas, San Joaquin, Shasta, Sierra, Siskiyou, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, Yuba
Suburban	Alameda, Contra Costa, El Dorado, Marin, Monterey, Napa, Orange, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Cruz, Solano, Sonoma
Urban	Los Angeles, Riverside, Sacramento, San Diego, San Francisco, San Mateo, Santa Clara, Ventura

Inflation

To account for the escalation in construction industry costs, and based on public feedback, a 4.7% inflation rate was factored in the 2022 Drought Infrastructure Cost Assessment Model. The State Water Board recognizes that current inflation in the construction industry can be continuously attributed to many factors: the increase in demand pulls, increasing raw material cost from suppliers, and rising wage cost in labor market.[50] The updated Cost Assessment Model will continue to conservatively adjust the modeled cost estimate for rising inflation using the inflation rate which will be determined based on public feedback.

Other Adjustments

Depending on the selected modeled solution and the cost components, a specific multiplier may be applied to account for additional associated costs. For example, the 2022 Drought Infrastructure Cost Assessment applied a 5% multiplier to backup generators to account for air pollution permitting fees; a 25% multiplier to new wells and interties; and an additional 20% contingency multiplier to intertie costs (Table 18). These multipliers will also be applied to the cost estimates presented in the proposed Cost Assessment model.

Table 18: Multipliers Used in the 2022 Drought Infrastructure Cost Assessment Model

Multipliers	Cost Component Applied
5% for Permitting fee	Backup electrical supply
25% for Planning and construction	New wells and interties

[50] Impact of inflation rate on construction projects budget: A review https://www.sciencedirect.com/science/article/pii/S2090447920300939

Multipliers	Cost Component Applied
20% for Contingency	New interties

Next Steps

The State Water Board will host a series of public webinar workshops to provide an opportunity for stakeholders to engage and provide feedback on the proposed changes to the Cost Assessment Model. Internal and external recommendations will be included into future workshops and corresponding white papers. The next webinar workshop will incorporate received feedback on the proposed changes and apply modifications as needed on the Cost Assessment Model assumptions. The workshop will dive deeper to further explore the solution-matching criteria and the detailed cost assumptions used for each modeled solution.

Subscribe to the SAFER mailing list to be notified of future workshops: https://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.html