Draft White Paper Discussion On:

Proposed Updates to the Drinking Water Cost Assessment Model: Other Essential Infrastructure, Admin Needs, and Interim Solutions

December 12, 2023

Table of Contents

Executive Summary **5**

Background **7**

Cost Assessment Model for Failing & At-Risk Public Water Systems 8

Failing Public Water Systems 8

At-Risk Public Water Systems 10

Cost Assessment Model for High-Risk State Small Water Systems & Domestic Wells **10**

Public Feedback 12

Additional Modeled Long-Term Needs for Failing and At-Risk Systems **12**

New and/or Replacement Well 13

Bottled Water 13

Other Essential Infrastructure (OEI) 14

Technical Assistance 14

Administrator Assistance 14

Estimating Interim Needs for Failing and At-Risk Systems **15**

Decentralized Treatment 16

Bottled Water 16

Interim Assistance Duration 16

Total Cost Assessment Modifiers and Multipliers **17**

Preliminary Cost Assessment Results **18**

Desired Public Feedback and Next Steps **24**

Desired Feedback 24

Next Steps 24

Appendix A: Additional Modeled Long-Term Needs Cost Assessment Assumptions **25**

Additional Long-Term Solutions for High-Risk State Small Water Systems & Domestic Wells 25

New Well for State Small Water Systems & Domestic Wells 25

Bottled Water for State Small Water Systems and Domestic Wells 32

Additional Long-Term Solutions for Failing at At-Risk Public Water Systems 34

Other Essential Infrastructure 34

Technical Assistance 51

Administrator Assistance ... 52
Total Cost Assessment Modifiers and Multipliers ... 54
Regional Cost Adjustment ... 57
Inflation Cost Adjustment ... 57
Contingency ... 58
Planning & Construction Multiplier ... 58
Engineering Multiplier ... 59
Overhead ... 60
CEQA ... 60
Other Adjustments ... 61
Appendix B: Cost Assessment Model Assumptions for Interim Modeled Solutions ... 62
Background ... 62
Systems Assessed for Interim Solutions in the Cost Assessment ... 62
Interim Decentralized Treatment ... 63
Systems Assessed for Decentralized Treatment as an Interim Modeled Solution ... 64
Duration of Decentralized Treatment Reliance ... 64
Capital Cost Estimate for Interim Decentralized Treatment ... 65
Operations & Maintenance for Interim Decentralized Treatment ... 65
Interim Bottled Water Assistance ... 65
Systems Assessed for Bottled Water as an Interim Modeled Solution ... 66
Duration of Bottled Water Reliance ... 66
Cost Assumptions for Bottled Water ... 67
Appendix C: Preliminary Cost Assessment Results ... 68
Background ... 68
Water Systems Assessed in the Preliminary Cost Assessment ... 68
Long-Term Modeled Solutions ... 69
Total Count of Selected Long-Term Solutions ... 69
Total Modeled Long-Term Cost Estimate ... 69
Total Long-Term Cost per Connection ... 70
Total Long-Term Cost by County ... 70
Modeled Long-Term Physical Consolidation ... 71
Modeled Long-Term Centralized Treatment ... 74

Modeled Long-Term Decentralized Treatment 75
Modeled New Private Well 78
Modeled Long-Term Bottled Water 80
Modeled Other Essential Infrastructure (OEI) 82
Modeled Technical Assistance 82
Modeled Administrator Assistance 83
Interim Solutions 84
Decentralized Treatment 84
Bottled Water 87
Appendix D: Public Feedback on the Proposed Updates to the Cost Assessment Model - Proposed Changes for Modeled Long-Term Treatment 90

Executive Summary

The Cost Assessment is a model comprised of decision criteria, cost assumptions, and calculation methodologies used to estimate a statewide cost for implementing long-term and interim solutions for Failing public water systems,[1] At-Risk public water systems, At-Risk state small water systems and domestic wells.[2]

The original Cost Assessment Model was developed in 2019-2020 for the inaugural Drinking Water Needs Assessment released in 2021.[3] In Spring 2022, the State Water Board released a comprehensive Drought Infrastructure Cost Estimate to inform SB 552 implementation.

In Summer 2022, the State Water Board began re-building its Cost Assessment Model to update and enhance its estimation outputs. The State Water Board is seeking public input on the proposed updates to the Cost Assessment Model through a series of webinar workshops and associated white papers. The State Water Board has released four white papers and hosted four public workshops to seek stakeholder feedback on the Cost Assessment Model re-build:

(1) August 2022: *Proposed Changed for the Cost Assessment*.[4]
(2) July 2023: *Proposed Updates to the Drinking Water Cost Assessment Model – Physical Consolidation Analysis*.[5]
(3) October 2023: *Proposed Changes for Modeled Long-Term Treatment*[6]
(4) December 2023: Proposed Updates to the Drinking Water Cost Assessment Model – Other Essential Infrastructure, Admin Needs, and Interim Solutions

[1] Failing Water Systems Criteria:
https://www.waterboards.ca.gov/water_issues/programs/hr2w/docs/hr2w_expanded_criteria.pdf

[2] 2023 Risk Assessment Results for public water systems, state small water systems and domestic wells:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023needsassessment.pdf

[3] 2021 Drinking Water Needs Assessment Report:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[4] Proposed Changes for the Cost Assessment White Paper:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/cost-assessment-white-paper.pdf

[5] Workshop 1, July 14, 2023: Proposed Updates to the Drinking Water Cost Assessment Model – Physical Consolidation Analysis White Paper:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/20230714-final-cost-assessment-consolidation-white-paper.pdf

[6] Workshop 2, October 5, 2023: Proposed Updates to the Drinking Water Cost Assessment Model – Proposed Changes for Modeled Long-Term Treatment White Paper
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf

This white paper follows the recommendations from the previous white papers and is the last step in the proposed updated Cost Assessment Model. The last step includes identifying additional long-term needs for Failing and At-Risk systems, identifying interim needs, and applying cost modifiers and multipliers to the certain capital cost estimates. The following summarize the recommended updated and changes made in this white paper:

- Adding a cost estimate for a new private well for high-risk (*Water Shortage* Risk Assessment category) state small water systems and domestic wells where modeled physical consolidation is not viable.
- Enhancing the identification of other essential infrastructure (OEI) needed by Failing and At-Risk public water systems. The original Model assumed a statewide percentage of needs based on a Kern County case study. The proposed updated Cost Assessment Model will utilize available system data to identify OEI needs.
- Enhancing underlying OEI capital cost estimate assumptions to reflect current market prices utilizing vendor-provided quotes, data from State Water Board funded projects, and staff recommendations.
- Updating eligibility criteria, cost and duration assumptions for technical assistance and Administrator assistance needs.
- Updating eligibility criteria, cost and duration assumptions for interim assistance (decentralized treatment and bottled water) for Failing public water systems and high-risk state small water systems and domestic wells.

To provide an example of how all of the proposed updates and changes may impact the statewide Cost Assessment estimate, the State Water Board has completed a preliminary analysis utilizing 2023 Needs Assessment data. The preliminary results indicate:

- Compared to the 2021 Cost Assessment results the total capital cost estimate for long-term solutions increased $6.01 billion (132%) from $4.56 billion to $10.57 billion.
- Compared to the 2021 Cost Assessment results 23% more Failing public water systems, 25% more At-Risk public water systems, 23% more high-risk state small water systems, and 9% more high-risk domestic wells have physical consolidation modeled as their long-term.
- The estimated cost for constructing a new private well for high *Water Shortage* risk domestic wells and state small water systems is $2.86 billion. This estimated cost represents 48% of the cost increase between the updated Cost Assessment Model and the 2021 Cost Assessment results.
- First year estimated interim assistance needs increased 33% from $273 million in the 2021 Cost Assessment to $362 million in the proposed updated Cost Assessment Model.
- The State Water Board recommends reducing the interim assistance duration by nearly a third (learn more in Appendix B). This has led to a 51% decrease in the

full duration cost estimate between the 2021 Cost Assessment Model results and the proposed updated Cost Assessment Model results from $1,050 million to $516 million.

The State Water Board is seeking public input on the proposed changes to the Cost Assessment Model. All submitted recommendations will be evaluated, and where deemed appropriate, incorporated into the final Cost Assessment Model that will be used for the 2024 Drinking Water Needs Assessment.

The 2024 Drinking Water Needs Assessment will be released in Spring 2024. It will include the final results of the updated Cost Assessment Model. The results will reflect the long-term and interim needs of:

- Failing public water systems as of January 1, 2024
- At-Risk public water systems utilizing updated data through January 1, 2024
- State small water systems and domestic wells identified as high-risk in the 2024 Risk Assessment *Water Quality* and *Water Shortage* categories.

The results of the 2024 Cost Assessment may differ from the preliminary results summarized in this white paper. The State Water Board will include a summary explanation of the changes made to the final 2024 Cost Assessment Model in the 2024 Drinking Water Needs Assessment. The 2024 Drinking Water Needs Assessment will also include an analysis of the differences between the preliminary results and final results.

Background

The Cost Assessment is a model comprised of decision criteria, cost assumptions, and calculation methodologies used to estimate a statewide cost for implementing long-term and interim solutions for Failing public water systems,[7] At-Risk public water systems, At-Risk state small water systems and domestic wells.[8]

The original 2021 Cost Assessment Model methodology was developed in partnership between the State Water Board, University of California, Los Angeles (UCLA) Luskin Center for Innovation, Corona Environmental Consulting (Corona), and Sacramento State University Office of Water Programs.[9] The 2021 Cost Assessment Model was developed through extensive stakeholder engagement through public workshops and

[7] Failing Water Systems Criteria: https://www.waterboards.ca.gov/water_issues/programs/hr2w/docs/hr2w_expanded_criteria.pdf

[8] 2023 Risk Assessment Results for public water systems, state small water systems and domestic wells: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023needsassessment.pdf

[9] 2021 Drinking Water Needs Assessment Report: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

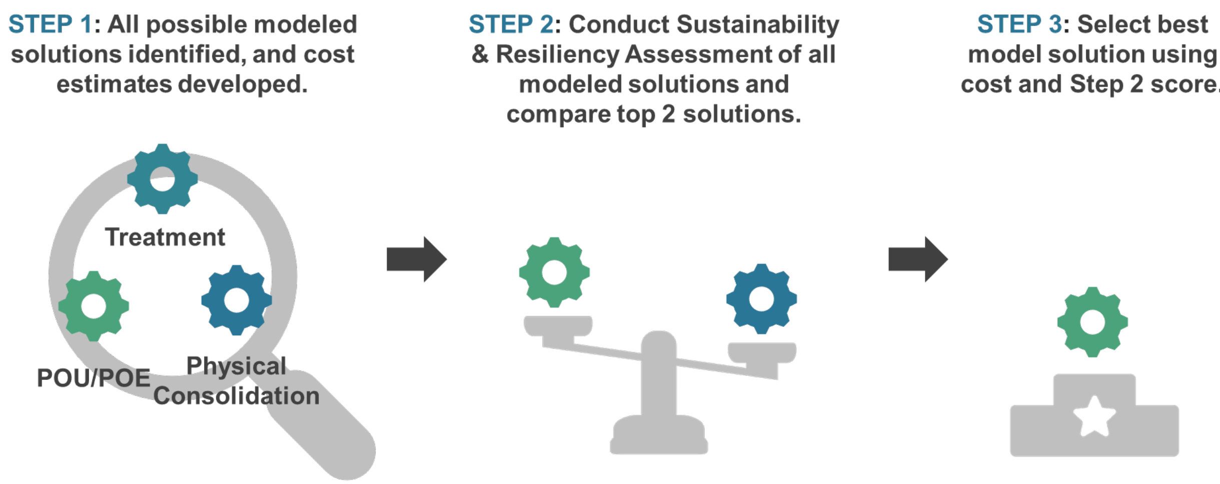
published white papers from 2019 through 2021. All materials related to the 2021 Cost Assessment Model are available on the State Water Board's website.[10]

Cost Assessment Model for Failing & At-Risk Public Water Systems

Failing Public Water Systems

The original 2021 Cost Assessment Model employed a three-step approach for identifying the best long-term modeled solution for Failing water systems with water quality violations (Figure 1). In Step 1, the Cost Assessment Model assessed Failing water systems; selected treatment technologies based on the system's failing analyte(s); estimated capital and operational costs for centralized treatment, decentralized treatment, and physical consolidation; and then compared the different potential solutions across several criteria in Step 2 (Sustainability & Resiliency Assessment) of the Model before selecting the final modeled solution in Step 3.

Figure 1: 2021 Cost Assessment Model Long-Term Solution Selection Process for Failing Water Systems



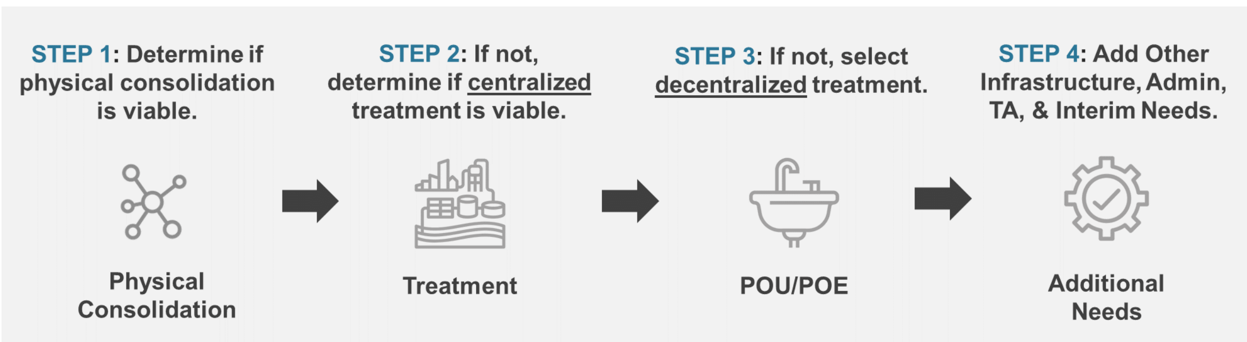
For Failing water systems, the 2021 Cost Assessment Model selected decentralized treatment (POU/POE) for 35%; centralized treatment for 45%; and physical consolidation for 20%. At the time of publication, the State Water Board recognized inherent limitations in the 2021 Cost Assessment Model that led to the over-selection of decentralized treatment and under-selection of physical consolidation as the modeled long-term solution. These limitations were attributed to the lack of data availability; the exclusion of modeled regional consolidation projects that would have driven down the modeled cost estimate of physical consolidation; and the inability of the Model's design to account for the inherent risk and long-term maintenance challenges posed by decentralized treatment. Therefore, the 2021 Cost Assessment's results did not fully reflect the State Water Board SAFER program's core mission and direction to promote

[10] State Water Board Drinking Water Needs Assessment https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html

physical consolidations where feasible and only advance decentralized treatment where no other long-term options may be viable.

Based on stakeholder feedback and internal deliberations, the State Water Board began rebuilding the Cost Assessment Model in 2022. The proposed updated Cost Assessment Model takes a more streamlined approach to identifying **long-term solutions** for Failing public water systems with water-quality related violations (Figure 2).[11] The proposed updated Cost Assessment Model first assesses the viability for physical consolidation for all Failing systems. If physical consolidation is not viable, then alternative centralized and decentralized treatment solutions are explored by the Model. The State Water Board has recommended the removal of the "Sustainability & Resiliency Assessment" (STEP 2 in Figure 1) comparing estimated physical consolidation capital costs to centralized and decentralized treatment.

Figure 2: Proposed Updated Cost Assessment Model Long-Term Solution Selection Process for Failing Public Water Systems



After the proposed updated Cost Assessment Model identifies whether physical consolidation, centralized treatment, or decentralized treatment is the selected long-term modeled solution, it then assesses Failing water systems for additional needs. The 2021 Cost Assessment Model included a cost estimate for interim solutions (decentralized treatment or bottled water), other essential infrastructure, and technical assistance. These additional costs were added to the Failing system's modeled long-term solution cost estimate to produce a final cost estimate per system. The State Water Board recommends continuing to include this additional cost analysis within the updated

[11] Failing water systems that are failing due to monitoring and reporting violations will not be assessed for long-term or short-term modeled treatment. Depending on the Failing system's economic status and size, the system may be assessed for an Administrator, technical assistance, and other essential infrastructure. These cost estimate assumptions will be explored in the next workshop and white paper.

At-Risk public water systems are excluded from the long-term and short-term modeled treatment analysis, steps 2 and 3 in Figure 2. Depending on the At-Risk public water system's economic status and size, the system may be assessed for an Administrator, technical assistance, and other essential infrastructure.

State small water systems and domestic wells at high-risk in the Risk Assessment's *Water Quality* category are assessed for decentralized long-term solutions only in the treatment analysis.

Cost Assessment Model with the addition of an Administrator assistance needs analysis. Learn more in Appendix A.

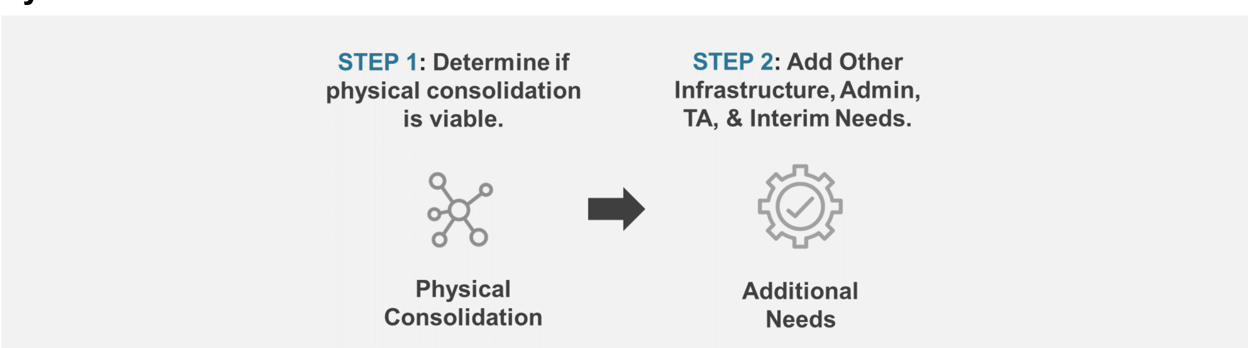
Figure 3: Identification of Additional Long-Term Needs for Failing & At-Risk Public Water Systems

At-Risk Public Water Systems

The original 2021 Cost Assessment Model assessed At-Risk public water systems for physical consolidation, other essential infrastructure, and technical assistance. If modeled physical consolidation was not viable, the system was only assessed for other essential infrastructure, and technical assistance. At-Risk systems were excluded from any treatment needs analysis or interim solution needs analysis.

For the proposed updated Cost Assessment Model, the State Water Board has recommended keeping this general approach, with the addition of an Administrator assistance needs analysis. Learn more in Appendix A.

Figure 4: Identification of Additional Long-Term Needs for At-Risk Public Water Systems



Cost Assessment Model for High-Risk State Small Water Systems & Domestic Wells

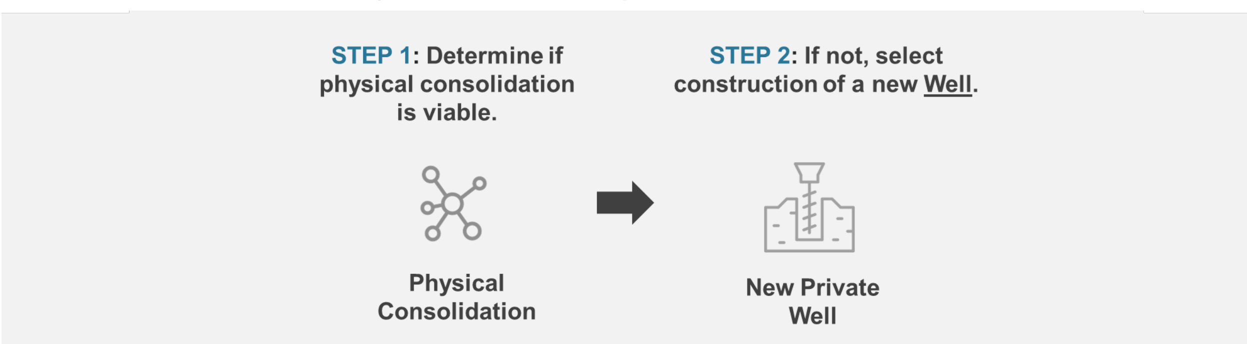
The original 2021 Cost Assessment Model employed a two-step approach for identifying the best long-term modeled solution for communities and households served by high-risk state small water systems and domestic wells. The 2021 Cost Assessment Model first evaluated if modeled physical consolidation was viable. If physical consolidation was not a viable modeled solution, then decentralized treatment or bottled water was assessed. The State Water Board recommends continuing utilizing this method for identifying the optimal modeled long-term solution for state small water systems and domestic wells that are high-risk in the Risk Assessment's *Water Quality* category (Figure 5).

Figure 5: Proposed Updated Cost Assessment Model Long-Term Solution Selection Process for High *Water Quality* Risk SSWS and DWs

The 2021 Risk Assessment for state small water systems and domestic wells only identified communities where there was high modeled water quality risk. In 2022, the State Water Board expanded the Risk Assessment for state small water systems and domestic wells to include a *Water Shortage* risk category.

To adapt to the expanded Risk Assessment for state small water systems and domestic wells, the State Water Board recommends including an additional potential long-term model solution in the proposed updated Cost Assessment Model. For communities served by systems with high *Water Shortage* risk, the State Water Board recommends first assessing whether modeled physical consolidation is a viable long-term solution. If physical consolidation is not viable, the Cost Assessment Model will estimate the costs for constructing a new private well (Figure 6). Learn more in Appendix A.

Figure 6: Proposed Updated Cost Assessment Model Long-Term Solution Selection Process for High *Water Shortage* Risk SSWS and DWs



Public Feedback

The State Water Board is seeking public input on the proposed updates to the Cost Assessment Model through a series of webinar workshops and associated white papers. The State Water Board has released four white papers and hosted four public workshops to seek stakeholder feedback on the Cost Assessment Model re-build:

(1) August 2022: *Proposed Changes for the Cost Assessment*.[12]
(2) July 2023: *Proposed Updates to the Drinking Water Cost Assessment Model* – ***Physical Consolidation Analysis***.[13]
(3) October 2023: *Proposed Changes for Modeled* ***Long-Term Treatment***[14]
(4) December 2023: *Proposed Updates to the Drinking Water Cost Assessment Model* – **Other Essential Infrastructure, Admin Needs, and Interim Solutions**

A summary of public feedback and the State Water Board's responses can be found in the Appendices of the white papers listed above. The State Water Board will consider all public feedback before finalizing the proposed updated Cost Assessment Model. The updated Cost Assessment Model's results will be released with the 2024 Drinking Water Needs Assessment. The report will include a detailed Appendix documenting the full Assessment's methodologies and underlying cost assumptions.

Additional Modeled Long-Term Needs for Failing and At-Risk Systems

The goal of the SAFER Program is to help address Failing and At-Risk water systems – building local capacity to ensure water systems are able to operate sustainably and achieve the Human Right to Water (HR2W). Therefore, the Cost Assessment Model includes estimated needs beyond physical consolidation and treatment. Additional capital infrastructure upgrades and managerial support through Administrator and/or technical assistance are also included in the analysis. The section below summarizes the additional long-term modeled solutions included in the Cost Assessment Model. Appendix A includes an in-depth overview of which systems are assessed per modeled need and the underlying cost assumptions.

[12] Proposed Changes for the Cost Assessment White Paper: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/cost-assessment-white-paper.pdf

[13] Workshop 1, July 14, 2023: Proposed Updates to the Drinking Water Cost Assessment Model – Physical Consolidation Analysis White Paper: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/20230714-final-cost-assessment-consolidation-white-paper.pdf

[14] Workshop 2, October 5, 2023: Proposed Updates to the Drinking Water Cost Assessment Model – Proposed Changes for Modeled Long-Term Treatment White Paper https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf

New and/or Replacement Well

The 2021 Cost Assessment Model assumed 26% of all Failing and At-Risk water systems need a new well. At-Risk state small water systems and domestic wells were excluded from this analysis. After the release of the 2021 Cost Assessment, the Governor Newsom signed Senate Bill 552[15] (SB 552) on September 23, 2021, to support planning and implementation of drought resiliency measures by counties and small water systems. SB 552 requires small water suppliers, defined as community water systems serving 15 to 2,999 service connections and non-transient, non-community water systems that are K-12 schools, to have at least one backup source of water supply no later than January 2, 2027, if funding is available. Therefore, in 2022, the State water Board conducted an analysis to determine which public water systems may need a back-up well and conducted a statewide cost estimate.

To support ongoing SB 552 planning and implementation efforts, the State Water Board is proposing to model the costs associated with the construction of a new well in the updated Cost Assessment for Failing and At-Risk water systems that have one groundwater source (Appendix A). The State Water Board also recommends modeling a new well for state small water systems and domestic wells that are at high-risk within the Risk Assessment's *Water Shortage* category and where modeled physical consolidation is not viable (Appendix A).

Bottled Water

The State Water Board's proposed updated Cost Assessment Model prioritizes modeling physical consolidation first, followed by decentralized treatment for high-risk state small water systems and domestic wells. There are some modeled scenarios where neither physical consolidation nor decentralized treatment may be feasible. Therefore, the State Water Board is proposing to model bottled water (Appendix A) as a long-term solution for state small water systems and domestic wells that are at high-risk in the Risk Assessment's Water Quality category. The following conditions must be met in the Cost Assessment Model for bottled water to be modeled as a long-term solution for high-risk state small water systems and domestic wells:

- Modeled physical consolidation is not viable.
- Modeled decentralized treatment is not viable due to:
    - Elevated nitrate concentration > 25 mg/l as nitrogen.
    - Microbial contamination.
    - Thallium contamination.
    - Aluminum contamination.
    - Bromate contamination.

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

Other Essential Infrastructure (OEI)

Many Failing and At-Risk public water systems have aging infrastructure. Upgrading and replacing them is essential to maintaining compliance with drinking water standards and to ensure system reliability. In the 2021 Cost Assessment Model, OEI needs were developed based on a Kern County, California case study conducted by Corona Environmental on behalf of the State Water Board. The case study identified OEI needs for Failing water system in the County and developed OEI statewide need assumptions.

In the proposed updated Cost Assessment Model, the State Water Board will be assessing OEI needs based on system and location-specific information rather than the Kern County case study assumptions (Appendix A). This new approach will also integrate the SB 552 drought resiliency infrastructure requirements into the OEI estimates. OEI needs include:

- Metering all un-metered service connections.
- Backup source of water supply (new well) for systems with a single source that is a well.
- Backup power to ensure continuous operation during a power failure.
- Sounder device to measure static well levels.
- Replace well pump and motor.
- Adding additional storage.
- Adding SCADA (supervisory control and data acquisition) and electrical upgrades.

Technical Assistance

The Cost Assessment Model includes estimated technical assistance (TA) needs for Failing and At-Risk public water systems. In many cases TA does not eliminate the need for other capital improvements, but it should increase the technical, managerial, and financial capacity of systems to address issues. Managerial support is designed to assist water systems in developing the financial and managerial structures to ensure a sustainable water system, including asset management plans, water rate studies, fiscal policies, drought plans, etc.

Administrator Assistance

The appointment of an Administrator is an authority that the State Water Board considers when necessary to provide an adequate supply of affordable, safe drinking water. In September 2019 (revised in 2023), the State Water Board adopted an Administrator Policy Handbook[16] to provide direction regarding the appointment of administrators by the State Water Board of designated water systems.

---

[16] Administrator Policy Handbook
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/administrator-policy-handbook-2023-revision.pdf

Administrators may be individual persons, businesses, non-profit organizations, local agencies like counties or nearby larger utilities, and other entities. Administrators generally act as a water system general manager, or may be assigned limited specific duties, such as managing an infrastructure improvement project on behalf of a designated water system. Administrators are named for a limited term to help a water system through a consolidation process or to otherwise come into compliance.

The 2021 Cost Assessment Model did not include estimated Administrator assistance. Not enough information was available at the time. Since 2021, the State Water Board has initiated eight Administrator projects with appointed Administrators and funding. This information has been used by the State Water Board to develop cost assumptions and modeling criteria for the updated Cost Assessment Model. See Appendix A for more information.

Estimating Interim Needs for Failing and At-Risk Systems

In addition to long-term modeled solutions, the Cost Assessment Model also estimates the costs associated with implementing interim solutions for disadvantage community water (DAC) systems included in the analysis. The State Water Board is committed to providing interim drinking water solutions in order to ensure access to reliable, potable water while longer-term solutions are being determined and implemented. Cost data for the full range of potential interim solutions is limited; therefore, the Cost Assessment Model is only able to assign decentralized treatment and bottled water interventions because there is limited data on other potential solutions such as vended and hauled water.

Table 1: Summary of Matching Modeled Interim Solutions to Systems

System Type	Long-Term Modeled Solution	Interim Modeled Solution
Failing System	• Physical Consolidation • Centralized Treatment	• Decentralized Treatment • Bottled water if modeled water quality concentration exceeds Decentralized Treatment viability
Failing System	• Decentralized Treatment	• Bottled water
High Water Quality Risk for SSWS/DW	• Physical Consolidation	• Decentralized Treatment • Bottled water if modeled water quality concentration exceeds Decentralized Treatment viability
High Water Quality Risk for SSWS/DW	• Decentralized Treatment • Bottled water if modeled water quality concentration exceeds	• Bottled water

System Type	Long-Term Modeled Solution	Interim Modeled Solution
	Decentralized Treatment viability	
High Water Shortage Risk for SSWS/DW	• Physical Consolidation • New Well	• Bottled water

Decentralized Treatment

Decentralized treatment, such as Point-of-Use (POU) and Point-of-Entry (POE) devices, are often installed at individual homes or businesses. Decentralized treatment is included in the Cost Assessment Model as both a modeled long-term solution and interim solution option. Systems that have either physical consolidation or centralized treatment as their modeled long-term solution will be assessed for interim decentralized treatment. Available and modeled water quality data for these systems is used to determine if decentralized treatment is viable. If water quality data indicates decentralized treatment may not be viable, the system is assessed for interim bottled water assistance. Learn more about the proposed matching criteria and cost assumptions in Appendix B.

Bottled Water

The State Water Board is proposing modeling bottled water as a possible interim solution where either decentralized treatment is the modeled long-term solution or where decentralized treatment is not viable due to water quality concentrations. Learn more about the proposed matching criteria and cost assumptions in Appendix B.

Interim Assistance Duration

In the 2021 Cost Assessment Model, interim assistance was estimated for 6 years for Failing water systems and 9 years for At-Risk state small water systems and domestic wells. Based on feedback from an internal workgroup of Division of Drinking Water and Division of Financial Assistance staff, the State Water Board recommended lowering the estimated duration of interim assistance to 3 years for Failing water systems and high-risk state small water systems; and 2 years for high-risk domestic wells. This recommendation is based on recent trends in observed emergency/interim projects funded by the State Water Board.

Table 2: Duration of Modeled Interim Decentralized Treatment Assistance

System Type	2021 Model	Recommended Update
Failing System	6 years	**3 years**
SSWS	9 years	**3 years**
DW	9 years	**2 years**

Total Cost Assessment Modifiers and Multipliers

All cost estimates presented in the subsequent sections were adjusted to account for the following elements (learn more in Appendix A):

Regional Cost Adjustment

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

Inflation Cost Adjustment

To acknowledge the recent escalation in construction industry prices, and based on public feedback, the State Water Board factored in a 3.7% inflation rate which was applied to all costed requirements.

Contingency

Construction contingency is the money allotted for unexpected costs during construction. It is a form of risk management used to avoid cutting costs in other areas to keep the project's schedule and quality commitments. For purposes of the Cost Assessment Model, a contingency multiplier may be applied to certain capital cost estimates where there may be more variability in market prices and construction risk.

Planning Construction Multiplier

Planning and construction multipliers account for accrued costs associated with fundamental planning and management of any construction project. Planning involves defining the work task, technology, resources and duration of each task and potential interactions amongst work tasks.

Engineering Multiplier

Engineering multipliers are applied to many of the centralized treatment equipment capital cost estimates to develop an estimate of the installed capital costs.[17] The engineering multipliers were modified for each treatment technology to account for the varied sources of cost data for each and their unique installation requirements. Installation costs can vary widely depending on the individual site constraints, and this multiplier is incorporated to provide a Class 5 cost estimate.[18]

---

[17] Installed capital costs account for costs for: equipment, installation materials, labor and taxes.

[18] Class 5 cost estimates are also known as the rough order of magnitude (ROM) estimates. This is a very high-level estimate that can assist with capital planning. Accuracy of the Class 5 estimates may be as low as 50% below actual costs to more than 100% greater than spend: https://seacoastconstruction.net/understanding-construction-cost-estimate-classes/#:~:text=Class%205%20%E2%80%93%20Class%205%20cost,than%20100%25%20greater%20than%20spend.

Overhead

Overhead costs include a wide array of expenses incurred by an organization that directly or indirectly supports infrastructure construction. Overhead costs are generally expenses that cannot be charged directly to a particular branch of work but are required to construct the project. Based on feedback from internal and external stakeholders, the State Water Board recommends including a 25% overhead cost estimate for centralized treatment capital costs in the proposed updated Cost Assessment Model.

California Environmental Quality Act (CEQA) Fees

New capital projects must often pass the CEQA environmental review process used to determine compliance with appropriate state and federal environmental regulations. The applicant must provide the final, project-specific environmental document, associated reports, and other supporting materials demonstrating compliance with CEQA as part of the application's Environmental Package. The costs for preparing CEQA-related documents are included in the Cost Assessment Model for certain modeled solutions where CEQA may be required.

Other Adjustments

Many of the requirements needed a specific multiplier to account for additional associated costs. For example, a 5% multiplier was applied to backup generators to account for air pollution permitting fees.

Preliminary Cost Assessment Results

The State Water Board has conducted a preliminary Cost Assessment utilizing the proposed updates to the Cost Model as detailed in this white paper and the previous white papers published this year. This analysis was conducted using the Failing public water system list as of January 1, 2023, and the results of the 2023 Risk Assessment published in April 2023.

The results of the preliminary Cost Assessment are summarized in Table 3 through Table 9 below and detailed in Appendix C. It is important to note that this analysis did not include an estimation of long-term operation and maintenance costs for modeled long-term solutions. The purpose of this analysis is to provide a preliminary estimate to compare how the proposed changes to the Cost Assessment Model differ from the 2021 Cost Assessment results.

The preliminary results indicate:

- Compared to the 2021 Cost Assessment results the total capital cost estimate for long-term solutions increased $6.01 billion (132%) from $4.56 billion to $10.57 billion.
- Compared to the 2021 Cost Assessment results 23% more Failing public water systems, 25% more At-Risk public water systems, 23% more high-risk state

small water systems, and 9% more high-risk domestic wells have physical consolidation modeled as their long-term.

- The estimated cost for constructing a new private well for high *Water Shortage* risk domestic wells and state small water systems is $2.86 billion. This estimated cost represents 48% of the cost increase between the updated Cost Assessment Model and the 2021 Cost Assessment results.
- First year estimated interim assistance needs increased 33% from $273 million in the 2021 Cost Assessment to $362 million in the proposed updated Cost Assessment Model.
- The State Water Board recommends reducing the interim assistance duration by nearly a third (learn more in Appendix B). This has led to a 51% decrease in the full duration cost estimate between the 2021 Cost Assessment Model results and the proposed updated Cost Assessment Model results from $1,050 million to $516 million.

Table 3: Preliminary Estimated Count of Modeled Long-Term Solutions by System Type

System Type	Total Systems	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well[19]	Bottled Water	Add. Costs[20]
Failing PWS	381	165 (43%)	179 (47%)	20 (6%)	N/A	N/A	356 (93%)[21]
At-Risk PWS	512	246 (48%)	N/A	N/A	N/A	N/A	471 (92%)[22]
High-Risk SSWS	810	436 (54%)	N/A	293 (36%)	146 (18%)	7 (0.01%)	N/A
High-Risk Domestic Wells	154,353	76,913 (49%)	N/A	42,067 (27%)	55,458 (36%)	1,667 (0.01%)	N/A

N/A = Not Applicable

Table 4: 2021 Count of Modeled Long-Term Solutions by System Type

System Type	Total Systems	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well[23]	Bottled Water	Add. Costs[24]
Failing PWS	305	61 (20%)	138 (45%)	106 (35%)	N/A	N/A	305 (100%)
At-Risk PWS	630	145 (23%)	N/A	N/A	N/A	N/A	630 (100%)
High-Risk SSWS	455	142 (31%)	N/A	303 (67%)	N/A	10 (2%)	N/A
High-Risk Domestic Wells	62,607	25,696 (41%)	N/A	36,911 (59%)	N/A	N/A	N/A

N/A = Not Applicable

[19] For high-risk state small water systems and domestic wells only.

[20] Additional (add.) costs include Other Essential Infrastructure (OEI); technical assistance, and/or Administrator assistance.

[21] Other Essential Infrastructure (327); Technical Assistance (207); and Administrator Assistance (27).

[22] Other Essential Infrastructure (411); Technical Assistance (303); and Administrator Assistance (20).

[23] A new private well was not included as possible modeled long-term solutions in the 2021 Cost Assessment Model for high-risk state small water systems and domestic.

[24] Additional (add.) costs include Other Essential Infrastructure (OEI); technical assistance, and/or Administrator assistance.

Table 5: Preliminary Estimated Modeled Long-Term Solution Costs, Excluding O&M, by System Type in Millions

System Type	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well	Bottled Water	Add. Costs	Estimated Total
Failing PWS	$531	$417	$1.7	N/A	N/A	$1,653[25]	**$2,603**
At-Risk PWS	$895	N/A	N/A	N/A	N/A	$2,256[26]	**$3,151**
High-Risk SSWS	$337	N/A	$20	$8	$0.72	N/A	**$366**
High-Risk Domestic Wells	$1,271	N/A	$315	$2,848	$20	N/A	**$4,464**
TOTAL:	**$3,034**	**$417**	**$337**	**$2,856**	**$21**	**$3,909**	**$10,574**

N/A = Not Applicable

Table 6: 2021 Modeled Long-Term Solution Costs, Excluding O&M, by System Type in Millions

System Type	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well	Bottled Water	Add. Costs	Estimated Total
Failing PWS	$131	$401	$19	N/A	N/A	$1,225	**$1,776**
At-Risk PWS	$293	N/A	N/A	N/A	N/A	$1,345	**$1,638**
High-Risk SSWS	$35	N/A	$18	N/A	N/A[27]	N/A	**$53**
High-Risk Domestic Wells	$800	N/A	$296	N/A	N/A	N/A	**$1,096**
TOTAL:	**$1,259**	**$401**	**$334**	**N/A**	N/A	**$2,570**	**$4,563**

N/A = Not Applicable

[25] Other Essential Infrastructure ($1,545,000,000); Technical Assistance ($87,975,000); and Administrator Assistance ($19,791,000).

[26] Other Essential Infrastructure ($2,176,000,000); Technical Assistance ($65,148,000); and Administrator Assistance ($14,660,000).

[27] Long-term bottled water costs were included in the Interim solution estimate in the 2021 Cost Assessment Model.

Table 7: Preliminary Estimated Count of Modeled Interim Solutions by System Type

System Type	Total Systems	Interim Solutions Not Assessed[28]	Decentralized Treatment	Bottled Water	Total
Failing PWS	381	223 (59%)	141 (37%)	38 (10%)	**179 (47%)**
At-Risk PWS[29]	512	512	0	0	**0**
High-Risk SSWS	810	650 (80%)	155 (19%)	128 (16%)	**283 (35%)**
High-Risk Domestic Wells	154,353	138,864 (90%)	15,079 (10%)	38,233 (25%)	**53,312 (35%)**

Table 8: 2021 Count of Modeled Interim Solutions by System Type

System Type	Total Systems	Interim Solutions Not Assessed[30]	Decentralized Treatment or Bottled Water[31]
Failing PWS	343	121 (35%)	**222 (65%)**
At-Risk PWS[32]	630	630	**0**
High-Risk SSWS	611	481 (79%)	**130 (21%)**
High-Risk Domestic Wells	77,569	57,126 (74%)	**20,443 (26%)**

Table 9, Table 10, and Table 11 demonstrate how the proposed updated Cost Assessment Model's interim solution methodology results differ from the 2021 Cost Assessment Model. The State Water Board has conducted a preliminary analysis of the first-year interim capital costs (Table 9) and the full-duration operations & maintenance cost estimate (Table 10). These cost estimates can be compared to the 2021 Cost Assessment results in Table 11. It is worth noting that the 2021 Cost Assessment results were not broken down by selected interim solution.

A key difference between the 2021 Cost Assessment Model's interim solution methodology and the proposed updated Cost Assessment Model's methodology is the assumed duration need of

[28] Systems not assessed for interim solutions include non-DAC medium and large Failing public water systems, as well as non-DAC high-risk state small water systems and domestic wells.

[29] At-Risk public water systems are not assessed for interim drinking water solutions in the Cost Assessment Model.

[30] Systems not assessed for interim solutions include non-DAC medium and large Failing public water systems, as well as non-DAC high-risk state small water systems and domestic wells.

[31] The 2021 Cost Assessment did not include a breakdown of the number of DAC state small water systems and domestic wells that received bottled water vs. decentralized treatment. See page 88. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[32] At-Risk public water systems are not assessed for interim drinking water solutions in the Cost Assessment Model.

interim assistance. The State Water Board recommends reducing the interim assistance duration by nearly a third (learn more in Appendix B). This has led to a 51% decrease in the full duration cost estimate between the 2021 Cost Assessment Model results and the proposed updated Cost Assessment Model results.

Table 9: Preliminary Estimated Modeled Interim Solution Costs (First Year) by System Type in Millions

System Type	Decentralized Treatment	Bottled Water	Estimated Total
DAC Failing PWS	$233	$4	**$237**
DAC High-Risk SSWS	$7	$1	**$8**
DAC High-Risk Domestic Wells	$71	$46	**$117**
TOTAL:	**$311**	**$51**	**$362**

Table 10: Preliminary Estimated Modeled Interim Solution Costs (Full Duration[33]), Including O&M, by System Type in Millions

System Type	Decentralized Treatment	Bottled Water	Estimated Total
DAC Failing PWS	$312	$11	**$323**
DAC High-Risk SSWS	$10	$4	**$14**
DAC High-Risk Domestic Wells	$ 85	$92	**$177**
TOTAL:	**$ 407**	**$107**	**$514**

Table 11: 2021 Modeled Interim Solution Costs by System Type in Millions

System Type	Bottled Water & Decentralized Treatment[34]	
	First Year	**Full Duration[35]**
DAC Failing PWS	**$172**	**$845**
DAC High-Risk SSWS	**$5**	**$9**
DAC High-Risk Domestic Wells	**$96**	**$192**
TOTAL:	**$273**	**$1,050**

[33] The proposed updated Cost Assessment Model calculates interim needs for a three-year term for Failing and high-risk state small water systems (SSWS) and a two-year term for high-risk domestic wells.

[34] The 2021 Cost Assessment did not include a breakdown of the number of DAC state small water systems and domestic wells that received bottled water vs. decentralized treatment. See page 88. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[35] Interim costs in the 2021 Cost Assessment Model were calculated for a six-year term for populations served by Failing public water systems, and a nine-year term for At-Risk state small water systems (SSWS) and domestic wells.

Desired Public Feedback and Next Steps

Desired Feedback

The State Water Board is committed to engaging with the public and stakeholder groups to solicit feedback and recommendations on the proposed updates detailed in this paper. Specifically, feedback is desired on the Cost Assessment Model's methodology and underlying assumptions for estimating long-term and interim modeled solutions. The received feedback will help refine the updated Cost Model over time. Feedback is due on January 15, 2024. Feedback may be submitted directly to DDW-SAFER-NAU@waterboards.ca.gov.

The State Water Board will continue to host public workshops to provide opportunities for stakeholders to learn about and contribute to the refinement of the Cost Assessment Model. Stakeholders are encouraged to sign-up for the SAFER Program's email listserv to receive notifications of when the public workshops are scheduled to occur.

The State Water Board is specifically seeking public feedback on the following:

- Should the updated Cost Assessment Model assume a similar well depth across all private (500 ft) and public wells (1,000 ft) or varying depths depending on the well's location (county)?
- What are the necessary components and requirements for electrical upgrades for a drinking water system?
- Are there any additional cost data available to update the Cost Assessment Model's underlying cost assumptions?

Next Steps

The State Water Board is seeking public input on the proposed changes to the Cost Assessment Model. All submitted recommendations will be evaluated, and where deemed appropriate, incorporated into the final Cost Assessment Model that will be used for the 2024 Drinking Water Needs Assessment.

The 2024 Drinking Water Needs Assessment will be released in Spring 2024 and will include the final results of the updated Cost Assessment Model. The results will reflect the long-term and interim needs of:

- Failing public water systems as of January 1, 2024.
- At-Risk public water systems utilizing updated data through January 1, 2024.
- State small water systems and domestic wells identified as high-risk in the 2024 Risk Assessment *Water Quality* and *Water Shortage* categories.

Appendix A: Additional Modeled Long-Term Needs Cost Assessment Assumptions

Additional Long-Term Solutions for High-Risk State Small Water Systems & Domestic Wells

The proposed updated Cost Assessment Model identifies possible long-term solutions for state small water systems (SSWS) and domestic wells (DW) that are high-risk in the Risk Assessment's *Water Quality* and/or *Water Shortage* categories. The proposed updated Cost Assessment Model first determines if modeled physical consolidation is a viable long-term solution. If it is not a viable long-term solution, the Cost Assessment Model will assess decentralized treatment for systems with high-risk in the Water Quality category of the Risk Assessment. More information about how the proposed updated Cost Assessment Model assessed decentralized treatment for SSWS and DWs is available in the White Paper *Proposed Changes for Modeled Long-Term Treatment*.[36]

If decentralized treatment is not a viable solution, then the Cost Assessment Model will develop a cost estimate for long-term bottled water reliance. This is considered by the State Water Board as a "worst-case" scenario and one that the Agency would hope to avoid at all costs. However, there are communities where bottled water reliance may be the only sustainable, long-term solution until a better solution becomes available.

For SSWSs and DWs that are high-risk in the *Water Shortage* category of the Risk Assessment, and where physical consolidation is not viable, the proposed updated Cost Assessment Model will develop a cost estimate for constructing a new well.

New Well for State Small Water Systems & Domestic Wells

In 2021, the Risk Assessment for state small water systems and domestic wells only included a *Water Quality* risk category. Therefore, the only long-term solutions modeled for At-Risk state small water systems and domestic wells in the 2021 Cost Assessment Model was physical consolidation and decentralized treatment. In 2022, the Risk Assessment for state small water systems and domestic wells was expanded to include a new *Water Shortage* risk category. The State Water Board recommends incorporating the construction of a new well as a possible long-term solution for state small water systems with high water shortage risk in the proposed updated Cost Assessment Model.

Systems Assessed for a New Private Well

The State Water Board recommends modeling a new well for state small water systems and domestic wells that are at high-risk within the Risk Assessment's *Water Shortage* category and where modeled physical consolidation is not viable.

---

[36] Draft White Paper: *Proposed Changes for Modeled Long-Term Treatment* (October 5, 2023) https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf

New Private Well Cost Estimate Assumptions

Wells must be drilled by a licensed contractor and must meet applicable local and/or state well standards. The State Water Board has developed a proposed list of new private well cost components summarized in Table 12. The individual cost components and cost assumptions differ from those used in the Cost Assessment Model for public water system wells. Wells that serve state small water systems and domestic wells typically tap shallower aquifers compared to public water system supply wells. Public water systems typically have deeper and larger diameter wells because they serve more customers.

Table 12: Summary Comparison of New Private Well Cost Assumptions for State Small Water Systems and Domestic Wells (500 ft)

Cost Component	2021 Model[37]	Recommended Update
Well Drilling	N/A	**$65/ft[38]**
Electrical Component & Control Box	N/A	**$600[39]**
Well Pump and Motor	N/A	**Domestic Well: $830[40]** **SSWS: $1,120[41]**
Water Sampling	N/A	**$400[42]**
Connection/Casing Pipe	N/A	**$2,150[43]**
Submersible Wire	N/A	**$5/ft**
Pressurized Water Tank	N/A	**$400[44]**
Well Permitting	N/A	**Included by County**
Destroy Old Well	N/A	**$3,300**
Additional Parts & Labor	N/A	**$3,500**

[37] The 2021 Cost Assessment Model did not include the construction of a new well as a possible modeled long-term solution for high-risk state small water systems or domestic wells.

[38] Local well drilling company pricing and recommendation for 500 ft depth.

[39] Local well drilling company pricing and recommendation.

[40] Franklin Electric-Submersible well pump, 0.5 HP, 10 gallons per minute for domestic wells use.

[41] Franklin Electric-Submersible well pump, 1.0 HP, 20 gallons per minute for state small water system wells use

[42] Pricing varies depending on the number of constituents analyzed and lab or outside business employed. Basic sampling can cost from $100 to $400.The upper range of the cost is recommended assuming the highest number of chemicals to be analyzed. https://www.waterboards.ca.gov/gama/domestic_wells_testing.html#:~:text=Basic%20sampling%20can%20cost%20from,a%20written%20estimate%20before%20sampling.

[43] Local well drilling company pricing and recommendation, cost ranges from $1,800-$2,500. The average cost is recommended.

[44] Amtrol WW Pressure Tank - 44 Gal. Base price is $367, additional cost is for tax and shipping:

https://www.rainbrothers.com/store/Amtrol-WW-Pressure-Tank-44-Gal-p281493592

Private Well Drilling

Construction of a well begins with making a hole. Wells are generally classified by construction method as dug/bored, driven, or drilled. For purposes of the Cost Assessment Mode, the construction method is assumed to be drilled rather than driven. Drilled wells are constructed by percussion or rotary-drilling machines. Drilled wells can be hundreds to thousands of feet deep and use continuous casing.

As the hole is excavated, the well driller keeps a log of geological formations such as depths at which water is found and earth materials. This information is used to design the well. Any water well construction activities must be performed only by a licensed C-57 Water Well Contractor and must meet applicable local and state well standards.[45]

For the proposed updated Cost Assessment Model, State Water Board staff conducted a review of State Water Board funded projects and the average well drilling costs for these projects was $62.50 per foot for an average well depth of 500 feet. Staff also conducted external outreach and market research to develop a new component cost estimate. The external quote was nearly identical the to the average of the State Water Board funded projects (Table 13). The State Water Board recommends utilizing a new private well drilling cost estimate of $32,500 for a 500 ft well.

Table 13: Summary Comparison of Private Well Drilling Costs (500 ft)

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$31,250[46] (2023)	$32,500[47] (2023)	**$32,500**

N/A: Not Available

Electrical Component & Control Box

The main job of a well pump's electrical control box is to cycle the pump's pressure switch on and off. In a private well system, the pump draws water up from the ground and pumps it into a pressure tank. The pressurization inside the tank then provides the force that gives a building access to running water. When the pressure in the tank dips below a certain level, the pump cycles on and off to continuously achieve and retain acceptable levels.

Well pump controllers usually have microprocessors that monitor power-line pump and voltage motor power draw. Electrical upgrades and a well pump control box is essential in that it protects submersible well pumps from:

[45] Well Standards
https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Standards

[46] Domestic well costs gathered from Self Help Enterprises, cost varies by driller.

[47] Local well drilling company pricing and recommendation for 500 ft depth with a drilling cost of $65 per foot.

- Too high or low voltage
- Clogged well screens
- Malfunctioning motors and pumps
- A drop in water level
- Rapid cycling
- Low yield wells

The 2021 Cost Assessment Model assumed a flat cost for upgraded electrical for each new well at $440,000 for new public supply wells. The 2021 Cost Assessment Model assumed these costs covered the installation of a main switchboard and motor control center; electrical conduit and wire - all equipment on a single 200' x 200' site; site lighting; and transformer slab.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found very limited information on electrical upgrades cost. Staff also conducted external outreach and market research to develop a new component cost estimate. Table 14 summarizes this research. The State Water Board recommends utilizing $600 to account for control box and its electrical component per site.

Table 14: Summary Comparison of New Well Electrical Component & Control Box Costs per Site

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	N/A[48]	$600[49] (2023)	**$600**

N/A: Not Available

Well Pump and Motor

A water well pump and motor draws water from the well and pushes it through the home's plumbing system. It must have enough force to provide adequate flow or water pressure. A flow rate of 5-7 gallons per minute is adequate in most rural communities. A modern home with two or more bathrooms will be better off with a pump that provides a peak flow rate of 10 gallons per minute.

There are many types of well pumps that can be used by a private well: piston pump, jet pump, and submersible pump. For the purposes of the Cost Assessment Model, the State Water Board recommend including a component cost estimate for a submersible well pump for a new private well.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found very limited information with

[48] Available data did not include a break down cost. Control box cost was a part of a total cost of $4,800, that included well pump, well motor, pump saver, in addition to a control box cost.

[49] Local well drilling company pricing and recommendation.

itemized new private well pump and motor costs. Staff also conducted external outreach and market research to develop a new component cost estimate. Table 15 summarizes this research. The State Water Board recommends utilizing 0.5 HP well pump and motor cost for domestic wells use, and 1 HP for state small water system well use.

Table 15: Summary Comparison of New Well Pump and Motor Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	N/A[50]	• $830[51](DW) (2023) • $1,120[52] (SSWS) (2023)	**$830 (DW) $1,120 (SSWS)**

N/A: Not Available

Water Sampling

In the 2021 Cost Assessment Model, initial water quality testing was excluded from the Cost Assessment Model's cost estimate for new well costs. Based on feedback from State Water Board technical assistance providers, staff recommend including initial water quality testing as part of the capital cost estimate for a new well. Water quality testing is often required to satisfy permitting requirements and it is important to know what contaminant(s) are prevalent that may need to be removed through treatment.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found the average water quality sampling cost for domestic wells to be $900. Staff also conducted external outreach and market research to develop a new component cost estimate. Table 16 summarizes this research. The State Water Board recommends utilizing $400 as a basic sampling cost for private wells.

Table 16: Summary Comparison of Water Quality Testing Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$900[53] (2023)	• $500[54] (2023) • $400[55] (2023)	**$400**

N/A: Not Available

[50] Available data from Self Help did not include a break down cost. Well pump and motor cost were a part of a total cost of $4,800, that included control box, pump saver, in addition to well pump and motor costs.

[51] Franklin Electric-Submersible well pump, 0.5 HP, 10 gallons per minute for domestic well use.

[52] Franklin Electric-Submersible well pump, 1.0 HP, 20 gallons per minute for state small water system wells use.

[53] Domestic well sampling costs gathered from Self Help Enterprises.

[54] Based on local well drilling company representative estimates.

[55] Based on GAMA domestic well testing website, the highest pricing was estimated to account for the maximum number of chemicals analyzed.

Connection/Casing Pipe

The "well casing" is a metal or plastic pipe that is centered in the hole and is the conduit for water movement through the well. To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found that the average cost for this type of pipe is approximately $5 per foot for a 500 – 600 foot well. Staff also conducted external outreach and market research to develop a new component cost estimate. Table 17 summarizes this research. The State Water Board recommends utilizing the average of the external quotes, $2,150 for the connection/casing pipe estimate in the updated Cost Assessment Model.

Table 17: Summary Comparison of Connection/Casing Pipe Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$2,500[56] (2023)	$1,800 - $2,500[57] (2023)	**$2,150**

N/A: Not Available

Pressurized Water Tank

A pressurized water tank uses compressed air to distribute potable water to a faucet. A pressurized water tank can boost the longevity of a well pumping system because it allows the pump to cool and prevents it from cycling on and off too frequently.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found the average cost of a pressurized pump to be $1,000 (no size specified). Staff also conducted external outreach and market research to develop a new component cost estimate. Table 18 summarizes this research. The State Water Board recommends utilizing a $400 cost estimate for a 44-gallon pressurized tank in the updated Cost Assessment Model since it aligns with the typical residential tank size needs.

Table 18: Summary Comparison of Pressurized Water Tank Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$1,000 (2023)	• $700[58] (2023) • $400[59] (2023)	**$400**

N/A = Not available

---

[56] Connection/Casing pipe costs for private wells gathered from Self Help Enterprises.

[57] Local well drilling company pricing and recommendation, lump sum cost range from $1,800 - $2,500.

[58] Local well drilling company pricing and recommendations for 44-gallon tank.

[59] Amtrol WW Pressure Tank - 44 Gal. Base price is $367, additional cost is for tax and shipping: https://www.rainbrothers.com/store/Amtrol-WW-Pressure-Tank-44-Gal-p281493592

Well Permitting

Well owners need to obtain permits from local environmental health agencies (often County agency) or local water districts before construction can take place. Well permitting costs vary by County. In 2021, the State Water Board conducted a state-wide review of new well permitting costs. Information on domestic well permits and associated fees was collected by calling county well permitting agencies and speaking on the phone with environmental health specialists, department directors, and permit fee specialists. County representatives were asked the cost of permitting if a homeowner wanted to build a replacement well, deepen an existing well, or build a second well. The first scenario, building a replacement well, was identified as the most common solution for when an existing well goes dry and was used here to develop County well permitting cost assumptions.

Table 19: Summary Comparison of New Well Permitting Fees

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
Excluded	Excluded	N/A	**Cost per County**[60] $90 - $5,900

N/A = Not available

Additional Parts & Labor

Construction of a new well may require additional cost estimates for parts, accessories, and installation fees, for example:

- Sealing material cost.
- Cost of other materials (drive shoe, screen, perforated casing, etc.)
- General installation cost for pump, motor, wiring, sealing material, etc.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found an average flat cost of $3,500 for additional parts and labor. Staff also conducted external outreach and market research and found an external quote that accounts for labor and parts as 5% of the total construction cost, this quote was disregarded since the total cost was smaller than the internal quote. Table 20 summarizes this research. The State Water Board recommends utilizing $3,500 in the updated Cost Assessment Model.

[60] The State Water Board has the new replacement well permit costs from 2021 per County. This dataset will be published with the 2024 Drinking Water Needs Assessment.

Table 20: Summary Comparison of Additional Parts & Labor Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$3,500[61] (2023)	5%[62] of total construction cost estimate	$3,500

N/A = Not available

Old Well Destruction

Abandoned wells can be pathways for pollutants to enter groundwater. They also pose a threat to public health and safety – children, animals, and even adults can fall into abandoned wells, causing injury or death. It is the responsibility of the well owner to destroy abandoned wells.[63] Old well destruction costs should be considered as a key component cost for constructing a new private well.

To develop a new cost estimate for a private well, State Water Board staff conducted a review of State Water Board funded projects and found an average well destruction cost of $3,300. Staff also conducted external outreach and market research to develop a new component cost estimate. Table 20 summarizes this research. The State Water Board recommends $3,300 for well destruction costs.

Table 21: Summary Comparison of Old Well Destruction Costs for Private Wells

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$3,300[64] (2023)	N/A	$3,300

N/A = Not available

Bottled Water for State Small Water Systems and Domestic Wells

For the purposes of the Cost Assessment, 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."[65] The State Water Board views bottled water reliance for meeting potable water needs as a worst case, long-term need for households.

Systems Assessed for Modeled Long-Term Bottled Water Reliance

The proposed updated Cost Assessment Model does not assess Failing water systems for modeled long-term bottled water reliance. However, there are some modeled

[61] Domestic well parts and labor costs gathered from Self Help Enterprises.

[62] Local well drilling company pricing and recommendations.

[63] Public Health and Safety Code, Part 9.5, Section 115700. https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=104.&title=&part=9.5.&chapter=&article=

[64] Domestic well destruction costs gathered from Self Help Enterprises.

[65] California Health and Safety Code Section 111070.

scenarios where neither physical consolidation nor decentralized treatment may be feasible for a state small water system or domestic well with modeled high water quality risk. The 2021 Cost Assessment Model assumed bottled water would be the long-term modeled solution for state small water systems and domestic wells where all other modeled solutions are not feasible.[66] The State Water Board recommends utilizing the same criteria in the proposed updated Cost Assessment Model:

- The system must be either a state small water system or domestic well with high-risk in the Water Quality category in the Risk Assessment.
- Modeled physical consolidation is not viable.
- Modeled decentralized treatment is not viable due to:
    - Elevated Nitrate concentration > 25 mg/l.
    - Microbial contamination.
    - Thallium contamination.
    - Aluminum contamination.
    - Bromate contamination.

Table 22: Systems Assessed for Long-Term Bottled Water Reliance

System Type	2021 Model	Recommended Update
Failing Systems	Excluded	No Change
At-Risk Systems	Excluded	No Change
High Water Quality Risk SSWS & DWs	Where physical consolidation and decentralized treatment is not feasible.	No Change

Duration of Bottled Water Reliance

The 2021 Cost Assessment Model did not include an estimated timeframe for long-term bottled water reliance. Therefore, the State Water Board is proposing estimating long-term bottled water reliance costs for 10 years.

Cost Assumptions for Bottled Water

The State Water Board provides funding to support bottled water deliveries to communities. Staff utilized data from these projects to update the unit cost components for bottled water:

Table 23: Summary Comparison of Bottled Water Costs

Component	2021 Model	State Water Board Funded Projects	State Water Board's Recommendation
Cost per Gallon	$1.00 per gallon	$4.99 – $7.50 (Varies by location)	**$1.25 per gallon**

[66] 2021 Drinking Water Needs Assessment, Page 249. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Component	2021 Model	State Water Board Funded Projects	State Water Board's Recommendation
Volume per Connection	60 gallons per month	60 gallons per month	**60 gallons per month = $75 a month**
Delivery Fee per Connection (2x a month)	Excluded	$7.99 - $13.99 per delivery	**$22 per month**
Hand Pump per Connection	Excluded	$8.75 - $12.99	**$11**

Additional Long-Term Solutions for Failing at At-Risk Public Water Systems

The State Water Board recognizes that Failing or At-Risk public water systems may need additional infrastructure and managerial assistance for the successful implementation of the long-term modeled solution and to enhance system sustainability. The Cost Assessment Model assesses the needs for other essential infrastructure (OEI), technical and administrative assistance.

Other Essential Infrastructure

Failing systems and At-Risk public water systems often have other assets that have not been properly maintained or were never installed at the time of system construction. For instance, a system may not have had enough storage to meet maximum day demand (MDD), thereby requiring a storage tank to alleviate the problem. For purposes of the Cost Assessment, the State Water Board assesses water system needs beyond modeled physical consolidation and/or treatment. These other essential infrastructure (OEI) needs are estimated to ensure the Cost Assessment Model's output is more holistic in estimating how much it costs to ensure the water system is more sustainable and resilient.

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 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 for systems with a single source.
- Backup power to ensure continuous operation during power failure.
- Sounder device to measure static well levels.

In the 2022 Drinking Water Needs Assessment, the State Water Board conducted a special SB 552 Drought Infrastructure Cost Assessment. The underlying component cost assumptions for the items listed above have been incorporated into the State Water Board's proposed updated Cost Assessment Model.

Table 24: Other Essential Infrastructure (OEI) Components

OEI Component	2021 Model	Recommended Update
Meters	Included	Included
Back-up Electrical Supply	Included	Included
Sounder	Excluded	Included
Additional Storage	Included	Included
Land Acquisition for Additional Storage	Included	Excluded
SCADA & Electrical Upgrades	Included	Incorporated into cost estimates for new wells, replacement wells, and storage tanks.
Replace Distribution System	Included	Excluded
Managerial Assistance	Included	Incorporated into Administrator Assistance estimate.
Add a Second Well	Included	Included
Replacement Well	Included	Included
Land Acquisition for New Well	Included	Excluded
Well Pump and Motor	Included for second well and replacement well estimates.	Included for second well and replacement well estimates.

Systems Assessed for Other Essential Infrastructure

In the 2021 Cost Assessment Model, OEI needs were developed based on a Kern County, California case study and conducted by Corona Environmental on behalf of the State Water Board. The case study identified OEI needs for Failing water system in the County and developed OEI statewide need assumptions for all Failing and At-risk public water systems.

Table 25: 2021 Cost Model Other Essential Infrastructure (OEI) Percentage Need Assumptions

OEI Component	2021 Model Assumption of Systems of Need per OEI Component
Meters	31%
Back-up Electrical Supply	38%
Additional Storage	36%
Land Acquisition for Additional Storage	10%
SCADA & Electrical Upgrades	9%
Replace Distribution System	31%
Managerial Assistance	80%
Add a Second Well	80% of systems with one well

OEI Component	2021 Model Assumption of Systems of Need per OEI Component
Land Acquisition for New Well	5%
Replacement Well	26%
Well Pump and Motor	9%

In the proposed updated Cost Assessment Model, the State Water Board will be assessing OEI needs based on system and location-specific information rather than the Kern County case study assumptions. Water system data pulled from the State Water Board's database of water system facility information[67] and data reported to the State from the Electronic Annual Report (eAR) will be utilized to determine which Failing and At-Risk public water systems should be assessed for each OEI component. This enhancement to how the Cost Assessment Model identified systems with OEI needs will improve the accuracy of the Cost Assessment's output.

Failing and At-Risk public water systems that have modeled physical consolidation as their long-their solution, that are identified as Joining water systems, will be excluded from the OEI analysis. Joining water systems will be subsumed by the Receiving water system. It is assumed that many of the OEI elements will either not be needed for the Joining system or that the OEI analysis for the potential Receiving analysis will capture the needs of the newly consolidated water system.

Table 26: Systems Assessed for Other Essential Infrastructure Needs

System Type	2021 Model	Recommended Update
Failing Systems	Percentage based.	• Joining systems are excluded. • Failing and At-Risk public water systems, based on system-specific information.
At-Risk Systems	Percentage based.	• Joining systems are excluded. • Failing and At-Risk public water systems, based on system-specific information.
High-Risk SSWS & DWs	Excluded	Excluded

Meters

Metering service connections for each customer is an important drought mitigation measure because it allows a water system to monitor water usage, identify potential water loss, and may also help customers reduce demand when needed.

[67] Safe Drinking Water Information System (SDWIS)

Systems Assessed for Meters

The inventory of systems lacking meters for some or all of their service connections is identified by analyzing eAR responses to Section 4, specifically the question about the count of un-metered service connections regardless of connection type.

Cost Assumptions

The 2021 Cost Assessment Model estimated the cost of installing new meters using component cost estimates for 1" meters and equipment/software upgrades. The 1" meters are assumed to be "drive-by" meters, which allows the meter reader to drive by and take an automated reading, as opposed to a manual reading. The 2021 Cost Assessment Model assumed a one-time estimated equipment and software upgrade cost of $29,000 plus $825 per new meter installed at each service connection. In 2022, the State Water Board updated the 1" meter cost estimate from $825 to $1,200 based on stakeholder feedback and vendor pricing. The estimated equipment and software upgrade cost estimates were not updated in 2022.

State Water Board staff conducted a review of State Water Board funded projects and found new meter quotes. Staff also conducted external outreach and market research to either validate the 2022 component cost estimates or develop an alternative estimate. Table 27 summarizes this research. The State Water Board recommends utilizing the same assumptions used in the 2022 Drought Infrastructure Cost Assessment Model.

Table 27: Meter Cost Assumptions

Component	2021 Model	2022 Model	State Water Board Funded Projects	External Quotes[68]	Recommended Update
Equipment & Software	$29,000[69]	$29,000	N/A	N/A	**$29,000**
1" Meters (drive by)	$825	$1,200[70]	$1,049[71] (2020)	N/A	**$1,200**

N/A: Not Available.

Backup Electrical Supply

To sustain operations during possible power outages, an onsite backup generator is necessary. Onsite backup generator needs are assessed based on the amount of water

---

[68] The State Water Board has contacted a meter manufacturer for updated quotes. Once these quotes are available, the State Water Board will review them, comparing them to the 2022 Drought Infrastructure Cost Assessment estimates. If acceptable, these updated cost estimates will be incorporated into the updated Cost Assessment Model for the 2024 Cost Assessment.

[69] This cost was used by Corona Environmental and utilized in the [2021 Drinking Water Needs Assessment](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515) https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

[70] Based public feedback and vendor recommendations and pricing.

[71] Mendota Automatic Meter Reading (2020). These meters are automatic meter reading (AMR). Cost provided is per meter with a total of 2,138 1-inch meters replaced in project.

necessary to maintain service to customers. The Cost Assessment Model assumes that backup generators are necessary in a single location. However, water systems may have sources in different locations that may each require onsite backup generators. Unfortunately, the State Water Board's backup generator information for public water systems does not currently include enough detailed information to determine if a system needs onsite backup generators at multiple locations. Therefore, the Cost Assessment Model's estimated onsite backup generator needs are likely underestimated.

Systems Assessed for Backup Electrical Supply

The estimated inventory of systems requiring backup power is identified by analyzing eAR responses to a non-mandatory question in Section 16.A about source auxiliary power supply. Since responses to this question are limited, the State Water Board utilized all (none), (blank), (some) and (null) responses within this analysis. If a water system has responded with (some), then the Cost Assessment Model will assume only 50% of their total active sources need backup power.

Cost Assumptions for Backup Electrical Supply

For the 2021 Cost Assessment Model, Corona Environmental developed a regression equation to estimate backup electrical supply costs.[72] The original equation was based on gathered quotes from external vendors. The State Water Board utilized the same equation in the 2022 Drought Infrastructure Cost Assessment.

Equation 1: Backup Electrical Supply

Total Cost Estimate ($)[73] = $30,134 + ($341 x MDD[74]) + Regional Multiplier + 5% Total Cost Permitting + 4.7% Total Cost Inflation

Table 28: 2021 – 2022 Backup Electrical Supply Cost Estimates by Flow Ranges

Size (kW)	Rate Flow (gpm)	2021 and 2022 Model
5	18	$50,000
30	110	$64,000
50	180	$80,000
75	270	$110,000
100	365	$160,000

[72] 2021 Drinking Water Needs Assessment, Page, 269
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

[73] This equation was developed by Corona Environmental to estimate backup power cost in the 2021 Needs Assessment.
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[74] The cost for each system was identified based on their maximum day demand (MDD), which is based on estimated average daily demand (ADD) of 150 gallon per day, served population, and a peaking factor of 2.25.

State Water Board staff conducted a review of State Water Board funded projects and conducted external outreach and market research to either validate the 2021/2022 Cost Assessment Model assumptions or develop an alternative estimate. Table 29 summarizes this research. No viable external quotes were found; however, three State Water Board funded projects had itemized costs for backup generators. The quotes from the State Water Board projects closely aligned with the formula utilized in the 2021 and 2022 Cost Assessments. Therefore, the State Water Board recommends utilizing the same cost equation in the proposed updated Cost Assessment Model.

Table 29: Backup Electrical Supply Cost Assumptions

2021 & 2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$30,134 + ($341 x MDD)	• $175,000[75] (2023) • $185,500[76] (2023) • $91,000[77] (2023)	N/A	**$30,134 + ($341 x MDD)**

N/A: Not Available.

Sounder

It is important to measure and monitor static well levels on a regular basis to diagnose well production or capacity issues before problems occur. A sounder is a device that measures water levels. Regular sounders measure the static water level using a tape with an electronic sensor that is lowered until it sounds an alarm when the static water level is reached. Using tape sounders often requires many adjustments to the wellhead. Due to the lack of site-specific details, the State Water Board recommends assuming a sounder device that utilizes sound waves for the Cost Assessment Model. This would eliminate the need to account for wellhead adjustment costs in the Model.[78]

Systems Assessed for a Sounder

The estimated inventory of systems that may require a sounder is identified based on (1) whether the system has at least one active well and (2) the water system's response to an optional question in the eAR, Section 5 (Source Inventory) regarding monitoring water level in wells. Water systems with wells that did not respond to this question or responded with "No" were assumed to lack equipment to be in compliance with SB 552 requirements and are included in this cost estimate.

[75] Del Oro Implementation Plan (2023). The generator is 100kW, 240V, 3-phase and includes costs for load bank & DPF, and ATS. Total project cost is $300,700.

[76] Fall River Valley Implementation Plan (2023). The generator is 200kW, 277/480V, 3-phase and the total cost is $446,406.

[77] North Folk Implementation Plan (2023). The generator is 60kW, 240V, 3-phase and includes cost for MTS. The total project cost is $138,700.

[78] Sounder 2010 Pro: https://www.geotechenv.com/Manuals/Eno_Scientific_Manuals/Eno_Scientific_Well_Sounder_2010_User_Manual.pdf

Cost Assumptions for a Sounder

The 2021 Cost Assessment Model did not include an estimate for a new sounder for water systems that have wells. However, a cost estimate was developed for the 2022 Drought Infrastructure Cost Assessment. State Water Board staff conducted a review of State Water Board funded projects and found no sounder cost data. Staff also conducted external outreach and market research to either validate the 2022 sounder cost estimate or to develop an alternative estimate. Table 30 summarizes this research. The State Water Board recommends $1,853.

Table 30: Sounder Cost Assumptions

2021 Model	2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
N/A	$1,700[79]	N/A	• $1,445[80] (2023) • $1,853[81] (2023) • $688 - $3,597[82] (2023) • $1,646[83] (2023)	**$1,853**

N/A: Not Available.

Additional Storage

Some Failing and At-Risk public water systems may not have enough storage to meet maximum day demand (MDD), thereby requiring a storage tank to ensure a constant sufficient supply of water. Storage tanks will potentially reduce pumping needs and pump wear since water will be pumped periodically.

Systems Assessed for Additional Storage

The estimated inventory of systems requiring additional storage is identified by analyzing water system facility information maintained by the State Water Board. Failing and At-Risk public water systems that do not have a storage tank facility will be assessed for a new storage tank in the Cost Assessment Model. Water systems with insufficient storage capacity, but that do have a storage tank, are excluded from this analysis. Unfortunately, the State Water Board's storage tank facility information for public water systems does not currently include enough detailed information in an easily

---

79 The base price is $1,245, the additional cost is shipping, handling, and warranty. https://www.fondriest.com/eno-scientific-2010p.htm

80 Eno Scientific (Well Sounder 2010 Pro) https://enoscientific.com/product/well-sounder-2010-pro/

81 The base price is $1,733, the additional cost is shipping, handling and warranty. https://carbonbulksales.com/products/solinst-model-104-sonic-water-level-meter?variant=39445844328644

82 WL500 Water Level Sounder with 100 ft tape https://www.ysi.com/wl500

83 Carbon Bulk Sales (Solonist Model 104 Sonic Water Level Meter)

https://carbonbulksales.com/products/solinst-model-104-sonic-water-level-meter utilized format to determine if a system's current storage tank(s) meet the system's current storage needs. Therefore, the Cost Assessment Model's estimated storage needs are likely underestimated.

Cost Assumptions for Additional Storage

The 2021 Cost Assessment Model developed estimated storage tank costs utilizing the cost components summarized in Table 31.

Table 31: Summary Comparison of Additional Storage Cost Assumptions

Cost Component	2021 Model	Recommended Update
Storage Tank	$38,000 - $3.2 M[84]	**$70,000 - $19 M**[85]
Upgraded Electrical per Site	$440,000[86]	**$440,000**
SCADA	$100,000[87]	**$73,403**[88]
Land Acquisition	$150,000	**Excluded**
Booster Pump	$39,000 - $2.7 M[89]	**($37,000 - $4.0 M)**[90]
Purchased sources	Excluded	**Included**

Storage Tank

The 2021 Cost Assessment Model utilized quotes for different storage tank configurations to develop a regression equation that was then used to estimate a new storage tank cost using estimated MDD. Table 32 provides an example of the estimated storage tank costs produced by the 2021 regression equation by volume per day.

Table 32: 2021 Storage Tank Cost Assumptions[91]

Volume (gallons) per Day	2021 Cost Model
50,000	$143,000
100,000	$243,000
250,000	$515,000
500,000	$870,000
1,000,000	$1,200,000

[84] Cost varies based on a regression equation that depends on the number of sources and the estimated maximum daily demand.

[85] Cost is based on a regression equation that maps tanks of different sizes ranging from 5,000 gallon-1,000,000 million gallons.

[86] Cost was only applied to water systems requiring storge greater than 10,000 gallons.

[87] Cost was only applied to water systems requiring storge greater than 10,000 gallons.

[88] California SCADA Services (2023). Total cost includes a 10% contingency.

[89] Based on regression equation applied to water systems requiring storge greater than 10,000 gallons

[90] Based on a regression equation applied to all water systems requiring storage tank regardless of their storage volume.

[91] The costs represented in this table is for storge only and is based on the results of a regression analysis utilizing the volumes listed in the table.

State Water Board staff conducted a review of State Water Board funded projects and was not able to find new storage tank quotes. Staff also conducted external outreach and market research to either validate the 2021 Cost Assessment Model assumptions or develop an alternative estimate. Table 33 summarizes this research. The State Water Board recommends creating a new regression equation to calculate the cost for the required storge. The new equation will utilize two data sources: new external quotes covering smaller size tanks, and quotes gathered for the 2021 Cost Model covering larger tank sizes.

Table 33: Summary Comparison of Storage Tank Costs

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$(-1E\text{-}06)(GPD)^2 + (2.1607)(GPD) + \$36,825$	N/A	\$25,000 - \$110,000[92] (2023)	$(1.2501)(GPD) + \$69,752$

GPD: Required Storage in gallons per day.
N/A: Not Available

Upgraded Electrical for New Storage Tank

The 2021 Cost Assessment Model assumed a flat cost for upgrading electrical infrastructure at \$440,000 per site. State Water Board staff conducted a review of State Water Board funded projects and found new storage tank quotes that included upgraded electrical cost data. Staff also conducted external outreach and market research to either validate the 2021 Cost Assessment Model assumptions or develop an alternative estimate. Table 34 summarizes this research. The externally sourced quote aligned closely with the 2021 Cost Assessment Model's assumptions. The State Water Board funded project costs are lower than the other quotes. This is because they represent repairs rather than new assets. Therefore, the State Water Board recommends continuing utilizing the 2021 Cost Assessment Model cost estimate in the updated Cost Assessment Model.

Table 34: Summary Comparison of Upgraded Electrical for Storage Tanks Costs

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
\$440,000	\$238,500[93] (2023)	\$461,675[94] (2023)	\$440,000

[92] National Storage Tank (2023). Tank sizes range from 5,000 to 50,000 gallons.

[93] Clear Creek CSD SCADA Electrical Emergency Repairs (2023).

[94] Based on a quote collected from a general electrician for a site of 200' x 200'. The cost includes Electrical panel/400 amps with an average cost of \$1,700, wiring with a unit cost of \$4/ square foot, labor with a unit cost of \$3/ square foot, and wiring conduit with a unit cost of \$2/ square foot. The Cost was

SCADA

The 2021 Cost Assessment Model assumed a flat cost for upgrading SCADA at $100,000 per site. State Water Board staff conducted a review of State Water Board funded projects and found very limited and outdated data on SCADA costs. Staff also conducted external outreach and market research to either validate the 2021 Cost Assessment Model assumptions or develop an alternative estimate. Table 34 summarizes this research. The State Water Board recommends utilizing an external quote with an average cost of $73,403 for storage tank SCADA.

Table 35: Summary Comparison of Upgraded Electrical for Storage Tanks Costs

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$100,000	$25,000[95] (2020)	$73,403[96] (2023)	**$73,403**

Booster Pump

The 2021 Cost Assessment Model utilized quotes for different booster pumps to develop a regression equation that was then used to estimate a new booster pump cost using estimated MDD. State Water Board staff conducted a review of State Water Board funded projects and did not find any itemized cost information for a booster pump. Staff also conducted external outreach and market research to either validate the 2021 Cost Assessment Model assumptions or develop an alternative estimate. Table 36 summarizes this research. The State Water Board recommends utilizing the 2021 Cost Assessment Model booster pump cost estimate in the updated Cost Assessment Model.

Table 36: Summary Comparison of Booster Pump Costs

2021 Model	State Water Board Funded Projects	External Quotes	Recommended Update
(135.18)(MDD) + $37,725	N/A	N/A	**(135.18)(MDD) + $37,725**

N/A: Not Available

New and/or Replacement Well

Water systems dependent on a single source to meet their maximum daily demand, need to have another source to provide emergency supply and ensure system redundancy during an emergency. Reliance on a single source to meet customer demand is an accessibility risk for a water system. The water system is at a higher risk

reviewed internally and deemed not inclusive of all the electrical upgrade requirements a water system might require.

[95] CSA6-Jones Valley Water Meter Replacement, Backwash Pump Installation and SCADA Improvement Project.

[96] California SCADA Services (2023). Total cost includes a 10% contingency.

of failure if their single source were to become contaminated, dry, collapses, or is taken out of service (i.e., for maintenance, etc.).

Furthermore, wells that are near or past their useful life should be upgraded or replaced to ensure the water system is able to meet demand. In 2020, Corona Environmental conducted a study in Kern County to identify the number of Failing systems that needed to have their wells replaced. The results of that study indicated 46% of Failing systems needed to replace their well due to old age.[97]

Systems Assessed for a New and/or Replacement Well

The Failing and At-Risk public water systems that will be assessed for a new additional well and/or a replacement well will be determined using water system facility data maintained by the State Water Board. Failing and At-Risk water systems, regardless of size, with a single well was included in the cost estimate.

- Identified water systems with at least one active well. Systems with one active well are modeled for an additional well.
- Using historical water quality data, the State Water Board identified wells with sample results more than 20 years old. The Cost Assessment Model assumes these wells are either nearing or past their useful life and need to be replaced. These wells are modeled for replacement in the Cost Assessment Model.

Cost Assumptions for a New Well

The 2021 Cost Assessment Model developed estimated well costs utilizing the cost components summarized in Table 37. The 2021 Cost Assessment Model's new well cost component assumptions were developed for a range of new well sizes and flow rates by QK, Incorporated, a design-engineering firm located in the Central Valley. The estimated costs were likely more representative of costs in the Central Valley than more expensive parts of the state. However, a City Cost Index (CCI) index adjustment was applied based on location to make the costs more locally grounded.

In 2022, the State Water Board conducted a new well statewide cost estimate as part of the 2022 Needs Assessment's Drought Infrastructure Cost Assessment. Some of the new well cost estimate components were updated at that time as summarized in Table 37. For the proposed updated Cost Assessment Model, the State Water Board is recommending additional updates to better reflect internal cost data and external quotes.

Table 37: Summary Comparison of New Well (1,000 ft) Cost Assumptions

Cost Component	2021 Model	2022 Model	Recommended Update
Well Drilling	$790,000	$1,200,000	**$2,500,000**

[97] 2021 Drinking Water Needs Assessment, Page 264
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Cost Component	2021 Model	2022 Model	Recommended Update
Upgraded Electrical per Site	$440,000	Excluded	**$440,000**
SCADA	$100,000	$100,000	**$73,403**
Well Pump and Motor	($136.73 x Well Production (MDD)) + $116,448	($136.73 x Well Production (MDD)) + $116,448	**($136.73 x Well Production (MDD)) + $116,448**
Well Development Cost	($145.01 x Well Production (MDD)) + $32,268	($145.01 x Well Production (MDD)) + $32,268	**($145.01 x Well Production (MDD)) + $32,268**
Land Acquisition	$150,000	Excluded	**Excluded**
Initial Water Quality Sampling	Excluded	Excluded	**$825**
Well Permitting	Excluded	Excluded	**2021 County Permitting Data**

Well Drilling

The 2021 Cost Assessment Model assumed a 1,000 ft well was an appropriate approximation for a new public supply well. The 2021 Cost Assessment Model assumed $140,000 for a test hole and $650,000 for the production well drilling costs. The total cost estimate for drilling a new well was assumed to be $790,000 for purposes of the 2021 Cost Assessment Model.[98]

When the State Water Board conducted internal and external stakeholder engagement for the 2022 Drought Infrastructure Cost Assessment recommendations were made to increase these cost assumptions to $1,200,000 per well.[99]

For the proposed updated Cost Assessment Model, State Water Board staff conducted a review of State Water Board funded projects and found two flat costs from two municipal well construction projects, however no drilling depth information or drilling cost per foot was available for one of the projects, which makes it difficult to utilize in the updated Cost Assessment Model, for the second project the drilling depth was 800 ft below ground level. Staff also conducted external outreach and market research to either validate the 2022 Cost Assessment Model assumptions or develop an alternative

[98] 2021 Drinking Water Needs Assessment, Page 265 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[99] 2022 Drinking Water Needs Assessment, Page 225 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

estimate. Table 38 summarizes this research. The State Water Board recommends utilizing an external quote with a cost of $2.5 million for a 1,000 ft well since it is within the range of the two internal quotes, approaching their average of $2.35 million.

Table 38: Summary Comparison of Water System Well Drilling Costs (1,000 ft)

2021 Model	2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$790,000	$1,200,000	• $2,815,500[100] (2021) • $1,863,305[101] (2023)	$2,500,000[102] (2023)	**$2,500,000**

Upgraded Electrical per Site

The 2021 Cost Assessment Model assumed a flat cost for upgraded electrical for each new well at $440,000. The 2021 Cost Assessment Model assumed these costs covered the installation of a main switchboard and motor control center; electrical conduit and wire - all equipment on a single 200' x 200' site; site lighting; and transformer slab.

The 2022 Drought Infrastructure Cost Assessment excluded upgraded electrical for the new well cost estimate because not enough cost data was available to either validate the 2021 cost assumption or develop a new cost estimate.

State Water Board staff conducted a review of State Water Board funded projects and found very limited information on electrical upgrades cost. Staff also conducted external outreach and market research to either validate the 2021 Cost Assessment Model assumptions or develop an alternative estimate. Table 39 summarizes this research. The State Water Board funded project costs are lower than the other quotes. This is because they represent repairs rather than new assets. Therefore, the State Water Board recommends continuing utilizing the 2021 Cost Assessment Model cost estimate in the updated Cost Assessment Model.

[100] Caruthers Community Services District, New Well #7, well depth = 800 ft (2021)

[101] New Well and Pipeline Project, Madera County.

[102] Best Drilling Company [102] price ranges from $2,000 to $3,000 depending on the material and location of the drilling. Overall price for a 1,000 foot well ranges from 2 million to 3 million dollars, the average quote was selected.

Table 39: Summary Comparison of Upgraded Electrical Costs per Site

2021 Model	2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$440,000	Excluded	$238,500[103] (2023)	$461,675[104] (2023)	**$440,000**

SCADA

The 2021 Cost Assessment Model assumed a flat cost for SCADA for each new well at $100,000. SCADA is used to run, monitor, and control well pumps and water flow, well level, system pressure, and any other elements of the water system's operation.

The State Water Board utilized the same cost assumptions for SCADA in the 2022 Drought Infrastructure Cost Assessment based on internal and external feedback.[105]

State Water Board staff conducted a review of State Water Board funded projects and found one project with itemized SCADA costs. Staff also conducted external outreach and market research to either validate the 2021 and 2022 Cost Assessment Model assumptions or develop an alternative estimate. Table 40 summarizes this research. The State Water Board Funded project and the external quote were both lower than the previous SCADA cost estimates. Therefore, the State Water Board recommends utilizing an external quote with an average cost of $73,403 for new well SCADA systems.

Table 40: Summary Comparison of SCADA Costs

2021 Model	2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
$100,000	$100,000	$25,000[106] (2020)	$73,403[107] (2023)	**$73,403**

Well Pump and Motor

For the 2021 Cost Assessment Model, Corona Environmental developed a regression

[103] Clear Creek CSD SCADA Electrical Emergency Repairs (2023)

[104] Based on a quote collected from a general electrician for a site of 200' x 200'. The cost includes Electrical panel/400 amps with an average cost of $1,700, wiring with a unit cost of $4/ square foot, labor with a unit cost of $3/ square foot, and wiring conduit with a unit cost of $2/ square foot. The Cost was reviewed internally and deemed not inclusive of all the electrical upgrade requirements a water system might require.

[105] 2022 Drinking Water Needs Assessment, Page 225 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

[106] CSA6-Jones Valley Water Meter Replacement, Backwash Pump Installation and SCADA Improvement Project (2020)

[107] California SCADA Services (2023). Total cost includes a 10% contingency.

equation to estimate well pump and motor costs.[108] The original equation was based on gathered quotes from external vendors for various motor sizes and flow rates. The State Water Board utilized the same equation in the 2022 Drought Infrastructure Cost Assessment.

Equation 2: New Well and Pump Cost

New Well and Pump Cost = ($136.73 x Well Production (MDD)) + $116,448

Table 41: 2021 Well Pump and Motos Cost Ranges by Flow Rates

Motor Size	Flow Rate (gpm)	2021 Equation Cost Estimate
25	85	$125,000
50	170	$135,000
75	255	$155,000
100	340	$165,000
150	500	$190,000
300	1,000	$250,000

When the State Water Board conducted internal and external stakeholder engagement for the 2022 Drought Infrastructure Cost Assessment recommendations were made to utilize the same formula to estimate well pump and motor costs.[109]

State Water Board staff conducted a review of State Water Board funded projects and found one project with $149,100 for a new well pump and motor for a well with a pumping rate of 1,000 GPM. However, this quote excludes a variable frequency drive system (VFD), which is included in the regression equation cost assumptions. VFD's can cost anywhere between $40,000 - $85,000[110] for this pump size. Staff used the 2021 and 2022 cost regression equation to compare the estimates. The output of the regression equation for a system of this size is $195,000. Factoring in the VFD for the State Water Board project quote indicates a close alignment between the project cost and the regression equation output. Available external quotes are for lower capacities and pumping rates resulting in a lower total cost, thus, are not considered. Therefore, the State Water Board recommends continuing utilizing the 2021 Cost Assessment

[108] 2021 Drinking Water Needs Assessment, Page 266 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

[109] 2022 Drinking Water Needs Assessment, Page 225 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

[110] Based on internal data and external research, VFD cost average $500/ HP: https://smartenergy.illinois.edu/wp-content/uploads/2022/08/PWI_online_calculator.html#:~:text=*VFD%20Cost%20Per%20Horsepower%20(%24%2F,and%20enter%20that%20value%20here.

Model cost estimate in the updated Cost Assessment Model since the output cost was validated using internally funded projects cost data.

Table 42: Summary Comparison of Well Pump and Motor Costs

2021 & 2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
($136.73 x Well Production (MDD)) + $116,448	$149,100[111] (2023)	$6,000 - $13,200[112] (2023)	**($136.73 x Well Production (MDD)) + $116,448**

Well Development

Well development is a process that ensures the removal of fines from the well screen. This step allows better free flow of water from the aquifer into the well and reduces the turbidity of the water during sampling events. The most common well development methods are surging, jetting, over pumping and bailing. For the 2021 Cost Assessment Model, Corona Environmental developed a regression equation to estimate well development costs.[113] The original equation was based on gathered quotes from external vendors. The State Water Board utilized the same equation in the 2022 Drought Infrastructure Cost Assessment.

Equation 3: Well Development Cost

Well Development Cost = ($136.73 x Well Production (MDD)) + $116,448

State Water Board staff conducted a review of State Water Board funded projects and did not find a cost breakdown that included itemized well development cost data. Staff also conducted external outreach and market research to either validate the 2022 Cost Assessment Model assumptions or develop an alternative estimate. Table 43 summarizes this research. The State Water Board recommends maintaining the same assumption utilized in the 2021 and 2022 Cost Assessment Model.

Table 43: Summary Comparison of Well Development Costs

2021 & 2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
($136.73 x Well Production (MDD)) + $116,448	N/A	N/A	**($136.73 x Well Production (MDD)) + $116,448**

N/A: Not Available

[111] New Well and Pipeline Project-Parkwood Water System (2023). The new well will produce 1,000 GPM.

[112] Well Pump and Motor Cost provided by Franklin Electric (2023). Cost range is for 90 GPM to 270 GPM.

[113] 2021 Drinking Water Needs Assessment, Page 266 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

Water Quality Sampling

In the 2021 Cost Assessment Model, initial water quality testing was excluded from the Cost Assessment Model's cost estimate for new well costs. Based on feedback from State Water Board technical assistance providers, staff recommend including initial water quality testing as part of the capital cost estimate for a new well. Water quality testing is often required to satisfy permitting requirements and it is important to know what contaminant(s) are prevalent that may need to be removed through treatment.

State Water Board staff conducted a review of State Water Board funded projects and found lab sampling costs for majority of the predominant contaminants related to the violations associated with the Failing public water systems.[114] The sampling cost for individual contaminants was summed to estimate the initial water quality sampling cost. Staff also conducted external outreach and market research to develop a new cost estimate. Table 44 summarizes this research. The State Water Board recommends utilizing the total water quality sampling cost of $852 from the internal quotes since it more fully captures the comprehensive costs for sampling all commonly occurring statewide contaminants.

Table 44: Summary Comparison of Initial Water Quality Sampling Costs

2021 & 2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
Excluded	$852[115] (2023)	$500[116] (2023)	**$852**

Well Permitting

The 2021 Cost Assessment Model and the 2022 Drought Infrastructure Cost Assessment did not include estimated well permitting costs.

Public water systems must obtain permits from local environmental health agencies (often County agency) or local water districts before construction can take place. Well permitting costs vary by County. In 2021, the State Water Board conducted a state-wide review of new well permitting costs. Information on well permits and associated fees was collected by calling county well permitting agencies and speaking on the phone with environmental health specialists, department directors, and permit fee specialists. County representatives were asked the cost of a new well and their responses are used here to develop County well permitting cost assumptions.

[114] Nitrate, Arsenic, Fluoride, Uranium, 1,2,3 TCP, volatile organic carbons, disinfection by products and ethylene dibromide.

[115] Nitrate ($79), Arsenic ($27), Fluoride ($27), Uranium ($27), 1,2,3 TCP ($200), volatile organic carbons ($307), and ethylene dibromide ($185).

[116] Local well drilling company pricing and recommendation.

Table 45: Summary Comparison of Well Permitting Costs

2021 & 2022 Model	State Water Board Funded Projects	External Quotes	Recommended Update
Excluded	N/A	N/A	**Cost per County**[117] $90 - $5,900

N/A: Not Available

Technical Assistance

In many cases technical assistance does not eliminate the need for other capital improvements, but it should increase the technical, managerial, and financial capacity of systems to address issues in each system. Managerial support is designed to assist water systems in developing the financial and managerial structures to ensure a sustainable water system, including asset management plans, water rate studies, fiscal policies, drought plans, etc. A combination of updated infrastructure and proactive long-term managerial and fiscal policies can help address affordability issues and preventatively meet the needs of these water systems before expensive emergency responses are necessary. Implementation of rate structures and fiscal policies to ensure repair and replacement of any installed infrastructure upgrades, funded by State grants, is anticipated to be a funding eligibility requirement for technical assistance.

Systems Assessed for Technical Assistance

Failing and At-Risk public water systems typically have a variety of technical, managerial, and financial capacity issues in addition to significant infrastructure needs. In the 2021 Cost Assessment Model, technical assistance was modeled for all Failing systems and At-Risk public water systems.

The 2021 technical assistance criteria were evaluated by State Water Board's internal workgroup composed of Division of Drinking Water Engagement Unit and Division of Financial Assistance staff. The workgroup recommends incorporating technical assistance eligibility criteria that more closely aligns with State Water Board technical assistance program eligibilities (Table 46).

Table 46: Systems Assessed for Modeled Technical Assistance Needs

System Type	2021 Model	Recommended Update
Failing Systems	All	• Systems with less than 3,300 service connections; and • Disadvantage community status (DAC or SDAC)
At-Risk Systems	All	• Systems with less than 3,300 service connections; and • Disadvantage community status (DAC or SDAC

[117] The State Water Board has the new replacement well permit costs from 2021 per County. This dataset will be published with the 2024 Drinking Water Needs Assessment.

System Type	2021 Model	Recommended Update
High-Risk SSWS & DWs	Excluded	Excluded

Technical Assistance Cost Assumptions & Duration

In the 2021 Cost Assessment Model, technical assistance needs were assumed to be $60,000 per year for 5 years ($300,000) for Failing water systems and $12,000 per year for 5 years ($60,000 total) for At-Risk public water systems. Staff reviewed more than 50 recent technical assistance projects funded by the State Water Board and recommends modifying these assumptions for the updated Cost Assessment Model (Table 47). The recommended update would estimate $85,000 per year for 5 years for all eligible Failing systems and At-Risk public water systems where physical consolidation is the modeled long-term solution. For At-Risk public water systems, where physical consolidation is not the modeled long-term solution, the Cost Assessment Model would estimate technical assistance at $22,000 per year for 2 years.

Table 47: Technical Assistance Needs Cost and Duration Assumptions

System Type	2021 Model	Recommended Update
Failing Systems – Physical Consolidation	$60,000 ($300,000 for 5 years)	**$85,000 ($425,000 for 5 years)**
Failing Systems – No Physical Consolidation	$60,000 ($300,000 for 5 years)	**$85,000 ($425,000 for 5 years)**
At-Risk Public Water Systems – Physical Consolidation	$12,000 ($60,000 for 5 years)	**$85,000 ($425,000 for 5 years)**
At-Risk Public Water Systems – No Physical Consolidation	$12,000 ($60,000 for 5 years)	**$22,000 ($44,000 for 2 years)**

Administrator Assistance

The appointment of an Administrator is an authority that the State Water Board considers when necessary to provide an adequate supply of affordable, safe drinking water. Administrators may be individual persons, businesses, non-profit organizations, local agencies like counties or nearby larger utilities, and other entities. Administrators generally act as a water system general manager, or may be assigned limited specific duties, such as managing an infrastructure improvement project on behalf of a designated water system. Administrators are named for a limited term to help a water system through a consolidation process or to otherwise come into compliance.

Systems Assessed for Administrator Assistance

In September 2019 (revised in 2023), the State Water Board adopted an Administrator Policy Handbook[118] to provide direction regarding the appointment of Administrators by the State Water Board for designated water systems. The Handbook guidance was evaluated by the State Water Board's internal workgroup composed of Division of Drinking Water Engagement Unit and Division of Financial Assistance staff. The workgroup recommends modeling Administrator assistance for small, disadvantaged Failing and At-Risk water systems with high technical, managerial, and financial risk scores in the Risk Assessment.

Table 48: Systems Assessed for Administrator Assistance

System Type	2021 Model[119]	Recommended Update
Failing Systems	N/A	• Systems with less than 500 service connections; and • Disadvantage community status (DAC or SDAC); and • "High" Technical Managerial and Financial (TMF) Capacity Category risk score in the Risk Assessment.
At-Risk Systems	N/A	• Systems with less than 200 service connections; and • Disadvantage community status (DAC or SDAC); and • "High" TMF Capacity Category risk score in the Risk Assessment.
High-Risk SSWS & DWs	N/A	Excluded

N/A = Not Applicable

Administrator Assistance Cost Assumptions

The 2021 Cost Assessment Model did not include estimated Administrator assistance. Not enough information was available at the time. Since 2021, the State Water Board has initiated eight Administrator projects with appointments and funding (Table 49).[120] This information has been used by the State Water Board to develop cost assumptions and modeling criteria for the updated Cost Assessment Model. Based on the Administrator projects funded by the State Water Board since 2021, the average Administrator project costs $733,052 per system or $25,047 per service connection for two years of Assistance (Table 49).[121]

[118] Administrator Policy Handbook https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/administrator-policy-handbook-2023-revision.pdf

[119] Administrator Assistance needs were not explicitly modeled in the 2021 Drinking Water Needs Assessment.

[120] Data provided by the State Water Board's Division of Financial Assistance.

[121] Administrator project costs may include salary and any benefits for the Administrator; Administrative costs attributed solely to the Administrator, including, but not limited to, additional computers, phones, furniture, and working space requirements; extraordinary legal, accounting, and other similar

Table 49: State Water Board Administrator Projects with Appointments (2-Year)

System Name	Year Funding Approved	Total Funding Approved	Cost per Connection
North Edwards Water District	09.01.2021	$309,457	$1,426
East Orosi CSD	11.02.2022	$585,923	$5,689
Keeler CSD	11.22.2022	$1,036,463	$15,470
Cazadero Water Company	01.30.2023	$512,765	$3,225
Six Acres Water Company	04.19.2023	$214,472	$9,749
Teviston CSD	06.08.2023	$872,216	$6,461
NorCal Water Works	07.26.2023	$1,166,558	$68,622
Sierra Vista Water Association	07.26.2023	$1,166,558	$89,736
AVERAGE:		**$733,052**	**$25,047**

The State Water Board's internal workgroup composed of Division of Drinking Water Engagement Unit and Division of Financial Assistance staff evaluated current and planned Administrator assistance projects. The workgroup recommends utilizing the average project cost ($733,000) rather than the average cost per connection ($25,000) to estimate Administrator assistance needs in the Cost Assessment Model. The workgroup pointed out that utilizing the average cost per connection would ultimately underestimate the Administrator project costs for small water systems with less than 50 service connections.

To date, the State Water Board has not appointed an Administrator to any At-Risk public water system. Therefore, the Cost Assessment Model will assume the same Administrator costs for both Failing and At-Risk water systems.

Table 50: Administrator Assistance Needs Cost Assumptions

System Type	2021 Model	Recommended Update
Failing Systems	N/A	**$733,000**
At-Risk Public Water Systems	N/A	**$733,000**

Total Cost Assessment Modifiers and Multipliers

Many of the Cost Assessment Model's component cost estimates will be adjusted to account for the elements summarized in Table 51 and Table 52. The application of certain cost modifiers and multipliers is based on (1) the age of the component cost estimate data source(s); (2) the region where the capital investment will occur; (3) the nature of the capital investment; etc.

administrative and managerial fees that cannot be paid for by the designated water system's rates, fees, charges, and existing accounts.

Table 51: Summary of the Cost Assessment Model's Capital Cost Estimate Adjustments

Modeled Solution	Regional Cost Adjustment	Inflation Adjustment	Contingency	Planning & Construction Multiplier	Engineering Multiplier	Overhead	CEQA
Physical Consolidation	✓	✓	✓	✓			✓
Centralized Treatment	✓	✓	✓ [122]	✓ [123]	✓	✓	
Decentralized Treatment	✓	✓	✓				
SSWS/DW Well	✓	✓	✓				
Bottled Water		✓					
Meters	✓	✓					
Back-up Electrical Supply	✓	✓					
Sounder	✓	✓					
Additional Storage	✓	✓					✓
Public Water System Well	✓	✓					✓

[122] For certain centralized treatments contingency costs are embedded in the engineering multiplier.

[123] For certain centralized treatments the planning & construction costs are embedded in the engineering multiplier.

Table 52: Summary of Adjustments Made to the Cost Assessment Model's Operations & Maintenance Estimates

Modeled Solution	Regional Cost Adjustment	Inflation Adjustment	Contingency	Planning & Construction Multiplier	Overhead	Engineering Multiplier
Centralized Treatment	✓	✓				
Decentralized Treatment	✓	✓				

Regional Cost Adjustment

To adjust the cost estimates presented in the subsequent sections for regional cost variance, the Model applied an RSMeans[124] City Cost Index (CCI). RSMeans catalogs a database of material, labor and equipment costs across the United States and creates an RSMeans CCI number for selected cities. This CCI was used to compare or adjust costs between locations and the national average. In 2019, the data publicly available at that time indicated the national average CCI was 3.0. Not all cities have a CCI assigned, in which cases relatively similar CCI were selected by county based upon urban and rural considerations.

In the 2021 Cost Assessment Model and the 2022 Drought Infrastructure Cost Assessment, cost estimates for treatment equipment and general civil site work were assigned the national average CCI of 3.0. The California CCI shown in Table 53 was then applied to adjust modeled capital costs based on each water system's location (Table 54).

For the proposed updated Cost Assessment Model, the State Water Board recommends continuing to utilize the same regional adjustments for each county.

Table 53: RSMeans CCI Selected for Locational Cost Estimating

Location	RSMeans CCI	Percent Adjustment
Rural	+ 3.00	0%
Suburban	+ 3.97	+ 32%
Urban	+ 3.89	+ 30%

Table 54: California Counties Categorizes by Generalized Model Location

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

Inflation Cost Adjustment

Current inflation in the construction industry can be attributed to many factors: the increase in demand pulls, increasing raw material cost from suppliers, and rising wage

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

cost in labor market. The increase in inflation can drive up construction project costs and should be considered when developing cost estimates. In the 2022 Needs Assessment, a 4.7% inflation multiplier was used to adjust the Drought Infrastructure Cost Assessment Estimate to current prices. For the 2024 Cost Assessment, the State Water Board recommends applying a 3.7%[125] inflation multiplier to all estimated capital costs to conservatively adjust for rising inflation.

Contingency

Construction contingency is the money allotted for unexpected costs during construction. It is a form of risk management used to avoid cutting costs in other areas to keep the project's schedule and quality commitments. For purposes of the Cost Assessment Model, a contingency multiplier may be applied to certain capital cost estimates where there may be more variability in market prices and construction risk.

A 20% contingency was added to the modeled physical consolidation capital cost estimates in the 2021 Cost Assessment Model.[126] The 2021 Cost Assessment Model also included varied contingency costs as part of specific centralized treatment engineering multipliers.[127]

For the proposed updated Cost Assessment Model, the State Water Board recommends maintaining a 20% contingency multiplier for estimated physical consolidation capital costs for public water systems and state small water systems. A contingency multiplier will not be applied to domestic well modeled physical consolidation capital cost estimates, since these projects are fairly small and do not typically generate unexpected costs that needs to be accounted for to the same extent as projects with larger water systems. For centralized treatment, the State Water Board recommends continuing to apply contingency as a part of the engineering multiplier.

Planning & Construction Multiplier

Planning and construction multipliers account for accrued costs associated with fundamental planning and management of any construction project. Planning involves defining the work task, technology, resources and duration of each task and potential interactions amongst work tasks.

---

[125] Considering California’s specific Consumer Price Index (CPI) values. Inflation is forecasted between October 2022- October 2023:
https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdof.ca.gov%2Fwp-content%2Fuploads%2Fsites%2F352%2FForecasting%2FEconomics%2FDocuments%2FUS-CA-Inflation-Forecast-MR-2023-24.xlsx&wdOrigin=BROWSELINK

[126] 2021 Drinking Water Needs Assessment, Page 254
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[127] 2021 Drinking Water Needs Assessment, Page 258
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

The 2021 Cost Assessment Model did include planning and construction multipliers for the estimated physical consolidation costs. For centralized treatment capital cost estimates, planning, engineering, and legal administration costs were embedded in the engineering multiplier and accounted for 15% of the final capital cost estimates. Construction administration was also part of the engineering multiplier and accounted for 10% of the final cost estimates.

For the proposed updated Cost Assessment Model, the State Water Board recommends maintaining the same assumptions for the centralized treatment planning and construction multipliers but recommends including a 10% planning and construction multiplier for estimated physical consolidation capital costs.

Engineering Multiplier

Engineering multipliers are applied to many of the centralized treatment equipment capital cost estimates to develop an estimate of the installed capital costs.[128] The engineering multipliers were modified for each treatment technology to account for the varied sources of cost data for each and their unique installation requirements. Installation costs can vary widely depending on the individual site constraints, and this multiplier is incorporated to provide a Class 5 cost estimate.[129]

In the 2021 Cost Assessment Model, engineering multipliers were applied to the treatment equipment capital cost estimates to develop an estimate of the installed capital costs. Due to the varied data sources providing capital cost estimates for a range of equipment with unique installation requirements, the engineering multipliers were modified for each treatment technology. Included in the multipliers were cost estimates for installation of the treatment equipment, general site work, electrical, contingency, and other planning and administrative fees. Installation costs can vary widely depending on the individual site constraints, and these multipliers were only used to provide a Class 5 estimate.

Table 55 displays the engineering multipliers used for each treatment technology in 2021 and summarizes the State Water Board's recommendations for the updated Cost Assessment Model.

Table 55: Engineering Multipliers Applied to Treatment Technology Capital Costs

Treatment Technology	2021 Model	Recommended Update
GAC	2.36	2.36
Anion/Cation Filtration	None	None

[128] Installed capital costs account for costs for: equipment, installation materials, labor and taxes.

[129] Class 5 cost estimates are also known as the rough order of magnitude (ROM) estimates. This is a very high-level estimate that can assist with capital planning. Accuracy of the Class 5 estimates may be as low as 50% below actual costs to more than 100% greater than spend: https://seacoastconstruction.net/understanding-construction-cost-estimate-classes/#:~:text=Class%205%20%E2%80%93%20Class%205%20cost,than%20100%25%20greater%20than%20spend.

Treatment Technology	2021 Model	Recommended Update
Coagulation Filtration	3.06	3.06
Filtration	3.06	3.06
Fluoride	3.06	3.06
Surface Water Package Treatment	3.06	3.06
4-Log Virus Inactivation	3.06	3.06
Absorption	2.36	2.36
Single-Use Ion Exchange	2.36	2.36

Overhead

Overhead costs include a wide array of expenses incurred by an organization that directly or indirectly supports infrastructure construction. Overhead costs are generally expenses that cannot be charged directly to a particular branch of work but are required to construct the project. Overhead costs also include expenses related to the cost of doing business and often are considered as fixed expenses that must be paid by the contractor. Overhead costs represent general and administrative functions, such as human resources; finance and accounting; information technology; legal services; purchasing and procurement; facilities management; etc.

The 2021 Cost Assessment Model and 2022 Drought Infrastructure Cost Assessment Model did not include overhead cost estimates. Based on feedback from internal and external stakeholders, the State Water Board recommends including a 25% overhead cost estimate for centralized treatment capital costs in the proposed updated Cost Assessment Model. This improves the accuracy of the Cost Assessment Model's output. Most infrastructure projects, including those funded by the State Water Board, include an overhead component.

CEQA

New capital projects must often pass the CEQA (California Environmental Quality Act) environmental review process used to determine compliance with appropriate state and federal environmental regulations. The applicant must provide the final, project-specific environmental document, associated reports, and other supporting materials demonstrating compliance with CEQA as part of the application's Environmental Package. The costs for preparing CEQA-related documents are included in the Cost Assessment Model for certain modeled solutions as summarized in Table 51.

The 2021 Cost Assessment Model assumed $85,000 flat CEQA cost estimate per modeled physical consolidation project and new well. CEQA-related costs were also embedded into capital construction and engineering multipliers used for other capital component cost estimates.

In the proposed updated Cost Assessment Model, the State Water Board recommends applying a CEQA cost estimate for public water systems and state small water systems with modeled physical consolidation as a long-term solution, based on the distance between *Receiving* and *Joining* systems. For intersect systems $25,000 is assumed to be needed for CEQA and for route systems $100,000 is assumed. A CEQA cost estimate is excluded from domestic well modeled physical consolidation capital cost estimates, since these projects are relatively less complex and do not typically generate a significant adverse effect on the environment and surroundings. The State Water Board recommends maintaining a $85,000 CEQA cost estimate for a new public supply well and storge tank capital costs estimate.

Other Adjustments

Many of the requirements needed a specific multiplier to account for additional associated costs. For example, a 5% multiplier was applied to backup generators to account for air pollution permitting fees. The State Water Boards recommends continuing to apply a 5% permitting fees to the systems requiring a backup generator.

Appendix B: Cost Assessment Model Assumptions for Interim Modeled Solutions

Background

The State Water Board recognizes that it may take many months or years to implement long-term sustainable solutions. Planning and construction timelines can vary dramatically due to the complexity of a project, public participation needs, funding availability, permitting schedules, labor, and material availability etc. Therefore, interim solutions may be needed to ensure communities have access to safe drinking water during this timeframe.

Systems Assessed for Interim Solutions in the Cost Assessment

The Cost Assessment Model identifies and develops cost estimates for interim solutions for Failing public water systems and high-risk state small water systems (SSWS) and domestic wells (DW). At-Risk public water systems are excluded from the Cost Assessment Model's interim solution analysis. At-Risk public water systems are excluded because they are in compliance and therefore their customers are not in need of alternative potable drinking water sources.

The Cost Assessment Model identifies the best modeled interim solution based on the system's SAFER status, modeled long-term solution, and water quality (Table 56).

Table 56: Summary of Recommended Modeled Interim Solutions by System Type

System Type	Long-Term Modeled Solution	Interim Modeled Solution
Failing System	• Physical Consolidation • Centralized Treatment	• Decentralized Treatment • Bottled water if water quality concentration exceeds Decentralized Treatment viability
Failing System	• Decentralized Treatment	• Bottled water
High Water Quality Risk for SSWS/DW	• Physical Consolidation	• Decentralized Treatment • Bottled water if modeled water quality concentration exceeds Decentralized Treatment viability
High Water Quality Risk for SSWS/DW	• Decentralized Treatment • Bottled water if modeled water quality concentration exceeds Decentralized Treatment viability	• Bottled water

System Type	Long-Term Modeled Solution	Interim Modeled Solution
High Water Shortage Risk for SSWS/DW	• Physical Consolidation • New Well	• Bottled water

Interim Decentralized Treatment

Providing decentralized treatment to customers served by Failing water systems, high-risk state small water systems or domestic wells may be a viable interim solution option to address contaminants that exceed water quality standards.

Point-of-Use (POU) treatment was considered for the most commonly occurring inorganic contaminants (for example nitrate or arsenic) and was not recommended when bacteriological contaminants exist. POU treatment is not acceptable for any contaminant that has a risk pathway beyond ingestion.

Point-of-Entry (POE) treatment must be considered in the case of 1,2,3-trichloropropane (1,2,3-TCP), or other volatile organic compounds, to address potential health impacts of inhaling the compounds during exposure in the shower for example.

Table 57 lists the contaminants that require treatment of this type, as determined in consultation with State Water Board staff. In communities where nitrate levels exceed 25 mg/L filtration is no longer an effective option and bottled water must be provided as the interim solution.

Table 57: Contaminants Treated by POU and POE in the Cost Assessment Model

Decentralized Treatment Technology	Contaminant	
POU	• Antimony • Arsenic • Barium • Beryllium • Cadmium • Chromium • Copper • Cyanide • Fluoride • Gross Alpha	• Gross Beta • Hexavalent Chromium • Lead • Mercury • Nickle • Nitrate • Perchlorate • Radium 228, Radium 226 • Selenium • Uranium

POE	• VOCs
	    ○ 1,2,3-Trichloropropane (1,2,3-TCP)
	    ○ Dibromochloropropane (DBCP)
	    ○ Ethylene Dibromide (EDB)	

Systems Assessed for Decentralized Treatment as an Interim Modeled Solution

In the 2021 Cost Assessment Model, interim decentralized treatment needs were only estimated for disadvantaged (DAC) populations served by Failing water systems and for At-Risk state small water systems and domestic wells. The State Water Board recommends minimal changes to the system matching criteria. Systems that have either physical consolidation or centralized treatment as their modeled long-term solution will be assessed for interim decentralized treatment. Available and modeled water quality data for these systems is used to determine if decentralized treatment is viable. If the system's water quality indicates decentralized treatment may not be viable, the system is assessed for interim bottled water assistance.

Table 58: Systems Assesses for Interim Decentralized Treatment

System Type	2021 Model	Recommended Update
Failing System	• System is Failing for a water-quality related violation; and • Where modeled water quality concentration meets decentralized treatment viability; and • Less than 3,300 service connections; and • Disadvantaged community (DAC) status.	• System is Failing for a water-quality related violation; and • Where the modeled long-term solution is either physical consolidation or centralized treatment; and • Where modeled water quality concentration meets decentralized treatment viability; and • Less than 3,300 service connections; and • Disadvantaged community (DAC) status.
High Water Quality Risk SSWS/DW	• All systems where modeled water quality concentration meets decentralized treatment viability; and • Disadvantaged community (DAC) status.	• Where the modeled long-term solution is physical consolidation; and • Where modeled water quality concentration meets decentralized treatment viability; and • Disadvantaged community (DAC) status.
High Water Shortage Risk SSWS/DW	• N/A	• N/A

N/A = Not Applicable

Duration of Decentralized Treatment Reliance

In the 2021 Cost Assessment Model, interim decentralized treatment assistance was estimated for 6 years for Failing water systems and 9 years for At-Risk state small water systems and domestic wells. Based on feedback from an internal workgroup of Division of Drinking Water and Division of Financial Assistance staff, the State Water Board recommended lowering the estimated duration of interim decentralized treatment assistance to 3 years for Failing water systems and high-risk state small water systems; and 2 years for high-risk domestic wells. This recommendation is based on recent trends in observed emergency/interim projects funded by the State Water Board.

Table 59: Duration of Modeled Interim Decentralized Treatment Assistance

System Type	2021 Model	Recommended Update
Failing System	6 years	**3 years**
SSWS	9 years	**3 years**
DW	9 years	**2 years**

Capital Cost Estimate for Interim Decentralized Treatment

The proposed updated Cost Assessment Model will rely on the underlying capital cost assumptions developed for decentralized treatment in the State Water Board's October 2023 White Paper *Proposed Changes for Modeled Long-Term Treatment*.[130]

Operations & Maintenance for Interim Decentralized Treatment

The proposed updated Cost Assessment Model will rely on the underlying operations and maintenance cost assumptions for decentralized treatment developed in the State Water Board's October 2023 White Paper *Proposed Changes for Modeled Long-Term Treatment*.[131] The annual operations and maintenance costs will be calculated for the durations summarized in Table 61.

Interim Bottled Water Assistance

For the purposes of the Cost Assessment, bottled water is defined as "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."[132] 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.[133] Types of bottled water provided by the State Water Board are typically either 1-gallon or 5-gallon bottles.

[130] White Paper Proposed Changes for Modeled Long-Term Treatment, October 5, 2023 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf

[131] White Paper Proposed Changes for Modeled Long-Term Treatment, October 5, 2023 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf

[132] California Health and Safety Code Section 111070.

[133] 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)

Systems Assessed for Bottled Water as an Interim Modeled Solution

In the 2021 Cost Assessment Model, interim bottled water needs were only estimated for disadvantaged (DAC) populations served by Failing water systems and for At-Risk state small water systems and domestic wells where modeled decentralized interim solutions are not viable. The State Water Board recommends keeping these assumptions in the proposed updated Cost Assessment Model.

Table 60: Systems Assesses for Interim Bottled Water Assistance

System Type	2021 Model	Recommended Update
Failing System	• Where modeled decentralized interim treatment is not viable; and • Less than 3,300 service connections; and • Disadvantaged community (DAC) status.	• No Change
High Water Quality Risk SSWS/DW	• Where modeled decentralized interim treatment is not viable; and • Disadvantaged community (DAC) status.	• No Change
High Water Shortage Risk SSWS/DW	• N/A[134]	• Disadvantaged community (DAC) status.

Duration of Bottled Water Reliance

In the 2021 Cost Assessment Model, interim bottled water assistance was estimated for 6 years for Failing water systems and 9 years for At-Risk state small water systems and domestic wells. Based on feedback from an internal workgroup of Division of Drinking Water and Division of Financial Assistance staff, the State Water Board recommended lowering the estimate duration of interim bottled water assistance to 3 years for Failing water systems and high-risk state small water systems; and 2 years for high-risk domestic wells. This recommendation is based on recent trends in observed emergency/interim projects funded by the State Water Board.

Table 61: Duration of Modeled Interim Bottled Water Assistance

System Type	2021 Model	Recommended Update
Failing System	6 years	**3 years**
SSWS	9 years	**3 years**
DW	9 years	**2 years**

[134] State small water systems and domestic wells were not assessed for water shortage risk in the 2021 Risk Assessment.

Cost Assumptions for Bottled Water

The State Water Board provides funding to support bottled water deliveries to communities. Staff utilized data from these projects to update the unit cost components for bottled water:

Table 62: Summary Comparison of Bottled Water Costs

Component	2021 Model	State Water Board Funded Projects	State Water Board's Recommendation
Cost per Gallon	$1 per gallon	$4.99 – $7.50 (Varies by location)	**$1.25 per gallon**
Volume per Connection	60 gallons per month	60 gallons per month	**60 gallons per month = $75 per month**
Delivery Fee per Connection (2x a month)	Excluded	$7.99 - $13.99 per delivery	**$22 per month**
Hand Pump per Connection[135]	Excluded	$8.75 - $12.99	**$11**

[135] A hand pump allows the bottled water consumer to more easily handle 5-gallon bottles of water. The cost for a hand pump is calculated once per connection.

Appendix C: Preliminary Cost Assessment Results

Background

To facilitate a comparison of how the proposed updates to the Cost Assessment Model impact the final results, the State Water Board has conducted a preliminary analysis. Staff utilized the 2023 Needs Assessment results to conduct this analysis.

The 2024 Drinking Water Needs Assessment will be released in Spring 2024. It will include the final results of the updated Cost Assessment Model. The results will reflect the long-term and interim needs of:

The results will reflect the long-term and interim needs of:

- Failing public water systems as of January 1, 2024
- At-Risk public water systems utilizing updated data through January 1, 2024
- State small water systems and domestic wells identified as high-risk in the 2024 Risk Assessment *Water Quality* and *Water Shortage* categories.

The results of the 2024 Cost Assessment may differ from the preliminary results summarized in this white paper. The State Water Board will include a summary explanation of the changes made to the final 2024 Cost Assessment Model in the 2024 Drinking Water Needs Assessment. The 2024 Drinking Water Needs Assessment will also include an analysis of the differences between the preliminary results and final results.

Water Systems Assessed in the Preliminary Cost Assessment

The preliminary Cost Assessment was conducted using the inventory of systems from the following:

- **Failing Public Water Systems**: Failing list on January 1, 2023.
- **At-Risk Public Water Systems**: 2023 Risk Assessment results utilizing data through January 1, 2023.
- **High-Risk State Small Water Systems & Domestic Wells**: 2023 Risk Assessment Results utilizing the *Water Quality* and *Water Shortage* category risk results.

Many of the tables below include rounded numbers; therefore, some of the cost estimates may not sum-up or align across different tables.

Long-Term Modeled Solutions

Total Count of Selected Long-Term Solutions

Table 63: Preliminary Estimated Count of Modeled Long-Term Solutions by System Type

System Type	Total Systems	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well	Bottled Water	Add. Costs[136]
Failing PWS	381	165 (43%)	179 (47%)	20 (6%)	N/A	N/A	356 (93%)[137]
At-Risk PWS	512	246 (48%)	N/A	N/A	N/A	N/A	471 (92%)[138]
High-Risk SSWS	810	436 (54%)	N/A	293 (36%)	146 (18%)	7 (0.01%)	N/A
High-Risk Domestic Wells	154,353	76,913 (49%)	N/A	42,067 (27%)	55,458 (36%)	1,667 (0.01%)	N/A

Total Modeled Long-Term Cost Estimate

Table 64: Preliminary Estimated Modeled Long-Term Solution Costs, Excluding O&M, by System Type in Millions

System Type	Physical Consolidation	Centralized Treatment	Decentralized Treatment	New Private Well	Bottled Water	Add. Costs	Estimated Total
Failing PWS	$531	$417	$1.7	N/A	N/A	$1,653[139]	**$2,603**
At-Risk PWS	$895	N/A	N/A	N/A	N/A	$2,256[140]	**$3,151**
High-Risk SSWS	$337	N/A	$20	$8	$0.72	N/A	**$366**
High-Risk Domestic Wells	$1,271	N/A	$315	$2,848	$20	N/A	**$4,454**
TOTAL:	**$3,034**	**$417**	**$337**	**$2,856**	**$21**	**$3,909**	**10,574**

[136] Additional (add.) costs include Other Essential Infrastructure (OEI); technical assistance, and/or Administrator assistance.

[137] Other Essential Infrastructure (327); Technical Assistance (207); and Administrator Assistance (27).

[138] Other Essential Infrastructure (411); Technical Assistance (303); and Administrator Assistance (20).

[139] Other Essential Infrastructure ($1,545,000,000); Technical Assistance ($87,975,000); and Administrator Assistance ($19,791,000).

[140] Other Essential Infrastructure ($2,176,000,000); Technical Assistance ($65,148,000); and Administrator Assistance ($14,660,000).

Total Long-Term Cost per Connection

Table 65: Modeled Long-Term Cost by Connection per System Type

System Type	3,300 +	3,300 – 1,001	1,000 – 501	500 – 101	100 or less[141]
Failing PWS	$4,486	$8.315	$15,824	$371,51	$694,243
At-Risk PWS	$3,789	$7,295	$12,738	$27,585	$606,580
High-Risk SSWS	N/A	N/A	N/A	N/A	$67,807
High-Risk Domestic Wells	N/A	N/A	N/A	$23,037	$34,134

Total Long-Term Cost by County

Table 66: Modeled Long-Term Costs by County ($ in Millions)

County	Cost	County	Cost
Alameda	$2.20	**Orange**	$6.37
Alpine	$65.67	**Placer**	$81.37
Amador	$167.18	**Plumas**	$52.64
Butte	$85.31	**Riverside**	$419.63
Calaveras	$51.19	**Sacramento**	$232.44
Colusa	$30.90	**San Benito**	$91.54
Contra Costa	$14.06	**San Bernardino**	$517.61
Del Norte	$99.48	**San Diego**	$389.12
El Dorado	$1,083.88	**San Joaquin**	$269.12
Fresno	$57.22	**San Luis Obispo**	$167.13
Glenn	$51.72	**San Mateo**	$48.24
Humboldt	$97.70	**Santa Barbara**	$111.96
Imperial	$46.34	**Santa Clara**	$125.08
Inyo	$781.93	**Santa Cruz**	$124.24
Kern	$195.33	**Shasta**	$159.30
Kings	$161.03	**Sierra**	$4.73

[141] Schools are included in this column. Because schools may only have one service connection, this cost per connection is higher than what is true for public water systems that serve communities.

County	Cost	County	Cost
Lake	$16.82	**Siskiyou**	$144.31
Lassen	$327.22	**Solano**	$21.23
Los Angeles	$533.28	**Sonoma**	$376.65
Madera	$29.63	**Stanislaus**	$356.58
Marin	$207.10	**Sutter**	$55.88
Mariposa	$121.18	**Tehama**	$178.78
Mendocino	$377.70	**Trinity**	$68.76
Merced	$11.69	**Tulare**	$667.12
Modoc	$22.85	**Tuolumne**	$157.48
Mono	$456.80	**Ventura**	$63.08
Monterey	$150.13	**Yolo**	$55.18
Napa	$261.17	**Yuba**	$110.61
Nevada	$9.76		
		TOTAL:	**$10,573**

Modeled Long-Term Physical Consolidation

Table 67: Modeled Physical Consolidation Costs for PWS by County ($ in Millions)

County	# of PWS	Cost	County	# of PWS	Cost
Alameda	1	$3.48	**Riverside**	14	$46.56
Amador	1	$5.72	**Sacramento**	2	$7.27
Butte	3	$11.33	**San Benito**	3	$6.78
Contra costa	4	$10.98	**San Bernardino**	18	$92.79
Del Norte	3	$5.84	**San Diego**	5	$19.56
El dorado	1	$1.39	**San Joaquin**	32	$83.88
Fresno	24	$90.87	**San Luis Obispo**	11	$33.56
Glenn	1	$3.37	**San Mateo**	1	$6.11
Humboldt	1	$9.23	**Santa Barbara**	6	$23.71
Imperial	4	$20.52	**Santa Clara**	9	$34.93
Inyo	1	$3.22	**Santa Cruz**	14	$62.71

County	# of PWS	Cost	County	# of PWS	Cost
Kern	59	$171.12	**Shasta**	2	$6.48
Kings	3	$17.57	**Siskiyou**	1	$5.50
Lake	4	$19.79	**Sonoma**	22	$67.26
Los Angeles	18	$69.60	**Stanislaus**	13	$39.91
Madera	13	$39.83	**Sutter**	5	$15.79
Mendocino	6	$24.96	**Tehama**	4	$5.04
Merced	7	$25.06	**Trinity**	1	$4.80
Monterey	21	$87.96	**Tulare**	30	$95.10
Napa	4	$9.88	**Tuolumne**	4	$25.51
Nevada	2	$10.15	**Ventura**	14	$37.08
Orange	3	$2.77	**Yolo**	3	$18.39
Placer	4	$16.64	**Yuba**	8	$18.31
Plumas	1	$7.54			
			TOTAL:	**PWS Count 411** **Cost $1,426**	

Table 68: Modeled Physical Consolidation Costs for SSWS by County ($ in Millions)

County	# of SSWS	Cost	County	# of SSWS	Cost
Butte	3	$2.64	**San Bernardino**	3	$1.86
Contra costa	4	$2.46	**San Diego**	4	$2.97
El dorado	12	$7.09	**San Joaquin**	16	$10.36
Fresno	2	$1.34	**San Luis Obispo**	12	$12.71
Humboldt	2	$0.93	**San Mateo**	3	$3.41
Kern	39	$22.46	**Santa Barbara**	18	$16.81
Kings	2	$1.13	**Santa Clara**	15	$12.48
Lake	5	$2.55	**Santa Cruz**	5	$3.61
Lassen	1	$0.66	**Shasta**	2	$0.95
Madera	8	$5.42	**Sierra**	1	$0.51
Marin	2	$1.22	**Siskiyou**	1	$0.57

County	# of SSWS	Cost	County	# of SSWS	Cost
Mariposa	2	$1.20	**Solano**	1	$0.61
Merced	1	$0.44	**Sonoma**	18	$15.46
Monterey	116	$109.72	**Stanislaus**	12	$8.55
Napa	3	$1.76	**Sutter**	3	$2.53
Nevada	1	$0.46	**Tehama**	4	$2.67
Orange	1	$0.69	**Trinity**	4	$2.84
Placer	1	$0.46	**Tulare**	25	$18.38
Plumas	1	$0.48	**Tuolumne**	7	$4.78
Riverside	57	$38.33	**Ventura**	6	$4.73
Sacramento	2	$1.34	**Yuba**	7	$3.49
San Benito	4	$3.78			
			TOTAL:	**SSWS Count 436** **Cost $337**	

Table 69: Modeled Physical Consolidation Costs for Domestic Wells by County ($ in Millions)

County	# of Wells	Cost	County	# of Wells	Cost
Alameda	123	$3.78	**Orange**	33	$1.92
Amador	305	$4.45	**Placer**	1,500	$18.94
Butte	2,452	$31.56	**Plumas**	307	$4.23
Calaveras	649	$9.76	**Riverside**	4,461	$99.55
Colusa	3	$0.08	**Sacramento**	1,148	$24.06
Contra Costa	755	$13.55	**San Benito**	295	$7.02
Del Norte	487	$6.05	**San Bernardino**	2,567	$58.66
El Dorado	2,009	$32.15	**San Diego**	3,592	$79.96
Fresno	5,246	$74.56	**San Joaquin**	2,945	$44.43
Glenn	853	$10.45	**San Luis Obispo**	732	$18.38
Humboldt	109	$2.61	**San Mateo**	616	$10.73
Imperial	17	$0.43	**Santa Barbara**	1,076	$25.81
Inyo	103	$1.92	**Santa Clara**	1,755	$31.79

County	# of Wells	Cost	County	# of Wells	Cost
Kern	2,368	$44.34	**Santa Cruz**	1,226	$22.10
Kings	752	$11.57	**Shasta**	1,689	$23.22
Lake	715	$11.56	**Sierra**	29	$0.51
Lassen	132	$2.01	**Siskiyou**	1,039	$13.08
Los Angeles	841	$25.44	**Solano**	330	$7.98
Madera	4,929	$61.98	**Sonoma**	4,538	$69.76
Marin	208	$4.22	**Stanislaus**	2,064	$31.02
Mariposa	455	$6.64	**Sutter**	670	$9.13
Mendocino	1,410	$17.52	**Tehama**	2,332	$29.38
Merced	1,620	$23.83	**Trinity**	195	$3.33
Modoc	53	$1.62	**Tulare**	2,812	$46.42
Mono	46	$1.14	**Tuolumne**	2,122	$28.81
Monterey	1,825	$39.59	**Ventura**	282	$9.86
Napa	2,108	$34.23	**Yolo**	528	$9.04
Nevada	4,116	$47.06	**Yuba**	1,341	$17.61
			TOTAL:	**DW Count 76,913** **Cost $1,271**	

Modeled Long-Term Centralized Treatment

Table 70: Average Long-Term Centralized Treatment Capital Cost per Connection by System Size for Failing List Systems (Excluding OEI Needs)

System Type	3,300+	3,300 – 1,001	1,000 – 501	500 – 101	100 or less
Failing	$1,500	$2,000	$3,700	$8,900	$37,600
Failing Schools	N/A	N/A	N/A	N/A	$438,559

Table 71: Modeled Long-Term Centralized Treatment Capital Costs by County (Excluding OEI Needs) ($ in Millions)

County	Cost	County	Cost	County	Cost
Alpine	$0.76	**Marin**	$0.94	**San Joaquin**	$11.19

County	Cost	County	Cost	County	Cost
Amador	$7.50	**Mariposa**	$1.13	**San Luis Obispo**	$8.68
Butte	$1.39	**Mendocino**	$1.91	**San Mateo**	$1.83
Colusa	$8.39	**Merced**	$28.14	**Santa Clara**	$1.47
Del Norte	$0.23	**Mono**	$2.64	**Santa Cruz**	$2.48
Fresno	$20.57	**Monterey**	$14.22	**Shasta**	$1.18
Imperial	$9.90	**Napa**	$11.63	**Siskiyou**	$0.65
Inyo	$5.02	**Nevada**	$1.18	**Solano**	$1.87
Kern	$61.11	**Riverside**	$2.74	**Sonoma**	$5.22
Kings	$31.54	**Sacramento**	$4.32	**Stanislaus**	$40.03
Lake	$2.06	**San Benito**	$9.60	**Sutter**	$2.05
Los Angeles	$4.35	**San Bernardino**	$20.72	**Tulare**	$40.68
Madera	$31.12	**San Diego**	$15.61	**Yuba**	$0.65
				TOTAL:	**$416.71**

Modeled Long-Term Decentralized Treatment

Table 72: Preliminary Modeled Long-Term Decentralized Treatment for Failing Public Water Systems by Solution Type ($ in Millions)

Decentralized Solution	Number of Failing PWS	Capital Cost Estimate
POE	12	$1
POU	8	$0.70
TOTAL:	**20**	**$1.70**

Table 73: Modeled Decentralized Long-Term Treatment Capital Cost Estimates for Failing Public Water Systems by County

County	Capital Cost Estimate
Yolo	$100,000
Tuolumne	$100,000
Merced	$100,000
Tulare	$100,000
Inyo	$100,000
Monterey	$200,000
Sonoma	$200,000
Imperial	$200,000
Santa Barbara	$200,000
Fresno	$200,000
Marin	$300,000
Madera	$300,000
Kern	$300,000
TOTAL:	**$1,700,000**

Table 74: Modeled Long-Term Decentralized Treatment for Domestic Wells by Solution Type

Decentralized Long-Term Solution	Number of Domestic Wells	Capital Cost Estimate
POE	2,905	$25,100,000
POE + POU	5,548	$81,300,000
POU	33,614	$208,300,000
TOTAL:	**42,067**	**$314,600,000**

Table 75: Modeled Long-Term Decentralized Treatment for Domestic Wells by County ($ in Millions)

County	Capital Cost Estimate	County	Capital Cost Estimate	County	Capital Cost Estimate
Alameda	$0.11	Lake	$1.66	Riverside	$7.72
Amador	$3.25	Lassen	$2.38	Sacramento	$3.90

County	Capital Cost Estimate	County	Capital Cost Estimate	County	Capital Cost Estimate
Butte	$5.93	**Los Angeles**	$2.68	**San Benito**	$1.18
Calaveras	$2.57	**Madera**	$11.74	**San Bernardino**	$13.96
Colusa	$0.19	**Marin**	$0.63	**San Diego**	$8.58
Contra Costa	$0.46	**Mariposa**	$4.21	**San Joaquin**	$19.38
Del Norte	$0.10	**Mendocino**	$4.19	**San Luis Obispo**	$6.00
El Dorado	$3.12	**Merced**	$21.89	**San Mateo**	$0.08
Fresno	$53.11	**Modoc**	$0.06	**Santa Barbara**	$2.48
Glenn	$2.42	**Mono**	$0.79	**Santa Clara**	$3.55
Humboldt	$0.02	**Monterey**	$4.39	**Santa Cruz**	$2.68
Imperial	$0.10	**Napa**	$2.31	**Shasta**	$3.13
Inyo	$0.78	**Nevada**	$12.11	**Sierra**	$0.07
Kern	$7.20	**Placer**	$4.90	**Siskiyou**	$0.87
Kings	$5.29	**Plumas**	$2.43	**Solano**	$3.72
Stanislaus	$18.76	**Tulare**	$18.06	**Yolo**	$2.02
Sutter	$1.86	**Tuolumne**	$2.67	**Yuba**	$3.06
Tehama	$7.07	**Ventura**	$0.20	**Tulare**	$18.06
				First Year TOTAL:	**$314**

Table 76: Modeled Decentralized Long-Term Treatment for SSWSs by Solution Type

Decentralized Long-Term Solution	Number of SSWSs	Capital Cost Estimate
POE	12	$1,000,000
POE + POU	49	$6,000,000
POU	232	$13,000,000
TOTAL:	**293**	**$20,000,000**

Table 77: Modeled Long-Term Decentralized Treatment for SSWSs by County ($ in Millions)

County	Capital Cost Estimate	County	Capital Cost Estimate	County	Capital Cost Estimate
Amador	$0.10	**Napa**	$0.12	**Tulare**	$0.97
Butte	$0.05	**Plumas**	$0.27	**Ventura**	$0.02
Colusa	$0.09	**Riverside**	$0.17	**Merced**	$0.83
Contra Costa	$0.13	**Sacramento**	$0.07	**Mono**	$0.03
El Dorado	$0.45	**San Benito**	$0.33	**Monterey**	$6.93
Fresno	$0.29	**San Bernardino**	$0.50	**Stanislaus**	$0.39
Humboldt	$0.06	**San Diego**	$0.28	**Sutter**	$0.27
Inyo	$0.10	**San Joaquin**	$0.56	**Tehama**	$0.09
Kern	$1.59	**San Luis Obispo**	$1.12	**Marin**	$0.13
Lake	$0.14	**Santa Barbara**	$0.86	**Mariposa**	$0.12
Lassen	$0.08	**Santa Clara**	$1.63	**Mendocino**	$0.03
Madera	$0.42	**Santa Cruz**	$0.49	**Shasta**	$0.25
Solano	$0.04	**Sonoma**	$0.44		
				First Year TOTAL:	**$20**

Modeled New Private Well

Table 78: Modeled New Private Well Costs for SSWSs by County ($ in Millions)

County	# of SSWS	Cost	County	# of SSWS	Cost
Amador	1	$0.05	**Riverside**	2	$0.13
Butte	1	$0.05	**San Bernadino**	1	$0.06
Contra costa	1	$0.06	**San Diego**	5	$0.32
Fresno	8	$0.40	**San Luis Obispo**	7	$0.45

County	# of SSWS	Cost	County	# of SSWS	Cost
Kern	10	$0.51	**Santa Barbara**	5	$0.32
Lake	8	$0.39	**Santa Clara**	8	$0.54
Lassen	1	$0.05	**Shasta**	6	$0.29
Madera	6	$0.30	**Siskiyou**	8	$0.39
Mariposa	4	$0.19	**Sonoma**	2	$0.13
Mendocino	1	$0.05	**Stanislaus**	2	$0.10
Merced	6	$0.29	**Tehama**	3	$0.15
Monterey	21	$1.44	**Trinity**	4	$0.19
Napa	2	$0.13	**Tulare**	14	$0.68
Nevada	2	$0.10	**Tuolumne**	2	$0.10
Plumas	4	$0.19	**Yuba**	1	$0.05
			TOTAL:	**SSWS Count 146** **Well Cost $8.1**	

Table 79: Modeled New Private Well Costs for Domestic Wells by County ($ in Millions)

County	# of Wells	Cost	County	# of Wells	Cost
Alameda	37	$2.32	**Placer**	786	$38.82
Alpine	6	$0.29	**Plumas**	496	$24.02
Amador	410	$19.83	**Riverside**	1,413	$89.93
Butte	1,614	$78.28	**San Benito**	60	$3.81
Calaveras	1,471	$71.87	**San Bernardino**	399	$25.12
Colusa	186	$9.01	**San Diego**	2,415	$154.52
Contra Costa	31	$1.97	**San Joaquin**	597	$29.19
El Dorado	709	$44.51	**San Luis Obispo**	1,020	$64.61
Fresno	10,514	$517.53	**San Mateo**	30	$2.12
Glenn	641	$31.08	**Santa Barbara**	251	$15.99
Humboldt	177	$8.57	**Santa Clara**	395	$26.38
Kern	698	$35.11	**Santa Cruz**	268	$17.42
Kings	946	$45.84	**Shasta**	2,282	$110.82

County	# of Wells	Cost	County	# of Wells	Cost
Lake	1,197	$57.85	**Sierra**	74	$3.60
Lassen	82	$3.96	**Siskiyou**	1,991	$96.47
Los Angeles	103	$6.90	**Solano**	76	$4.71
Madera	3,893	$190.73	**Sonoma**	1,074	$67.73
Marin	122	$8.00	**Stanislaus**	913	$44.30
Mariposa	3,597	$172.31	**Tehama**	1,478	$71.15
Mendocino	832	$40.51	**Trinity**	1,168	$56.22
Merced	1,793	$87.53	**Tulare**	2,570	$124.27
Modoc	24	$1.15	**Tuolumne**	1,505	$74.10
Monterey	263	$17.77	**Ventura**	123	$7.96
Napa	654	$40.86	**Yolo**	48	$2.36
Nevada	3,647	$178.76	**Yuba**	397	$19.36
			TOTAL:	**Well Count** **Well Cost**	**55,458** **$2,848**

Modeled Long-Term Bottled Water

Table 80: Modeled Long-Term Bottled Water Costs, Excluding O&M, by System Type ($ in Millions)

System Type	Number of Systems	Cost Estimate
Failing PWS	N/A	N/A
At-Risk PWS	N/A	N/A
High-Risk SSWS	7	$0.72
High-Risk Domestic Wells	1,667	$20
TOTAL:	**1,674**	**$21**

Table 81: Modeled Long-Term Bottled Water Costs for High-Risk Domestic Wells, Excluding O&M, by System Type ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Amador	$0.01	$0.02	**San Diego**	$0.02	$0.15
Butte	$0.04	$0.39	**San Joaquin**	$0.07	$0.65

County	First Year	Full Duration	County	First Year	Full Duration
Calaveras	$0.02	$0.24	**San Luis Obispo**	$0.006	$0.06
Fresno	$0.14	$1	**San Mateo**	$0.01	$0.15
Inyo	$0.002	$0.02	**Santa Barbara**	$0.02	$0.15
Kern	$0.006	$0.06	**Santa Clara**	$0.09	$0.89
Kings	$0.03	$0.27	**Santa Cruz**	$0.002	$0.02
Lake	$0.07	$0.69	**San Joaquin**	$0.07	$0.65
Inyo	$0.002	$0.02	**San Luis Obispo**	$0.006	$0.06
Madera	$0.09	$0.93	**San Mateo**	$0.01	$0.15
Mariposa	$0.01	$0.08	**Sierra**	$0.02	$0.22
Mendocino	$0.09	$0.92	**Solano**	$0.002	$0.02
Merced	$0.08	$0.77	**Sonoma**	$0.03	$0.35
Monterey	$0.09	$0.88	**Stanislaus**	$0.21	$2
Napa	$0.05	$0.48	**Tehama**	$0.26	$3
Plumas	$0.07	$0.68	**Tulare**	$0.21	$2
Riverside	$0.01	$0.13	**Tuolumne**	$0.03	$0.34
Sacramento	$0.004	$0.04	**Yolo**	$0.002	$0.02
San Benito	$0.02	$0.18	**Yuba**	$0.07	$0.71
San Bernardino	$0.15	$1.5			
			TOTAL:	**First Year $2**	**Full Duration $20**

Table 82: Modeled Long-Term Bottled Water Costs for High-Risk SSWS, Excluding O&M, by System Type in Millions

County	First Year	Full Duration	County	First Year	Full Duration
Lake	$0.008	$0.08	**Sonoma**	$0.006	$0.06
Monterey	$0.03	$0.27	**Yuba**	$0.02	$0.15
Plumas	$0.02	$0.17			

County	First Year	Full Duration	County	First Year	Full Duration
			TOTAL[142]:	First Year $0.08 Full Duration $0.73	

Modeled Other Essential Infrastructure (OEI)

Table 83: Modeled OEI Cost Per Item

OEI Item	Public Water System Count	Total Cost Estimate
Backup Generator	399	$139,000,000
Sounder	205	$443,000
Meter	476	$78,000,000
New Well	165	$620,000,000
Well Replacement	268	$ 2,180,000,000
Storage Tank	464	$705,000,000
TOTAL:	**738**	**$3,722,000,000**

Table 84: OEI Average Cost Per Connection Per Public Water System Type

System Type	3,300+	3,300 – 1,001	1,000 – 501	500 – 101	100 or less
Failing PWS	$950	$1,800	$2,700	$150,000	$260,000
At-Risk PWS	$1,200	$2,000	$4,300	$86,000	$169,000

Modeled Technical Assistance

Table 85: Modeled Technical Assistance Costs by County ($ In Millions)

County	Cost	County	Cost	County	Cost
Amador	$0.89	**Madera**	$11.83	**San Joaquin**	$7.31
Butte	$1.74	**Mariposa**	$0.51	**San Luis Obispo**	$1.28
Calaveras	$0.04	**Mendocino**	$2.68	**Santa Barbara**	$1.32
Colusa	$0.89	**Merced**	$4.60	**Santa Clara**	$0.43
Contra Costa	$0.85	**Modoc**	$0.43	**Santa Cruz**	$1.70

[142] Totals may differ slightly from above due to rounding.

County	Cost	County	Cost	County	Cost
Del Norte	$0.85	**Mono**	$0.51	**Shasta**	$1.07
El Dorado	$0.47	**Monterey**	$5.32	**Siskiyou**	$1.03
Fresno	$14.69	**Napa**	$0.13	**Sonoma**	$4.05
Glenn	$0.51	**Nevada**	$0.09	**Stanislaus**	$4.47
Humboldt	$0.69	**Orange**	$0.85	**Sutter**	$1.32
Imperial	$3.15	**Placer**	$1.28	**Tehama**	$1.83
Inyo	$1.92	**Plumas**	$0.51	**Trinity**	$0.43
Kern	$24.04	**Riverside**	$3.96	**Tulare**	$16.52
Kings	$0.94	**Sacramento**	$2.43	**Tuolumne**	$0.43
Lake	$1.03	**San Benito**	$0.89	**Ventura**	$2.98
Lassen	$0.04	**San Bernardino**	$8.05	**Yolo**	$0.89
Los Angeles	$6.46	**San Diego**	$1.45	**Yuba**	$1.36
				TOTAL:	**$153**

Table 86: Modeled Technical Assistance Costs by PWS Type ($ in Millions)

System Type	Count of PWS	Cost
At-Risk	**303**	**$65.15**
DAC	99	$21.88
SDAC	204	$43.27
Failing	**207**	**$87.98**
DAC	45	$19.13
SDAC	162	$68.85
TOTAL:	**510**	**$153**

Modeled Administrator Assistance

Table 87: Modeled Administrator Assistance Costs by County ($ in Millions)

County	Cost	County	Cost
Colusa	0.733	**Riverside**	1.466
El Dorado	0.733	**San Bernardino**	4.398
Fresno	2.199	**San Luis Obispo**	0.733

County	Cost	County	Cost
Imperial	0.733	**Santa Clara**	0.733
Inyo	1.466	**Shasta**	0.733
Kern	5.131	**Siskiyou**	0.733
Lake	0.733	**Sonoma**	0.733
Madera	2.199	**Sutter**	0.733
Mendocino	2.199	**Tulare**	5.131
Monterey	0.733	**Yuba**	0.733
Napa	1.466		
		TOTAL:	**$34**

Table 88: Modeled Administrator Assistance Costs by PWS Type ($ in Millions)

System Type	Count of PWS	Cost
At-Risk	**20**	**$14.66**
DAC	5	$3.67
SDAC	15	$11.00
Failing	**27**	**$19.79**
DAC	5	$3.67
SDAC	22	$16.13
TOTAL:	**47**	**$34**

Interim Solutions

Decentralized Treatment

Table 89: Modeled Interim Decentralized Treatment Cost for Failing Water Systems by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Amador	$13.54	$18.10	**Monterey**	$1.02	$1.37
Butte	$0.07	$0.08	**Plumas**	$1.19	$1.56
Colusa	$8.01	$10.85	**Riverside**	$1.66	$2.19
Contra Costa	$1.26	$1.68	**Sacramento**	$0.83	$1.10

County	First Year	Full Duration	County	First Year	Full Duration
Fresno	$38.52	$49.95	**San Bernardino**	$13.47	$18.11
Imperial	$0.45	$0.61	**San Diego**	$1.47	$1.98
Inyo	$0.61	$4.30	**San Joaquin**	$0.21	$0.27
Kern	$41.28	$53.53	**San Luis Obispo**	$0.00	$0.01
Kings	$10.30	$13.77	**Santa Barbara**	$0.49	$0.66
Lake	$10.57	$14.13	**Siskiyou**	$0.02	$0.02
Los Angeles	$0.88	$1.18	**Sonoma**	$0.80	$1.06
Madera	$3.41	$4.72	**Stanislaus**	$8.13	$10.46
Mariposa	$0.18	$0.24	**Sutter**	$0.32	$0.43
Mendocino	$0.53	$0.71	**Tulare**	$47.17	$61.90
Merced	$26.71	$34.98	**Ventura**	$0.42	$0.57
Mono	$0.10	$0.14			
			TOTAL:	**First Year $234** **Full Duration $311**	

Table 90: Modeled Interim Decentralized Treatment Cost for High *Water Quality* Risk State Small Water Systems by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Contra Costa	$0.05	$0.07	**San Bernardino**	$0.02	$0.04
El dorado	$0.18	$0.25	**San Deigo**	$0.09	$0.12
Fresno	$0.12	$0.17	**San Joaquin**	$0.14	$0.18
Humboldt	$0.04	$0.06	**San Luis Obispo**	$0.05	$0.08
Kern	$0.83	$1.21	**Santa Barbara**	$0.09	$0.13
Kings	$0.02	$0.04	**Shasta**	$0.02	$0.03
Madera	$0.21	$0.30	**Solano**	$0.05	$0.07
Merced	$0.04	$0.05	**Sonoma**	$0.21	$0.30
Monterey	$0.87	$1.23	**Stanislaus**	$0.65	$0.88
Napa	$0.08	$0.13	**Sutter**	$0.02	$0.03
Nevada	$0.02	$0.03	**Tehama**	$0.03	$0.05

County	First Year	Full Duration	County	First Year	Full Duration
Plumas	$0.04	$0.06	**Tulare**	$0.44	$0.60
Riverside	$2.18	$3.08	**Tuolumne**	$0.11	$0.15
Sacramento	$0.10	$0.15	**Ventura**	$0.10	$0.17
San Benito	$0.07	$0.11	**Yuba**	$0.13	$0.17
			TOTAL:	First Year **$7.02** Full Duration **$9.92**	

Table 91: Modeled Interim Decentralized Treatment Cost for High *Water Quality* Risk Domestic Wells by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Amador	$0.31	$0.37	**Placer**	$0.13	$0.15
Butte	$1.79	$2.10	**Plumas**	$0.71	$0.83
Calaveras	$0.71	$0.87	**Riverside**	$4.71	$5.68
Colusa	$0.01	$0.01	**Sacramento**	$1.26	$1.50
Contra Costa	$0.38	$0.46	**San Benito**	$0.12	$0.15
Del Norte	$1.31	$1.54	**San Bernardino**	$5.29	$6.40
El Dorado	$0.41	$0.49	**San Diego**	$1.47	$1.77
Fresno	$8.10	$9.73	**San Joaquin**	$2.94	$3.53
Glenn	$0.47	$0.55	**San Luis Obispo**	$0.27	$0.33
Humboldt	$0.05	$0.06	**San Mateo**	$0.02	$0.02
Imperial	$0.00	$0.00	**Santa Barbara**	$0.18	$0.21
Inyo	$0.06	$0.07	**Santa Clara**	$0.02	$0.02
Kern	$3.88	$4.74	**Santa Cruz**	$0.09	$0.11
Kings	$0.58	$0.69	**Shasta**	$0.73	$0.86
Lake	$0.19	$0.22	**Sierra**	$0.01	$0.01
Lassen	$0.18	$0.21	**Siskiyou**	$0.19	$0.23
Los Angeles	$0.61	$0.74	**Solano**	$0.30	$0.35
Madera	$5.56	$6.82	**Sonoma**	$3.00	$3.53
Mariposa	$0.37	$0.44	**Stanislaus**	$2.46	$2.95
Mendocino	$3.31	$3.97	**Sutter**	$0.65	$0.77

County	First Year	Full Duration	County	First Year	Full Duration
Merced	$4.64	$5.45	**Tehama**	$0.52	$0.62
Modoc	$0.18	$0.21	**Tulare**	$4.48	$5.32
Mono	$0.29	$0.35	**Tuolumne**	$1.46	$1.75
Monterey	$1.23	$1.47	**Ventura**	$0.16	$0.20
Napa	$0.19	$0.22	**Yolo**	$0.38	$0.46
Nevada	$3.85	$4.51	**Yuba**	$0.74	$0.86
Orange	$0.05	$0.06			
			TOTAL:	**First Year $71** **Full Duration $85**	

Bottled Water

Table 92: Modeled Interim Full Duration Bottled Water Costs, Excluding O&M, by System Type ($ in Millions)

System Type	Number of Systems	Cost Estimate
DAC Failing PWS	38	$11
DAC High-Risk SSWS	128	$4
DAC High-Risk Domestic Wells	38,233	$92
TOTAL:	**38,399**	**$107**

Table 93: Modeled Interim Bottled Water Costs for DAC Failing PWS, including O&M, by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Butte	$0.01	$0.05	**San Bernardino**	$0.25	$0.74
Fresno	$0.06	$0.20	**San Diego**	$0.37	$1
Imperial	$2	$6	**San Luis Obispo**	$0.06	$0.17
Inyo	$0.07	$0.23	**Shasta**	$0.07	$0.22
Kern	$0.09	$0.28	**Sonoma**	$0.06	$0.17
Madera	$0.02	$0.07	**Tulare**	$0.04	$0.13
Mendocino	$0.02	$0.05	**Tuolumne**	$0.002	$0.007
Merced	$0.02	$0.13	**Yolo**	$0.002	$0.007

County	First Year	Full Duration	County	First Year	Full Duration
Monterey	$0.07	$0.20	**Yuba**	$0.001	$0.004
				TOTAL[143]:	**First Year $4** **Full Duration $10**

Table 94: Modeled Interim Bottled Water Costs for DAC High-Risk Domestic Wells, including O&M, by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Amador	$0.20	$0.39	**Nevada**	$2	$4
Butte	$0.38	$2	**Placer**	$0.02	$0.04
Calaveras	$0.10	$1.5	**Plumas**	$0.48	$1
Colusa	$0.20	$0.40	**Riverside**	$2	$4
El Dorado	$0.17	$0.34	**Sacramento**	$0.03	$0.07
Fresno	$6	$12	**San Bernardino**	$2	$4
Glenn	$1	$2	**San Diego**	$1	$2
Humboldt	$0.02	$0.04	**San Joaquin**	$1	$2
Imperial	$0.002	$0.005	**San Luis Obispo**	$0.09	$0.18
Inyo	$0.05	$0.09	**Santa Barbara**	$0.04	$0.08
Kern	$1	$2	**Shasta**	$2	$5
Kings	$0.48	$1	**Sierra**	$0.08	$0.18
Lake	$0.7	$1	**Siskiyou**	$3	$6
Lassen	$0.23	$0.5	**Sonoma**	$0.15	$0.3
Los Angeles	$0.08	$0.16	**Stanislaus**	$1	$2
Madera	$2	$4	**Sutter**	$0.11	$0.23
Mariposa	$3	$7	**Tehama**	$3	$6
Mendocino	$1	$3	**Trinity**	$2	$3
Merced	$2	$4	**Tulare**	$3	$5
Modoc	$0.04	$0.08	**Tuolumne**	$1	$2
Mono	$0.16	$0.32	**Ventura**	$0.06	$0.13
Monterey	$0.13	$0.40	**Yolo**	$0.16	$0.33

[143] Totals may differ slightly from above due to rounding.

County	First Year	Full Duration	County	First Year	Full Duration
Napa	$0.05	$0.09	**Yuba**	$0.77	$1.5
			TOTAL[144]:	**First Year $44** **Full Duration $91**	

Table 95: Modeled Interim Bottled Water Costs for DAC High-Risk SSWS, including O&M, by County ($ in Millions)

County	First Year	Full Duration	County	First Year	Full Duration
Amador	$0.015	$0.044	**San Joaquin**	$0.06	$0.17
Contra Costa	$0.006	$0.02	**San Luis Obispo**	$0.016	$0.05
Fresno	$0.03	$0.09	**Santa Barbara**	$0.02	$0.06
Kern	$0.06	$0.18	**Shasta**	$0.06	$0.19
Lake	$0.12	$0.37	**Siskiyou**	$0.11	$0.32
Madera	$0.08	$0.24	**Solano**	$0.006	$0.018
Mariposa	$0.06	$0.19	**Stanislaus**	$0.02	$0.06
Merced	$0.56	$0.17	**Sutter**	$0.03	$0.09
Monterey	$0.09	$0.26	**Tehama**	$0.04	$0.13
Nevada	$0.02	$0.06	**Tulare**	$0.19	$0.55
Riverside	$0.015	$0.04	**Tuolumne**	$0.03	$0.11
San Bernardino	$0.04	$0.12	**Ventura**	$0.012	$0.036
San Diego	$0.04	$0.12	**Yuba**	$0.04	$0.13
			TOTAL:	**First Year $2** **Full Duration $4**	

[144] Totals may differ slightly from above due to rounding.

Appendix D: Public Feedback on the Proposed Updates to the Cost Assessment Model - Proposed Changes for Modeled Long-Term Treatment

On October 5, 2023, the State Water Board hosted a public webinar workshop on the proposed updates to the Cost Assessment Model's long-term treatment analysis. The State Water Board released a white paper and provided a summary of the proposed changes to the long-term treatment methodologies and underlying cost assumptions. The State Water Board solicited public feedback during the webinar and for approximately 30 days after the webinar. The sections below summarize the feedback received and the State Water Board's responses.

From: Leadership Council; Community Water Center; and Clean Water Action

Received: November 3, 2023

*"**We Support the Revised Approach of Modeling Centralized Treatment for Smaller Public Water Systems and Schools**: While the 2021 Cost Assessment modeled centralized treatment only for Failing public water systems with greater than 200 connections, the White Paper proposes to model centralized treatment for Failing public water systems with greater than 20 connections. Given the technical, managerial, and financial (TMF) challenges of reliably implementing Point-of-Use (POU) and Point-of-Entry (POE) treatment at the household scale, we support using centralized treatment for smaller public water systems. We also support the White Paper's proposal to model centralized treatment for public water systems with less than 20 connections that serve schools."*

State Water Board Response: No response needed.

"***Decentralized Treatment Cost Assumptions Should Include the Full Costs of Implementing Decentralized Treatment**: We recommend the Board incorporate additional costs to better capture the full costs of implementing decentralized treatment:*

(1) Higher community/household outreach and communication costs should be used for installation and Operations and Maintenance (O&M) of treatment systems for state small water systems and domestic wells to include the additional costs associated with identifying eligible households in need of treatment, such as travel and outreach to dispersed households. Outreach and coordination costs are much higher for state small water systems and domestic wells than they are for public water systems where all residents are already identified and in contact with the public water system operator.

(2) The operator and communication costs for O&M of POU and POE treatment systems should be increased to incorporate time required to schedule and conduct

water quality sampling and filter replacement visits, compile and share water quality results with residents, and conduct any unexpected maintenance or service calls that may arise during the year. Contingency should also be added for unexpected delays, such as a resident not being at home at the time of a scheduled appointment. We recommend budgeting at least 6 hours per year if only one site visit is scheduled annually. Additional cost should be budgeted for systems treating nitrate and fluoride, where two sampling visits are budgeted each year.

(3) POU and POE O&M costs should also include the ongoing costs of project management and administration by a qualified party.

(4) The Cost Assessment states that POU treatment will not be implemented when bacteriological contamination is present but does not say how bacteriological contamination will be addressed or whether POE treatment will be implemented if bacteriological contamination is present. Seventy-eight percent of domestic wells considered for CWC's 123-TCP POE Treatment Pilot (see below) were contaminated with total coliform bacteria and in a few cases E. coli bacteria. Well and water system repairs and disinfection were conducted at several sites in an effort to eliminate bacteria contamination, but total coliform contamination often persisted. CWC plans to pilot UV disinfection at some sites with persistent bacteria contamination. The Cost Assessment should include initial bacteria sampling for POE treatment at small water systems and domestic wells, indicate how bacteriological contamination could be addressed, and include estimated costs.

(5) POE costs should be based on a system design with a lead and a lag vessel, with water quality sampling between the two vessels, so that contaminant breakthrough can be detected downstream of the lead vessel and carbon in that vessel can be replaced before residents are exposed to the contaminant. With the Cost Assessment's current assumptions, once breakthrough is detected downstream of the single carbon vessel, residents will have already been exposed to the contaminant. Given the assumed collection of samples only two times per year, residents could be using unsafe water for 6 months before the problem is addressed.

(6) POE annual filter replacement cost assumptions should be more conservative and include labor for replacement. Based on manufactures' estimates of carbon lifetime, the Cost Assessment assumes replacement only every 8-10 years. However, actual results will likely vary significantly depending on total organic carbon levels in the source water and potential fouling of the carbon due to biological growth or scaling over a 8-10 year timeframe. More frequent carbon replacement should be assumed, and the Cost Assessment should include labor costs for the changeout, including measures to prevent bacteriological contamination of the carbon and treatment system.

State Water Board Response: For recommendation (1) and (3), these recommendations go beyond the scope of the Cost Assessment Model, in that it assumes third party involvement in the implementation of these solutions. The purpose of the Cost Assessment Model is to identify the costs associated with the long-term solution that would be borne by the location community. The State Water Board then determines if State Water Board funding is available to meet some of this need.

For recommendation (2), the operator costs within the O&M estimate do reflect the costs associated with water quality sampling, filter replacement, inspections etc. These estimates are based on invoicing from current State Water Board funded decentralized projects. If additional cost data becomes available, the underling cost assumptions in the Cost Assessment Model can be updated.

For recommendation (4), the white paper did include a summary of how state small water systems and domestic wells with bacteriological contamination will be addressed on page 24. The white paper recommends modeling bottled water for state small water systems and domestic wells with bacteriological contamination.

For recommendation (5), the State Water Board consulted with its internal Cost Assessment Model workgroup and determined the modeled POE devices and sampling frequency of once a year are reasonable assumptions for the Cost Assessment Model. There are two pathways for use of devices. If a device is certified for a contaminant, and the influent concentration is below the challenge test level, then once a year testing will ensure treatment is functioning appropriately. When the influent concentration is below the certification level, a significant safety factor is applied to ensure changeout prior to exhaustion, with the annual testing functioning as a spot check verification. If a device is not certified, or the influent concentration is higher than the challenge test level, then lead / lag vessels with increased monitoring as suggested would be appropriate to ensure public health protection. While this limitation is recognized, the State Water Board is actively working with the NSF Drinking Water Treatment Unit's standards group and anticipates an increase in certified devices being available. Work is also in progress to certify refillable vessels. The Cost Assessment Model assumes the use of a certified device and the associated requirements.

For recommendation (6), the proposed updated Cost Assessment Model does include operator costs within the POE O&M cost estimate for filter replacement. Based on available data, the filter replacement rate included in the Cost Assessment Model better reflects the rates needed across multiple different contaminants. State Water Board staff agree that assuming more filter replacement beyond what is captured currently would overestimate the state-wide need.

*"**Decentralized Treatment Cost Assumptions Should Take into Account Costs from Community Water Center's 123-TCP POE Treatment Pilot**: The cost assessment should incorporate costs from Community Water Center's (CWC) 123-TCP POE Treatment Pilot Project for Domestic Well Households in Northern Monterey*

County. The first phase of this project (2020-2023) was funded through a supplemental environmental project (SEP) as an enforcement action brought by the Central Coast Regional Water Quality Control Board against Monterey Mushrooms, Inc. and Spawn Mate, Inc. for unauthorized discharges of process wastewater and polluted stormwater in 2017. A continuation of the project through 2026 is funded by the SWRCB's SAFER program. Because off-the-shelf POE treatment devices certified by the State Water Board or NSF for treatment of 123-TCP are not available, CWC convened a technical advisory committee (TAC) of technical and implementation experts from the SWRCB (including technical experts from the Division of Drinking Water), the Monterey County Environmental Health Bureau, other technical assistance providers, consulting firms, and the research community to advise treatment system design and implementation. Attached to this comment letter is the final report from the first phase of the project, including appendices with detailed costs, design information, well and water system repair information, and TAC meeting minutes. A summary of CWC's pilot was also included in Appendix I of the SWRCB's recently released POU/POE Report.

There are substantial differences between the POE assumptions in the Board's Cost Assessment and the approach and costs from CWC's pilot:

- *Implementation costs for the smallest system design used in CWC's pilot (4.0 cubic feet of carbon split between lead and lag vessels) averaged $9,752, not including outreach and project management costs. This is nearly three times the Board's Cost Assessment's assumption of $3,439 for POE device, installation labor, initial water quality testing, and 5% contingency. Apart from the manufacturers' claims that they are effective, no evidence (such as SWRCB or NSF certification) is available to verify the efficacy of the lower-cost POE devices cited in the Cost Assessment.*

- *Outreach, project management, and technical oversight costs of CWC's pilot (see Appendix I of final report) during site assessments, installations, and O&M averaged $22,345 per system, drastically higher than costs assumed in the SWRCB's Cost Assessment. While full-scale implementation of decentralized treatment will likely require significantly less staff time than was required for CWC's pilot, installing, and reliably operating what is essentially a small water treatment plant at an individual household is a complex task and will always require skilled and careful oversight. Until the Board has more well-documented real-world experience with the effective implementation of decentralized treatment, significant management and oversight costs should be assumed."*

State Water Board Response: Division of Drinking Water and Division of Financial Assistance staff met to discuss the applicability of the pilot project costs to the proposed updated Cost Assessment Model. Staff recommended excluding the costs from this project in the Cost Assessment Model because (1) the pilot project's POE devices are larger (4 cubic feet) vs. what is costed in the Cost Assessment Model (2) The pilot project costs reflect high county-specific costs that will be accounted for by the Model's regional cost multipliers. (3) The costs from this project are high because it is a pilot project and therefore does not accurately represent market prices.

The State Water Board will continue to collect cost data from this project and others as they are implemented. Cost data will be compared to other available market data to update future iterations of the Cost Assessment Model.

*"**More piloting of decentralized treatment on state small water systems and private domestic wells is needed to set standards to protect public health and better estimate actual costs**. As we indicated in our December 8, 2022, comments on the Board's Draft POU/POE Treatment Report, more comprehensive and well-documented pilot projects are needed in order to better understand the costs and feasibility of reliably implementing decentralized treatment for state small water systems and private domestic wells. We encourage the Board to continue to fund such pilots with the goal of setting standards and metrics for operation and monitoring of decentralized treatment for state smalls and private domestic wells to provide a degree of public health protection equal to that provided by centralized treatment in public water systems."*

State Water Board Response: The State Water Board's work on POU/POE for state small water systems and private domestic wells has largely been through coordination with Regional Board programs which require the provision of safe water to these users. The State Water Board has been working with several of these programs (CV SALTS, Irrigated Agriculture) to provide both funding and technical guidance where appropriate. As these programs ramp up, the State Water Board will use the data gathered from them to inform other state-wide efforts. The State Water Board has also coordinated with some of the groups implementing these solutions to better understand the costs associated with POU/POE to incorporate into the proposed updated Cost Assessment Model.