CALIFORNIA
Water Boards

SUPPLEMENTAL APPENDIX:
ADDITIONAL LONG-TERM MODELED SOLUTIONS COST ESTIMATE METHODOLOGY

LAST UPDATED: JUNE 2024

This supplemental appendix is related to the Drinking Water Needs Assessment's Cost Assessment Component. Learn more here: [Appendix: Cost Assessment Methodology.]

CONTENTS

INTRODUCTION

The Drinking Water Needs Assessment's Cost Assessment methodology utilizes a model to estimate the financial costs of both necessary interim measures and longer-term solutions to bring Failing list systems into compliance and address the challenges faced by high-risk state small water systems and domestic wells as identified via the Risk Assessment. The goal of the Cost Assessment is to inform the prioritization of the spending of existing funding sources, particularly via the SB 200-mandated annual *Safe and Affordable Drinking Water Fund Expenditure Plan*, as well as to identify potential additional funding sources to leverage, and to estimate the size of the current funding gap to continue to advance the Human Right to Water for all Californians.

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 long-term 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. This appendix includes an in-depth overview of which systems are assessed per modeled need and the underlying cost assumptions.

Figure 1: Identification of Additional Long-Term Needs for Failing & At-Risk Public Water Systems

It is important to note that the Cost Assessment is not intended to identify actual community solutions. The purpose of the Cost Assessment is to estimate drinking water costs to provide safe, potable, and wholesome drinking water. An evaluation of each system will be needed to identify and cost a range of solutions.

ADDITIONAL LONG-TERM NEEDS METHODOLOGY DEVELOPMENT

The Cost Assessment Model's development and enhancement process is designed to encourage public and stakeholder participation, providing opportunities for feedback and recommendations. The additional long-term needs analysis included in the Cost Assessment Model has gone through two iterations, incorporating feedback from 16 public workshops. The first additional long-term needs analysis was conducted for the 2021 Drinking Water Needs Assessment. The second iteration of the additional long-term needs analysis was updated and enhanced for the 2024 Drinking Water Needs Assessment. The following sections provide an overview of the work.

VERSION 1.0 (2021)

The first iteration of the additional long-term needs analysis was conducted for the *2021 Drinking Water Needs Assessment.* It was developed by the State Water Board, in partnership with the University of California, Los Angeles Luskin Center for Innovation, Corona Environmental Consulting, and Sacramento State University Office of Water Programs. Three public workshops were hosted to solicit public feedback on the Cost Assessment's methodology and underlying cost assumptions:

May 10, 2019: *Cost Analysis Workshop*

- Public Notice
- Agenda
- Webcast Recording
- Consolidation-Related Presentation PDFs:
  - SWRCB DDW, D. Polhemus
  - Corona Environmental Consulting, T. Henrie
  - UCLA, Y. Cohen
  - Los Angeles County Sativa, D. Lafferty

August 28, 2020: *Cost Estimate: Overview of Approach and Update*

- Public Notice
- White Paper
- Webinar Recording

November 20, 2020: *Cost Estimate: In-Depth Cost Methodology Discussion Webinar*

- Public Notices: English | Spanish
- White Paper
- Presentation
- Webinar Recording

In addition to the public feedback solicited during the workshops, the State Water Board received a handful of comment letters throughout this effort and some adjustments to the Cost Assessment methodology were made as a result. Additional details that were requested in the comment letters were added to the 2021 Cost Assessment Methodology Appendix.[1]

More information can be found on the State Water Board's Drinking Water Needs Assessment website.[2]

VERSION 2.0 (2024)

From 2022 – 2023, the State Water Board hosted a series of four webinar workshops to solicit stakeholder feedback on updates and enhancements to the Cost Assessment Model. The workshop dates and corresponding white papers, presentations, and webinar recording are

[1] 2021 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf.

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

provided below. The fourth workshop was solely focused on the proposed updates to the additional long-term needs analysis.

August 8, 2022: *Proposed Changes for the Cost Assessment*

- Public Notices: English | Spanish
- White Paper
- Presentation
- Webinar Recording

July 14, 2023: *Proposed Updates to the Drinking Water Cost Assessment Model – Workshop 1: Physical Consolidation Analysis*

- Public Notices: English | Spanish
- White Paper
- Presentation
- Webinar Recording

October 5, 2023: *Proposed Updates to the Drinking Water Cost Assessment Model – Workshop 2: Modeled Treatment Analysis*

- Public Notice: English | Spanish
- White Paper
- Presentation
- Webinar Recording

December 20, 2023: *Proposed Updates to the Drinking Water Cost Assessment Model – Workshop 3: Other Essential Infrastructure, Administrative Needs, and Interim Solutions*

- Public Notice: English | Spanish
- White Paper
- Presentation
- Webinar Recording

Below is a brief summary of the changes made to the additional long-term needs analysis compared to the methodology used in the 2021 Cost Assessment:

- 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 2021 Cost Assessment 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.

The following sections in this supplemental appendix detail the current additional long-term needs analysis methodology and cost assumptions.

SUMMARY OF CURRENT ADDITIONAL LONG-TERM MODELED SOLUTIONS ANALYSIS METHODOLOGY

A core component of the Cost Assessment Model is the selection and cost estimation of additional long-term needs for Failing public water systems, At-Risk public water systems, and high-risk state small water systems and domestic wells. Additional long-term needs are considered for all systems included in the Cost Assessment.

The following is a summary of the steps taken by the Cost Assessment Model to conduct the additional long-term needs analysis:

> **STEP 1**: Match System Challenges to Modeled Additional Long-Term Solutions (beyond or in addition to modeled physical consolidation and/or modeled treatment).
>
> **STEP 2**: Calculate Estimated Additional Long-Term Solution Capital Costs
>
> **STEP 3**: Add Additional Long-Term Solution Costs to Other Model-Selected Long-Term Solution Costs (i.e. physical consolidation and/or treatment)

The following sections and corresponding appendices provide a detailed guide for how the additional long-term solution analysis is conducted within the Cost Assessment Model.

ADDITIONAL LONG-TERM MODELED SOLUTION ANALYSIS METHODOLOGY

STEP 1: MATCH SYSTEM CHALLENGES TO MODELED ADDITIONAL LONG-TERM SOLUTIONS

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 long-term modeled solutions and to enhance system sustainability. The Cost Assessment Model assesses the needs for other essential infrastructure (OEI), technical and administrative assistance.

> **Other Essential Infrastructure**: 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. These other essential infrastructure (OEI) needs are estimated to ensure the Cost Assessment Model’s output is more holistic in estimating how much it may cost to ensure the water system is more sustainable and resilient. In the Cost Assessment Model, OEI needs are estimated based on system and location-specific information. Many of the Cost

Assessment Model's OEI solutions align with the SB 552 drought resiliency infrastructure requirements.[3]

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.[4] In September 2019 (revised in 2023), the State Water Board adopted an Administrator Policy Handbook[5] to provide direction regarding the appointment of administrators by the State Water Board of designated water systems.

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.

Table 1: Public Water Systems Assessed for Additional Long-Term Solutions

Modeled Long-Term Solution	Systems Included
Other Essential Infrastructure (OEI)	All Failing and At-Risk public water systems; except those that are modeled as *Joining* systems in the physical consolidation analysis.[6]
Service Connection Meters	• Systems without 100% metered service connections.
Back-Up Electrical Supply	• Systems that do not currently have back-up power for their sources.
Sounder to Measure Static Well Levels	• Systems that do not currently have access to a device that will allow them to measure their well's groundwater level.
Additional Storage	• Systems that need additional storage.

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

[4] Administrator webpage https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/administrator.html

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

[6] *Joining* systems in the physical consolidation analysis with un-metered service connections were included in the OEI analysis, since meters are essential for consolidation projects.

Modeled Long-Term Solution	Systems Included
SCADA & Electrical Upgrades	• Incorporated into cost estimates for additional storage.
New Public Supply Well	• Systems with only one active well • Systems that have an active well that is nearing the end of its useful life.
Well Pump & Motor	• Incorporated into cost estimates for new public wells and replacement public wells.
SCADA & Electrical Upgrades	• Incorporated into cost estimates for new public wells and replacement public wells.
Technical Assistance	• Failing and At-Risk systems with less than 3,300 service connections; and • Disadvantage community status (DAC or SDAC).
Administrator Assistance	• Failing systems with less than 500 service connections and At-Risk systems with less than 200 service connections; and • Disadvantage community status (DAC or SDAC); and • "High" Technical Managerial and Financial (TMF) Capacity Category risk score in the Risk Assessment.[7]

STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

The Cost Assessment Model identifies possible long-term solutions for state small water systems and domestic wells that are high-risk in the Risk Assessment's *Water Quality* and/or *Water Shortage* categories. The 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 Cost Assessment Model assesses decentralized treatment for state small water systems and domestic wells refer to Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology.[8]

Disadvantaged communities (DAC) served by state small water systems and domestic wells that have decentralized treatment modeled as their long-term and/or interim solution will be assessed for technical assistance. For purposes of the Cost Assessment Model, technical assistance captures funding needs associated with community outreach and education on decentralized treatment.

[7] Appendix: Risk Assessment Public Water System Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024risk-assessment-pws-methodolgy.pdf

[8] Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-decentralized-treatment.pdf

The Cost Assessment Model will develop a cost estimate for long-term bottled water reliance for state small water systems and domestic wells that are high-risk in the *Water Quality* category of the Risk Assessment and where modeled physical consolidation and modeled decentralized treatment is not a viable modeled solution. 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 state small water systems and domestic wells that are high-risk in the *Water Shortage* category of the Risk Assessment, and where physical consolidation is not viable, the Cost Assessment Model includes a cost estimate for constructing a new private well.

Table 2: State Small Water Systems & Domestic Wells Assessed for Additional Long-Term Solutions

Modeled Long-Term Solution	Systems Included
New Private Well	• Locations that are high-risk in the Risk Assessment's *Water Shortage* category; and • Modeled physical consolidation is not viable.
Bottled Water	• Locations that are high-risk in the Risk Assessment's *Water Quality* category; and • Modeled decentralized treatment is not viable.
Technical Assistance	• Locations that are high-risk in the Risk Assessment's *Water Quality* category; and • Modeled decentralized treatment is a modeled long-term and/or interim solution; and • The community served is DAC/SDAC.

STEP 2: CALCULATE ESTIMATED ADDITIONAL LONG-TERM SOLUTION CAPITAL COSTS

The Cost Assessment Model utilizes a set of assumptions to develop estimates for additional long-term solution capital and operational costs. The Cost Assessment Model's underlying cost assumptions were updated in 2023 to reflect current market values. The cost assumptions were derived from extensive internal and external outreach:

- Reviewed 2021 Cost Assessment Model documentation.
- Consulted with vendors and consulting firms.
- Reviewed State Water Board funding projects.
- Reviewed U.S. EPA Work Breakdown Structure (WBS) Models.
- Reached out to water systems to collect and confirm cost data.
- Consulted with an internal workgroup of Division of Drinking Water engineers and Division of Financial Assistance staff.
- Solicited public feedback and recommendation through public webinar workshops.

Learn more in the white paper *Proposed Updates to the Drinking Water Cost Assessment Model: Other Essential Infrastructure, Admin Needs, and Interim Solutions*.[9]

It is worth noting that the Cost Assessment Model utilizes estimated Maximum Daily Demand (MDD), rather than Average Daily Demand (ADD) in calculating estimated capital costs. MDD allows the Cost Assessment Model to accommodate or "size" modeled treatment technologies for potential population increases or account for any seasonal supply variances. The calculation methodology is detailed in Appendix: Cost Assessment Methodology.[10]

The Cost Assessment Model's OEI, capital costs are adjusted using several multipliers, refer to Appendix A for additional details.

Table 3: OEI Capital Cost Adjustments

Multiplier	Adjustment Purpose	Applicable OEI Items
Regional Multiplier	Account for price differences between rural, suburban, and urban areas.	Meters, back-up power, sounder, storage tank
Inflation	Account for rising prices.	Meters, back-up power, sounder, storage tank
Electrical	Account for electrical wiring fees.	Back-up power, storage tank.
Planning & Construction	Account for a wide array of indirect capital costs.	Storage tank.
Engineering Services	Account for design services.	Meters, storage tank.
Contingency	Account for construction contingency.	Meters, back-up power, storage tank.
Overhead	Account for expenses for the contractor's labor and business overhead costs.	Storage tank.
Permitting / Environmental	Account for CEQA and/or permitting fees.	Meters, back-up power, storage tank.

The Cost Assessment Model's new public supply well capital costs were adjusted using several multipliers as summarized Table 4. Refer to Appendix A for additional details.

Table 4: Capital Cost Adjustments for New Public Supply Well

Multiplier	Adjustment Purpose
Regional Multiplier	Account for price differences between rural, suburban, and urban areas.

[9] Proposed Updates to the Drinking Water Cost Assessment Model: Other Essential Infrastructure, Admin Needs, and Interim Solutions
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/2023-cost-assessment-model-workshop-3-white-paper.pdf
[10] Appendix: Cost Assessment Methodology
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-methodology.pdf

Multiplier	Adjustment Purpose
Inflation	Account for rising prices.
Electrical	Account for electrical wiring fees.
Planning & Construction	Account for a wide array of indirect capital costs.
Engineering Services	Account for design services.
Contingency	Account for construction contingency.
Overhead	Account for expenses for the contractor's labor and business overhead costs.
Permitting / Environmental	Account for CEQA and/or permitting fees.

For state small water systems and domestic wells that are high-risk in the *Water Shortage* and where the long-term solution in the Cost Assessment Model includes constructing a new private well, then the estimated new private well costs were adjusted using three multipliers, as summarized in Table 5. Refer Appendix B for additional details.

Table 5: Capital Cost Adjustments for New Private Well (State Small Water Systems and Domestic Wells)

Multiplier	Adjustment Purpose
Regional Multiplier	Account for price differences between rural, suburban, and urban areas.
Inflation	Account for rising prices.
Electrical	Account for electrical wiring fees.

STEP 3: ADD ADDITIONAL LONG-TERM SOLUTION COSTS TO OTHER MODEL-SELECTED LONG-TERM SOLUTION COSTS

The Cost Assessment Model assesses whether other long-term and interim solutions may be modeled for Failing public water systems, At-Risk public water systems, high-risk state small water systems, and high-risk domestic wells. These other modeled solutions are documented in the following supplemental Appendices:

- Supplemental Appendix: Physical Consolidation Cost Estimate Methodology
- Supplemental Appendix: Centralized Treatment Cost Estimate Methodology
- Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology
- Supplemental Appendix: Interim Solutions Cost Estimate Methodology

The Cost Assessment Model will add the estimate capital and operational costs from the additional long-term solutions analysis to any other estimated costs derived for that system or location. These final cost estimates are then used to illustrate the results of the Needs Assessment's Cost Assessment results.

APPENDIX A: 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's sustainability. The Cost Assessment Model assesses the needs for other essential infrastructure (OEI), new public supply well, technical and Administrator assistance.

OTHER ESSENTIAL INFRASTRUCTURE (OEI)

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 support SB 552 planning and implementation, and to focus on addressing aging drought-related infrastructure issues, the State Water Board aligned the Cost Assessment Model's OEI needs with SB 552 requirements. OEI includes some of the SB 552-specific infrastructure requirements and those include:

- Metering all un-metered service connections.
- Backup power to ensure continuous operation during power failure.
- Sounder device to measure static well levels.

Additional OEI components included in the Cost Assessment include:

- Additional Storage
- SCADA & Electrical Upgrades (for additional storage)

SYSTEMS ASSESSED FOR OTHER ESSENTIAL INFRASTRUCTURE

Cost Assessment Model assesses OEI needs based on system and location-specific information. Water system data pulled from the State Water Board's database of water system facility information[11] and data reported to the State from the Electronic Annual Report (eAR) is

[11] Safe Drinking Water Information System (SDWIS)

utilized to determine which Failing and At-Risk public water system should be assessed for each OEI component.

Failing and At-Risk public water systems that have modeled physical consolidation as their long-term solution, that are identified as *Joining* water systems, will be excluded[12] 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.

High-risk state small water systems and domestic wells are also excluded from the OEI analysis. Not enough information is available to assess additional infrastructure needs beyond treatment and/or replacement wells.

Table 6: Other Essential Infrastructure (OEI) Components

Components	Systems Included
Service Connection Meters	• Failing and At-Risk systems without 100% metered service connections.
Back-Up Power	• Failing and At-Risk systems that do not currently have back-up power for their sources.
Sounder to Measure Static Well Levels	• Failing and At-Risk systems that do not currently have access to a device that will allow them to measure their well's groundwater level.
Additional Storage	• Failing and At-Risk systems that need additional storage.
SCADA & Electrical Upgrades	• Incorporated into cost estimates for storage tanks.

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.

Systems Assessed for Meters

The inventory of systems lacking meters for some, or all of their service connections is identified in the Cost Assessment Model 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 Cost Assessment Model estimates the cost of installing new meters using component cost estimates for 1" meters and equipment/software upgrades. The 1" meters are assumed to be

[12] Metering un-metered service connections is the only OEI item that was modeled for all systems regardless of their modeled consolidation results.

“drive-by” meters, which allows the meter reader to drive by and take an automated reading, as opposed to a manual reading.

The Cost Assessment Model assumes a one-time estimated equipment and software upgrade cost of $29,000 plus $$1,200 per new meter installed at each service connection. These cost assumptions were developed using vendor and State Water Board funded project quotes.

Table 7: Meter Cost Assumptions

Cost Element	Cost Estimate
Components	
Equipment & Software	$29,000[13]
1” Meters (drive by)	$1,200[14]
Cost Adjustments	
Engineering	8%[15]
Contingency	10%[16]
Environmental & Permitting	$4,000[17]
Inflation	3.1%
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties

Equation 1: Water Meters

Total Cost Estimate ($) = $29,000 + $1,200 + Regional Multiplier + 8% Total Cost Engineering +10% Total Cost Contingency + $4,000+ 3.1% Total Cost Inflation

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

[13] 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

[14] $1,200 quote was derived from public feedback and vendor recommendations and pricing from the 2022 Drought Infrastructure Cost Assessment. $1,049 quote from State Water Board funded project: 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.

[15] City of Williams- water meter replacement project (2016). Engineering services cost accounts for preliminary engineering report, construction and post constriction phase services, and preliminary and final design phase services.

[16] City of Williams- water meter replacement project (2016). Contingency cost accounts for general construction contingency

[17] [17] Based on reviewing internally funded projects for meter installation, it was noted that these types of projects are likely to require filling for CEQA Categorical Exemption/Environmental impact report. Based on California Department of Fish and Wildlife the filing fees cost as of 2024 is $4,051.25. https://wildlife.ca.gov/Conservation/Environmental-Review/CEQA/Fees.

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[18] 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

The Cost Assessment Model utilizes a regression equation to estimate backup electrical supply costs. This equation was developed for the 2021 Cost Assessment.[19] The original equation was based on gathered quotes from external vendors. In 2023, State Water Board staff conducted a review of State Water Board funded projects to validate the 2021 Cost Assessment Model assumptions. The quotes from the State Water Board projects closely aligned with the regression formula's outputs.

Table 8: Backup Electrical Supply Cost Assumptions

Cost Element	Cost Estimate
Components	
Generator	$30,134 + ($341 x MDD)[20]
Cost Adjustments	
Inflation	3.1%
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties
Permitting	5%[21]

[18] This question was optional in the 2022 eAR reporting period.
[19] 2021 Drinking Water Needs Assessment (p. 269) https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf
[20] This equation was developed by Corona Environmental and utilized in the 2021 Cost Assessment Model. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=235&zoom=100,69,96
[21] This cost was developed for the Drought Infrastructure Cost Assessment Final results, based on public and external feedback. This cost covers air pollution permitting fees. 2022 Drinking Water Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf.

Cost Element	Cost Estimate
Electrical	5%[22]
Contingency	25%[23]

Equation 2: Backup Electrical Supply
Total Cost Estimate ($)[24] = $30,134 + ($341 x MDD[25]) + Regional Multiplier + 5% Total Cost Permitting + 3.1% Total Cost Inflation + 5% Total Cost Electrical + 25% Total Cost Contingency

Table 9: Backup Electrical Supply Cost Estimates by Flow Ranges

Size (kW)	Flow Rate Range (gpm)	Cost Equation Average Estimate	State Water Board Funded Project Quotes
5 - 30	18 - 110	$67,000	
31- 50	111 - 180	$105,000	
51- 60	181 - 216	$117,000	$91,000[26] (2023)
61 - 75	217 - 270	$141,000	
76 - 100	271 - 365	$165,000	$175,000[27] (2023)
101 - 200	366 - 730	$228,000	$185,500[28] (2023)

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

[22] This percentage is derived from a Lime Saddle Marina emergency generators project (2023). The percentage is based on an average of the electoral costs associated with the installation of three generators: lake intake (4.5%), water treatment plant (3.75%), mid-zone pump station (5.6%). The electrical cost includes generator accessories power, and conduit/conductor entrance.
[23] Total project contingency, Lime Saddle Marina emergency generators 2023.
[24] This equation was developed by Corona Environmental to estimate backup power cost in the 2021 Drinking Water Needs Assessment.
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf
[25] 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.
[26] North Folk Implementation Plan (2023). The generator is 60kW, 240V, 3-phase and includes cost for MTS. The total project cost is $138,700.
[27] 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.
[28] Fall River Valley Implementation Plan (2023). The generator is 200kW, 277/480V, 3-phase and the total cost is $446,406.

waves for the Cost Assessment Model. This would eliminate the need to account for wellhead adjustment costs in the Cost Assessment Model.[29]

Systems Assessed for a Sounder

The 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[30] (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.

Cost Assumptions for a Sounder

The Cost Assessment Model assumes a flat one-time cost of $1,853 for a sounder. This sounder cost estimate was derived in 2023 from analyzing four external quotes.[31]

Table 10: Sounder Device Cost Assumptions

Cost Element	Cost Estimate
Components	
Sounder device	$1,853[32]
Cost Adjustments	
Inflation	3.1%
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties

Equation 3: Sounder Device

Total Cost Estimate ($) = $1,853 + Regional Multiplier + 3.1% Total Cost Inflation

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[29] Sounder 2010 Pro:
https://www.geotechenv.com/Manuals/Eno_Scientific_Manuals/Eno_Scientific_Well_Sounder_2010_User_Manual.pdf
[30] The question was optional for 2022 eAR reporting period.
[31] $1,853 cost estimate for a sounder is based on the following external quotes collected in 2023:
$1,445 from Eno Scientific (Well Sounder 2010 Pro)
https://enoscientific.com/product/well-sounder-2010-pro/
$1,853 from Carbon Bulk Sales. 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
$699 - $3,597 from YSI for a WL500 Water Level Sounder with 100 ft tap.
https://www.ysi.com/wl500
$1,646 from Carbon Bulk Sales (Solonist Model 104 Sonic Water Level Meter)
https://carbonbulksales.com/products/solinst-model-104-sonic-water-level-meter
[32] $1,853 from Carbon Bulk Sales. 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

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 water 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 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 Cost Assessment Model estimates storage tank costs utilizing the cost components summarized in Table 11.

Table 11: Additional Storage Cost Assumptions

Cost Element	Cost Estimate
Components	
Storage Tank	$70,000 - $19 M[33]
SCADA	$73,403[34]
Booster Pump	($38,000 - $8.7 M)[35]
CEQA	$85,000[36]
Cost Adjustments	
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties
Inflation	3.1%
Contingency	15%[37]

[33] Cost is based on a regression equation that maps tanks of different sizes ranging from 5,000 gallon- 1,000,000 million gallons.
[34] California SCADA Services (2023). Total cost includes a 10% contingency.
[35] Based on a regression equation applied to all water systems requiring storage tank regardless of their storage volume.
[36] This cost was developed by Corona Environmental and utilized in the 2021 Cost Assessment Model. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=235&zoom=100,69,96.
[37] This percentage is derived from a Golden State Water Company - water system project (2023). This percentage covers general construction contingency.

Cost Element	Cost Estimate
Planning & Construction	10%[38]
Engineering Services	15%[39]
Overhead	10%[40]
Upgraded Electrical per Site	20%[41]

STORAGE TANK

The Cost Assessment Model utilizes a regression equation to estimate the cost for a new storage tank using estimated MDD for each system included in the analysis. The regression equation was developed using two data sources: external quotes collected in 2023[42] covering smaller size tanks, and quotes gathered for the 2021 covering larger tank sizes.

Equation 4: Storage Tank

Total Cost Estimate ($) = [(1.2501) (GPD[43]) + $69,752][44] + $73,403 + $85,000 + Booster Pump + Regional Multiplier + 3.1% Total Cost Inflation + 15% Total Cost Contingency + 10% Total Cost Planning & Construction + 15% Total Cost Engineering Services + 10% Total Cost Overhead + 20% Total Cost Electrical

UPGRADED ELECTRICAL FOR NEW STORAGE TANK

The Cost Assessment Model assumes a 20% for upgrading electrical infrastructure per site. This cost estimate was developed based on reviewing internally funded projects. Electrical upgrades cost can cover the costs associated with electrical equipment, instrumentation, conduits, duct banks, wiring, grounding, programming configuration and testing, commissioning, systems testing, and startup costs.

SCADA FOR NEW STORAGE TANK

SCADA is necessary to monitor and control tank level to ensure a consistent supply at uninterrupted pressure. The Cost Assessment Model assumes a flat cost for upgrading SCADA at $73,403 per site. This cost estimate was updated in 2023 using a quote from an external California vendor.[45]

BOOSTER PUMP

[38] This percentage is derived from a Golden State Water Company - water system project (2023). Planning and construction cost covers construction inspection and management.
[39] This percentage is derived from a Golden State Water Company - water system project (2023), engineering services cover project design fees.
[40] This percentage is derived from a Golden State Water Company - water system project (2023), it covers contractor's overhead and profit.
[41] This percentage is derived from a Golden State Water Company – water system project (2023). The electrical cost includes electrical equipment, instrumentation, conduits, duct banks, wiring, grounding, programming configuration and testing, commissioning, systems testing, and startup costs.
[42] $25,000 - $110,000 from National Storage Tank (2023). Tank sizes range from 5,000 to 50,000 gallons.
[43] Required storage in gallons per day (GPD).
[44] The output cost of this equations is the base storage tank cost.
[45] California SCADA Services (2023). Total cost includes a 10% contingency.

The Cost Assessment Model utilizes a regression equation based on vendor-provided quotes to estimate a new booster pump cost using estimated MDD. The quotes utilized to develop the regression equation are based on the research conducted for the 2021 Cost Assessment.[46]

Equation 5: Booster Pump Cost Estimate
(135.18) (MDD) + $37,725

NEW PUBILC SUPPLY WELL

Water systems dependent on a single source to meet their MDD, need to have another source to provide emergency supply and ensure system redundancy during an emergency. Reliance on a single source to meet customer demand is an accessibility risk for a water system. The water system is at a higher risk of failure if its single source becomes contaminated, dry, collapses, or is taken out of service (i.e., for maintenance, etc.). SB 552 requires small water systems to construct a back-up source if they rely on a single source. Therefore, the Cost Assessment Model includes a new well for systems reliant on a single source.

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 that 46% of Failing system's wells needed to be replaced due to old age.[47] Therefore, the Cost Assessment Model also assessed systems for a replacement well if their current active well is at or near the end of its estimated useful life.

SYSTEMS ASSESSED FOR A NEW PUBLIC SUPPLY WELL

The Failing and At-Risk public water systems assessed for a new and/or a replacement public supply well are 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 are included in the cost estimate.

- Identified water systems with at least one active well. Systems with one active well are modeled for an additional back-up well.
- Using historical water quality data, the State Water Board identifies water systems with active wells with water quality sample results older than 25 years. The Cost Assessment Model assumes these wells are either nearing or past their useful life and need to be replaced. These public supply wells are modeled for replacement in the Cost Assessment Model.

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[46] 2021 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf.
[47] 2021 Drinking Water Needs Assessment (p. 264)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

COST ASSUMPTIONS FOR A NEW PUBLIC SUPPLY WELL

The Cost Assessment Model assumes the new public supply well is 1,000 feet deep and 12 inches wide. These cost assumptions were developed in 2023-2024 through extensive internal review of State Water Board funded projects and outreach to public water systems that have constructed public supply wells between 2022-2023. State Water Board staff collected several itemized public supply wells quotes. After internal discussion with expert staff, the State Water Board developed new public supply well cost assumptions. Table 12 summarizes the cost assumptions utilized to develop new public supply well cost.

Table 12: Summary of New Public Supply Well (1,000 ft) Cost Assumptions

Cost Elements	Cost Estimate
Components	
Well Drilling	$900,000[48]
SCADA	$73,403[49]
Well Pump and Motor	$226,500[50]
Well Development Cost	$36,000[51]
Initial Water Quality Sampling	$3,030[52]
Well Permitting	2021 County Permitting Data
Cost Adjustments	
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties
Inflation	3.1%
Contingency	15%[53]
Planning & Construction	10%[54]
Engineering Services	15%[55]
Overhead	10%[56]

[48] Well Drilling cost quote from California American Water. Cost is reflective of a large utility municipal well site, for 12" and 1000 ft depth well.
[49] California SCADA Services (2023). Total cost includes a 10% contingency.
[50] Caruthers community services district (2021), cost includes well pump test, well pump foundation, pump bowls, pump motor, column pipe and shaft, discharge head pipe manifold valves, and VFD installation.
[51] San Gabriel Valley, well development including swabbing, bailing, pumping and consolidation of gravel pack.
[52] BSK Lab, original quote was $3,390, based on internal feedback gross beta, strontium, and tritium costs were removed.
[53] This percentage is derived from a Golden State Water Company - water system project (2023). This percentage covers general construction contingency.
[54] This percentage is derived from a Golden State Water Company - water system project (2023). Planning and construction cost covers construction inspection and management.
[55] This percentage is derived from a Golden State Water Company - water system project (2023), engineering services cover project design fees.
[56] This percentage is derived from a Golden State Water Company - water system project (2023), it covers contractor's overhead and profit.

Cost Elements	Cost Estimate
Upgraded Electrical per Site	20%[57]

Equation 6: New Public Supply Well

Total Cost Estimate ($) = $900,000 + $73,403 + $226,500 + $36,000 + $3,030 + County Permitting Cost + Regional Multiplier + 3.1% Total Cost Inflation + 15% Total Cost Contingency + 10% Total Cost Planning & Construction + 15% Total Cost Engineering Services + 10% Total Cost Overhead + 20% Total Cost Electrical

PUBLIC SUPPLY WELL DRILLING

The Cost Assessment Model assumes the cost for drilling a 1,000 ft well is $900,000.[58] This cost assumption was developed in 2023-2024 through extensive internal review of State Water Board funded projects and outreach to public water systems that have constructed public supply wells from 2022-2023. State Water Board staff collected several quotes representing wells of different sizes and depths, the drilling cost for these quotes ranged from $309,820[59]-. $3,000,000.[60] These quotes were used to develop the cost estimate. The State Water Board determined $900,000 was the most appropriate well drilling cost estimate to include in the Cost Assessment Model because it was more closely aligned with the quotes for wells with a similar size and depth that the Cost Assessment Model is modeling for.

UPGRADED ELECTRICAL PER SITE

The Cost Assessment Model assumes a 20%[61] for upgrading electrical infrastructure per site. This cost estimate was developed based on reviewing internally funded projects. Electrical upgrades cost can cover the costs associated with electrical equipment, instrumentation, conduits, duct banks, wiring, grounding, programming configuration and testing, commissioning, systems testing, and startup costs.

SCADA FOR NEW PUBLIC SUPPLY WELL

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 Cost Assessment Model assumes a flat cost for upgrading SCADA at $73,403 per site. This cost estimate was updated in 2023 using a quote from an external California vendor.[62]

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[57] This percentage is derived from a Golden State Water Company – water system project (2023). The electrical cost includes electrical equipment, instrumentation, conduits, duct banks, wiring, grounding, programming configuration and testing, commissioning, systems testing, and startup costs.
[58] Well Drilling cost quote from California American Water. Cost is reflective of a large utility municipal well site, for 12" and 1000 ft depth well.
[59] 6"diameter. PVC cased well to a depth of 1000' in Santa Cruz County, cost includes permit, hole test, seal, and casing.
[60] New public well supply quote (Engineering consultant) for a 1000 ft well drilling cost (drilling and casing). Cost can vary depending on material, region, labor cost but can range between (100-300) $/ft.
[61] This percentage is derived from a Golden State Water Company – water system project (2023). The electrical cost includes electrical equipment, instrumentation, conduits, duct banks, wiring, grounding, programming configuration and testing, commissioning, systems testing, and startup costs.
[62] California SCADA Services (2023). Total cost includes a 10% contingency.

WELL PUMP AND MOTOR

After a well is installed, a pump is required to lift the water and push it from underground to the designated location (storage tank, pressure tank, distribution system). There are several types of pumps and choosing the right pump should be based on site-specific information, such as: well depth, well diameter, and overall site conditions.

For the Preliminary 2023 Cost Assessment,[63] the State Water Board used a regression equation originally developed by Corona Environmental[64] for the 2021 Cost Assessment Model. However, based on internal feedback recommendations to update cost assumptions using the most up-to-date available data, the State Water Board updated well pumps and motors to $226,500[65] per well site. The cost included a pump test, foundation, bowles, motor, column pipe and shaft, discharge head pipe manifold valves, and variable frequency drive (VFD) installation.

PUBLIC SUPPLY 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 Preliminary 2023 Cost Assessment,[66] the State Water Board utilized a regression equation originally developed by Corona Environmental for the 2021 Cost Assessment Model[67]. However, based on internal feedback and recommendations to update new well cost assumptions using the most up-to-date available data, the State Water Board updated well development cost to $36,000[68] per well site. The cost included swabbing, bailing, pumping and consolidation of gravel pack.

WATER QUALITY SAMPLING

Water quality testing is often required to satisfy new public supply well permitting requirements. It is important to know what contaminants may need to be removed through treatment. State Water Board staff conducted external outreach to accredited California labs to collect analytical costs for regulated drinking water contaminants. The sampling cost for individual contaminants

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[63] Proposed Updates to the Drinking Water Cost Assessment Model: Other Essential Infrastructure, Admin Needs, and Interim Solutions:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/2023-cost-assessment-model-workshop-3-white-paper.pdf

[64] 2021 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[65] Caruthers community services district (2021), cost includes well pump test, well pump foundation, pump bowls, pump motor, column pipe and shaft, discharge head pipe manifold valves, and VFD installation.

[66] Proposed Updates to the Drinking Water Cost Assessment Model: Other Essential Infrastructure, Admin Needs, and Interim Solutions:
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/2023-cost-assessment-model-workshop-3-white-paper.pdf

[67] 2021 Drinking Water Needs Assessment
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

[68] San Gabriel Valley, well development including swabbing, bailing, pumping and consolidation of gravel pack.

were summed to develop the cost estimate for initial water quality sampling needed for a new public supply well. After reviewing the quotes summarized in Table 13 and assessing the included contaminants along with their analysis methodology, State Water Board utilized the quote from BSK, since it captures most regulated drinking water contaminants. The quote was adjusted by removing the cost associated with analyzing gross beta, strontium, and tritium. The Cost Assessment Model assumes a flat cost of $3,030 per well site for the initial water quality lab sampling cost.

Table 13: Summary of Initial Water Quality Sampling Cost Quotes

Lab	Quote (2024)
Babcock	$6,475
Chemtech	$3,000 - $4,500
Eurofins	$2,885
Caltest	$5,232
BSK	$3,030

PUBLIC SUPPLY WELL PERMITTING

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. Well permitting costs range from $90 - $5,900. The Cost Assessment Model utilizes the cost per county for each new public supply well as summarized in Table 14.

Table 14: Well Permitting Cost Per County

County	Well Permitting Cost
Alameda	$794
Alpine	$512
Amadro	$450
Butte	$593
Calaveras	$935
Colusa	$532
Contra Costa	$1,383
Del Norte	$150
El Dorado	$771
Fresno	$1,287
Glenn	$575
Humboldt	$522

County	Well Permitting Cost
Imperial	$3,776
Inyo	$512
Kern	$2,320
Kings	$550
Lake	$422
Lassen	$339
Los Angeles	$3,209
Madera	$1,065
Marin	$2,846
Mariposa	$248
Mendocino	$772
Merced	$894
Modoc	$90
Mono	$648
Monterey	$4,344
Napa	$546
Nevada	$1,086
Orange	$738
Placer	$1,450
Plumas	$514
Riverside	$719
Sacramento	$1,086
San Benito	$1,348
San Bernadino	$906
San Diego	$970
San Francisco[69]	MISSING
San Joaquin	$966
San Luis Obispo	$1,196
San Mateo	$5,939
Santa Barbara	$1,482
Santa Clara	$3,034
Santa Cruz	$2,441
Shasta	$650
Sierra	$747
Siskiyou	$545
Solano	$184

[69] The average permitting cost in urban counites was utilized as surrogate for missing well permitting cost in San Fransisco County. Average well permitting cost in urban counites is $2,356.

County	Well Permitting Cost
Sonoma	$987
Stanislaus	$615
Sutter	$1,062
Tehama	$241
Trinity	$240
Tulare	$447
Tuolumne	$1,298
Ventura	$1,535
Yolo	$1,322
Yuba	$857

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. 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 proactively 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. The Cost Assessment Model estimates technical assistance needs for small, disadvantages water systems. The Cost Assessment Model's criteria for determining which water systems may need technical assistance is based on the technical assistance eligibility criteria currently used by State Water Board technical assistance programs.

Table 15: Systems Assessed for Modeled Technical Assistance Needs

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

TECHNICAL ASSISTANCE COST ASSUMPTIONS & DURATION

The Cost Assessment Model estimates $85,000 per year for 5 years for all eligible Failing public water 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 estimates technical assistance at $22,000 per year for 2 years. These cost estimate assumptions were developed in 2023 after reviewing more than 50 recent technical assistance projects funded by the State Water Board.

Table 16: Technical Assistance Needs Cost and Duration Assumptions

System Type	Cost Estimate
Failing Systems – Physical Consolidation	$425,000 for 5 years
Failing Systems – No Physical Consolidation	$425,000 for 5 years
At-Risk Public Water Systems – Physical Consolidation	$425,000 for 5 years
At-Risk Public Water Systems – No Physical Consolidation	$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[70] to provide direction regarding the appointment of Administrators by the State Water Board for designated water systems. The Cost Assessment Mode utilizes the Handbook guidance to model Administrator assistance for small, disadvantaged Failing and At-Risk water systems with high technical, managerial, and financial risk scores in the Risk Assessment.

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

Table 17: Systems Assessed for Administrator Assistance

System Type	Included
Failing Systems	• 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	• 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.

ADMINISTRATOR ASSISTANCE COST ASSUMPTIONS

Since 2021, the State Water Board has initiated eight Administrator projects with appointments and funding (Table 18).[71] This information was used to develop the Administrator assistance cost assumptions and modeling criteria for the Cost Assessment Model. Since 2021, the average Administrator project costs $914,763 per system or $26,002 per service connection for two years of Assistance (Table 18).[72] Therefore, the Cost Assessment Model assumes Administrator assistance is $914,763 per system.

Table 18: 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	$2,325,909	$17,228
NorCal Water Works	07.26.2023	$1,166,558	$68,622
Sierra Vista Water Association	07.26.2023	$1,166,558	$89,736
AVERAGE:		**$914,763**	**$26,002**

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

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

APPENDIX B: ADDITIONAL LONG-TERM SOLUTIONS FOR HIGH-RISK STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

The Cost Assessment Model identifies possible long-term solutions for state small water systems and domestic wells that are high-risk in the Risk Assessment's *Water Quality* and/or *Water Shortage* categories. The 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 assesses whether decentralized treatment is a viable modeled long-term solution 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 state small water systems and domestic wells is available in Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology.[73]

If modeled decentralized treatment is not a viable solution, then the Cost Assessment Model will develop a cost estimate for long-term bottled water reliance for locations with high-risk in the *Water Quality* category of the Risk Assessment. 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 state small water systems and domestic wells that are high-risk in the *Water Shortage* category of the Risk Assessment, and where modeled physical consolidation is not viable, the Cost Assessment Model develops a cost estimate for constructing a new private well.

NEW PRIVATE WELL

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 were 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. In 2023-2024, the State Water Board incorporated the construction of a new private well as a possible modeled long-term solution for state small water systems with high *Water Shortage* risk in the Cost Assessment Model.

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[73] Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-decentralized-treatment.pdf

SYSTEMS ASSESSED FOR A NEW PRIVATE WELL

The State Water Board models a new private 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. Some state small water systems and domestic wells may be modeled for decentralized treatment or bottled water if they are also high-risk within the Risk Assessment's *Water Quality* category.

NEW PRIVATE WELL COST ESTIMATE ASSUMPTIONS

Private wells must be drilled by a licensed contractor and must meet applicable local and/or state well standards. In 2023-2024, the State Water Board developed estimated new private well cost components summarized in Table 19. 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.

For the purposes of the Cost Assessment Model, new private wells are assumed to be 500 feet deep with a diameter ranging between 4-6 inches. This depth is deeper than typical private wells because the Cost Assessment Model is modeling a new private well for high *Water Shortage* risk state small water systems and domestic wells. Typically, these areas require deeper wells in response to these drought and water shortage risk drivers.

Table 19: Summary of New Private Well Cost Assumptions (500 ft)

Cost Elements	Cost Estimate
Components	
Well Drilling	$65/ft[74]
Electrical Component & Control Box	$600[75]
Well Pump and Motor	Domestic Well: $830[76] State Small Water System: $1,120[77]
Water Sampling	$400[78]
Connection/Casing Pipe	$2,150[79]
Submersible Wire	$5/ft

[74] Local well drilling company pricing and recommendation for 500 ft depth.
[75] Local well drilling company pricing and recommendation.
[76] Franklin Electric-Submersible well pump, 0.5 HP, 10 gallons per minute for domestic wells use.
[77] Franklin Electric-Submersible well pump, 1.0 HP, 20 gallons per minute for state small water system wells use
[78] 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.
GAMA - Domestic Well Testing | California State Water Resources Control Board
https://www.waterboards.ca.gov/gama/domestic_wells_testing.html#:~:text=Basic%20sampling%20can%20cost%20from,a%20written%20estimate%20before%20sampling.
[79] Local well drilling company pricing and recommendation, cost ranges from $1,800-$2,500. The average cost is recommended.

Cost Elements	Cost Estimate
Pressurized Water Tank	$400[80]
Well Permitting	Included by County
Destroy Old Well	$3,300[81]
Additional Parts & Labor	$3,500[82]
Cost Adjustments	
Regional Multiplier	Rural (0%); Urban (+32%); Suburban (+30%) Counties
Inflation	3.1%

Equation 7: New Private Supply Well

Total Cost Estimate ($) = $32,500[83] + ($830 or $1,120) + $3,300 + $3,500 + $400 + $400+ $600 + $2,150 + $2,500[84]+ County Permitting Cost+ Regional Multiplier + 3.1% Total Cost Inflation

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 Model, 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.[85]

The Cost Assessment Model assumes a flat cost of $32,500 for drilling a 500 foot private well. This cost estimate was developed in 2023 after reviewing State Water Board funded project quotes[86] and external quotes.[87]

[80] 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
[81] Domestic well destruction costs gathered from Self Help Enterprises.
[82] Domestic well parts and labor costs gathered from Self Help Enterprises.
[83] Total well drilling cost ($65 x 500 ft)
[84] Total submersible wire cost ($5/ft x 500 ft)
[85] Well Standards https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Standards
[86] $31,250 (2023) – average cost for drilling private wells gathered from Self Help Enterprises, cost varies by driller.
[87] $32,500 (2023) – quote from Californian well drilling company. Quote is for a 500 ft private well with a drilling cost of $65 per foot.

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:

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

The Cost Assessment Model assumes $600 for a new private well's control box and its electrical component. This cost estimate was developed in 2023 through outreach to external private well drilling company in California.[88]

PRIVATE 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 incorporates a cost estimate for a submersible well pump for a new private well. The Cost Assessment Model assumes a 0.5 HP well pump and motor is needed for domestic wells and 1 HP for state small water system wells.

The Cost Assessment Model assumes a new private well pump and motor is $830[89] for domestic wells and $1,120[90] for state small water system private wells. These cost estimates were developed in 2023 using external vendor quotes.

PRIVATE WELL INITIAL WATER QUALITY SAMPLING

Water quality testing is often required to satisfy permitting requirements for a new private well and it is important to know what contaminant(s) are prevalent that may need to be removed

[88] Local well drilling company pricing and recommendation.
[89] Franklin Electric-Submersible well pump, 0.5 HP, 10 gallons per minute for domestic well use.
[90] Franklin Electric-Submersible well pump, 1.0 HP, 20 gallons per minute for state small water system wells use.

through treatment. The Cost Assessment Model assumes $400 for initial private well water quality sampling. This cost estimate was developed in 2023 through internal research.[91]

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. The Cost Assessment Model assumes $2,150 for the connection/casing pipe. This cost estimate was developed in 2023 by reviewing State Water Board funded projects and external quotes.[92]

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. The Cost Assessment Model assumes $400 for a private well pressurized water tank. This cost estimate was developed in 2023 using an external quote.[93]

PRIVATE 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 is used in the Cost Assessment Model. The county's permitting costs vary from $90 - $5,900.

Table 20: Well Permitting Cost Per County

County	Well Permitting Cost
Alameda	$794
Alpine	$512
Amadro	$450
Butte	$593
Calaveras	$935
Colusa	$532
Contra Costa	$1,383

[91] Based on GAMA domestic well testing website, the highest pricing was estimated to account for the maximum number of chemicals analyzed.
[92] New private well connection/casing pipe estimate of $2,150 was developed utilizing the following quotes:
$2,500 (2023) from data provided by State Water Board contractor Self Help Enterprises.
$1,800 - $2,500 (2023) from Local well drilling company pricing and recommendation
[93] 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

County	Well Permitting Cost
Del Norte	$150
El Dorado	$771
Fresno	$1,287
Glenn	$575
Humboldt	$522
Imperial	$3,776
Inyo	$512
Kern	$2,320
Kings	$550
Lake	$422
Lassen	$339
Los Angeles	$3,209
Madera	$1,065
Marin	$2,846
Mariposa	$248
Mendocino	$772
Merced	$894
Modoc	$90
Mono	$648
Monterey	$4,344
Napa	$546
Nevada	$1,086
Orange	$738
Placer	$1,450
Plumas	$514
Riverside	$719
Sacramento	$1,086
San Benito	$1,348
San Bernadino	$906
San Diego	$970
San Francisco[94]	MISSING
San Joaquin	$966
San Luis Obispo	$1,196
San Mateo	$5,939
Santa Barbara	$1,482
Santa Clara	$3,034

[94] The average permitting cost in urban counites was utilized as surrogate for missing well permitting cost in San Fransisco County. Average well permitting cost in urban counites is $2,356.

County	Well Permitting Cost
Santa Cruz	$2,441
Shasta	$650
Sierra	$747
Siskiyou	$545
Solano	$184
Sonoma	$987
Stanislaus	$615
Sutter	$1,062
Tehama	$241
Trinity	$240
Tulare	$447
Tuolumne	$1,298
Ventura	$1,535
Yolo	$1,322
Yuba	$857

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.

The Cost Assessment Model assumes $3,500 for additional parts and labor associated with the construction of a new private well. The cost estimate was developed in 2023 by reviewing State Water Board funded project costs.[95]

OLD PRIVATE 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.[96] Old well destruction costs should be considered as a key component cost for constructing a new private well. The Cost Assessment Model assumes $3,300 for old well destruction. The cost estimate was developed in 2023 by reviewing State Water Board funded project costs.[97]

[95] Domestic well parts and labor costs gathered from Self Help Enterprises in 2023.
[96] Health and Safety Code, Division 104, Section 115700. https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=104.&title=&part=9.5.&chapter=&article=
[97] Domestic well parts and labor costs gathered from Self Help Enterprises in 2023.

LONG-TERM BOTTLED WATER

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."[98] 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 Cost Assessment Model does not assess Failing or At-Risk public water systems for modeled long-term bottled water reliance. However, there are some modeled 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 Cost Assessment Model assumes bottled water is the long-term modeled solution for state small water systems and domestic wells **where all other modeled solutions are not feasible**. The following criteria is used to determine which systems has bottled water modeled as their long-term solution:

- 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.[99]
- Modeled decentralized treatment is not viable[100] due to:
  - Elevated Nitrate concentration > 25 mg/l.
  - Microbial contamination.
  - Thallium contamination.
  - Aluminum contamination.
  - Bromate contamination.

Table 21: Systems Assessed for Long-Term Bottled Water Reliance

System Type	Modeling Criteria
Failing Systems	Excluded
At-Risk Systems	Excluded
High *Water Quality* Risk State Small Water Systems & Domestic Wells	Where physical consolidation and decentralized treatment is not feasible.

[98] California Health and Safety Code Section 111070.
[99] Supplemental Appendix: Physical Consolidation Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-physical-consolidation.pdf
[100] Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-decentralized-treatment.pdf

DURATION OF BOTTLED WATER RELIANCE

The Cost Assessment Model estimates 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. In 2023, the State Water Board utilized data from these projects to update the unit cost components for bottled water:

Table 22: Summary Comparison of Bottled Water Costs

Cost Elements	Cost Estimate
Component	
Cost per Gallon	$1.25 per gallon
Volume per Connection	60 gallons per month = $75 a month
Delivery Fee per Connection (2x a month)	$22 per month
Hand Pump per Connection[101]	$11
Cost Adjustments	
Inflation	3.1%

Equation 8: Annual Bottled Water Cost

Total Cost Estimate ($) = [($75 + $22) x 12[102] + $11[103]] x Number of Service Connections + 3.1% Total Cost Inflation

TECHNICAL ASSISTANCE

Community and household outreach and communication costs can be an essential part of the process for installing decentralized treatment devices. The State Water Board supports several technical assistance agreements with a variety of organizations that help conduct community and household outreach around the instillation of decentralized treatment.

SYSTEMS ASSESSED FOR TECHNICAL ASSISTANCE

In the Cost Assessment, disadvantaged communities (DAC) served by state small water systems and domestic wells that have decentralized treatment modeled as their long-term and/or interim solution will be assessed for technical assistance (Table 23). For the purposes of the Cost Assessment, technical assistance captures funding needs associated with community outreach and education on decentralized treatment.

[101] One time cost, calculated for modeled year 1.
[102] Number of months in one year.
[103] One time cost, calculated for modeled year 1.

Table 23: Systems Assessed for Modeled Technical Assistance Needs

System Type	Included
• **State Small Water System** • **Domestic Well**	• Locations that are high-risk in the Risk Assessment's *Water Quality* category; and • Modeled decentralized treatment is a modeled long-term and/or interim solution; and • The community served is DAC/SDAC.

TECHNICAL ASSISTANCE COST ASSUMPTIONS

The Cost Assessment Model estimates an upfront technical assistance cost of $631 for the initial instillation of the decentralized treatment.[104] The cost estimate was derived from averaging State Water Board funded project quotes and external quotes collect in 2023 together.[105]

[104] Decentralized treatment: Point-of-Use (POU) or Point-of-Entry (POE) treatment technologies.
[105] $338 from State Water Board Funded project with the Kings Water Alliance (2022); $845 from Self-Help, in Visalia, California (2023); and $711 from Valley Water Collaborative, in Modesto, California (2023).