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SUPPLEMENTAL APPENDIX: DECENTRALIZED TREATMENT 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, address the challenges faced by High-Risk state small water systems and domestic well 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.

Decentralized treatment is one of many possible long-term solutions modeled in the Cost Assessment. "**Decentralized treatment**" is a water treatment device that removes contaminants from the water served to only one home or building and are not used to treat irrigation water. Decentralized treatment in the Cost Assessment Model includes Point-of-Entry (POE) and Point-of-Use (POU) technologies. While POE devices treat the water supply for an entire building or residence, POU devices are applied to a single water tap, usually in a kitchen, for drinking water and cooking. POU devices leave the water from other household taps, such as showers, untreated.

The decentralized treatment modeling methodology detailed in this Appendix was developed to identify potential decentralized treatment projects for estimating statewide funding needs for water systems failing for water quality-related challenges and for state small water systems and domestic wells that are High-Risk for water quality contamination. The Cost Assessment results include two cost estimates related to modeled decentralized treatment:

Capital Cost Estimate: Includes all estimated costs associated with the upfront device purchase and installation of modeled decentralized treatment technologies. In addition, the capital cost estimate includes costs associated with initial water quality testing, engineering services fees, construction contingency, legal and admin fees, planning & construction, and community outreach cost.

Operations and Maintenance (O&M) Cost Estimate: Includes the estimated 20-year annual expenses associated with operating and maintaining the modeled decentralized treatment technologies. Annual O&M estimates may account for filter replacement, water quality sampling costs, and operator and communication fees.

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.

DECENTRALIZED TREATMENT 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 decentralized treatment analysis included in the Cost Assessment Model has gone through two iterations, incorporating feedback from 16 public workshops. The first decentralized treatment analysis was conducted for the 2021 Drinking Water Needs Assessment. The second iteration of the centralized treatment 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 decentralized treatment analysis conducted for the 2021 Drinking Water Needs Assessment 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]

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

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 provided below. The third workshop was solely focused on the proposed updates to the decentralized treatment analysis, however many of the other workshops included some information related to the decentralized treatment 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: *See preliminary decentralized treatment analysis results starting on Page 18. Also, refer to Appendix D: Public Feedback on the Proposed Updates to the Cost Assessment Model - Proposed Changes for Modeled Long-Term Treatment on Page 90.*
- Presentation
- Webinar Recording

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

Below is a brief summary of the changes made to the decentralized treatment analysis compared to the methodology used in the 2021 Cost Assessment:

- Utilizing additional information about each Failing water system to better identify which systems to include in the treatment analysis and better match potential modeled treatment to the Failing system's violations. For example, systems that are only failing for the Failing criteria's monitoring and reporting violation category will not have treatment modeled as a potential solution.
- Removing the sustainability and resiliency assessment to accommodate the new approach for matching potential model solutions to each system based on their challenges identified by Failing criteria or the Risk Assessment for state small water systems and domestic wells.
- Lowering the modeled decentralized treatment threshold for Failing public water systems from 200 to 20 service connections for most, but not all contaminants. This means more water systems will be assessed for centralized treatment over decentralized treatment.
- Enhancing underlying capital and O&M cost estimate assumptions to reflect current market prices utilizing updated U.S. Environmental Protection Agency (U.S. EPA) treatment models, vendor-provided quotes, data from State Water Board funded projects, and staff recommendations.

The following sections in this Appendix detail the current decentralized treatment analysis methodology and cost assumptions.

SUMMARY OF CURRENT DECENTREALIZED TREATMENT ANALYSIS METHODOLOGY

A core component of the Cost Assessment Model is the selection and cost estimation of decentralized treatment technologies for Failing public water systems,[3] high-risk state small water systems and domestic wells where (1) water quality challenges exist; (2) modeled physical consolidation is not viable as a *Joining*[4] system; and (3) modeled centralized treatment is not viable.

- At-Risk public water systems are excluded from the long-term modeled treatment analysis. 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 in the Cost Assessment Model.[5] Learn more here: Supplemental Appendix: Additional Long-Term Solutions Cost Estimate Methodology.[6]

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[3] Failing for water quality related criteria only. Systems failing for monitoring and reporting violations are excluded from the centralized treatment analysis.

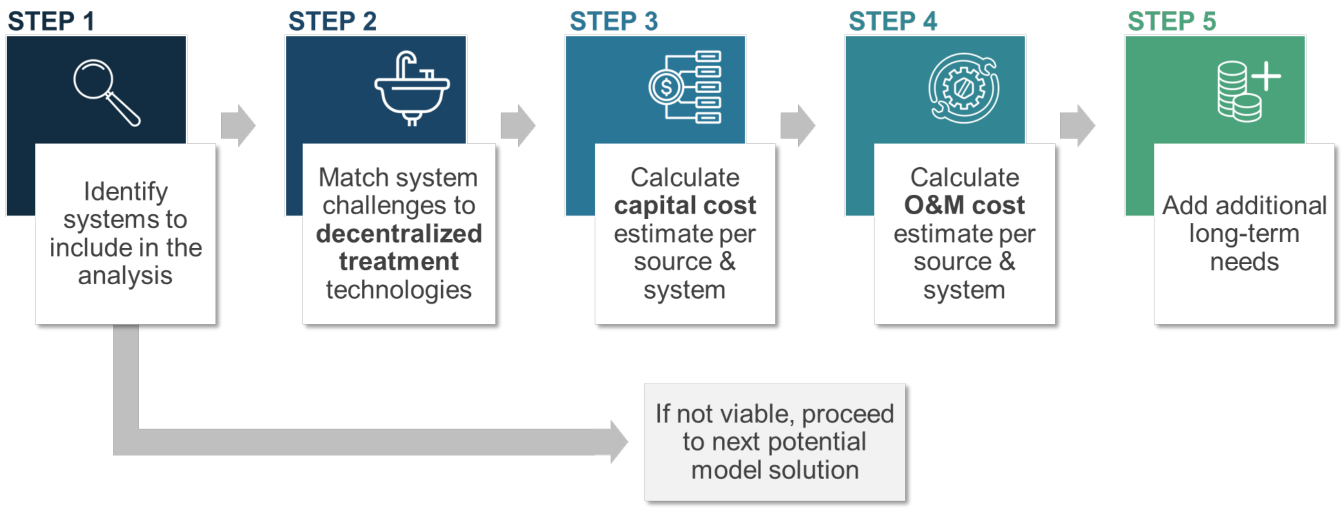
[4] Joining Systems: Commonly smaller public water systems, state small water systems, and domestic wells that are dissolved into an existing Receiving public water system and are no longer responsible for providing water to their own customers.

[5] The Cost Assessment Model's methodology and cost assumptions for Administrator, technical assistance, and other essential infrastructure will be explored in the December 2023 White Paper and public webinar workshop.

[6] Supplemental Appendix: Additional Long-Term Modeled Solutions Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-add-longterm-solutions.pdf

- State small water systems and domestic wells that are High-Risk in the *Water Shortage* category of the Risk Assessment may be assessed for a new private well if modeled physical consolidation is not viable. Learn more here: Appendix: Cost Assessment Methodology.[7]

Figure 1: Steps for Decentralized Treatment Analysis



The following is a brief summary of the steps taken by the Cost Assessment Model to conduct the centralized treatment analysis:

STEP 1: Identification of Systems to Include in the Modeled Decentralized Treatment Analysis

STEP 2: Matching System Challenges to Modeled Decentralized Treatment Technologies

STEP 3: Calculate Estimated Modeled Decentralized Treatment Capital Costs

STEP 4: Calculate Estimated Modeled Decentralized Treatment Operations & Maintenance (O&M) Costs

STEP 5: Estimate Additional Needs: Administrator; Technical Assistance; and Other Essential Infrastructure

The following sections and corresponding appendices provide a detailed guide for how the decentralized treatment analysis is conducted within the Cost Assessment Model.

[7] Appendix: Cost Assessment Methodology
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-methodology.pdf

DECENTRALIZED TREATMENT ANALYSIS METHODOLOGY

STEP 1: IDENTIFICATION OF SYSTEMS TO INCLUDE IN DECENTREALIZED TREATMENT ANALYSIS

The Cost Assessment models decentralized treatment as a long-term solution for Failing public water systems,[8] high-risk state small water systems and domestic wells where (1) water quality challenges exist; (2) modeled physical consolidation is not viable as a *Joining*[9] system; and (3) modeled centralized treatment is not viable. At-Risk public water systems are excluded from the decentralized treatment analysis because they are currently in compliance with drinking water standards.

FAILING PUBLIC WATER SYSTEMS

Since 2021, the State Water Board has expanded the Failing criteria for public water systems to include treatment technique violations, monitoring and reporting violations, and *E. coli* violations.[10] The Cost Assessment Model will continue to model long-term treatment for Failing water systems with water-quality related violations (Table 1) where modeled physical consolidation as a *Joining* system is not viable. Failure due to monitoring and reporting violations will be assessed for potential Administrator and/or technical assistance in the Cost Assessment Model.

Table 1: Failing Public Water Systems Assessed for Decentralized Treatment

Failing Water System Criteria	Systems Included	Criteria
Failing systems where modeled consolidation is viable	Included	• System must be selected by the Model as a *Receiving* system; and • Modeled centralized treatment is not viable; and • System must be failing for a primary MCL, secondary MCL, *E. coli*, and/or treatment technique violation.
Failing system where modeled consolidation is not viable		
Primary MCL	Included	Modeled centralized treatment is not viable.

[8] Failing for water quality related criteria only. Systems failing for monitoring and reporting violations are excluded from the centralized and decentralized treatment analysis.
[9] Joining Systems: Commonly smaller public water systems, state small water systems, and domestic wells that are dissolved into an existing Receiving public water system and are no longer responsible for providing water to their own customers.
[10] Failing Water Systems Criteria:
https://www.waterboards.ca.gov/water_issues/programs/hr2w/docs/hr2w_expanded_criteria.pdf

Failing Water System Criteria	Systems Included	Criteria
Secondary MCL	Included	Modeled centralized treatment is not viable.
E. coli MCL	Included	Modeled centralized treatment is not viable.
Treatment Technique	Included	Modeled centralized treatment is not viable.
Monitoring & Reporting	Excluded	

HIGH-RISK STATE SMALL WATER SYSTEMS & DOMESTIC WELLS

- The Cost Assessment models decentralized treatment as a long-term solution for high-risk state small water systems and domestic wells where (1) the location has high Water Quality risk determined by the Risk Assessment; and (2) modeled physical consolidation is not viable as a *Joining*[11] system. Locations with modeled water quality levels exceeded decentralized treatment viability are excluded from the analysis and are modeled for long-term bottled water. Learn more in Supplemental Appendix: Additional Long-Term Solutions Cost Estimate Methodology.[12]

STEP 2: MATCHING SYSTEM CHALLENGES TO MODELED DECENTREALIZED TREATMENT TECHNOLOGIES

The Cost Assessment Model utilizes Failing water system information regarding water quality violations and associated contaminants to identify potential decentralized treatment solutions. The Cost Assessment for state small water systems and domestic wells, on the other hand, utilizes the Risk Assessment results for high *Water Quality* risk locations and the associated modeled water quality data to identify potential decentralized treatment solutions.

The Cost Assessment Model includes two types of decentralized treatment technologies: point of use (POU) and point of entry (POE) treatment devices. Among various drinking water treatment technologies, the Cost Assessment Model employs reverse osmosis (RO) technology for POU and granular activated carbon technology for POE. Table 2 and Table 3 summarize the most common contaminants in the Cost Assessment Model; however, the Model is designed to select POU for most inorganic and radioactive chemical treatment and POE for organic chemicals and disinfection byproduct (DBP) treatment.

Some Failing public water systems have multiple contaminants associated with the water quality violations, which may require both POU and POE installation at a single service connection. A portion of state small water systems and domestic wells also have multiple contaminants contributing to high water quality risk where the Cost Assessment Model assigns both POU and POE at a single service connection or well. In such cases, the Cost Assessment

[11] Joining Systems: Commonly smaller public water systems, state small water systems, and domestic wells that are dissolved into an existing Receiving public water system and are no longer responsible for providing water to their own customers.

[12] Supplemental Appendix: Additional Long-Term Modeled Solutions Cost Estimate Methodology https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-add-longterm-solutions.pdf

Model combines the costs for POU and POE to assess the “per service connection” or “per well” cost. Please see Table 5 in this Appendix below.

POINT OF USE

A point of use (POU) device is a decentralized treatment device that is applied to a single tap and can help reduce contaminant levels in drinking water. There are various types of POU installations such as under the sink or installation on the countertop. These devices can treat a specific contaminant, or range of contaminants, depending on the need of the customer. Table 2 summarizes the contaminants treated by POU devices in the Cost Assessment Model and the system criteria.

Table 2: Contaminants Treated by POU in the Cost Assessment Model

Contaminant	System Criteria
Inorganics/Radionuclides,[13] ***some examples include*:** • **Nitrate** • **Arsenic** • **Uranium** • **Fluoride**	• Failing water systems with < 20 service connections. • State small water systems that are high-risk due to water quality. • Domestic wells that are high-risk due to water quality.

POINT OF ENTRY

A point of entry (POE) device is located outside or inside the building and applied to drinking water entering a house or building. Unlike a POU device that treats one tap inside a house or building, a POE device treats all water entering the house or building. Since more water is being treated, POE devices are generally more expensive than POU devices in both capital and O&M costs. POE treatment is selected by the Cost Assessment Model to treat for 1,2,3-TCP, or other volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs), as exposure can happen through inhalation/ingestion. The Cost Assessment Model also selects POE to treat disinfection byproducts (DBPs). POU treatment is not considered for any contaminant that has a risk pathway beyond ingestion. Please see Table 3 below.

[13] Radon is excluded per CCR, Title 22, Section 64418: General Provisions of Point-of Use Treatment: https://govt.westlaw.com/calregs/Document/I77CCD27D5B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

Table 3: Contaminants Treated by POE in the Cost Assessment Model

Contaminant	System Criteria
SOCs, *some examples include*: • **1,2,3-Trichloropropane (1,2,3-TCP)** • **Dibromochloropropane (DBCP)** • **Ethylene Dibromide (EDB)** **VOCs, *some examples include*:** • **1,1-Dichloroethylene (1,1-DCE)** • **Trichloroethylene (TCE)** **DBPs:** • **Total Trihalomethanes (TTHM)** • **Haloacetic Acids (five) (HAA5)**	• Failing water systems with < 20 service connections. • State small water systems that are high-risk due to water quality. • Domestic wells that are high-risk due to water quality.

STEP 3: CALCULATE ESTIMATED MODELED DECENTREALIZED TREATMENT CAPITAL COSTS

The Cost Assessment Model utilizes a set of assumptions to develop estimates for long-term decentralized treatment capital costs. The Cost Assessment Model's underlying cost assumptions were updated in 2023 to reflect current market values. Learn more in the white paper, *Proposed Changes for Modeled Long-Term Treatment.*[14]

For nontransient, noncommunity K-12 school systems, the Cost Assessment Model applies the modeled decentralized treatment solution per service connection. K-12 schools require a POU installation at each tap to achieve compliance if they have inorganic/radioactivity contaminants, therefore POU is deemed not suitable for K-12 schools for purposes of compliance. Whereas POE can be selected for K-12 schools to treat organic chemicals or disinfection byproducts. POE devices are typically installed to treat all water entering a building, which provides higher treated flow rates that are distributed equally through all building water taps. The number of installed POE devices at each school is determined based on the population served by the water system:

- Five POE devices for schools with population between 10 and 50.
- Ten POE devices for schools with population greater than 50.

STEP 4: CALCULATE ESTIMATED MODELED DECENTREALIZED TREATMENT O&M COSTS

The Cost Assessment Model includes an estimation of long-term and interim operations and maintenance (O&M) costs for the modeled decentralized treatment technologies. The State

[14] 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

Water Board includes estimated O&M expenses related to modeled long-term and interim technologies because SAFER program funding can support qualifying O&M expenses.[15] Therefore, for planning purposes, it is important for the Cost Assessment to estimate how much O&M assistance may be needed to operate a decentralized treatment.

The Cost Assessment Model's O&M methodology includes cost estimates capturing three cost components as listed below.

OPERATOR AND COMMUNICATION COSTS

Communication costs include outreach to customers to help maintain POU and POE devices and facilitate water quality testing. Community and household outreach and communication costs are calculated for public water systems within the capital cost estimate whereas this cost is excluded for high-risk state small water systems and domestic wells. This cost is included in the Technical Assistance cost estimate for DAC high-risk state small water systems and domestic wells that have decentralized treatment modeled as a long-term solution. Learn more in the following sections of this Appendix.

ANNUAL FITLER REPLACEMENT COSTS

Replacing filters is an important aspect of maintaining the treatment capacity of POE and POU devices. Without proper filtration, human health may be at risk. Learn more in the following sections of this Appendix.

ANNUAL WATER QUALITY SAMPLING COSTS

Ongoing water quality sampling is required to ensure POU and POE devices are functioning well and removing contaminants as expected. Learn more in the following sections of this Appendix.

20-YEAR NET PRESENT WORTH OF CAPITAL AND O&M COSTS

Lifecycle costs of modeled capital costs and O&M costs are presented in net present worth terms (NPW). All net present worth costs are developed using a 20-year period and 4% annual discount rate.

The Cost Assessment Model develops a lifecycle O&M Net Present Value (NPV) cost estimate for each modeled treatment technology. All NPVs are developed based on a 20-year period and an annual 4% interest rate.

Equation 1: O&M NPV Calculations

O&M NPV = Total Annual O&M x [(1+i) ^n-1] / [i x (1+i) ^n]

[15] FY 2022-23 Fund Expenditure Plan (pp. 3-4)
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/2022/final-2022-23-sadw-fep.pdf

Where: Total Estimated Annual O&M = (Annual O&M estimates may account for filter replacement, water quality sampling costs, and operator and communication fees.

i = 4% interest rate

n = 20-year life cycle

Equation 2: NPW Calculations

20-year NPW = Capital Cost + O&M NPV

Where: Capital Cost includes all estimated costs associated with the upfront device purchase and installation of modeled decentralized treatment technologies. In addition, the capital cost estimate includes costs associated with initial water quality testing, engineering services fees, construction contingency, legal and admin fees, planning & construction, and community outreach cost.

It is important to note that the Cost Assessment Model's O&M estimates are not representative of the total O&M costs needs to sustainability run a drinking water system. They only represent the estimated cost associated with the new modeled treatment.

STEP 5: MODEL ADDITIONAL NEEDS

Systems that have long-term modeled decentralized treatment will also be assessed for additional interim solutions, other essential infrastructure needs, technical assistance, Administrator assistance, etc. These additional costs are included in the final statewide Cost Assessment results. Learn more here: Appendix: 2024 Cost Assessment Results[16]

[16] Appendix: 2023 Cost Assessment Results https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment.pdf

APPENDIX A: METHODOLOGY FOR MODELING TREATMENT FOR CO-CONTAMINANTS

COMBINED TREATMENT COST ASSUMPTIONS

When a Failing public water system, state small water system, or domestic well has multiple contaminants requiring both POU and POE installation, the Cost Assessment Model assigns both POU and POE at a single service connection or well and combines two cost estimates to assess the "per service connection" or "per well" cost. Table 4 provides some examples of co-contaminant combinations where the Cost Assessment Model assigns both POU and POE installation within one service connection or well.

Table 4: Co-Contaminants Requiring Both Modeled POU and POE

Criteria	Model Decision	Co-Contaminants
Co-contaminants cannot be removed with the same type of decentralized treatment technology (either one of POU or POE).	The Cost Assessment Model selects both POU and POE per service connection or per well and combines two capital costs and O&M costs.	***Examples***: • Nitrate + 1,2,3-TCP • Arsenic + Uranium + 1,2,3-TCP • Uranium + Gross Alpha + 1,2,3-TCP

APPENDIX B: DECENTRALIZED TREATMENT CAPITAL & O&M COST ASSUMPTIONS

The sections below detail the **capital** and **O&M** cost methodology for POU and POE devices utilized in the Cost Assessment Model. The Cost Assessment Model selects either POU or POE to reduce a specific contaminant of concern for either a public water system, state small water system, or domestic well. Modeling POU or POE is restricted by many factors, such as the presence of competing ions. Elevated levels of competing ions can significantly reduce the removal efficiency of POU and POE devices. Therefore, assessing source water quality is needed to determine the appropriate modeled decentralized treatment technology solution.

POINT OF USE (POU)

A point of use (POU) treatment device is a decentralized treatment technology that is applied to a single tap and can help reduce contaminant levels. There are various types of POU installations such as under the sink or installation on a countertop. These devices can treat specific contaminants, or a range of contaminants, depending on the need of the customer. In the Cost Assessment Model, Failing water systems with 20 service connections, high *Water Quality* risk state small water systems, and high-risk domestic wells are modeled for POU as a long-term solution.

Table 5: Contaminants Treated by POU in the Cost Assessment Model

Contaminant	System Criteria
Inorganics/Radionuclides,[17] ***some examples include*****:** • **Nitrate** • **Arsenic** • **Uranium** • **Fluoride**	• Failing water systems with < 20 service connections. • State small water systems that are high-risk due to water quality. • Domestic wells that are high-risk due to water quality.

POU CAPITAL COST COMPONENTS & ASSUMPTIONS

In 2023, the State Water Board conducted internal and external research to update the Cost Assessment Model's POU capital cost assumptions. The research included reviewing State Water Board funded projects and consultations with State Water Board technical assistance

[17] Radon is excluded per CCR, Title 22, Section 64418: General Provisions of Point-of Use Treatment: https://govt.westlaw.com/calregs/Document/I77CCD27D5B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

providers that have extensive experience with installing POU devices. Table 5 summarizes the Cost Assessment Model's capital cost component assumptions. The sections below detail each capital cost component.

Table 6: Summary of POU Component Capital Cost Assumptions

Cost Element	Cost Estimate
Components	
POU Device Cost per Unit	$1,321
Labor Cost per Unit Install	$399
Initial Water Quality Testing	$194[18]
Administration/Project Management	$551
Community/Household Outreach and Communication Cost[19]	$631
5% Contingency	$155
Total Estimated Capital Cost:	**$3,251**
Cost Adjustments	
Regional Multiplier	• Rural Counties (0%) • Suburban Counties (+30%) • Urban Counties (+32%)
Inflation	3.1%
Planning & Construction	3%
Engineering Services	15%
Permitting / Environmental	3%

POU DEVICE COST PER UNIT

A POU treatment device is a decentralized treatment technology that is applied to a single tap and can help reduce contaminant levels. There are various types of POU installations such as under the sink or installation on a countertop. These devices can treat a specific contaminant, or range of contaminants, depending on the need of the customer. The Cost Assessment Model assumes each POU device costs $1,321 per unit. This cost assumption was derived in

[18] For state small water systems and domestic wells, $25 will be added to account for total coliform/*E. coli* sampling.

[19] Community/Household Outreach and Communication costs are calculated for public water systems within the capital cost estimate. This cost is excluded for state small water systems and domestic wells. This cost is included in the Technical Assistance cost estimate for state small water systems and domestic wells.

2023 from the average of the external quotes collected from a State Water Board technical assistance provider.[20]

LABOR COST PER UNIT INSTALLED

Labor costs for POU devices include equipment installation costs. Factors like existing plumbing conditions and travel distance between sites affect installation times and consequently influence labor costs. The Cost Assessment Model assumes the labor costs associated with the installation of each POU device costs $399 per unit. This cost assumption was derived in 2023 from an external quote collected from a State Water Board technical assistance provider.[21]

INITIAL WATER QUALITY TESTING

The Cost Assessment Model includes a cost estimate for an initial water quality test as part of the capital cost estimate for POU. It is important to know what contaminant(s) are prevalent and the specific filters needed for POU treatment. The Cost Assessment Model assumes $194 for an initial water quality test. This cost estimate was derived in 2023 from averaging three quotes gathered from internal and external sources; averaging costs across different contaminants.[22]

ADMINISTRATION/PROJECT MANAGEMENT

The administration/project management costs refer to the administrative costs associated with POU installation. The Cost Assessment Model assumes $551 per unit for POU installation administration and project management. This cost estimate was derived in 2023 from averaging three quotes gathered from internal and external sources.[23]

COMMUNITY/HOUSEHOLD OUTREACH AND COMMUNICATION COST

Community and household outreach and communication costs are an essential part of the process for installing POU devices. The Cost Assessment Model assumes $631 per POU unit

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[20] $1,132 POU unit cost estimate is derived from the average of two external quotes from Self-Help $1,496 (2023) and $1,146 (2023) from POU projects in Visalia.

[21] $399 POU unit instillation cost estimate is derived from an external quote from Self-Help (2023) from a POU project in Visalia.

[22] $194 POU initial water quality test cost estimate was derived from averaging sampling costs collected from the following internal and external sources: (Nitrate $61; Arsenic $46; Uranium $60; and Fluoride $27). For state small water systems and domestic wells, $25 will be added incorporating bacti-sampling requirement.
(1) State Water Board funded projects: Average of two quotes from “Tulare POU” project (2022) and “Household Domestic Well” project (2022): Nitrate $52; Arsenic $55; Uranium $77; Total Coliform/*E. coli* $25.
(2) California-based Laboratory (2023): Nitrate $79; Arsenic $27; Uranium $27; Fluoride $27.

[23] $551 POU administration and project management cost estimate was derived from averaging quotes collected from the following internal and external sources: $893 (2022) from State Water Board funded project with the Tule Basin Water Foundation; $182 (2022) from State Water Board funded project with the Kings Water Alliance; and $579 (2023) from Valley Water Collaborative, in Modesto, California.

for household outreach and communication costs. This cost estimate was derived in 2023 from averaging three quotes gathered from internal and external sources.[24]

Community and household outreach and communication costs are calculated for public water systems within the capital cost estimate whereas this cost is excluded for high-risk state small water systems and domestic wells. This cost is included in the Technical Assistance cost estimate for disadvantaged communities (DAC) high-risk state small water systems and domestic wells that have decentralized treatment modeled as a long-term solution.

CONTINGENCY

The cost of POU projects can vary and budgeting for contingency can help account for any unexpected expenses. The Cost Assessment Model assumes a 5% contingency per POU unit. This cost estimate was derived in 2023 through the recommendations of from State Water Board staff and external technical assistance providers.[25]

PLANNING & CONSTRUCTION

The State Water Board staff considers pilot testing of a POU device as a part of planning and construction for public water systems, state small water systems, and domestic wells. Pilot testing costs may be accounted for in cases where a system tests one or more devices to evaluate their effectiveness under local conditions. The Cost Assessment Model assumes 3% pilot testing costs.[26]

ENGINEERING SERVICES

The State Water Board staff considers engineering services as a crucial part of selecting the appropriate POU devices for public water systems, state small water systems, and domestic wells. Engineering services for POU devices may cover expenses related to evaluating compliance options for the system and selecting the most technology. The Cost Assessment Model assumes 15% engineering services.[27]

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[24] $631 POU instillation community/household outreach and communication cost estimate were derived from averaging quotes collected from the following internal and external sources: $338 (2022) from State Water Board funded project with the Kings Water Alliance; $845 (2023) from Self-Help, in Visalia, California; and $711 from Valley Water Collaborative, in Modesto, California.

[25] 5% POU unit installation contingency cost estimate was developed by the State Water Board through reviewing: 4% contingency from State Water Board funded 224 Budget, Mobile Home Park project; and 10% from U.S. EPA's Point of Use/Point of Entry Cost Estimating Tool
https://www.epa.gov/sdwa/point-usepoint-entry-cost-estimating-tool

[26] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend a 3% indirect capital cost for pilot testing. The U.S. EPA (2006) notes that "if the system uses a POE device, some form of field testing is required under 40 CFR Section 141.100. If POU or POE devices are used under a variance or exemption, 40 CFR Section 142.62(h) also requires field testing."
https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models

[27] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend 15% indirect capital cost for Engineering.
https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models

PERMITTING/ ENVIRONMENTAL

Permitting costs may be needed in cases where an operating permit or compliance plan review is required by local and/or State agencies. The Cost Assessment Model assume 3% permitting/environmental costs for POU devices.[28]

POU O&M COST COMPONENTS & ASSUMPTIONS

Maintaining POU devices over time is critical to ensure they are effectively treating water and protecting public health. Typical POU O&M consists of regular visits by an operator to collect water samples, obtain operational data, and replace filters when appropriate. Annual O&M costs may vary based on the contaminants being treated by the devices. The Cost Assessment Model attempts to capture the average O&M costs associated with POU devices treating different contaminates across the state. Table 6 summarizes the Cost Assessment Model's POU O&M cost estimate components. The sections below provide additional details about these cost components.

Table 7: Summary of POU O&M Component Costs

Cost Element	Cost Estimate
Components	
Annual Operator and Communication	$300[29]
Annual Filter Replacement	• Multi-contaminant $321 • Nitrate $123 • Arsenic $189 • Uranium $156[30] • Fluoride $156[31]
Annual Water Quality Sampling	• Nitrate $158 • Arsenic $54 • Uranium $54 • Fluoride $54
Total Estimated Annual O&M Cost:	• **Nitrate $581** • **Arsenic $543** • **Uranium $510** • **Fluoride $510**
Average Estimated Annual O&M Cost:	**$536[32]**

[28] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend 3% indirect capital cost for permitting.
https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models
[29] Assumes 3 hours at $100 an hour.
[30] Annual filter replacements costs were not found for uranium. Therefore, the average of the filter replacement costs for nitrate and arsenic was used for uranium.
[31] Annual filter replacements costs were not found for fluoride. Therefore, the average of the filter replacement costs for nitrate and arsenic was used for fluoride.
[32] Averaging nitrate, arsenic, uranium, and fluoride total estimated annual O&M costs.

Cost Element	Cost Estimate
Cost Adjustments	
Regional Multiplier	• Rural Counties (0%) • Suburban Counties (+30%) • Urban Counties (+32%)
Inflation	• 3.1%

ONGOING OPERATOR & COMMUNICATION COSTS

Operator and communication costs include outreach to customers to help maintain POU devices and facilitate water quality testing. The Cost Assessment Model assumes $300 ($100 for 3 hours) annually per POU unit for ongoing operator and communication costs. This cost estimate was derived in 2020 and reviewed in 2023.[33]

ANNUAL FILTER REPLACEMENT

Replacing POU filters is an important aspect of maintaining the treatment capacity of the device. Without proper filtration, human health may be at risk. The Cost Assessment Model utilizes filter replacement cost estimates for specific contaminants and for filters that are designed for multiple contaminants (Table 7). These filter replacement cost estimates were derived in 2023 by averaging quotes from State Water Board funded projects and external multi-contaminant and individual contaminant filter quotes.

Table 8: Annual Filter Replacement Costs

Contaminant	Quotes	Cost Assessment Model Estimate
Multi-contaminant	• $218.63 (2022)[34] • $255 (2023)[35] • $285.80 (2023)[36]	$321
Nitrate	• $125 (2021)[37] • $108 (2023)[38] • $136 (2023)[39]	$123

[33] Proposed Changes for Modeled Long-Term Treatment, October 5, 2023 (p. 113) https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf
[34] State Water Board funded project cost provided by the "SAFER Valley Water Collaborative 3-year Budget" project.
[35] Price quote provided by Self-Help, in Visalia, California.
[36] Price quote provided by Valley Water Collaborative, in Modesto, California.[37] State Water Board funded project cost provided by the "228 Budget, Mobile Home Park" project.
[37] State Water Board funded project cost provided by the "228 Budget, Mobile Home Park" project.
[38] Price quote provided by Self-Help, in Visalia, California.
[39] Price quote provided by Valley Water Collaborative, in Modesto, California.

Contaminant	Quotes	Cost Assessment Model Estimate
Arsenic	• $189 (2023)[40]	$189

WATER QUALITY SAMPLING

The Cost Assessment Model assumes annual water quality testing for POU devices. The water quality testing cost estimates are $158[41] for nitrate, $54 for arsenic, $54 for uranium, and $54[42] for fluoride. These cost estimates were developed in 2023 from quotes collected from a California based laboratory.

POINT OF ENTRY (POE)

A point of entry (POE) device is located outside or inside the building and applied to drinking water entering a house or building. Unlike a POU device that treats one tap inside a house or building, a POE device treats all water entering the house or building. Since more water is being treated, POE devices are generally more expensive than POU devices in both capital and O&M costs. POE treatment is selected by the Cost Assessment Model to treat for volatile organic chemicals (VOCs) or synthetic organic chemicals (SOCs), such as 1,2,3-trichloropropane (1,2,3-TCP), as exposure can happen through inhalation/ingestion. POU treatment is not considered for any contaminant that has a risk pathway beyond ingestion. POE treatment is also selected for treating disinfection byproducts (DBPs). Please see Table 8 below.

Table 9: Contaminants Treated by POE in the Cost Assessment Model

Contaminant	System Criteria
SOCs, *some examples include*: • **1,2,3-Trichloropropane (1,2,3-TCP)** • **Dibromochloropropane (DBCP)** • **Ethylene Dibromide (EDB)** **VOCs, *some examples include*:** • **1,1-Dichloroethylene (1,1-DCE)** • **Trichloroethylene (TCE)** **DBPs:** • **Total Trihalomethanes (TTHM)** • **Haloacetic Acids (five) (HAA5)**	• Failing water systems with < 20 service connections. • State small water systems that are high-risk due to water quality. • Domestic wells that are high-risk due to water quality.

40 Price quote provided by Self-Help, in Visalia, California.
41 Annual cost assuming two samples per year with an analytical cost of $79 per sample.
42 Annual cost assuming two samples per year with an analytical cost of $27 per sample.

POE CAPITAL COST COMPONENTS & ASSUMPTIONS

In 2023, the State Water Board conducted internal and external research to update the Cost Assessment Model's POE capital cost assumptions. The research included reviewing State Water Board funded projects and consultations with State Water Board technical assistance providers that have extensive experience with installing POE devices. Table 5 summarizes the Cost Assessment Model's capital cost component assumptions. The sections below detail each capital cost component.

Table 10: Summary of POE Component Capital Cost Assumptions

Cost Element	Cost Estimate
Components	
POE Device Cost per Unit	$1,700
Labor Cost per Unit Install	$1,000
Initial Water Quality Testing	$575
Administration/Project Management	$551
Community/Household Outreach and Communication Cost[43]	$631
5% Contingency	$223
Total POE Capital Cost:	**$4,680**
Cost Adjustments	
Regional Multiplier	• Rural Counties (0%) • Suburban Counties (+30%) • Urban Counties (+32%)
Inflation	3.1%
Planning & Construction	3%
Engineering Services	15%
Permitting / Environmental	3%

POE DEVICE COST PER UNIT

The Cost Assessment Model assumes the POE devices are GAC-based with additional prefiltration. The Cost Assessment Model assumes each POE device costs $1,700 per unit.

[43] Community/Household Outreach and Communication costs are calculated for public water systems within the capital cost estimate. This cost is excluded for the capital cost estimate state small water systems and domestic wells. This cost is included in the Technical Assistance cost estimate for DAC state small water systems and domestic wells.

This cost assumption was derived in 2023 from the average of the external quotes collected from external vendors.[44]

LABOR COST PER UNIT INSTALLED

Labor costs for POE devices include equipment installation costs. Factors like existing plumbing conditions and travel distance between sites affect installation times and consequently influence labor costs. The Cost Assessment Model assumes the labor costs associated with the installation of each POE device costs $1,000 per unit. This cost assumption was derived in 2023 from an external quote collected from a POE manufacturer.[45]

INITIAL WATER QUALITY TESTING

The Cost Assessment Model includes an estimate of initial water quality testing as part of the capital cost estimate for POE. It is important to know what contaminant(s) are prevalent and the specific filters needed for POE treatment. The Cost Assessment Model assumes $575 for an initial water quality test. This cost estimate was derived in 2023 from averaging three quotes[46] gathered from internal and external sources; averaging costs across different contaminants. These averages calculated for each contaminant were added together to develop the cost estimate, assuming all contaminants would need to be tested, for purposes of the initial water quality testing.

Table 11: Initial Water Quality Testing Cost Estimate

Contaminant	Quotes	Cost Assessment Model Estimate
DBCP/EDB	• $84 (2022)[47] • $185 (2023)[48]	Total: $575[49] per POE unit.
1,2,3-TCP	• $124 (2022)[50] • $200 (2023)[51]	
Other VOCs	• $307 (2023)[52]	

[44] $1,700 POE unit cost estimate is derived from two external quotes:
(1) $1,000 - $1,700 (2023) from SpringWell: https://www.springwellwater.com/
POE devices equipped with prefilter and GAC filter. Costs vary depending on size of the house and flow rate: $1,016 (1–3-bathroom unit, 9 gpm-12 gpm); $1,200 (4–6-bathroom unit, 12 gpm-15 gpm); and $1,737 (7+ bathroom unit, 20 gpm-24 gpm).
(2) $1,100 - $1,700 (2023) from Quality Water Treatment: https://qualitywatertreatment.com/
POE device with carbon filter. Costs vary depending on size of the house and flow rate: $1,110 (1–2-bathroom unit, 6 gpm-7 gpm); $1,223 (2–3-bathroom unit, 6 gpm-7 gpm); $1,425 (3–4-bathroom unit, 8 gpm-10 gpm); and $1,650 (4-5-bathroom unit, 11+ gpm)

[45] ECOsmarte: https://www.ecosmarte.com/whole-house-systems-nosaltwatersoftener-wholehousedrinkingwater
Installation costs vary depending on the scope of work.

[46] Two quotes from State Water Board funded POE projects and one quote from external vendor.

[47] Average of two quotes from Tulare project (2022) and “Household Domestic Well” project (2022).

[48] Analytical cost per sample from a California-based laboratory.

[49] A total of averaged costs calculated by each analyte (DBCP/EDB $118; 1,2,3-TCP $150; and other VOCs $307).

[50] Average of two quotes from Tulare project (2022) and “Household Domestic Well” project (2022).

[51] Analytical cost per sample from a California-based laboratory.

[52] Analytical cost per sample from a California-based laboratory.

ADMINISTRATION/PROJECT MANAGEMENT

The administration/project management costs refer to the administrative costs associated with POE installation. The Cost Assessment Model assumes $551 per unit for POE installation administration and project management. This cost estimate was derived in 2023 from averaging three quotes gathered from internal and external sources for POU-related projects and applied here for POE devices as well.[53]

COMMUNITY/HOUSEHOLD OUTREACH AND COMMUNICATION COST

Community and household outreach and communication costs are an essential part of the process for installing POE devices. The Cost Assessment Model assumes $631 per POE unit for household outreach and communication costs. This cost estimate was derived in 2023 from averaging three quotes gathered from internal and external sources for POU-related projects and applied here for POE devices as well.[54]

Community and household outreach and communication costs are calculated for public water systems within the capital cost estimate whereas this cost is excluded for high-risk state small water systems and domestic wells. This cost is included in the Technical Assistance cost estimate for DAC high-risk state small water systems and domestic wells that have decentralized treatment modeled as a long-term solution.

CONTINGENCY

The cost of POE projects can vary and budgeting for contingency can help account for any unexpected expenses. The Cost Assessment Model assumes a 5% contingency per POE unit. This cost estimate was derived in 2023 through the recommendations of from State Water Board staff and external technical assistance providers on POU-related costs and applied here for POE as well.[55]

PLANNING & CONSTRUCTION

The State Water Board staff considers pilot testing of a POE device as a part of planning and construction for public water systems, state small water systems, and domestic wells. Pilot testing costs may be accounted for in cases where a system tests one or more devices to

[53] $551 POU administration and project management cost estimate was derived from averaging quotes collected from the following internal and external sources: $893 (2022) from State Water Board funded project with the Tule Basin Water Foundation; $182 (2022) from State Water Board funded project with the Kings Water Alliance; and $579 (2023) from Valley Water Collaborative, in Modesto, California.

[54] $631 POU instillation community/household outreach and communication cost estimate was derived from averaging quotes collected from the following internal and external sources: $338 (2022) from State Water Board funded project with the Kings Water Alliance; $845 (2023) from Self-Help, in Visalia, California; and $711 from Valley Water Collaborative, in Modesto, California.

[55] 5% POU unit installation contingency cost estimate was developed by the State Water Board through reviewing: 4% contingency from State Water Board funded 224 Budget, Mobile Home Park project; and 10% from U.S. EPA's U.S. EPA Point of Use/Point of Entry Cost Estimating Tool https://www.epa.gov/sdwa/point-usepoint-entry-cost-estimating-tool

evaluate their effectiveness under local conditions. The Cost Assessment Model assumes 3% pilot testing costs.[56]

ENGINEERING SERVICES

The State Water Board staff considers engineering services as a crucial part of selecting POE devices for public water systems, state small water systems, and domestic wells. Engineering services for POE devices may cover expenses related to evaluating compliance options for the system and selecting the most technology. The Cost Assessment Model assumes 15% engineering services.[57]

PERMITTING/ ENVIRONMENTAL

Permitting costs may be needed in cases where an operating permit or compliance plan review is required by local and/or State agencies. The Cost Assessment Model assume 3% permitting/environmental costs for POE devices.[58]

POE O&M COST COMPONENTS & ASSUMPTIONS

Maintaining POE devices over time is critical to ensure they are effectively treating water and protecting public health. Typical POE O&M consists of regular visits by an operator to collect water samples, obtain operational data, and replace filters when appropriate. Annual O&M costs may vary based on the contaminants being treated by the devices. The Cost Assessment Model attempts to capture the average O&M costs associated with POE devices treating different contaminates across the state. Table 11 summarizes the Cost Assessment Model's POE O&M cost estimate components. The sections below provide additional details about these cost components.

Table 12: Summary of POE O&M Component Costs

Cost Element	Cost Estimate
Component	
Annual Operator and Communication	$300[59]
Annual Filter Replacement	$84

[56] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend a 3% indirect capital cost for pilot testing. The U.S. EPA (2006) notes that "if the system uses a POE device, some form of field testing is required under 40 CFR Section 141.100. If POU or POE devices are used under a variance or exemption, 40 CFR Section 142.62(h) also requires field testing." https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models

[57] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend 15% indirect capital cost for Engineering. https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models

[58] U.S. EPA Drinking Water Treatment Technology Unit Cost Models recommend 3% indirect capital cost for permitting. https://www.epa.gov/sdwa/drinking-water-treatment-technology-unit-cost-models

[59] Assumes 3 hours at $100 an hour.

Cost Element	Cost Estimate
Annual Water Quality Sampling[60]	$270 - $614
Total Estimated Annual O&M Cost:	**$654 - $998**
Average Estimated Annual O&M Cost:	**$786**[61]
Cost Adjustments	
Regional Multiplier	• Rural Counties (0%) • Suburban Counties (+30%) • Urban Counties (+32%)
Inflation	3.1%

ONGOING OPERATOR & COMMUNICATION COSTS

Operator and communication costs include outreach to customers to help maintain POE devices and facilitate water quality testing. The Cost Assessment Model assumes $300 ($100 for 3 hours) annually per POE unit for ongoing operator and communication costs. This cost estimate was derived in 2020 and reviewed in 2023.[62]

ANNUAL FILTER REPLACEMENT

Replacing filters is an important aspect of maintaining the treatment capacity of the POE device. Without proper filtration, human health may be at risk. In the Cost Assessment Model, the annual filter replacement cost per POE unit is estimated at $84 regardless of the contaminant treated for by the device. This cost estimate was developed in 2023 by averaging two quotes collected from POE device manufacturers.[63]

WATER QUALITY SAMPLING

The Cost Assessment Model assumes annual water quality testing for POE devices. The water quality testing cost estimates are $235 for DBCP/EDB, $299 for 1,2,3-TCP, and $614 for other

[60] Cost varies, depending on target analyte(s).
[61] Averaging total estimated annual O&M cost.
[62] Proposed Changes for Modeled Long-Term Treatment, October 5, 2023 (p. 113)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/modeled-treatment-draft-whitepaper.pdf
[63] $84 annual filter replacement cost estimate is based on the average of the following two quotes:
(1) $73 (2023) from SpringWell: https://www.springwellwater.com/
Sediment filter replacement cost: $40 per year; and
Carbon media replacement cost: $334 per every 1 MG of water treated, which equates to about every 10 years for most households.
(2) $94 (2023) from ECOsmarte: https://www.ecosmarte.com/whole-house-systems-nosaltwatersoftener-wholehousedrinkingwater
Media replacement cost: $500 for 1-cubic feet per every 8-year, typically. Thus, the total media replacement cost varies depending on sizes of the POE system. The dollar amount, $94/year is an average of the two costs for the most common sizes, 1 and 2-cubic feet.

VOSs. These cost estimates were developed in 2023 from quotes collected from a California based laboratory and projects funded by the State Water Board.

Table 13: Annual Water Quality Testing Cost Estimate

Contaminant	Quotes	Cost Assessment Model Estimate
DBCP/EDB	• $168 (2022)[64] • $370 (2023)[65]	$235
1,2,3-TCP	• $248 (2022)[66] • $400 (2023)[67]	$299
Other VOCs	• $614 (2023)[68]	$614

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[64] Quote from two State Water Board funded projects: "Tulare POU" project (2022) and "Household Domestic Well" project (2022). Annual cost assuming two samples per year with an analytical cost of $84 per sample.
[65] Quote from a California-based laboratory, specific for DBCP & EDB. Annual cost assuming two samples per year with an analytical cost of $185 per sample.
[66] Quote from two State Water Board funded projects: "Tulare POU" project (2022) and "Household Domestic Well" project (2022). Annual cost assuming two samples per year with an analytical cost of $124 per sample.
[67] Quote from a California-based laboratory, specific for 1,2,3-TCP. Annual cost assuming two samples per year with an analytical cost of $200 per sample.
[68] Quote from a California-based laboratory, for all other VOCs except for DBCP/EDB & 1,2,3-TCP. Annual cost assuming two samples per year with an analytical cost of $307 per sample.