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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of California-American Water
Company (U210W) to Obtain Approval of an
Updated Cost Cap for the Monterey Peninsula
Water Supply Project and Updated Ratemaking
Framework.

Application _____
(Filed ____, 2026)

DIRECT TESTIMONY OF DAVID PEZZINI

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Dated: October 23, 2026

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7
8 **DIRECT TESTIMONY OF DAVID PEZZINI**

9
10 **I. BACKGROUND**

11 Q1. Please state your name and business address.

12 A1. My name is David Pezzini. My business address is 511 Forest Lodge Road, Suite 100,
13 Pacific Grove, CA 93950.

14
15 Q2. By whom are you employed and in what capacity?

16 A2. I have been employed by California-American Water Company (“California American
17 Water”) since January 2021. My current job title is Senior Manager, Engineering Project
18 Delivery within California American Water's Central Division. The Central Division
19 includes the Monterey Main, Hidden Hills, Ambler, Toro, Ralph Lane, Chualar and
20 Garrapata water systems.

21
22 Q3. What are your responsibilities?

23 A3. As Senior Manager, Engineering Project Delivery for California American Water’s
24 Central Division, I oversee the Engineering Department and am responsible for the
25 planning, engineering, permitting, and construction of capital investment projects for
26 both water and wastewater systems. My responsibilities include managing the
27 development and delivery of infrastructure projects from initial planning through
28 construction and project completion.

1 Q4. Please describe your educational background.

2 A4. I received a Bachelor of Science degree in Civil Engineering from California Polytechnic
3 State University, San Luis Obispo, in 2011. In 2013, I earned a Master of Science degree
4 in Water Engineering and a Master of Business Administration from California
5 Polytechnic State University, San Luis Obispo.

6

7 Q5. Please describe your professional experience.

8 A5. Upon completing my graduate studies in 2013, I joined West Yost Associates in Davis,
9 California, as an Engineer in the Infrastructure Design Group. In that role, I was
10 responsible for the design of water and wastewater infrastructure projects, including
11 pipelines, storage tanks, and pump stations.

12

13 In 2017, I was promoted to Associate Engineer, where my responsibilities expanded to
14 include project management, permitting, engineering design, and engineering services
15 during construction for a variety of water and wastewater capital improvement projects.

16

17 In 2019, I joined Harris & Associates in Salinas, California, as a Senior Project Manager.
18 There, I managed and designed public works projects, including storm drain systems,
19 development review activities, and emergency roadway repair projects.

20

21 In 2021, I joined California American Water as an Engineering Project Manager. In that
22 position, I was responsible for the delivery of capital improvement projects throughout
23 the Central Division, including water main replacement projects, development review
24 activities, evaluation of new service connections, and implementation of requirements
25 associated with the State Water Resources Control Board's ("SWRCB") Cease and Desist
26 Order, collectively SWRCB Orders 2009-0060 and 2016-0016 ("CDO").

27

28

1 In 2026, I assumed my current role as Senior Manager, Engineering Project Delivery, for
2 California American Water's Central Division. In addition to overseeing the Engineering
3 Department and the delivery of capital improvement projects, I am responsible for
4 management of the conveyance system components of the Monterey Peninsula Water
5 Supply Project ("MPWSP"). These responsibilities also include overseeing easement
6 acquisition efforts for the MPWSP and managing consultant and contractor activities
7 associated with the MPWSP intake wells, desalination facility, and conveyance pipeline
8 systems.

9
10 I am also responsible for coordinating with American Water Service Company's
11 engineering team and consultants to forecast the long-term operation and maintenance
12 costs of the MPWSP.

13
14 Q6. Are you a registered professional engineer?

15 A6. Yes. Since 2016, I have been a registered professional engineer (civil) in California.
16

17 Q7. Are you a member of any boards or professional associations?

18 A7. Yes. In addition to my professional responsibilities, I am actively involved in the
19 American Public Works Association, Monterey Bay Chapter. I served as the Chapter
20 President in 2024 and currently serve on the Board of Directors as a Director-at-Large.
21

22 Q8. Have you previously testified before the California Public Utilities Commission
23 ("Commission" or "CPUC")?

24 A8. Yes. I have previously submitted and sponsored testimony before the California Public
25 Utilities Commission regarding matters affecting the water supply and demand of
26 California American Water's Monterey Main Water System, including testimony in
27 Proceeding A.21-11-024.
28

1 Q9. Are you including any Attachments with your testimony?

2 A9. Yes. Attachment 1 is the Technical Memorandum dated October 9, 2026, titled
3 “MPWSP – Operation and Maintenance Cost Estimate,” from Steve Creel, consultant to
4 American Water, and Peter J. Keenan, American Water Senior Director of Technical
5 Services, to Lacy Carothers, Senior Director of Engineering at California American
6 Water, and David Pezzini, Senior Manager for California American Water (the “2026
7 O&M TM”).
8

9 **II. PURPOSE AND SCOPE OF TESTIMONY**

10 Q10. What is the purpose of your testimony?

11 A10. The purpose of my testimony is to present and support the updated operations and
12 maintenance (“O&M”) cost estimate for the portion of the Monterey Peninsula Water
13 Supply Project (“MPWSP” or the “Project”) consisting of the desalination plant and
14 associated facilities. My testimony describes the components of the O&M cost estimate,
15 the basis for those costs, the technical and engineering support for the estimate (including
16 the 2026 O&M TM), the reconciliation of the updated estimate with the O&M cost
17 estimates previously presented in Application (“A.”) 12-04-019, and how the updated
18 O&M costs are addressed under the ratemaking framework approved in Decision (“D.”)
19 18-09-017 and Resolution W-5211. The O&M cost estimates presented in this testimony,
20 and supported by the 2026 O&M TM, represent California American Water’s best
21 current estimate of the O&M costs for the desalination plant and associated facilities,
22 based on the information available at the time this Application is filed. These estimates
23 are intended to support the updated financing plan, revenue requirement, and customer
24 bill impact analyses included in this Application.
25

26 Q11. Do you have any introductory comments regarding the updated O&M cost estimates
27 presented in testimony?
28

1 A11. Yes. The O&M cost estimate provided in testimony is based on the analytical framework
2 presented in A.12-04-019. It is not a new analysis; rather, it uses the same general
3 categories and methodology reflected in that prior analysis and in D.18-09-017, updated
4 to reflect the current plant design, unit costs, and anticipated plant operation. The cost
5 components and assumptions are documented in the 2026 O&M TM, Attachment 1.

6
7 Q12. Please summarize the organization of your testimony.

8 A12. My testimony is organized as follows:

9
10 (1) Section III provides an overview of the updated O&M cost estimate and the
11 supporting 2026 O&M TM, including its authorship and the production
12 assumptions underlying the estimate;

13 (2) Section IV summarizes the basis for each of the eight O&M cost categories
14 addressed in the 2026 O&M TM: energy, chemicals, labor, waste disposal,
15 environmental monitoring, cartridge filters, maintenance, and miscellaneous
16 operating expense;

17 (3) Section V provides a history of the O&M cost estimates presented in A.12-04-
18 019 and a reconciliation of those estimates with the updated estimate;

19 (4) Section VI discusses fixed and variable cost components; and

20 (5) Section VII describes how the updated O&M costs are treated under the
21 ratemaking framework approved in D.18-09-017 and Resolution W-5211,
22 including the role of the Tier 2 advice letter process and the MPWSP
23 Operations and Maintenance Memorandum Account (“MOMMA”).¹

24
25
26
27
28 ¹ My testimony describes the process of updating and tracking the O&M costs. The testimony of Jonathan Morse, Senior Director of Rates for California American Water, addresses the ratemaking issues discussed in this proceeding.

1 **III. OVERVIEW OF THE UPDATED O&M COST ESTIMATE AND TECHNICAL**
2 **MEMORANDUM**

3 Q13. What is the source of the updated O&M cost estimate presented in this testimony?

4 A13. The updated O&M cost estimate is based on the 2026 O&M TM. The 2026 O&M TM is
5 a Technical Memorandum dated October 9, 2026, prepared by Steve Creel, consultant to
6 American Water, and Peter J. Keenan, American Water Senior Director of Technical
7 Services, and addressed to Lacy Carothers, Senior Director of Engineering at California
8 American Water, and David Pezzini, Senior Manager for California American Water.
9 The 2026 O&M TM documents the assumptions and methods used to estimate the future
10 O&M costs for the desalination treatment plant and associated slant wells.
11

12 Q14. What completion date and production levels do the 2026 O&M TM assume?

13 A14. The 2026 O&M TM assumes completion of construction of the plant and wells in late
14 2029. Production during startup in 2029 was estimated to be equivalent to 1 mgd across
15 the entire year. Production in subsequent years was assumed to be equivalent to 4.2 mgd,
16 which accommodates expected plant maintenance and operational considerations.²
17 Actual annual hours of operation and production are expected to vary based on system
18 demand, operational decisions regarding the use of available water supplies, source water
19 quality characteristics, treatment and maintenance requirements, regulatory compliance
20 obligations, staffing and operational considerations, equipment performance, and the
21 need to optimize facility operations over time. Therefore, actual production may differ
22 from the assumptions used for planning and cost-estimating purposes in the 2026 O&M
23 TM.
24

25 Q15. At a high level, what does the updated O&M cost estimate show?
26
27

28 ² 4.2 mgd production capacity reflects anticipated plant maintenance requirements and acknowledges that the facility will not operate at its maximum 4.8 mgd design capacity at all times. Production capacity accounts for an approximate 10% operational buffer of the design capacity.

1 A15. The 2026 O&M TM presents an annual OPEX cost estimate for the years 2029 through
2 2032, reflecting the startup year (2029) and subsequent years of operation at an
3 equivalent capacity of 4.2 mgd or 4,700 AFY. The estimate is organized into eight cost
4 categories, summarized in Table 1 of the 2026 O&M TM.

5
6 Q16. What categories of O&M costs are addressed in the updated estimate?

7 A16. The 2026 O&M TM organizes the updated O&M cost estimate into eight categories: (1)
8 energy; (2) chemicals; (3) labor; (4) waste disposal; (5) environmental monitoring; (6)
9 cartridge filters; (7) maintenance; and (8) miscellaneous operating expense. The 2026
10 O&M TM also separately addresses two other significant cost items—membrane
11 replacement and long-term equipment renewal costs—which are treated as capital items
12 rather than as part of the annual OPEX estimate. Each of the eight OPEX categories, and
13 the treatment of membrane replacement and renewal costs, is discussed in Section IV
14 below.

15
16 **IV. COMPONENTS OF THE O&M COST ESTIMATE AND BASIS FOR THE**
17 **UPDATED COSTS**

18 Q17. Why does your testimony only summarize the O&M cost categories rather than describe
19 them in detail?

20 A17. The 2026 O&M TM, attached as Attachment 1, provides detailed assumptions,
21 methodologies, and unit cost information supporting each O&M cost category. Rather
22 than repeat that level of detail in my testimony, I summarize below the principal basis for
23 each category and refer to the 2026 O&M TM for the supporting detail.

24
25 **A. Energy**

26 Q18. How were energy costs estimated for the updated O&M cost estimate?

27 A18. Energy is typically the single largest annual cost item for a seawater desalination facility.
28 Energy costs were calculated separately for the plant and the slant wells because they will

1 be metered separately under different electricity tariffs. The plant is the primary energy
2 user because of the pumping requirements of the reverse osmosis (“RO”) process. RO
3 energy use was based on the membrane supplier’s modeling of the RO membrane system,
4 with the model run selected reflecting average water quality (salinity), a temperature of
5 16 degrees Celsius, and membrane age of 2.44 years, producing a specific energy
6 requirement of 2.223 kWh/kgal (based on 100 percent efficient pumps). This specific
7 energy requirement was then adjusted to reflect the actual efficiency of the pumps,
8 motors, and variable speed drives associated with each RO train and the filtered
9 (seawater) water pumping stage, as well as finished water (distribution) pumping at the
10 site. Electrical costs for lighting and HVAC are addressed separately under
11 Miscellaneous Operating Expense, discussed below. A miscellaneous energy
12 consumption allowance of approximately 2.5 percent was included, along with a 5
13 percent loss through transformers, cables, and electrical gear. Pumping costs for the slant
14 wells were based on source water flow requirements and projected head as identified in
15 the Basis of Design Report (“BODR”) and the well design documents, with wire-to-water
16 efficiency estimated based on engineering judgment regarding pump, motor, and variable
17 frequency drive efficiencies.

18
19 Q19. What electricity rates and escalation assumptions were used to estimate energy costs?

20 A19. Electricity pricing was based on published PG&E rates. PG&E Tariff B-20 (primary
21 service) was identified as applicable to the plant, and Tariff B-19 (secondary service) was
22 identified as applicable to the wells. The published bundled rates used in the estimate
23 were \$0.246 per kWh for the plant and \$0.321 per kWh for the wells. Actual costs will
24 be determined by a more complex accounting of time-based demand and consumption
25
26
27
28

charges under the applicable tariffs. An inflation rate of 1.5 percent per year was applied to electrical costs.³

Q20. Does the updated O&M estimate reflect energy efficiency measures incorporated into the plant design?

A20. Yes. The plant design incorporates energy recovery devices (“ERDs”) on the reverse osmosis system that recover a substantial portion of the hydraulic energy from the high-pressure concentrate stream. ERDs typically recover 95 to 98 percent of the energy in the concentrate, reducing net energy consumption by 30 to 40 percent compared to older RO system designs without energy recovery. The plant also employs variable frequency drive (“VFD”) motors and high-efficiency pumps throughout the source water, RO, and product water systems. These design features are reflected in the energy consumption estimates in the 2026 O&M TM.

Q21. Will California American Water continue to study power costs for the MPWSP?

A21. Yes, California American Water will continue to study options for supplying power to the desalination plant, including potential use of power from a landfill gas site. The energy cost estimate presented in the 2026 O&M TM is therefore based on currently applicable PG&E rates and costs. To the extent the power cost study determines that power from the landfill gas site or another source would result in lower costs, California American Water will address the resulting change in O&M costs through the Tier 2 advice letter process described in Section VII below, with any overcollection returned to customers.

B. Chemicals

Q22. How were chemical costs estimated for the updated O&M cost estimate?

³ The electricity cost escalation rate of 1.5% per year (nominal) is based on the U.S. Energy Information Administration's *Annual Energy Outlook 2026* (Counterfactual Baseline case) projection of industrial-sector electricity prices for the Pacific Census Division, 2025–2050.

1 A22. Several chemicals are required for pretreatment of seawater prior to the RO membranes,
2 as well as for post-treatment prior to distribution. Chemical dosages used in the 2026
3 O&M TM were largely based on the average values identified in the BODR and were
4 reported on a finished water basis, even where applied to raw water. Post-treatment
5 chemical dosages were projected based on assumed optimum finished water quality for
6 blending with other water in the distribution system—specifically, total hardness of 50
7 mg/L as CaCO₃, total alkalinity of 78 mg/L as CaCO₃, and pH of 7.8—with an average
8 dose of zinc orthophosphate (1 mg/L as product) assumed for corrosion inhibitor based
9 on the historical product used by California American Water. California American Water
10 anticipates that a blending study will ultimately determine the setpoint values for pH,
11 alkalinity, hardness, and orthophosphate, as well as the type and dosage of corrosion
12 inhibitor, appropriate for corrosion control and blending of desalinated water in the
13 distribution system. California American Water intends to engage a qualified consultant
14 to support the study effort, evaluate the study results, and provide recommendations
15 regarding target water quality parameters, corrosion control strategies, and operational
16 implementation.

17
18 Q23. What unit costs and escalation assumptions were used for chemicals, and which
19 chemicals represent the largest cost?

20 A23. Unit prices for chemicals were based on current pricing obtained from California
21 American Water, American Water, chemical distributors, and pricing obtained by CDM
22 Smith. Chemical costs were escalated based on the CPUC non-labor escalation factor
23 memorandum for 2027 through 2030. The rates for 2027 through 2030 were 2.74%,
24 2.32%, 2.38%, and 2.20%, respectively. For 2031 and beyond, a composite rate of
25 2.41% was used. Bulk storage was provided where appropriate to allow for lower pricing
26 compared to drums and intermediate bulk containers. The four chemicals identified with
27 the highest annual cost are carbon dioxide (used for pH adjustment), sodium hypochlorite
28 (used for disinfection and oxidation), calcite (used for hardness addition), and antiscalant

(used for protection of the RO membranes). The annual chemical cost estimates by chemical, together with the corresponding annual average flows, are presented in Table 2 of the 2026 O&M TM.

C. Labor

Q24. How was the staffing plan, and the associated labor cost estimate, developed for the updated O&M cost estimate?

A24. An initial staffing level of approximately 15.3 people has been identified as necessary to operate and maintain the plant and the wells, although actual staffing will depend on a number of factors, including regulatory requirements and union negotiations. The staffing plan assumes one operator per shift, requiring four individuals, plus one day of scheduled overtime per week (equivalent to 0.2 persons). Two operator/maintenance staff are also included for the dual role of filling in for operators when needed and performing routine maintenance. The plan also includes a working maintenance foreman, an instrument technician to perform routine maintenance, calibration, and replacement (with outside contractors used for major maintenance work), and an electrical maintenance position given the extensive electrical infrastructure at the facility. Two non-union water quality specialists are included given the extensive sampling required for plant operation and waste disposal, along with a compliance supervisor responsible for ensuring accurate and timely monitoring and reporting. Other supervisory and administrative positions include a full-time plant supervisor, a superintendent-level position responsible for the plant and wells, and an administrative assistant.

Q25. Does the labor cost estimate include any temporary or specialized labor during startup, and what wage and escalation assumptions were used?

A25. Yes. California American Water intends to begin hiring staff in 2029, with one or more individuals working alongside CDM Smith, the design-build contractor, as construction is completed and testing begins. It is anticipated that some specialized labor will be needed

1 during construction and through the first two years of operation while California
2 American Water staff become acclimated to the facility, which may be provided by a
3 consultant or other third party. This temporary specialized labor begins in 2029, peaks in
4 2030 at approximately 3.25 persons, tapers off in 2031, and is essentially zero by 2032
5 and 2033. In 2030, the total staffing requirement for facility operations of is 18.45. The
6 only ongoing specialized labor anticipated beyond that period is consulting services for
7 optimization of membrane performance and service life. Labor and contract labor costs
8 were escalated based on the CPUC labor escalation factor memorandum for 2027 through
9 2030. The rates for 2027 through 2030 were 3.20%, 2.30%, 2.30%, and 2.20%,
10 respectively. For 2031 and beyond, a composite rate of 2.50% was used.

11
12 Q26. How were waste disposal costs estimated for the updated O&M cost estimate?

13 A26. The RO concentrate will be sent to Monterey One Water for blending with its discharge
14 to its ocean outfall. An annual fee or lease for use of the outfall and associated increased
15 costs to Monterey One Water has been discussed but has not been finalized. For this
16 estimate, an annual fee of \$700,000 is included in waste disposal. There may also be iron
17 and/or manganese in the source water that will need to be removed prior to the RO
18 process; the plan is to capture and concentrate this waste, with ultimate disposal to
19 Monterey One Water. Similarly, neutralized RO cleaning solutions will be trucked to
20 Monterey One Water for disposal. A disposal rate for these waste streams likewise has
21 not been established, so a placeholder value of \$250 per thousand gallons was assumed.
22 This category also includes the extensive chemical analyses expected to be required
23 under the facility's NPDES permit; an estimate of laboratory fees was developed
24 assuming a likely set of analyses and frequency and by obtaining a laboratory quotation,
25 with a 25 percent contingency added given the incomplete status of the permit at this
26 time. Waste disposal costs were escalated based on the CPUC non-labor escalation factor
27 memorandum rates, except for the outfall lease fee which was not escalated.

D. Environmental Monitoring

Q27. How were environmental monitoring costs estimated for the updated O&M cost estimate?

A27. The facility's NPDES permit will require monitoring of the ocean near the outfall to observe and document any degradation associated with the blending and disposal of plant concentrate. An estimate of the annual ocean monitoring costs of \$500,000 was obtained from a consultant and is included in the 2026 O&M TM. In addition, a program of groundwater level monitoring is required to determine whether pumping from the slant wells is having a negative impact on groundwater, with a projected annual cost of \$400,000 included for that purpose. The final scope of environmental monitoring requirements—including the relative financial responsibilities of Monterey One Water and California American Water —has not yet been determined, and no placeholder value for any such reallocation is included in the estimate. Accordingly, the estimate reflects current assumptions pending final resolution of the outfall lease negotiations with Monterey One Water. Environmental monitoring costs were escalated based on the CPUC non-labor escalation factor memorandum rates.

E. Cartridge Filters

Q28. How were cartridge filter replacement costs estimated for the updated O&M cost estimate?

A28. Cartridge filters are installed immediately upstream of the RO process to capture particulate material that may be present in the source water and to protect the RO membranes. The filters are disposable, and replacement at two-month intervals is projected if the plant is operating at its design rate. Replacement costs for the filters are included in the 2026 O&M TM, with replacement performed by California American Water staff as part of routine maintenance activity.

F. Maintenance

Q29. What does the maintenance category include, and how was the maintenance cost estimated?

A29. The maintenance category in the 2026 O&M TM is defined as the routine repair and replacement of small parts, including instruments, analyzers, and sensors, and includes items such as scheduled maintenance of electrical gear, vibration analysis for rotating equipment, and UV system maintenance. It does not include internal labor, which is addressed under the Labor category discussed above, and it does not include large or extensive repair and replacement of equipment and systems, which are not treated as an OPEX maintenance item. An industry rule of thumb is that maintenance should be approximately 5 to 6 percent of total annual O&M cost, which equates to approximately \$750,000 per year for this facility, or approximately 5 percent of the total when the plant is operating at 4.2 mgd. The 2026 O&M TM assumes that only two-thirds of that value is needed for the first full year of operation, because the facility will be under contractor/supplier warranty and California American Water will be responsible only for scheduled maintenance and routine repairs during that period. The 2026 O&M TM further assumes that only minor maintenance activity will be required for the wells during the first three years of operation, which can be accommodated within the identified plant maintenance budget. Maintenance costs were escalated based on the CPUC non-labor escalation factor memorandum rates.

G. Miscellaneous Operating Expense

Q30. What costs are included in miscellaneous operating expenses?

A30. This category addresses a variety of activities needed to operate the plant and wells. It includes the relatively minor electrical costs of operating HVAC, lighting, and the UV system; costs for vehicles, laboratory supplies, and site utility costs such as sewer and phone service; the cost of diesel fuel to test-run the plant generator; drinking water compliance testing; and costs for janitorial services, landscaping, and security system

upkeep. Miscellaneous operating costs were escalated based on the CPUC non-labor escalation factor memorandum rates.

H. Other Significant Costs Not Included in the OPEX Estimate – Membrane Replacement and Long-Term Renewal Costs

Q31. Does the 2026 O&M TM address membrane replacement and long-term equipment renewal costs, and if so, how are those costs treated?

A31. Yes. The RO membranes, in both the first pass and partial second pass, have a limited-service life and require routine replacement to maintain overall system performance. The 2026 O&M TM assumes a replacement rate of 12.5 percent per year, equating to 245 replacement membranes per year, a value recommended by CDM Smith. With no contingency, the cost of replacement membranes, including installation, is approximately \$239,000 per year (2026 dollars). Because membranes are expected to be treated as a capital item, the cost of periodic membrane replacement is not included in the OPEX estimate discussed above. Separately, CDM Smith provided an estimate of long-term equipment renewal and replacement costs for the treatment plant, based on an approximate facility capital cost of \$180 million and equipment cost of \$50 million, with costs increasing over time and averaging approximately \$1,225,000 per year over a 20-year period. This renewal cost information is provided in the 2026 O&M TM for awareness only and, like membrane replacement, is not included in the annual OPEX estimate as these are considered capital expenditures.

V. HISTORY OF O&M COST ESTIMATES IN A.12-04-019 AND RECONCILIATION WITH THE UPDATED ESTIMATE

Q32. Please describe the history of the O&M cost estimates presented in A.12-04-019.

A32. The O&M cost estimate for the MPWSP has been updated several times since it was first presented in A.12-04-019, as the Project design has evolved and as more current cost

1 information has become available. The key milestones in that history are described
2 below.

3
4 Q33. What was the initial O&M cost estimate presented in A.12-04-019?

5 A33. The initial O&M cost estimate was presented in a Technical Memorandum from Paul
6 Findley of RBF Consulting to Richard Svindland, dated January 9, 2013, titled
7 “Monterey Peninsula Water Supply Project (MPWSP) Capital and O&M Cost Estimate
8 Update” (the “2013 RBF Cost Report”). That memorandum was included with the
9 supplemental testimony of Mr. Svindland filed on January 11, 2013. The 2013 RBF Cost
10 Report presented annual O&M cost estimates for both a 6.4 mgd and a 9.6 mgd
11 desalination facility option, broken down into the categories of energy, chemicals, labor
12 and miscellaneous, membrane and media replacement, and general repair and
13 replacement.

14
15 Q34. Did any party propose changes to the O&M cost estimate presented in the 2013 RBF
16 Cost Report?

17 A34. Yes. The Public Advocates Office (“Cal Advocates”), then the Division of Ratepayer
18 Advocates, proposed certain changes to the O&M cost estimate. California American
19 Water addressed those proposed changes in the rebuttal testimony of Eric Sabolsice, filed
20 on March 8, 2013.

21
22 Q35. Were the O&M cost estimates subsequently updated in the prior proceeding (A.12-04-
23 019)?

24 A35. Yes. Mr. Svindland provided updated O&M cost information in supplemental testimony
25 filed on December 15, 2015. That testimony cited a Technical Memorandum from Ian
26 Crooks and Chris Cook to Mr. Svindland, dated December 14, 2015, which presented
27 updated O&M cost estimates using the same methodological framework as the 2013 RBF
28 Cost Report but with updated unit cost information.

1 Q36. Were the O&M cost estimates updated again after 2015?

2 A36. Yes. Mr. Cook provided further updated O&M cost information in his direct testimony
3 filed on September 15, 2017, with errata filed on September 27, 2017. Mr. Crooks' direct
4 testimony, also filed on September 15, 2017 (with errata filed September 27, 2017),
5 likewise addressed O&M costs for the Project. The 2017 testimony of Messrs. Cook and
6 Crooks constitutes the most recent prior O&M cost estimate filed in A.12-04-019.

7
8 Q37. Does the 2026 O&M TM use the same cost categories as the prior O&M cost estimates in
9 A.12-04-019?

10 A37. Partially, but not entirely. The 2013 RBF Cost Report and subsequent prior estimates
11 organized O&M costs into five categories: energy, chemicals, labor and miscellaneous,
12 membrane and media replacement, and general repair and replacement. The 2026 O&M
13 TM instead organizes O&M costs into eight categories: energy, chemicals, labor, waste
14 disposal, environmental monitoring, cartridge filters, maintenance, and miscellaneous
15 operating expense, as discussed in Section IV above. In general terms, energy,
16 chemicals, and labor remain consistent categories across both estimates. Waste disposal,
17 environmental monitoring, and cartridge filters are now broken out as separate categories
18 to provide greater visibility into costs associated with the facility's anticipated NPDES
19 permit and discharge arrangements with Monterey One Water, which were not separately
20 identified in the prior estimates. Maintenance and miscellaneous operating expense in
21 the 2026 O&M TM together occupy the role served by the prior "labor and
22 miscellaneous" and "general repair and replacement" categories, although the underlying
23 cost components are not identical. Membrane and media replacement, which was
24 included as an annual O&M expense in the prior estimates, is instead treated as a capital
25 item in the 2026 O&M TM and is therefore excluded from the OPEX estimate, as
26 discussed in Section IV above.

1 Q38. What are the principal reasons for the updated O&M cost estimate differing from the
2 estimates presented previously in A.12-04-019?

3 A38. The updated O&M cost estimate differs from the estimates presented in A.12-04-019 due
4 to several factors: (1) general cost escalation and inflation since 2017; (2) updated unit
5 costs for energy, chemicals, and other operating cost categories reflecting current market
6 conditions; (3) refinements to the plant design, including incorporation of energy
7 recovery systems and high-efficiency pumping equipment; (4) revised assumptions
8 regarding initial plant capacity and production phasing; and (5) incorporation of
9 operating experience and lessons learned from other desalination facilities. Collectively,
10 these updates result in a more current and detailed estimate of the anticipated costs to
11 operate and maintain the proposed desalination facility.

12
13 **VI. FIXED AND VARIABLE COSTS AND EFFECT OF PLANT CAPACITY**
14 **PHASING**

15 Q39. How does the production schedule reflected in the 2026 O&M TM compare to the
16 capacity addressed in prior O&M cost estimates?

17 A39. The 2026 O&M TM assumes a startup year in 2029, during which production is
18 estimated to be equivalent to 1 mgd across the entire year, with production in subsequent
19 years assumed to be equivalent to 4.2 mgd, reflecting all trains in service. The O&M cost
20 estimates presented in A.12-04-019, including the 2013 RBF Cost Report, were based on
21 a 6.4 mgd design capacity. The updated estimate therefore reflects both the lower
22 production levels expected during and shortly after startup and the plant's initial 4.8 mgd
23 design capacity, which is lower than the 6.4 mgd capacity addressed in the prior
24 estimates.

25
26 Q40. Does lower production during startup, or the reduction in initial operating capacity from
27 6.4 mgd to 4.8 mgd, result in a proportional reduction in total O&M costs?
28

1 A40. No. While certain O&M cost categories that vary directly with the volume of water
2 produced will be lower during the 2029 startup year and at the 4.8 mgd initial capacity
3 than at full 6.4 mgd capacity, many other O&M cost categories are largely fixed and do
4 not decrease proportionally with lower production or reduced plant capacity.

5
6 Q41. Which categories of O&M costs are primarily variable with plant production, and which
7 are primarily fixed?

8 A41. Energy costs and chemical costs are primarily variable, because energy consumption for
9 pumping and treatment and chemical dosing scale with the volume of water produced.
10 Cartridge filter replacement costs are also largely variable, since the assumed
11 replacement frequency is based on operation at the design production rate. By contrast,
12 labor costs are largely fixed, because the staffing plan reflects a baseline complement
13 needed to operate and maintain the facility regardless of production level, although the
14 2026 O&M TM does reflect some reduction in temporary specialized labor as the facility
15 moves beyond the startup years. Maintenance costs are also substantially fixed, because
16 they are tied to the routine repair and replacement of plant equipment and instrumentation
17 rather than to the volume of water produced, although the 2026 O&M TM does reflect a
18 lower maintenance allowance during the first year of operation while the facility remains
19 under contractor and supplier warranty. Waste disposal, environmental monitoring, and
20 miscellaneous operating expense include a mix of fixed and variable components.

21
22 Q42. How does the updated O&M cost estimate account for these differences in fixed and
23 variable costs across the startup period and subsequent years of operation?

24 A42. The 2026 O&M TM presents annual OPEX cost estimates for the years 2029 through
25 2032 in Table 1, reflecting the lower variable costs (energy, chemicals, and cartridge
26 filters) associated with reduced production during startup, together with the largely fixed
27 costs (labor and maintenance) that apply across the same period, adjusted only for the
28

warranty-related maintenance reduction and the temporary specialized labor described above.

VII. RATEMAKING TREATMENT OF O&M COSTS UNDER D.18-09-017 AND RESOLUTION W-5211

Q43. How are the O&M cost estimates presented in this testimony intended to be used for ratemaking purposes?

A43. The O&M cost estimates presented in this testimony, and supported by the 2026 O&M TM, represent California American Water's best current estimate of the O&M costs for the desalination plant and associated facilities, based on the information available at the time this Application is filed. These estimates are intended to support the updated financing plan, revenue requirement, and customer bill impact analyses included in this Application. As described below, D.18-09-017 and Resolution W-5211 establish a process to update these O&M cost estimates no later than 60 days prior to the commercial operation date of the plant, and to true up any differences between costs used to set rates and actual costs incurred after operations commence.

Q44. What process did D.18-09-017 and Resolution W-5211 establish for updating O&M cost estimates prior to setting initial rates?

A44. D.18-09-017 approved elements of the Comprehensive Settlement, including the O&M ratemaking process set forth in Section 8 of the Comprehensive Settlement.⁴ Consistent with that framework, and as further addressed in Resolution W-5211, California American Water is authorized to file a Tier 2 advice letter no later than 60 days prior to the commercial operation date of the desalination plant to update the O&M cost estimate that will be used to set the initial revenue requirement and rates for the MPWSP.⁵ This process allows California American Water to incorporate the most current available

⁴ D.18-09-017, pp. 90, 210, Ordering Paragraph 20. On July 13, 2013, a comprehensive settlement agreement (Comprehensive Settlement) by 16 parties was submitted for Commission approval.

⁵ Resolution W-5211, dated December 19, 2019, p. 9, Ordering Paragraph 1, Attachment A, p. 5.

1 information regarding O&M costs—including, for example, the results of the power cost
2 study described in Section IV.A—before O&M costs are reflected in customer rates.

3
4 Q45. What is the MOMMA, and what is its purpose?

5 A45. The MOMMA is a memorandum account established pursuant to the Comprehensive
6 Settlement, as approved in D.18-09-017, and as reflected in the Preliminary Statement
7 provisions approved in Resolution W-5211. The MOMMA tracks differences between
8 the O&M costs reflected in the revenue requirement and rates established through the
9 Tier 2 advice letter process described above, and the actual O&M costs California
10 American Water incurs once the desalination plant becomes operational. Details on the
11 previously approved ratemaking framework for the MPWSP and updates proposed in this
12 application can be found in the Direct Testimony of Jonathan Morse.

13
14 Q46. How does D.18-09-017 address the treatment of O&M-type costs incurred prior to
15 commercial operation of the desalination plant?

16 A46. D.18-09-017 reflects the expectation, consistent with the Comprehensive Settlement, that
17 most if not all O&M-type costs incurred prior to commercial operation of the desalination
18 plant will be capitalized as part of the cost of constructing the Project, rather than
19 expensed. To the extent any such costs must be expensed for accounting or other
20 requirements rather than capitalized, those expensed amounts will be tracked in the
21 MOMMA and reviewed in the next general rate case proceeding following
22 commencement of operations.

23
24 Q47. How will differences tracked in the MOMMA be addressed for ratemaking purposes?

25 A47. Differences tracked in the MOMMA—including both any pre-commercial-operation
26 O&M-type costs that were expensed rather than capitalized, and any differences between
27 the O&M costs reflected in rates through the Tier 2 advice letter process and the actual
28 O&M costs incurred after the plant becomes operational—will be reviewed for

1 reasonableness in the first general rate case filed after the desalination plant has been in
2 commercial operation for approximately one year. That general rate case will address the
3 disposition of amounts recorded in the MOMMA and will incorporate updated, actual
4 O&M cost experience into California American Water's ongoing revenue requirement for
5 the MPWSP.

6
7 **VIII. CONCLUSION**

8 Q48. Does this conclude your testimony?

9 A48. Yes, it does.

ATTACHMENT 1



TECHNICAL MEMORANDUM

TO: Lacy Carothers (CAW)
David Pezzini (CAW)

FROM: Steve Creel (Consultant to AW)
Peter J. Keenan (AW)

DATE: October 9, 2026

RE: MPWSP Phase 1 Project – Operation and Maintenance Cost Estimate

The purpose of this Technical Memorandum is to document the assumptions and methods used to estimate the future operating and maintenance costs (OPEX) for the desalination treatment plant (plant) and associated slant wells (wells). These costs are used to update the revenue requirement and customer bill impact analysis. O&M costs will be updated through the Tier 2 advice letter process approved in D.18-09-017, at the time the plant is placed in-service. This memorandum assumes completion of construction of the plant and wells in late 2029.

OPEX costs were estimated across eight (8) categories as shown in Table 1. Production during startup in 2029 was estimated to be equivalent to 1 mgd across the entire year. Subsequent years' production was assumed to be equivalent to 4.2 mgd to produce 4,700 acre-feet/year (AFY) per the decision D.18-09-017. The assumed production level is considered reasonable as it reflects anticipated plant maintenance requirements and acknowledges that the facility will not operate at its maximum design capacity at all times. This approach also affords operations staff the flexibility to manage plant production in a manner that maximizes the utilization of other available system supplies. This assumed production aligns with 10% standard operational buffer in evaluating water system supplies.

Table 1 OPEX Cost Estimate 2029-2032

	Annual Avg Flow, MGD	1.0	4.2	4.2	4.2
		***** YEAR *****			
	CATEGORY	2029	2030	2031	2032
1	Energy	\$ 1,670,000	\$ 7,120,000	\$ 7,230,000	\$ 7,340,000
2	Chemicals	\$ 280,000	\$ 1,220,000	\$ 1,240,000	\$ 1,270,000
3	Labor	\$ 1,032,300	\$ 3,910,000	\$ 3,440,000	\$ 2,840,000
4	Waste Disposal	\$ 734,000	\$ 827,000	\$ 830,000	\$ 833,000
5	Envir Monitoring	\$ 240,000	\$ 960,000	\$ 990,000	\$ 1,010,000
6	Cartridge Filters	\$ 20,000	\$ 87,000	\$ 89,000	\$ 92,000
7	Maintenance	\$ -	\$ 492,000	\$ 750,000	\$ 768,075
8	Misc Op Exp	\$ 25,308	\$ 234,000	\$ 240,000	\$ 246,000
	TOTAL	\$ 4,001,608	\$ 14,850,000	\$ 14,809,000	\$ 14,399,075
	NOTES				
1	NPDES quality testing costs are in WASTE DISPOSAL				
2	Labor costs during startup phase assume a 4 month duration				
3	Assuming in service date of 12/2029				
	<u>Membrane Replacement</u>				
	Membrane replacement would likely be treated as a capital replacement , not O&M				
	Estimated annual cost of membrane replacement is \$239,000 (2026 \$). No inflation included.				

ENERGY

Energy is typically the single largest annual cost item for a seawater desalination facility. Energy costs were calculated separately for the plant and wells as they will be metered separately with different electricity pricing. The plant is the primary energy user because of the pumping requirements of reverse osmosis (RO). The estimate of RO energy use is based on the energy requirements of the RO membrane system as identified by the membrane supplier's modeling. The energy requirement varies depending on source quality, temperature, and membrane age. The model run selected was for the scenario of average source water quality (salinity), 16 degrees C temperature, and membrane age of 2.44 years producing a specific energy requirement of 2.223 kwhr/kgal (based on 100% efficient pumps).

Added to the membrane specific energy is the inefficiency of the three (3) pumps associated with each RO train plus the filtered (seawater) water pumping stage. Appropriate efficiencies of the pumps, motors, and variable speed drives were estimated to determine a wire-to-water efficiency for each RO rack. The specific energy consumption of finished water (distributive) pumping at the site was included. Electrical costs for lighting and HVAC were included in

Miscellaneous Operating Costs. A miscellaneous energy consumption of about 2.5% was included as well as 5% loss through transformers, cables, and electrical gear.

Pumping costs for the slant wells were based on source water flow requirements, and projected head as identified in the BODR and the well design documents. Wire-to-water efficiency was estimated based on engineering judgment about the efficiencies of pump, motor, and VFD.

Electricity pricing was based on published PG&E rates. Tariff B-20 (primary service) was identified for the plant while B-19 (secondary service) was identified for the wells. The published bundled rates were \$0.246 per kwhr for the plant and \$0.321 per kwhr for the wells¹. Actual costs will be determined by a complex accounting of time-based demands and consumption.

The electricity cost escalation rate of 1.5% per year (nominal) is based on the U.S. Energy Information Administration's *Annual Energy Outlook 2026* (Counterfactual Baseline case) projection of industrial-sector electricity prices for the Pacific Census Division, 2025–2050.

CHEMICALS

A number of chemicals are required for pretreatment of seawater prior to RO membranes, as well as for post-treatment prior to distribution. Chemical dosages used in this analysis were the average values identified in the Basis of Design Report (BODR) except for post-treatment chemicals such as calcite, carbon dioxide, and caustic soda. Chemicals in this analysis were reported on a finished water basis, even if applied to raw water. Post-Treatment chemical dosages were projected based on assumed optimum water quality requirements for blending with other water in the distribution system. The assumed optimum finished water quality was total hardness of 50 mg/L as CaCO₃, total alkalinity of 78 mg/L as CaCO₃, and pH of 7.8. An average dose of zinc orthophosphate (1 mg/L as product) was assumed for corrosion inhibitor. A proposed blending study will ultimately determine setpoint values for pH, alkalinity, hardness and orthophosphate that are appropriate for corrosion control and blending of desalinated water in the distribution system. The type of corrosion inhibitor to be used, including the amount of zinc, and the dosage, will be part of the study. For this estimate, the historical product used by CAW was assumed. The proposed study is not anticipated to be completed until closer to startup and commissioning.

Unit prices for chemicals were based on current chemical pricing from CAW, American Water, distributors, and pricing obtained by CDM Smith. An annual inflation rate was used to escalate costs based on the CPUC non-labor escalation factor memorandum for 2027 through 2030. The rate for 2027 through 2030 was 2.74%, 2.32%, 2.38%, and 2.20%, respectively. For 2031 and beyond, a composite rate of 2.41% was used. Bulk storage is provided where appropriate to allow for lower pricing compared to drums and intermediate bulk containers (IBC or totes).

¹ The B-20 and B-19 tariff rates are based on PG&E's published tariffs and average total bundled time of use rate advice effective 3/1/2026.

The estimated annual chemical costs are shown in Table 2 with the annual average flows. The four chemicals identified with the highest annual cost are carbon dioxide (pH adjustment), sodium hypochlorite (disinfection and oxidation), calcite (hardness addition), and antiscalant (protection of membranes).

Table 2 Annual Chemical Cost Summary

	AVG FLOW, MGD	1.0	4.2	4.2	4.2
CHEMICAL COST SUMMARY		2029	2030	2031	2032
SODIUM HYPOCHLORITE		\$ 53,405	\$ 229,234	\$ 234,759	\$ 240,416
SODIUM BISULFITE		\$ 18,332	\$ 78,689	\$ 80,586	\$ 82,528
ANTISCALANT		\$ 45,458	\$ 195,125	\$ 199,827	\$ 204,643
ZINC ORTHOPHOSPHATE		\$ 3,048	\$ 13,082	\$ 13,397	\$ 13,720
CALCITE		\$ 44,229	\$ 189,849	\$ 194,424	\$ 199,110
CARBON DIOXIDE		\$ 75,353	\$ 323,446	\$ 331,241	\$ 339,224
FERRIC CHLORIDE		\$ 7,088	\$ 30,423	\$ 31,157	\$ 31,908
SODIUM HYDROXIDE		\$ 30,720	\$ 130,506	\$ 133,651	\$ 136,872
CITRIC ACID		\$ 5,820	\$ 24,981	\$ 25,583	\$ 26,200
TOTAL CHEMICAL COST/ YEAR		\$ 280,000	\$ 1,220,000	\$ 1,240,000	\$ 1,270,000
NOTES					
1 Chemical pricing from CAW, AW Supply Chain and CDM					
2 Inflation rate described in text.					
3 Avg doses from BODR used except for Calcite, Sodium hydroxide, and carbon dioxide					
4 Calcite, sodium hydroxide and carbon dioxide dosed to achieve pH=7.8, hardness = 50 mg/L as CaCO ₃ , alkalinity = 78 mg/L as CaCO ₃					

LABOR

A staffing level of approximately 15.3 persons has been identified as necessary to operate and maintain the plant and wells. Note that actual staffing will depend on several factors, including regulatory requirements and union negotiations. For this analysis it is assumed that one operator per shift is needed, requiring four (4) individuals along with one day of scheduled overtime per week (equivalent to 0.2 persons). Two (2) operator/maintenance staff are also needed for the dual role of filling in for operators when needed and performing routine maintenance.

A working maintenance foreman is forecast, along with an instrument technician to perform routine maintenance/calibrations/replacements, while outside contractors will be used to perform major maintenance work. An electrical maintenance position is needed at the facility given the extensive electrical infrastructure.

Two non-union water quality specialists are projected given the extensive sampling required for plant operation and waste disposal. A compliance supervisor is needed to provide assurance that accurate and timely monitoring and reporting is performed.

Other supervision includes a full-time plant supervisor and a superintendent level person that would be responsible for the plant and wells. Rounding out the staff is an administrative assistant.

CAW intends to initiate hiring of staff in 2029 with one or more individuals working alongside CDM Smith, the DB contractor, as construction is completed and testing begins. It is anticipated that some specialized labor will be needed during construction and through the first two (2) years of operation while CAW staff become acclimated to the facility. The temporary specialized labor may be provided by a consultant or other third party. The specialized labor begins in 2029, peaks in 2030 at 3.25 persons, and tapers off in 2031, and is essentially zero for 2032 and 2033 other than the need for minimal time for offsite miscellaneous assistance. In 2030, the total persons needed for operation of the facility is 18.45. The only ongoing specialized labor is consulting services for optimization of membrane performance and service life.

Labor costs are based on union wage agreements where available. Internal labor costs for CAW reflect all applicable overhead costs, including pension, benefits and payroll taxes. Labor and contract labor costs were escalated based on the CPUC labor escalation factor memorandum for 2027 through 2030. The rate for 2027 through 2030 was 3.20%, 2.30%, 2.30%, and 2.20%, respectively. For 2031 and beyond, a composite rate of 2.50% was used.

WASTE DISPOSAL

The RO concentrate will be sent to Monterey One for blending with their discharge to their ocean outfall. An annual fee or lease for use of the outfall and associated increased costs to Monterey One has been discussed but not finalized. For this estimate, an annual fee of \$700,000 is included in waste disposal. Inflation is not included.

There may be iron and/or manganese in the source water that will need to be removed prior to the RO process. It is planned to capture and concentrate the waste with ultimate disposal to Monterey One. Similarly, neutralized RO cleaning solutions will be trucked to Monterey One for disposal. A disposal rate has not been established so a placeholder value of \$250 per thousand gallons was assumed for this memorandum.

Also included in this category is the extensive chemical analyses expected to be part of the NPDES permit. An estimate of the laboratory fees was made by assuming a likely set of analyses, a frequency, and obtaining a laboratory quotation. A contingency of 25% was added given the incomplete permit status at this time.

Waste disposal costs were escalated based on the PUC non-labor escalation factor memorandum rates, with the exception of the outfall lease fee which was not escalated at this time.

ENVIRONMENTAL MONITORING

The NPDES permit will require certain monitoring of the ocean near the ocean outfall to observe and document any degradation related to the blending and disposal of concentrate from the

plant. An estimate of the annual ocean monitoring activities of approximately \$500,000 was obtained from a consultant and is included.

A program of monitoring ground water levels is required to determine if pumping from the beach wells is having a negative impact on ground water. A projected annual cost of \$400,000 is included.

Environmental monitoring costs were escalated based on the PUC non-labor escalation factor memorandum rates.

CARTRIDGE FILTERS

Cartridge filters are required immediately upstream of the RO process to capture particulate material that may be present and protect the RO membranes. The filters are disposable and replacement at two (2) month intervals is projected if operating at design rate. For this analysis, replacement at 3-month intervals is included. Approximately 500 cartridges, which requires 2000 cartridges annually four times per year. The cost of each cartridge is estimated to be \$40 in 2026 dollars (per CDM except with no contingency). The PUC Non-Labor escalation rates were used. Replacement costs for the filters are included in the model, with replacement labor by CAW staff as part of maintenance activity.

MAINTENANCE

The maintenance line in this analysis is defined as routine repair and replacement of small parts, including instruments, analyzers, sensors, etc. It does not include internal labor because that is already addressed under the Labor category. It includes items such as scheduled maintenance of electrical gear, vibration analysis for rotating equipment, and UV system maintenance. Costs for large and extensive repair and replacement of equipment and systems are not included as an OPEX maintenance item.

An industry rule of thumb for seawater desalination places routine maintenance at 5–6% of total annual O&M cost. For this plant, approximately \$750,000 per year (2031 dollars) was used, about 5% of total OPEX at 4.2 mgd. The analysis assumes that only two-thirds of that value is needed for the first full year of operation as the facility is under contractor/supplier warranty. CAW is responsible for scheduled maintenance and routine repairs for the first year of operation. Warranty coverage addresses defects or malfunctions attributable to equipment or installation issues, whereas scheduled maintenance includes the routine activities and preventative measures necessary to ensure the equipment operates safely, efficiently, and in accordance with design requirements.

This analysis assumes only minor maintenance activity is required for the wells for the first three (3) years of operation and can be accomplished with the identified maintenance budget for the plant.

Maintenance costs were escalated based on the PUC non-labor escalation factor memorandum rates.

MISCELLANEOUS OPERATING EXPENSE

This category addresses a multitude of activities needed to operate the plant and wells. It includes the relatively minor electrical costs for operating HVAC and lighting, and the UV system. Costs for vehicles, laboratory supplies, site utility costs such as sewer and phone are included. Costs for diesel fuel to test run the plant generator is included. Drinking water compliance testing is also included in this line. Finally, costs for janitorial services, landscaping, and security system upkeep are included in this line. Miscellaneous operating costs were escalated based on the PUC non-labor escalation factor memorandum rates.

OTHER SIGNIFICANT COSTS – MEMBRANE REPLACEMENT

The RO membranes, in both the first pass and partial second pass, have a limited-service life. They require routine replacement to maintain overall system performance. For this analysis, the replacement rate is assumed to be 12.5% per year which equates to 245 replacement membranes per year. Note that this value is recommended by CDM Smith. With no contingency, the cost of replacement membranes, including installation, is approximately \$239,000 per year (2026\$). It is expected that membranes will be considered a capital item, so costs for periodic membrane replacement were not included in the OPEX estimate.

OTHER SIGNIFICANT COSTS-RENEWAL COSTS

CDM Smith provided an estimate of long-term equipment renewal (and replacement) costs for the treatment plant based on approximate facility capital cost of \$180 million and equipment cost of \$50 million. As expected, costs are greater in the second 10-year period than in the first ten years as shown in Table 3. Plant equipment renewal costs are appropriately categorized as capital expenditures rather than operating expenses and, therefore, are excluded from the O&M cost projections.

This information is provided for awareness only.

Table 3 Plant Equipment Renewal Cost (Courtesy of CDM Smith)

Equipment renewal cost		Period
Expenditure year 5	\$500,000	Year 0 -5
Expenditure year 10	\$2,000,000	Year 5-10
Expenditure year 15	\$8,500,000	Year 10-15
Expenditure year 20	\$13,500,000	Year 15-20
Annual renewal	\$1,225,000	Total/ 20 years