AGENDA

18700 Ward St.
Fountain Valley, CA 92708
(714) 378-3200

WATER ISSUES COMMITTEE MEETING
WITH BOARD OF DIRECTORS *
ORANGE COUNTY WATER DISTRICT
Wednesday, March 12, 2025 12:00 p.m., Boardroom

*The OCWD Water Issues Committee meeting is noticed as a joint meeting with the Board of Directors for the purpose of strict compliance with the Brown Act and it provides an opportunity for all Directors to hear presentations and participate in discussions. Directors receive no additional compensation or stipend as a result of simultaneously convening this meeting. Items recommended for approval at this meeting will be placed on the **March 19** Board meeting Agenda for approval.

This meeting will be held in person. As a convenience for the public, the meeting may also be accessed by Zoom Webinar and will be available by either computer or telephone audio as indicated below. Because this is an in-person meeting and the Zoom component is not required, but rather is being offered as a convenience, if there are any technical issues during the meeting, this meeting will continue and will not be suspended.

Computer Audio: Join the Zoom Webinar by clicking on the following link:
https://ocwd.zoom.us/j/98592928069

Webinar ID: 985 9292 8069

Telephone Audio: (213) 338 8477

Teleconference Sites:
10382 Bonnie Drive, Garden Grove
20 Civic Center, Santa Ana
100 South Main Street, Los Angeles
1454 Madison Street, Tustin
1502 North Broadway, Santa Ana
6148 Baja Drive, Anaheim
* Members of the public may attend and participate at all locations.

PLEDGE OF ALLEGIANCE

ROLL CALL

ITEMS RECEIVED TOO LATE TO BE AGENDIZED

RECOMMENDATION: Adopt resolution determining need to take immediate action on item(s) and that the need for action came to the attention of the District subsequent to the posting of the Agenda (requires two-thirds vote of the Board members present, or, if less than two-thirds of the members are present, a unanimous vote of those members present.)

VISITOR PARTICIPATION

Time has been reserved at this point in the agenda for persons wishing to comment for up to three minutes to the Board of Directors on any item that is not listed on the agenda, but within the subject matter jurisdiction of the District. By law, the Board of Directors is prohibited from taking action on such public comments. As appropriate, matters raised in these public comments will be referred to District staff or placed on the agenda of an upcoming Board meeting.

At this time, members of the public may also offer public comment for up to three minutes on any item on the Consent Calendar. While members of the public may not remove an item from the Consent Calendar for separate discussion, a Director may do so at the request of a member of the public.

CONSENT CALENDAR (ITEMS NO. 1 – 11)

All matters on the Consent Calendar are to be approved by one motion, without separate discussion on these items, unless a Board member or District staff request that specific items be removed from the Consent Calendar for separate consideration.

1. MINUTES OF WATER ISSUES COMMITTEE MEETING HELD FEBRUARY 12, 2025

   RECOMMENDATION: Approve minutes as presented

2. REQUEST FOR PROPOSALS: 2025 ASPHALT PAVEMENT REHABILITATION DESIGN

   RECOMMENDATION: Agendize for March 19 Board Meeting: Authorize issuance of a Request for Proposals for the 2025 Asphalt Pavement Rehabilitation Design

3. EMERGENCY REPAIR WORK ORDER RATIFICATIONS

   RECOMMENDATION: Agendize for March 19 Board meeting:

   1) Ratify Work Order No. 7 of Agreement No. 1451 and payment to W.A. Rasic, Inc. for emergency repairs totaling $29,258; and,

   2) Ratify Work Order No. 10 of Agreement No. 1451 and payment to W.A. Rasic, Inc. for emergency repairs totaling $25,563

4. CONTRACT SB-2025-1, BOND BASIN SLOPE REPAIR PROJECT: REQUEST FOR PROPOSALS FOR CONSTRUCTION MANAGEMENT AND INSPECTION SERVICES

   RECOMMENDATION: Agendize for March 19 Board meeting: Authorize issuance of RFP for Construction Management and Inspection Services for Contract No. SB-2025-1, Bond Basin Slope Repair Project

5. CITY OF ANAHEIM WELLS 39 AND 47 PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

   RECOMMENDATION: Agendize for March 19 Board meeting:

   1) Approve the Engineer's Report for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

   2) Authorize filing of a Categorical Exemption for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project in compliance with the California Environmental Quality Act (CEQA) guidelines

6. CITY OF ANAHEIM WELLS 48 AND 53 PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

   RECOMMENDATION: Agendize for March 19 Board meeting:

   1) Approve the Engineer's Report for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

   2) Authorize filing of a Categorical Exemption for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project in compliance

with the California Environmental Quality Act (CEQA) guidelines

7. CITY OF SANTA ANA PFAS TREATMENT AT JOHN GARTHE RESERVOIR: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

RECOMMENDATION: Agendize for March 19 Board meeting:

1) Approve the Engineer's Report for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project and determine the project feasible, necessary and beneficial to the lands of the District; and

2) Authorize filing of a Categorical Exemption for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project in compliance with the California Environmental Quality Act (CEQA) guidelines

8. AUTHORIZE AMENDMENT NO. 1 TO WORK ORDER TO ENVIRONMENTAL SCIENCE ASSOCIATES FOR ARCHEOLOGICAL MONITORING AT SA-2023-1

RECOMMENDATION: Agendize for March 19 Board meeting: Authorize Amendment No. 1 for Work Order 12 to Agreement 1135 with ESA, in the amount of $59,198, to conduct archeological monitoring during new ground disturbance activities for the construction of City of Santa Ana PFAS Water Treatment Plant Well Nos. 27 & 28

9. MULTISPECTRAL AERIAL IMAGERY AND LIGHT DETECTION RANGING (LIDAR) DATA ACQUISITION OF PRADO BASIN RFP

RECOMMENDATION: Agendize for March 19 Board meeting: Authorize issuance of request for proposals for multispectral aerial imagery and LiDAR data acquisition of Prado Basin

10. GOLDEN STATE WATER COMPANY LA JOLLA PLANT AND FERN PLANT PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

RECOMMENDATION: Agendize for March 19 Board meeting:

1) Approve the Engineer's Report for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

2) Authorize filing of a Categorical Exemption for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project in compliance with the California Environmental Quality Act (CEQA) guidelines

11. AWARD CONTRACT NO. FUL-2024-1 FULLERTON KIMBERLY WELL 2 PFAS WATER TREATMENT PLANT TO R C FOSTER CORPORATION

RECOMMENDATION: Agendize for March 19 Board meeting:

1) Receive and file Affidavit of Publication of Notice Inviting Bids for Contract FUL-2024-1 Fullerton Kimberly Well 2 PFAS Water Treatment Plant;

2) Ratify issuance of Addenda 1-2;

3) Accept bid and award contract FUL-2024-1 to the lowest responsive bid and responsible bidder, R C Foster Corporation, in the amount of $7,071,100; and

4) Establish the Fullerton Kimberly Well 2 PFAS Water Treatment Plant Project budget in the amount of $10,888,160

END OF CONSENT CALENDAR

MATTER FOR CONSIDERATION

12. EVALUATION OF LAND SUBSIDENCE HISTORY AND POTENTIAL IN THE ORANGE COUNTY GROUNDWATER BASIN

RECOMMENDATION: Agendize for March 19 Board meeting: Authorize issuance of a professional services agreement to GSI Environmental in an amount not to exceed $34,333 to evaluate land subsidence in the Orange County groundwater basin

INFORMATIONAL ITEM

13. PROPOSED FISCAL YEAR 2025-26 WATER PURCHASE BUDGET

CHAIR DIRECTION AS TO ITEMS IF ANY TO BE AGENDIZED AS MATTERS FOR CONSIDERATION AT THE MARCH 19 BOARD MEETING

DIRECTORS' ANNOUNCEMENTS/REPORTS

GENERAL MANAGER'S ANNOUNCEMENTS/REPORTS

ADJOURNMENT

WATER ISSUES COMMITTEE MEMBERS

Committee Members
Cathy Green – Chair
Erik Weigand – Vice Chair
Roger Yoh
Van Tran
Dina Nguyen

Alternates
Valerie Amezcua
Fred Jung
Natalie Meeks
Steve Sheldon
Denis Bilodeau

In accordance with the requirements of California Government Code Section 54954.2, this agenda has been posted at the guard shack entrance and in the main lobby of the Orange County Water District, 18700 Ward Street, Fountain Valley, CA and on the OCWD website not less than 72 hours prior to the meeting date and time above. All written materials relating to each agenda item are available for public inspection in the office of the District Secretary. Backup material for the Agenda is available at the District offices for public review and can be viewed online at the District's website: www.ocwd.com

Pursuant to the Americans with Disabilities Act, persons with a disability who require a disability-related modification or accommodation in order to participate in a meeting, including auxiliary aids or services, may request such modification or accommodation from the District Secretary at (714) 378-3234, by email at cfuller@ocwd.com by fax at (714) 378-3373. Notification 24 hours prior to the meeting will enable District staff to make reasonable arrangements to assure accessibility to the meeting.

As a general rule, agenda reports or other written documentation has been prepared or organized with respect to each item of business listed on the agenda and can be reviewed at www.ocwd.com. Copies of these materials and other disclosable public records distributed to all or a majority of the members of the Board of Directors in connection with an open session agenda item are also on file with and available for inspection at the Office of the District Secretary, 18700 Ward Street, Fountain Valley, California, during regular business hours, 8:00 am to 5:00 pm, Monday through Friday. If such writings are distributed to members of the Board of Directors on the day of a Board meeting, the writings will be available at the entrance to the Board of Directors meeting room at the Orange County Water District office.

MINUTES OF BOARD OF DIRECTORS MEETING
WATER ISSUES COMMITTEE
ORANGE COUNTY WATER DISTRICT
February 12, 2025, @ 12:00 p.m.

Director Green called the Water Issues Committee meeting to order at 12:00 p.m. in the District Boardroom. Public access was also provided via Zoom webinar. The Secretary called the roll and reported a quorum as follows:

Committee Members		OCWD
Cathy Green		John Kennedy – General Manager
Erik Weigand	(arrived 12:05 p.m.)	Chris Olsen – Executive Director of Engineering/Water Resources
Roger Yoh		
Van Tran		Mehul Patel – Executive Director of Operations
Dina Nguyen		Jason Dadakis – Executive Director of Water Quality & Technical Resources
Alternates		Lisa Haney – Executive Director of Planning & Natural Resources
Valerie Amezcua		
Fred Jung	(arrived 12:03 p.m.)	Roy Herndon – Chief Hydrogeologist
Natalie Meeks	(absent)	Bill Leever – Principal Hydrogeologist
Steve Sheldon	(arrived 12:13 p.m.)	Adam Hutchinson – Recharge Planning Manager
Denis Bilodeau	(arrived 12:03 p.m.)	Megan Plumlee – Director of Research
		Pat Versluis – Director of Water Quality
		Randy Fick – Treasurer/CFO
		Alicia Harasty – Legislative Affairs Liaison
		Randy Bouley – Director of Engineering
		Shawn Neville – Principal Planner
		Kevin O'Toole – Senior Planner
		Alex Waite – Principal Engineer
		Jeremy Jungreis – General Counsel
		Leticia Villarreal – Assistant District Secretary

CONSENT CALENDAR
The Consent Calendar was approved upon motion by Director Amezcua, seconded by Director Tran and carried [4-0], as follows:
Ayes: *Green, Yoh, Tran, Amezcua*

1. Minutes of Water Issues Committee Meeting

The Minutes of the Water Issues Committee meeting held January 8, 2025, were approved as presented.

2. Authorization Resolution for Watersmart Title XVI Water Infrastructure Improvements for the Nation Act Water Reclamation and Reuse Projects for Fiscal Years 2023 and 2024 Grant Application

Recommended for approval at February 19 Board meeting: Approve and adopt an Authorization Resolution for the District's Grant Application of the Orange County Water District PFAS Removal Program for the WaterSMART: Title XVI Water Infrastructure Improvements for the Nation Act Water Reclamation and Reuse Projects for Fiscal Years 2023 and 2024.

3. Award Contract GBM-2024-3 Construction of Shallow Aquifer Piezometers and Talbert Gap Monitoring Well Cluster

Recommended for approval at February 19 Board meeting:

1. **Receive and file Affidavit of Publication of Notice Inviting Bids for Contract GBM-2024-3; and**

2. **Accept bid and award contract GBM-2024-3 to J&H Drilling Co, Inc. dba MR Drilling for an amount not to exceed $199,025**

4. Service Agreement with BESST, Inc. for a Depth-Specific Flow and Water Quality Survey at Buena Park's Linden Well

Recommended for approval at February 19 Board meeting: Authorize issuance of a service agreement to BESST, Inc. in an amount not to exceed $40,700 to provide depth-specific data collection services at Buena Park's Linden well.

5. Authorize General Manager Approval of Agreement with USACE for Surface Water Level Monitoring at Prado Dam

Recommended for approval at February 19 Board meeting: Authorize General Manager to execute 5-year license agreement with the USACE for surface water level monitoring at two sites, subject to approval as to form by the District's General Counsel.

6. Contract SB-2025-1 Bond Basin Slope Repair Categorical Exemption and Notice Inviting Bids

Recommended for approval at February 19 Board meeting:

1. **Authorize filing of a Categorical Exemption for the Bond Basin Slope Repair project in compliance with the California Environmental Quality Act (CEQA) guidelines; and;**

2. **Authorize publication of Notice Inviting Bids for Contract No. SB-2025-1, Bond Basin Slope Repair Project**

7. City of Orange Wells 25 and 27 PFAS Treatment Plant Project: Engineer's Report and Categorical Exemption

Recommended for approval at February 19 Board meeting:

1. **Authorize filing of a Categorical Exemption for the Bond Basin Slope Repair project in compliance with the California Environmental Quality Act (CEQA) guidelines; and;**

2. **Authorize publication of Notice Inviting Bids for Contract No. SB-2025-1, Bond Basin Slope Repair Project**

8. K-2025-1: Kraemer Basin Check Valve Replacements: Award Construction Contract to Innovative Construction Solutions

Recommended for approval at February 19 Board meeting:

1. **Receive and file Affidavit of Publication of Notice Inviting Bids for Contract No. K-2025-1;**

2. **Increase Kraemer Basin Check Valve Replacement project budget by $165,000, for a total project budget of $365,000; and;**

3. **Accept bid and award contract K-2025-1 to Innovative Construction Solutions for an amount not to exceed $347,500**

9. Santiago Basin Floating Pump Station Power Wire and Conduit Repairs – Amendment No. 1 to Agreement with T.E. Roberts

Recommended for approval at February 19 Board meeting: Authorize Amendment No. 1 to Agreement No. 1610 with T.E. Roberts for an amount not to exceed $64,757 for the Santiago Basin Floating Pump Station Power Wire and Conduit Repairs.

10. Final Resilience Plan: Adaptive Strategies for Securing Abundant and Reliable Water Supplies

Recommended for approval at February 19 Board meeting:

1. **Receive and file the OCWD Resilience Plan; and**

2. **Authorize filing of Notice of Exemption in compliance with California Environmental Quality Act**

11. Execution of License Agreement for Existing Monitoring Well Site IDM-4 on Orange County Flood Control District Property

Recommended for approval at February 19 Board meeting: Authorize the General Manager to finalize and execute a 10-year term License Agreement with the Orange County Flood Control District, including payment of an administrative fee not to exceed $5,000, for continued access to existing monitoring well site IDM-4.

12. Anaheim Lake Valve Vault – Amendment No. 1 to Agreement 1681 with MKN

Recommended for approval at February 19 Board meeting: Authorize Amendment No.1 to Agreement No. 1681 with MKN for an amount not to exceed $33,200 for design services for the Anaheim Lake Valve Vault Project.

MATTERS FOR CONSIDERATION

13. Amendment No. 7 to Agreement No. 1175 with Intera, Inc. for Additional Supplies

Principal Hydrogeologist Bill Leever recapped to the Committee that the Sunset Gap seawater intrusion issues were first identified in 2009 when Huntington Beach Well HB-12 showed rising chloride levels, leading to well destruction due to corroded casing. He recalled that these issues triggered efforts for well installations and electro geophysics, to assess the extent of chloride intrusion. He shared modeling consultant Intera, Inc. updated and refined calibration of the Alamitos-Sunset Gap groundwater model with current data and conducted simulations of optimized barrier flow rates and a “no-barrier” alternative. He advised that based on the modeling results, staff asked Intera for estimated costs to perform additional model simulations to refine flow rates and evaluate injection water supply options. He stated these refinements will support the ongoing barrier feasibility study, which is partially funded by a $200,000 grant from the U.S. Bureau of Reclamation. He stated that staff will provide an update on the feasibility study.

Upon motion by Director Yoh, seconded by Director Amezcua and carried [5-0], the Committee Recommended for approval at the February 19 Board meeting: Authorize issuance of Amendment No. 7 to Agreement No. 1175 with Intera, Inc., in the amount of $57,550 for additional groundwater modeling of the Sunset Gap area.

Ayes: Green, Weigand, Yoh, Tran, Amezcua

14. Prado Dam Short-Term Compliance Sediment Management Planning and Design Agreement Amendment

Director of Engineering, Ryan Bouley recalled that the short-term sediment removal obligation originated in 2020 due to a U.S. Fish and Wildlife Service biological opinion regarding sediment accumulation behind Prado Basin. He advised that concerns were raised that sustained higher water levels for water conservation could impact habitat; and as a result, Fish and Wildlife mandated that 250,000 cubic yards of sediment be removed to maintain year-round water storage at 505 feet. He shared that for the Orange County Water District (OCWD), this requirement is critical for maintaining and increasing water conservation efforts. He reported that storing water at 505 feet allows controlled releases to recharge systems at optimal flow rates, maximizing water capture and aquifer replenishment. He noted that OCWD needs to remove 250,000 cubic yards of sediment by 2032. Mr. Bouley stated that in July the OCWD Board approved an agreement with Scheevel Engineering to assess how best to meet this obligation. He reported that Scheevel Engineering has developed an excavation plan, including optimal routes to transport sediment offsite. He noted that the remaining tasks include securing permits for storage, making minor infrastructure improvements for truck access, and implementing monitoring and support systems throughout the project's execution.

Upon motion by Director Weigand, seconded by Director Amezcua and carried [5-0], the Committee Recommended for approval at the February 19 Board meeting: Authorize Amendment No. 1 to Agreement No. 1607 with Scheevel Engineering, for and amount not to exceed $225,000, to assist with final design of the District's Prado Basin short-term compliance sediment removal obligation project.

Ayes: Green, Weigand, Yoh, Tran, Amezcua

CHAIR DIRECTION AS TO ITEMS IF ANY TO BE AGENDIZED AS MATTERS FOR CONSIDERATION AT THE FEBRUARY 19 BOARD MEETING

ADJOURNMENT

There being no further business, the meeting was adjourned at 12:47 p.m.

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Cathy Green, Chair

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AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: M. Patel/B. Smith

Budgeted: Yes
Proposed Budget: $100,000
Cost Estimate: $70,000
Funding Source: R&R
Program/Line Item No. R24023
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: REQUEST FOR PROPOSALS: 2025 ASPHALT PAVEMENT REHABILITATION DESIGN

SUMMARY

In 2024, the District worked with a consultant to create a pavement management plan that resulted in a multi-year method of rehabilitating the 35-acres of asphalt surfaces it owns. It is recommended to hire a designer for the first year of rehabilitations.

RECOMMENDATION

Agendize for March 19 Board meeting: Authorize issuance of a Request for Proposals for the 2025 Asphalt Pavement Rehabilitation Design.

BACKGROUND/ANALYSIS

Many of the District's sites include asphalt pavements on roadways, parking lots, and maintenance yards that total an area greater than 35 acres across more than a dozen different sites. The sites are located in the cities of Fountain Valley, Anaheim, Orange, Corona, and unincorporated county areas. Some of the asphalt pavements are failing, while others are in various stages of disrepair. If proactively managed, asphalt pavements can have a long lifespan. Active maintenance of the surfaces reduces the lifecycle costs of asphalt pavements compared to replacements required after catastrophic failures. As part of its Replacement and Rehabilitation (R&R) program, the District sets aside funds each year for pavement maintenance.

In 2024, Staff worked with the consultant Bucknam Infrastructure Group, Inc. to assess existing pavement qualities and to map out a plan for their rehabilitations. The effort culminated in a Pavement Management Plan (PMP) that defines the Pavement Condition Index (PCI) for each section of asphalt, estimates the annual investment amounts that are required to maintain or improve the asphalt conditions, and recommends the sequence of work to be the most cost effective in the long-term. The PCI scale ranges from 0 to 100 and the weighted total PCI for District asphalts was found to be 74. Staff have interpreted the PMP and laid out a multi-year plan to accomplish its recommendations (see Table 1) for which funding would draw from the R&R fund. The work is not expected to be eligible for grant funding since the pavement areas are generally not open for public use.

Table 1: Asphalt Pavement Management Plan

Fiscal Year	Cost Estimate
2024 - 25	$ 100,000
2025 - 26	$ 1,000,000
2026 - 27	$ 950,000
2027 - 28	$ 750,000
2028 - 29	$ 1,500,000

Staff has prepared a Request for Proposals (RFP) for design of the fiscal year 2025-26 asphalt pavement construction work. The scope of work for this year will include approximately 432,400 square feet (9.9 acres) of asphalt pavement at the Fountain Valley campus (administration and GWRS treatment plant areas), the Green Acres Project's Santa Ana Reservoir, and pavements at Burris, Riverview, Five Coves, and Kraemer Basins. The fiscal year 2025-26 proposed budget includes three separate construction project line items in the R&R section. Proposals will be due in April and staff expects to bring a recommendation for Agreement award to the Board in May.

PRIOR RELEVANT BOARD ACTION(S)

N/A

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/M. Patel/
F. Almario

Budgeted: Yes
Budgeted Amount: $300,000
Cost Estimate: $54,821
Funding Source: R&R
Program/Line Item No.: R24009
General Counsel Approval: N/A
Engineers Report: N/A
CEQA Compliance: N/A

Subject: EMERGENCY REPAIR WORK ORDER RATIFICATIONS

SUMMARY

The District annually establishes an emergency repair budget to facilitate a rapid response to periodic infrastructure failures and repairs. This budget item is funded by the District's Replacement and Refurbishment (R&R) reserves. Emergency expenditures in this fiscal year have totaled $124,771.

RECOMMENDATION

Agendize for March 19 Board meeting:

1. Ratify Work Order No. 7 of Agreement No. 1451 and payment to W.A. Rasic, Inc. for emergency repairs totaling $29,258; and,

2. Ratify Work Order No. 10 of Agreement No. 1451 and payment to W.A. Rasic, Inc. for emergency repairs totaling $25,563.

BACKGROUND/ANALYSIS

The District has implemented several measures to facilitate rapid response to emergency repairs, such as situations threatening loss of life or property. These measures are needed to respond immediately to emergencies that cannot wait for the District's normal processes to scope, design, bid, award, and execute construction work. The District has multi-year agreements in place with three contractors to respond to emergencies. The General Manager has been authorized to issue Work Orders in accordance with the emergency agreements. The District establishes an annual line item in each year's budget that is funded by the Replacement and Refurbishment (R&R) fund for emergency work. A budget of $300,000 was established for FY 2024-25. A brief description of the emergency repairs are provided below.

Staff was notified of a damaged fiber optic vault on Garfield Avenue, just outside of the OC San gates. The metal hatch was permanently damaged due to semi-truck traffic both entering and leaving the gates. A District emergency contractor was mobilized to secure the damaged vault by installing a traffic rated steel plate over the entire vault. This would prevent additional damage to the hatch and protect the fiber optic cable

housed in the vault. A new heavy duty hatch section was ordered and installed by the contractor. The new hatch is rated for continuous semi-truck traffic. Total contractor invoicing for this repair amounted to $29,258.

On September 25, 2024, staff was notified of a Green Acres Project (GAP) pipeline leak on Bear Avenue north of I-405, in the City of Costa Mesa. A District emergency contractor mobilized to the site to assess the extents of the leak. The area of the leak was excavated, and the leak was found to be from a lateral to a service connection. The damaged lateral and isolation valve were replaced, and the system was placed back online. Total contractor invoicing for this repair amounted to $25,563.

Table 1: FY 2024-25 Emergency Repair Budget Summary

Description	Budget
Sinkhole in Fountain Valley – July 2024	
W.A. Rasic W.O.8 *(Ratified November 2024)*	$ 14,299
RO Pipe Supports – August 2024	
T.E. Roberts W.O. 9/9A *(Ratified November 2024)*	$ 55,650
Fiber Optic Vault Repair – July 2024	$ 29,258
W.A. Rasic W.O.7	
GAP Pipeline Leak – September 2024	$ 25,563
W.A. Rasic W.O. 10	
Emergency Repairs Total:	$ 124,770
Remaining Repair Budget in FY 2024-25	$ 175,230
Total Budget	$ 300,000

Staff recommends ratification of Work Order 7 and Work Order 10 and payments to W.A. Rasic.

PRIOR RELEVANT BOARD ACTION(S)

3/20/24; R24-3-19: Authorize Amendments to Agreements for Emergency On-Call Repair Services with W.A. Rasic Construction Company, Inc., Doty Bros. Equipment Company, and T.E. Roberts, Inc. for Emergency On-Call Repair Services; and Authorize General Manager to Initiate Emergency Repairs with On-Call Firms.

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/L. Esguerra

Budgeted: Yes
Budgeted Amount: $200,000
Cost Estimate: $200,000
Funding Source: R&R Fund
Program/Line Item No.: R22028
General Counsel Approval: N/A
Engineers/Feasibility Report: NA
CEQA Compliance: Cat. Ex.

Subject: CONTRACT SB-2025-1, BOND BASIN SLOPE REPAIR PROJECT: REQUEST FOR PROPOSALS FOR CONSTRUCTION MANAGEMENT AND INSPECTION SERVICES

SUMMARY

Publication of Notice Inviting Bids for Contract No. SB-2025-1, Bond Basin Slope Repair Project construction contract was authorized by the Board on February 19, 2025. Staff recommends issuing a Request for Proposal (RFP) for a construction management firm to oversee construction, construction inspection, and material testing services.

RECOMMENDATION

Agendize for March 19 Board meeting: Authorize issuance of RFP for Construction Management and Inspection Services for Contract No. SB-2025-1, Bond Basin Slope Repair Project.

DISCUSSION

Bond Basin is part of the Santiago Basins recharge system as shown in Figure 1. The southeasterly corner of the basin contains a City of Orange storm drain. Over the past few years, the supporting slope and storm drain failed causing significant erosion to the area. Emergency repair work to construct a soil nail wall with rip rap placement was completed in January 2023 (See Figure 2). Final design on the permanent repair and storm drain pipeline re-alignment was completed and publication of the Notice Inviting Bids for construction was authorized by the Board on February 19, 2025. It is anticipated that this work will take place this summer and continue for seven months.

Due to the complexity and high-profile location of the work Staff recommends issuing a Request for Proposals for a construction management firm to oversee construction and perform inspections. The RFP scope of work will generally include overseeing overall construction activities for the District including conducting construction progress meetings; facilitating responses to submittals, RFIs, and change order requests; daily inspections to confirm the slope repairs and storm drain re-alignment are constructed per the plans and specifications; and material testing services the District cannot perform in-house such as fill material soil testing, soil compaction testing, concrete compressive strength testing, and special inspections of steel reinforcement.

Figure 1 – Project Location

Figure 2 – Soil Nail Wall at corner of Bond Basin

PREVIOUS BOARD ACTIONS

2/19/25, R25-2-15: Authorize filing of a Categorical Exemption in compliance of CEQA and authorize publication of Notice Inviting Bids for Contract No. SB-2025-1, Bond Basin Slope Repair Project.

3/20/24, R24-3-17: Authorize issuance of an Amendment to Agreement No. 1555 with ENGEO for final design services of Bond Basin slope repair and storm drain realignment for an amount not to exceed $42,500.

10/18/23, R23-10-140: Authorize issuance of a Professional Services Agreement to ENGEO for design services for the permanent Bond Basin slope repair and storm drain extension for an amount not to exceed $46,800.

11/16/22, R22-11-153: Ratify the emergency slope repair contract for Bond Basin in an amount of $992,000 to Access Limited Construction and ratify an amendment issued to ENGEO Incorporated for testing, construction inspection and reporting for $76,400.

10/5/22, R22-10-141: Authorized the General Manager to negotiate and execute a 50/50 cost share agreement with the city of Orange.

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/F. Almario

Budgeted: Yes
Budgeted Amount: $0
Cost Estimate: $0
Funding Source: CIP / Fed. CPF
Program/Line Item No.: C24014
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: CITY OF ANAHEIM WELLS 39 AND 47 PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

SUMMARY

The design for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project is currently in progress. Both the design and the construction costs will be funded, in part, by a WaterSMART: Title XVI WIIN Act Grant from the United States Bureau of Reclamation. Staff recommends approving the Engineer's Report for the project and filing a Categorical Exemption in compliance with the California Environmental Quality Act guidelines.

Attachment: Engineer's Report for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project

RECOMMENDATION

Agendize for March 19 Board Meeting:

1. Approve the Engineer's Report for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

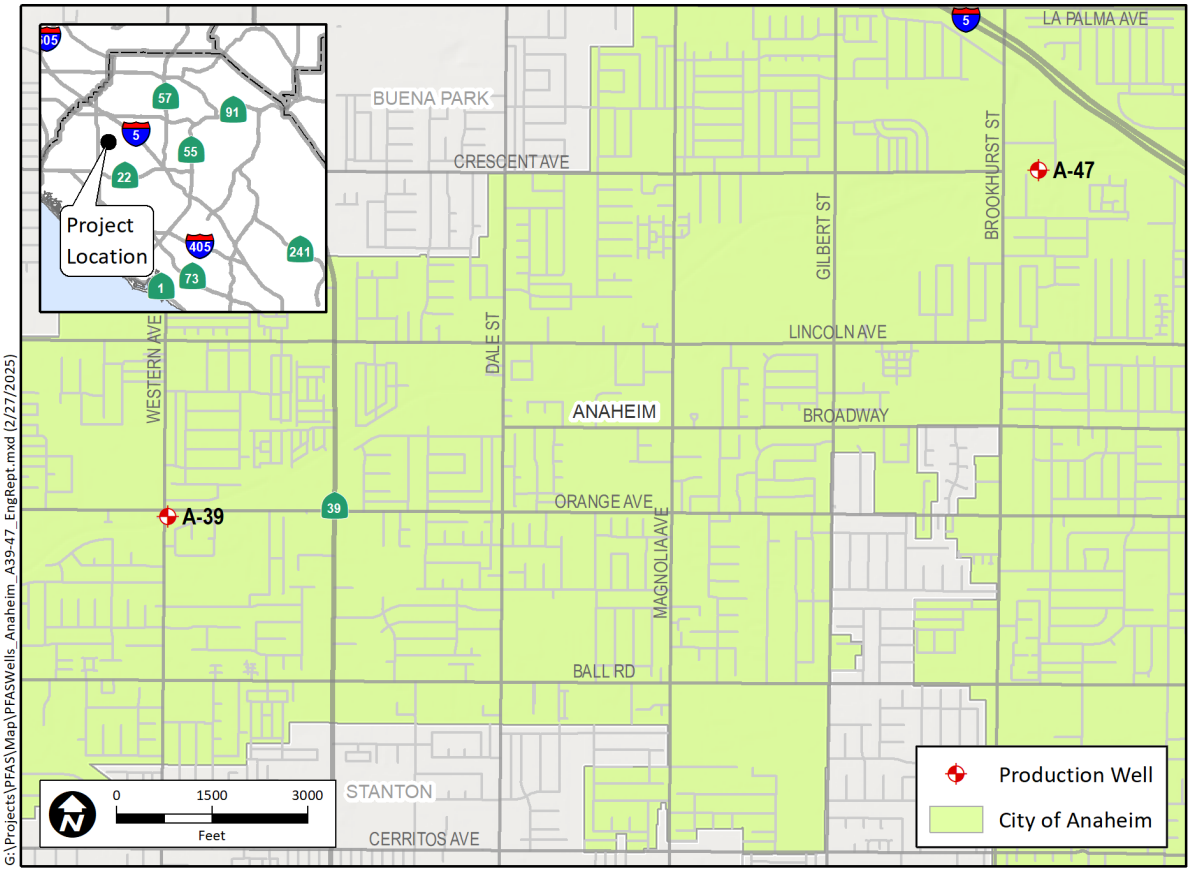
2. Authorize filing of a Categorical Exemption for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project in compliance with the California Environmental Quality Act (CEQA) guidelines

BACKGROUND/ANALYSIS

To restore the use of groundwater supplies impacted by PFAS contaminants with minimal delay, the engineering firm, Hazen and Sawyer, began design of the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Plant Project in September of 2024. Due to property constraints at the wells sites, a wellhead Ion Exchange (IX) treatment system has been selected as the treatment method. The number of vessels and required support systems needed for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), Nanofiltration (NF), or Reverse Osmosis (RO). Without additional land acquisition, IX quickly became the treatment choice for these sites. Hazen and Sawyer is currently in design of the PFAS treatment systems for Wells 39 and 47, and plans will be available

for review by OCWD and the City of Anaheim in March 2025. Figure 1 shows the location of the City of Anaheim wells:

Figure 1: City of Anaheim PFAS Well Treatment Sites



The City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project will include installing IX vessel systems and all pre-filtration, site piping, well modifications, electrical upgrades, and other appurtenances. Staff has determined that the Wells 39 and 47 PFAS Treatment Systems Project is consistent with a California Environmental Quality Act (CEQA) Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures. The expected project schedule is shown in Table 1.

Table 1: City of Anaheim PFAS Treatment Project Schedule Summary

Description	Date
City of Anaheim Wells 39 & 47 PFAS Treatment Systems	
Design	Sept 2024 – Aug 2025
DDW Permitting	Aug 2025 – Jan 2028
Construction Contract	Nov 2026 – Jan 2028

The District was awarded a $30 million Grant from the United States Bureau of Reclamation (USBR) as part of the WaterSMART: Title XVI WIIN Act. This funding, provided by Bipartisan Infrastructure Law, is designated for the District's PFAS treatment program to eliminate per- and polyfluoroalkyl substances from local groundwater. Therefore, both the design and construction costs of the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project will be funded, in part, by the WaterSMART:Title XVI WIIN Act Grant for PFAS projects up to $30 Million. Staff is currently working with the USBR Denver Office on the final approval of the District's Grant application, PFAS program budget, funding matrix, program components and schedule, and NEPA and CEQA compliances.

However, prior to any construction costs being eligible for Grant reimbursement, the USBR is requiring that the District process a Categorical Exemption as part of the CEQA compliance. Upon completion of CEQA, the USBR will act as the lead agency for compliance with the National Environmental Policy Act (NEPA) – a process that can take up to six months to complete. This NEPA process is in addition to OCWD filing the CEQA Categorical Exemption and cannot proceed until after OCWD's filing is complete. Both the CEQA and NEPA environmental compliances require the Engineer's Report to provide the basis for the project. The recommended action in this submittal only includes approving the Engineer's Report and authorizing CEQA filing. This action does not include authorizing bidding or construction of the project. Staff will return to the Board to request authorization of a Notice Inviting Bids at a later date.

Staff recommends approving the Engineer's Report and authorizing the filing of a Categorical Exemption in compliance with CEQA guidelines for the City of Anaheim Wells 39 and 47 PFAS Treatment Systems Project.

PRIOR RELEVANT BOARD ACTION(S)

None

ENGINEER'S REPORT

FOR

CITY OF ANAHEIM
WELLS 39 AND 47
PFAS TREATMENT SYSTEMS PROJECT

Prepared By:

Fernando Almario, P.E.
February 2025

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1.0 EXECUTIVE SUMMARY

The purpose of this Engineer's Report is for Orange County Water District (OCWD; the District) and the City of Anaheim (City; Anaheim) to evaluate the need, benefits, and cost of constructing a Per- and Polyfluoroalkyl Substances (PFAS) treatment systems for Anaheim Wells 39 and 47.

In April of 2024, the United States Environmental Protection Agency (EPA) issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable maximum contaminant level (MCL) and non-enforceable maximum contaminant level goal (MCLG) for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2]- $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

In February 2020, the State Water Resources Control Board's Division of Drinking Water (DDW) issued revised drinking water response levels of 10 parts per trillion (ppt) for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS. DDW recommends that sources exceeding these limits be taken out of service, treated, or blended. When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

In 2019, the District hired Carollo to conduct a PFAS Planning Study to evaluate options for the treatment of groundwater wells that are potentially impacted by PFAS and to develop preferred alternatives. The five alternatives evaluated in the Planning Study

were shutting down the potentially impacted well and replacing the source with imported water, blending well water with imported water, blending well water with other groundwater, packing part of the well to avoid zones with PFAS, and engineered treatment. Although Anaheim Wells 39 and 47 were not part of the original Planning Study efforts, it was determined that engineered treatment, specifically ion exchange, would be the preferred given the similar nature of all the wells that were part of the study. The District also hired Jacobs in 2019 to perform pilot testing and life-cycle cost analysis of various treatment technologies. Preliminary results from the Jacobs study indicate that ion-exchange is an efficient technology to remove PFAS.

This project will consist of installing ion exchange vessel systems in lead-lag configuration at each well, including the necessary piping, prefilters and related appurtenances.

Benefits of constructing a PFAS Treatment System at the wells sites include:

- Allow the City of Anaheim to continue to utilize its well and infrastructure investment.
- Allow the City of Anaheim to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $6,970,041 per year in water supply costs.
- Save OCWD approximately $3,091,850 per year by paying for the treatment plant instead of losing RA revenue.
- Save the City of Anaheim approximately $3,878,192 per year by utilizing groundwater instead of imported water.

In November 2019, the District adopted a PFAS policy to design and construct the lowest reasonable cost but efficient treatment system to remove PFOA and PFOS compounds for Groundwater Producers, such as Anaheim. Additionally, the policy states that OCWD will provide a 50 percent subsidy for future operation and maintenance expenses up to $89.60 per acre-foot.

The current estimated capital cost of this project is $17,340,000. The current estimated Operation and Maintenance cost is $215 per acre-foot per year, to be split between OCWD and Anaheim. These costs will be adjusted as the engineering details are finalized and construction is completed.

2.0 BACKGROUND

In 2009, the United States Environmental Protection Agency (EPA) established a provisional health advisory of 400 ppt for PFOA and 200 ppt for PFOS to assess the potential risk for short-term exposure through drinking water. The EPA later released a non-regulatory health advisory level of 70 ppt for PFOA and PFOS (combined) in 2016.

In March 2019, the DDW issued mandatory PFAS testing orders to 12 public water systems (Groundwater Producers) in the District's service area. Dozens of wells in the District's service area had water quality testing results exceeding the DDW Notification Levels. Affected Producers were required to provide governing body notifications for exceedances of the Notification Level. Later in 2019, DDW lowered the Notification Limits to 5.1 ppt for PFOA and to 6.5 ppt for PFOS. In February 2020 DDW lowered the Response Levels to 10 ppt for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS.

In April of 2024, the EPA issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable MCLs and non-enforceable MCLGs for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2] $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

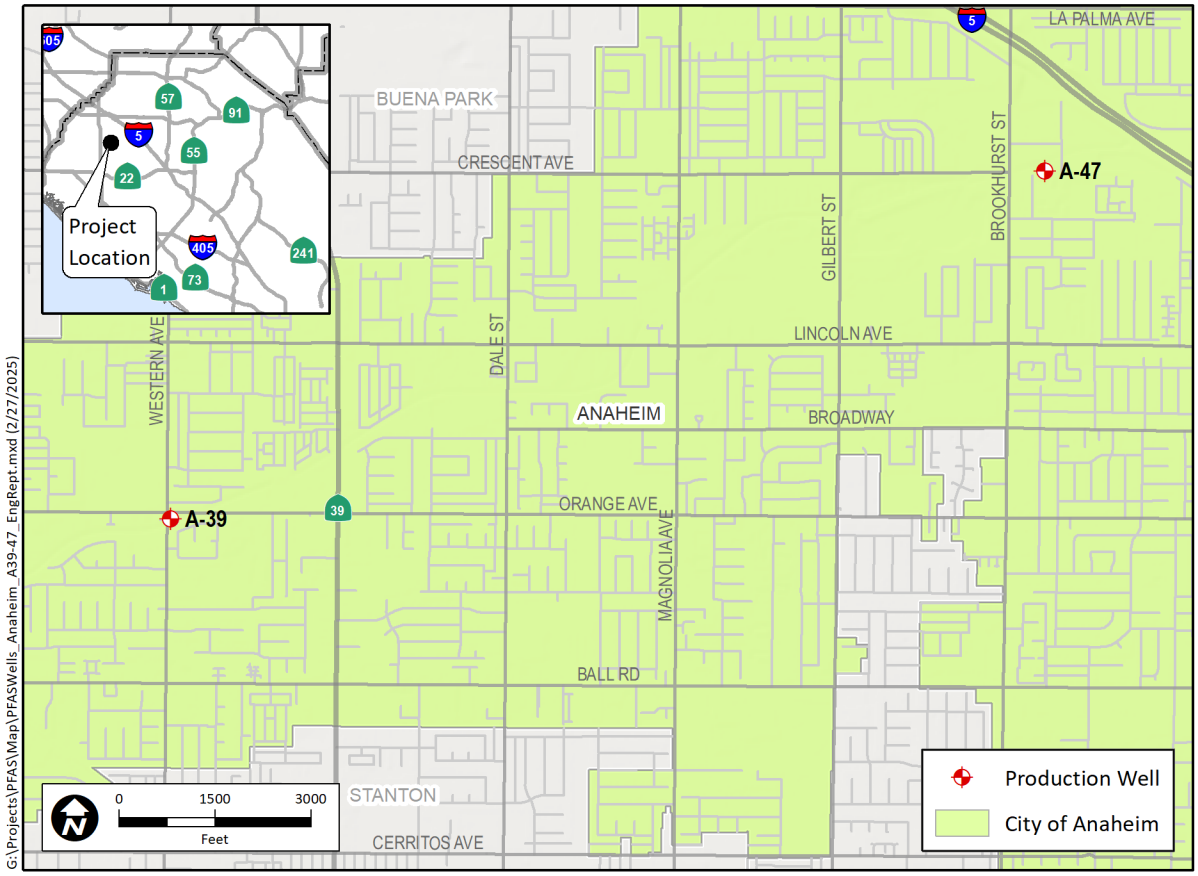
In preparation for the impacts of PFAS to groundwater supplies, the District adopted a PFAS policy in November 2019. Among other items, the policy states that OCWD will fund the lowest reasonable and efficient treatment system design and construction costs to remove PFAS compounds for Groundwater Producers. Additionally, the policy states that OCWD will provide a 50 percent subsidy for operation and maintenance

expenses up to $75 per acre-foot. The rate is adjusted annually each July 1 (beginning July 1, 2021) and the maximum subsidy for operation and maintenance has been updated to $89.60 per acre-foot for fiscal year 2023/2024.

When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

The City of Anaheim Wells are currently under consideration for PFAS treatment systems shown in Figures 1. All sites are owned by the City of Anaheim and currently house the Well head and discharge piping, communication equipment, electrical equipment, and disinfection facilities.

Figure 1: City of Anaheim Wells Vicinity Map



IX is the preferred and most efficient treatment for the well sites due to site area limitations. The number of vessels and support systems required for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), and IX would be more cost-effective than Nanofiltration (NF)

or Reverse Osmosis (RO). RO is a treatment technology that ensures high reliability for PFAS removal but would generate a liquid waste stream containing PFAS and would be more expensive than the other technologies. Additionally, a RO plant would likely require additional City of Anaheim staff with the appropriate water treatment certifications to operate. Although RO would be the most effective option for long-term removal of PFAS, the costs associated with RO make IX the most feasible treatment choice for the wells at this time.

The Jacobs-OCWD joint pilot study of various treatment medias began testing of IX in December 2019. The study has shown that IX successfully removes PFAS.

3.0 PROJECT PURPOSE AND DESCRIPTION

3.1 Project Purpose

The purpose of this project is to design, permit, construct, and operate PFAS removal systems for the well sites in accordance with the District PFAS policy. The proposed IX treatment system is to remove PFOA and PFOS to less than 2 ppt (the current non-detect limit). Use of this PFAS removal treatment system will ensure the groundwater supplied by the well sites can be served in compliance with PFAS regulations.

3.2 Project Components

The PFAS treatment systems will be located at Wells 39 and 47 and will be sized to treat the maximum well discharge flow rates. Trains (or systems) of two IX vessels will be used in lead-lag configuration. See Table 1 for the treatment capacity and vessel dimensions and quantity for each well head treatment plant.

Table 1: Well Treatment Capacity Summary

Well Site	IX Vessels	Pumping Capacity (gpm)	Treatment Capacity (gpm)
Well 39	Two (2) Trains; Four (4) Vessels; 12 feet diameter x 13 feet height	2,381	3,200
Well 47	Three (3) Trains; Six (6) Vessels; 12 feet diameter x 13 feet height	3,500	4,800

The IX vessels are expected to be provided by Evoqua Water Technologies or Aqueous Vets. The influent and effluent supply pipelines can be operated in a way to switch which vessel is the lead and lag position by controlling valves. The lead-lag arrangement is beneficial because once the PFAS constituents reach a predetermined threshold in the lead vessel's effluent, then the lead vessel can be switched to the lag position once the spent resin in it is replaced with fresh resin. The new lead vessel houses pre-loaded IX resin from when the vessel was formerly in the lag position. Replacement of the IX media is performed before the lead vessel returns to service in the lag position. Sample ports are located at several positions in the vessel so that resin performance can be monitored.

Prior to the water entering the IX vessels, it first passes through a pre-filtration system. Since IX media should not be backwashed, its lifespan would be greatly reduced if solids loading were to occur. It is proposed to use 5-micron bag-filters prior to the IX vessels to catch solids that may be discharged by the well.

The existing disinfection systems used at the wells must be reconfigured to facilitate the operation and replacement activities.

Electrical and telemetry systems will be integrated into the treatment plant to convey information into the existing SCADA system. Flow rates, pressure differential, and flood alarms are included in the list of proposed instrumentation.

3.3 Permits and Regulatory Issues

The City's drinking water system operates under a DDW permit that would need to be amended for the proposed PFAS treatment systems. Submittals for the amendment shall be submitted to DDW for review, including the 90% completed design. The permit amendment is not officially granted until after the system is constructed and satisfactorily inspected by DDW.

Several permits will be required from the City of Anaheim:

- A right of entry permit will be required to grant the District and its consultants and contractors control of the site during construction.
- A grading permit will be required from the City of Anaheim Public Works Department.

In accordance with the California Environmental Quality Act (CEQA) guidelines, it is proposed to file a Categorical Exemption for the project. The project is consistent with the Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures.

4.0 FINANCIAL ANALYSIS

4.1 Construction Cost Estimates

The estimated construction cost for the IX project is $13,340,000 as detailed in Table 2.

Table 2: IX Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization	1	LS	$1,175,000	$1,175,000
General Conditions	1	LS	$470,000	$470,000
Pre-Filtration System	1	LS	$1,500,000	$1,500,000
Vessel Systems with IX Resin (3400 cubic feet)	1	EA	$1,500,000	$1,500,000
IX Systems (appurtenances, install)	1	LS	$2,820,000	$2,820,000
Yard Piping	1	LS	$1,410,000	$1,410,000
Site Work	1	LS	$1,645,000	$1,645,000
Electrical and Communication	1	LS	$940,000	$940,000
Pump and Motor Upgrades	1	LS	$1,880,000	$1,880,000
			Total =	**$13,340,000**

The estimated construction cost for the Reverse Osmosis system is $20,257,000, as detailed in Table 3.

Table 3: RO Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization (7%)	1	LS	$1,175,000	$1,175,000
General Conditions (5%)	1	LS	$940,000	$940,000
Pre-Filtration System	1	LS	$517,000	$517,000
RO Treatment Systems & Pumps	1	LS	$4,700,000	$4,700,000
RO Membranes	1	LS	$1,175,000	$1,175,000
Chemical Storage	1	LS	$940,000	$940,000
Sewer Connection & Fees	1	LS	$940,000	$940,000
Yard Piping & Mechanical	1	LS	$2,585,000	$2,585,000
Building	1	LS	$940,000	$940,000
Site Work	1	LS	$3,055,000	$3,055,000
Electrical and Communication	1	LS	$2,115,000	$2,115,000
Pump and Motor Upgrades	1	LS	$1,175,000	$1,175,000
			Total =	**$20,257,000**

4.2 Capital Cost Estimate

The estimated total capital cost for the IX project is $17,340,000, as shown in Table 4. The estimated total capital cost for a RO treatment plant is $27,057,000 as shown in the same table. The table includes the cost of constructing the site improvements for the PFAS treatment system, engineering services for design and construction phases, construction management and the cost associated with meeting regulatory requirements.

Table 4: Capital Cost Estimate

Item	IX Cost	RO Cost
Engineering, Permitting, Construction Management and Inspection & CEQA	$ 2,000,00	$ 3,800,000
Construction	$ 13,340,000	$ 20,257,000
Contingency	$ 2,000,000	$ 3,000,000
Total =	**$ 17,340,000**	**$ 27,057,000**

4.3 Annual Operation and Maintenance Cost Estimate

The estimated annual Operation and Maintenance (O&M) cost for the IX project is $1,470,000 per year, as detailed in Table 5. It conservatively assumes that visual inspection will be performed daily, and analytical testing will be performed by an outside entity instead of OCWD.

The five-year average annual production from the City wells is approximately 6,843 acre-feet. Using this value results in a unit O&M cost of $215 per acre-foot. Per the District's PFAS policy, the O&M costs will be split between OCWD and the City of Anaheim with OCWD's portion being no larger than $89.60 per acre-foot. The estimated $215 per acre-foot O&M unit cost would result in OCWD incurring $89.60 per acre-foot and the City of Anaheim to incur $125 per acre-foot.

Table 5: IX Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Power	12	Month	$50,000	$600,000
Labor	1	Year	$30,000	$30,000
Maintenance	1	Year	$30,000	$30,000
Analytical Testing	12	Month	$5,000	$60,000
Media Replacement	1	Year	$750,000	$750,000
			Total =	**$ 1,470,000**

Table 6 shows an itemized breakdown of O&M cost for a RO treatment plant. Using an annual volume of 6,843 acre-feet, the RO O&M unit cost is estimated to be $414 per acre-foot.

Table 6: RO Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Power	12	Month	$100,000	$1,200,000
Chemicals	12	Month	$6,500	$78,000
Labor	1	Year	$90,000	$90,000
Maintenance	1	Year	$225,000	$225,000
Analytical Testing	12	Month	$5,500	$66,000
Membrane Replacement	1	Year	$1,175,000	$1,175,000
			Total =	**$ 2,834,000**

4.4 Ion-Exchange Cost Comparisons

Three methods to evaluate the economic effectiveness of the IX project are presented below. All three methods indicate that there is a financial benefit to move forward with this project.

1) OCWD Service Territory Perspective - The total project cost of providing water to the OCWD service territory via treated groundwater versus purchasing MWD imported water.
2) OCWD Perspective - The OCWD lost revenue due to no City of Anaheim groundwater production versus the OCWD cost to construct and operate the treatment plant.
3) City of Anaheim Perspective – The cost of providing treated groundwater versus purchasing MWD imported water.

Method 1: OCWD Service Territory Perspective

The unit cost for the City of Anaheim to acquire treated imported water through MWD will be $1,460 per acre-foot ($1,395 Full Service Treated + $65 readiness to serve) on January 1, 2025. An annual volume of 6,843 acre-feet would cost $9,990,225.

If the capital cost is amortized over 30 years at a 4% interest rate, the annual payment for the PFAS treatment plant would be $1,022,774, or $147 per acre-foot for 6,843 acre-feet. The well power cost to pump groundwater averages $80 per acre-foot. The PFAS treatment system's O&M expense is estimated to be $215 per acre-foot. As shown in Table 7, the total unit cost of the treated groundwater would be $441 per acre-foot, or $3,020,184 per year for 6,873 acre-feet. Note that the Replenishment Assessment (RA) is not considered in this calculation because it would be both paid and received by agencies within the OCWD Service Territory.

Implementation of the PFAS treatment system at the City of Anaheim Wells is estimated to save the OCWD service territory $6,970,042 per year in water supply costs.

Table 7: OCWD Service Territory Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,022,774	$147	Full Service Treated	$ 9,545,455	$ 1,395
Project O&M	$ 1,470,000	$215	Readiness to Serve	$ 444,770	$ 65
Well Power	$ 547,410	$80			
Total	$ 3,020,184	$441	Total	$ 9,990,225	$ 1,460

Method 2: OCWD Perspective

Taking the City of Anaheim Wells out of service would reduce the RA payments made by Anaheim to OCWD. This assumes that other wells are not available to pump the volume. At an annual volume of 6,843 acre-feet and the current RA of $688 per acre-foot, OCWD would lose revenue of $4,707,723.

The District's expenses to construct the PFAS treatment plants at the Anaheim Wells includes the capital expense and $89.60 of the O&M. As previously discussed, the amortized unit capital expense is $147 per acre-foot and OCWD's portion of the estimated O&M expense is $89.60 per acre-foot. The resulting unit cost of constructing and operating PFAS plants at the wells would be $236 per acre foot, or $1,615,873 per year using 6,843 acre-feet per year.

Table 8: OCWD Perspective

Project Cost			Lost Revenue		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,002,774	$ 147	Replenishment Assessment	$ 4,707,723	$ 688
Project O&M	$ 613,099	$ 89.60			
Total	$ 1,615,873	$ 236	Total	$ 4,707,723	$ 688

Implementation of PFAS treatment systems at City of Anaheim Wells is estimated to save OCWD $3,091,850 per year by utilizing the treatment plant instead of losing RA revenue.

Method 3: City of Anaheim Perspective

Given the need for the City of Anaheim to acquire water supplies to meet the demands of its customers, it is faced with a situation to utilize the PFAS treatment system or to purchase MWD imported water. As previously discussed, the cost to the City of Anaheim to purchase 6,843 acre-feet of MWD water would be $9,990,225 per year, or $1,460 per acre-foot.

The costs for the City of Anaheim to produce groundwater from the Anaheim Wells and operate the PFAS treatment plant include payment of the RA ($688 per acre-foot), their portion of the O&M expenses and well power costs ($205 per acre-foot). The total unit cost would be $893 per acre-foot, or $6,112,033 per year for 6,843 acre-feet.

Table 9: City of Anaheim Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Replenishment Assessment	$ 4,707,723	$ 688	Full Service Treated	$ 9,545,455	$ 1,395
Project O&M and Well Power	$ 1,404,311	$205	Readiness to Serve	$ 444,771	$ 65
Total	$ 6,112,033	$ 893	Total	$ 9,990,225	$ 1,460

Implementation of PFAS treatment systems at the Anaheim Wells is estimated to save the City over $3,878,192 per year by utilizing groundwater instead of MWD imported water.

4.5 Reverse Osmosis versus Ion Exchange Unit Cost

RO would provide a more robust, comprehensive, and reliable treatment for long-term removal of PFAS. However, the capital and operating cost of the treatment system are more expensive. If the estimated RO capital cost of $27,057,000 is amortized over 30 years at a 4% interest rate, the annual payment for the RO PFAS treatment plant would be $1,564,709, or $229 per acre-foot for 6,843 acre-feet. The RO PFAS treatment system's O&M expense is estimated to be $414 per acre-foot for 6,843 acre-feet. As shown in Table 10, the total unit cost of the RO treated groundwater would be $643 per acre-foot, or $4,398,709 per year for 6,843 acre-feet. The IX project costs are also summarized in the same table.

Table 10: Reverse Osmosis versus Ion Exchange Unit Cost

IX			RO		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,002,774	$ 147	Project Capital	$ 1,564,709	$ 229
Project O&M	$ 1,470,000	$ 215	Project O&M	$ 2,834,000	$ 414
Total	$ 2,472,774	$ 361	Total	$ 4,398,709	$ 643

5.0 CONCLUSIONS AND RECOMMENDATIONS

Constructing the proposed IX PFAS Treatment Plant at the City of Anaheim Wells 39,47,48 & 53 will:

- Allow the City of Anaheim to continue to utilize its well and infrastructure investment.
- Allow the City of Anaheim to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $6,970,041 per year in water supply costs.
- Save OCWD approximately $3,091,850 per year by paying for the treatment plant instead of losing RA revenue.
- Save the City of Anaheim approximately $3,878,192 per year by utilizing groundwater instead of imported water.

Given the financial benefits to the OCWD service territory, OCWD, and the City of Anaheim to utilize a less expensive treated groundwater supply instead of MWD water, it is recommended that OCWD proceed with PFAS Treatment System Project for the City of Anaheim Wells 39 and 47. Additionally, the City of Anaheim would be able to continue using their Well investment and maintain their local water component of their supply portfolio.

6.0 PROPOSED IMPLEMENTATION SCHEDULE (TENTATIVE)

Date	Activity
June 2026	Board authorizes Notice Inviting Bids
July 2026	Advertise for construction bids
September 2026	Board awards construction contract
January 2028	Completion of construction

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/F. Almario

Budgeted: Yes
Budgeted Amount: $0
Cost Estimate: $0
Funding Source: CIP / Fed. CPF
Program/Line Item No.: C24001
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: CITY OF ANAHEIM WELLS 48 AND 53 PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

SUMMARY

The design for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project is currently in progress. Both the design and the construction costs will be funded, in part, by a WaterSMART: Title XVI WIIN Act Grant from the United States Bureau of Reclamation. Staff recommends approving the Engineer's Report for the project and filing a Categorical Exemption in compliance with the California Environmental Quality Act guidelines.

Attachment: Engineer's Report for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project

RECOMMENDATION

Agendize for March 19 Board Meeting:

1. Approve the Engineer's Report for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

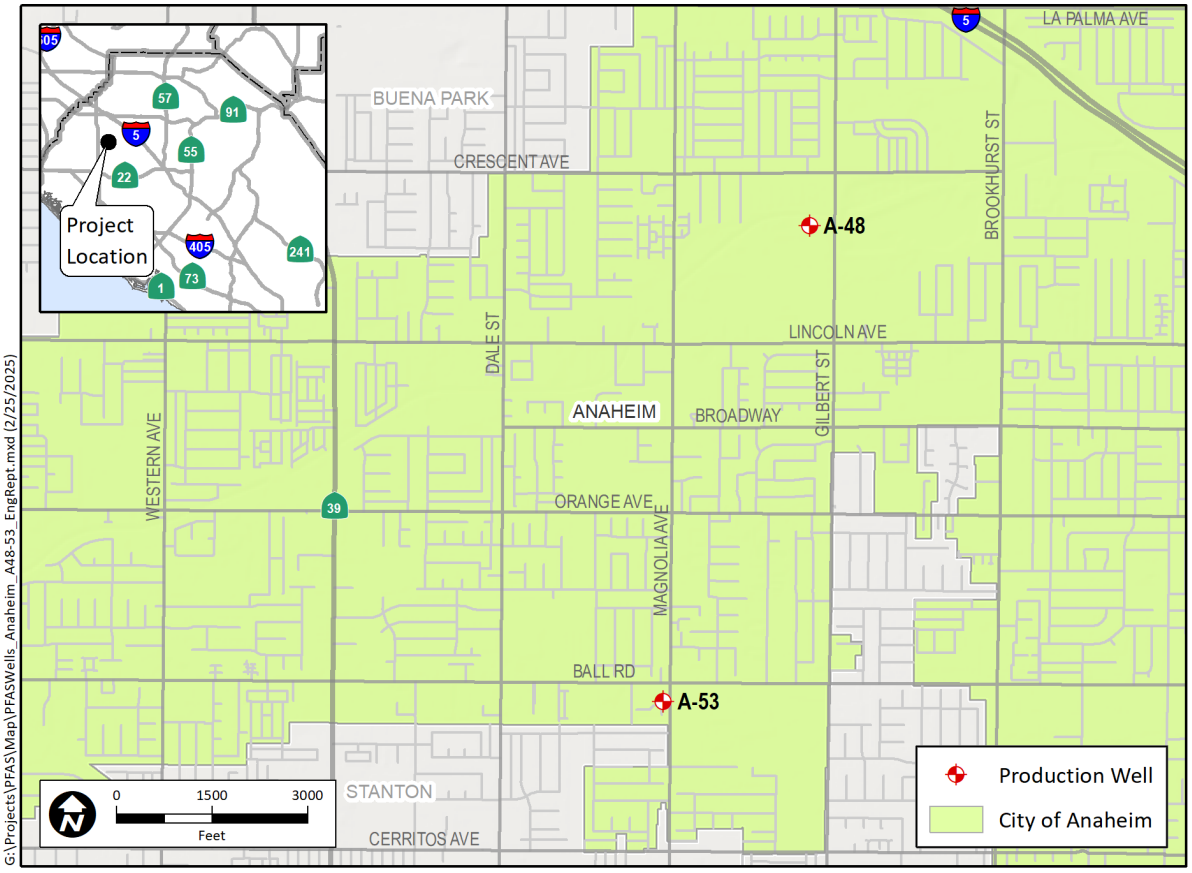
2. Authorize filing of a Categorical Exemption for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project in compliance with the California Environmental Quality Act (CEQA) guidelines

BACKGROUND/ANALYSIS

To restore the use of groundwater supplies impacted by PFAS contaminants with minimal delay, the engineering firm, Hazen and Sawyer, began design of the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Plant Project in September of 2024. Due to property constraints at the wells sites, a wellhead Ion Exchange (IX) treatment system has been selected as the treatment method. The number of vessels and required support systems needed for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), Nanofiltration (NF), or Reverse Osmosis (RO). Without additional land acquisition, IX quickly became the treatment choice for these sites. Hazen and Sawyer is currently in design of the PFAS treatment systems for Wells 48 and 53, and plans will be available

for review by OCWD and the City of Anaheim in March 2025. Figure 1 shows the location of the City of Anaheim wells:

Figure 1: City of Anaheim PFAS Well Treatment Sites



The City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project will include installing IX vessel systems and all pre-filtration, site piping, well modifications, electrical upgrades, and other appurtenances. Staff has determined that the Wells 48 and 53 PFAS Treatment Systems Project is consistent with a California Environmental Quality Act (CEQA) Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures. The expected project schedule is shown in Table 1.

Table 1: City of Anaheim PFAS Treatment Project Schedule Summary

Description	Date
City of Anaheim Wells 48 & 53 PFAS Treatment Systems	
Design	Sept 2024 – Aug 2025
DDW Permitting	Aug 2025 – Aug 2027
Construction Contract	Nov 2025 – Aug 2027

The District was awarded a $30 million Grant from the United States Bureau of Reclamation (USBR) as part of the WaterSMART: Title XVI WIIN Act. This funding, provided by Bipartisan Infrastructure Law, is designated for the District's PFAS treatment program to eliminate per- and polyfluoroalkyl substances from local groundwater. Therefore, both the design and construction costs of the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project will be funded, in part, by the WaterSMART:Title XVI WIIN Act Grant for PFAS projects up to $30 Million. Staff is currently working with the USBR Denver Office on the final approval of the District's Grant application, PFAS program budget, funding matrix, program components and schedule, and NEPA and CEQA compliances.

However, prior to any construction costs being eligible for Grant reimbursement, the USBR is requiring that the District process a Categorical Exemption as part of the CEQA compliance. Upon completion of CEQA, the USBR will act as the lead agency for compliance with the National Environmental Policy Act (NEPA) – a process that can take up to six months to complete. This NEPA process is in addition to OCWD filing the CEQA Categorical Exemption and cannot proceed until after OCWD's filing is complete. Both the CEQA and NEPA environmental compliances require the Engineer's Report to provide the basis for the project. The recommended action in this submittal only includes approving the Engineer's Report and authorizing CEQA filing. This action does not include authorizing bidding or construction of the project. Staff will return to the Board to request authorization of a Notice Inviting Bids at a later date.

Staff recommends approving the Engineer's Report and authorizing the filing of a Categorical Exemption in compliance with CEQA guidelines for the City of Anaheim Wells 48 and 53 PFAS Treatment Systems Project.

PRIOR RELEVANT BOARD ACTION(S)

None

ENGINEER'S REPORT

FOR

CITY OF ANAHEIM
WELLS 48 and 53
PFAS TREATMENT SYSTEMS PROJECT

Prepared By:

Fernando Almario, P.E.
February 2025

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1.0 EXECUTIVE SUMMARY

The purpose of this Engineer's Report is for Orange County Water District (OCWD; the District) and the City of Anaheim (City; Anaheim) to evaluate the need, benefits, and cost of constructing a Per- and Polyfluoroalkyl Substances (PFAS) treatment systems for Anaheim Wells 48 and 53.

In April of 2024, the United States Environmental Protection Agency (EPA) issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable maximum contaminant level (MCL) and non-enforceable maximum contaminant level goal (MCLG) for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2]- $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

In February 2020, the State Water Resources Control Board's Division of Drinking Water (DDW) issued revised drinking water response levels of 10 parts per trillion (ppt) for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS. DDW recommends that sources exceeding these limits be taken out of service, treated, or blended. When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

In 2019, the District hired Carollo to conduct a PFAS Planning Study to evaluate options for the treatment of groundwater wells that are potentially impacted by PFAS and to develop preferred alternatives. The five alternatives evaluated in the Planning Study

were shutting down the potentially impacted well and replacing the source with imported water, blending well water with imported water, blending well water with other groundwater, packing part of the well to avoid zones with PFAS, and engineered treatment. Although Anaheim Wells 48 and 53 were not part of the original Planning Study efforts, it was determined that engineered treatment, specifically ion exchange, would be the preferred given the similar nature of all the wells that were part of the study. The District also hired Jacobs in 2019 to perform pilot testing and life-cycle cost analysis of various treatment technologies. Preliminary results from the Jacobs study indicate that ion-exchange is an efficient technology to remove PFAS.

This project will consist of installing ion exchange vessel systems in lead-lag configuration at each well, including the necessary piping, prefilters and related appurtenances.

Benefits of constructing a PFAS Treatment System at the wells sites include:

- Allow the City of Anaheim to continue to utilize its well and infrastructure investment.
- Allow the City of Anaheim to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $4,463,935 per year in water supply costs.
- Save OCWD approximately $1,909,874 per year by paying for the treatment plant instead of losing RA revenue.
- Save the City of Anaheim approximately $2,554,061 per year by utilizing groundwater instead of imported water.

In November 2019, the District adopted a PFAS policy to design and construct the lowest reasonable cost but efficient treatment system to remove PFOA and PFOS compounds for Groundwater Producers, such as Anaheim. Additionally, the policy states that OCWD will provide a 50 percent subsidy for future operation and maintenance expenses up to $89.60 per acre-foot.

The current estimated capital cost of this project is $18,660,000. The current estimated Operation and Maintenance cost is $270 per acre-foot per year, to be split between OCWD and Anaheim. These costs will be adjusted as the engineering details are finalized and construction is completed.

2.0 BACKGROUND

In 2009, the United States Environmental Protection Agency (EPA) established a provisional health advisory of 400 ppt for PFOA and 200 ppt for PFOS to assess the potential risk for short-term exposure through drinking water. The EPA later released a non-regulatory health advisory level of 70 ppt for PFOA and PFOS (combined) in 2016.

In March 2019, the DDW issued mandatory PFAS testing orders to 12 public water systems (Groundwater Producers) in the District's service area. Dozens of wells in the District's service area had water quality testing results exceeding the DDW Notification Levels. Affected Producers were required to provide governing body notifications for exceedances of the Notification Level. Later in 2019, DDW lowered the Notification Limits to 5.1 ppt for PFOA and to 6.5 ppt for PFOS. In February 2020 DDW lowered the Response Levels to 10 ppt for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS.

In April of 2024, the EPA issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable MCLs and non-enforceable MCLGs for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2] $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

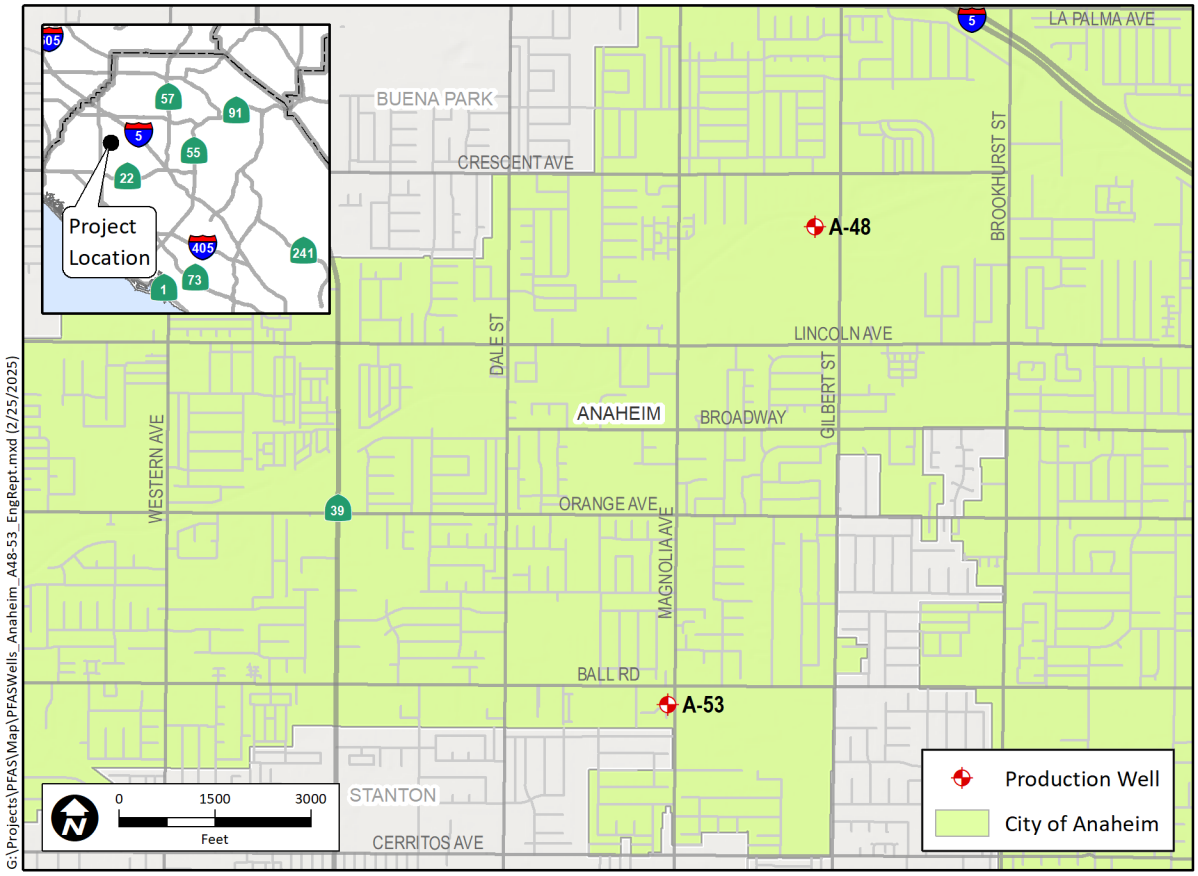
In preparation for the impacts of PFAS to groundwater supplies, the District adopted a PFAS policy in November 2019. Among other items, the policy states that OCWD will fund the lowest reasonable and efficient treatment system design and construction costs to remove PFAS compounds for Groundwater Producers. Additionally, the policy states that OCWD will provide a 50 percent subsidy for operation and maintenance

expenses up to $75 per acre-foot. The rate is adjusted annually each July 1 (beginning July 1, 2021) and the maximum subsidy for operation and maintenance has been updated to $89.60 per acre-foot for fiscal year 2023/2024.

When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

The City of Anaheim Wells are currently under consideration for PFAS treatment systems shown in Figures 1. All sites are owned by the City of Anaheim and currently house the Well head and discharge piping, communication equipment, electrical equipment, and disinfection facilities.

Figure 1: City of Anaheim Wells Vicinity Map



IX is the preferred and most efficient treatment for the well sites due to site area limitations. The number of vessels and support systems required for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), and IX would be more cost-effective than Nanofiltration (NF)

or Reverse Osmosis (RO). RO is a treatment technology that ensures high reliability for PFAS removal but would generate a liquid waste stream containing PFAS and would be more expensive than the other technologies. Additionally, a RO plant would likely require additional City of Anaheim staff with the appropriate water treatment certifications to operate. Although RO would be the most effective option for long-term removal of PFAS, the costs associated with RO make IX the most feasible treatment choice for the wells at this time.

The Jacobs-OCWD joint pilot study of various treatment medias began testing of IX in December 2019. The study has shown that IX successfully removes PFAS.

3.0 PROJECT PURPOSE AND DESCRIPTION

3.1 Project Purpose

The purpose of this project is to design, permit, construct, and operate PFAS removal systems for the well sites in accordance with the District PFAS policy. The proposed IX treatment system is to remove PFOA and PFOS to less than 2 ppt (the current non-detect limit). Use of this PFAS removal treatment system will ensure the groundwater supplied by the well sites can be served in compliance with PFAS regulations.

3.2 Project Components

The PFAS treatment systems will be located at Wells 48 and 53 and will be sized to treat the maximum well discharge flow rates. Trains (or systems) of two IX vessels will be used in lead-lag configuration. See Table 1 for the treatment capacity and vessel dimensions and quantity for each well head treatment plant.

Table 1: Well Treatment Capacity Summary

Well Site	IX Vessels	Pumping Capacity (gpm)	Treatment Capacity (gpm)
Well 48	Three (3) Trains; Six (6) Vessels; 12 feet diameter x 13 feet height	3,700	4,800
Well 53	Two (2) Trains; Four (4) Vessels; 12 feet diameter x 13 feet height	3,000	3,200

The IX vessels are expected to be provided by Evoqua Water Technologies or Aqueous Vets. The influent and effluent supply pipelines can be operated in a way to switch which vessel is the lead and lag position by controlling valves. The lead-lag arrangement is beneficial because once the PFAS constituents reach a predetermined threshold in the lead vessel's effluent, then the lead vessel can be switched to the lag position once the spent resin in it is replaced with fresh resin. The new lead vessel houses pre-loaded IX resin from when the vessel was formerly in the lag position. Replacement of the IX media is performed before the lead vessel returns to service in the lag position. Sample ports are located at several positions in the vessel so that resin performance can be monitored.

Prior to the water entering the IX vessels, it first passes through a pre-filtration system. Since IX media should not be backwashed, its lifespan would be greatly reduced if solids loading were to occur. It is proposed to use 5-micron bag-filters prior to the IX vessels to catch solids that may be discharged by the well.

The existing disinfection systems used at the wells must be reconfigured to facilitate the operation and replacement activities.

Electrical and telemetry systems will be integrated into the treatment plant to convey information into the existing SCADA system. Flow rates, pressure differential, and flood alarms are included in the list of proposed instrumentation.

3.3 Permits and Regulatory Issues

The City's drinking water system operates under a DDW permit that would need to be amended for the proposed PFAS treatment systems. Submittals for the amendment shall be submitted to DDW for review, including the 90% completed design. The permit amendment is not officially granted until after the system is constructed and satisfactorily inspected by DDW.

Several permits will be required from the City of Anaheim:

- A right of entry permit will be required to grant the District and its consultants and contractors control of the site during construction.
- A grading permit will be required from the City of Anaheim Public Works Department.

In accordance with the California Environmental Quality Act (CEQA) guidelines, it is proposed to file a Categorical Exemption for the project. The project is consistent with the Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures.

4.0 FINANCIAL ANALYSIS

4.1 Construction Cost Estimates

The estimated construction cost for the IX project is $14,660,000 as detailed in Table 2.

Table 2: IX Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization	1	LS	$1,325,000	$1,325,000
General Conditions	1	LS	$530,000	$530,000
Pre-Filtration System	1	LS	$1,500,000	$1,500,000
Vessel Systems with IX Resin (3400 cubic feet)	1	EA	$1,500,000	$1,500,000
IX Systems (appurtenances, install)	1	LS	$3,180,000	$3,180,000
Yard Piping	1	LS	$1,590,000	$1,590,000
Site Work	1	LS	$1,855,000	$1,855,000
Electrical and Communication	1	LS	$1,060,000	$1,060,000
Pump and Motor Upgrades	1	LS	$2,120,000	$2,120,000
			Total =	**$14,660,000**

The estimated construction cost for the Reverse Osmosis system is $23,760,000, as detailed in Table 3.

Table 3: RO Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization (7%)	1	LS	$1,325,000	$1,325,000
General Conditions (5%)	1	LS	$1,060,000	$1,060,000
Pre-Filtration System	1	LS	$1,500,000	$1,500,000
RO Treatment Systems & Pumps	1	LS	$5,300,000	$5,300,000
RO Membranes	1	LS	$1,325,000	$1,325,000
Chemical Storage	1	LS	$1,060,000	$1,060,000
Sewer Connection & Fees	1	LS	$1,060,000	$1,060,000
Yard Piping & Mechanical	1	LS	$2,915,000	$2,915,000
Building	1	LS	$1,060,000	$1,060,000
Site Work	1	LS	$3,445,000	$3,445,000
Electrical and Communication	1	LS	$2,385,000	$2,385,000
Pump and Motor Upgrades	1	LS	$1,325,000	$1,325,000
			Total =	**$23,760,000**

4.2 Capital Cost Estimate

The estimated total capital cost for the IX project is $18,660,000, as shown in Table 4. The estimated total capital cost for a RO treatment plant is $30,560,000 as shown in the same table. The table includes the cost of constructing the site improvements for the PFAS treatment system, engineering services for design and construction phases, construction management and the cost associated with meeting regulatory requirements.

Table 4: Capital Cost Estimate

Item	IX Cost	RO Cost
Engineering, Permitting, Construction Management and Inspection & CEQA	$ 2,000,00	$ 3,800,000
Construction	$ 14,660,000	$ 23,760,000
Contingency	$ 2,000,000	$ 3,000,000
Total =	**$ 18,660,000**	**$ 30,560,000**

4.3 Annual Operation and Maintenance Cost Estimate

The estimated annual Operation and Maintenance (O&M) cost for the IX project is $1,350,000 per year, as detailed in Table 5. It conservatively assumes that visual inspection will be performed daily, and analytical testing will be performed by an outside entity instead of OCWD.

The five-year average annual production from the City wells is approximately 4,995 acre-feet. Using this value results in a unit O&M cost of $270 per acre-foot. Per the District's PFAS policy, the O&M costs will be split between OCWD and the City of Anaheim with OCWD's portion being no larger than $89.60 per acre-foot. The estimated $270 per acre-foot O&M unit cost would result in OCWD incurring $89.60 per acre-foot and the City of Anaheim to incur $181 per acre-foot.

Table 5: IX Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Power	12	Month	$40,000	$480,000
Labor	1	Year	$30,000	$30,000
Maintenance	1	Year	$30,000	$30,000
Analytical Testing	12	Month	$5,000	$60,000
Media Replacement	1	Year	$750,000	$750,000
			Total =	**$ 1,350,000**

Table 6 shows an itemized breakdown of O&M cost for a RO treatment plant. Using an annual volume of 4,995 acre-feet, the RO O&M unit cost is estimated to be $567 per acre-foot.

Table 6: RO Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Power	12	Month	$100,000	$1,200,000
Chemicals	12	Month	$6,500	$78,000
Labor	1	Year	$90,000	$90,000
Maintenance	1	Year	$225,000	$225,000
Analytical Testing	12	Month	$5,500	$66,000
Membrane Replacement	1	Year	$1,175,000	$1,175,000
			Total =	**$ 2,834,000**

4.4 Ion-Exchange Cost Comparisons

Three methods to evaluate the economic effectiveness of the IX project are presented below. All three methods indicate that there is a financial benefit to move forward with this project.

1) OCWD Service Territory Perspective - The total project cost of providing water to the OCWD service territory via treated groundwater versus purchasing MWD imported water.
2) OCWD Perspective - The OCWD lost revenue due to no City of Anaheim groundwater production versus the OCWD cost to construct and operate the treatment plant.
3) City of Anaheim Perspective – The cost of providing treated groundwater versus purchasing MWD imported water.

Method 1: OCWD Service Territory Perspective

The unit cost for the City of Anaheim to acquire treated imported water through MWD will be $1,460 per acre-foot ($1,395 Full Service Treated + $65 readiness to serve) on January 1, 2025. An annual volume of 4,995 acre-feet would cost $7,292,641.

If the capital cost is amortized over 30 years at a 4% interest rate, the annual payment for the PFAS treatment plant would be $1,079,110, or $216 per acre-foot for 4,995 acre-feet. The well power cost to pump groundwater averages $80 per acre-foot. The PFAS treatment system's O&M expense is estimated to be $270 per acre-foot. As shown in Table 7, the total unit cost of the treated groundwater would be $566 per acre-foot, or $2,828,706 per year for 4,995 acre-feet. Note that the Replenishment Assessment (RA) is not considered in this calculation because it would be both paid and received by agencies within the OCWD Service Territory.

Implementation of the PFAS treatment system at the City of Anaheim Wells is estimated to save the OCWD service territory $4,463,935 per year in water supply costs.

Table 7: OCWD Service Territory Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,079,110	$216	Full Service Treated Readiness to Serve	$ 6,967,969	$ 1,395
Project O&M	$ 1,350,000	$270		$ 324,672	$ 65
Well Power	$ 399,597	$80			
Total	$ 2,828,706	$566	Total	$ 7,292,641	$ 1,460

Method 2: OCWD Perspective

Taking the City of Anaheim Wells out of service would reduce the RA payments made by Anaheim to OCWD. This assumes that other wells are not available to pump the volume. At an annual volume of 4,995 acre-feet and the current RA of $688 per acre-foot, OCWD would lose revenue of $3,436,532.

The District's expenses to construct the PFAS treatment plants at the Anaheim Wells includes the capital expense and $89.60 of the O&M. As previously discussed, the amortized unit capital expense is $216 per acre-foot and OCWD's portion of the estimated O&M expense is $89.60 per acre-foot. The resulting unit cost of constructing and operating PFAS plants at the wells would be $306 per acre foot, or $1,526,658 per year using 4,995 acre-feet per year.

Table 8: OCWD Perspective

Project Cost			Lost Revenue		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,079,110	$ 216	Replenishment Assessment	$ 3,436,532	$ 688
Project O&M	$ 447,548	$ 89.60			
Total	$ 1,526,658	$ 306	Total	$ 4,707,723	$ 688

Implementation of PFAS treatment systems at City of Anaheim Wells is estimated to save OCWD $1,909,874 per year by utilizing the treatment plant instead of losing RA revenue.

Method 3: City of Anaheim Perspective

Given the need for the City of Anaheim to acquire water supplies to meet the demands of its customers, it is faced with a situation to utilize the PFAS treatment system or to purchase MWD imported water. As previously discussed, the cost to the City of Anaheim to purchase 4,995 acre-feet of MWD water would be $7,292,642 per year, or $1,460 per acre-foot.

The costs for the City of Anaheim to produce groundwater from the Anaheim Wells and operate the PFAS treatment plant include payment of the RA ($688 per acre-foot), their portion of the O&M expenses and well power costs ($261 per acre-foot). The total unit cost would be $949 per acre-foot, or $4,738,581 per year for 4,995 acre-feet.

Table 9: City of Anaheim Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Replenishment Assessment	$ 3,436,532	$ 688	Full Service Treated	$ 6,967,969	$ 1,395
Project O&M and Well Power	$ 1,302,048	$ 261	Readiness to Serve	$ 324,672	$ 65
Total	$ 4,738,581	$ 949	Total	$ 7,292,642	$ 1,460

Implementation of PFAS treatment systems at the Anaheim Wells is estimated to save the City over $2,554,061 per year by utilizing groundwater instead of MWD imported water.

4.5 Reverse Osmosis versus Ion Exchange Unit Cost

RO would provide a more robust, comprehensive, and reliable treatment for long-term removal of PFAS. However, the capital and operating cost of the treatment system are more expensive. If the estimated RO capital cost of $30,560,000 is amortized over 30 years at a 4% interest rate, the annual payment for the RO PFAS treatment plant would be $1,767,288, or $354 per acre-foot for 4,995 acre-feet. The RO PFAS treatment system's O&M expense is estimated to be $561 per acre-foot for 4,995 acre-feet. As shown in Table 10, the total unit cost of the RO treated groundwater would be $643 per acre-foot, or $4,601,288 per year for 4,995 acre-feet. The IX project costs are also summarized in the same table.

Table 10: Reverse Osmosis versus Ion Exchange Unit Cost

IX			RO		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 1,079,110	$ 216	Project Capital	$ 1,767,288	$ 354
Project O&M	$ 1,350,000	$ 270	Project O&M	$ 2,834,000	$ 561
Total	$ 2,429,110	$ 486	Total	$ 4,601,288	$ 921

5.0 CONCLUSIONS AND RECOMMENDATIONS

Constructing the proposed IX PFAS Treatment Plant at the City of Anaheim Wells 39,47,48 & 53 will:

- Allow the City of Anaheim to continue to utilize its well and infrastructure investment.
- Allow the City of Anaheim to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $4,463,935 per year in water supply costs.
- Save OCWD approximately $1,909,874 per year by paying for the treatment plant instead of losing RA revenue.
- Save the City of Anaheim approximately $2,554,061 per year by utilizing groundwater instead of imported water.

Given the financial benefits to the OCWD service territory, OCWD, and the City of Anaheim to utilize a less expensive treated groundwater supply instead of MWD water, it is recommended that OCWD proceed with PFAS Treatment System Project for the City of Anaheim Wells 48 and 53. Additionally, the City of Anaheim would be able to continue using their Well investment and maintain their local water component of their supply portfolio.

6.0 PROPOSED IMPLEMENTATION SCHEDULE (TENTATIVE)

Date	Activity
June 2026	Board authorizes Notice Inviting Bids
July 2026	Advertise for construction bids
September 2026	Board awards construction contract
January 2028	Completion of construction

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/L. Esguerra

Budgeted: Yes
Budgeted Amount: $0
Cost Estimate: $0
Funding Source: CIP / Fed. CPF
Program/Line Item No.: C24008
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: CITY OF SANTA ANA PFAS TREATMENT AT JOHN GARTHE RESERVOIR: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

SUMMARY

The final plans and specifications for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project (Project) are nearing completion. Both the design and the construction costs will be funded, in part, by a WaterSMART: Title XVI WIIN Act Grant from the United States Bureau of Reclamation. Staff recommends approving the Engineer's Report for the project and filing a Categorical Exemption in compliance with the California Environmental Quality Act guidelines.

Attachment: Engineer's Report for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project

RECOMMENDATION

Agendize for March 19 Board Meeting:

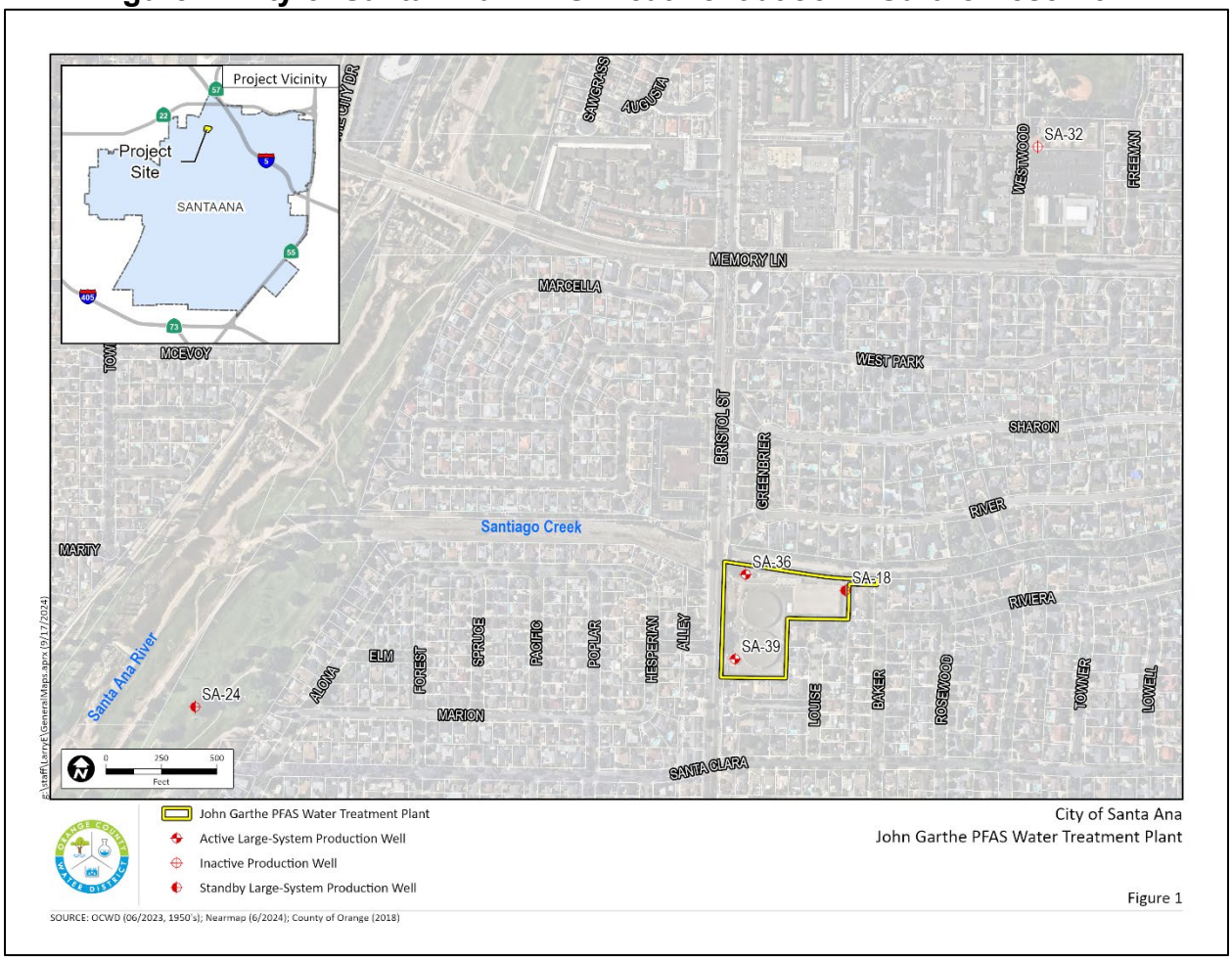
1. Approve the Engineer's Report for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project and determine the project feasible, necessary and beneficial to the lands of the District; and

2. Authorize filing of a Categorical Exemption for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project in compliance with the California Environmental Quality Act (CEQA) guidelines;

BACKGROUND/ANALYSIS

In anticipation of the US Environmental Protection Agency issuing National Primary Drinking Water Regulation for PFAS, the City of Santa Ana prepared conceptual layouts for PFAS treatment systems for five City wells; 18, 24, 32, 36, and 39. In November 2023, the City of Santa Ana contracted design to Tetra Tech for the installation of six ion exchange vessel systems for the treatment of five wells at a centralized PFAS treatment plant located at the City's John Garthe Reservoir shown on Figure 1. Due to site constraints at the reservoir site IX treatment with a capacity of 9,600 gallon per minute has been selected. The City is nearing completion of design and requested to be reimbursed for design costs and have the project be "OCWD-Built" per the District's PFAS program.

Figure 1: City of Santa Ana PFAS Treatment at John Garthe Reservoir



Staff has determined that the City of Santa Ana project is consistent with the Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures. The expected project schedule is shown in Table 1.

Table 1: City of Santa Ana PFAS Treatment at John Garthe Reservoir Schedule Summary

Description	Date
City of Santa Ana PFAS Treatment at John Garthe	
Design	Nov 2023 – April 2025
DDW Permitting	Nov 2023 – July 2027
Construction Contract	July 2025 – July 2027

The District was awarded a $30 million Grant from the United States Bureau of Reclamation (USBR) as part of the WaterSMART: Title XVI WIIN Act. This funding, provided by Bipartisan Infrastructure Law, is designated for the District's PFAS treatment program to eliminate per- and polyfluoroalkyl substances from local groundwater. Therefore, both the design and construction costs of the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project will be funded, in part, by the

WaterSMART:Title XVI WIIN Act Grant for PFAS projects up to $30 Million. Staff is currently working with the USBR Denver Office on the final approval of the District's Grant application, PFAS program budget, funding matrix, program components and schedule, and Federal environmental compliances.

However, prior to any construction costs being eligible for Grant reimbursement, the USBR is requiring that the District process a Categorical Exemption as part of CEQA compliance. Upon completion of CEQA, the USBR will act as the lead agency for compliance with the National Environmental Policy Act (NEPA) – a process that can take up to six months to complete. This NEPA process is in addition to OCWD filing the CEQA Categorical Exemption and cannot proceed until after OCWD's filing is complete. Both the CEQA and NEPA environmental compliances require the Engineer's Report to provide the basis for the project. The recommended action in this submittal only includes approving the Engineer's Report and authorizing CEQA filing. This action does not include authorizing bidding or construction of the project. Staff will return to the Board to request authorization of a Notice Inviting Bids at a later date.

Staff recommends approving the Engineer's Report and authorizing the filing of a Categorical Exemption in compliance with CEQA guidelines for the City of Santa Ana PFAS Treatment at John Garthe Reservoir Project.

PRIOR RELEVANT BOARD ACTIONS

1/22/20, R20-1-12 - Approved modifications to the PFAS Policy

11/20/19, R19-146 - Approved PFAS Policy

ENGINEER'S REPORT

FOR

CITY OF SANTA ANA
JOHN GARTHE RESERVOIR
PFAS WATER TREATMENT PLANT PROJECT

Prepared By:

Laurence Esguerra, P.E.

October 2024

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1.0 EXECUTIVE SUMMARY

The purpose of this Engineer's Report is for Orange County Water District (OCWD or District) and the City of Santa Ana (City) to evaluate the need, benefits, and cost of constructing a Per- and Polyfluoroalkyl Substances (PFAS) treatment system for City production wells SA-18, SA-24, SA-32, SA-36, and SA-39 (City Wells), specifically to remove perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).

In April of 2024, the United States Environmental Protection Agency (EPA) issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable maximum contaminant level (MCL) and non-enforceable maximum contaminant level goal (MCLG) for the following PFAS.

Compound	**Final MCLG**	**Final MCL (enforceable levels)**
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2] $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

In February 2020, the State Water Resources Control Board's Division of Drinking Water (DDW) issued revised drinking water response levels of 10 parts per trillion (ppt) for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS. DDW recommends that sources exceeding these limits be taken out of service, treated, or blended. Water produced from the City Wells has tested 3.4 – 15.2 ppt for PFOA, 6.1 – 21.5 ppt for PFOS, and non-detect – 6.5 ppt for PFBS. When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

In 2019, the District hired Carollo to conduct a PFAS Planning Study to evaluate options for the treatment of groundwater wells that are potentially impacted by PFAS and to develop preferred alternatives. The five alternatives evaluated in the Planning Study

were shutting down the potentially impacted well and replacing the source with imported water, blending well water with imported water, blending well water with other groundwater, packing part of the well to avoid zones with PFAS, and engineered treatment. The City has selected engineered treatment with ion exchange (IX) media for PFAS treatment, primarily due to site limitations restricting other engineered treatment options. The District hired Jacobs in 2019 to perform pilot testing and life-cycle cost analysis of various treatment technologies. Preliminary results from the Jacobs study confirm that ion-exchange is an efficient technology to remove PFAS.

This project will consist of installing 12 ion exchange vessel system at the City's John Garthe Reservoir and Pump Station site in a lead-lag configuration including the necessary piping, prefilters and related appurtenances to treat a combination of flows from production wells SA-18, SA-24, SA-32, SA-36, and SA-39.

Benefits of constructing a PFAS Treatment System at City's John Garthe Reservoir include:

- Allowing the City to continue to utilize its wells and infrastructure investment.
- Allowing the City to maintain a diversified water supply portfolio with a substantial local supply component.
- Saving the OCWD service territory millions of dollars in water supply costs.
- Saving OCWD over $2.3 million per year by paying for the treatment plant instead of losing RA revenue.
- Avoiding millions of dollars of imported water costs incurred by the City by utilizing groundwater instead of imported water.

In November 2019, the District adopted a PFAS policy to design and construct the lowest reasonable cost but efficient treatment system to remove PFOA and PFOS compounds for Groundwater Producers, such as the City. Additionally, the policy states that OCWD will provide a 50 percent subsidy for future operation and maintenance expenses up to $89.60 per acre-foot.

The current estimated capital cost of this project is $29,500,000. The current estimated Operation and Maintenance cost is $311 per acre-foot per year, to be split between OCWD and the City. These costs will be adjusted as the engineering details are finalized and construction is completed.

2.0 BACKGROUND

In 2009, the United States Environmental Protection Agency (EPA) established a provisional health advisory of 400 ppt for PFOA and 200 ppt for PFOS to assess the potential risk for short-term exposure through drinking water. The EPA later released a non-regulatory health advisory level of 70 ppt for PFOA and PFOS (combined) in 2016.

In March 2019, the DDW issued mandatory PFAS testing orders to 12 public water systems (Groundwater Producers) in the District's service area, including the City of Santa Ana. Dozens of wells in the District's service area had water quality testing results exceeding the DDW Notification Levels. Affected Producers were required to provide governing body notifications for exceedances of the Notification Level. Later in 2019, DDW lowered the Notification Limits to 5.1 ppt for PFOA and to 6.5 ppt for PFOS. In February 2020 DDW lowered the Response Levels to 10 ppt for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS.

In April of 2024, the EPA issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable MCLs and non-enforceable MCLGs for the following PFAS.

Compound	**Final MCLG**	**Final MCL (enforceable levels)**
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2] $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO-\quad ppt}{10\ ppt}$

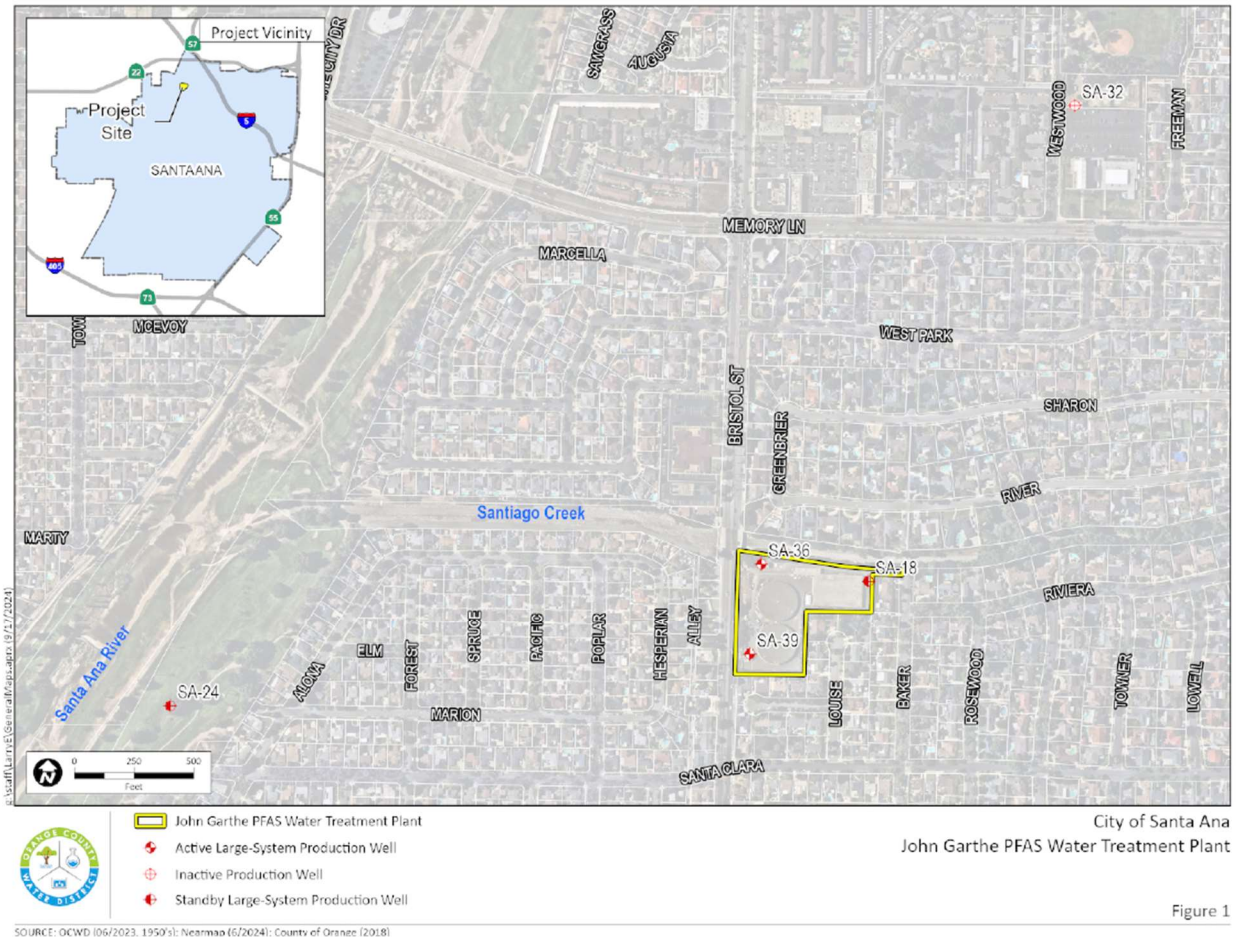
In preparation for the impacts of PFAS to groundwater supplies, the District adopted a PFAS policy in November 2019. Among other items, the policy states that OCWD will fund the lowest reasonable and efficient treatment system design and construction costs to remove PFAS compounds for Groundwater Producers. Additionally, the policy states that OCWD will provide a 50 percent subsidy for operation and maintenance expenses up to $75 per acre-foot. The rate is adjusted annually each July 1 (beginning July 1, 2021) and the maximum subsidy for operation and maintenance has been updated to $89.60 per acre-foot for fiscal year 2023/2024.

The City has 5 wells (SA-18, SA-24, SA-32, SA-36, and SA-39) currently under consideration for a centralized PFAS treatment system at their John Garthe Reservoir

and Pump Station site shown in Figure 1. Five alternatives to address PFAS at these wells were evaluated in the Carollo planning study:

1) shutting down the potentially impacted well and replacing the source with imported water,
2) blending well water with imported water,
3) blending well water with other groundwater,
4) packing part of the well to avoid zones with PFAS, and
5) engineered treatment.

Figure 1: Vicinity Map



The City has selected engineered treatment with Ion Exchange (IX) media for PFAS treatment media at the sites because IX will reduce the treatment plant's footprint and because IX has shown that it removes shorter chain PFAS compounds that may be regulated in the future. The number of vessels and support systems required for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), and IX would be more cost-effective than Nanofiltration (NF) or Reverse Osmosis (RO). RO is a treatment technology that ensures high reliability for PFAS removal but would generate a liquid waste stream

containing PFAS and would be more expensive than the other technologies. Additionally, a RO plant would likely require additional staff with the appropriate water treatment certifications to operate. Although RO would be the most effective option for long-term removal of PFAS, the costs associated with RO make IX the most feasible treatment choice for the City Wells at this time.

The Jacobs-OCWD joint pilot study of various treatment medias began testing of IX in December 2019. The study has shown that IX successfully removes PFAS.

3.0 PROJECT PURPOSE AND DESCRIPTION

3.1 Project Purpose

The purpose of this project is to design, permit, construct, and operate a PFAS removal system for the City Wells, in accordance with the District PFAS policy. The proposed IX treatment system is to remove PFOA and PFOS to less than 2 ppt (the current non-detect limit). Use of this PFAS removal treatment system will ensure the groundwater supplied by the City Wells can be served in compliance with current PFAS regulations.

3.2 Site Location

The proposed treatment system will be located at the John Garthe Reservoir and Pump Station site, 2401 North Bristol Street in Santa Ana. The land is owned by the City and houses City Wells SA-18, SA-36, and SA-39, three concrete reservoirs, pumping station, MWD turn-out, hydro generation facility, on-site sodium hypochlorite generation equipment and storage, piping, communication equipment, and electrical equipment. Wells SA-24 and SA-32 are located off-site and existing distribution pipelines convey well water to the site. The site is surrounded by residential land uses and Santiago Creek.

3.3 Project Components

The PFAS treatment plant will consist of twelve IX vessels used in lead-lag configuration as six trains (or systems), see Figures 2 and 3. The IX vessels will be provided by AqueousVets or Evoqua and measure approximately 16-feet tall by 12-feet wide. The influent and effluent supply pipelines can be operated in a way to switch which vessel is the lead and lag position by controlling valves. The lead-lag arrangement is beneficial because once the PFAS constituents reach a predetermined threshold the lead vessel's effluent, then the lead vessel can be switched to the lag. The new lead vessel houses fresh IX resin. Replacement of the IX media is performed after the spent resin is placed into lag service. Sample ports are located at several positions in the vessel so that resin performance can be monitored.

Prior to the water entering the IX vessels, it first passes through a pre-filtration system. Since IX media should not be backwashed, its lifespan would be greatly reduced if solids loading were to occur. It is proposed to use 5-micron cartridge-filters prior to the IX vessels to catch solids that may be discharged by the wells.

Electrical and telemetry systems will be integrated into the treatment plant to convey information into the City's existing SCADA system. Flow rates, pressure differential, and flood alarms are included in the list of proposed instrumentation.

Figure 2: Proposed Treatment System Rendering

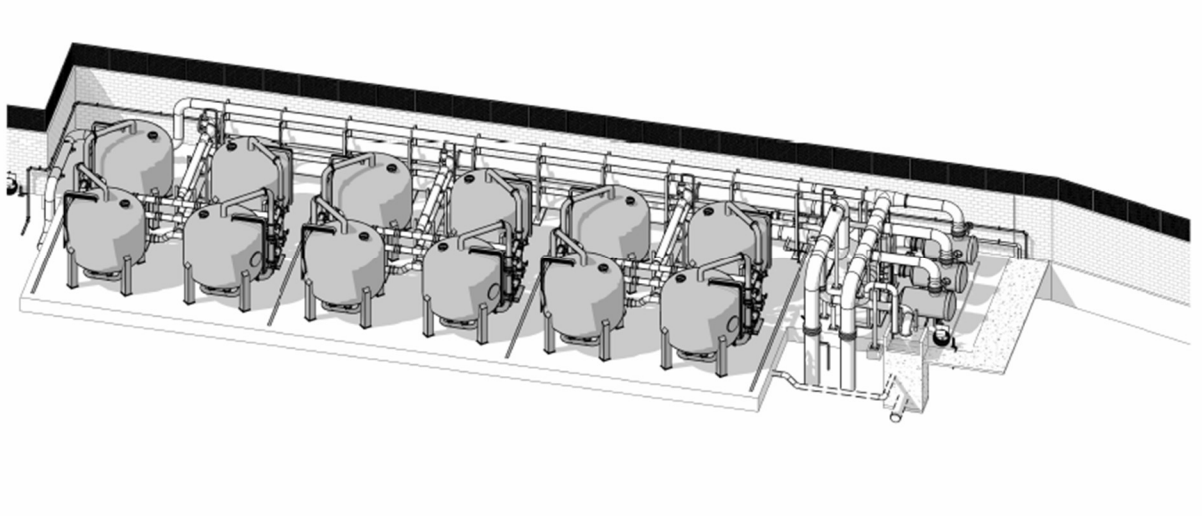
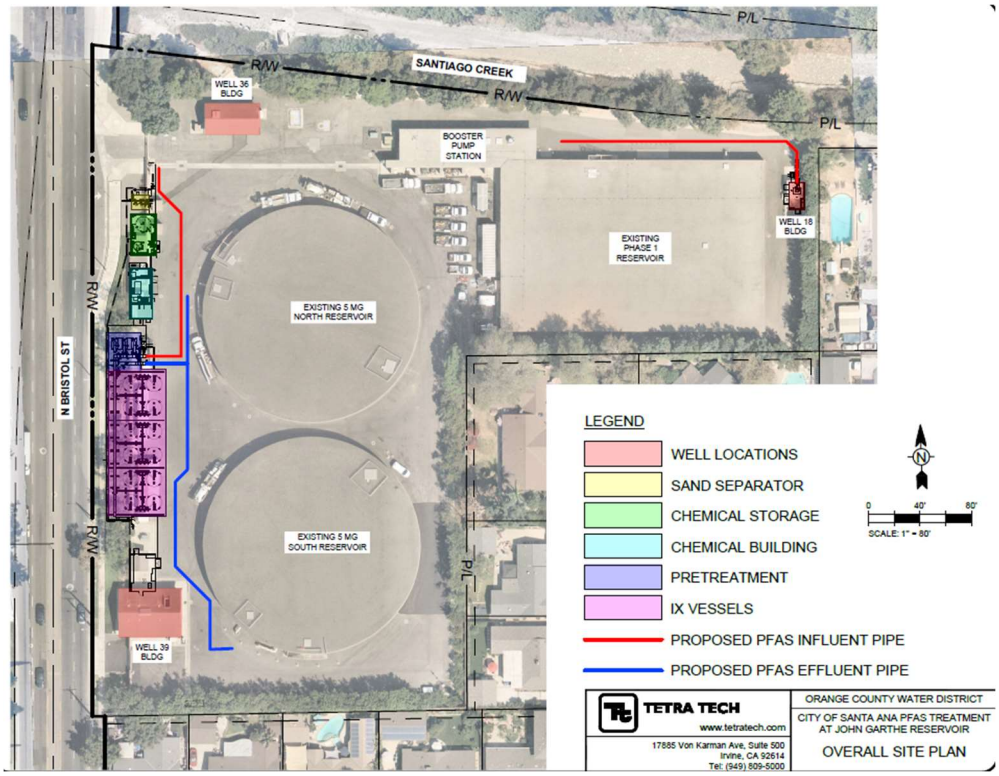


Figure 3: Conceptual Treatment System Site Plan



The five wells that will pump to the treatment system vary in flow production and the operation of the wells is determined by customer demand and the average production is 6,732 acre-feet a year (AFY).

3.4 Permits and Regulatory Issues

The City's drinking water system operates under a DDW permit that would need to be amended for the proposed PFAS treatment system. Submittals for the amendment have been sent to DDW for review, including the 90% completed design plans and technical specifications. The permit amendment is not officially granted until after the system is constructed and proven to meet the required water quality criteria.

A right of entry permit will be granted to the District and its consultants and contractor for control of the site to perform construction activities.

In accordance with the California Environmental Quality Act (CEQA) guidelines, it is proposed to file a Categorical Exemption for the project. The project is consistent with the Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited numbers of new, small facilities or structures.

4.0 FINANCIAL ANALYSIS

4.1 Construction Cost Estimates

The estimated construction cost for the IX project is $24,600,000 as detailed in Table 1.

Table 1 – IX Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization	1	LS	$300,000	$300,000
General Conditions	1	LS	$1,000,000	$1,000,000
Pre-Filtration System	1	LS	$1,000,000	$1,000,000
Pre-Purchased Vessel Systems	6	LS	$600,000	$3,600,000
IX Systems (appurtenances, install)	1	LS	$5,000,000	$5,000,000
IX Resin (9,240 cubic feet)	1	LS	$2,000,000	$2,000,000
Chemical System	1	LS	$2,900,000	$2,900,000
Yard Piping	1	LS	$900,000	$900,000
Site Work	1	LS	$1,700,000	$1,700,000
Well Upgrades (18, 36, 39)	1	LS	$3,900,000	$3,900,000
Electrical and Communication	1	LS	$3,200,000	$3,200,000
			Total =	**$24,600,000**

A construction cost estimate for a Reverse Osmosis system is detailed in Table 2.

Table 2 – RO Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization	1	LS	$1,000,000	$1,000,000
General Conditions	1	LS	$3,000,000	$3,000,000
Pre-Filtration System	1	LS	$2,000,000	$2,000,000
RO Treatment Systems & Pumps	1	LS	$10,700,000	$10,700,000
RO Membranes	1	LS	$2,500,000	$2,500,000
Chemical Storage	1	LS	$500,000	$500,000
Sewer Connection & Fees	1	LS	$800,000	$800,000
Yard Piping & Mechanical	1	LS	$5,000,000	$5,000,000
Building	1	LS	$3,000,000	$3,000,000
Site Work	1	LS	$1,500,000	$1,500,000
Electrical and Communication	1	LS	$10,000,000	$10,000,000
			Total =	**$40,000,000**

4.2 Capital Cost Estimate

The estimated total capital cost for the IX project is $29,500,000 as shown in Table 3. The estimated total capital cost for a RO treatment plant is $48,000,000 as shown in the same table. The table includes the cost of constructing the site improvements for the PFAS treatment system, engineering services for design and construction phases, construction management and the cost associated with meeting regulatory requirements.

Table 3 - Capital Cost Estimate

Item	IX Cost	RO Cost
Engineering, Permitting, & CEQA	$2,440,000	$4,000,000
Construction	$24,600,000	$40,000,000
Contingency (~10%)	$2,460,000	$4,000,000
Total =	**$29,500,000**	**$48,000,000**

4.3 Annual Operation and Maintenance Cost Estimate

The estimated annual Operation and Maintenance (O&M) cost for the IX project is $2,093,000 per year, as detailed in Table 4. It conservatively assumes that visual inspection will be performed daily, and analytical testing will be performed by an outside entity instead of OCWD.

The average annual production from the City Wells is approximately 6,732 acre-feet. Using this value results in a unit O&M cost of $311 per acre-foot. Per the District's PFAS policy, the O&M costs will be split between OCWD and the City with OCWD's portion being no larger than $89.60 per acre-foot for fiscal year 2023/2024. The estimated $311 per acre-foot O&M unit cost would be split; OCWD will incur a cost of $89.60 per acre-foot and the City will incur a cost of $221.40 per acre-foot.

Table 4 - Annual IX O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Power	12	Month	$38,500	$462,000
Labor	1	Year	$250,000	$250,000
Maintenance	1	Year	$100,000	$100,000
Analytical Testing	12	Month	$10,000	$120,000
Media Replacement	1	Year	$1,616,000	$1,161,000
			Total =	**$2,093,000**

Table 5 shows an itemized breakdown of O&M cost for a RO treatment plant. Using an annual volume of 6,732 acre-feet, the RO O&M unit cost is estimated to be $450 per acre-foot.

Table 5 - Annual RO O&M Cost Estimate				
Description	**Quantity**	**Units**	**Unit Cost ($/unit)**	**Cost ($)**
Power	12	Month	$118,104	$1,417,248
Chemicals	12	Month	$5,000	$60,000
Labor	1	Year	$400,000	$400,000
Maintenance	1	Year	$500,000	$500,000
Analytical Testing	12	Month	$8,000	$96,000
Brine Disposal	12	Month	$5,000	$60,000
Membrane Replacement (every 5 years)	1	Year	$499,752	$499,752
			Total =	**$3,033,000**

4.4 Ion-Exchange Cost Comparisons

Three methods to evaluate the economic effectiveness of the IX project are presented below. All three methods indicate that there is a financial benefit to move forward with this project.

1) OCWD Service Territory Perspective - The total project cost of providing water to the OCWD service territory via treated groundwater versus purchasing MWD imported water.

2) OCWD Perspective - The OCWD lost revenue due to no City groundwater production versus the OCWD cost to construct and operate the treatment plant.

3) City Perspective – The cost of providing treated groundwater versus purchasing MWD imported water.

Method 1: OCWD Service Territory Perspective

The unit cost for the City to acquire treated imported water through MWD will be $1,460 per acre-foot ($1,395 Full Service Treated + $65 readiness to serve) on January 1, 2025. An annual volume of 6,732 acre-feet would cost $9,828,720.

If the capital cost of $29.5 million is amortized over 30 years at a 4% interest rate, the annual payment for the PFAS treatment plant would be $1,709,928 or $254 per acre-foot for 6,732 acre-feet. The well power cost to pump groundwater and the treatment system's O&M expense is estimated to be $311 per acre-foot. As shown in Table 6, the total unit cost of the treated groundwater would be $565 per acre-foot, or $3,803,580 per year for 6,732 acre-feet. Note that the Replenishment Assessment (RA) is not considered in this calculation because it would be both paid and received by agencies within the OCWD Service Territory.

Implementation of the PFAS treatment system at the City is estimated to save the OCWD service territory $6,025,140 per year in water supply costs.

Table 6 – OCWD Service Territory Perspective					
Groundwater			**MWD Import**		
Description	**Annual Cost**	**Unit Cost ($/AF)**	**Description**	**Annual Cost**	**Unit Cost ($/AF)**
Project Capital	$1,709,928	$254	Full Service Treated	$9,391,140	$1,395
Project O&M	$2,093,652	$311	Readiness to Serve	$437,580	$ 65
Total	$3,803,580	$565	Total	$9,828,720	$1,460

Method 2: OCWD Perspective

Taking the 5 wells out of service would reduce the RA payments made by the City to OCWD. At an annual volume of 6,732 acre-feet and the current RA of $688 per acre-foot, OCWD would lose a revenue of $4,631,616.

The District's expenses to construct the PFAS treatment plant include the capital expense and half of the O&M. As previously discussed, the amortized unit capital expense is $254 per acre-foot and OCWD's portion of the estimated O&M expense is $89.60 per acre-foot. The resulting unit cost of constructing and operating the PFAS treatment plant would be $343.60 per acre foot, or $2,313,115 per year using 6,732 acre-feet per year.

Implementation of the PFAS treatment system is estimated to save OCWD $2,318,501 per year by constructing and operating the treatment plant instead of losing RA revenue.

Table 7 – OCWD Perspective					
Project Cost			**Lost Revenue**		
Description	**Annual Cost**	**Unit Cost ($/AF)**	**Description**	**Annual Cost**	**Unit Cost ($/AF)**
Project Capital	$1,709,928	$254	Replenishment Assessment	$4,631,616	$688
Project O&M	$603,187	$89.60			
Total	$2,313,115	$343.60	Total	$4,631,616	$688

Method 3: City Perspective

Given the need for the City to acquire water supplies to meet the demands of its customers, it is faced with a situation to utilize the PFAS treatment system or to purchase MWD imported water. As previously discussed, the cost to the City to purchase 6,732 acre-feet of MWD water would be $9,828,720 per year, or $1,460 per acre-foot.

The costs for the City to produce groundwater and operate the PFAS treatment plant include payment of the RA ($688 per acre-foot), their portion of the well power costs O&M expenses ($221.40 per acre-foot). The total unit cost would be $909.40 per acre-foot, or $6,122,081 per year for 6,732 acre-feet.

Table 8 – City Perspective					
Groundwater			**MWD Import**		
Description	**Annual Cost**	**Unit Cost ($/AF)**	**Description**	**Annual Cost**	**Unit Cost ($/AF)**
Replenishment Assessment	$ 4,631,616	$ 688	Full Service Treated	$9,391,140	$1,395
Project O&M	$ 1,490,465	$ 221.40	Readiness to Serve	$ 437,580	$ 65
Total	$ 6,122,081	$ 909.40	Total	$ 9,828,720	$ 1,460

Implementation of the PFAS treatment system is estimated to save the City $3,706,639 per year by utilizing groundwater instead of MWD imported water.

4.5 Reverse Osmosis versus Ion Exchange Unit Cost

RO would provide a more robust, comprehensive, and reliable treatment for long-term removal of PFAS. However, the capital and operating cost of the RO treatment system are more expensive. If the estimated RO capital cost of $48 million is amortized over 30 years at a 4% interest rate, the annual payment for the RO PFAS treatment plant would be $2,773,584 or $412 per acre-foot for 6,732 acre-feet. The RO PFAS treatment system's O&M expense is estimated to be $450 per acre-foot for 6,732 acre-feet. As shown in Table 9, the total unit cost of the RO treated groundwater would be $862 per acre-foot, or $5,802,984 per year for 6,732 acre-feet. The IX project costs are also summarized in the same table.

4.6 Table 9 – Reverse Osmosis versus Ion Exchange Unit Cost					
IX			**RO**		
Description	**Annual Cost**	**Unit Cost ($/AF)**	**Description**	**Annual Cost**	**Unit Cost ($/AF)**
Project Capital	$1,422,620	$211	Project Capital	$ 2,773,584	$ 412
Project O&M	$2,093,000	$311	Project O&M	$ 3,029,400	$ 450
Total	$3,515,620	$ 522	Total	$ 5,802,984	$ 862

5.0 CONCLUSIONS AND RECOMMENDATIONS

Constructing the proposed IX PFAS Treatment System for City Wells will:

- Allow the City to continue to utilize its well and infrastructure investment.
- Allow the City to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $6,025,140 per year in water supply costs.
- Save OCWD approximately $2,318,501 per year by paying for the treatment plant instead of losing RA revenue.
- Save the City approximately $3,706,639 per year by utilizing groundwater instead of imported water.

Given the financial benefits to the OCWD service territory, OCWD, and the City to utilize a less expensive treated groundwater supply instead of MWD water, it is recommended that OCWD proceed with PFAS Treatment System Project for the City Wells. Additionally, the City would be able to continue using their well investment and maintain their local water component of their supply portfolio.

6.0 PROPOSED IMPLEMENTATION SCHEDULE (TENTATIVE)

Date	Activity
November 13, 2024	Authorize Notice Inviting Bids
January 2025	Advertise for construction bids
March 2025	Award construction contract
December 2026	Completion of construction

7.0 REFERENCES

Carollo, *PFAS Treatment Systems Planning Study – City of Santa Ana,* 2020

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/A. Perry

Budgeted: Yes
Budgeted Amount: $97,958
Cost Estimate: $59,198
Funding Source: WIFIA; SWRCB
Program/Line Item No.: C19020
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: AUTHORIZE AMENDMENT NO. 1 TO WORK ORDER TO ENVIRONMENTAL SCIENCE ASSOCIATES FOR ARCHEOLOGICAL MONITORING AT SA-2023-1

SUMMARY

The conditions of approval for the SWRCB Principal Forgiveness Grant that is partially funding construction of the City of Santa Ana PFAS Water Treatment Plant Well Nos. 27 & 28 require the implementation of archeological construction monitoring. The Contractor has encountered many more archeological objects than normal, and this has greatly increased monitoring costs. Staff recommends authorizing Amendment No. 1 to Work Order 12 to Agreement 1135 with Environmental Science Associates (ESA), in the amount of $59,198, to conduct archeological monitoring during the remainder of the construction of the facilities.

Attachment: ESA archeological monitoring proposal dated January 27, 2025

RECOMMENDATION

Agendize for March 19 Board meeting: Authorize Amendment No. 1 to Work Order 12 to Agreement 1135 with ESA, in the amount of $59,198, to continue archeological monitoring during new ground disturbance activities for the construction of City of Santa Ana PFAS Water Treatment Plant Well Nos. 27 & 28.

BACKGROUND/ANALYSIS

To restore the use of groundwater supplies impacted by PFAS contaminants, the Board awarded Contract SA-2023-1 to Caliagua Incorporated for the construction of PFAS treatment at Wells SA-27 and SA-28. The Wells SA-27 & SA-28 project received a SWRCB Principal Forgiveness Grant that will fund up to 50% of OCWD's project costs up to $5M. The conditions of approval of this grant require the implementation of archeological monitoring during construction activities that require new ground disturbances.

In November 2024, the Board authorized a work order to the consulting firm ESA, who is currently approved on the District's On-Call environmental consultants list to conduct archeological monitoring for the project. ESA provided the original proposal based on an initial assessment of the number of days of ground disturbances at the site that would require archeological monitoring. However, as work has progressed, Staff has identified

additional days of ground disturbances requiring archeological monitoring. Additionally, current ground disturbances at the project site have resulted in the identification of approximately 20 historic period artifacts that require documentation. This number of artifacts is much higher than normally anticipated for a similar site, and the cost of the work required to document these artifacts is taking away from the original budget for ground disturbance monitoring. Therefore, an amendment to the original Agreement is required. Table 1 shows the archeological monitoring costs within the overall project budget.

Table 1: City of Santa Ana PFAS Water Treatment Plant Wells No. 27 & 28 Budget Summary

Description	Budget	Proposed Expenditure
Design and Construction Management		
Design-Work Order 3 Wells 27 & 28 (Stantec)	$870,332	$870,332
Work Order 3A (CM Services)	$517,968	$517,968
Design and CM Subtotal	**$1,388,300**	**$1,388,300**
Construction		
Contract SA-2023-1	$12,327,491	$12,327,491
Treatment Vessels (Aqueous Vets)	$1,087,020	$1,087,020
IX Resin	$850,000	$850,000
Permits and Advertisement Costs	$50,000	$50,000
Staff Expenses	$50,000	$50,000
Archeological Monitoring	*$0*	*$97,958*
Construction Subtotal	**$14,364,511**	**$14,462,469**
Project Contingency (5% of Contract Amount)	*$616,375*	*$518,417*
Total Project Budget	**$16,369,186**	**$16,369,186**
City of Santa Ana Contribution Appx.	$4,282,150	$4,282,150
Total Cost to OCWD	**$12,087,036**	**$12,087,036**

ESA has demonstrated expertise in conducting archeological construction monitoring on behalf of OCWD in support of several projects, including the GWRS Final Expansion project and installation of a monitoring well in Seal Beach that was a component of the Sunset Gap Monitoring Wells project. Staff recommends authorizing Amendment No. 1 for Work Order 12 to Agreement 1135 with ESA, in the amount of $59,198, to continue archeological monitoring for the remainder of new ground disturbance activities at the City of Santa Ana PFAS Water Treatment Plant Well Nos. 27 & 28.

PRIOR RELEVANT BOARD ACTIONS

11/20/24, R24-11-143: Authorize Work Order No. 12 to Agreement 1135 with Environmental Science Associates ESA, in the amount of $38,760 to conduct archeological monitoring for portions of the construction of City of Santa Ana PFAS Water Treatment Plant Well Nos. 27 & 28.

06/19/2024, R24-6-63: Award Contract SA-2023-1 City of Santa Ana PFAS Water Treatment Plant Wells No. 27 & 28 to Caliagua Incorporated.

12/15/2021, R21-12-177: Approve the Engineer's Report for the City of Santa Ana Wells SA-27, SA-28, SA-31, and SA-40 PFAS Water Treatment Plant Project and determine the project feasible, necessary and beneficial to the lands of the District; Authorize the General Manager to execute the Agreement Regarding Temporary Right of Entry between the District and the Redwoods Homeowners Association.

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www.esassoc.com

January 27, 2025

Mr. Shawn Nevill, Principal Planner
Orange County Water District
18700 Ward Street
Fountain Valley, California 92708

Subject: Amendment No. 1 for Work Order 12 (Agreement No. 1135) - Additional Archaeological Construction Monitoring Services for the Santa Ana Wells 27 and 28 PFAS Water Treatment Plant Project; City of Santa Ana, County of Orange, California

Dear Mr. Nevill:

Environmental Science Associates (ESA) appreciates the opportunity to submit this Amendment No. 1 request to Orange County Water District (OCWD) to provide additional archaeological construction monitoring services for the Santa Ana Wells 27 and 28 PFAS Water Treatment Project (Project) located in the city of Santa Ana, Orange County, California. Per your request, we have prepared an itemized Scope of Work, Schedule, and Fees for the tasks necessary to provide these services during construction of the Project.

Project Background and Justification for Amendment

Since December 9, 2024, ESA has been conducting archaeological monitoring services during construction of OCWD's Santa Ana Wells (Well 27 and Well 28) PFAS Treatment Plant Project (Project) in Santa Ana, California. ESA's original scope of work for the Project (dated October 2, 2024) assumed twenty (20) 10-hour monitoring days. Since activities that warrant archaeological monitoring are anticipated to extend for approximately six (6) additional weeks, ESA has included fees in Task 1, below, to cover an additional thirty (30) 10-hour days of monitoring at the Project.

Moreover, ESA has discovered approximately 20 historic period isolated artifacts and one historic period cesspool feature during monitoring services at the Project to date. Although these discoveries are not significant pursuant to the California Environmental Quality Act (CEQA), they need to be documented on California Department of Parks and Recreation Site Forms and included in the final monitoring report in accordance with industry standards. The fees for these services are provided in Task 2, below.

Scope of Work

Task 1 – Conduct Additional Archaeological Construction Monitoring

ESA will provide an archaeological monitor to be present during earth-moving activities (e.g., demolition, clearing/grubbing, grading, trenching, etc.) associated with construction and development of the Project. Specifically, this task assumes that excavations will collectively last approximately thirty (30) 10-hour working days (including travel time), plus mileage to and from the project site. The cost for this task includes one (1) 2-

hour field visit by ESA's Senior Archaeologist or Project Manager to provide monitoring support to the monitor and project management and coordination (3 hours per week for six weeks). If excavation plans require a more intensive monitoring schedule and/or extend beyond the anticipated six weeks (or 30 10-hour days), ESA will contact OCWD and submit an additional cost estimate to provide these out-of-scope services that will need to be approved prior to continuing monitoring work.

If additional resources beyond January 27, 2025, are encountered during earthmoving operations that require additional evaluation or work in accordance with industry standards (such as the development and implementation of a treatment/data recovery plan and follow-up artifact/fossil processing and curation), ESA will contact OCWD and submit an additional cost estimate to provide these out-of-scope services. ESA will require that an expedited contract in an identified not-to-exceed amount (depending on the nature of the discovery) be executed covering the out-of-scope services prior to the recovery/removal of the resource(s).

Monitors require 48-hours advanced notice prior to needing to be on site. Once work begins, monitors should be notified of the next day's schedule at the end of each workday. Monitors may be subject to a 4-hour minimum charge per day in the event of cancellation of work with less than 24-hour notice.

Task 2 – Recordation and Documentation of Discovered Archaeological Resources

As discussed above, ESA discovered approximately 20 historic period isolated artifacts and one historic period cesspool feature during monitoring services at the project to date. Although these discoveries are not significant pursuant to CEQA, they need to be documented on California Department of Parks and Recreation Site Forms (DPR Site Forms) and included in the final monitoring report in accordance with industry standards. ESA has also included fees to conduct research on the cesspool feature and to prepare a basic catalog of a representative sample of historic period artifacts that include manufacture dates of artifacts that are temporarily diagnostic.

Schedule

Please note the schedule has been prepared based on the information available to ESA at the time of this proposal. Should new information be presented or the project become subject to factors outside of ESA's control, the schedule may be subject to revision. The time frames indicated on the following page will begin immediately upon our receipt of the Work Order Authorization, the Data Needs listed below, and a Notice to Proceed from OCWD.

Service/Task	Duration/Timeframe
Task 1: Conduct Additional Archaeological Construction Monitoring	During Construction
Task 2: Recordation and Documentation of Discovered Archaeological Resources	8 Weeks After Monitoring is Complete

Deliverable Products and Data Needs

ESA will provide OCWD with the following deliverable products resulting from the activities outlined in this Scope of Work:

1. One (1) electronic draft and final copies of the DPR Site Forms (provided as an appendix to the final monitoring report).

Fees

Based on our understanding of the Project and the Scope of Work and assumptions provided in the previous section, our estimated fee by task is provided on the following page. Fees and charges will be billed on a monthly basis in accordance with the terms in Agreement No. 1135 between ESA and OCWD and ESA's original scope of work dated October 2, 2024.

Service/Task	Fees
Task 1: Conduct Additional Archaeological Construction Monitoring	$50,654
Task 2: Recordation and Documentation of Discovered Archaeological Resources	$6,695
Expenses/ODCs: Mileage for Monitor	*$1,849*
Total Fees:	***$59,198***

Please Note: This is a not-to-exceed budget and time not expended will not be invoiced. Conversely, should the effort required to provide these services be greater than assumed, or additional professional services beyond those set forth in this Scope of Work are required, ESA will notify OCWD immediately and a resolution will be sought. ESA reserves the right to transfer fees among line items, as budget flexibility is needed to respond to shifts in effort that may occur due to unexpected circumstances.

The terms of this proposal shall remain valid for sixty (60) days and subject to change after that time. If this proposal and the terms and conditions contained herein are acceptable to you and you elect to engage ESA as your consultant, please forward a Work Order Authorization for review. If you have any questions, please contact Kyle Garcia at (949) 412-4037 or via email at kgarcia@esassoc.com. Thank you for considering ESA.

Sincerely,

Kyle Garcia, M.A., RPA
Principal Archaeologist

Daniel Woodward, M.A., RPA
Regional Business Group Director

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: K. O'Toole/Z. Henderson

Budgeted: Yes
Budgeted Amount: $70,000
Cost Estimate: $70,000
Funding Source: General Fund/Outside Partners Reimbursement
Program/Line Item No. 1044.53001
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: MULTISPECTRAL AERIAL IMAGERY AND LIGHT DETECTION RANGING (LIDAR) DATA ACQUISITION OF PRADO BASIN RFP

The District periodically collects aerial imaging and other remote sensing data of Prado Basin to assist with assessment of vegetation health and sedimentation, which are critical factors related to water conservation behind Prado Dam. Staff have coordinated with Inland Empire Utilities Agency and Chino Basin Watermaster to cost share a portion of the 2025 aerial image. Staff is requesting Board authorization to issue a request for proposals from qualified firms to collect remote sensing data of Prado Basin.

RECOMMENDATION

Agendize for March 19 Board meeting: Authorize issuance of request for proposals for multispectral aerial imagery and LiDAR data acquisition of Prado Basin.

BACKGROUND/ANALYSIS

Prado Basin is dynamic and can experience significant year over year changes from natural (e.g. weather) and human caused (e.g. fires) events. These events can result in significant changes to vegetation and sediment deposition in Prado Basin. To support water conservation activities behind Prado Dam OCWD needs to identify locations where changes are occurring and evaluate ways to minimize their impact on OCWDs interest.

To help achieve these goals the District periodically collects aerial imaging and LiDAR data of Prado Basin to assist with assessment of vegetation health, Arundo Donax control, habitat mapping, determining sedimentation rates and updating elevation contours. The proposed mapping area is shown in Figure 1. These images are compared with prior years images to identify, monitor and evaluate changes.

The aerial image is taken annually around July 1st of each year to assist in comparing year over year changes in vegetation health. The cost of the image is shared 50/50 with the Prado Basin Habitat Sustainability Committee, which is administered by the Chino Basin Water Master and the Inland Empire Utilities Agency.

OCWD regularly collects LiDAR data in Prado Basin to obtain highly accurate ground surface contours and uses them to track and study sedimentation rates and locations. The cost of LIDAR will not be funded by other agencies.

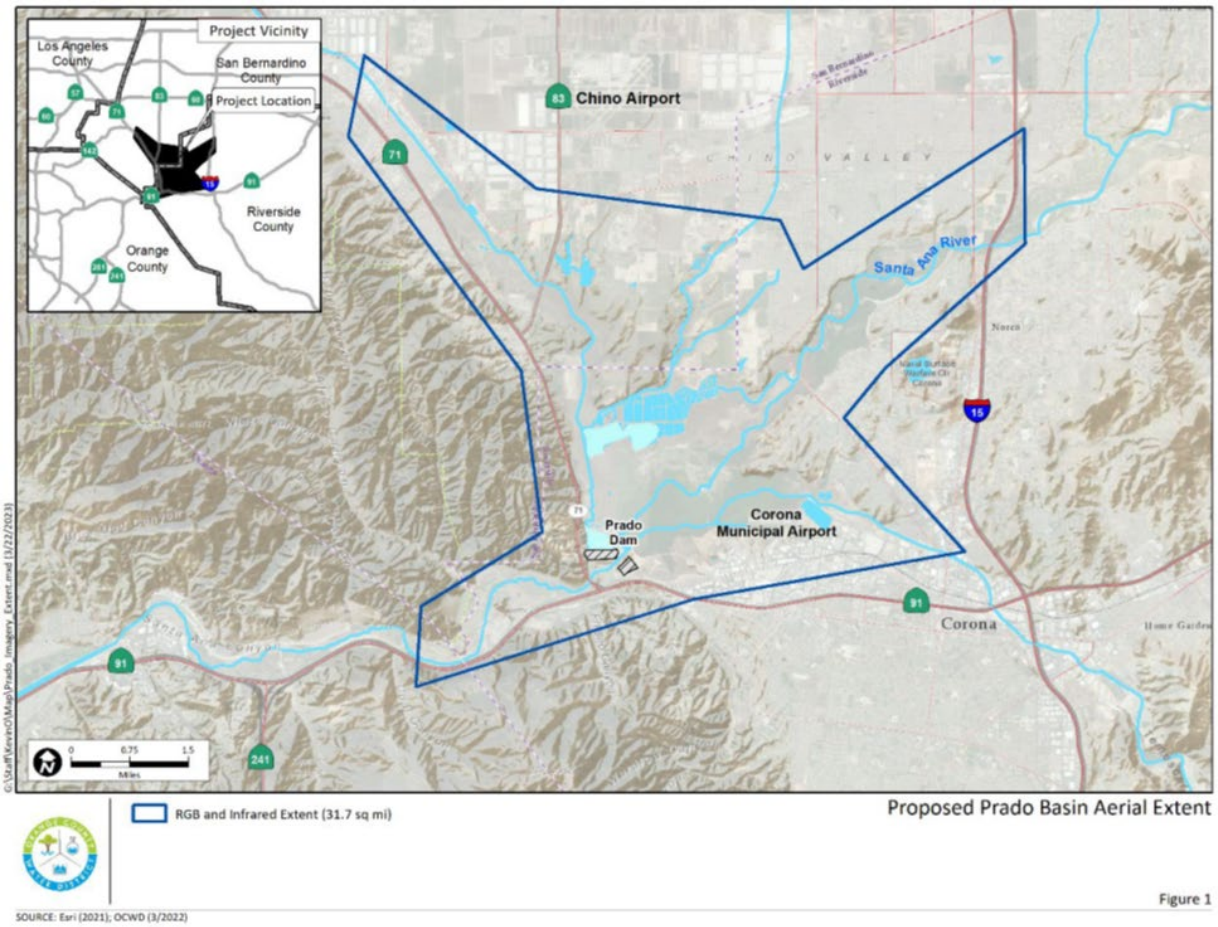


Figure 1: Proposed Prado Basin Aerial Imaging Area

Staff is recommending issuing an RFP for Aerial Imaging and LiDAR data acquisition of Prado Basin. The scope of services will include multispectral imaging (Red, Green Blue and Near Infared Band) at 3-inch or better resolution, LiDAR data acquisition will occur concurrently and meet USGS Quality Level 1 (QL1) standards. Final deliverables will consist of a summary report and digital files in a format suitable for OCWD's GIS software. Upon completion of the RFP process, staff will return with a recommendation to the Board for consideration.

PRIOR RELEVANT BOARD ACTION(S)

None

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley / L. Esguerra

Budgeted: Yes
Budgeted Amount: $0
Cost Estimate: $0
Funding Source: CIP / Fed. CPF
Program/Line Item No.: C24012
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: GOLDEN STATE WATER COMPANY LA JOLLA PLANT AND FERN PLANT PFAS TREATMENT SYSTEMS PROJECT: ENGINEER'S REPORT AND CATEGORICAL EXEMPTION

SUMMARY

The plans and specifications for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project (Project) are nearing 30% completion. Both the design and the construction costs will be funded, in part, by a WaterSMART: Title XVI WIIN Act Grant from the United States Bureau of Reclamation. Staff recommends approving the Engineer's Report for the project and filing a Categorical Exemption in compliance with the California Environmental Quality Act guidelines.

Attachment: Engineer's Report for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project

RECOMMENDATION

Agendize for March 19 Board Meeting:

1. Approve the Engineer's Report for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project and determine the project feasible, necessary and beneficial to the lands of the District; and

2. Authorize filing of a Categorical Exemption for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project in compliance with the California Environmental Quality Act (CEQA) guidelines.

BACKGROUND/ANALYSIS

To restore the use of groundwater supplies impacted by PFAS contaminants with minimal delay, the firm of PACE Advance Water Engineering began design of the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project in July of 2024. Due to site constraints at the two sites, Ion Exchange (IX) treatment has been selected as the treatment method. The number of vessels and required support systems needed for IX allows for less area to be occupied by the treatment plants than would be required for Granular Activated Carbon (GAC), Nanofiltration (NF), or Reverse Osmosis (RO). Without additional land acquisition, IX quickly became the treatment choice for these sites. PACE is nearly 30% complete with

design of the PFAS treatment systems for La Jolla Plant and Fern Plant. Figures 1 and 2 shows the location of the Golden State Water Company Wells:

Figure 1: GSWC PFAS Treatment System at La Jolla Plant

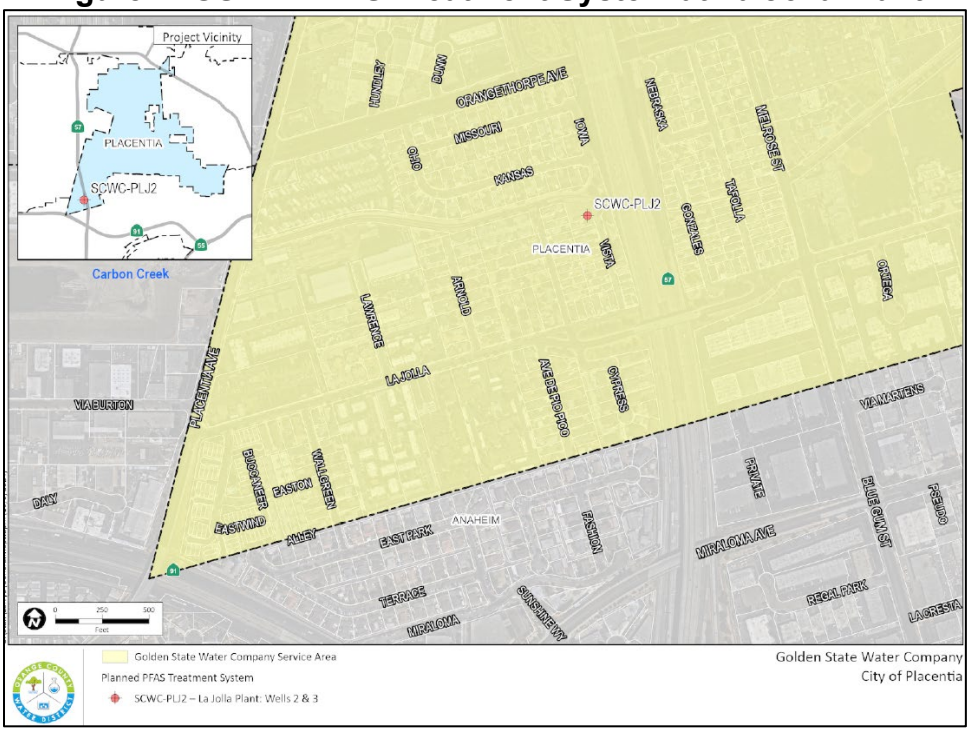
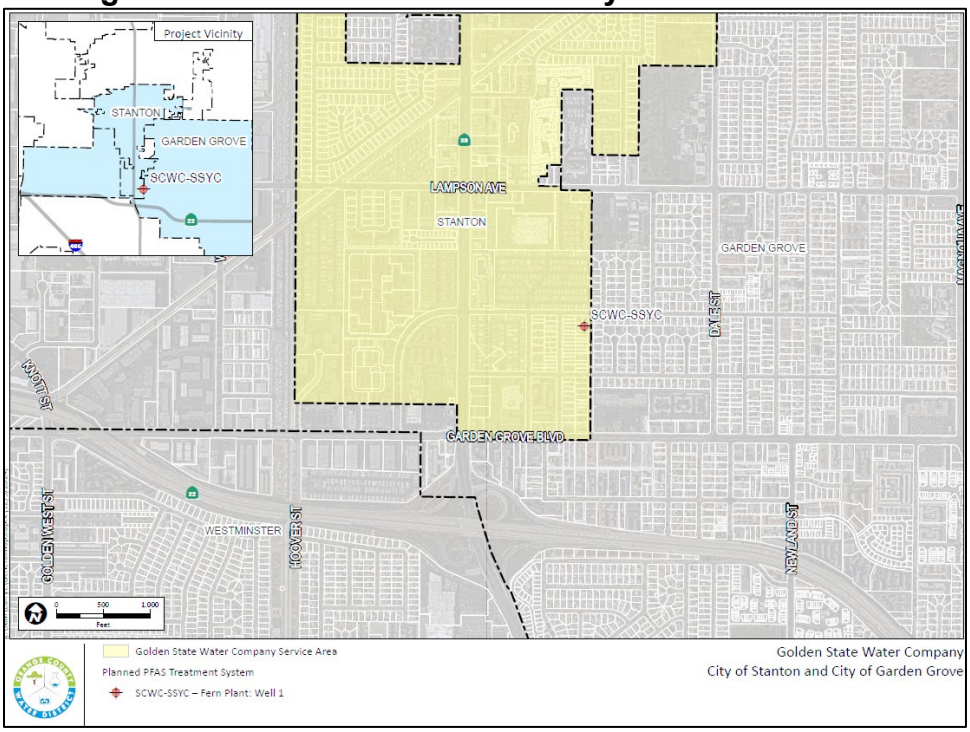


Figure 2: GSWC PFAS Treatment System at Fern Plant



The Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project will include installing IX vessel systems and all pre-filtration, site piping, well modifications, electrical upgrades, and other appurtenances. Staff has determined

that the La Jolla Plant and Fern Plant PFAS Treatment Systems Project is consistent with a California Environmental Quality Act (CEQA) Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures. The expected project schedule is shown in Table 1.

Table 1: GSWC PFAS Treatment Systems at La Jolla Plant and Fern Plant Schedule Summary

Description	Date
Design	July 2024 – Dec 2025
DDW Permitting	July 2024 – Aug 2027
Construction Contract	Mar 2026 – Sep 2027

The District was awarded a $30 million Grant from the United States Bureau of Reclamation (USBR) as part of the WaterSMART: Title XVI WIIN Act. This funding, provided by Bipartisan Infrastructure Law, is designated for the District's PFAS treatment program to eliminate per- and polyfluoroalkyl substances from local groundwater. Therefore, both the design and construction costs of the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project will be funded, in part, by the WaterSMART:Title XVI WIIN Act Grant for PFAS projects up to $30 Million. Staff is currently working with the USBR Denver Office on the final approval of the District's Grant application, PFAS program budget, funding matrix, program components and schedule, and Federal environmental compliances.

However, prior to any construction costs being eligible for Grant reimbursement, the USBR is requiring that the District process a Categorical Exemption as part of the CEQA compliance. Upon completion of CEQA, the USBR will act as the lead agency for compliance with the National Environmental Policy Act (NEPA) – a process that can take up to six months to complete. This NEPA process is in addition to OCWD filing the CEQA Categorical Exemption and cannot proceed until after OCWD's filing is complete. Both the CEQA and NEPA environmental compliances require the Engineer's Report to provide the basis for the project. The recommended action in this submittal only includes approving the Engineer's Report and authorizing CEQA filing. This action does not include authorizing bidding or construction of the project. Staff will return to the Board to request authorization of a Notice Inviting Bids at a later date.

Staff recommends approving the Engineer's Report and authorizing the filing of a Categorical Exemption in compliance with CEQA guidelines for the Golden State Water Company La Jolla Plant and Fern Plant PFAS Treatment Systems Project.

PRIOR RELEVANT BOARD ACTIONS

1/22/20, R20-1-12 - Approved modifications to the PFAS Policy

11/20/19, R19-146 - Approved PFAS Policy

ENGINEER'S REPORT

FOR

GOLDEN STATE WATER COMPANY
LA JOLLA WELLS 2 & 3 AND FERN WELL 1
PFAS TREATMENT SYSTEMS PROJECT

Prepared By:

Laurence Esguerra, P.E.

February 2025

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Tables

Figures

1.0 EXECUTIVE SUMMARY

The purpose of this Engineer's Report is for Orange County Water District (OCWD; the District) and Golden State Water Company (GSWC) to evaluate the need, benefits, and cost of constructing a Per- and Polyfluoroalkyl Substances (PFAS) treatment systems for GSWC Wells: La Jolla Wells 2 and 3 and Fern Well 1 (GSWC Wells).
In April of 2024, the United States Environmental Protection Agency (EPA) issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable maximum contaminant level (MCL) and non-enforceable maximum contaminant level goal (MCLG) for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2]- $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

In February 2020, the State Water Resources Control Board's Division of Drinking Water (DDW) issued revised drinking water response levels of 10 parts per trillion (ppt) for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS. DDW recommends that sources exceeding these limits be taken out of service, treated, or blended. Water produced from the GSWC Wells has tested 3.4 – 12.3 ppt for PFOA, 4.2 – 13.2 ppt for PFOS, and non-detect – 6.8 ppt for PFBS. When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

In 2019, the District hired Carollo to conduct a PFAS Planning Study to evaluate options for the treatment of groundwater wells that are potentially impacted by PFAS and to

develop preferred alternatives. The five alternatives evaluated in the Planning Study were shutting down the potentially impacted well and replacing the source with imported water, blending well water with imported water, blending well water with other groundwater, packing part of the well to avoid zones with PFAS, and engineered treatment. Although GSWC was not part of the original Planning Study efforts, it was determined that engineered treatment, specifically ion exchange, would be the preferred treatment for the GSWC Wells: La Jolla Wells 2 and 3 and Fern Well 1 given the similar nature of all the wells that were part of the study. The District also hired Jacobs in 2019 to perform pilot testing and life-cycle cost analysis of various treatment technologies. Preliminary results from the Jacobs study indicate that ion-exchange is an efficient technology to remove PFAS.

This project will consist of installing ion exchange vessel systems in lead-lag configuration (two vessels) at each well site, including the necessary piping, prefilters and related appurtenances.

Benefits of constructing a PFAS Treatment System at the wells sites include:

- Allowing GSWC to continue to utilize its well and infrastructure investment.
- Allowing GSWC to maintain a diversified water supply portfolio with a substantial local supply component.
- Saving the OCWD service territory approximately $1,808,480 per year in water supply costs.
- Saving OCWD over $653,972 per year by paying for the treatment plant instead of losing RA revenue.
- Avoiding approximately $1,155,220 of imported water costs incurred by GSWC by utilizing groundwater instead of imported water.

In November 2019, the District adopted a PFAS policy to design and construct the lowest reasonable cost but efficient treatment system to remove PFOA and PFOS compounds for Groundwater Producers, such as GSWC. Additionally, the policy states that OCWD will provide a 50 percent subsidy for future operation and maintenance expenses up to $89.60 per acre-foot.

The current estimated capital cost of this project is $5,100,000. The current estimated Operation and Maintenance cost is $213 per acre-foot per year, to be split between OCWD and GSWC. These costs will be adjusted as the engineering details are finalized and construction is completed.

2.0 BACKGROUND

In 2009, the United States Environmental Protection Agency (EPA) established a provisional health advisory of 400 ppt for PFOA and 200 ppt for PFOS to assess the potential risk for short-term exposure through drinking water. The EPA later released a non-regulatory health advisory level of 70 ppt for PFOA and PFOS (combined) in 2016.

In March 2019, the DDW issued mandatory PFAS testing orders to 12 public water systems (Groundwater Producers) in the District's service area. Dozens of wells in the District's service area had water quality testing results exceeding the DDW Notification Levels. Affected Producers were required to provide governing body notifications for exceedances of the Notification Level. Later in 2019, DDW lowered the Notification Limits to 5.1 ppt for PFOA and to 6.5 ppt for PFOS. In February 2020 DDW lowered the Response Levels to 10 ppt for PFOA and 40 ppt for PFOS. In March 2021, DDW issued a drinking water response level of 5 parts per billion (5,000 ppt) for PFBS and in October 2022 DDW issued a response level of 20 ppt for PFHxS.

In April of 2024, the EPA issued final National Primary Drinking Water Regulation for six PFAS. EPA established enforceable MCLs and non-enforceable MCLGs for the following PFAS.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA - perfluorooctanoic acid	Zero	4.0 parts per trillion (ppt)
PFOS - perfluorooctane sulfonate	Zero	4.0 ppt
PFHxS - perfluorohexanesulfonic acid	10 ppt	10 ppt
PFNA - perfluorononanoic acid	10 ppt	10 ppt
HFPO-DA - hexafluoropropylene oxide dimer acid (Commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more PFHxS, PFNA, HFPO-DA, and PFBS) [1]	1 Hazard Index[2]	1 Hazard Index[2]

[1] - perfluorobutane sulfonic acid (PFBS)

[2] $Harad\ Index\ (unitless) = \frac{PFBS\ ppt}{2{,}000\ ppt} + \frac{PFHxs\ ppt}{10\ ppt} + \frac{PFNA\ ppt}{10\ ppt} + \frac{HFPO{-}DA\ ppt}{10\ ppt}$

In preparation for the impacts of PFAS to groundwater supplies, the District adopted a PFAS policy in November 2019. Among other items, the policy states that OCWD will fund the lowest reasonable and efficient treatment system design and construction costs to remove PFAS compounds for Groundwater Producers. Additionally, the policy states that OCWD will provide a 50 percent subsidy for operation and maintenance

expenses up to $75 per acre-foot. The rate is adjusted annually each July 1 (beginning July 1, 2021) and the maximum subsidy for operation and maintenance has been updated to $89.60 per acre-foot for fiscal year 2023/2024.

Water produced from La Jolla Wells 2 and 3 and Fern Well (GSWC Wells) has tested 3.4 – 12.3 ppt for PFOA, 4.2 – 13.2 ppt for PFOS, and non-detect – 6.8 ppt for PFBS. When groundwater sources are taken out of service, their production is commonly replaced with more expensive imported water from the Metropolitan Water District of Southern California (MWD).

The GSWC Wells are currently under consideration for PFAS treatment systems shown in Figures 1 and 2. La Jolla Wells 2 and 3 are in the City of Placentia and Fern Well 1 is in the City of Stanton. All sites are owned by GSWC and currently house the well head and discharge piping, communication equipment, electrical equipment, and disinfection facilities.

The La Jolla Well site is surrounded on three sides by residential use and a flood control channel on the fourth side. The Fern Well site is surrounded by residential use on all sides.

IX is the preferred and most efficient treatment for the well sites due to site area limitations. The number of vessels and support systems required for IX allows for less area to be occupied by the treatment plant than would be required for Granular Activated Carbon (GAC), and IX would be more cost-effective than Nanofiltration (NF) or Reverse Osmosis (RO). RO is a treatment technology that ensures high reliability for PFAS removal but would generate a liquid waste stream containing PFAS and would be more expensive than the other technologies. Additionally, a RO plant would likely require additional GSWC staff with the appropriate water treatment certifications to operate. Although RO would be the most effective option for long-term removal of PFAS, the costs associated with RO make IX the most feasible treatment choice for the wells at this time.

The Jacobs-OCWD joint pilot study of various treatment medias began testing of IX in December 2019. The study has shown that IX successfully removes PFAS.

Figure 1: La Jolla Wells 2 and 3

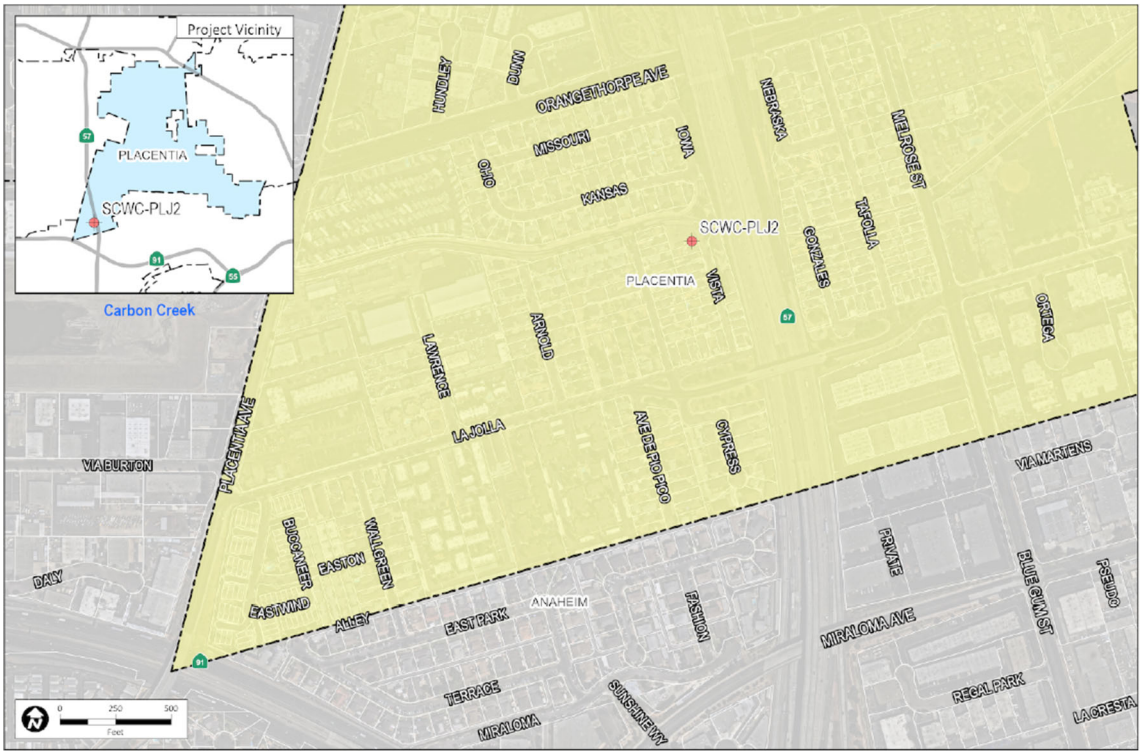
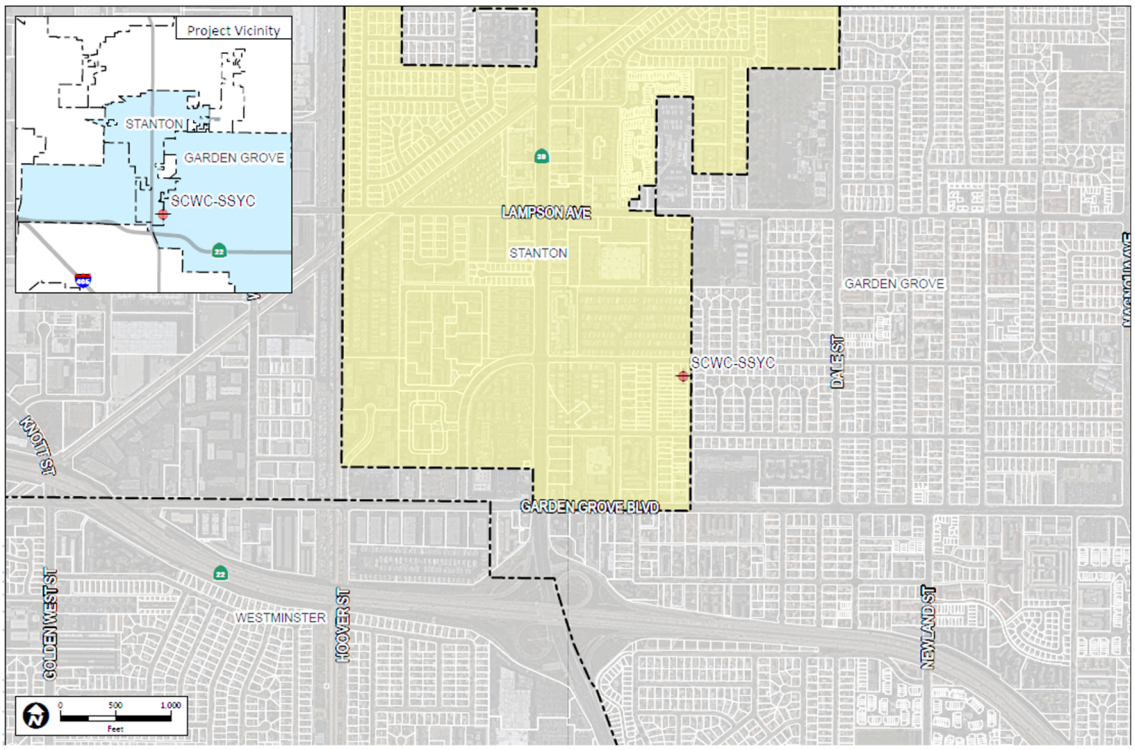


Figure 2: Fern Well 1



3.0 PROJECT PURPOSE AND DESCRIPTION

3.1 Project Purpose

The purpose of this project is to design, permit, construct, and operate PFAS removal systems for the well sites in accordance with the District PFAS policy. The proposed IX treatment system is to remove PFOA and PFOS to less than 2 ppt (the current non-detect limit). Use of this PFAS removal treatment system will ensure the groundwater supplied by the well sites can be served in compliance with PFAS regulations.

3.2 Project Components

The PFAS treatment plant will be sized to treat the maximum well discharge flow rates for the sites. Trains (or systems) of two IX vessels will be used in lead-lag configuration. Each well site will have one or two IX systems and the treatment capacity will be design for the well pumping capacity. See Table 1 for the treatment capacity and vessel dimensions and quantity for each well site.

Table 1: Well Treatment Capacity Summary

Well Site	IX Vessels	Pumping Capacity (gpm)	Treatment Capacity (gpm)
La Jolla Plant Well 2 & 3	Two (2) Trains; Four (4) Vessels; 12 feet diameter x 13 feet height	3,500	4,000
Fern Plant Well 1	One (1) Train; Two (2) Vessels; 8 feet diameter x 13 feet height	400	600

The IX vessels are expected to be provided by Evoqua Water Technologies or Aqueous Vets. The influent and effluent supply pipelines can be operated in a way to switch which vessel is the lead and lag position by controlling valves. The lead-lag arrangement is beneficial because once the PFAS constituents reach a predetermined threshold in the lead vessel's effluent, then the lead vessel can be switched to the lag position once the spent resin in it is replaced with fresh resin. The new lead vessel houses pre-loaded IX resin from when the vessel was formerly in the lag position. Replacement of the IX media is performed before the lead vessel returns to service in the lag position. Sample ports are located at several positions in the vessel so that resin performance can be monitored.

Prior to the water entering the IX vessels, it first passes through a pre-filtration system. Since IX media should not be backwashed, its lifespan would be greatly reduced if solids loading were to occur. It is proposed to use 5-micron bag-filters prior to the IX vessels to catch solids that may be discharged by the well.

The existing disinfection systems used at the wells must be reconfigured to facilitate the operation and replacement activities.

Electrical and telemetry systems will be integrated into the treatment plant to convey information into the existing SCADA system. Flow rates, pressure differential, and flood alarms are included in the list of proposed instrumentation.

3.3 Permits and Regulatory Issues

GSWC's drinking water system operates under a DDW permit that would need to be amended for the proposed PFAS treatment systems. Submittals for the amendment shall be submitted to DDW for review, including the 90% completed design. The permit amendment is not officially granted until after the system is constructed and satisfactorily inspected by DDW.

Several permits will be required from GSWC:

- A right of entry permit will be required to grant the District and its consultants and contractors control of the site during construction.

In accordance with the California Environmental Quality Act (CEQA) guidelines, it is proposed to file a Categorical Exemption for the project. The project is consistent with the Categorical Exemption for New Construction or Conversion of Small Structures (Class 3) because it consists of the construction and operation of a limited number of new, small facilities or structures.

4.0 FINANCIAL ANALYSIS

4.1 Construction Cost Estimates

The estimated construction cost for the IX project is $5,100,000, as detailed in Table 2.

Table 2: IX Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization	1	LS	$550,000	$550,000
General Conditions	1	LS	$400,000	$400,000
Fern Plant Well 1				
Pre-Filtration System	1	LS	$50,000	$50,000
Vessel Systems with IX Resin (170 cubic feet)	1	EA	$500,000	$500,000
IX Systems (appurtenances, install)	1	LS	$225,000	$225,000
Yard Piping	1	LS	$150,000	$150,000
Site Work	1	LS	$225,000	$225,000
Electrical and Communication	1	LS	$400,000	$400,000
La Jolla Plant Wells 2 & 3				
Pre-Filtration System	1	LS	$100,000	$100,000
Vessel Systems with IX Resin (460 cubic feet)	1	EA	$650,000	$650,000
IX Systems (appurtenances, install)	1	LS	$300,000	$300,000
Yard Piping	1	LS	$400,000	$400,000
Site Work	1	LS	$400,000	$400,000
Electrical and Communication	1	LS	$750,000	$750,000
			Total =	**$5,100,000**

The estimated construction cost for the Reverse Osmosis system is $10,900,000, as detailed in Table 3.

Table 3: RO Construction Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Mobilization (7%)	1	LS	$600,000	$600,000
General Conditions (5%)	1	LS	$500,000	$500,000
Fern Plant Well 1				
Pre-Filtration System	1	LS	$50,000	$50,000
RO Treatment Systems & Pumps	1	LS	$500,000	$500,000
RO Membranes	1	LS	$100,000	$100,000
Chemical Storage	1	LS	$150,000	$150,000
Sewer Connection & Fees	1	LS	$150,000	$150,000
Yard Piping & Mechanical	1	LS	$300,000	$300,000
Building	1	LS	$250,000	$250,000
Site Work	1	LS	$250,000	$250,000
Electrical and Communication	1	LS	$500,000	$500,000
La Jolla Plant Wells 2 & 3				
Pre-Filtration System	1	LS	$150,000	$150,000
RO Treatment Systems & Pumps	1	LS	$3,000,000	$3,000,000
RO Membranes	1	LS	$600,000	$600,000
Chemical Storage	1	LS	$300,000	$300,000
Sewer Connection & Fees	1	LS	$300,000	$300,000
Yard Piping & Mechanical	1	LS	$750,000	$750,000
Building	1	LS	$450,000	$450,000
Site Work	1	LS	$500,000	$500,000
Electrical and Communication	1	LS	$1,500,000	$1,500,000
			Total =	**$10,900,000**

4.2 Capital Cost Estimate

The estimated total capital cost for the IX project is $7,100,000, as shown in Table 4. The estimated total capital cost for a RO treatment plant is $15,200,000 as shown in the same table. The table includes the cost of constructing the site improvements for the PFAS treatment system, engineering services for design and construction phases, construction management and the cost associated with meeting regulatory requirements.

Table 4: Capital Cost Estimate

Item	IX Cost	RO Cost
Engineering, Permitting, Construction Management and Inspection & CEQA	$ 1,000,00	$ 2,150,000
Construction	$ 5,100,000	$ 10,900,000
Contingency	$ 1,000,000	$ 2,150,000
Total =	**$ 7,100,000**	**$ 15,200,000**

4.3 Annual Operation and Maintenance Cost Estimate

The estimated annual Operation and Maintenance (O&M) cost for the IX project is $379,700 per year, as detailed in Table 5. It conservatively assumes that visual inspection will be performed daily, and analytical testing will be performed by an outside entity instead of OCWD.

The five-year average of annual production from the GSWC Wells is approximately 1,780 acre-feet. Using this value results in a unit O&M cost of $213 per acre-foot. Per the District's PFAS policy, the O&M costs will be split between OCWD and GSWC with OCWD's portion being no larger than $89.60 per acre-foot. The estimated $213 per acre-foot O&M unit cost would cause OCWD to incur $89.60 per acre-foot and GSWC to incur $123 per acre-foot.

Table 5: IX Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Fern Plant Well 1				
Power	12	Month	$3,500	$42,000
Labor	1	Year	$10,000	$10,000
Maintenance	1	Year	$2,500	$2,500
Analytical Testing	12	Month	$300	$3,600
Media Replacement	1	Year	$37,500	$37,500
La Jolla Plant Wells 2 & 3				
Power	12	Month	$14,000	$168,000
Labor	1	Year	$10,000	$10,000
Maintenance	1	Year	$2,500	$2,500
Analytical Testing	12	Month	$300	$3,600
Media Replacement	1	Year	$100,000	$100,000
			Total =	**$ 379,700**

Table 6 shows an itemized breakdown of O&M cost for a RO treatment plant. Using an annual volume of 1,780 acre-feet, the RO O&M unit cost is estimated to be $730 per acre-foot.

Table 6: RO Annual O&M Cost Estimate

Description	Quantity	Units	Unit Cost ($/unit)	Cost ($)
Fern Plant Well 1				
Power	12	Month	$14,000	$168,000
Chemicals	12	Month	$600	$7,200
Labor	1	Year	$37,000	$37,000
Maintenance	1	Year	$50,000	$50,000
Analytical Testing	12	Month	$1,000	$12,000
Membrane Replacement	1	Year	$20,000	$20,000
La Jolla Plant Wells 2 & 3				
Power	12	Month	$61,000	$732,000
Chemicals	12	Month	$2,500	$30,000
Labor	1	Year	$64,000	$64,000
Maintenance	1	Year	$80,000	$80,000
Analytical Testing	12	Month	$1,250	$15,000
Membrane Replacement	1	Year	$85,000	$85,000
			Total =	**$ 1,300,200**

4.4 Ion-Exchange Cost Comparisons

Three methods to evaluate the economic effectiveness of the IX project are presented below. All three methods indicate that there is a financial benefit to move forward with this project.

1) OCWD Service Territory Perspective - The total project cost of providing water to the OCWD service territory via treated groundwater versus purchasing MWD imported water.
2) OCWD Perspective - The OCWD lost revenue due to no GSWC groundwater production versus the OCWD cost to construct and operate the treatment plant.
3) GSWC Perspective – The cost of providing treated groundwater versus purchasing MWD imported water.

Method 1: OCWD Service Territory Perspective

The unit cost for GSWC to acquire treated imported water through MWD will be $1,460 per acre-foot ($1,395 Full Service Treated + $65 readiness to serve) on January 1, 2025. An annual volume of 1,780 acre-feet would cost $2,598,800.

If the capital cost is amortized over 30 years at a 4% interest rate, the annual payment for the PFAS treatment plant would be $410,594, or $231 per acre-foot for 1,780 acre-

feet. The well power cost to pump groundwater averages $80 per acre-foot. The PFAS treatment system's O&M expense is estimated to be $133 per acre-foot. As shown in Table 7, the total unit cost of the treated groundwater would be $444 per acre-foot, or $790,320 per year for 1,780 acre-feet. Note that the Replenishment Assessment (RA) is not considered in this calculation because it would be both paid and received by agencies within the OCWD Service Territory.

Implementation of the PFAS treatment system at the GSWC Wells is estimated to save the OCWD service territory $1,808,480 per year in water supply costs.

Table 7: OCWD Service Territory Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 410,594	$231	Full Service Treated	$ 2,483,100	$ 1,395
Project O&M	$ 236,740	$133	Readiness to Serve	$ 115,700	$ 65
Well Power	$ 142,400	$80			
Total	$ 790,320	$444	Total	$ 2,598,800	$ 1,460

Method 2: OCWD Perspective

Taking GSWC Wells out of service would reduce the RA payments made by GSWC to OCWD. This assumes that other wells are not available to pump the volume. At an annual volume of 1,780 acre-feet and the current RA of $688 per acre-foot, OCWD would lose revenue of $1,224,640.

The District's expenses to construct the PFAS treatment plants at the GSWC Wells includes the capital expense and $89.60 of the O&M. As previously discussed, the amortized unit capital expense is $231 per acre-foot and OCWD's portion of the estimated O&M expense is $89.60 per acre-foot. The resulting unit cost of constructing and operating PFAS plants at the wells would be $320.60 per acre foot, or $570,688 per year using 1,780 acre-feet per year.

Table 8: OCWD Perspective

Project Cost			Lost Revenue		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 411,180	$ 231	Replenishment Assessment	$ 1,224,640	$ 688
Project O&M	$ 159,488	$ 89.60			
Total	$ 570,668	$ 320.60	Total	$ 1,224,640	$ 688

Implementation of PFAS treatment systems at GSWC Wells is estimated to save OCWD $653,972 per year by utilizing the treatment plant instead of losing RA revenue.

Method 3: GSWC Perspective

Given the need for GSWC to acquire water supplies to meet the demands of its customers, it is faced with a situation to utilize the PFAS treatment system or to purchase MWD imported water. As previously discussed, the cost to GSWC to purchase 1,780 acre-feet of MWD water would be $2,598,800 per year, or $1,460 per acre-foot.

The costs for GSWC to produce groundwater from the GSWC Wells and operate the PFAS treatment plant include payment of the RA ($688 per acre-foot), their portion of the O&M expenses and well power costs ($123 per acre-foot). The total unit cost would be $811 per acre-foot, or $1,443,580 per year for 1,780 acre-feet.

Table 9: GSWC Perspective

Groundwater			MWD Import		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Replenishment Assessment	$ 1,224,640	$ 688	Full Service Treated	$ 2,483,100	$ 1,395
Project O&M and Well Power	$ 218,940	$123	Readiness to Serve	$ 115,700	$ 65
Total	$ 1,443,580	$ 811	Total	$ 2,598,800	$ 1,460

Implementation of PFAS treatment systems at GSWC Wells is estimated to save GSWC over $1,155,220 per year by utilizing groundwater instead of MWD imported water.

4.5 Reverse Osmosis versus Ion Exchange Unit Cost

RO would provide a more robust, comprehensive, and reliable treatment for long-term removal of PFAS. However, the capital and operating cost of the treatment system are more expensive. If the estimated RO capital cost of $15,200,000 is amortized over 30 years at a 4% interest rate, the annual payment for the RO PFAS treatment plant would be $879,320, or $494 per acre-foot for 1,780 acre-feet. The RO PFAS treatment system's O&M expense is estimated to be $730 per acre-foot for 1,780 acre-feet. As shown in Table 9, the total unit cost of the RO treated groundwater would be $1,224 per acre-foot, or $2,178,720 per year for 1,780 acre-feet. The IX project costs are also summarized in the same table.

Table 10: Reverse Osmosis versus Ion Exchange Unit Cost

IX			RO		
Description	**Annual Cost**	**Unit Cost**	**Description**	**Annual Cost**	**Unit Cost**
Project Capital	$ 411,180	$ 231	Project Capital	$ 879,320	$ 494
Project O&M	$ 379,140	$ 213	Project O&M	$ 1,299,400	$ 730
Total	$ 790,320	$ 444	Total	$ 2,178,720	$ 1,224

5.0 CONCLUSIONS AND RECOMMENDATIONS

Constructing the proposed IX PFAS Treatment Systems at GSWC Wells: La Jolla Wells 2 and 3 and Fern Well 1 will:

- Allow the GSWC to continue to utilize its well and infrastructure investment.
- Allow the GSWC to maintain a diversified water supply portfolio with a substantial local supply component.
- Save the OCWD service territory approximately $1,808,480 per year in water supply costs.
- Save OCWD approximately $653,972 per year by paying for the treatment plant instead of losing RA revenue.
- Save the GSWC approximately $1,155,220 per year by utilizing groundwater instead of imported water.

Given the financial benefits to the OCWD service territory, OCWD, and GSWC to utilize a less expensive treated groundwater supply instead of MWD water, it is recommended that OCWD proceed with PFAS Treatment System Project for GSWC Wells: La Jolla Wells 2 and 3 and Fern Well 1. Additionally, GSWC would be able to continue using their well investment and maintain their local water component of their supply portfolio.

6.0 PROPOSED IMPLEMENTATION SCHEDULE (TENTATIVE)

Date	Activity
October 2025	Board authorizes Notice Inviting Bids
November 2025	Advertise for construction bids
February 2026	Board awards construction contract
October 2027	Completion of construction

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Bouley/A. Waite

Budgeted: Yes
Proposed Budget: $10,888,160
Cost Estimate: $10,080,000
Funding Source: CIP
Program/Line Item No.: C23005
General Counsel Approval: Yes
Engineers Report: Completed
CEQA Compliance: Cat. Ex.

Subject: AWARD CONTRACT NO. FUL-2024-1 FULLERTON KIMBERLY WELL 2 PFAS WATER TREATMENT PLANT TO R C FOSTER CORPORATION

SUMMARY

A total of six construction bids were received on March 4, 2025, for the Fullerton Kimberly Well 2 PFAS Water Treatment Plant Project, Contract FUL-2024-1 (the "Project"). Based on a review of the bids received, staff recommends awarding a contract to R C Foster Corporation as the responsible bidder submitting the lowest responsive bid, in the amount of $7,071,100. Staff also recommends establishing a total project budget of $10,888,160.

Attachment: Affidavit of Publication for Notice Inviting Bids for Contract FUL-2024-1

RECOMMENDATION

Agendize for March 19 Board meeting:

1. Receive and file Affidavit of Publication of Notice Inviting Bids for Contract FUL-2024-1 Fullerton Kimberly Well 2 PFAS Water Treatment Plant;

2. Ratify issuance of Addenda 1-2;

3. Accept bid and award contract FUL-2024-1 to the lowest responsive bid and responsible bidder, R C Foster Corporation, in the amount of $7,071,100; and

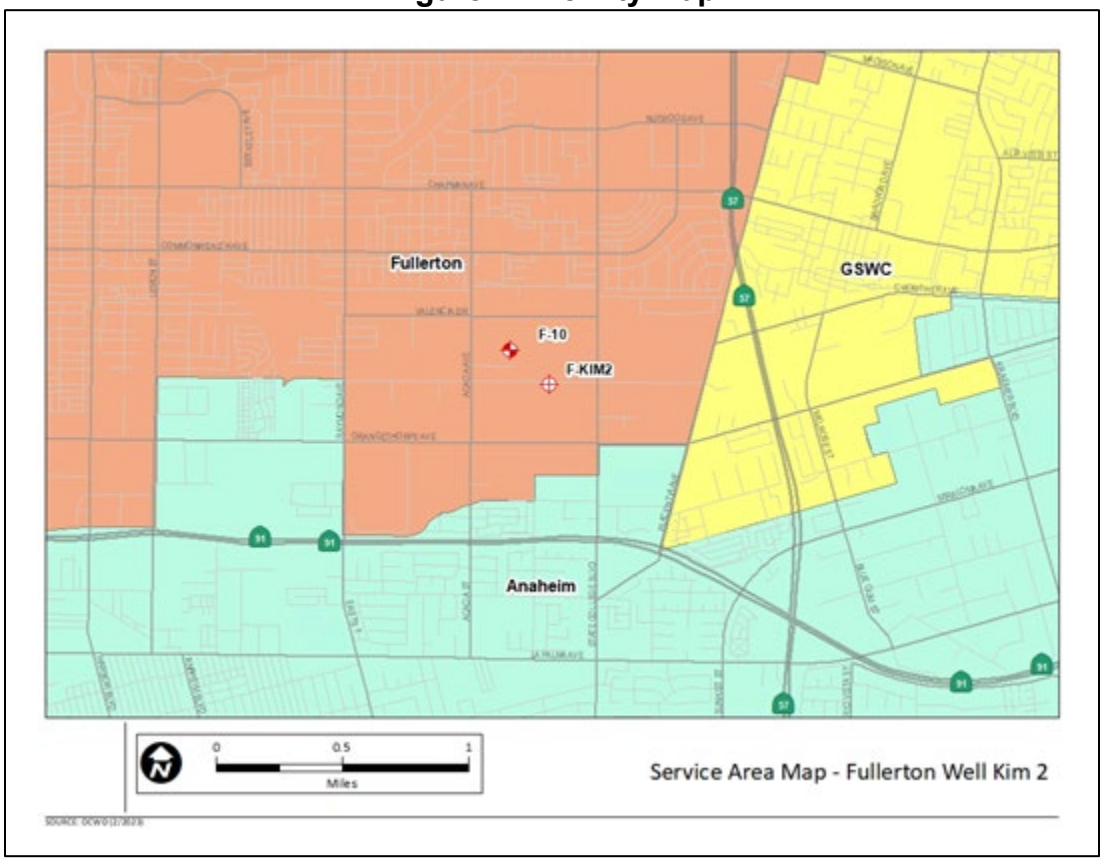
4. Establish the Fullerton Kimberly Well 2 PFAS Water Treatment Plant Project budget in the amount of $10,888,160.

BACKGROUND/ANALYSIS

Design of the City of Fullerton (City) Kimberly Well 2 (Kim 2) PFAS Water Treatment Plant project began in June 2023. The Project reached final design in May 2024 for treating Well Kim 2; however, the Project was amended to include one additional IX vessel system and one additional filter cartridge vessel to accommodate future treatment of Well Sunclipse 10 which is impacted due to the PFAS MCL. Sunclipse 10 is located approximately 1,600 feet northwest of Well Kim 2, and a project to treat this well will be bid in the future. The Project also includes rehabilitating the existing well, a new standby generator, and an automatic transfer switch that will be reimbursed by the

City. Design was completed in November 2024. A map showing the locations of the Fullerton Kim 2 site and Well Sunclipse 10 is shown in Figure 1.

Figure 1: Vicinity Map



The Project was advertised for bid on January 16, 2025, and Addenda No. 1 & 2 were issued to revise the Bid Opening date, provide revised project plans and specifications, and to provide responses to potential bidders' questions. Six construction bids were received on March 4, 2025, and a summary of these bids is shown below in Table 1. The original engineer's estimate was $7,200,000.

Table 1: FUL-2024-1 Fullerton Well Kim 2 PFAS Water Treatment Plant Bid Summary

Contractor	Bid Price
R C Foster Corporation	$7,071,100
Pyramid Building & Engineering, Inc.	$7,139,630
Pacific Hydrotech Corporation	$7,266,344
Caliaqua Inc.	$7,908,804
MMC, Inc.	$8,953,000
Covenant Technical Solutions	$8,995,360

Staff reviewed the bid of the R C Foster Corporation and found it to be responsive. Staff also checked R C Foster Corporation's references, and confirmed that their contractor's license is current, active, and in good standing with the State of California. Staff recommends awarding the construction contract to R C Foster Corporation as the

lowest responsible bidder that submitted a responsive bid in the amount of $7,071,100. The project budget for the City of Fullerton Well Kim 2 PFAS Water Treatment Plant Project, Contract FUL-2024-1, is summarized in Table 2.

Table 2: FUL-2024-1 Fullerton Well Kim 2 PFAS Water Treatment Plant Budget Summary

Description	Budget
Design and Construction Management	
Design-Work Order 5A & 5B Well Kim 2 (Tetra Tech)	$662,745
Work Order 5A (CM Services - Tetra Tech)	$546,110
Design and CM Subtotal	**$1,208,855**
Construction	
Contract FUL-2024-1	$7,071,100
IX Treatment Systems	$1,195,000
IX Resin	$949,650
Permits and Advertisement Costs	$50,000
Staff Expenses	$60,000
Construction Subtotal	**$9,325,750**
Project Contingency (5% of Contract Amount)	$353,555
Total Project Budget	**$10,888,160**
City of Fullerton Contribution Approx.	$611,300
Total Cost to OCWD	**$10,276,860**

The expected project schedule is shown below in Table 3.

Table 3: FUL-2024-1 Fullerton Well Kim 2 PFAS Water Treatment Plant Schedule Summary

Description	Date
Design	June 2023 – Nov 2024
DDW Permitting	Feb 2025 – Sep 2026
Construction Contract FUL-2024-1	May 2025 – Sep 2026

PRIOR RELEVANT BOARD ACTION(S)

9/2/20, R24-9-114: Receive and file the Engineer's Report for the Fullerton Wells Kim 2 and Sunclipse 10 PFAS Water Treatment Plants and determine the project feasible, necessary and beneficial to the lands of the District; Authorize filing of a Categorical

Exemption for the Fullerton Well Kim 2 PFAS Water Treatment Plant project in compliance with the California Environmental Quality Act (CEQA) guidelines; and, authorize publication of Notice Inviting Bids for Contract No. FUL-2024-1, Fullerton Well Kim 2 PFAS Water Treatment Plant.

THE ORANGE COUNTY
REGISTER
1920 Main Street, Suite 209
Irvine, California 92614
(714) 796-7000
legals@inlandnewspapers.com

Orange County Water District
18700 Ward Street
Fountain Valley, California 92708

Account Number:	5179533
Ad Order Number:	0011714585
Customer's Reference/PO Number:	
Publication:	The Orange County Register
Publication Dates:	01/16/2025
Total Amount:	$1112.32
Payment Amount:	$0.00
Amount Due:	$1112.32
Notice ID:	AP4G91c6DnzjjTyEAzoL
Invoice Text:	

THE ORANGE COUNTY
REGISTER
The Orange County Register
1920 Main Street, Suite 209
Irvine, California 92614
(714) 796-7000

0011714585

Orange County Water District
18700 Ward Street
Fountain Valley, California 92708

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Orange

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not party to or interested in the above-entitled matter. I am the principal clerk of the printer of The Orange County Register, a newspaper of general circulation, printed and published in the City of Irvine*, County of Orange, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of County of Orange, State of California, under the date of November 19, 1905, Case No.A-21046. The notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

01/16/2025

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Dated at Irvine, California

On this 16th day of January, 2025.

Sandra Campos
Signature

NOTICE INVITING BIDS
FULLERTON KIMBERLY WELL 2 PFAS WATER TREATMENT PLANT
CONTRACT NO. FUL-2024-1

PLEASE TAKE NOTICE that sealed bids will be received at the office of the Contracts Administrator of the Orange County Water District ("District"), 18700 Ward Street, Fountain Valley, CA 92708 (mailing address: P.O. Box 8300, Fountain Valley, CA 92728-8300), until 2:00 P.M. local time on Thursday, February 20, 2025, at which time the bids will be publicly opened and read aloud for performing all work and furnishing all labor, materials and equipment for construction of a wellhead water treatment plant project for the City of Fullerton (City) to remove Per- and Polyfluoroalkyl substances (PFAS) contaminants at Kimberly Well 2 before furnishing the treated drinking water to the City's customers. The Fullerton Kimberly Well 2 PFAS Water Treatment Plant includes the work shown on the Drawings and Specifications and summarized as follows:

1. Take delivery and install District furnished Dual Media Pressure Vessel systems including pressure testing, disinfection, and bacteria testing.
2. Coordinate and assist with the installation of District purchased Ion Exchange (IX) media into dual media pressure vessels.
3. Furnish and install a prefilter system for the IX system.
4. Rehabilitate City water supply Well 2.
5. Demolish existing pedestal and construct new Well 2 pedestal. Furnish and install a new well pump, motor and enclosure.
6. Construct structural concrete, masonry building, and pre-fabricated enclosure.
7. Furnish and install pipelines for connections to the Water Treatment Plant and to the distribution system.
8. Demolish select existing facilities, and complete paving and site improvements
9. Demolish existing fence and furnish and install exterior fencing and gates.
10. Furnish and install all electrical and instrumentation equipment, conduits, wiring, gear and ancillaries. Instrumentation and control systems shall be coordinated with the City's Controls Systems Integrator.
11. Furnish and install generator.
12. Provide all commissioning and start-up-services.

NON-MANDATORY PRE-BID CONFERENCE: A pre-bid conference will be held at the project site, 2200 Kimberly Ave, Fullerton, CA 92831 on Thursday, January 30, 2025 at 10:00 A.M. All potential bidders, contractors and other interested parties are encouraged to attend this conference conducted by the District and Engineer. Any potential bidder that does not attend the pre-bid conference will be charged with knowledge of all information that was available at the pre-bid conference.

PROJECT ADMINISTRATION: All questions regarding the Bid must be submitted in writing before the deadline due date of Monday, February 10, 2025 at 2:00 PM PT. Questions received after the questions due date may not be considered. All questions relative to this project prior to the opening of bids shall be directed, in writing, to the to procurement@ocwd.com.

COMPLETION OF WORK AND LIQUIDATED DAMAGES: All Work must be substantially completed within Four Hundred Fifty (450) consecutive calendar days from the date of the Notice to Proceed issued by the District. Failure to complete the Work within the time set forth herein will result in the imposition of liquidated damages for each day of delay, in the amount set forth in the Information for Bidders.

OBTAINING CONTRACT DOCUMENTS: Plans and specifications and all contract documents must be purchased through HB Digital at www.ocwdplanroom.com. Payment will not be refunded, and the plans and specifications and contract documents are not required to be returned.

Dated: January 16, 2025

ORANGE COUNTY W, TER DISTRICT

By: John Kennedy, P.E., General Manager

The Orange County Register
Published: 1/16/25

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: R. Herndon/B. Leever

Budgeted: No
Budgeted Amount: $0
Cost Estimate: $34,333
Funding Source: General Fund
Program/Line Item No.: 1075.53010.9900
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: EVALUATION OF LAND SUBSIDENCE HISTORY AND POTENTIAL IN THE ORANGE COUNTY GROUNDWATER BASIN

SUMMARY

Consideration to expand the operational storage range for the Orange County groundwater basin is one of the priority projects in the OCWD Resilience Plan. Because land subsidence is a risk of operating the basin at a low storage condition, staff requested and received proposals from experts in this field to evaluate the history and potential for subsidence to occur. Staff recommends proceeding with this initial evaluation via issuance of a professional services agreement to the firm of GSI Environmental in the amount of $34,333.

Attachment: Proposal from GSI Environmental dated January 21, 2025.

RECOMMENDATION

Agendize for March 19 Board meeting: Authorize issuance of a professional services agreement to GSI Environmental in an amount not to exceed $34,333 to evaluate land subsidence in the Orange County groundwater basin.

BACKGROUND/ANALYSIS

The basin operating range of 0 to 500,000 AF from full was established by the OCWD Board in 2007 based on an evaluation of factors including drought preparedness, seawater intrusion barrier performance, groundwater pumping levels, and colored water upwelling potential. The potential for land subsidence is another risk factor if groundwater storage is reduced below historical conditions.

The stratigraphic composition of the groundwater basin includes permeable sands and gravels with interbedded clays and silts. When groundwater storage is reduced, the accompanying lower hydrostatic pressure in the clay and silt deposits can lead to compaction of the clays/silts which can eventually result in land subsidence. This is the case in the much-publicized southern Central Valley of California.

Because land subsidence is a specialized area of study that spans geotechnical engineering and hydrogeology, staff reached out to two subject matter experts,

Professor Nicholas Sitar (UC Berkeley) and Dr. Bill Mok (GSI Environmental) and requested a proposal for an initial evaluation. The study objectives include:

- Identify areas within OCWD where historical subsidence has already occurred
- Identify areas that may be more susceptible to subsidence
- Identify data gaps that prevent more definitive subsidence evaluation

The scope of work includes review of representative geologic and geophysical drilling logs, historical groundwater level and pumping records, and historical ground surface survey data. Because the basin underwent periods of significant storage depletion in the late 1940s through late 1950s, a key question is if the basin has already experienced some amount of land subsidence. This could affect the potential for future subsidence under low-basin storage conditions.

To proceed with this evaluation, staff recommends issuance of a professional services agreement to GSI Environmental in the amount of $34,333.

PRIOR RELEVANT BOARD ACTIONS

2/19/25, R25-2-19 – Receive and file the OCWD Resilience Plan and authorize filing of Notice of Exemption in compliance with CEQA.

3/21/07 M07-44 Receive and file staff report, titled “Evaluation of Orange County Groundwater Basin Storage and Operational Strategy,” and adopt new three-layer storage change methodology with the associated new full basin condition.

January 21, 2025

Roy Herndon
Chief of Hydrogeology
Orange County Water District
18700 Ward Street
Fountain Valley, CA 92708

Re: Evaluating the potential land subsidence impact of reducing groundwater storage in the OC basin below historical levels

Dear Mr. Herndon,

As discussed during our Zoom meeting on November 6, 2024, GSI Environmental Inc. (GSI) and Dr. Nicholas Sitar are hereby jointly proposing a staged approach to the proposed study. The first stage of the study will be an assessment of available historical data and familiarization with existing monitoring programs and data.

Background
Based on the historical data available on the OCWD website and the materials you shared with us, different sections of this very large land area were subject to significant overdrafts in the past, especially during the 1950's and 1960's. In the last 50 years the basin has been carefully managed. The groundwater levels have significantly recovered and have been fluctuating within a relatively tight range. In addition, aggregated data from the 8-year period between 2015 and 2024, suggests very minor localized subsidence in small areas along the basin margins, with the rest of basin showing ground surface remaining stable or rebounding by as much as 0.15 ft in a few locations. While this data is very encouraging, suggesting that the compressible clays within the basin may have been consolidated to a point of relative equilibrium within the current operating range, there are other historical factors that should be evaluated to assess what additional work/analyses are needed to get a better understanding of the existing conditions as follows:

1) As already noted, it is our understanding that the principal groundwater overdrafts occurred in the 1950's and 1960's, although agricultural overdrafts started much earlier in the 1930's. These early issues led to the creation of the Water District in 1933.
2) Active groundwater management and recharge operations did not begin until the late 1960's and early 1970's.

Given the above it is very likely that a significant amount of localized subsidence occurred during these roughly 30+ years, without being directly observed as the nature of land use across the various parts of the basin was changing very rapidly from principally agricultural to light industrial and, eventually, extensive housing developments. Thus subsidence would have been subsequently arrested by the active management and recharge of the aquifers in the groundwater basin and may be reflected in the most recent surveys. However, it is essential that this postulated history be carefully vetted and analyzed.

Proposed First Stage Assessment:

1) As already noted, the period from the early 1930's to late 1960's saw the most significant historical groundwater overdrafts. Therefore, we recommend performing a search of the historical survey data as follows:

a. Topographic land surveys at county and city levels that provide topographic elevations of landmarks that can be correlated with current elevations at those locations.
b. Well head elevation surveys from the earliest days to present to assess rate of subsidence at points of maximum water level depression and corresponding groundwater levels.
c. Well installation records, including grain size analyses for screen sizing, if available.
d. Geotechnical sampling of the different units and any laboratory tests, especially consolidation tests, if available.
e. Geophysical logs for the wells if they were performed during drilling and installation.
f. Historical water level data, broken down by unit and subbasin, if such detail is available.
g. Seismic reflection data, if such data is available to the District.

2) Revisiting the most current ground surface elevation surveys to extend the measurements to at least the year 2000. We note that in the plots that you shared with us in your presentation there are two periods, 2000-2003, and 2008-2010, during which the groundwater levels in the principal aquifer were substantially lower than during the 2015-2023, period. Thus, these periods specifically, and the entire period between 2000 and 2023 would provide a much-needed information on the degree of elasticity and the potential for long term consolidation of the compressible layers in the stratigraphic sequence.

3) Given that active recharge wells are operating in parts of the aquifer, the data on local groundwater levels and ground surface elevation should be aggregated to provide additional data for modeling the consolidation characteristics of the sedimentary sequence in the respective locations. The data on well installation: borehole logs, grain size analyses, etc. should be included as a part of this effort.

Project Management:
Upon completion of the First Stage Assessment, we will prepare a Technical Memorandum to document our work performed and recommendations. We will organize a meeting with OCWD to present the findings.

We propose to perform the First Stage Assessment on a time-and-material basis. The estimated total cost is $34,333. Table 1 shows the estimated labor hours and costs by labor categories. GSI's labor rates are based on our most recent audit by the Defense Contract Audit Agency (DCAA) for federal projects. We will not exceed the total estimated cost without prior approval by OCWD.

Tasks	Labor hours			Cost
	Dr. Sitar	Dr. Mok	Dr. Li	
1. Data Compilation			40	$ 5,892
2. Land Subsidence Potential Assessment	20	20	40	$ 20,971
3. Meeting and Preparation	2	2	4	$ 2,097
4. Technical Memorandum	4	4	16	$ 5,373
Subtotal	22	22	100	
Total				**$ 34,333**

If you have any questions this proposal, please contact me at cmmok@gsienv.com or Dr. Nicholas Sitar at sitar@berkeley.edu.

Sincerely,

Chin Man "Bill" Mok, PhD, PE, GE, PG, BC.WRE, BC.GE
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RESUME

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Education: B.A.Sc., Geological Engineering, University of Windsor, 1973
M.S., Geology--Hydrogeology, Stanford University, 1975
Ph.D., Civil Engineering--Geotechnical, Stanford University, 1979

Citizenship: Canadian, US Permanent Resident

Professional Registration: Professional Engineer, British Columbia, Lic. # 12288

Academic and Professional Experience:

July 2012 – Present	Edward G. Cahill and John R. Cahill Professor, Dept. of Civil and Environmental Engineering, UC Berkeley
July 2002 – Dec.2008	Director, Earthquake Engineering Research Center, UC Berkeley
July 1998 - June 2001	Vice Chair for Graduate Affairs, CEE
July 1992 - June 1994	Vice Chair for Academic Affairs, Dept. of Civil and Env. Engrg. UC Berkeley
July 1990- Present	Professor, Dept. of Civil and Env. Engineering, UC Berkeley
March 1988 - June 1988	Postdoctoral Research Fellow, Norwegian Geotechnical Institute, Oslo, Norway
July 1986 - June 1990	Associate Professor, Dept. of Civil Engineering, UC Berkeley
Jan. 1981 - June 1986	Assistant Professor, Dept. of Civil Engineering, UC Berkeley
Jan. 1979 - Dec. 1980	Assistant Professor, Department of Geological Sciences, University of British Columbia
Oct. 1976 - Dec. 1978	Research Assistant in Geotechnical Engineering, Department of Civil Engineering, Stanford University
July 1976	Soil Engineer, Dominion Soil Investigation Inc., Windsor, Ont. Design of shallow foundations including field supervision and report writing
June - Sept. 1975	Engineer, Dr. James L. Sherard, Consulting Engineer. Study of dispersive clays and seepage through zoned embankments
Jan. 1975 - June 1976	Research Assistant in Hydrogeology, Department of Geology, Stanford University
Sept. 1973 - Dec. 1974	Teaching Assistant, Department of Geology, Stanford University
Summer 1973, 1972	Field Assistant, Noranda Exploration Co., Thunder Bay, Ont. Reconnaissance and detailed geological and geophysical mapping in Ontario and Manitoba.
Summer 1971	Field Assistant, R. E. Chaplin, P. Eng., Vancouver, B.C. Reconnaissance geological and geophysical mapping in B.C.

Consulting:

Consultant on various projects, including:

- Stability evaluations of slopes and embankments under static and seismic loading
- Evaluation of the influence of geologic setting on the performance of engineered structures
- Evaluation of behavior of cemented and calcareous soils under static and cyclic loading
- Rock slope stability and erosion evaluation
- Numerical modeling of seismic slope response
- Investigations of groundwater contamination by nonaqueous liquids
- Assessment of techniques for cleanup of groundwater contamination

Professional Service:

Prof. Society Memberships:

American Society of Civil Engineers - GeoInstitute, Association of Engineering Geologists, American Geophysical Union, Earthquake Engineering Research Institute

Committees & Activities:

Member, International Society of Rock Mechanics, Commission on Discontinuous Deformation Analysis, 2019-present

Chair, Committee on Geological and Geotechnical Engineering, Board for Earth Sciences, National Research Council, 2002-2004

Editor and Member of the Editorial Board, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, 1995-1998

Chair, ASCE, GT Division, Committee on Engineering Geology, 1985-93, member - current

Member, ASCE, GT Division., Committee on Soil Properties, 1984-88

Awards and Honors:

Sowers Lecture, Georgia Tech and Atlanta Section of ASCE GeoInstitute, Atlanta, May 9, 2023
Invited Keynote, Int. Conf. on Discontinuous Deformation Analysis, ICADD 14, Beijing, Oct. 27, 2018
Best Paper Award, American Rock Mechanics Association, June 2018
Spring 2015 Cross Canada Lecturer, Canadian Geotechnical Society, May 2015
Invited Plenary Lecture, 8th Chilean Geotechnical Engineering Congress, Santiago, Chile, 2014
Korean Geotechnical Society Award and Lecture, 2012
20th Hilf Memorial Lecture in Geotechnical Engineering, University of Colorado, Boulder, 2012
Edward G. Cahill and John R. Cahill Professor of Civil and Environmental Engineering 2010-
Chancellor's Professor, UC Berkeley, 1998-2001
James M. Robbins Excellence-in-Teaching Award, Pacific District, Chi Epsilon, 1998
Huber Research Prize, ASCE, 1993
Best Professor Award, U.C. Berkeley Student Chapter of ASCE, 1991
Best Advisor Award, U.C. Berkeley Student Chapter of ASCE, 1988
Association of Engineering Geologists Douglas R. Piteau Outstanding Young Member Award for 1986
Award for Outstanding Service with the Student Chapter, ASCE, 1984, 1985, 2024
1984 NSF Presidential Young Investigator Award
NSERC Postgraduate Scholarship, 1973 and 1975
University of Windsor, Board of Governors Medal in Geological Engineering, 1973

Recent Projects:

FERC - March 2017 – June 2018 – Oroville Dam, CA. Member of a FERC after action review panel to assess factors leading to the failure of the flood control outlet channel and to provide advice on modifications of Part 12 review procedures to improve the robustness of the process.

USBR - Nov. 2019 - Scoggins Dam, OR– CRB Member. Review of seismic redesign of the existing dam, assessment of the expected seismic performance of spillway walls and stability of reservoir slopes.

Santa Clara Water District - May 2020 - present – Pacheco Dam, CA. TRB Member. Review of siting, design, and expected performance of the proposed embankment dam, including foundation conditions, conditions of reservoir slopes, and seismic hazards.

Bay Conservation and Development Commission (BCDC) – Member of the Engineering Criteria Review Board (ECRB) = Providing professional advice on geological, geotechnical, and environmental issues for proposed projects at SF Bay margins within BCDC jurisdiction.

Relevant Publications:

1. Aquado, E., Sitar, N. and Remson, I., "Sensitivity Analysis in Aquifer Studies," Water Resources Research, Vol. 13, No. 4, 1977, pp. 733 737.
2. Oliveira, D.P. and Sitar, N., "Groundwater Contamination from Underground Solvent Storage Tanks, Santa Clara, California," Proceedings of the Fifth National Symposium on Aquifer Restoration and Groundwater Monitoring, Columbus, Ohio, May 1985.
3. Sitar, N., Cawlfield, J.D. and Der Kiureghian, A., "First-Order Reliability Approach to Stochastic Analysis of Groundwater Flow and Solute Transport," Geotechnical Engineering Report No. UCB/GT/85-01, University of California, Berkeley, CA, Sept. 1985, 85 pp.
4. McDowell-Boyer, L.M., Hunt, J.R. and Sitar, N., "Particle Transport Through Porous Media," Sanitary Engineering and Environmental Health Research Laboratory Report No. UCB-SEEHRL 85-12, University of California, Berkeley, CA, Nov. 1985, 71 pp.
5. Sitar, N. and Oliveira, D.P., "Mobility of Organic Solvents in an Aquifer--A Case History and its Implications," Abstract, EOS, Transactions, American Geophysical Union, Vol. 66, No. 46, November 1985, p. 894.
6. Johnson, K.A. and Sitar, N., "A Field Investigation of the Temporal Relationship between Hillslope Hydrologic Response and Individual Rainfall Events," Abstract, EOS, Transactions, American Geophysical Union, Vol. 66, No. 46, November 1985, p. 898.
7. Hunt, J.R., Sitar, N. and Udell, K.S., "Mechanisms Controlling the Movement of Organic Solvents in Aquifers and their Implications for Cleanup," Abstract, EOS, Transactions, American Geophysical Union, Vol. 66, No. 46, November 1985, p. 904.
8. Hunt, J.R., Sitar, N. and Udell, K.S., "Organic Solvents and Petroleum Hydrocarbons in the Subsurface: Transport and Cleanup," Sanitary Engineering and Environmental Health Research Laboratory Report No. UCB-SEEHRL 86-11, August 29, 1986.
9. Geller, J.F., Hunt, J.R., Sitar, N. and Udell, K.S., "Organic Solvents and Petroleum Hydrocarbons in the Subsurface: Transport and Cleanup," Abstract, EOS, Transactions, American Geophysical Union, Vol. 67, No. 44, November 1986, p. 948.
10. McDowell-Boyer, L.M., Hunt, J.R. and Sitar, N., "Particle Transport in Porous Media," Water Resources Research, Vol. 22, No. 13, December 1986, pp. 1901-1921.
11. Hunt, J.R., McDowell-Boyer, L. and Sitar, N., "Colloid Migration in Porous Media," Proceedings International Symposium on Coupled Processes Associated with Nuclear Waste Repositories, Academic Press, Inc., 1987, pp. 453-472.
12. Sitar, N., Cawlfield, J.D. and Der Kiureghian, A., "First-Order Reliability Approach to Stochastic Analysis of Subsurface Flow and Contaminant Transport," AGU, Water Resources Research, Vol. 23, No. 5, May 1987, pp. 794-904.
13. Sitar, N., Hunt, J.R. and Udell, K.S., "Movement of Nonaqueous Liquids in Groundwater," Invited Paper, Geotechnical Practice for Waste Disposal '87, Procs. Spec. Conf. sponsored by the Geotechnical Engineering Division of ASCE, University of Michigan, Ann Arbor, June l5-17, 1987, Geot. Spec. Publ. No. 13, pp. 205-223.
14. Cawlfield, J.D. and Sitar, N., "Application of First-Order Reliability to Stochastic Finite Element Analysis of Groundwater Flow," Geotechnical Engineering Report No. UCB/GT/87-01, University of California, Berkeley, CA, June 1987, 191 pp.
15. Cawlfield, J.D. and Sitar, N., "First-Order Reliability Approach to Stochastic Analysis of Groundwater Flow," Abstract, International Union of Geodesy and Geophysics, XIX General Assembly, August 9-22, 1987, Vancouver, B.C., Canada, Vol. 3, p. 957
16. Cawlfield, J.D. and Sitar, N., "First Order Reliability Analysis of Groundwater Flow," Procs. of the 5th ASCE Specialty Conference on Probabilistic Methods in Civil Engineering, Blacksburg, Virginia, May 25 27, 1988, pp. 144 147.

17. Hunt, J.R., Geller, J.T., Sitar, N. and Udell, K.S., "Subsurface Transport Processes for Gasoline Components," Procs. 1988 CSCE ASCE National Conference, Vancouver, B.C., Canada, July 13, 15, 1988, pp. 536 543.
18. Hunt, J.R., Sitar, N. and Udell, K.S., "Nonaqueous Phase Liquid Transport and Cleanup, 1. Analysis of Mechanisms," AGU, Water Resources Research, Vol. 24, No. 8, August 1988, pp. 1247 1258.
19. Hunt, J.R., Sitar, N. and Udell, K. S., "Nonaqueous Phase Liquid Transport and Cleanup, 2. Experimental Studies," AGU, Water Resources Research, Vol. 24, No. 8, August 1988, pp. 1259 1269.
20. Cawlfield, J.D. and Sitar, N., "Stochastic Finite Element Analysis of Groundwater Flow Using the First Order Reliability Method," Invited Paper in Consequences of Spatial Variability in Aquifer Properties and Data Limitations for Groundwater Modelling Practice, IAHS Publication No. 175, 1988, pp. 191 216.
21. Mitchell, J.K., Sitar, N. and Seed, R.B., "Waste Geotechnics at the University of California, Berkeley," Geotechnical News, Vol. 7, No. 4, Dec. 1989, pp. 28 30.
22. Sitar, N., Jang, Y.S. and Der Kiureghian, A., "Reliability Approach to Probabilistic Modelling of Contaminant Transport in Groundwater," Abstract, EOS, Transactions, American Geophysical Union, Vol. 71, No. 17, April 24, 1990, pp. 518.
23. Jang, Y.S. and Sitar, N., "Reliability Analysis of Contaminant Transport Through Clay Liners," Geotechnical Engineering Report No. UCB/GT 90 4, Department of Civil Engineering, University of California, Berkeley, CA, December 1990, 31 pp.
24. Shamsai, A. and Sitar, N., "A Method for Determination of Hydraulic Conductivity in Unsaturated Porous Media," J. of the Irrigation and Drainage Engineering, ASCE, 117(1): January/February 1991, pp. 64-78.
25. Pantazidou, M. and Sitar, N., "Migration of Nonaqueous Liquids in the Vadose Zone," Geotechnical Engineering Report No. UCB/GT/91 03, Department of Civil Engineering, University of California, Berkeley, CA, May 1991, 264 pp.
26. Jang, Y.S. and Sitar, N., "CALREL TRANS User's Manual," Geotechnical Engineering Report No. UCB/GT/91 04, Department of Civil Engineering, University of California, Berkeley, CA, June 1991, 27 pp.
27. Pantazidou, M. and Sitar, N., "An Experimental Study of the Movement of Nonaqueous Liquids in Partly Saturated Porous Media," Abstract, EOS, Transactions, American Geophysical Union, Vol. 72, No. 17, April 1991, p. 127.
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29. Sitar, N., Hunt, J.R. and Geller, J.T., "Practical Aspects of Multiphase Equilibria in Evaluating the Degree of Contamination", Proceedings of the Conference on Subsurface Contamination by Immiscible Fluids, K.U. Weyer ed., Balkema, Rotterdam, 1992, pp. 265-270.
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39. Grubb, D.G. and Sitar, N., "Experimental Evaluation of in-situ displacement of Trichloroethene (TCE) from aquifer media using ethanol." Proceedings, Second International Congress on Environmental Geotechnics, Osaka, November 1996, M. Kamon, editor, A.A. Balkema, Rotterdam, Vol. 2, pp. 1005-1009.
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2. George, M.F. and Sitar, N. "3D Block Erodibility: Dynamics of Rock-Water Interaction in Rock Scour." UC Berkeley, Geotechnical Engineering, Report No. UCB GT 16-01, January 2016. doi:10.21418/G8RP47
3. Wagner, N. and Sitar, N. "Seismic Earth Pressures on Deep Stiff Walls." Proceedings of the 2016 Geotechnical and Structural Engineering Congress, ASCE, C.Y. Chandran and M.I. Hoit, editors, Phoenix, AZ, February 14-17, 2016. doi: 10.1061/9780784479742.041
4. George, M.F. and Sitar, N. "System reliability approach for rock scour." *International Journal of Rock Mechanics and Mining Sciences* (2016), pp. 102-111, DOI: 10.1016/j.ijrmms.2016.03.012
5. Wagner, N.B. and Sitar, N. "Seismic Earth Pressure on Basement Walls with Cohesionless Backfill", UC Berkeley, Geotechnical Engineering Report No. UCB GT 16-02, June 2016, doi:10.21418/G8WC7H
6. Geraili Mikola, R., Candia, G., and Sitar, N. (2016). "Seismic Earth Pressures on Retaining Structures and Basement Walls in Cohesionless Soils." *J. Geotech. Geoenviron. Eng.*, doi: 10.1061/(ASCE)GT.1943-5606.0001507
7. Candia G., Mikola R.G. and Sitar, N. (2016) "Seismic response of retaining walls with cohesive backfill: Centrifuge model studies" *Soil Dynamics and Earthquake Engineering*, 90 (2016) 411–419, doi: 10.1016/j.soildyn.2016.09.013
8. Wagner, N.B. and Sitar, N., "On seismic response of stiff and flexible retaining structures." *Soil Dynamics and Earthquake Engineering* 90 (2016),doi: 10.1016/j.soildyn.2016.09.025
9. Wagner, N. and Sitar, N., "Influence of the depth of embedment on seismic earth pressures on basement walls." Proceedings, 16th World Conference on Earthquake, 16WCEE 2017, Santiago Chile, Paper N° 1023.
10. Zheng, F., Jiao, Y.Y., Gardner, M. and Sitar, N. "A fast direct search algorithm for contact detection of convex polygonal or polyhedral particles" *Computers and Geotechnics* 87:76-85, February 2017, DOI: 10.1016/j.compgeo.2017.02.001
11. Chen, T., Deng, J., Sitar, N, Zheng, J., Liu, T., Liu, A. and Zheng, L. "Stability investigation and stabilization of a heavily fractured and loosened rock slope during construction of a strategic hydropower station in China" *Engineering Geology*, Vol. 221, April 2017, Pages 70–81, DOI: 10.1016/j.enggeo.2017.02.031
12. Lanzafame, R., Teng, H. and Sitar, N. "Stochastic Analysis of Levee Stability Subject to Variable Seepage Conditions" Proceedings GeoRisk 2017, Denver, Colorado, June 4–7, 2017, ASCE Geotechnical Special Publication 283, Pages 554-563
13. Gardner, M., Kolb, J. and Sitar, N. "Parallel and scalable block system generation" *Computers and Geotechnics*, Vol. 89, Sept 2017, Pages 168–178m, DOI: 10.1016/j.compgeo.2017.05.001
14. Lanzafame, R.C. and Sitar, N. "Reliability Analysis of the Influence of Woody Vegetation on Levee Performance" Dept. of Civil and Environmental Engineering, UC Berkeley, Report No. UCB-GT/18/01, March 2018, 160 p., DOI: 10.13140/RG.2.2.34674.20163
15. Wagner, N. and Sitar, N. "Comparison of Pseudo-Static Limit Equilibrium and Elastic Wave Equation Analyses of Dynamic Earth Pressures on Retaining Structures" Proceedings, Geotechnical Earthquake Engineering and Soil Dynamics V: Numerical Modeling and Soil Structure Interaction, GeoInstitute, ASCE, Austin, TX, June 10-13, 2018, pp. 340-350, DOI: 10.1061/9780784481479.035
16. Gardner, M. and Sitar, N. "Modeling of Rock Scour using Coupled 3-D Discrete Element and Lattice Boltzmann Methods" Proceedings, 52nd US Rock Mechanics/Geomechanics Symposium, Seattle, WA, June

17-20, 2018.
17. Zheng, F., Jiao, Y-Y. and Sitar, N. "Generalized Contact Model for Polyhedra in Three-Dimensional Discontinuous Deformation Analysis" Int J Numer Anal Methods Geomech. 2018;1–22, DOI: 10.1002/nag.2798
18. Gardner, M. and Sitar, N. "Coupled 3-D DEM-LBM Model for Simulation of Dynamic Rock-Fluid Interaction" Dept. of Civil and Environmental Engineering, UC Berkeley, Report No. UCB-GT/18/02, July 2018, 160 p. DOI: 10.13140/RG.2.2.21301.73441
19. Lanzafame, R. and N. Sitar, "Reliability analysis of the influence of seepage on levee stability," Environmental Geotechnics, October 2018. https://doi.org/10.1680/jenge.18.00060
20. Gardner, M. and Sitar, N. "Modeling of Dynamic Rock–Fluid Interaction Using Coupled 3-D Discrete Element and Lattice Boltzmann Methods" Rock Mech Rock Eng (2019). https://doi.org/10.1007/s00603-019-01857-x
21. Gardner, M. and Sitar, N. "Coupled Three-Dimensional Discrete Element-Lattice Boltzmann Methods for Fluid-Solid Interaction with Polyhedral Particles" Int J Numer Anal Methods Geomech. Volume 43 (14), October 2019, 2270-2287. DOI: 10.1002/nag.2972
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27. Wagner, N., and Sitar, N. Seismic Earth Pressure: Pitfalls and Recommendations. Proceedings, Geo-Congress 2022, March 2022, https://doi.org/ 10.1061/9780784484029.045
28. Garcia, F.E., Andó, E., Viggiani, G., and Sitar, N. Influence of depositional fabric on mechanical properties of naturally deposited sands, Géotechnique, 2022, https://doi.org/10.1680/jgeot.21.00230
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Chin Man W. Mok, PHD, PE, PG, GE, BC.WRE, BC.GE, F.ASCE, F.EWRI

Vice President, Principal Engineer and Geologist

Education

Ph.D., Civil and Environmental Engineering, University of California, 1999.
M.S., Civil and Environmental Engineering, University of California, 1987
B.Sc.(Eng.), Civil and Structural Engineering, University of Hong Kong, 1985
B.Sc.(Eng.) Part I, Mechanical Engineering, University of Hong Kong, 1982

Licenses/Certifications

Professional Civil Engineer, California, #46755
Arizona, #39042
Florida, #75351
Texas, #119446
Professional Geologist, Arizona # 40746
Florida #3051
Texas #15476
Registered Geotechnical Engineer, California #2365
Board Certified Water Resources Engineer
Board Cerfified Geotechnical Engineer

Affiliations

Fellow, American Society of Civil Engineers
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Dr. Mok is a Professional Engineer and Professional Geologist with 39 years of experience in hydrological, hydraulic, environmental, geotechnical, geological, structural, and earthquake engineering. He has directed and managed numerous projects supporting the design and evaluation of water, energy, and transportation infrastructure. His expertise includes high resolution site characterization, integrated water resources management, land subsidence, erosion and sedimentation, and climate impact evaluation. He has been appointed as subject matter experts on review panels for several high-profile projects. In addition, he has provided technical support for litigation and cost-allocation.

Dr. Mok is knowledgeable of California land subsidence issues. He has conducted subsidence evaluation for the California High-Speed Rail through the El Nido, Corcoran, and Antelope Valley subsidence bowls. He is Friant Water Authority's land subsidence consultant on issues along the Friant-Kern Canal. He has been retained to develop conceptual land subsidence management plan for the Delta-Mendota Canal. He has performed independent review of Groundwater Sustainability Plans for several water districts in the San Joaquin Valley. He has performed hydrologic and geomechanical modeling to estimate local and regional subsidence and has used data science techniques to deveop data-driven models using subsidence data. In addition, he has performed flood modeling to evaluate the impacts of land subsidence on flood plain and flood depth.

Dr. Mok has been holding adjunct faculty positions in academia. He has taught courses on groundwater, engineering risk, ground improvement and data sciences at several universities. Furthermore, he has taught professional short courses internationally on geotechnical engineering, hydrogeology, contamination control and remediation, and environmental statistics. He has been a principal investigator of many research projects funded by federal agencies. He has been an invited speaker and keynote lecturer at conferences, workshops, and seminars, and has co-chaired a groundwater optimization symposium. He serves on several American Society of Civil Engineers (ASCE) technical committees, including the KSTAT standard committee, developing guidance documents. He has chaired a groundwater management committee.

RELEVANT PROJECTS

Consulting Projects

Evaluation of Ground Subsidence and Potential Impacts, California High-Speed Rail Authority. Modeling and Engineering Risk Analysis Leader. Directed an assessment of the potential subsidence impacts on High-Speed Rail from Northern California to Southern California through the

El Nido, Corcoran, and Antelope Valley subsidence bowls. Work performed for the evaluation included groundwater modeling, HEC-RAS and FLO-2D flood hydraulic modeling, and development of data-driven regional prediction model using LiDAR and InSAR data. Geomechanical modeling was performed to estimate local subsidence and horizontal ground movement due to a pumping well. The results were used to estimate future ground deformations and the resulting impacts on high-speed rail infrastructure and railroad, future flood zones and flood depths.

Land Subsidence Characterization and Project Feasibility Determination for the Delta-Mendota Subbasin, San Luis and Delta-Mendota Water Authority, California, Principal-in-charge. Directed an assessment of historical and future subsidence impacts on Delta-Mendota canal and critical infrastructures due to groundwater level change resulting from groundwater extraction. The evaluation was based on pumping, InSAR, extensometer, and GPS data. Developed a conceptual subsidence management and monitoring plan which has been used as a roadmap for future implementation.

Land Subsidence Impacts on Friant-Kern Canal, Friant Water Authority, California. Principal-in-charge. Reviewed Eastern Tule Subbasin Groundwater Sustainability Agency's groundwater and subsidence model. Analyzed InSAR, extensometer, and GPS data quarterly. Performed modeling of historical and future subsidence along Friant-Kern canal to support the canal replacement project. Evaluated the criteria imposed by the U.S. Bureau of Reclamation to control pumping of groundwater into the Delta-Mendota Canal and Friant-Kern Canal. Representing Friant Water Authority in various meetings. Providing support to Friant Water Authority on issues related to Delta-Mendota Canal which is upstream of the Friant-Kern Canal.

Evaluation of Impacts of Oil and Gas Operations on Land Subsidence, California, Confidential Client. Retained by attorneys on behalf of client to evaluate the impacts of operations at an oil field on land subsidence along an aqueduct. Reviewed relevant reports, multiple sets of InSAR subsidence data, extraction and produced water injection operations data, and reservoir characterization information to develop opinions on the level of impacts. Operation details were analyzed to estimate the net fluid extraction signature for assessing the spatial and temporal distribution of the land subsidence impacts. OpenET was used to compute crop demands for estimating agricultural water use and the resulting land subsidence signatures.

Review of Six Groundwater Sustainability Plans by Groundwater Sustainability Agencies in Tule Subbasin, California. Arvin-Edison Water Storage District. Dr. Mok has been retained as a subconsultant to EKI Environmental and Water, Inc. to (1) review six Sustainability Plans released individually by the Alpaugh, Delano-Earlimart Irrigation District, Eastern Tule, Lower Tule Irrigation District, Pixley Irrigation District District, and Tri-County Water Authority Groundwater Sustainability Agencies and (2) prepare a specialist report to provide comments on behalf of the Arvin-Edison Water Storage District.

Review of Several Water Banking Projects in East Tule Subbasin, California. Arvin-Edison Water Storage District. Principal-in-charge. Prepare specialist report on subsidence concerns due to recovery phase of the water banking projects.

Tai Hang Road Land Subsidence Investigation, Geotechnical Engineering Office, Hong Kong. Tasked by the Hong Kong Government Geotechnical Engineering Office, Dr. Mok was engaged by Fugro (Hong Kong) in a detailed study of the geotechnical and groundwater conditions below Tai Hang Road following the ground collapse incidences in 2009. Notable signs of ground deformations were observed. He conducted groundwater investigation in the failure locations to evaluate the possibility that groundwater level rising to ground surface was the cause of the failure.

Applied Research and Development Projects

Development of HydroImage—A User-Friendly Hydrogeophysical Characterization Software Package, U.S. Department of Energy Small Business Technology Transfer. Principal Investigator. Developed a software tool that uses Bayesian statistical techniques to integrate spatially extensive geophysical data with direct (geological, hydrological, biogeochemical, and geophysical) borehole measurements to improve characterization and monitoring of the subsurface over a variety of resolutions and spatial scales. The current Phase II work focuses on refining, augmenting, and testing the basic HydroImage package using real data sets from existing and new contaminated sites.

Cost-effective and High-resolution Subsurface Characterization Using Hydraulic Tomography, Environmental Security Technology Certification Program of U.S. Department of Defense. Principal Investigator. Directed a 5-year program to demonstrate the application of hydraulic tomography (HT) techniques to cost-effectively estimate the spatial distribution of hydrogeologic parameters in high-resolution at Air Force Plant 44 and the North Campus Research Site at the University of Waterloo. Hydraulic tomography involves (1) conducting sequential aquifer hydraulic test over a well network and (2) analyzing the complete data set to obtain a consistent interpretation of the hydrogeologic property distribution and systematically reduce the associated uncertainties. The objectives of the project were to (1) demonstrate that HT is superior to conventional methods, (2) illustrate that a HT survey can be readily conducted at DoD sites using existing well network, and (3) develop guidance for HT field instrumentation and compare costs of HT and conventional methods. (https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Persistent-Contamination/ER-201212)

Teaching

University Courses:

ESCI 530 Data Science for Environmental, Hydrological, And Geosciences Applications, Fall 2018 and Spring 2020

CE 173 Groundwater and Seepage, University of California at Berkeley, Fall 2016, 2020, 2021

CE 193 Engineering Risk Analysis, University of California at Berkeley, Fall 2014

CIVL 3033 Ground Improvement, University of Hong Kong, Fall 2010

CIVL 6043 Groundwater, University of Hong Kong, Fall 2010

Professional Short Courses and Workshops:

5-day Training Workshop on Groundwater Modeling – Part 3: Development, Calibration, and Applications, Thailand Department of Groundwater Resources, 2017.

5-day Training Workshop on Groundwater Modeling – Part 2: Applications of Flow and Subsidence Simulations, Thailand Department of Groundwater Resources, 2017.

5-day Training Workshop on Groundwater Modeling – Part 1: Flow Simulations, Thailand Department of Groundwater Resources, 2016.

7-day Fulbright and United States-India Educational Foundation Short Course on Risk-Based Subsurface Environmental Management and Sustainable Remediation, India, 2012.

5-day Fulbright Short Course on “Remediation of Contaminated Soils and Groundwater, The California Experience”, Tel Aviv, Israel, 2008.

2-day Professional Courses on “Applications of Risk Assessment for Environmental Decision Making”, California State Water Resources Control Board, three classes per year throughout California, 2005-2008.

PUBLICATIONS AND PRESENTATIONS

Mok, C.M. and B.A. Carrera, 2024, Using Crosshole and Hole-to-Surface Electrical Resistivity Tomography to Detect Chemical Arrival, GeoEnviroMeet, 2024.

Mok, C.M., P.-C. Li, B.A. Carrera, H.M. Hort, and M.-C. Li, 2024, Land Subsidence – A Geo-Hydro-Enviro-Problem, GeoEnviroMeet, 2024.

Mok, C.M., B.A. Carrera, H.M, Hort, L.A., Santi, A.D., Daus, S. Panday, D. Jones, R. Partington, E. Ferguson, 2023, Simulation-Optimization Approach for Siting Injection Wells in Urban Area with Complex Hydrogeology, Groundwater, National Ground Water Association, April 2023

Luo, N., Z. Zhao, W.A. Illman, Y. Zha, **C.M.W. Mok**, and T.C.J. Yeh, 2023, Three-Dimensional Steady-State Hydraulic Tomography Analysis With Integration of Cross-Hole Flowmeter Data at a Highly Heterogeneous Site. Water Resources Research, Volume 59, Issue 6.

Mok, C.M., T.C.J. Yeh, and W.A. Illman, 2022, High-Resolution Delineation of Facility-Scale Subsurface Heterogeneity by Hydraulic and Geophysical Tomography, Battelle Twelfth International Conference on Remediation of Chlorinated and Recalcitrant Compounds.

Heyer, B., T.C. Osorno, B.A. Carrera, **CM.W. Mok**, and J.F. Devlin. 2022. Water Flux Depth Profiling in Fractured Rock with an In-Well Point Velocity Probe, Journal of Hydrology.

Mok, C.M. and B.A. Carrera, 2021. Subsidence and Groundwater Sustainability, Groundwater Resources Association of California Western Congress.

Carrera, B.A., **C.M.W. Mok,** and I. Papaioannou, 2020. Efficient estimation of hydraulic conductivity heterogeneity with non-redundant measurement information. International Journal on Geomathematics. DOI:10.1007/s13137-020-00151-1.

Zha, Y., Yeh, T. C. J., Illman, W. A., **C.M.W. Mok,** Tso, C. H. M., Carrera, B. A., and Wang, Y. L., 2019. Exploitation of pump-and-treat remediation systems for characterization of hydraulic heterogeneity. Journal of Hydrology, 573, 324-340. https://doi.org/10.1016/j.jhydrol.2019.03.089

Zhao, Z., W.A. Illman, Y. Zha, T.-C.J. Yeh, **C.M.W. Mok,** S.J. Berg, and D. Han, 2019. Transient Hydraulic Tomography Analysis of Fourteen Pumping Tests at a Highly Heterogeneous Multiple Aquifer–Aquitard System. Water, 11, 1864.

French, J., **C.M. Mok**, and B.A. Carrera, 2018. California High Speed Rail Ground Subsidence Study, Geo-Institute, San Francisco Chapter, invited presentation.

Mok, C.M., B.A. Carrera, J. French, and M. Rucker, 2018. Subsidence-Induced Changes to Floodplain and drainage Patterns, International Association for Engineering Geology and the Environment Annual Conference.

Zha, Y., T.-C. J. Yeh, W. A. Illman, H. Onoe, **C. M. W. Mok,** J.-C. Wen, S.-Y. Huang, and W. Wang, 2017. Incorporating geologic information into hydraulic tomography: A general framework based on geostatistical approach, Water Resources Research, 53, 2850–2876, doi:10.1002/2016WR019185.

Berg, S.J., W.A. Illman, and **C.M.W.Mok**, 2014. Joint Estimation of Hydraulic and Poroelastic Parameters from a Pumping Test, Groundwater.

PROFESSIONAL BACKGROUND

Vice President, Principal Engineer and Geologist, GSI Environmental Inc., California. 2013 to present

Adjunct Professor, Earth, Environmental and Planetary Sciences, Rice University. 2017 to present

Lecturer, Civil and Environmental Engineering, University of California at Berkeley. 2014 to 2022

Principal Engineer and Hydrogeologist, Geomatrix/AMEC, Oakland, California. 1987 - 2013

Rudolf Diesel Fellow and Affiliated Professor, Engineering Risk Analysis, Technical University of Munich, Germany. 2012 to 2015

Adjunct Professor, Earth and Environmental Sciences, University of Waterloo, Canada. 2008 to 2021

Visiting Associate Professor, Civil and Environmental Engineering, University of Hong Kong. 2010

Geotechnical and Structural Engineer, Maunsell Consultants Asia, Ltd., Hong Kong. 1985 - 1986

AGENDA ITEM SUBMITTAL

Meeting Date: March 12, 2025

To: Water Issues Committee
Board of Directors

From: John Kennedy

Staff Contact: C. Olsen/R. Fick

Budgeted: N/A
Budget Amount: $11.1 Million
Cost Estimate: $11.1 Million
Funding Source: Water Budget
Program/Line Item No: N/A
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: PROPOSED FISCAL YEAR 2025-26 WATER PURCHASE BUDGET

SUMMARY

The proposed fiscal year (FY) 2025-26 water budget totals $11.1 million. Information from the draft FY 2025-26 budget document provided to the Board on March 5, 2025, is attached and provides the water budget details. The budget is based upon the 2025 and estimated 2026 Metropolitan Water District (MWD) water rates. Staff will review the budget with the Committee.

Attachments:
- Water Budget Spreadsheet
- Water Budget Description
- Presentation

RECOMMENDATION

Informational

DISCUSSION/ANALYSIS

The water budget expense items are listed below:

- Municipal Water District of Orange County (MWDOC) Groundwater charge - $400,000
- MWD Capacity Charge which is passed through by MWDOC - $10,000
- MWD Readiness-to-serve charge which is passed through by MWDOC - $1.1 million
- Purchase of non-interruptible untreated MWD water - $4.74 million
- Purchase of injection water for the Alamitos Seawater Barrier - $4.85 million

The budget includes the purchase of MWD untreated full service water in which the average of 2025 and 2026 rates will be $948/acre-foot, to recharge the groundwater basin to support higher levels of groundwater pumping. In general, it is a good basin management strategy to budget money for MWD untreated water purchases. In the likely event no water is purchased for FY 2025-26, this money stays in the water fund for future purchases as reflected in the table below. The two primary benefits of this strategy include:

- This program allows the District to conjunctively operate with the MWD imported water system. During drought years and reductions to imported water supplies, OCWD can

overdraft the groundwater basin if necessary, knowing that at least partial funding is available to refill the basin when wet periods occur.

- Eventually the water is pumped out of the groundwater basin by the Groundwater Producers, disinfected and served to their customers. This operation reduces the amount of treated imported water that is purchased by the Groundwater Producers, which currently costs $1,395/acre-foot, resulting in a net water supply savings to the region.

Although staff is recommending to budget for non-interruptible untreated MWD water, it is likely the money will stay in the water fund for the following reasons:

- The recent expansion of the GWRS is providing the District with additional recharge water; and
- The groundwater basin is in very good condition.

Staff also anticipates recommending the continued inclusion of funding to purchase MWD untreated water in future budget years as included in the five year forecast presented at the March 5, 2025 Board Meeting.

Staff is estimating the accumulated overdraft will be approximately 113,000 acre-feet as of June 30, 2025. If the current year continues to be dry the accumulated overdraft could increase to somewhere in the area of 160,000 acre-feet. The proposed FY 2025-26 budget would reduce the accumulated overdraft by approximately 20,000 acre-feet assuming average hydrology as shown below. Thus, the accumulated overdraft would decrease to 93,000 acre-feet as of June 30, 2026.

Expected FY25-26 Groundwater Basin Water Balance

Sources	Amount (af)
Captured Santa Ana River Baseflows	74,000
Captured Santa Ana River Stormflows	72,000
Natural Incidental Recharge	40,000
MWD Untreated Full Service Water	0
GWR System	128,000
Alamitos Seawater Barrier	3,000
Total water recharged	**317,000**
Expected Basin Pumping at 85% BPP	(297,000)
Increase in water storage supplies or reduction to accumulated overdraft	20,000

PRIOR RELEVANT BOARD ACTIONS

3/5/25 – Provided draft FY 2025-26 budget and Replenishment Assessment and Basin Production Percentage.
1/15/25 - Provided initial FY 2025-26 Replenishment Assessment and Basin Production Percentage estimates.
12/28 - Informational Item Administrative Finance Committee – initiated budget process

Review of FY25-26 Proposed Water Purchase Budget

Water Issues Committee

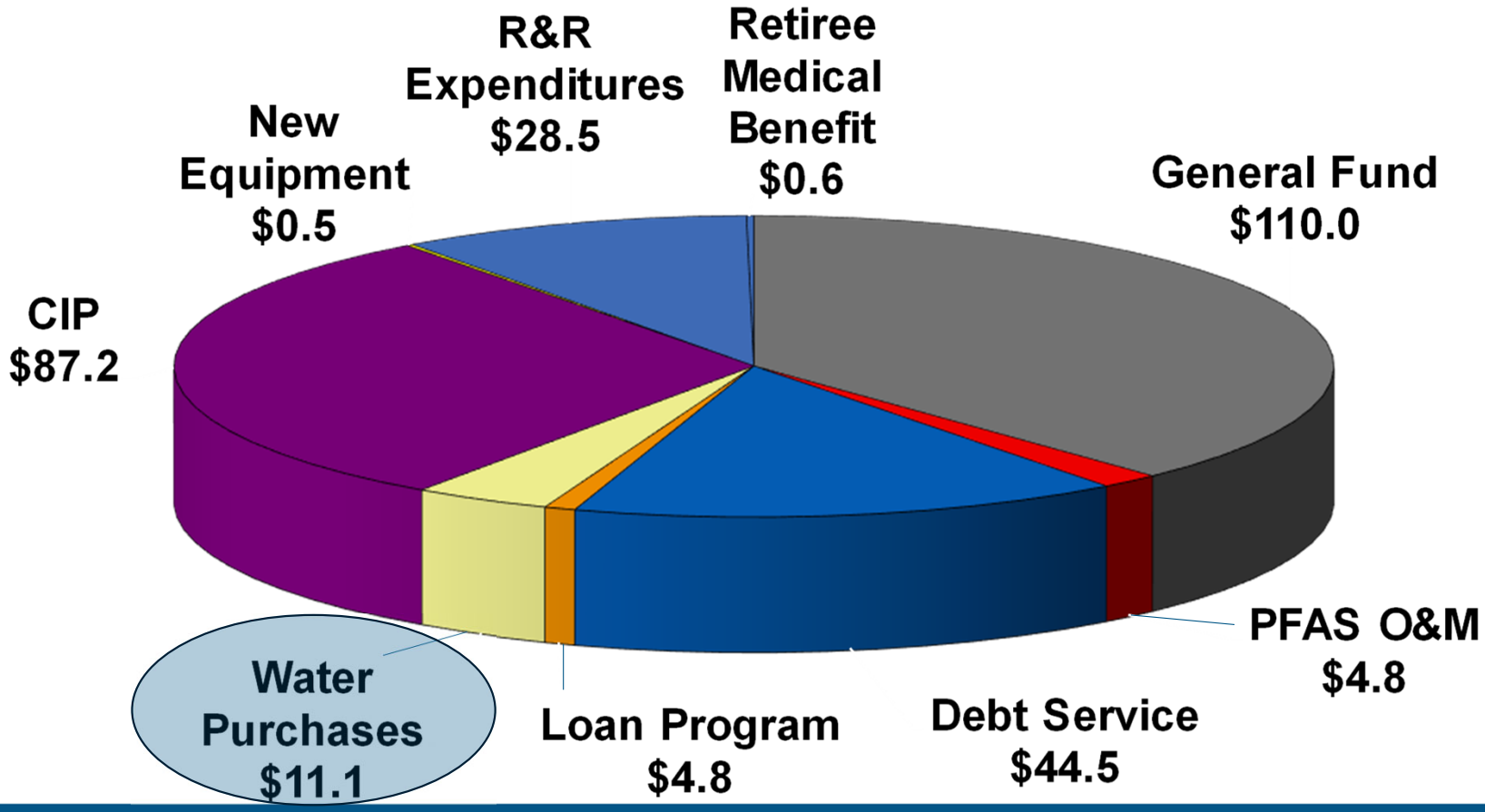
March 12, 2025

FY 2025-26 Budget Schedule

Date	Meeting	Topic
December 12, 2024	Admin/Finance Cte	Budget preparation overview and kick-off
January 9, 2025	Admin/Finance Cte	Provide preliminary BPP and RA estimates
March 5, 2025	Board	Present Draft Budget
March 12, 2025	Producers	Present Draft Budget
March 12, 2025	Water Issues Cte	Review Water Budget
March 13, 2025	Admin/Finance Cte	Review R&R Budget
April 9, 2025	Producers	Discuss Draft Budget
April 9, 2025	Water Issues Cte	Review CIP Budget
April 10, 2025	Admin/Finance Cte	Review General Fund Budget
April 16, 2025	Board	Public Hearing to set RA & BPP Consideration to approve budget

FY 25-26 Budget Components

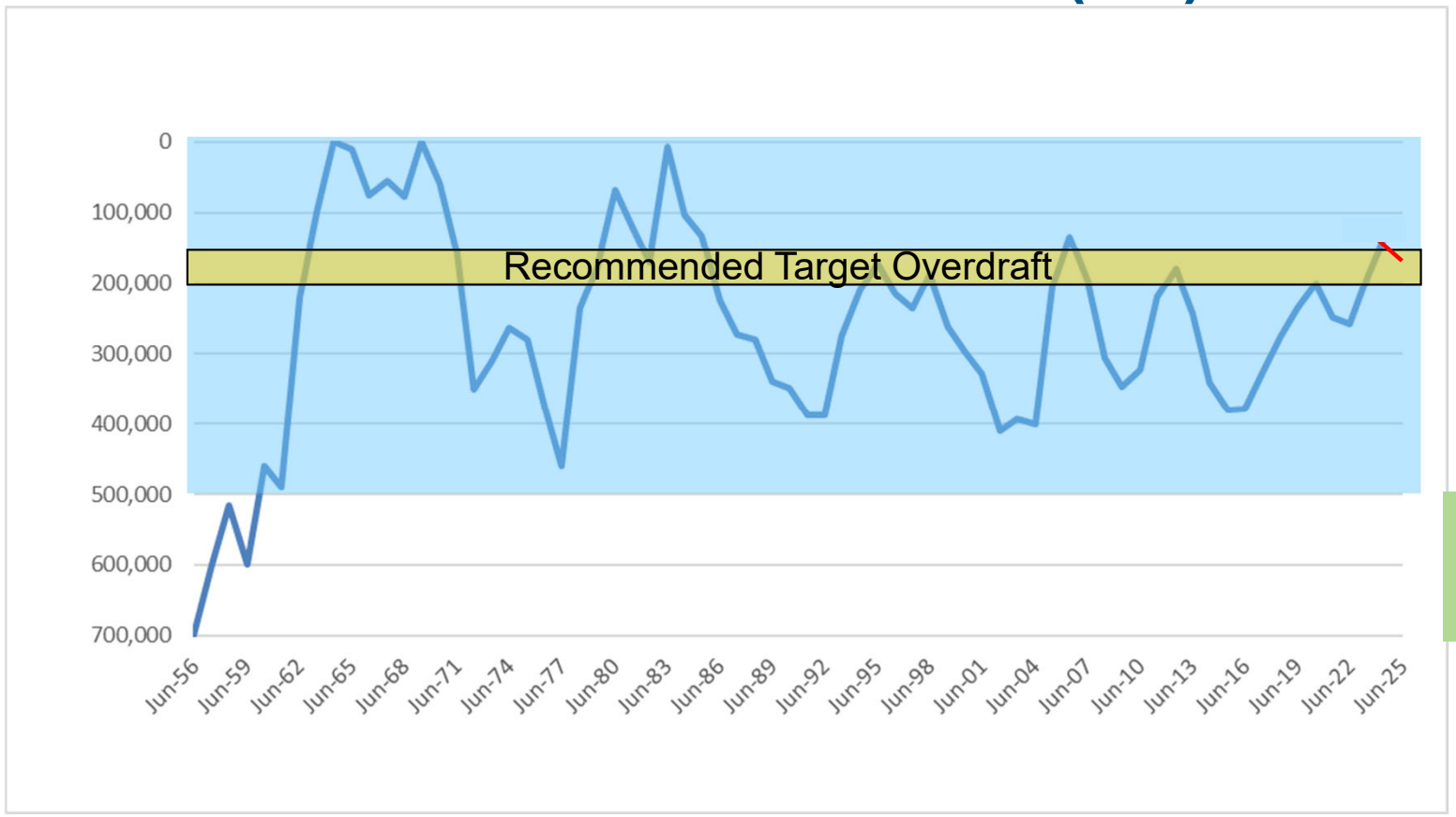
Expenditures - $292.0 million



Proposed FY 2025-26 Water Budget Expenses

Water Source	Amount (af)	Unit Cost	Amount
Alamitos Barrier	3,000	$1,615.00/af	$4,845,000
MWD untreated full service	5,000	$948.00/af	$4,740,000
Subtotal	8,000		$9,585,000
MWD readiness to serve charge			$1,100,000
MWDOC Groundwater Charge			$400,000
MWD Capacity Charge			$10,000
Total Expenses			$11,095,000

OCWD Groundwater Basin Accumulated Overdraft (AF)



113,000 af projected 6/30/25

~160,000 af if a dry year

133,000 af as of 6/30/24

FY 2025-26 Groundwater Basin Water Balance

Water Source	Amount (afy)
SAR Baseflow	74,000
SAR Stormflows	72,000
Incidental Recharge	40,000
GWR System	128,000
MWD untreated supplies	0
Other	3,000
Total Water Into Basin	317,000
Expected Pumping @ 85% BPP	297,000
Subtotal Basin Gain/(Loss)	20,000

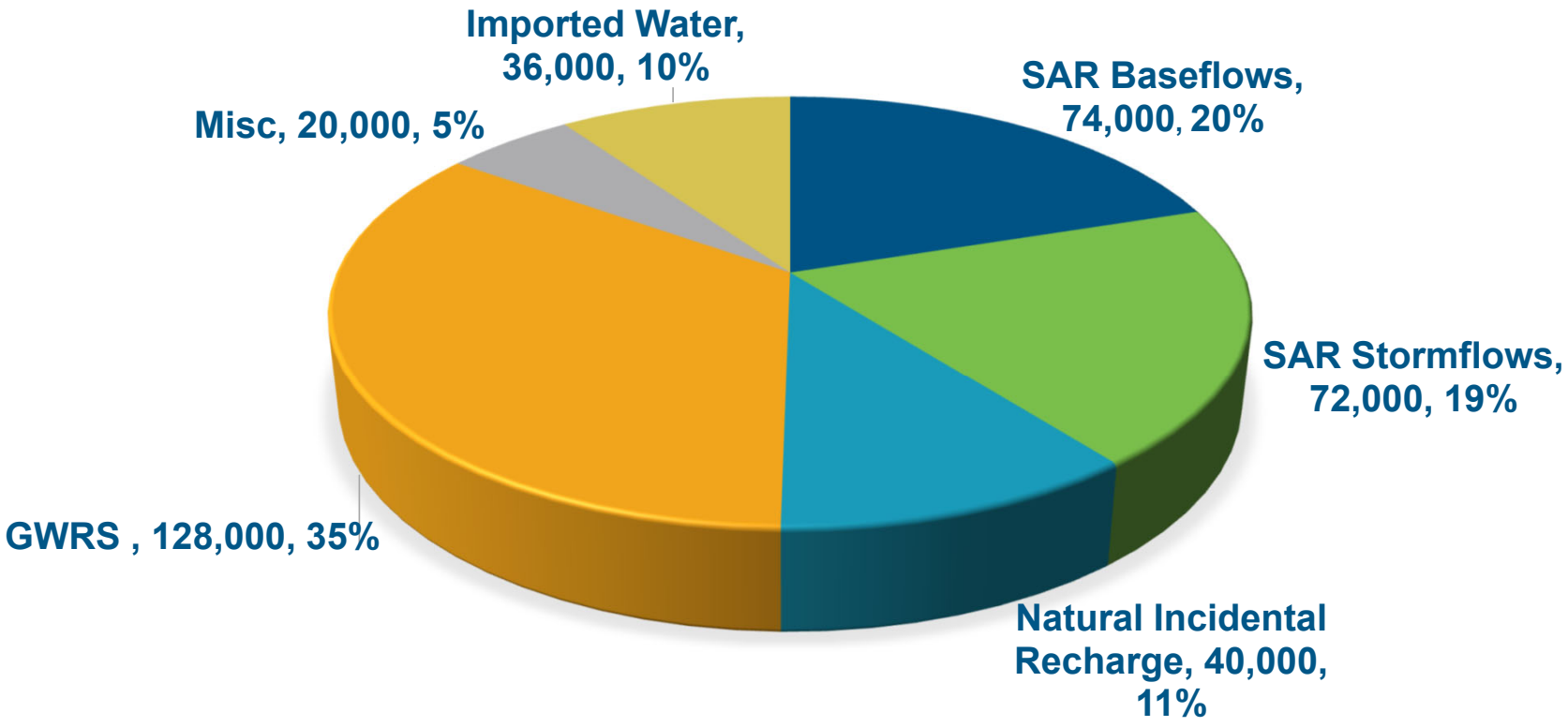
FY25-26 Accumulated Overdraft Projection

July 1, 2025 → **June 30, 2026**

~160,000 af likely —Avg. Year→ 140,000 af

Current OCWD Service Territory Water Supply Sources

Total Water Demands = ~370,000 afy



Recommendations

- Informational
- Received Committee comments
- Discuss with Groundwater Producers