AGENDA
REGULAR MEETING BOARD OF DIRECTORS
ORANGE COUNTY WATER DISTRICT
18700 Ward Street, Fountain Valley, CA (714) 378-3200
Wednesday, July 3, 2024 – 5:30 p.m. - Boardroom

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: Please click the link below to join the Zoom webinar:
https://ocwd.zoom.us/j/81643856309

Telephone Audio: (213) 338 8477

Meeting ID: 816 4385 6309

Teleconference Sites:
10382 Bonnie Drive, Garden Grove
1454 Madison Street, Tustin
6148 E Baja Drive, Anaheim
1037 Sherwood Lane, Santa Ana
2672 N. Vista Crest Road, Orange
* 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- 4)

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. APPROVAL OF CASH DISBURSEMENTS

RECOMMENDATION: Ratify/authorize payment of bills

2. CHILDREN'S WATER EDUCATION FESTIVAL PAYMENT OF EVENT CONTRACT WITH UNIVERSITY OF CALIFORNIA, IRVINE

RECOMMENDATION: Approve an additional expenditure of up to $5,000, for an amended total of $92,500, to the University of California, Irvine for hosting the 2024 Children's Water Education Festival

3. FINAL PHASE: IMPLEMENTING FORECAST INFORMED RESERVOIR OPERATIONS (FIRO) AT PRADO DAM

RECOMMENDATION: 1) Authorize entering into an agreement with UC San Diego/Scripps Institute of Oceanography for Implementation of Forecast Informed Reservoir Operations at Prado Dam: Implementation Support and approve the 3-year budget not to exceed $1,398,000; and,

2) Authorize entering into a sole source agreement with Apex Environmental & Water Resources for Integrated Environmental Modeling for Increased Water Conservation for an amount not to exceed $100,000

4. COALITION FOR ENVIRONMENTAL PROTECTION, RESTORATION AND DEVELOPMENT (CEPRD) REGIONAL RELIABILITY & SUSTAINABILITY PROJECT

RECOMMENDATION: Authorize the General Manager to support the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000

MATTER FOR CONSIDERATION

5. OCWD SEDIMENT STRATEGIC PLANNING AND OBLIGATIONS

RECOMMENDATION: Authorize agreement with Scheevel Engineering to assist in the Sediment Management Plan development and long-term planning needs for sediment removal within the Prado Basin for a total amount not to exceed $170,000

INFORMATIONAL ITEMS

6. SAWPA UPDATE

7. COMMITTEE/CONFERENCE/MEETING REPORTS

- ► Reports on Committees/Conferences/Meetings Attended at District Expense (at which a quorum of the Board was present)

8. VERBAL REPORTS

- PRESIDENT'S REPORT
- GENERAL MANAGER'S REPORT
- DIRECTORS' REPORTS
- GENERAL COUNSEL REPORT

ADJOURNMENT

Agenda Posting: In accordance with the requirements of California Government Code Section 54954.2, this agenda has been posted in the main lobby of the Orange County Water District, 18700 Ward Street, Fountain Valley, CA and on the OCWD website: www.ocwd.com 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 Assistant 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.

Accommodations to the Disabled: 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 or by email at cfuller@ocwd.com. Notification 24 hours prior to the meeting will enable District staff to make reasonable arrangements to assure accessibility to the meeting.

Availability of Agenda Material: As a general rule, agenda reports or other written documentation that has been prepared or organized with respect to each item of business listed on the agenda 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 a.m. to 5:00 p.m., 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.

AGENDA ITEM SUBMITTAL

Meeting Date: July 03, 2024

To: Board of Directors

From: John Kennedy

Staff Contact: M. Ochoa

Budgeted: N/A
Budgeted Amount:
Cost Estimate $9,102,997.61
Funding Source: N/A
Program/Line Item No. N/A
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: APPROVAL OF CASH DISBURSEMENTS

SUMMARY

For the period of June 13, 2024 through June 26, 2024, including manual checks and wire transfers, staff is presenting cash disbursements totaling $9,102,997.61 disbursed for each period as follows:

Accounts Payable:		
06/13/2024 - 06/19/2024	$	2,172,392.70
06/20/2024 - 06/26/2024	$	5,642,428.82
Payroll	$	1,288,176.09
Total Disbursements	**$**	**9,102,997.61**

RECOMMENDATION

Ratify/Authorize payment of bills

PRIOR RELEVANT BOARD ACTION(S)

Semi-monthly

Orange County Water District

Check Register

Begin Date: 2024-06-13 **End Date:** 2024-06-19

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
803915	2024-06-19	SIGMA-ALDRICH, INC.	Inv# 562755204	SUPPLIES	$674.25		
803915	2024-06-19	SIGMA-ALDRICH, INC.	Inv# 562755204	Trans/Handling	$19.51		
803915	2024-06-19	SIGMA-ALDRICH, INC.	Inv# 562798899	Supplies	$681.86		
803915	2024-06-19	SIGMA-ALDRICH, INC.	Inv# 562798899	Supplies	$227.29		
803915	2024-06-19	SIGMA-ALDRICH, INC.	Inv# 562798899	Trans/Handling	$87.21		
	Total for Check:	803915				$1,690.12	$24,615.63
803916	2024-06-19	THERMO ELECTRON NORTH AMERICA LLC	Inv# 9021431545	SUPPLIES	$1,086.41		
803916	2024-06-19	THERMO ELECTRON NORTH AMERICA LLC	Inv# 9021431545	Shipping and handling	$21.75		
	Total for Check:	803916				$1,108.16	$122,394.92
803917	2024-06-19	WESTAIR GASES & EQUIPMENT	Inv# 0011843069	5/22 propane	$57.41		
803917	2024-06-19	WESTAIR GASES & EQUIPMENT	Inv# 0011843069	haz.mtl	$16.03		
803917	2024-06-19	WESTAIR GASES & EQUIPMENT	Inv# 0011843592	5/23 nitrogen	$166.71		
803917	2024-06-19	WESTAIR GASES & EQUIPMENT	Inv# 0011843592	haz.mtl, freight, surcharge	$59.12		
	Total for Check:	803917				$299.27	$106,539.88
803918	2024-06-19	WESTERN EXTERMINATOR COMPANY	Inv# 60597884	BPO RODENT & PEST CONTROL	$445.80		
	Total for Check:	803918				$445.80	$5,334.00
Run Date:	***6/18/2024***				**$3,543.35**	**$3,543.35**	

Orange County Water District

Check Register

Begin Date: 2024-06-13 **End Date:** 2024-06-19 Page: 1

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118466	2024-06-12	Harasty, Alicia	Inv# MAY 20 AND JUNE 10 TRAVEL		($27.80)		
118466	2024-06-12	Harasty, Alicia	Inv# MAY 20 AND JUNE 10 TRAVEL		($1,513.29)		
Total for Check:		118466				($1,541.09)	$10,403.04
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# BH MAY24 CC	BH May24 cc, exclude Costco P3	$34,118.91		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# CMF MAY 2024 CC	CMF May 2024 cc	$769.93		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# JLK MAY 2024 CC	JLK May 2024 cc	$4,831.69		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# LAV MAY 2024 CC	LAV May24 cc	$2,087.15		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$626.08		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$540.47		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$237.38		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$163.02		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$103.44		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$99.11		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112543812		$97.81		
118520	2024-06-19	U.S. BANK CORPORATE PAYMENT SYSTEM	Inv# ORDER #1112939357 5/15/24 1	Generated by reorder	$492.15		
Total for Check:		118520				$44,167.14	$737,416.86
118521	2024-06-19	ACE CRANE SERVICE, INC.	Inv# 32240	R23018 FHQ shop south crane re	$2,700.00		
118521	2024-06-19	ACE CRANE SERVICE, INC.	Inv# 32240	R23018 FHQ shop south crane re	$1,880.67		
118521	2024-06-19	ACE CRANE SERVICE, INC.	Inv# 32240	R23018 FHQ shop south crane re	$866.67		
118521	2024-06-19	ACE CRANE SERVICE, INC.	Inv# 32240	Shipping and Handling	$476.26		
Total for Check:		118521				$5,923.60	$34,653.15
118522	2024-06-19	AGILENT TECHNOLOGIES, INC.	Inv# 127900788	Supplies	$123.70		
118522	2024-06-19	AGILENT TECHNOLOGIES, INC.	Inv# 127900792	Supplies	$2,251.13		
118522	2024-06-19	AGILENT TECHNOLOGIES, INC.	Inv# 127900792	Supplies	$365.40		

Orange County Water District

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Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118522	2024-06-19	AGILENT TECHNOLOGIES, INC.	Inv# 127900792	Supplies	$250.13		
118522	2024-06-19	AGILENT TECHNOLOGIES, INC.	Inv# 127908817	Supplies	$123.70		
	Total for Check:	118522				$3,114.06	$330,004.46
118523	2024-06-19	AMAZON WEB SERVICES INC	Inv# 1TP9-6GQ1-M9Y7	T-133 Rep fuel tank/ lunch rm	$766.58		
118523	2024-06-19	AMAZON WEB SERVICES INC	Inv# 1TP9-6GQ1-M9Y7	T-133 Rep fuel tank/ lunch rm	$35.55		
	Total for Check:	118523				$802.13	$4,210.65
118524	2024-06-19	AMERICAN WATER CHEMICAL, INC	Inv# 52234371	5/23 40720 lb antiscalant	$53,343.20		
	Total for Check:	118524				$53,343.20	$1,773,124.60
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0127464300_20240613	05/08/2024 to 06/11/2024	$2,123.32		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0127602300_20240613	05/08/2024 to 06/11/2024	$101.83		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0127603000_20240613	05/09/2024 to 06/11/2024	$56.63		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0127704000_20240613	05/09/2024 to 06/11/2024	$502.22		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128276000_20240614	05/10/2024 to 06/12/2024	$125.68		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128277000_20240614	05/10/2024 to 06/12/2024	$1,294.62		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128279000_20240614	05/10/2024 to 06/12/2024	$1,671.47		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128280300_20240614	05/09/2024 to 06/11/2024	$98.84		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128282300_20240614	05/09/2024 to 06/11/2024	$904.19		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128283000_20240614	05/10/2024 to 06/12/2024	$1,232.82		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128284000_20240614	05/10/2024 to 06/12/2024	$99.70		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0128660002_20240614	05/10/2024 to 06/12/2024	$471.93		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0131487000_20240614	05/10/2024 to 06/12/2024	$63.67		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0132538000_20240614	05/10/2024 to 06/12/2024	$410.95		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0134144000_20240614	05/10/2024 to 06/12/2024	$76.57		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0134145000_20240613	05/09/2024 to 06/11/2024	$60.20		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0134965000_20240613	05/09/2024 to 06/11/2024	$89.06		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0138802000_20240614	05/10/2024 to 06/12/2024	$27.46		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0139824000_20240614	05/10/2024 to 06/12/2024	$62.25		
118526	2024-06-19	ANAHEIM, CITY OF	Inv# 0145552000_20240614	05/10/2024 to 06/12/2024	$51.40		
	Total for Check:	118526				$9,524.81	$531,701.13
118527	2024-06-19	APPLIED INDUSTRIAL TECHNOLOGIES	Inv# 7029688175	Generated by reorder 4/22/24 6	$651.30		
118527	2024-06-19	APPLIED INDUSTRIAL TECHNOLOGIES	Inv# 7029688175	Shipping and Handling	$22.81		

Orange County Water District

Check Register

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Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
Total for Check:	118527					$674.11	$9,067.81
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225408	Chair parts for Chris	$92.49		
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225408	Chair parts for Chris	$89.56		
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225408	Chair parts for Chris	$79.28		
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225408	Fuel Surcharge	$2.99		
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225634	Generated by reorder 5/13/24 2	$2,370.75		
118528	2024-06-19	BLUESPACE INTERIORS	Inv# I-02225634	Fuel surcharge	$2.99		
Total for Check:	118528					$2,638.06	$23,824.95
118529	2024-06-19	BOOT BARN INC.	Inv# INV00371333	BPO BOOT BARN	$200.00		
118529	2024-06-19	BOOT BARN INC.	Inv# INV00371334	BPO BOOT BARN	$200.00		
Total for Check:	118529					$400.00	$6,729.48
118530	2024-06-19	BRENNTAG PACIFIC INC.	Inv# BPI436813	6/10 11.5587 ton caustic sdoa	$8,497.38		
118530	2024-06-19	BRENNTAG PACIFIC INC.	Inv# BPI436813	discount	($169.95)		
118530	2024-06-19	BRENNTAG PACIFIC INC.	Inv# BPI438199	6/17 22.61 ton citric acid	$29,850.29		
118530	2024-06-19	BRENNTAG PACIFIC INC.	Inv# BPI438199	discount	($597.01)		
Total for Check:	118530					$37,580.71	$2,045,115.27
118531	2024-06-19	BURLINGTON SAFETY LABORATORY, INC.	Inv# 94240	AirLite 12CAL Shroud Kit JHAMM	$737.53		
118531	2024-06-19	BURLINGTON SAFETY LABORATORY, INC.	Inv# 94240	freight	$50.00		
118531	2024-06-19	BURLINGTON SAFETY LABORATORY, INC.	Inv# 94240	AirLite 12CAL Shroud Kit JHAMM	$30.52		
118531	2024-06-19	BURLINGTON SAFETY LABORATORY, INC.	Inv# 94240	Discount	($7.06)		
Total for Check:	118531					$810.99	$2,468.79
118532	2024-06-19	Baumdraher, John	Inv# REFUND RETIREE PREMIUMS	J.Baumdraher Refund Premiums	$173.25		
Total for Check:	118532					$173.25	$173.25
118533	2024-06-19	CDM SMITH, INC.	Inv# 90206424	2/18-3/13 PFAS IRWD wo#3	$24,522.00		
118533	2024-06-19	CDM SMITH, INC.	Inv# 90206426	short paid due to avail.balanc	$9,330.70		
Total for Check:	118533					$33,852.70	$671,844.59
118534	2024-06-19	CDW GOVERNMENT, INC	Inv# RL50041	Adobe Acrobat for Emgemeering	$72.24		
Total for Check:	118534					$72.24	$49,571.27
118535	2024-06-19	CITY OF ORANGE	Inv# 00062272-00_20240605	04/03/2024 - 06/04/2024	$509.70		

Orange County Water District

Check Register

Begin Date: 2024-06-13 **End Date:** 2024-06-19

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
Total for Check:		118535				$509.70	$296,862.54
118536	2024-06-19	COMMERCIAL DOOR OF ORANGE CO.	Inv# 27922	Roof Hatch Repair at RO Buildi	$945.23		
Total for Check:		118536				$945.23	$16,579.23
118537	2024-06-19	DAYFORCE US, INC.	Inv# 1N1204227	Jun24 payroll	$5,716.74		
Total for Check:		118537				$5,716.74	$24,524.72
118538	2024-06-19	E.S.R.I. INC.	Inv# 94731106	GIS software	$50,000.00		
Total for Check:		118538				$50,000.00	$54,186.00
118539	2024-06-19	EVOQUA WATER TECHNOLOGIES, LLC	Inv# 906478391	agmt 1489 O&M refill for YLWD	$169,578.69		
Total for Check:		118539				$169,578.69	$3,794,196.77
118540	2024-06-19	FACTORY MOTOR PARTS	Inv# 12-5947113		$130.26		
Total for Check:		118540				$130.26	$17,104.06
118541	2024-06-19	FEDERAL EXPRESS CORPORATION	Inv# 8-530-59992	Package Delivery	$193.34		
118541	2024-06-19	FEDERAL EXPRESS CORPORATION	Inv# 8-530-59993	Package Delivery	$49.66		
Total for Check:		118541				$243.00	$17,796.64
118542	2024-06-19	FERGUSON ENTERPRISES LLC	Inv# 3544218	Generated by reorder 4/2/24 11	$5,392.01		
Total for Check:		118542				$5,392.01	$27,768.01
118543	2024-06-19	FISHER SCIENTIFIC CO.	Inv# 2156624	Supplies	$1,407.23		
118543	2024-06-19	FISHER SCIENTIFIC CO.	Inv# 2156625	lab supplies	$197.97		
118543	2024-06-19	FISHER SCIENTIFIC CO.	Inv# 2194804	Supplies	$125.41		
118543	2024-06-19	FISHER SCIENTIFIC CO.	Inv# 2230036	SUPPLIES	$40.48		
Total for Check:		118543				$1,771.09	$232,815.74
118544	2024-06-19	FRUIT GROWERS LABORATORY INC	Inv# 405429A	BPO RADIOACTIVITY ANAYLSES	$283.00		
118544	2024-06-19	FRUIT GROWERS LABORATORY INC	Inv# 405431A	BPO RADIOACTIVITY ANAYLSES	$283.00		
118544	2024-06-19	FRUIT GROWERS LABORATORY INC	Inv# 405626A	BPO RADIOACTIVITY ANAYLSES	$540.00		
118544	2024-06-19	FRUIT GROWERS LABORATORY INC	Inv# 405627A	BPO RADIOACTIVITY ANAYLSES	$540.00		
Total for Check:		118544				$1,646.00	$45,687.00

Orange County Water District

Check Register

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Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118545	2024-06-19	Field, David M.	Inv# DEC 2023-JUN 2024 STIPEND stipends (6)	12/14/23-6/13/24	$240.00		
	Total for Check:	118545				$240.00	$710.34
118546	2024-06-19	GLOBAL TEST SUPPLY	Inv# 478478-01	Calibration - Certification I&	$650.00		
	Total for Check:	118546				$650.00	$5,037.14
118549	2024-06-19	GRAINGER INC.	Inv# 9109494824		$439.24		
118549	2024-06-19	GRAINGER INC.	Inv# 9111820198	Material Portable Generator Ho	$498.19		
118549	2024-06-19	GRAINGER INC.	Inv# 9110772267	BPO INDUSTRIAL SUPPLIES	$30.57		
118549	2024-06-19	GRAINGER INC.	Inv# 9111820198	Material Portable Generator Ho	$205.20		
118549	2024-06-19	GRAINGER INC.	Inv# 9111820198	Material Portable Generator Ho	$48.26		
118549	2024-06-19	GRAINGER INC.	Inv# 9111820198	Material Portable Generator Ho	$31.76		
118549	2024-06-19	GRAINGER INC.	Inv# 9113013123	Generated by reorder 5/6/24 6:	$309.17		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072418		$176.05		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072418		$135.69		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072418		$62.37		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072418		$31.64		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072426	Generated by reorder 5/6/24 6:	$2,467.32		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072426	Generated by reorder 5/6/24 6:	$693.82		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072426	Generated by reorder 5/6/24 6:	$399.67		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072426	Generated by reorder 5/6/24 6:	$358.53		
118549	2024-06-19	GRAINGER INC.	Inv# 9113072434		$66.89		
118549	2024-06-19	GRAINGER INC.	Inv# 9113217054	Hubble Enclosures, JHAMMER	$585.55		
118549	2024-06-19	GRAINGER INC.	Inv# 9113217054	Hubble Enclosures, JHAMMER	$410.03		
118549	2024-06-19	GRAINGER INC.	Inv# 9114378038	Generated by reorder 5/8/24 10	$176.06		
118549	2024-06-19	GRAINGER INC.	Inv# 9114378038	Generated by reorder 5/8/24 10	$70.43		
118549	2024-06-19	GRAINGER INC.	Inv# 9115539851	BPO INDUSTRIAL SUPPLIES	$8.47		
118549	2024-06-19	GRAINGER INC.	Inv# 9125250127	BPO INDUSTRIAL SUPPLIES	$232.40		
118549	2024-06-19	GRAINGER INC.	Inv# 9135143924	Credit INV #9125250127	($232.40)		
	Total for Check:	118549				$7,204.91	$226,404.74
118550	2024-06-19	HACH COMPANY	Inv# 14046566	Supplies	$64.92		
118550	2024-06-19	HACH COMPANY	Inv# 14046566	Freight	$13.06		
	Total for Check:	118550				$77.98	$95,019.29
118551	2024-06-19	HOME DEPOT CREDIT SERVICES	Inv# 0614253	BPO INDUSTRIAL SUPPLIES	$9.49		

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Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118551	2024-06-19	HOME DEPOT CREDIT SERVICES	Inv# 0614253	BPO INDUSTRIAL SUPPLIES	$1.26		
118551	2024-06-19	HOME DEPOT CREDIT SERVICES	Inv# 1613986	BPO INDUSTRIAL SUPPLIES	$17.15		
118551	2024-06-19	HOME DEPOT CREDIT SERVICES	Inv# 5020428	BPO INDUSTRIAL SUPPLIES	$32.28		
118551	2024-06-19	HOME DEPOT CREDIT SERVICES	Inv# 9281032	BPO INDUSTRIAL SUPPLIES	$33.21		
	Total for Check:	118551				$93.39	$35,206.80
118552	2024-06-19	HORIBA INSTRUMENTS, INC	Inv# 5104226415	Horiba Ammonium, Potassium, an	$913.50		
118552	2024-06-19	HORIBA INSTRUMENTS, INC	Inv# 5104226415	Horiba Ammonium, Potassium, an	$913.50		
118552	2024-06-19	HORIBA INSTRUMENTS, INC	Inv# 5104226415	Horiba Ammonium, Potassium, an	$913.50		
118552	2024-06-19	HORIBA INSTRUMENTS, INC	Inv# 5104226415		$35.00		
	Total for Check:	118552				$2,775.50	$5,618.61
118553	2024-06-19	Harasty, Alicia	Inv# MAY 20 AND JUNE 10 TRAVEL		$1,513.29		
118553	2024-06-19	Harasty, Alicia	Inv# MAY 20 AND JUNE 10 TRAVEL		$27.80		
118553	2024-06-19	Harasty, Alicia	Inv# MAY 20-23 LODG DEDUCT deduct	5/20-23 D.C. lodging	($1,492.29)		
	Total for Check:	118553				$48.80	$10,403.04
118554	2024-06-19	JACOBS ENGINEERING GROUP, INC.	Inv# W9Y31900-14	8/26/23-4/26/24 PFAS Tustin #1	$311,089.90		
118554	2024-06-19	JACOBS ENGINEERING GROUP, INC.	Inv# W9Y31900-14	8/26/23-4/26/24 PFAS Tustin #1	$19,103.21		
118554	2024-06-19	JACOBS ENGINEERING GROUP, INC.	Inv# W9Y31902-14	2/3-5/22 PFAS GSWC wo#2	$2,019.97		
	Total for Check:	118554				$332,213.08	$940,834.57
118555	2024-06-19	JOE A. GONSALVES AND SON	Inv# 161601	Jun24 legis.support/SACTO	$8,000.00		
	Total for Check:	118555				$8,000.00	$96,000.00
118556	2024-06-19	KENNEDY/JENKS CONSULTANTS, INC.	Inv# 171887	Thru 4/26 PFAS Orange wo#2	$45,510.00		
	Total for Check:	118556				$45,510.00	$306,392.99
118557	2024-06-19	LANCE, SOLL & LUNGHARD, LLP	Inv# 63125	2024 Gov't audit-interim	$17,100.00		
	Total for Check:	118557				$17,100.00	$52,353.00
118558	2024-06-19	LHOIST NORTH AMERICA	Inv# 1102409432		$21,179.27		
118558	2024-06-19	LHOIST NORTH AMERICA	Inv# 1102410338	credit memo for 1102409432	($21,179.27)		
118558	2024-06-19	LHOIST NORTH AMERICA	Inv# 1102410339	5/5 lime(2) 26.72 & 25.19 tons	$23,263.99		
	Total for Check:	118558				$23,263.99	$1,533,903.80

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118559	2024-06-19	LONG BEACH WATER DEPARTMENT	Inv# 36876	Apr24 Alamitos 56 af	$78,120.00		
Total for Check:	118559					$78,120.00	$924,945.82
118560	2024-06-19	MCFADDEN-DALE HARDWARE CO.	Inv# 5483815	BPO INDUSTRIAL SUPPLIES	$22.52		
118560	2024-06-19	MCFADDEN-DALE HARDWARE CO.	Inv# 5483815	Discount	($0.63)		
Total for Check:	118560					$21.89	$9,189.55
118561	2024-06-19	MCMASTER-CARR SUPPLY COMPANY	Inv# 28456780	Generated by reorder 6/10/24 9	$132.46		
118561	2024-06-19	MCMASTER-CARR SUPPLY COMPANY	Inv# 28456780	Shipping	$11.69		
118561	2024-06-19	MCMASTER-CARR SUPPLY COMPANY	Inv# 28456780	Discount	($2.65)		
Total for Check:	118561					$141.50	$24,046.19
118562	2024-06-19	MENDOCINO FARMS LLC	Inv# 617823	BPO CATERING SERVICE	$352.35		
118562	2024-06-19	MENDOCINO FARMS LLC	Inv# 617823	BPO CATERING SERVICE	$63.57		
118562	2024-06-19	MENDOCINO FARMS LLC	Inv# 617823	Delivery Fee	$29.09		
118562	2024-06-19	MENDOCINO FARMS LLC	Inv# 618846	BPO CATERING SERVICE	$475.18		
118562	2024-06-19	MENDOCINO FARMS LLC	Inv# 618846	Delivery	$29.09		
Total for Check:	118562					$949.28	$1,663.56
118563	2024-06-19	MOULTON NIGUEL WATER DISTRICT	Inv# 6268203	WINS Sponsorship 2024	$5,000.00		
Total for Check:	118563					$5,000.00	$6,454.56
118564	2024-06-19	MYTHICS	Inv# 211307	Renew Oracle Support Contract	$4,521.34		
Total for Check:	118564					$4,521.34	$22,035.46
118565	2024-06-19	NAPA AUTO PARTS	Inv# 123975	BPO TRUCK PARTS	$62.45		
118565	2024-06-19	NAPA AUTO PARTS	Inv# 124585	BPO TRUCK PARTS	$99.59		
118565	2024-06-19	NAPA AUTO PARTS	Inv# 124585	BPO TRUCK PARTS	$70.85		
118565	2024-06-19	NAPA AUTO PARTS	Inv# 124692	BPO TRUCK PARTS	$24.23		
118565	2024-06-19	NAPA AUTO PARTS	Inv# 124916	BPO TRUCK PARTS	$69.58		
Total for Check:	118565					$326.70	$1,338.95
118566	2024-06-19	NAPA/ORANGE COUNTY AUTO PARTS	Inv# 713749	BPO AUTO PARTS	$43.45		
118566	2024-06-19	NAPA/ORANGE COUNTY AUTO PARTS	Inv# 713749	DISCOUNT	($0.87)		
Total for Check:	118566					$42.58	$3,908.49

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118567	2024-06-19	NEARMAP US INC	Inv# INV01361367	Nearmap aerial imagery renewl	$3,200.00		
	Total for Check:	118567				$3,200.00	$3,200.00
118568	2024-06-19	NEWPORT URGENT CARE INC	Inv# 160933	J.Velasco DOT Physical	$88.00		
118568	2024-06-19	NEWPORT URGENT CARE INC	Inv# 160934	J.Evans DOT Physical	$88.00		
	Total for Check:	118568				$176.00	$528.00
118569	2024-06-19	ONESOURCE DISTRIBUTORS INC.	Inv# S007479225.001	Generated by reorder 5/28/24 1	$9,312.37		
118569	2024-06-19	ONESOURCE DISTRIBUTORS INC.	Inv# S007479225.001	Discount	($85.63)		
118569	2024-06-19	ONESOURCE DISTRIBUTORS INC.	Inv# S007509604.001	ELECTRICAL SUPPLIES	$214.51		
118569	2024-06-19	ONESOURCE DISTRIBUTORS INC.	Inv# S007509604.001	Discount	($1.97)		
	Total for Check:	118569				$9,439.28	$214,809.82
118570	2024-06-19	ORANGE COUNTY DEPARTMENT OF EDUCATION	Inv# 94TI4886	1548	$3,840.00		
	Total for Check:	118570				$3,840.00	$13,260.00
118571	2024-06-19	PAPER RECYCLING & SHREDDING SPECIALIST	Inv# 574552	On-Site Shredding	$171.00		
	Total for Check:	118571				$171.00	$2,187.00
118572	2024-06-19	PIKE, DONNA R	Inv# MAR.19-JUN 4, 2024	Mar.4,19-Jun 4,2024	$983.62		
	Total for Check:	118572				$983.62	$6,981.68
118573	2024-06-19	PRIMEX	Inv# CD99526672	Engineered Panels Q-36686-1	$15,126.04		
118573	2024-06-19	PRIMEX	Inv# CD99526673	Engineered Panels Q-36687-1	$14,804.14		
	Total for Check:	118573				$29,930.18	$29,930.18
118574	2024-06-19	PTI SAND & GRAVEL	Inv# 0145647	1/2" rock - research lab test	$597.13		
118574	2024-06-19	PTI SAND & GRAVEL	Inv# 0145647	1/2" rock - research lab test	$274.67		
	Total for Check:	118574				$871.80	$1,565.45
118575	2024-06-19	PURCOR PEST SOLUTIONS	Inv# 11509650	PEST CONTROL-REP BPO#517507	$525.00		
	Total for Check:	118575				$525.00	$2,840.00
118576	2024-06-19	QUINN COMPANY	Inv# PC830422046	BPO EQUIPMENT & SUPPLIES	$99.77		
118576	2024-06-19	QUINN COMPANY	Inv# PC830422047	Generated by reorder 5/15/24 1	$202.91		
118576	2024-06-19	QUINN COMPANY	Inv# PC830422047	Generated by reorder 5/15/24 1	$126.88		
118576	2024-06-19	QUINN COMPANY	Inv# PC830422047	Generated by reorder 5/15/24 1	$44.30		
118576	2024-06-19	QUINN COMPANY	Inv# PC830422084	BPO EQUIPMENT & SUPPLIES	$438.60		
118576	2024-06-19	QUINN COMPANY	Inv# PC830422085	BPO EQUIPMENT & SUPPLIES	$448.16		
	Total for Check:	118576				$1,360.62	$2,105,117.93

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118577	2024-06-19	POWERPLAN OIB	Inv# P6660835	Generated by reorder 5/15/24 1	$120.24		
118577	2024-06-19	POWERPLAN OIB	Inv# P6660835	Generated by reorder 5/15/24 1	$80.29		
118577	2024-06-19	POWERPLAN OIB	Inv# P6660835	Shipping and Handling	$21.00		
	Total for Check:	118577				$221.53	$24,943.13
118578	2024-06-19	RAINBOW DISPOSAL CO INC	Inv# 0605-001089686	BPO TRASH SERVICE	$6,603.77		
	Total for Check:	118578				$6,603.77	$76,868.62
118579	2024-06-19	RED WING SHOE CO. INC.	Inv# 789-1-63939	BPO WORK BOOTS	$200.00		
118579	2024-06-19	RED WING SHOE CO. INC.	Inv# 789-1-64159	BPO WORK BOOTS	$200.00		
118579	2024-06-19	RED WING SHOE CO. INC.	Inv# 789-1-64241	BPO WORK BOOTS	$200.00		
	Total for Check:	118579				$600.00	$13,070.64
118580	2024-06-19	RESTEK CORPORATION	Inv# CD50449994	Supplies	$92.84		
118580	2024-06-19	RESTEK CORPORATION	Inv# CD50449994	Freight	$19.00		
118580	2024-06-19	RESTEK CORPORATION	Inv# CD50449994	Discount	($2.24)		
	Total for Check:	118580				$109.60	$12,781.86
118581	2024-06-19	ROYAL WHOLESALE ELECTRIC	Inv# 7693-1014192		$193.03		
118581	2024-06-19	ROYAL WHOLESALE ELECTRIC	Inv# 7693-1014192		$48.94		
118581	2024-06-19	ROYAL WHOLESALE ELECTRIC	Inv# 7693-1014192		$22.84		
118581	2024-06-19	ROYAL WHOLESALE ELECTRIC	Inv# 7693-1014192		$278.51		
	Total for Check:	118581				$543.32	$11,803.85
118582	2024-06-19	SALCO DYNAMIC SOLUTIONS INC.	Inv# 109660	Generated by reorder 5/23/24 8	$124.39		
118582	2024-06-19	SALCO DYNAMIC SOLUTIONS INC.	Inv# 109660	Delivery by Salco car	$27.19		
118582	2024-06-19	SALCO DYNAMIC SOLUTIONS INC.	Inv# 109660	Discount	($2.79)		
	Total for Check:	118582				$148.79	$30,991.73
118583	2024-06-19	SANTA ANA UNIFIED SCHOOL DISTRICT	Inv# 5249	Taft ES	$350.56		
118583	2024-06-19	SANTA ANA UNIFIED SCHOOL DISTRICT	Inv# 5261	Franklin ES	$830.68		
118583	2024-06-19	SANTA ANA UNIFIED SCHOOL DISTRICT	Inv# 5281	Carver ES	$530.90		
118583	2024-06-19	SANTA ANA UNIFIED SCHOOL DISTRICT	Inv# 5292	Thorpe Fundamental	$1,090.27		
	Total for Check:	118583				$2,802.41	$3,784.63
118584	2024-06-19	SC FUELS	Inv# 2662900-IN	BPO BULK RED DIESEL	$3,204.37		
118584	2024-06-19	SC FUELS	Inv# 2662900-IN	Discount	($29.47)		

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Total for Check:	118584					$3,174.90	$132,100.45
118585	2024-06-19	SOLTIS AND COMPANY, INC.	Inv# SD1503	ON-CALL LANDSCAPE SERVICE	$775.00		
118585	2024-06-19	SOLTIS AND COMPANY, INC.	Inv# SD1504	MULCH - SANTIAGO BIKE TRAIL	$6,500.00		
118585	2024-06-19	SOLTIS AND COMPANY, INC.	Inv# SD1504	MULCH - SANTIAGO BIKE TRAIL	$1,200.00		
118585	2024-06-19	SOLTIS AND COMPANY, INC.	Inv# SD1504	MULCH - SANTIAGO BIKE TRAIL	$150.00		
Total for Check:	118585					$8,625.00	$127,845.42
118586	2024-06-19	SOUTHERN CALIFORNIA EDISON CO.	Inv# 700145466803_20240610		$612,748.54		
Total for Check:	118586					$612,748.54	$10,529,536.86
118587	2024-06-19	SOUTHERN TIRE MART LLC	Inv# 7090029305		$19.95		
118587	2024-06-19	SOUTHERN TIRE MART LLC	Inv# 7090029305	BPO TIRES	$9.79		
Total for Check:	118587					$29.74	$2,598.71
118588	2024-06-19	SPARKLETTS DS WATER OF AMERICA LP	Inv# 20367056 061424	BPO WATER DELIVERY	$88.98		
Total for Check:	118588					$88.98	$9,015.91
118589	2024-06-19	STATE WATER RESOURCES CONTROL BOARD	Inv# SC-143850	01.01.24-03.31.24 North Basin	$2,284.98		
Total for Check:	118589					$2,284.98	$61,596.83
118590	2024-06-19	STATE WATER RESOURCES CONTROL BOARD	Inv# 42423-01	SEAWATER INTRU — ALAMITOS BARR	$153,294.71		
Total for Check:	118590					$153,294.71	$10,267,057.84
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV70920	2" SS Gate Valves for Lime Loo	$1,052.44		
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV70920	discount	($9.68)		
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV71002	Generated by reorder 6/10/24 9	$1,435.50		
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV71002	Generated by reorder 6/10/24 9	$162.21		
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV71002	Shipping Cost	$21.70		
118591	2024-06-19	SUNSET INDUSTRIAL PARTS	Inv# INV71002	Discount	($14.69)		
Total for Check:	118591					$2,647.48	$22,175.64
118592	2024-06-19	SURF CITY OPTOMETRY	Inv# 113889	BPO FOR RX GLASSES	$250.00		
Total for Check:	118592					$250.00	$2,812.00
118593	2024-06-19	Smith, Benjamin	Inv# MAR-JUN TRAVELS,STIPENDS		$374.28		
Total for Check:	118593					$374.28	$1,152.18
118594	2024-06-19	TETRA TECH, INC.	Inv# 52246229	Thru 4/26 PFAS Kimberly wo#2	$5,345.00		
118594	2024-06-19	TETRA TECH, INC.	Inv# 52248285	Thru 4/26 PFAS GSWC wo#6	$40,615.00		

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118594	2024-06-19	TETRA TECH, INC.	Inv# 52248284	Thru 4/26 PFAS F.Kimb wo#5A	$720.00		
	Total for Check:	118594				$46,680.00	$1,496,656.43
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1337649		$27.00		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1337649	BPO FORD PARTS	$11.79		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1337649	BPO FORD PARTS	$5.88		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1337924	BPO FORD PARTS	$78.66		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1337924	BPO FORD PARTS	$27.00		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1338161	BPO FORD PARTS	$200.74		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1338161	freight	$27.00		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1338211	BPO FORD PARTS	$382.03		
118595	2024-06-19	TOM'S TRUCK CENTER, INC	Inv# 1338211		$27.00		
	Total for Check:	118595				$787.10	$48,303.95
118596	2024-06-19	TUCKER ELLIS LLP	Inv# 964124	Apr24 legal/PFAS	$1,400.00		
	Total for Check:	118596				$1,400.00	$123,113.23
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190175637	1557	$271.10		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190175637	1557	$0.62		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176592	1557	$50.84		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176593	1557	$13.77		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176594	1557	$262.98		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176595	1557	$10.78		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176596	1557	$435.49		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176597	1557	$118.80		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2190176598	1557	$22.44		
118597	2024-06-19	UNIFIRST CORPORATION	Inv# 2200137384	1557	$38.08		
	Total for Check:	118597				$1,224.90	$28,257.82
118598	2024-06-19	UNIGUEST HOLDINGS INC	Inv# INV-69449	UCView Yearly Maintenance	$7,470.00		
118598	2024-06-19	UNIGUEST HOLDINGS INC	Inv# INV-69449	July24 - Feb 2025	$4,980.00		
118598	2024-06-19	UNIGUEST HOLDINGS INC	Inv# INV-69449	March 24- June 2024	$2,490.00		
118598	2024-06-19	UNIGUEST HOLDINGS INC	Inv# INV-69449		($7,470.00)		
	Total for Check:	118598				$7,470.00	$7,470.00
118599	2024-06-19	UNITED PARCEL SERVICE	Inv# 0000X81601244_20240615		$156.11		
	Total for Check:	118599				$156.11	$5,418.60

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118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52171515	6/12 22.183 ton sulfuric acid	$5,013.36		
118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52171515	discount	($100.27)		
118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52171516	6/12 23.123 ton sulfuric acid	$5,225.80		
118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52171516	discount	($104.52)		
118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52176605	6/17 785 gal s.bisulfite	$1,613.47		
118600	2024-06-19	UNIVAR SOLUTIONS USA	Inv# 52176605	discount	($32.27)		
	Total for Check:	118600				$11,615.57	$623,085.88
118601	2024-06-19	UNIVERSITY OF WATERLOO	Inv# 31058864	LAB TESTING	$600.00		
	Total for Check:	118601				$600.00	$2,550.00
118602	2024-06-19	UTILIQUEST LLC	Inv# 334350-Q	5/12-18 screen/mark pipes	$1,112.97		
118602	2024-06-19	UTILIQUEST LLC	Inv# 334350-Q	5/12-18 screen/mark pipes	$12.29		
118602	2024-06-19	UTILIQUEST LLC	Inv# 334350-Q	5/12-18 screen/mark pipes	$605.91		
	Total for Check:	118602				$1,731.17	$101,371.28
118603	2024-06-19	VWR INTERNATIONAL LLC	Inv# 8816114290		$73.73		
118603	2024-06-19	VWR INTERNATIONAL LLC	Inv# 8816146793	FIELD WORK SUPPLIES	$619.35		
118603	2024-06-19	VWR INTERNATIONAL LLC	Inv# 8816151049	Generated by reorder 3/11/24 6	$844.15		
118603	2024-06-19	VWR INTERNATIONAL LLC	Inv# 8816151049	Generated by reorder 3/11/24 6	$753.68		
	Total for Check:	118603				$2,290.91	$113,195.21
118604	2024-06-19	Versluis, Patrick	Inv# JULY 2023-JUNE 2024 STIPE phone stipends	7/10/23-6/9/24	$440.00		
	Total for Check:	118604				$440.00	$1,079.29
118605	2024-06-19	WATER QUALITY & TREATMENT SOLUTIONS INC	Inv# 24-3710	Thru 4/30 WRF PFAS TC	$3,000.00		
	Total for Check:	118605				$3,000.00	$57,933.64
118606	2024-06-19	WATER RESEARCH FOUNDATION	Inv# 0005132-2024	WRFMBR Utility Memb FY 24/25	$164,679.49		
	Total for Check:	118606				$164,679.49	$164,679.49
118607	2024-06-19	WATERS TECHNOLOGIES CORP.	Inv# 231242177	Supplies	$1,348.50		
118607	2024-06-19	WATERS TECHNOLOGIES CORP.	Inv# 231242177	Supplies	$1,016.81		
118607	2024-06-19	WATERS TECHNOLOGIES CORP.	Inv# 231242177	freight	$177.25		
118607	2024-06-19	WATERS TECHNOLOGIES CORP.	Inv# 231242177	Supplies	$152.25		
118607	2024-06-19	WATERS TECHNOLOGIES CORP.	Inv# 231242177	Supplies	$117.45		
	Total for Check:	118607				$2,812.26	$145,579.76
118608	2024-06-19	WIENHOFF DRUG TESTING	Inv# 121173	TESTING	$135.00		

Orange County Water District

Check Register

Begin Date: 2024-06-13 **End Date:** 2024-06-19

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118608	2024-06-19	WIENHOFF DRUG TESTING	Inv# 122311	TESTING	$140.00		
Total for Check: 118608						$275.00	$2,645.00
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941720	6/3 4784 gal s.hypochlorite	$8,237.57		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941720	CA Mill	$172.99		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941720	discount	($164.75)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941721	6/3 4770 gal s.hypochlorite	$8,213.46		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941721	CA Mill	$172.48		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941721	discount	($164.27)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941722	6/3 4931 gal s.hypochlorite	$8,490.69		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941722	CA Mill	$178.30		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941722	discount	($169.81)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941723	6/3 6917 gal s.hypochlorite	$8,466.58		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941723	CA Mill	$177.80		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941723	discount	($169.33)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941859	6/4 4879 gal s.hypochlorite	$8,401.15		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941859	CA Mill	$176.42		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941859	discount	($168.02)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941861	6/4 4834 gal s.hypochlorite	$8,323.66		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941861	CA Mill	$174.80		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941861	discount	($166.47)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941862	6/4 4889 gal s.hypochlorite	$8,418.37		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941862	CA Mill	$176.79		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941862	discount	($168.37)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941863	6/4 4875 gal s.hypochlorite	$8,394.26		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941863	CA Mill	$176.28		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 941863	discount	($167.89)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942106	6/6 4853 gal s.hypochlorite	$8,356.38		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942106	CA Mill	$175.48		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942106	discount	($167.13)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942107	6/6 4796 gal s.hypochlorite	$8,258.23		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942107	CA Mill	$173.42		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942107	discount	($165.16)		

Orange County Water District

Check Register

Begin Date: 2024-06-13 **End Date:** 2024-06-19

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942108	6/6 4873 gal s.hypochlorite	$8,390.82		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942108	CA Mill	$176.21		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942108	discount	($167.82)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942109	6/6 4917 gal s.hypochlorite	$8,466.58		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942109	CA Mill	$177.80		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942109	discount	($169.33)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942250	6/7 4925 gal s.hypochlorite	$8,480.36		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942250	CA Mill	$178.09		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942250	discount	($169.61)		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942251	6/7 4853 gal s.hypochlorite	$8,356.38		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942251	CA Mill	$175.48		
978439	2024-06-13	JCI JONES CHEMICAL, INC	Inv# 942251	discount	($167.13)		
	Total for Check:	978439				$117,371.74	$2,348,091.67
978440	2024-06-14	BOOKY OREN GLOBAL WATER TECHNOLOGIES LTD	Inv# 01/0000068	May24 operation efficiency	$7,500.00		
	Total for Check:	978440				$7,500.00	$90,000.00
Run Date:	***6/18/2024***				**$2,168,849.35**	**$2,168,849.35**	

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
803919	2024-06-26	IRON MOUNTAIN	Inv# JMXX269	BPO ARCHIVAL SERVICES	$4,565.25		
	Total for Check:	803919				$4,565.25	$78,231.20
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994216	Apr24 legal/Water Resources	$3,024.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994217	Apr24 legal/Personnel Issues	$720.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994218	Apr24 legal/Admin matters	$12,516.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994219	Apr24 legal/Reclaim.Wtr.BPP	$864.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994220	Apr24 legal/CWEF	$180.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994221	Apr24 legal/PFAS	$2,700.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994222	Apr24 legal/LAFCO Advice	$324.00		
803920	2024-06-26	RUTAN & TUCKER, LLP	Inv# 994223	Apr24 legal/OCWD v USEPA	$216.00		
	Total for Check:	803920				$20,544.00	$365,968.76
803921	2024-06-26	SIGMA-ALDRICH, INC.	Inv# 562818474	lab Supplies	$254.48		
803921	2024-06-26	SIGMA-ALDRICH, INC.	Inv# 562818474	Trans/handling	$36.19		
803921	2024-06-26	SIGMA-ALDRICH, INC.	Inv# 562818474	lab Supplies	$33.71		
	Total for Check:	803921				$324.38	$24,940.01
803922	2024-06-26	WECK LABORATORIES, INC.	Inv# W4E2007	BPO WATER ANALYSES	$600.00		
803922	2024-06-26	WECK LABORATORIES, INC.	Inv# W4E2154	BPO WATER ANALYSES	$120.00		
	Total for Check:	803922				$720.00	$25,403.50
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011845096	Lab-argon	$1,210.17		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011845096	haz.mtl, frt, surcharge	$59.12		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011845309	haz.mtl, frt, surcharge	$59.11		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011845309	Wtr.Prod-nitrogen	$35.24		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011846855	helium and nitrogen	$1,429.14		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0011846855	haz.mtlk,frt,surcharges	$872.56		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592924	May24 cylinder rental	$20.82		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592925A	May24 cylinder rental-Lab	$784.43		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592925B	May24 cylinder rental/Wtr.Prod	$301.03		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592925B	May24 cylinder rental/Hydrogeo	$18.41		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592925C	May24 cylinder rental/Recharge	$9.21		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592926	May24 cylinder rental	$168.13		
803924	2024-06-26	WESTAIR GASES & EQUIPMENT	Inv# 0080592927	May24 cylinder rental	$1,049.27		
	Total for Check:	803924				$6,016.64	$112,556.52

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
Run Date:	*6/25/2024*				**$32,170.27**	**$32,170.27**	

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118567	2024-06-19	NEARMAP US INC	Inv# INV01361367	Nearmap aerial imagery renewl	($3,200.00)		
	Total for Check:	118567				($3,200.00)	$3,200.00
118609	2024-06-26	CITY OF ORANGE	Inv# 00095690_20240606	04/03/2024 - 06/05/2024	$165.23		
118609	2024-06-26	CITY OF ORANGE	Inv# 0170431	PFAS reimbursement #03	$1,299,161.80		
118609	2024-06-26	CITY OF ORANGE	Inv# REIMBURS COST SHARE AGREE		$76,686.59		
	Total for Check:	118609				$1,376,013.62	$1,672,876.16
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 117310	EMERGENCY REPAIR- ACI CIRCUT 1	$27,488.39		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 117311	AC1 EMERGENCY REPAIR CIRCUIT 2	$25,744.50		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 117313	New Compressor at 140bldg AC U	$2,897.10		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 117313	New Compressor at 140bldg AC U	$2,040.00		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 20550245	AC1 Repairs at 540 bldg.	$2,040.00		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 20550245	AC1 Repairs at 540 bldg.	$100.00		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 20550246	Admin Boiler Not Heating	$680.00		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 20550246	Admin Boiler Not Heating	$100.00		
118610	2024-06-26	ACCO ENGINEERED SYSTEMS	Inv# 20553794	Jun24 HVAC maintenance	$8,423.00		
	Total for Check:	118610				$69,512.99	$360,213.97
118611	2024-06-26	ACCUSTANDARD, INC.	Inv# 1005548	Supplies	$701.45		
118611	2024-06-26	ACCUSTANDARD, INC.	Inv# 1005548	Supplies	$478.50		
118611	2024-06-26	ACCUSTANDARD, INC.	Inv# 1005548	Shipping	$29.33		
118611	2024-06-26	ACCUSTANDARD, INC.	Inv# 1005548	Handling	$10.87		
	Total for Check:	118611				$1,220.15	$15,006.79
118612	2024-06-26	ACE CRANE SERVICE, INC.	Inv# 32178	Annual Crane Inspection and Tr	$3,590.00		
118612	2024-06-26	ACE CRANE SERVICE, INC.	Inv# 32178	Annual Crane Inspection and Tr	$1,216.22		
	Total for Check:	118612				$4,806.22	$39,459.37
118613	2024-06-26	AECOM TECHNICAL SERVICES, INC.	Inv# 2000894661	4/27-5/24 PFAS IRWD OPA-1	$1,330.00		
	Total for Check:	118613				$1,330.00	$234,106.03
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127923806	Supplies	$1,305.00		
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127923806	Supplies	$353.44		
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127923806	Shipping and Handling	$8.70		
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127933614	Supplies	$911.33		
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127933614	Supplies	$184.60		
118614	2024-06-26	AGILENT TECHNOLOGIES, INC.	Inv# 127933614	shipping and Handling	$7.80		

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
	Total for Check:	118614				$2,770.87	$332,775.33
118615	2024-06-26	AIR SITES 2000 LLC	Inv# 19579	Site lease for repeater and an	$450.00		
	Total for Check:	118615				$450.00	$4,972.50
118616	2024-06-26	ALLISON MECHANICAL, INC.	Inv# 86024	SCADA room A/C repair	$515.49		
	Total for Check:	118616				$515.49	$2,886.98
118617	2024-06-26	ALTERNATIVE HOSE, INC.	Inv# 6084071	BPO HOSES	$358.07		
	Total for Check:	118617				$358.07	$4,342.59
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1MC4-FGRP-GW4T		$65.15		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1MC4-FGRP-GW4T		$36.96		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$66.88		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$27.08		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$17.29		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$13.04		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$8.52		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1P7H-NTFD-G7JQ	CHAIN CONNECTORS/ OFFICE SUPPL	$7.60		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1PWR-V43X-J4DH	OFFICE EQUIPMENT	$390.40		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1PWR-V43X-J4DH		$5.00		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$206.60		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$108.74		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$76.10		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$64.15		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$29.95		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$15.20		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$14.76		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$13.05		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$12.10		
118619	2024-06-26	AMAZON CAPITAL SERVICES, INC	Inv# 1TVH-NHPW-JTDV	OFFICE EQUIPMENT	$6.51		
	Total for Check:	118619				$1,185.08	$41,650.60

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118620	2024-06-26	AMAZON WEB SERVICES INC	Inv# 1713235541	R&D CLOUD ACCOUNT	$96.02		
	Total for Check:	118620				$96.02	$4,306.67
118621	2024-06-26	ANAHEIM, CITY OF	Inv# 0110196000_20240618	05/15/2024 to 06/14/2024	$24.96		
118621	2024-06-26	ANAHEIM, CITY OF	Inv# 0110198000_20240618	05/15/2024 to 06/14/2024	$208.40		
118621	2024-06-26	ANAHEIM, CITY OF	Inv# 0110199000_20240618	05/15/2024 to 06/14/2024	$38,853.42		
	Total for Check:	118621				$39,086.78	$570,787.91
118622	2024-06-26	AT & T	Inv# 339 259-6949_20240607	06/07/2024 to 07/06/2024	$66.23		
	Total for Check:	118622				$66.23	$25,441.60
118623	2024-06-26	AT & T	Inv# 335 253-2206_20240607	06/07/2024 to 07/06/2024	$82.07		
	Total for Check:	118623				$82.07	$25,441.60
118624	2024-06-26	AT & T	Inv# 714 974-3616_20240611	05/27/2024 to 06/26/2024	$86.61		
	Total for Check:	118624				$86.61	$25,441.60
118625	2024-06-26	ATLAS COPCO COMPRESSORS LLC	Inv# 1124054916	Generated by reorder 4/10/24 7	$299.15		
118625	2024-06-26	ATLAS COPCO COMPRESSORS LLC	Inv# 1124054916	Freight	$20.84		
	Total for Check:	118625				$319.99	$14,598.09
118626	2024-06-26	AYALA, GINA	Inv# MARCH 26, JUNE 10-13, 202 AWWA ACE24	3/26 CWEF, 6/10-13	$237.46		
	Total for Check:	118626				$237.46	$2,624.10
118627	2024-06-26	B & M LAWN & GARDEN CENTER	Inv# 641144	BPO LANDSCAPING SUPPLIES	$43.28		
118627	2024-06-26	B & M LAWN & GARDEN CENTER	Inv# 641144	BPO LANDSCAPING SUPPLIES	$25.29		
118627	2024-06-26	B & M LAWN & GARDEN CENTER	Inv# 641145		$103.40		
	Total for Check:	118627				$171.97	$4,282.39
118628	2024-06-26	BAY ALARM COMPANY	Inv# 21438914	1529	$540.00		
118628	2024-06-26	BAY ALARM COMPANY	Inv# 21439848	1529	$300.00		
118628	2024-06-26	BAY ALARM COMPANY	Inv# 21454831	1529	$209.04		
118628	2024-06-26	BAY ALARM COMPANY	Inv# 21494149		($27.00)		
	Total for Check:	118628				$1,022.04	$43,838.00
118629	2024-06-26	BRENNTAG PACIFIC INC.	Inv# BPI439230	6/19 21.37 ton H.peroxide	$10,685.00		
118629	2024-06-26	BRENNTAG PACIFIC INC.	Inv# BPI439230	discount	($213.70)		

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
Total for Check:	118629					$10,471.30	$2,055,586.57
118630	2024-06-26	BYKOWSKI EQUIPMENT CO	Inv# 0129997-IN	Generated by reorder 1/9/24	$5,578.88		
118630	2024-06-26	BYKOWSKI EQUIPMENT CO	Inv# 0129997-IN	Generated by reorder 1/9/24	$4,184.16		
118630	2024-06-26	BYKOWSKI EQUIPMENT CO	Inv# 0129997-IN	Generated by reorder 1/9/24	$381.71		
118630	2024-06-26	BYKOWSKI EQUIPMENT CO	Inv# 0129997-IN	Freight	$228.96		
Total for Check:	118630					$10,373.71	$10,373.71
118631	2024-06-26	Barker, Zachary	Inv# JAN 18-JUN 17, 2024 STIPE stipends(5)	1/18-6/17/24 phone	$200.00		
Total for Check:	118631					$200.00	$680.00
118632	2024-06-26	CALIAGUA INC	Inv# 16	Prog.Pmt#16 TUS-2022-1	$1,483,045.00		
118632	2024-06-26	CALIAGUA INC	Inv# PROGRESS BILLING #09 ORA-2022-1	Prog.Pmt#9	$604,485.00		
Total for Check:	118632					$2,087,530.00	$14,265,881.15
118633	2024-06-26	PACIFIC PREMIER BANK	Inv# ESC 20230117-2773 RET#16	Ret#16 TUS-2022-1	$78,055.00		
Total for Check:	118633					$78,055.00	$592,354.60
118634	2024-06-26	PACIFIC PREMIER BANK	Inv# ESC 20231011-7499 RET#9 ORA-2022-1	Ret#9 Caliagua	$31,815.00		
Total for Check:	118634					$31,815.00	$158,481.25
118635	2024-06-26	CAMBRIDGE ISOTOPE LABORATORIES	Inv# SI-00015086	Supplies	$1,233.23		
118635	2024-06-26	CAMBRIDGE ISOTOPE LABORATORIES	Inv# SI-00015086	Supplies	$1,223.44		
118635	2024-06-26	CAMBRIDGE ISOTOPE LABORATORIES	Inv# SI-00015086	Shipping and Handling	$52.61		
Total for Check:	118635					$2,509.28	$13,485.91
118636	2024-06-26	CEL ANALYTICAL INC	Inv# 240515-5036	BPO WQ ANALYSIS	$630.00		
Total for Check:	118636					$630.00	$13,730.00
118637	2024-06-26	CHEMCO PRODUCTS COMPANY	Inv# 223452	Monthly Closed Loop Water Serv	$301.70		
Total for Check:	118637					$301.70	$6,057.32
118638	2024-06-26	COMPSYCH CORPORATION	Inv# 24071047	District EAP Program for ee's	$1,512.00		
Total for Check:	118638					$1,512.00	$4,536.00
118639	2024-06-26	CONSTELLATION NEWENERGY INC.	Inv# 68501455201	05/03/2024 to 06/04/2024	$654,519.92		
Total for Check:	118639					$654,519.92	$16,010,188.17

Orange County Water District

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Begin Date: 2024-06-20 **End Date:** 2024-06-26

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Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118640	2024-06-26	CORPORATE IMAGE MAINTENANCE	Inv# 37351	1095	$13,999.14		
118640	2024-06-26	CORPORATE IMAGE MAINTENANCE	Inv# 37351	1095	$1,696.42		
118640	2024-06-26	CORPORATE IMAGE MAINTENANCE	Inv# 37351	1095	$247.44		
	Total for Check:	118640				$15,943.00	$207,238.00
118641	2024-06-26	CWEA	Inv# MEMB RENEWAL J.KIRKWOOD		$324.00		
	Total for Check:	118641				$324.00	$8,352.00
118642	2024-06-26	CWEA	Inv# CERT RENEWAL R.CAMACHO		$98.00		
	Total for Check:	118642				$98.00	$8,352.00
118643	2024-06-26	DARYL HUTCHISON	Inv# OCWD REPLEN. VID DEPOSIT	DEPOSIT FOR VIDEO	$5,500.00		
	Total for Check:	118643				$5,500.00	$5,500.00
118644	2024-06-26	DAVIDSON, ELY	Inv# JAN 12-JUN 11, 2024 STIPE	1/12-6/11/24 phone stipends (5	$200.00		
	Total for Check:	118644				$200.00	$440.00
118645	2024-06-26	DEBTBOOK	Inv# DB2002785	DEBTBOOK SOFTWARE	$14,000.00		
	Total for Check:	118645				$14,000.00	$26,500.00
118646	2024-06-26	DOTY BROS. CONSTRUCTION COMPANY	Inv# 85237	Asphalt repair	$10,143.00		
	Total for Check:	118646				$10,143.00	$262,635.22
118647	2024-06-26	Drain, Matthew	Inv# DEC 17 2023-JUN 26 2024 S	12/27/23-6/26/24 stipends (6)	$240.00		
	Total for Check:	118647				$240.00	$720.00
118648	2024-06-26	EDELSTEIN GILBERT ROBSON AND SMITH	Inv# 1780	May24 legis.support/SACTO	$8,000.00		
	Total for Check:	118648				$8,000.00	$96,000.00
118649	2024-06-26	ENS RESOURCES, INC.	Inv# 3590*	May24 legis.support/D.C.	$8,129.71		
	Total for Check:	118649				$8,129.71	$97,510.85
118650	2024-06-26	ES OPCO USA LLC	Inv# IN-4586251		$872.79		
118650	2024-06-26	ES OPCO USA LLC	Inv# IN-4586251		$394.37		
118650	2024-06-26	ES OPCO USA LLC	Inv# IN-4586251		$374.19		
	Total for Check:	118650				$1,641.35	$2,347.94

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118651	2024-06-26	EUROFINS ENVIRONMENT TESTING SW LLC	Inv# 5700181542	BPO WATER ANALYSES	$452.50		
Total for Check:		118651				$452.50	$7,197.50
118652	2024-06-26	EVANTEC CORPORATION	Inv# 202400874	Generated by reorder 4/22/24 6	$493.03		
118652	2024-06-26	EVANTEC CORPORATION	Inv# 202400874	Generated by reorder 4/22/24 6	$246.47		
118652	2024-06-26	EVANTEC CORPORATION	Inv# 202400874	Shipping	$131.00		
118652	2024-06-26	EVANTEC CORPORATION	Inv# 202400874	Hazmat Fee	$55.00		
Total for Check:		118652				$925.50	$53,035.97
118653	2024-06-26	FACTORY MOTOR PARTS	Inv# 106-560100	Generated by reorder 5/22/24 1	$56.87		
118653	2024-06-26	FACTORY MOTOR PARTS	Inv# 106-560100	Generated by reorder 5/22/24 1	$33.39		
118653	2024-06-26	FACTORY MOTOR PARTS	Inv# 109-959032	Generated by reorder 5/22/24 1	$33.39		
118653	2024-06-26	FACTORY MOTOR PARTS	Inv# 164-336997	BPO AUTO PARTS	$56.94		
Total for Check:		118653				$180.59	$17,284.65
118654	2024-06-26	FEDERAL EXPRESS CORPORATION	Inv# 8-538-23357	Package Delivery	$113.42		
Total for Check:		118654				$113.42	$17,910.06
118655	2024-06-26	FISHER SCIENTIFIC CO.	Inv# 2264394		$383.67		
118655	2024-06-26	FISHER SCIENTIFIC CO.	Inv# 2302448	lab supplies	$611.23		
118655	2024-06-26	FISHER SCIENTIFIC CO.	Inv# 2302448	lab supplies	$69.10		
118655	2024-06-26	FISHER SCIENTIFIC CO.	Inv# 2411752		$1,203.32		
Total for Check:		118655				$2,267.32	$235,083.06
118656	2024-06-26	FRONTIER COMMUNICATIONS	Inv# 213-002-8985_20240607	06/07/2024 to 07/06/2024	$45.47		
Total for Check:		118656				$45.47	$52,715.59
118657	2024-06-26	FRONTIER COMMUNICATIONS	Inv# 714-274-0393_20240607	06/07/2024 to 07/06/2024	$1,250.33		
Total for Check:		118657				$1,250.33	$52,715.59
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405804A	BPO RADIOACTIVITY ANAYLSES	$72.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405805A	BPO RADIOACTIVITY ANAYLSES	$103.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405806A	BPO RADIOACTIVITY ANAYLSES	$103.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405807A	BPO RADIOACTIVITY ANAYLSES	$103.00		

Orange County Water District

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Begin Date: 2024-06-20 **End Date:** 2024-06-26

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Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405808A	BPO RADIOACTIVITY ANAYLSES	$318.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405809A	BPO RADIOACTIVITY ANAYLSES	$201.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405822A	BPO RADIOACTIVITY ANAYLSES	$131.00		
118658	2024-06-26	FRUIT GROWERS LABORATORY INC	Inv# 405825A	BPO RADIOACTIVITY ANAYLSES	$561.00		
	Total for Check:	118658				$1,592.00	$47,279.00
118659	2024-06-26	GE GRID SOLUTIONS, LLC	Inv# 1706101	Fedex	$49.50		
118659	2024-06-26	GE GRID SOLUTIONS, LLC	Inv# 1706101	Service Repair Obsolete 750 Fe	$2,074.68		
	Total for Check:	118659				$2,124.18	$7,461.01
118660	2024-06-26	GOLD COAST AWARDS	Inv# 12474	Employee of the Year	$241.20		
118660	2024-06-26	GOLD COAST AWARDS	Inv# 519329	Service Awards	$273.52		
	Total for Check:	118660				$514.72	$1,666.84
118661	2024-06-26	GRAINGER INC.	Inv# 9117957143	BPO INDUSTRIAL SUPPLIES	$51.42		
118661	2024-06-26	GRAINGER INC.	Inv# 9119760925	BPO INDUSTRIAL SUPPLIES	$15.38		
118661	2024-06-26	GRAINGER INC.	Inv# 9120329215	BPO INDUSTRIAL SUPPLIES	$48.40		
	Total for Check:	118661				$115.20	$226,519.94
118662	2024-06-26	GREAT SCOTT TREE SERVICES, INC.	Inv# 53211	1519	$1,320.00		
	Total for Check:	118662				$1,320.00	$56,834.00
118663	2024-06-26	Greening, Mark	Inv# JAN 5-JUN 4, 2024 STIIPEN (5)	1/5-6/4/24 stipends	$200.00		
	Total for Check:	118663				$200.00	$720.00
118664	2024-06-26	HABITAT WEST	Inv# 91247	wo#9 Pheasant Field	$35,000.00		
	Total for Check:	118664				$35,000.00	$270,602.18
118665	2024-06-26	HACH COMPANY	Inv# 14051530	lab supplies	$42.25		
118665	2024-06-26	HACH COMPANY	Inv# 14051530	Freight	$17.40		
	Total for Check:	118665				$59.65	$95,078.94
118666	2024-06-26	HB DIGITAL ARTS & BLUEPRINT	Inv# INV-124822		$96.98		
	Total for Check:	118666				$96.98	$1,873.76
118667	2024-06-26	HOME DEPOT CREDIT SERVICES	Inv# 7805018	BPO INDUSTRIAL SUPPLIES	$2.09		
118667	2024-06-26	HOME DEPOT CREDIT SERVICES	Inv# 9381682	BPO INDUSTRIAL SUPPLIES	$67.84		

Orange County Water District

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Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118667	2024-06-26	HOME DEPOT CREDIT SERVICES	Inv# 9614406	BPO INDUSTRIAL SUPPLIES	$116.28		
	Total for Check:	118667				$186.21	$35,393.01
118668	2024-06-26	IDEXX LABORATORIES, INC.	Inv# 3153054257	Generated by reorder 4/10/24 8	$864.56		
118668	2024-06-26	IDEXX LABORATORIES, INC.	Inv# 3153054257	Shipping	$114.91		
	Total for Check:	118668				$979.47	$14,659.89
118669	2024-06-26	INDUSTRIAL METAL SUPPLY CO.	Inv# 2519329	Metal to Fabricate a Motor Sta	$1,262.74		
118669	2024-06-26	INDUSTRIAL METAL SUPPLY CO.	Inv# 2519329	Discount	($11.61)		
	Total for Check:	118669				$1,251.13	$5,583.77
118670	2024-06-26	INGERSOLL-RAND INDUSTRIAL U.S., INC.	Inv# 26961097	Generated by reorder 4/10/24 6	$413.25		
118670	2024-06-26	INGERSOLL-RAND INDUSTRIAL U.S., INC.	Inv# 26961097	Freight	$13.83		
118670	2024-06-26	INGERSOLL-RAND INDUSTRIAL U.S., INC.	Inv# 26963122	Generated by reorder 10/26/23	$2,114.10		
118670	2024-06-26	INGERSOLL-RAND INDUSTRIAL U.S., INC.	Inv# 26963122	Freight	$46.08		
	Total for Check:	118670				$2,587.26	$4,682.49
118671	2024-06-26	INTERA INCORPORATED	Inv# 04-24-47	Apr24 Alamitos GAP grndwtr.mod	$21,205.76		
	Total for Check:	118671				$21,205.76	$155,387.76
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118162143.001	1-1/2" 316 SS Pipe for Slide A	$1,763.06		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118162143.001	S&H	$27.18		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118162143.001	Discount	($32.42)		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118162143.002	1-1/2" 316 SS Pipe for Slide A	$587.67		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118162143.002	Discount	($10.81)		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118222970.001	PRV- ROC Flow Meter JSMITH	$422.99		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118222970.001	S&H	$15.51		
118672	2024-06-26	IRVINE PIPE & SUPPLY CO	Inv# S118222970.001	Discount	($7.78)		
	Total for Check:	118672				$2,765.40	$99,170.88
118673	2024-06-26	KDC SYSTEMS	Inv# 35476	1551	$12,465.01		
118673	2024-06-26	KDC SYSTEMS	Inv# 35475	FHQ PLC upgrade	$10,420.00		
	Total for Check:	118673				$22,885.01	$329,563.94
118674	2024-06-26	KONICA MINOLTA BUSINESS SOLUTIONS USA IN	Inv# 294013638	BPO COPY CHARGES	$61.30		
	Total for Check:	118674				$61.30	$630.43

Orange County Water District

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Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118675	2024-06-26	LANCE, SOLL & LUNGHARD, LLP	Inv# 63446	2023 457 Def comp & MPP	$4,899.00		
	Total for Check:	118675				$4,899.00	$57,252.00
118676	2024-06-26	LHOIST NORTH AMERICA	Inv# 1102411241	5/28 24.48 ton lime	$10,970.96		
	Total for Check:	118676				$10,970.96	$1,544,874.76
118677	2024-06-26	LILLESTRAND LEADERSHIP CONSULTING	Inv# 8012	5/21-23, 5/29-30 leadership co	$2,406.25		
	Total for Check:	118677				$2,406.25	$39,647.50
118678	2024-06-26	MAKAI SOLUTIONS	Inv# SD1578	Vehicle lift repair	$395.93		
	Total for Check:	118678				$395.93	$395.93
118679	2024-06-26	MESA WATER DISTRICT	Inv# SALES2659	brackish groundwater F.S.	$50,000.00		
	Total for Check:	118679				$50,000.00	$50,000.00
118680	2024-06-26	METTLER-TOLEDO	Inv# 655295855	Maintenance Equipment	$3,671.62		
	Total for Check:	118680				$3,671.62	$3,967.24
118681	2024-06-26	MYBINDING, LLC	Inv# SI2893295		$256.54		
	Total for Check:	118681				$256.54	$256.54
118682	2024-06-26	Miller, Liam	Inv# JAN 21-JUN 20, 2024 STIPE (5)	1/21-6/20/24 stipends	$200.00		
	Total for Check:	118682				$200.00	$680.00
118683	2024-06-26	NAPA/ORANGE COUNTY AUTO PARTS	Inv# 714631	BPO AUTO PARTS	$123.98		
118683	2024-06-26	NAPA/ORANGE COUNTY AUTO PARTS	Inv# 714631	Discount	($2.48)		
	Total for Check:	118683				$121.50	$4,029.99
118684	2024-06-26	NATIONAL WATER SUPPLY ALLIANCE	Inv# 10051	Membership Jul24 - Jun25	$5,000.00		
	Total for Check:	118684				$5,000.00	$5,000.00
118685	2024-06-26	NEARMAP US INC	Inv# INV01361367	Nearmap aerial imagery renewl	$3,200.00		
	Total for Check:	118685				$3,200.00	$3,200.00
118686	2024-06-26	NEW PIG CORPORATION	Inv# 24339327-00	Generated by reorder 4/10/24 1	$1,585.58		
118686	2024-06-26	NEW PIG CORPORATION	Inv# 24339327-00	Freight	$58.61		
	Total for Check:	118686				$1,644.19	$1,644.19
118687	2024-06-26	O'Toole, Kevin	Inv# DEC 13-JUN 12 STIPENDS stipends (6)	12/13/23-6/12/24	$240.00		
	Total for Check:	118687				$240.00	$1,100.00

Orange County Water District

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Begin Date: 2024-06-20 **End Date:** 2024-06-26

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Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007498698.002	ELECTRICAL SUPPLIES	$31.33		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007498698.002	Discount	($0.29)		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007516017.001	ELECTRICAL SUPPLIES	$127.35		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007516017.001	Discount	($1.17)		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007516017.002	ELECTRICAL SUPPLIES	$32.47		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007516017.002	S&H	$9.25		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007516017.002	Discount	($0.30)		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007517910.001	Generated by reorder 6/12/24 1	$780.85		
118688	2024-06-26	ONESOURCE DISTRIBUTORS INC.	Inv# S007517910.001	Discount	($7.18)		
	Total for Check:	118688				$972.31	$215,782.13
118689	2024-06-26	ORACLE AMERICA, INC	Inv# 100675753	JDE Update, License, Support	$17,555.78		
	Total for Check:	118689				$17,555.78	$72,366.22
118690	2024-06-26	Okey, Brian M.	Inv# FEB 6-JUN 5, 2024 STIPEND (4)	2/6-6/5/24 stipends	$120.00		
	Total for Check:	118690				$120.00	$330.00
118691	2024-06-26	PACIFIC HYDROTECH CORPORATION	Inv# 7 SA-2022-1	Prog.Pmt#7 SA-2022-1	$396,895.75		
	Total for Check:	118691				$396,895.75	$7,837,450.65
118692	2024-06-26	AMERICAN BUSINESS BANK	Inv# ESC 8799804 RET#7	Ret#7 P.Hydro SA-2022-1	$20,889.25		
	Total for Check:	118692				$20,889.25	$99,660.46
118693	2024-06-26	PACWEST SECURITY SERVICES	Inv# OC37387	Jun24 security service	$34,500.73		
	Total for Check:	118693				$34,500.73	$415,131.20
118694	2024-06-26	PAPER RECYCLING & SHREDDING SPECIALIST	Inv# 569414	Box Destruction	$832.00		
118694	2024-06-26	PAPER RECYCLING & SHREDDING SPECIALIST	Inv# 575246	ON-SITE SHREDDING	$288.00		
	Total for Check:	118694				$1,120.00	$3,307.00
118695	2024-06-26	PRECISION SOLUTIONS INTERNATIONAL LLC	Inv# 6261	Assistance with JD Edwards	$77.50		
	Total for Check:	118695				$77.50	$16,980.00
118696	2024-06-26	PROMEGA CORPORATION	Inv# 91817562	R&D lab supplies JANA S.	$6,295.54		
118696	2024-06-26	PROMEGA CORPORATION	Inv# 91817562	R&D lab supplies JANA S.	$1,259.33		
118696	2024-06-26	PROMEGA CORPORATION	Inv# 91817562	R&D lab supplies JANA S.	$1,259.32		
	Total for Check:	118696				$8,814.19	$8,814.19

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118697	2024-06-26	Pannu, Meeta	Inv# JAN-JUN 2024 STIPENDS	Jan-Jun24 stipends (6)	$240.00		
118697	2024-06-26	Pannu, Meeta	Inv# JUL-DEC23 STIPENDS DEDUCT	Jul-Dec23 stipends deduction	($40.00)		
118697	2024-06-26	Pannu, Meeta	Inv# JUNE 13, 2024 TRAVEL ACE24	6/13 Anaheim AWWA	$53.24		
	Total for Check:	118697				$253.24	$1,820.02
118698	2024-06-26	Price, Rebecca	Inv# JAN 9-JUN 8, 2024 SIIPEND (5)	1/9-6/8/24 stipends	$194.31		
	Total for Check:	118698				$194.31	$667.70
118699	2024-06-26	QUINN COMPANY	Inv# PC830422126	BPO EQUIPMENT & SUPPLIES	$741.15		
	Total for Check:	118699				$741.15	$2,105,859.08
118700	2024-06-26	RA AUTOMOTIVE SOFTWARE SOLUTIONS INC	Inv# 3732	Heavy Duty Vehicle Inspection	$500.00		
118700	2024-06-26	RA AUTOMOTIVE SOFTWARE SOLUTIONS INC	Inv# 3732	Heavy Duty Vehicle Inspection	$336.00		
	Total for Check:	118700				$836.00	$836.00
118701	2024-06-26	RED WING SHOE CO. INC.	Inv# 789-1-64377	BPO WORK BOOTS	$160.20		
118701	2024-06-26	RED WING SHOE CO. INC.	Inv# 789-1-64377	BPO WORK BOOTS	$39.80		
118701	2024-06-26	RED WING SHOE CO. INC.	Inv# 789-1-64595	BPO WORK BOOTS	$200.00		
	Total for Check:	118701				$400.00	$13,470.64
118702	2024-06-26	INTERSTATE BILLING SERVICE, INC.	Inv# 3037663966	BPO TRUCK PARTS	$91.48		
	Total for Check:	118702				$91.48	$12,591.64
118703	2024-06-26	S & P GLOBAL RATINGS	Inv# 11475678	Surv 05.01.24-04.30.25	$5,000.00		
	Total for Check:	118703				$5,000.00	$5,000.00
118704	2024-06-26	SCHEEVEL ENGINEERING, LLC	Inv# 1586	May24 Upper SAR survey	$18,900.00		
	Total for Check:	118704				$18,900.00	$58,200.00
118705	2024-06-26	SMBC C/O CITIBANK, NA NEW YORK	Inv# 6215	4/1-06/30/24 LG/MIS/NY 088214	$62,318.22		
	Total for Check:	118705				$62,318.22	$251,229.32
118706	2024-06-26	SNAP-ON INDUSTRIAL	Inv# ARV61351863		$1,376.66		
	Total for Check:	118706				$1,376.66	$21,219.40
118707	2024-06-26	SOCIAL AND ENVIRONMENTAL ENTREPRENEURS	Inv# 0000224	CADC FY 24-25 Memb	$16,500.00		
	Total for Check:	118707				$16,500.00	$35,000.00

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118708	2024-06-26	SOLTIS AND COMPANY, INC.	Inv# 8639	1258	$4,503.58		
118708	2024-06-26	SOLTIS AND COMPANY, INC.	Inv# 8640	1258	$3,000.00		
118708	2024-06-26	SOLTIS AND COMPANY, INC.	Inv# SD1510	ON-CALL LANDSCAPE SERVICE	$280.00		
	Total for Check:	118708				$7,783.58	$135,629.00
118709	2024-06-26	SPARKLETTS DS WATER OF AMERICA LP	Inv# 6144555 060724	BPO WATER DELIVERY	$49.96		
118709	2024-06-26	SPARKLETTS DS WATER OF AMERICA LP	Inv# 6144555 060724	BPO WATER DELIVERY	$9.00		
	Total for Check:	118709				$58.96	$9,074.87
118710	2024-06-26	CHARTER COMMUNICATIONS	Inv# 0043285061324	05/22/2024 to 06/21/2024	$3,462.15		
	Total for Check:	118710				$3,462.15	$44,857.02
118711	2024-06-26	STANTEC CONSULTING INC. (SCI)	Inv# 2239578	Thru 5/3 PFAS S.A. 31 wo#3	$12,766.98		
118711	2024-06-26	STANTEC CONSULTING INC. (SCI)	Inv# 2239579	Thru 5/3 PFAS S.A.27-28 wo#3	$42,202.67		
	Total for Check:	118711				$54,969.65	$1,382,993.53
118712	2024-06-26	SUPERIOR SWEEPING LTD.	Inv# 337-0624	BPO STREET SWEEPING	$495.00		
	Total for Check:	118712				$495.00	$5,940.00
118713	2024-06-26	TANKNOLOGY, INC.	Inv# 1975412	3-year and annual underground	$783.50		
	Total for Check:	118713				$783.50	$4,089.50
118714	2024-06-26	THE NELAC INSTITUTE	Inv# 6554	Conference payment	$9,595.00		
	Total for Check:	118714				$9,595.00	$10,195.00
118715	2024-06-26	THE PRINTERY INC	Inv# 141284	Generated by reorder 5/14/24 8	$1,808.34		
	Total for Check:	118715				$1,808.34	$10,118.18
118716	2024-06-26	THE REGENTS OF THE UNIVERSITY OF CA	Inv# 8782CA0060	1286	$4,894.24		
118716	2024-06-26	THE REGENTS OF THE UNIVERSITY OF CA	Inv# 8782CA0061	1286	$13,226.98		
	Total for Check:	118716				$18,121.22	$185,652.10
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1337929	BPO FORD PARTS	$486.92		
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1337929	Freight	$27.00		
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1338633	BPO FORD PARTS	$405.88		
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1338633	Freight	$27.00		
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1338722	BPO FORD PARTS	$112.62		
118717	2024-06-26	TOM'S TRUCK CENTER, INC	Inv# 1338722	Freight	$27.00		
	Total for Check:	118717				$1,086.42	$49,390.37

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #		Purpose	Invoice Amount	Check Amount	FYTD
118718	2024-06-26	TROPICAL PLAZA NURSERY, INC.	Inv# 2750	1255		$3,771.87		
118718	2024-06-26	TROPICAL PLAZA NURSERY, INC.	Inv# 2750	1255		$549.96		
	Total for Check:	118718					$4,321.83	$94,019.83
118719	2024-06-26	UNDERGROUND SERVICE ALERT	Inv# 23-2425885			$302.06		
118719	2024-06-26	UNDERGROUND SERVICE ALERT	Inv# 520240500		UOCINO1 New Ticket Charges	$904.25		
	Total for Check:	118719					$1,206.31	$13,976.90
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190178624		1557	$280.43		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190178624		1557	$0.62		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179718		1557	$52.70		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179719		1557	$16.77		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179720		1557	$299.00		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179721		1557	$10.78		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179722		1557	$433.93		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179723		1557	$118.80		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2190179724		1557	$16.83		
118720	2024-06-26	UNIFIRST CORPORATION	Inv# 2200139896		1557	$38.08		
	Total for Check:	118720					$1,267.94	$29,525.76
118721	2024-06-26	UNIVAR SOLUTIONS USA	Inv# 52186394		6/19 23.187 ton sulfuric acid	$5,240.26		
118721	2024-06-26	UNIVAR SOLUTIONS USA	Inv# 52186394		discount	($104.81)		
118721	2024-06-26	UNIVAR SOLUTIONS USA	Inv# 52190382		6/19 23.216 ton sulfuric acid	$5,246.82		
118721	2024-06-26	UNIVAR SOLUTIONS USA	Inv# 52190382		discount	($104.94)		
	Total for Check:	118721					$10,277.33	$633,363.21
118722	2024-06-26	UTILIQUEST LLC	Inv# 334509-Q		5/19-25 screen/mark pipes	$1,927.96		
118722	2024-06-26	UTILIQUEST LLC	Inv# 334509-Q		5/19-25 screen/mark pipes	$405.12		
118722	2024-06-26	UTILIQUEST LLC	Inv# 334509-Q		5/19-25 screen/mark pipes	$16.68		
	Total for Check:	118722					$2,349.76	$103,721.04
118723	2024-06-26	VALIN CORPORATION	Inv# 3664128		Seals for Cartridge Filters (O	$235.17		
118723	2024-06-26	VALIN CORPORATION	Inv# 3664128		Freight out	$15.26		
118723	2024-06-26	VALIN CORPORATION	Inv# 3664128		Discount	($2.16)		
118723	2024-06-26	VALIN CORPORATION	Inv# 3664128		Freight in	$22.07		
	Total for Check:	118723					$270.34	$9,904.87
118724	2024-06-26	VHG LABORATORIES INC.	Inv# 105277037		Supplies	$658.00		

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
118724	2024-06-26	VHG LABORATORIES INC.	Inv# 105277037	Freight	$42.00		
	Total for Check:	118724				$700.00	$798.00
118725	2024-06-26	VWR INTERNATIONAL LLC	Inv# 8816174916		$1,296.47		
118725	2024-06-26	VWR INTERNATIONAL LLC	Inv# 8816186128		$169.39		
118725	2024-06-26	VWR INTERNATIONAL LLC	Inv# 8816186129	Lab Supplies	$317.60		
	Total for Check:	118725				$1,783.46	$114,978.67
118726	2024-06-26	WAVELENGTH AUTOMATION, INC.	Inv# 56335	SUBSCRIPTION TO CAPITOL TRACK	$2,148.00		
118726	2024-06-26	WAVELENGTH AUTOMATION, INC.	Inv# 56335	July 2024- May 2025	$1,969.00		
118726	2024-06-26	WAVELENGTH AUTOMATION, INC.	Inv# 56335	June 2024	$179.00		
118726	2024-06-26	WAVELENGTH AUTOMATION, INC.	Inv# 56335		($2,148.00)		
	Total for Check:	118726				$2,148.00	$2,148.00
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942330	6/10 5034 gal s.hypochlorite	$8,668.04		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942330	CA Mill	$182.03		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942330	discount	($173.36)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942331	6/10 5099 gal s.hypochlorite	$8,779.97		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942331	CA Mill	$184.38		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942331	discount	($175.60)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942333	6/10 4873 gal s.hypochlorite	$8,390.82		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942333	CA Mill	$176.21		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942333	discount	($167.82)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942356	6/10 4848 gal s.hypochlorite	$8,347.77		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942356	CA Mill	$175.30		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942356	discount	($166.96)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942457	6/11 5046 gal s.hypochlorite	$8,688.71		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942457	CA Mill	$182.46		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942457	discount	($173.77)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942458	6/11 5043 gal s.hypochloirite	$8,683.54		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942458	CA Mill	$182.35		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942458	discount	($173.67)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942459	6/11 4833 gal s.hypochlorite	$8,321.94		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942459	CA Mill	$174.76		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942459	discount	($166.44)		

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942460	6/11 4831 gal s.hypochlorite	$8,318.50		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942460	CA Mill	$174.69		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942460	discount	($166.37)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942688	6/13 4851 gal s.hypochlorite	$8,352.94		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942688	CA Mill	$175.41		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942688	discount	($167.06)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942689	6/13 4810 gal s.hypochlorite	$8,282.34		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942689	CA Mill	$173.93		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942689	discount	($165.65)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942690	6/13 4853 gal s.hypochlorite	$8,356.38		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942690	CA Mill	$175.48		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942690	discount	($167.13)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942691	6/13 4917 gal s.hypochlorite	$8,466.58		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942691	CA Mill	$177.80		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942691	discount	($169.33)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942830	6/14 5115 gal s.hypochlorite	$8,807.52		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942830	CA Mill	$184.96		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942830	discount	($176.15)		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942831	6/14 4998 gal s.hypochlorite	$8,606.06		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942831	CA Mill	$180.73		
978441	2024-06-20	JCI JONES CHEMICAL, INC	Inv# 942831	discount	($172.12)		
	Total for Check:	978441				$119,190.17	$2,467,281.84
978442	2024-06-20	U.S. BANK N.A. MINNESOTA-PARS	Inv# PARS Q4 APR-JUN24	OPEB Trust Contribution	$160,000.00		
	Total for Check:	978442				$160,000.00	$640,000.00
978443	2024-06-20	McLaughlin, Brooke	Inv# CK#2361	Final PR CK#2361	$2,104.95		
	Total for Check:	978443				$2,104.95	$4,218.81
978444	2024-06-20	McLaughlin, Brooke	Inv# CK#2362	Final PR C.K#2362	$2,113.86		
	Total for Check:	978444				$2,113.86	$4,218.81
978445	2024-06-20	CALIFORNIA DEPARTMENT OF TAX & FEE ADMIN	Inv# 024-792532 Q2 PP#2 #07010	Use Tax 024-792532	$1,569.00		
	Total for Check:	978445				$1,569.00	$30,929.00
978446	2024-06-25	WELLS FARGO BANK	Inv# JUNE 26, 2024 #6527	Jun 26,24 PR#13 #6527	$35,092.86		
	Total for Check:	978446				$35,092.86	$25,037,482.87

Orange County Water District

Check Register

Begin Date: 2024-06-20 **End Date:** 2024-06-26

Accounts Payable Check Register Presented for Board Ratification and/or Approval

Check No.	Date	Vendor Name	Invoice #	Purpose	Invoice Amount	Check Amount	FYTD
978447	2024-06-25	WELLS FARGO BANK	Inv# JUNE 26, 2024 #6911	Jun 26, 24 PR#13 #6911	$910,492.86		
	Total for Check:	978447				$910,492.86	$25,037,482.87
978448	2024-06-25	WELLS FARGO BANK	Inv# JUNE 26, 2024 GARNABF GarnABF	Jun 26, 24 PR#13	$1,790.30		
	Total for Check:	978448				$1,790.30	$25,037,482.87
978449	2024-06-26	FIDELITY INVESTMENTS	Inv# JUNE 26, 2024 401A	Jun 26, 24 PR#13 401a	$238,095.03		
	Total for Check:	978449				$238,095.03	$4,185,713.81
978450	2024-06-26	FIDELITY INVESTMENTS	Inv# JUNE 26, 2024 457B	Jun 26, 24 PR#13 457b	$97,767.11		
	Total for Check:	978450				$97,767.11	$1,702,717.26
978451	2024-06-26	MILLER, TENIA R.	Inv# CK#2363	Final PR CK#2363	$719.12		
	Total for Check:	978451				$719.12	$719.12
Run Date:	***6/25/2024***				**$6,898,434.64**	**$6,898,434.64**	

AGENDA ITEM SUBMITTAL

Meeting Date: July 03, 2024

To: Board of Directors

From: John Kennedy

Staff Contact: G. Ayala/D. Berch

Budgeted: Yes
Budget Amount: $87,500
Cost Estimate: $92,500
Funding Source: 1012.51112
Program/Line Item No. 1206
General Counsel Approval: N/A
Engineers/Feasibility Report Approved: N/A
CEQA Compliance: N/A

SUBJECT: CHILDREN'S WATER EDUCATION FESTIVAL PAYMENT OF EVENT CONTRACT WITH UNIVERSITY OF CALIFORNIA, IRVINE

SUMMARY

The Orange County Water District (OCWD) hosted the 27th annual Children's Water Education Festival in March 2024 at the University of California, Irvine (UCI). Final pricing from UCI exceeded the amount previously approved by the Board. The Communications and Legislative Liaison Committee requested a letter be sent to UCI's Chancellor highlighting that OCWD is a public, not-for-profit government agency hosting a free educational event for Orange County students and that UCI consider supporting this educational endeavor by lowering costs. However, OCWD Director Erik Weigand recommended that in lieu of sending the letter, OCWD continue meeting with the Vice Chancellor to discuss increased support from UCI. At this time, staff request approval of an additional $5,000 to cover the full amount owed to UCI.

RECOMMENDATION

Approve an additional expenditure of up to $5,000, for an amended total of $92,500, to the University of California, Irvine for hosting the 2024 Children's Water Education Festival.

DISCUSSION/ANALYSIS

Background

The Children's Water Education Festival, started in 1997, is an annual program educating Orange County's youth about the importance of water. Over 150,000 students have participated since its inception. The event is free and open to all third, fourth, and fifth-grade classes in Orange County, California. Since 2013, the Festival has been held at UC Irvine, accommodating over 7,500 students and 1,600 teachers, presenters, and volunteers annually. UCI staff provide crucial support, and feedback on the event and location is consistently positive.

Budget and Cost Increase

The Festival is a budgeted expense ($265,000 for FY 2023-24), with one of the largest costs being the venue rental. In August 2023, the Board approved $85,700 for UCI's facilities, based on the previous year's costs plus a 5% increase as a buffer. The UCI fee includes five-day usage, outdoor/indoor space, parking, event/parking/maintenance staff, labor, facility maintenance (trash cans, trash removal, landscaping, barricades, etc.). However, the final price was higher due to increased parking costs. The specific reasons for this increase include:

- **Set up day parking change**: In prior years, presenters could drive directly onto the event grounds to unload their vehicles at no cost. UCI did not allow this in 2024, and presenters were forced to park in the parking lot. This increased the number of parking permits charged to OCWD.

- **Event day parking change**: In prior years, event day vehicle parking was charged as a partial lot buy out. However, in 2024 UCI changed their billing procedure and OCWD was charged per vehicle. This change increased our costs.
- **School bus parking increase**: OCWD rents an entire parking lot for school buses on Wednesday and Thursday. The price difference for this rental from 2023 to 2024 was more than $7,000.
- **Increased parking rate**: Vehicle parking rates rose from a daily parking fee of $13 in 2023 to a $20 special event fee in 2024; a 65% increase. Over the three-day period, there were more than 750 vehicles.

On June 6, 2024, the Communications and Legislative Liaison Committee requested a letter be sent to UCI's Chancellor highlighting that OCWD is a public, not-for-profit government agency hosting a free educational event for Orange County students and that UCI consider lowering costs to support this educational endeavor on its campus. The Committee also requested that staff consult with Board Member Erik Weigand regarding this direction as Director Weigand has been leading the effort to enhance the partnership with UCI and bring down the event cost to OCWD. Instead of a letter, Director Weigand recommended continuing meetings with the Vice Chancellor to discuss increased support from UCI.

Venue Research and Selection
Staff researched alternative locations for the 2024 Festival, including Irvine Great Park, Orange County Fairgrounds, and Mile Square Park. However, none met the Festival's requirements or were available. Thus, UCI remained the best option for the 2024 event.

Future Planning
To prevent similar issues in the future, staff are exploring several additional venues for the 2025 Festival that are willing and able to host the event. Concurrently, Director Weigand and staff continue to work with UCI's Vice Chancellor to increase collaboration with UCI departments and gain possible sponsorships. This proactive approach aims to ensure cost efficiency, while maintaining the high standards of the Festival.

PRIOR RELEVANT BOARD ACTION(S)

8/16/2023, R23-8-101 Approve Children's Water Education Festival Location and Service Contracts

AGENDA ITEM SUBMITTAL

Meeting Date: July 3, 2024

To: Board of Directors

From: John Kennedy

Staff Contact: L. Haney

Budgeted: Yes
Budgeted Amount: $520,000 (Year 1)
Cost Estimate: $545,000 (Year 1)
Funding Source: 1044.53001
Program/Line Item No. N/A
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: FINAL PHASE: IMPLEMENTING FORECAST INFORMED RESERVOIR OPERATIONS (FIRO) AT PRADO DAM

SUMMARY

The recently completed Forecast Informed Reservoir Operations (FIRO) Study showed that FIRO is viable at Prado Dam and can yield significant additional recharge to the groundwater basin. Implementing FIRO at Prado Dam will take approximately five years and will require additional support from the Center for Western Weather and Water Extremes (CW3E)/ UC San Diego/ Scripps Institution of Oceanography to refine decision support tools and develop a habitat assessment tool. This final implementation step will establish the standard operating procedure for Prado Dam, optimizing stormwater capture while maintaining flood control.

Attachment(s):

- Proposal from the Center for Western Weather and Water Extremes (CW3E)/ UC San Diego/Scripps Institution of Oceanography for Forecast Informed Reservoir Operations (FIRO) at Prado Dam: Implementation Support (3 Years)
- Proposal from Apex Environmental & Water Resources for Integrated Environmental Modeling for Increased Water Conservation (1 Year)

RECOMMENDATIONS

1) Authorize entering into an agreement with UC San Diego/Scripps Institute of Oceanography for Implementation of Forecast Informed Reservoir Operations at Prado Dam: Implementation Support and approve the 3-year budget not to exceed $1,398,000; and,
2) Authorize entering into a sole source agreement with Apex Environmental & Water Resources for Integrated Environmental Modeling for Increased Water Conservation for an amount not to exceed $100,000.

BACKGROUND/ANALYSIS

OCWD has a long history of working with the US Army Corps of Engineers (USACE) to temporarily impound stormwater behind Prado Dam for water conservation. Over the

last 25 years, OCWD has captured and recharged an average of 55,000 acre-feet per year (afy) of stormwater with a maximum of 117,000 acre-feet (af) in 1995.

To increase stormwater capture, OCWD and the USACE have worked since the late 1960s to increase the maximum storage volume that can be temporarily stored behind the dam. In April 2021, the maximum level of the water conservation pool was raised from an elevation of 498 feet in the storm season (Oct-Feb) to 505 feet. Now water can be temporarily impounded up to an elevation of 505 feet in both the non-storm (March-Sept) and storm seasons (Oct-Feb). The storage volume at elevation 505 feet is approximately 20,000 af.

Multi-Phase Forecast Informed Reservoir Operations (FIRO) Study

To explore the potential for increased stormwater capture, the Board approved a Multi-Phase Study on FIRO at Prado Dam in collaboration with the Center for Western Weather and Water Extremes (CW3E) at the Scripps Institution of Oceanography in 2017. This study marked the second FIRO pilot study in the country, following the initial one conducted at Lake Mendocino on the Russian River. Concurrently, additional FIRO studies are in progress throughout California, including at Lake Sonoma, Lake Oroville, New Bullards Bar Dam, Seven Oaks Dam and at Howard Hansen Dam in Washington.

In summary, FIRO is a flexible water management strategy that uses data from watershed monitoring and modern weather and hydrologic forecasting to help water managers selectively retain or release water from reservoirs in a manner that reflects current and forecasted conditions. FIRO uses emerging science and technology to optimize limited resources and adapt to changing climate conditions.

Final Viability Assessment (FVA) of FIRO at Prado Dam

The culmination of the FIRO Study was the completion of the Final Viability Assessment (FVA) in November 2023 (Prado FIRO Final Viability Assessment). The FVA assessed whether higher water conservation pool elevations could be safely managed to provide further water supply reliability benefits for Orange County without compromising the primary flood risk management purpose of the dam.

Key findings presented in the FVA include:

- FIRO strategies can successfully enhance recharge for OCWD.
- On average, FIRO strategies from elevation 510 feet to 512 feet are estimated to yield 4,000 to 6,000 afy of additional groundwater recharge over existing operations (i.e., 505 feet).
- Additional monitoring and operational triggers are needed to further study impacts and adjust water levels as needed for habitat and nesting season protection during FIRO operations.

The FVA also contained the following key recommendations:

- Maximum water conservation pool elevations of 510 to 512 feet should be explored.

- The decision support tools (DST) developed by CW3E and the USACE must continue to be developed and tested to support the final implementation of FIRO at Prado Dam.
- Expand the existing environmental monitoring program above 505 feet to identify potential environmental impacts and, as needed, implement an adaptive management program to offset FIRO impacts.

FIRO Implementation Roadmap

The roadmap to implementing FIRO at Prado Dam involves the completion of several key activities as shown in Figure 1.

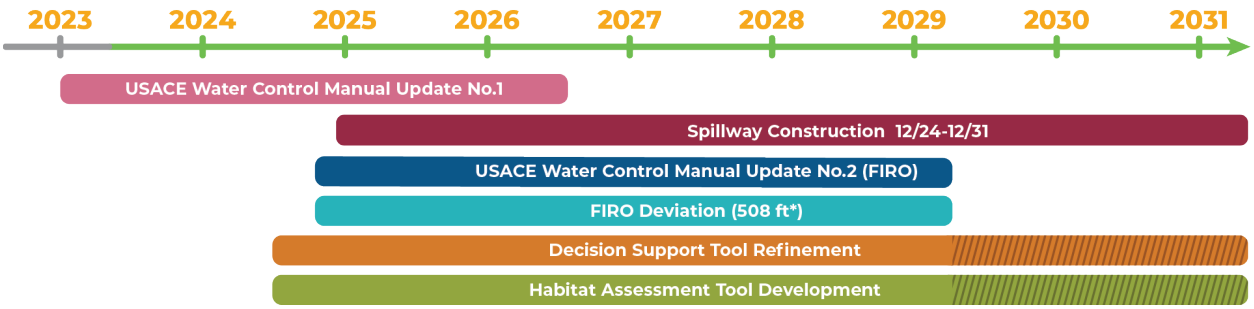


Figure 1. FIRO Implementation Roadmap and Schedule

Water Control Manual Update No. 1 and No. 2

The ultimate objective of this program is to incorporate FIRO into the USACE's Prado Dam Water Control Manual (WCM), which describes the rules the USACE follows in operating Prado Dam. The USACE is currently working to complete WCM Update No. 1 which addresses the increased discharge capacity of the dam from 10,000 cubic feet per second (cfs) to 30,000 cfs. This is expected to be completed by July 2026.

Water Control Manual Update No. 2 is solely to incorporate FIRO into the WCM. This update cannot be implemented until WCM Update No. 1 is completed in 2026; however, work will proceed in planning for Update No. 2 so it can be implemented as soon as possible.

The USACE estimates it will cost $1,000,000 to complete WCM Update No. 2. It has already received $540,000 in its FY24 budget and will request additional federal funding to complete the update in the future. The current target time frame for completing WCM Update No. 2 is March 2029 (see Figure 1).

FIRO Deviation

OCWD is working with the USACE to process a FIRO Deviation to increase the water conservation pool to an elevation of 508 feet for five years. OCWD has provided

$245,000 in funding to support the USACE in processing this deviation and expects to have the deviation in place by fall 2024.

There are multiple reasons for seeking a FIRO Deviation.

- The first is to test FIRO at an intermediate elevation, continue developing decision support tools and forecast tools specific to Prado Dam operations, and develop assessment tools to better understand how FIRO may affect the habitat behind Prado Dam.

- The second reason is to act as a bridge until WCM Update No. 2 is implemented. Five years was selected to provide sufficient time for wet years to occur to test FIRO. Based on FVA modeling, raising the water conservation pool elevation to 508 feet will provide an average of 2,000 afy of additional recharge to the groundwater basin.

Decision Support Tool Refinement and Apex Prado Basin Digital Twin Environmental Scope of Work and Budget

During the FIRO Study, CW3E and the USACE developed specific weather forecasting tools for Prado Dam that have proven useful and are used by the USACE Los Angeles District Reservoir Regulation staff. These tools need further refinement based on FIRO Deviation experience, aiming for their incorporation into the USACE's Corps Water Management System (CWMS).

One challenge in implementing FIRO at Prado Dam is understanding the various factors affecting habitat health behind the dam. Increased inundation from water conservation activities can impact habitat health, but other factors such as groundwater levels, Santa Ana River baseflow, and temperature also play roles. Currently, no method exists to distinguish the effects of water conservation from other factors, nor is there a science-based metric to measure these effects.

The previously used "Stacked Cube Method" for assessing habitat suitability has been found ineffective by both the Orange County Water District (OCWD) and the US Fish and Wildlife Service (USFWS). In the Biological Opinion for the FIRO 508 Deviation, the USFWS requires OCWD to develop a new approach to understanding the critical factors affecting habitat health and the Least Bell's Vireo population. Staff hypothesizes that increased water conservation may be enhancing habitat and Vireo carrying capacity within Prado Basin. As OCWD seeks higher elevations for water conservation and updates the water control manual with the Corps, it becomes important to develop a method to accurately quantify inundation effects on the Prado riparian habitat and the Least Bell's Vireo population.

To comply with the BO requirement, OCWD is taking a two-pronged approach: conducting rigorous field inspections along pre-agreed transects to document habitat changes over time and working with the USFWS to develop a multi-parameter digital twin environmental model to identify the specific effects of water conservation on Least Bell's Vireo habitat and carrying capacity in Prado Basin. Data from field inspections will

be used to validate the model output as well as CW3E model independent validation work.

This initiative aims to develop a comprehensive understanding of water inundation effects behind Prado Dam and their impact on the Least Bell's Vireo habitat through advanced environmental modeling and predictive analytics. The project involves collecting and evaluating data from diverse sources, including LiDAR, aerial imaging, satellite data, historical water elevation records, weather parameters, shallow groundwater elevations, and habitat condition data. This data will be used to develop a holistic model, serving as a digital twin of Prado Basin, integrating historical weather forecasts, decades of OCWD ecological monitoring data, and aerial imaging of stormwater retention. Based on recorded data, this model will enhance accuracy in reflecting days of inundation and assess other factors contributing to habitat degradation unrelated to water conservation. Distinguishing between water conservation effects and other impacts on habitat health will directly influence mitigation requirements for past and future water conservation efforts.

Methodology:

- Integrate historical data on habitat conditions and species dynamics in Prado Basin.
- Investigate the effects of prolonged stormwater retention on habitats and the Least Bell’s vireo species.

Predictive Analysis:

- Leverage machine learning and artificial intelligence to identify patterns and trends in habitat changes.
- Develop a predictive analysis model to anticipate future scenarios and potential impacts on critical species and their habitats.

Anticipated Outcomes:

- Quantifiable assessment of the impacts or benefits of water conservation on habitats and species, particularly the Least Bell's Vireo in Prado Basin.
- Development of a robust, data-driven framework for quantifying past elevation effects over time to determine if mitigation was needed.
- Enhanced understanding of ecological responses to groundwater levels.
- Empowerment of decision-makers with data-driven tools for informed permit formulation and implementation requirements.

Future development opportunities of the model if continued beyond year 1:

- Utilize the model as a digital twin to understand how future reductions in Santa Ana River base flows may affect water supply over time and develop informed support metrics to help prioritization of projects listed in the OCWD Resiliency Plan.

- Utilize the model as a digital twin to understand how future reductions in Santa Ana River base flows may affect the function of Prado wetlands based on water availability. The design and maintenance of the future vision of the constructed wetlands will be dependent on the amount of water available to support the size and number of constructed ponds.
- Assess sediment removal efforts and their associated effects on the Prado Basin, including the rate and spatial settlement of sediment over time. This can be used as a planning tool for water conservation and sediment removal compliance strategic planning, and protection of infrastructure like the River Road bridge and the Inland Empire Brine line.

This project represents a significant advancement in integrating technological innovation with environmental management. By developing predictive environmental models, we will be able to navigate the complex confounding factors of water management and habitat conservation, ensuring compliance with regulatory mandates while promoting sustainable ecological outcomes.

The estimated budget for Apex is $100,000 for a 1-year contract and is part of the FIRO requirement to have a robust scientific metric to evaluate habitat condition as it relates to water conservation efforts. It also serves as a platform tool in which to build additional uses for multiple departments across the agency including Planning, Natural Resources, Operations, GIS, and Hydrogeology. Should the tool and proof of concept be successful, the digital twin could be further developed to inform decisions in planning the future of the wetlands, water supply, and the development of OCWD's sediment strategic planning efforts.

See the attached proposal for more information on each task and deliverables for the first-year proof of concept digital twin development.

CW3E Scope of Work and Budget

CW3E has provided a scope of work and budget to support FIRO implementation over the next three years (July 2024 to June 2027). Four main tasks, along with specific deliverables, have been identified in collaboration with OCWD and USACE staff. In summary, the tasks include the following:

Task 1: Reconstitute Leadership Team and Associated Activities

Reform leadership team based on needs for implementation, track progress, plan and lead Steering Committee (SC) meetings once per year and as needed. Also, hold technical workshops as needed to plan and organize upcoming work; working sessions for workgroups, and other side meetings as needed to ensure cross-team coordination and follow-up / prepare for SC meetings. Maintain and update project timeline with OCWD staff; tracking action items and ensuring follow-up and completion of action items; technical writing (fact sheets, drafting, and editing documents), maintaining a Prado Dam project website and SharePoint site; CW3E management staff support and associated travel, including participation in water agency meetings, and providing

briefings as appropriate. On-call assistance will be provided between meetings to ensure close communication.

Task 2: Support FIRO Implementation

USACE will consider FIRO tool recommendations from the FVA as they proceed with the Prado Dam Water Control Manual update (WCM Update #2). The preferred FIRO modeling approach in the FVA will be considered and likely refined along with other alternatives. This task will enable improvements to the FVA recommended FIRO tools to support water managers in making discharge decisions. Investigation will continue to determine the appropriate maximum water conservation buffer pool. The water control plan within WCM update #2 will identify the appropriate buffer pool elevation, and how USACE LA District will make operational release decisions.

Task 3: Support During Water Year Operations

Decision support tools (e.g., Ensemble Forecast Operations (EFO), Atmospheric River (AR) forecast tools) will be made available from CW3E to provide FIRO modeling support to guide water control decisions. These tools enhance situational awareness of incoming significant ARs and related extreme precipitation, as well as provide outputs to assist with reservoir operations management. The EFO will be run in real-time throughout the period of performance of this project.

Task 4: Habitat Modeling

The Prado Dam FIRO viability assessment has produced significant work on environmental considerations related to FIRO. This task will continue to cultivate the environmental work team to implement monitoring and mitigation recommendations, track monitoring results, identify further actions needed, and continue to build on the positive relationships that have been established with the U.S. Fish and Wildlife Service (USFWS). CW3E will participate in environmental work team meetings to maintain relationships and ensure follow-through on FIRO related to environmental considerations (meetings to be held at least twice per year).

As part of the USFWS Biological Opinion for the Prado Dam Deviation 508 ft, OCWD will implement a new program that monitors changes in the Vireo habitat. CW3E will contribute to this program by developing a verification prototype machine learning model to assess the accuracy of the Apex digital twin. Both the Army Corps and US Fish and Wildlife requested a third-party research-based team to validate the tool development process and incorporate the AI weather forecasting tools that CW3E has already developed. The verification model will be developed in collaboration with OCWD, USFWS, Army Corps, and Apex. The proposed methods include decision tree-based algorithms such as random forest and gradient-boosted decision trees, as well as neural networks and long short-term memory networks (LSTM), a type of recurrent neural network. After training and calibrating each machine learning model on observational data, the accuracy of the trained models will be assessed against out-of-sample or independent subsets of the data. Meetings will be held to coordinate with stakeholders on model development (one meeting) and model visualization (one

meeting), as well as online meetings to quality control, process data and communicate progress on model development amongst teams.

Progress toward identifying the physical drivers of extreme precipitation in the PVA phase at Prado led to an improved understanding of regional meteorological conditions and their influences on water supply, habitat, and flood hazards. The continued effort in the FVA phase has led to improvements in the predictability of extreme events at the relevant temporal and spatial scales for operational water management at Prado Dam. See the attached proposal for more information on each task and deliverables.

The estimated three-year budget for these tasks is presented in Table 1. The overall FIRO Project budget with work conducted to date and future work is summarized in Table 2.

Table 1:
CW3E FIRO Implementation Project Budget

Task	**Year 1 ($)**	**Year 2 ($)**	**Year 3 ($)**
1: Leadership Team and Associated Activities	40,000	43,000	47,000
2: Support FIRO implementation	135,000	140,000	145,000
3: Support during water year operations	110,000	115,000	120,000
4: Environmental Team and Associated Activities	160,000	168,000	175,000
Total (Tasks 1, 2, 3, and 4)	**445,000**	**466,000**	**487,000**

Table 2:
FIRO Study and Implementation Project Budget

Task	Activity	OCWD Contribution	Federal Contribution
Phase I Scoping Study	Scoping Study, Develop FIRO Viability Assessment Work Plan Outline, Preliminary Technical Studies	$295,000(1)	
Phase II Scoping Study	Complete FIRO Viability Assessment Work Plan, Continue Technical Studies	$325,000	
Phase III FIRO Study	Prepare Preliminary FIRO Viability Assessment Report	$291,000	
Phase IV FIRO Study	Prepare Final FIRO Viability Assessment Report and Peer Review	$306,000	$7,000,000(2)
Phase V FIRO Study	Conduct FIRO Deviation to Elevation 508 feet msl	$265,000	
FIRO Deviation	Provide Funding to USACE to process FIRO Deviation (3)	$245,000	
Subtotal of Work Completed	**Work completed as of July 2024**	**$1,727,000**	**$7,000,000**
Water Control Manual Update No. 2	Update of Water Control Manual by USACE to incorporate FIRO	$0	$1,000,000(4)
Implementation Task 1	Leadership Team and Associated Activities	$130,000	
implementation Task 2	Support FIRO Implementation, Decision Support Tools	$420,000	
Implementation Task 3	Provide Support During Water Year Operations	$345,000	
Implementation Task 4	Develop Habitat Assessment Tool to satisfy USFWS requirements.	$503,000	
Subtotal: Implementation	**Work Remaining to Implement FIRO**	**$1,398,000**	**$1,000,000**
Grand Total	**Total Estimated Cost**	**$3,125,000**	**$8,000,000**

(1) Includes $45,000 to USACE to be part of National FIRO Program.
(2) Estimated contribution from National USACE FIRO Program due to Prado Dam Pilot Study Status.
(3) Includes $30,000 provided to the USACE in June 2024 to complete FIRO Deviation.
(4) USACE estimates $1,000,000 to complete Water Control Manual Update. $540,000 funding has already been received by USACE. USACE will request additional federal funding in the future.

Sole Source Justification for Apex to Develop the Digital Twin of Prado Basin

Introduction

This provides a justification for the sole source procurement of Apex to develop the digital twin of Prado Basin. The purpose of this justification is to explain why Apex is uniquely qualified for this project and why a competitive bidding process is not feasible or in the best interest of the project.

Project Background

The Prado Basin is a critical water management area, requiring a sophisticated and highly accurate digital twin to model its hydrological and ecological dynamics. The digital twin will be essential for enhancing flood management, water resource planning, and environmental conservation efforts. Given the complexity and critical nature of this project, it is imperative to engage a vendor with specific expertise and experience in AI models related to the environment, not engineered systems, and for the purpose of regulatory compliance.

Unique Qualifications of Apex

a. Apex possesses specialized expertise in developing digital twins for water management systems. Their team includes hydrologists, ecologists, and data scientists with extensive experience in similar environmental-based projects. This makes them uniquely equipped to address the ecological aspects of the Prado Basin. CW3E lacks expertise in environmental data types and habitat AI models, requiring Apex's specialized knowledge to effectively integrate weather data with habitat information.

b. Apex has a proven track record of successfully implementing AI technology for large-scale water management projects. Their previous work has demonstrated their ability to deliver high-quality, reliable models that meet the stringent requirements of regulatory based projects.

c. Apex utilizes proprietary technology and methodologies that are not available from other vendors. Their advanced algorithms and data integration techniques provide a level of accuracy and functionality that is unique in the industry.

d. Apex has a deep understanding of the Prado Basin’s unique characteristics, existing environmental studies, and curation of needed data from the region to build a digital twin. This prior knowledge significantly reduces the learning curve and ensures that the project can proceed efficiently and effectively.

e. The Center for Western Weather and Water Extremes (CW3E) supports working with Apex on this project. CW3E's endorsement underscores

Apex's capability and reliability, as CW3E is a respected authority in the field of water resource management and weather extremes. This partnership will enhance the project's credibility and effectiveness.

Benefits of Sole Source Procurement

a. Engaging Apex through a sole-source procurement process ensures continuity and efficiency. Given their existing familiarity with the project requirements and the basin's specific needs, Apex can commence work immediately without the delay associated with onboarding a new vendor. The long-term benefits and cost savings from reduced project delays, rework, and errors justify this approach.

b. Apex is offering a special pricing package for the first year to collaborate with OCWD. They recognize that AI and digital twins are new technologies that need time and trust to be fully embraced, which they aim to build through their proof-of-concept approach. Apex's proven methodologies and expertise in this field will minimize the risk of costly overruns and ensure timely project completion.

c. The specialized nature of Apex's services ensures a high-quality outcome that meets the project's stringent requirements. Their proprietary technologies and expert team will deliver a digital twin that satisfies all specified performance and accuracy criteria for both the Army Corps and US Fish and Wildlife.

Conclusion

Apex is uniquely positioned to develop the digital twin of Prado Basin due to its specialized expertise, proven track record, proprietary technology, deep understanding of the project area, and the support of CW3E. A competitive bidding process is not feasible as no other vendor can match Apex's qualifications and readiness to deliver the required outcomes. Therefore, a sole source procurement is justified.

Recommendation

Staff recommends that Apex be awarded the sole source contract to develop the digital twin of Prado Basin. This decision will ensure that the project benefits from the highest level of expertise and efficiency, ultimately supporting the effective management and conservation of the Prado Basin and the investment OCWD has already committed to the FIRO development process.

PRIOR RELEVANT BOARD ACTIONS

6/19/24, R24-6-65 - Authorize approval of the Fourth Amended Cooperative Research and Development Agreement with the United States Army Corps of Engineers for the Review and Processing of Water Control Plan Deviation for Forecast Informed Reservoir Operations (FIRO) for Prado Dam, California subject to approval as to form

and content by District's General Counsel, for an additional $30,000 for a total amount not to exceed $245,000.

3/15/23, R23-3-32 - Authorize amending agreement with UC San Diego/Scripps Institution of Oceanography by adding $265,000 for Phase V, Implementation Support for Forecast Informed Reservoir Operations at Prado Dam.

3/15/23, R23-3-29 - Authorize approval of Third Amended Cooperative Research and Development Agreement with the United States Army Corps of Engineers for Forecast Informed Reservoir Operations Study that provides a no-cost schedule extension to March 31, 2027.

6/15/22, R22-6-78 - Authorize amending agreement with UC San Diego/Scripps Institution of Oceanography by adding an amount not to exceed $265,000 to complete Phase IV of Study on Forecast-Informed Reservoir Operations at Prado Dam.

3/16/22, R22-3-24 – Authorize approval of the Second Amended Cooperative Research and Development Agreement with the United States Army Corps of Engineers for the Forecast Informed Reservoir Operations Study subject to approval as to form and content by District's General Counsel, for an additional $120,000 for a total amount not to exceed $215,000 to fund Army Corps staff time in reviewing and processing the deviation and Authorize approval of agreement with Q3 Consulting to perform hydrologic modeling to support the Corps evaluation of the deviation at Prado Dam for an amount not to exceed $35,280.

9/15/21, R21-9-131 – Authorize the General Manager to request that the United States Army Corps of Engineers review and process a proposed deviation to the Prado Dam Water Control Plan and authorize Amended Cooperative Research and Development Agreement with the United States Army Corps of Engineers for the Forecast Informed Reservoir Operations Study for an amount not to exceed $95,000.

2/17/21, R21-2-27 - Authorize amending agreement with UC San Diego/Scripps Institution of Oceanography by adding an amount not to exceed $291,000 for Phase IV of Study on Forecast-Informed Reservoir Operations at Prado Dam and Authorize reimbursing three independent reviewers at $5,000 each for an independent review of the Prado FIRO Preliminary Viability Assessment for a total amount not to exceed $15,000.

1/22/20, R20-1-9 - Authorize amending agreement with UC San Diego/Scripps Institution of Oceanography by adding an amount not to exceed $291,000 for Phase III of Study on Forecast-Informed Reservoir Operations at Prado Dam.

10/17/18, R18-10-146 - Approve Phase II FIRO Scoping Study with Scripps Institution of Oceanography; Authorize amending agreement with Scripps Institution of Oceanography by adding an amount not to exceed $325,000 for Phase II

1/17/18, R18-1-5 – Authorize execution of an agreement with the United States Army Corps of Engineers for the Forecast Informed Reservoir Operations study for an amount not to exceed $45,000.

6-21-2017, R17-6-90 - Authorize execution of an agreement for Phase I of a Scoping Study on Forecast-Informed Reservoir Operations (FIRO) at Prado Dam with UC San Diego/Scripps Institution of Oceanography for an amount not to exceed $250,000; and, Authorize the District's Membership and Participation in the Subseasonal-to-Seasonal Precipitation Coalition, which is at no cost to the District.

PROPOSAL TO ORANGE COUNTY WATER DISTRICT (OCWD)

Forecast-Informed Reservoir Operations at Prado Dam:
Implementation Support

PI: F. Martin Ralph, Ph.D.
Center for Western Weather and Water Extremes (CW3E)
Scripps Institution of Oceanography, University of California San Diego

Period of performance: July 1, 2024 – June 30, 2027

1. Overview and Purpose

The Center for Western Weather and Water Extremes proposes technical, scientific, and communications support to pursue the implementation of forecast-informed reservoir operations (FIRO) at Prado Dam. This proposal describes the work that will be undertaken following recommendations in the Prado Dam FIRO Final Viability Assessment (FVA) published in November 2023, to move the FIRO process forward. These are the five major objectives of the proposed activities:

1. Support the successful implementation of the FIRO Deviation (508' deviation).
2. Provide support to develop tools integrated with the Corps Water Management System (CWMS) model.
3. Develop the necessary training and FIRO-related decision support tools to support the FIRO implementation led by the United States Army Corps of Engineers (USACE) Los Angeles (LA) District.
4. Establish the monitoring needed to support the adjustments of the FIRO implementation. Those include a possible increase of the conservation pool elevation to account for climate change and habitat objectives, and the development of prototype machine learning (ML) models to assess the impact of watershed inundation on the Vireo habitat behind Prado Dam.
5. Provide support on weather and streamflow predictions over the Santa Ana River watershed and generate ensemble forecast operations (EFO) simulations to support water control decision-making processes.

2. Summary of Progress to Date

The FIRO project has explored the potential for Prado Dam to provide enhanced opportunities for additional groundwater recharge. The approved Prado Basin feasibility study supported a change to the buffer pool from 498 to 505 feet. There is a pending deviation to further increase the buffer pool to 508 feet. This deviation to 508 feet (also called "FIRO Deviation") is anticipated to expire around the time of the completion of WCM update #2. The recently completed FIRO FVA also recommends an investigation of the buffer pool elevation going up to 510 feet (and possibly 512 feet) which would support a change to the water control plan contained in WCM update #2. With the buffer pool elevation up to 510 or 512 feet, resulting in an average annual increase of 4,000-6,000 acre-feet of groundwater recharge and up to 23,000 acre-feet of additional recharge during a wet year could be possible. Implementing FIRO at Prado Dam would result in a significant boost to the water supply, valued at millions of dollars, as well as improving the water control decisions made to maximize flood risk management.

These are the FVA key findings:

- FIRO strategies can successfully enhance recharge for OCWD.
- On average, FIRO strategies from elevation 510 feet to 512 feet are estimated to yield 4,000 to 6,000 acre-feet per year of additional groundwater recharge over existing operations (505 feet buffer pool). Increasing the buffer pool elevation to 520 feet yields an average of 12,000 acre-feet of recharge annually, but is impractical given that the Corona Airport is impacted at 514 feet.
- Over the range of the hindcast period (1990–2019) and for scaled events (100-, 200-, and 500-year three-day volume), FIRO strategies (Ensemble Forecast Operations and Simpler Ensemble Forecast Operations) have a slight positive impact on flood risk management outcomes associated with reservoir spill and releases in excess of channel capacity for all buffer pools tested up to 520 feet.
- The change in the inundation frequency of Corona Municipal Airport (514 feet) for Ensemble Forecast Operations and Simpler Ensemble Forecast Operations with buffer pools up to 512 feet is insignificant when compared to baseline WCM operations.
- Data suggests that wetter conditions improve the Vireo habitat. Except for the understory, data does not indicate irreparable forest damage from prolonged inundation. Additional monitoring and operational triggers are needed to further study these impacts and adjust water levels as needed for the protection of the habitat and nesting during FIRO operations.

Based on the work conducted for the FVA, the Prado Dam Steering Committee (SC) made the following recommendations:

- Buffer pools of 510 ft to 512 ft should be explored during the FIRO Deviation period before WCM update #2.
- Steering Committee involvement should continue throughout the FIRO Deviation period and through the finalization of the updated WCM #2.
- Decision support tools must be adaptive to future improvements in forecast skills and infrastructure. Elements of the Decision Support Systems (DSS) should be developed and tested during the FIRO Deviation implementation period.
- AR tools, observations, and precipitation forecast products should be leveraged to support real-time operations at Prado Dam.
- Work to evaluate potential improvements and advances in meteorological and hydrologic forecasting models should continue for additional FIRO benefit.

USACE LA District will consider the FVA recommendations while updating the Prado Dam Water Control Plan, a key component of the WCM, which governs the operation of Prado Dam. Figure 1 below shows the timeline that includes the FIRO Deviation implementation period, the completion of the two planned WCM updates (post-FVA in the overall FIRO process), spillway construction, decision support tool refinement, and habitat assessment tool development. Note that two WCM updates are planned for Prado Dam. WCM update #1 addresses the increased maximum discharge capacity of the Prado Dam outlet and the downstream channel (30,000 cfs). WCM update #2 will include a formal consideration of FIRO. During the FIRO Deviation operations period (prior to WCM update #2), work will continue to refine the FIRO approach and gain experience with buffer pools greater than 505 feet. The FIRO

Deviation will be in place for a period of 5 years, which is anticipated to be long enough to allow completion and implementation of WCM Update #2.

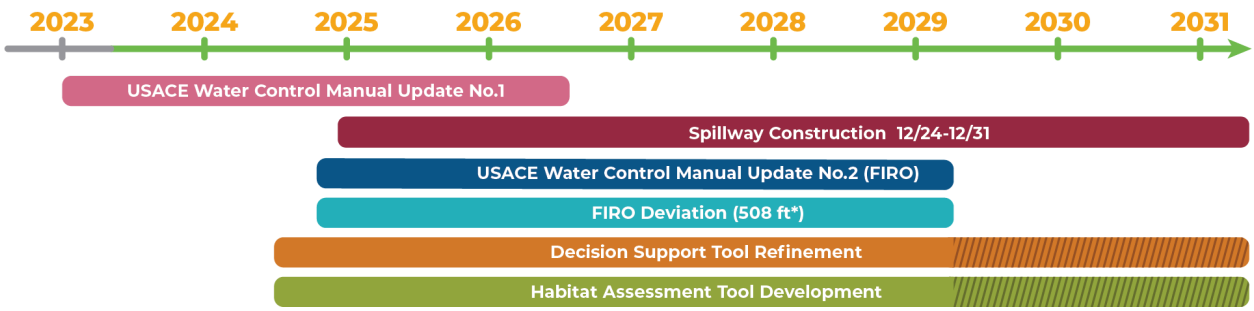


Figure 1 Prado Dam FIRO WCM update and implementation timeline.

3. Technical Approach

Task 1: Reconstitute Leadership Team and Associated Activities

This task supports the efforts of F. M. Ralph, who co-chairs the SC, and support staff. Key areas of responsibility include tracking progress, planning and executing meetings of the FIRO-SC (including agenda development, note taking, and facilitation); formation of a leadership team and adjustments to SC membership as needed; prep calls in between SC meetings and between leadership team meetings as needed; technical workshops as needed to plan and organize upcoming work; working sessions for workgroups and other side meetings as needed to ensure cross-team coordination and follow-up / prepare for upcoming FIRO-SC meetings; maintaining and updating the project timeline with OCWD staff; tracking action items and ensuring follow-up and completion of action items; technical writing (fact sheets, drafting, and editing documents), maintaining a Prado Dam project website and SharePoint site; CW3E management staff support and associated travel, including participation in water agency meetings, and providing briefings as appropriate. On-call assistance is provided between meetings to ensure close communication.

Over the next three years, CW3E will continue to support USACE LA District's efforts toward WCM update #2 that leverage outcomes from and insight gained through the FVA, and with the implementation of the FIRO Deviation operation. Specifically, the following activities will be undertaken:

a. Meetings of the full SC (to be held once per year, but remote meetings can also be added if needed). Update Terms of Reference to reflect post-FVA goals.
b. Leadership team meetings (co-chairs plus USACE leadership and others as needed) to focus on key policy issues and pivot points in technical tasks including input on the WCM update (to be held quarterly).

Deliverables

Year 1, Year 2, and Year 3

One SC per year and four Leadership Meetings per year.

Task 2: Support FIRO Implementation

USACE will consider FIRO tool recommendations from the FVA as they proceed with the Prado Dam Water Control Manual update (WCM Update #2). The preferred FIRO modeling approach in the FVA will be considered and likely refined along with other alternatives. This task will enable improvements to the FVA-recommended FIRO tools to support water managers in making discharge decisions. Investigation will continue to determine the appropriate maximum water conservation buffer pool (i.e., 510 or 512 feet). The water control plan within WCM update #2 will identify the appropriate buffer pool elevation, and how USACE LA District will make operational release decisions. To that end, the following subtasks will be performed:

- Task 2.1 Integration of the EFO into CWMS. CW3E will assist and collaborate with the USACE LA District to complete this integration by Year 3 of this project. This will allow for the water manager to have alternative FIRO model output other than the EFO to consider and compare, which will help refine water control decisions. The selection of release alternatives will be accompanied by probabilistic information about expected reservoir levels as well as flows/stages downstream given the current ensemble forecasts. The CWMS is the official modeling tool used by USACE to support its water control management mission. The CWMS modeling suite incorporates essential models such as the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS), Reservoir System Simulation (HEC-ResSim), River Analysis System (HEC-RAS), and Flood Impacts Analysis (HEC-FIA). The Control and Visualization Interface (CAVI) within CWMS ensures quality assurance and control of monitoring data and forecast modeling, aiding in decision-making processes. Figure 2 shows a schematic of the integration of the EFO within the CWMS framework.

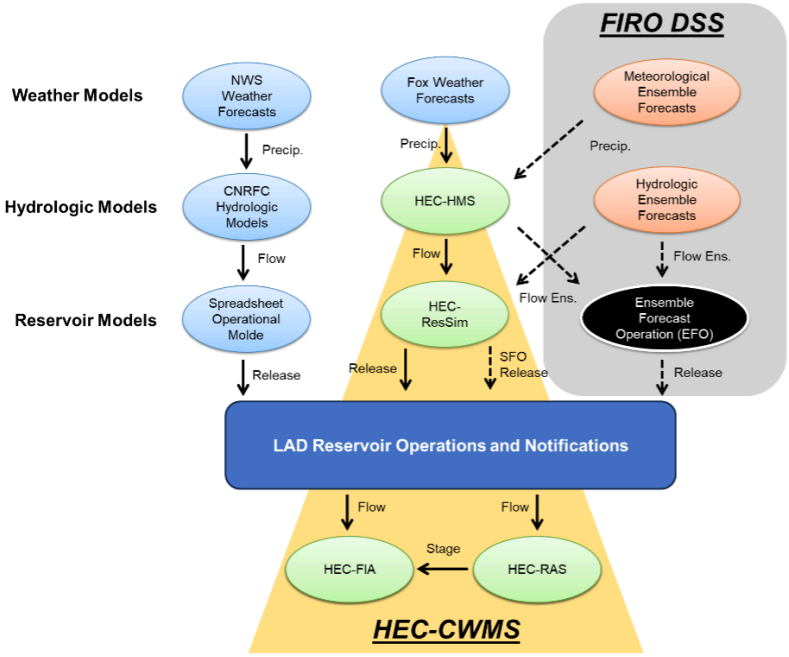


Figure 2 Proposed integration of EFO functionality into the CWMS.

The following activities will be included in this subtask:

- Year 1

        - *Project Initialization:* Form project team, define roles, and develop project plan. *Data Management and Integration:* Set up centralized databases, automate data collection and processing, and develop data retrieval mechanisms. *Model Development:* coordinate with HEC to enable HEC-ResSim Simpler Forecast Operations (SFO), initiate standalone EFO model development, and plan integration with CWMS. *User Interface and Visualization:* Design preliminary UI for EFO dashboard.
    - Year 2
        - *EFO Model Integration Phase:* Enhance EFO model functionality, implement integration with CWMS, and conduct preliminary testing. *Robustness Testing:* Test modified HEC-ResSim with historical data, conduct robustness testing of WCM alternatives, and simulate extreme flood events. *Operational Trials:* Implement operational trials and gather feedback for model and interface refinement.
    - Year 3
        - *EFO Model Completion Phase:* Finalize EFO model development, refine integration with CWMS, conduct full testing and validation, and prepare for deployment. *System Refinement:* Refine WCP alternatives, ensure system robustness and reliability, and deploy system for full-scale operational use. *Documentation:* Prepare EFO manual and comprehensive documentation for the integrated system.
- Task 2.2 The following three features will be added to the EFO:
    - Year 1
        - Feature #1: adding a third objective elevation to the EFO. While the Corona Airport (514') and Prado Spillway (currently 543') are critical levels for the EFO model, it has become clear that adding a third objective elevation, the maximum buffer pool (FIRO Deviation 508'), would be an effective approach. This would provide the benefit of pre-releasing water in advance of forecasted storms to minimize the level of encroachment above elevation 508 ft after a storm, thus minimizing the need to make larger flood risk management releases to evacuate water that could exceed the maximum buffer pool. This additional objective could be easily changed in the future based on the final water conservation buffer pool elevation determined for Prado Dam.
        - Feature #2: adding a deterministic forecast scenario to the EFO. As discussed in the Decision Support Tool workshops conducted by CW3E for the Final Viability Assessment, USACE LA District uses the CNRFC deterministic streamflow forecasts to support real time operations. A deterministic forecast scenario will be included in the EFO model as an added release option for USACE LA District to consider during real time operations for additional situational awareness. Deterministic scenarios could also be included with the alternative operations for the higher water conservation buffer pool elevation scenarios to compare simulated water management option outcomes.
    - Year 2
        - Feature #3: SFO model. Coordinate as needed with the USACE on refinements needed to the SFO model to keep it comparable to the EFO. The goal is to have parallel models, EFO and SFO, using the same CNRFC input and providing real-time operations output.
- Task 2.3 Training:
    - Technical workshop to be held each year at the beginning of the wet season (e.g., in October) to familiarize the USACE LA District with the several DSTs and forecasts products available on CW3E website, including introduction on new products that may have not been available the previous year.

- Training on the EFO new features introduced during this project (see bullets above); this will start in Year 2 and will be scheduled once per year, likely in October, but additional training may be required if there will be significant updates to the EFO implementation within the CWMS framework.

Deliverables

Year 1

Task 2.1

Established centralized database for ensemble support and ensemble simulations and SFO by HEC-ResSim.

Task 2.2

Implement Features #1 and #2.

Task 2.3

Technical workshop on CW3E DSTs and web forecast products.

Year 2

Task 2.1

Integrated and tested EFO model with CWMS.

Task 2.2

Implement Feature #3.

Task 2.3

Technical workshop on CW3E DSTs and web forecast products.
Training on EFO new features.

Year 3

Task 2.1

Fully developed and integrated EFO model within CWMS, supported by comprehensive documentation and training materials.

Task 2.3

Technical workshop on CW3E DSTs and web forecast products.
Training on EFO new features.

Task 3: Support During Water Year Operations

Decision support tools (e.g., EFO DST, AR forecast tools) will be made available from CW3E to provide FIRO modeling support to guide water control decisions. These tools enhance situational awareness of incoming significant ARs and related extreme precipitation, as well as provide outputs to assist with reservoir operations management. The EFO will be run in-real time throughout the period of performance of this project.

Specifically, the following are activities that will be executed during each year of this 3-year agreement.

a. Continue to develop a real-time operational EFO model to support FIRO implementation at Prado Dam.
b. Conduct meteorological briefings to support and assist USACE LA District with reservoir operational and water management decisions. These briefings will be conducted prior to a significant precipitation event and will include a description of numerical weather prediction products and web-based decision support tools that have been developed for directed and purposeful interactions

with water managers and users of forecast information. This includes a training session for selected staff (see Task 2.3).

c. Continued development of the water control DST for the FIRO Deviation (508' buffer pool) with EFO model runs and accompanying weather forecast tools (e.g., landfall tool and CW3E's Weather Research and Forecast atmospheric model tailored for the prediction of ARs over the Western US – West-WRF).

Deliverables

Year 1, Year 2, and Year 3

Real time operations support with the EFO.
Meteorological briefings for significant AR events potentially impactful for the Santa Ana River watershed.

Task 4: Modeling support for integrated habitat tool development

The Prado Dam FIRO viability assessment has produced significant work on environmental considerations related to FIRO. This task will continue to cultivate the environmental work team consisting of OCWD, USACE, and USWFS staff, to implement monitoring and mitigation recommendations, track monitoring results, identify further actions needed, and continue to build on the positive relationships that have been established with U.S. Fish and Wildlife Service (USFWS). CW3E will participate in environmental work team meetings to maintain relationships and ensure follow-through on FIRO related to environmental considerations (meetings to be held four times in the first year and twice per year after that).

As part of the USFWS Biological Opinion for the FIRO Deviation (508 ft), OCWD will implement a new program that monitors changes in the Vireo habitat, based on the growing season (leaf-out) and days of inundation annually, by elevation band. CW3E will contribute to this program by developing prototype ML models to assess the impact of watershed inundation on Vireo habitat behind Prado Dam. A proof of concept of the model that will be developed in collaboration with OCWD and USFWS will be delivered by September 1st, 2024. Figure 3 depicts an outline of the proposed ML framework, illustrating major meteorological (Fig. 3a), hydrological stressors (Fig. 3b), and biological stressors (Fig. 3c). These stressors will be derived from available data sources including temperature, humidity, precipitation (both satellite and in situ measurements), inflow and outflow at Prado Dam, groundwater elevations, and vegetation data. Also, biological stressors and their variability will be considered in this study, given their importance for the response of Vireo. Using these stressors for model training, various ML models will be tested, as shown in Fig. 3d. The proposed methods include decision tree-based algorithms such as random forest and gradient-boosted decision trees, as well as neural networks and long short-term memory networks (LSTM), a type of recurrent neural network. The key variables of interest that will be estimated by the ML models for a given set of inputs (Figs. 3a, 3b, and 3c) are the OCWD Vireo population and distribution (Fig. 3e). After training and calibrating each ML model on observational data, the accuracy of the trained models will be assessed against out-of-sample or independent subsets of the data. The ML methods proposed, such as the decision tree-based algorithms (Fig. 3f), are particularly suitable for applications requiring model interpretability, as in this case for identifying key stressors and quantifying their impacts on Vireo habitat (Fig. 3g). The best-performing, multi-parameter prototype ML model(s) can then be utilized to quantify the impact of forecasted inundation on Vireo habitat in real-time.

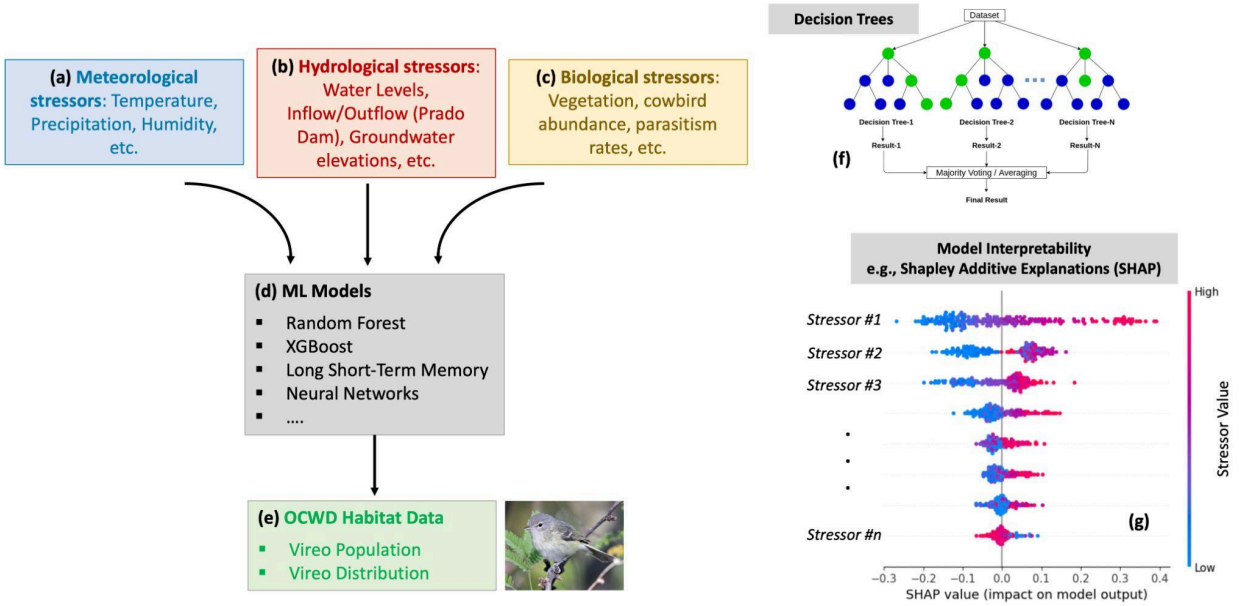


Figure 3 Proposed machine learning (ML) methodology to evaluate the impact of watershed inundation on Vireo habitat.

CW3E will assess requirements and data inputs and then begin the development of habitat ML models in Year 1, develop and test a prototype in Year 2, and develop model output visualization in Year 3. Meetings will be held to coordinate with stakeholders on model development (one meeting) and model visualization (one meeting), as well as online meetings to quality control, process data and communicate progress on model development amongst teams. The following highlights the main steps involved in the development of the habitat tool over OCWD:

- Year 1: In collaboration with OCWD and USFWS develop a proof of concept of the ML- based habitat modeling capability. Develop a project plan that includes gathering requirements via meetings and interviews of sponsors and end-users, collection of all relevant data sets, quality control of data sets, formatting of data for input to ML models, selection of training, validation, and testing periods. Start the development and testing of ML models.
- Year 2: Continue the development and testing of ML models. Iteratively build the best-performing model. Start developing visualization techniques for use-case with examples.
- Year 3: Implement model visualization for application in real-time and hand-over user interface to OCWD.

Deliverables

Year 1

Proof of concept of the ML-based habitat modeling capability (due on September 1st, 2024; developed in collaboration with OCWD and USFWS).
Report to OCWD on the initial progress and development of the ML model aimed at assessing impact of watershed inundation on Vireo habitat.
Demo of preliminary capability.
Four meetings with the Environment Work Team.

Year 2

One peer-reviewed publication on developed ML method for the habitat model.

Demo of refined capability.
Two meetings with the Environment Work Team.

Year 3

Implementation of the ML-based habitat tool for near real-time applications (via CW3E website).
Demo of near real-time capability.
Two meetings with the Environment Work Team.

4. Budget and Period of Performance

Estimated costs for people, travel, supplies relevant to Tasks 1 to 4 described above; executed over 3 years with a period of performance from July 1, 2024 to June 30, 2027. Total funding request is $1,398,000.

Table 1 Budget estimate by task and year.

Task	**Year 1 ($)**	**Year 2 ($)**	**Year 3 ($)**
1: Leadership Team and Associated Activities	40,000	43,000	47,000
2: Support FIRO implementation	135,000	140,000	145,000
3: Support during water year operations	110,000	115,000	120,000
4: Modeling support for integrated habitat tool development	160,000	168,000	175,000
Total (Tasks 1, 2, 3, and 4)	**445,000**	**466,000**	**487,000**

Appendix

Background

The ~6900 km^2 Santa Ana River watershed flows from the San Gabriel, San Bernardino, and San Jacinto Mountains to its terminus at the Pacific Ocean (see Figure 4, below). These mountains form a barrier to moisture transport in winter storms, including from atmospheric rivers (ARs), and force moist flow upward to generate clouds and precipitation. Rainfall accumulation during several extreme events each winter season accounts for 40 to 50 percent of annual precipitation, with large inter-annual variability in total precipitation arising due primarily to differences in AR activity. Thus, these relatively infrequent extreme events contribute significantly to flood hazards and water supply within the Santa Ana River watershed.

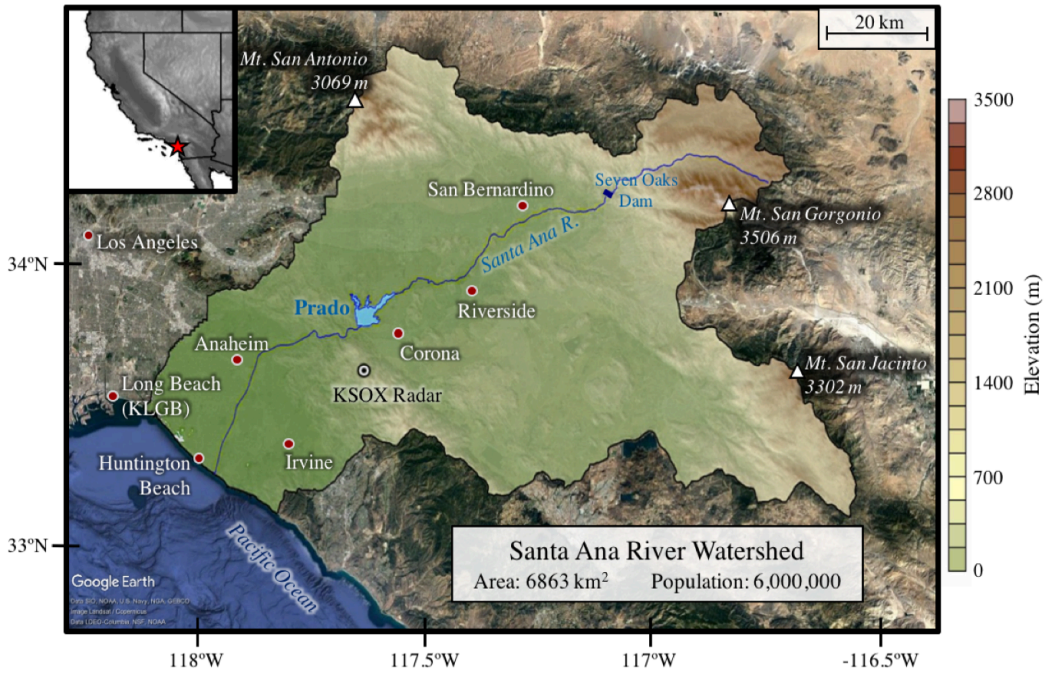
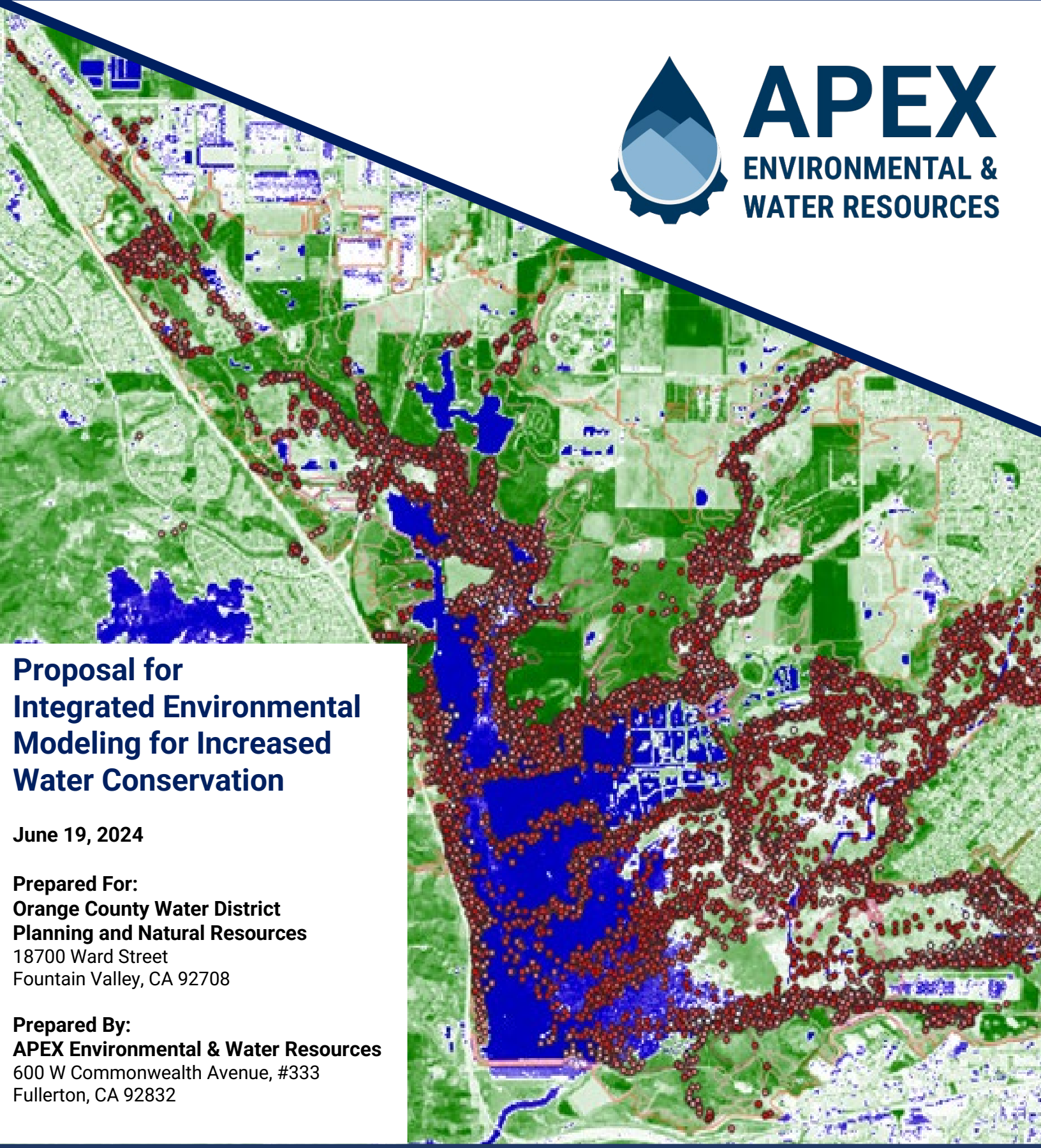


Figure 4 Santa Ana Watershed in Southern California

USACE operations at Prado Dam have historically accounted for such storms, but recent advances in understanding ARs, the physical mechanisms that generate precipitation in the watershed, and how to better predict them yield the potential to enhance water supply reliability and flood control capacity at the dam. This project builds on a decade of science to understand ARs formation and evolution and their impact on the U.S. West Coast, and on experience in developing the concept of FIRO at Lake Mendocino in the Russian River and New Bullards Bar and Oroville Dams in the Yuba-Feather River system.

Progress toward identifying the physical drivers of extreme precipitation in the PVA phase at Prado led to improved understanding of regional meteorological conditions and their influences on water supply and flood hazards. The continued effort in the FVA phase has led to improvements in the predictability of extreme events at the relevant temporal and spatial scales for operational water management at Prado Dam.

APEX
ENVIRONMENTAL &
WATER RESOURCES



Proposal for Integrated Environmental Modeling for Increased Water Conservation

June 19, 2024

Prepared For:
Orange County Water District
Planning and Natural Resources
18700 Ward Street
Fountain Valley, CA 92708

Prepared By:
APEX Environmental & Water Resources
600 W Commonwealth Avenue, #333
Fullerton, CA 92832

APEX Environmental & Water Resources

The Leader in Application of AI for Environmental & Water Management
Bridging the Water industry with Tech Through Innovative AI, Automation & BI solutions

600 W Commonwealth Avenue, #333, Fullerton, CA 92832; (949) 491-3049; www.apexewr.com

APEX
ENVIRONMENTAL &
WATER RESOURCES

Ms. Lisa Haney
Executive Director
Planning and Natural Resources
Orange County Water District
18700 Ward Street,
Fountain Valley, CA 92708

June 19, 2024

Proposal For
Integrated Environmental Modeling for
Increased Water Conservation

Prado Basin Habitat Area
Orange County Water District

Dear Ms. Haney:

The Orange County Water District (OCWD) Planning and Natural Resources Department must be commended for their insightful recognition of the value and potential of Artificial Intelligence (AI) and technological advances for environmental and water management. APEX Environmental & Water Resources, LLC (APEX) is pleased to submit this proposal, drawing upon our knowledge of the local issues. With our partners NOAH Global Solutions, LLC (NOAH) and Aqaix, two technology pioneers in water industry, we have assembled an exceptional team of engineers, developers, data scientists, hydrogeologists, and biologists—all dedicated to achieving the main objective of this project: understanding the effects of water inundation and other factors from Prado Dam operations (water conservation and flood control) on wildlife's habitat in the Prado Basin, particularly the Least Bell's Vireo. Engaging APEX will ensure OCWD benefits from:

- **In-Depth Local Understanding:** Our team's longstanding work within Orange County has granted us an intimate knowledge of the region's environmental intricacies. This local expertise ensures tailored, context-aware solutions to the unique water management challenges of the area.
- **Assembled Team of Distinguished Experts:** APEX's team is a constellation of industry luminaries—seasoned engineers, pioneering AI in water experts, data scientists with cutting-edge proficiencies, hydrogeologists with decades of hands-on experience, and biologists deeply versed in local ecosystems. You can read more on our team's capabilities in ***Section 3*** of this proposal.

- **Innovators in AI-Driven Water Management:** We are at the vanguard of integrating Artificial Intelligence into water resource management, transforming data into predictive insights and strategic actions, which positions us to offer OCWD cutting-edge solutions for complex environmental challenges.

- **Proven Hands-On Project Experience:** Our portfolio includes a history of successfully delivered projects that mirror the scope and ambition of OCWD's initiatives. This hands-on experience is a testament to our ability to navigate and deliver on complex, high-stakes projects with precision and excellence. You can read more on our past projects on ***Section 4*** of this proposal.

- **Advanced Technological Proficiency:** We wield the latest technological tools and data analytics platforms to foster smart, sustainable environmental solutions. Our adept use of technology streamlines data management, enhances analytical capabilities, and fortifies decision-making processes. You can read more on our tools on ***Section 1.6*** of this proposal.

- **Collaborative Project Delivery:** Recognizing the value of stakeholder engagement, we prioritize collaboration, ensuring that all voices are heard and integrated into a cohesive project strategy. This approach not only aligns with OCWD's collaborative ethos but also enriches project outcomes through diverse perspectives.

- **Dynamic and Responsive Project Strategy:** We take pride in our proactive and adaptive project management strategies. Our team remains agile, responding effectively to new information and adjusting course as needed to align with project goals and environmental stewardship commitments.

- **Unnegotiable Commitment to Quality:** Quality is not just a checkbox for us; it is woven into the fabric of our work ethic. We enforce stringent quality assurance measures that meet and exceed industry standards, ensuring that every deliverable reflects excellence. You can read more on our QA/QC measure on ***Section 1.4*** of this proposal.

- **Client-Centric Service Philosophy:** At APEX, we understand that our success is measured by client satisfaction. Every aspect of our work is shaped to meet OCWD's goals, deliver value, and exceed expectations. It is APEX's main philosophy that "Money is just a tool for us to do impactful things and not the purpose of what we do".

- **Dedicated to Sustainable Outcomes:** Our environmental solutions are designed not just for the present but for the enduring well-being of the community. We

stand committed to conservation and sustainable practices, ensuring OCWD's projects contribute to a lasting positive environmental legacy.

At last, APEX embraces the opportunity to contribute to OCWD's legacy of environmental innovation. We are confident that our comprehensive proposal reflects not only the synergy of our team's expertise but also our commitment to advancing sustainable water management practices. We are excited to collaborate with OCWD on this pivotal project, applying our shared passion for technological advancement to protect and enhance the natural habitats within the Prado Basin. We truly appreciate your constructive feedback that led to the necessary revisions of this proposal for better clarity and understanding of the mutual objectives of the project. Should you have any questions regarding the content provided herein, please feel free to contact me at (949) 491-3049 or roohi@apexewr.com.

Respectfully submitted,

APEX Environmental & Water Resources, LLC

Roohi Toosi

Roohi Toosi, PE (CA 91825)
President & Principal Engineer

TABLE OF CONTENTS

1.0 TECHNICAL QUALIFICATIONS

1.1 APEX ENVIRONMENTAL & WATER RESOURCES

As a local Orange County business, APEX is a visionary consulting and engineering firm dedicated to ensuring a clean and safe environment and safeguarding California's precious water resources for future generations. With a mission rooted in delivering superior services, APEX stands at the forefront of integrating technology with conventional practices to elevate our industry standards. Our firm is driven by a unique set of core values that focus on adding value to our clients' operations and using our skills for the greater good—not just profitability. This philosophy fuels our daily activities and guides our long-term strategies to demonstrate that "money is just a tool for us to do impactful things, and not the purpose of what we do".

APEX:

- ✓ **Visionary Company with Purpose**
- ✓ **Five Regulatory Compliance Projects**
- ✓ **Growth-Minded Executives**
- ✓ **Leader in Application of AI/Automation for Water & Environmental Industries**
- ✓ **Flexible Team with Vast Resources**
- ✓ **The Connector between Tech & Water**
- ✓ **Strong Tech Partners and Tools**
- ✓ **Experience with Various Types of Clients: Government & Private**

Currently, APEX is engaged in five major environmental regulatory compliance projects along with multiple smaller environmental assessment jobs, assisting clients to comply with regulatory directives and orders. These projects showcase our commitment to excellence and our capability to handle complex compliance challenges effectively through effective communication and negotiations with the regulatory agencies.

APEX is also a leader in bridging the gap between the environmental and water industries with the tech sector. By harnessing the transformative potential of Artificial Intelligence (AI) and automation, we are setting new benchmarks in water management and environmental stewardship. Our efforts are focused on developing AI-driven tools for predictive modeling and optimization, enhancing data collection, and improving decision-making processes through advanced analytics.

APEX's current clients include private developers, landowners, and construction companies and we are working under direct supervision of the State Water Resources Control Board (SWRCB) as some of these projects are funded by the State through grants and cleanup funds. However, APEX principals in their previous roles have worked directly with variety of clients from Federal, State, and Local governments to private organizations and utilities. Some of the prominent past clients of our principals

include Southern California Edison, Los Angeles Community College District, Vandenberg Air Force Base, Caltrans District 7, City of Alhambra, Palo Verde Irrigation District, and dozens of private developers/investors. This has equipped APEX with a unique understanding of each type of clients' needs and an ability to adapt to project requirements.

We stay in the forefront of technological advances and innovative solutions for our industry by participating in various related associations and organizations. We serve on the board of California's Groundwater Resources Association (GRA) and contribute to the growth of our industry by publishing articles in GRA's HydroVisions magazine and organizing impactful events. Our founder is the conference chair for GRA's 2024 Western Groundwater Congress, to be held in October 2024 in Tahoe, CA.

1.2 NOAH'S QUALIFICATIONS

Neural Optimization Applied Hydrology, or NOAH Global Solutions, LLC (NOAH), is the global leader in AI and optimization for innovative water resources management solutions. A spin-off from the University of Arizona's world-renowned Hydrology & Water Resources department, NOAH was established in the early 2000s and was the first to envision and apply AI to a number of complex water management problems, as evidenced by NOAH's registered U.S. Patent. NOAH has consulted nations on every continent short of Antarctica. Their singularly unique team combines advanced theoretical knowledge with extensive real-world experience in a diversity of settings and applications. As the first to apply AI to a number of real-world water management applications, our team has supported clients by developing models and data-driven strategies to help manage some of the world's most challenging and important water problems including:

NOAH:

- ✓ **Pioneer in Application of AI for Water Management Challenges (22+ Years)**
- ✓ **Experience with EPA, USGS, and other US Governmental Agencies**
- ✓ **Experience with International Governments: China, Malta, S Korea**
- ✓ **Patented AI and Optimization Algorithm**
- ✓ **Shared Vision and Strong Partnership with APEX for the Past Five Years**
- ✓ **Expert in GIS and Advanced Analytics**

- Minimizing human health risks and environmental degradation
- Protecting water resources from over-exploitation and water quality degradation
- Reducing climate change uncertainty and risk
- Improving water supply resiliency
- Optimizing consumer provided water quality
- Minimizing energy costs

NOAH's services include but are not limited to:

- Characterizing and assessing the natural water resources;
- Developing and/or improving data collection strategies;
- Deploying field instrumentation;
- Hardware system analysis;
- Data organization and assimilation;
- Advanced statistical analysis;
- Developing AI models for prediction and simulation, and management of water resources and assets;
- Using advanced analytics and methods to identify important cause and effect relationships;
- Developing optimization models, including multi-objective for advanced decision making;
- Geographic Information Systems (GIS) with supporting spatial and temporal data analysis;
- Analytical and numerical modeling;
- Developing algorithms and methods for specific client needs;

NOAH has consulted major U.S. government agencies, including the United States Environmental Protection Agency (EPA), the United States Geological Survey (USGS), and the New Jersey Department of Environmental Protection, as well as international governments like China, South Korea, and Malta. Some of these projects required joint collaboration between governmental agencies and major water utilities; for example, the U.S. EPA and American Water, and Malta's Energy & Water Agency and the Water Services Corporation, their national water utility. NOAH also consulted the South Korean national government on the use of AI for modeling a complex biological system – algae blooms. Additionally, NOAH's personnel have extensive experience with not only data collection but design of data collection systems. Furthermore, as described above, NOAH has vast experience in developing methods to use this data for innovative modeling that yields accurate predictions and insights into complex system dynamics; for example, improving and quantifying the relationship between different variables. Our team has a unique combination of expertise in GIS, including satellite data, hydrology, and integration of related data into AI or machine learning.

For the last several years NOAH and APEX have been working together to bridge AI and optimization related services to water management in California, where we envisioned AI modeling to be utilized for regulatory compliance issues. We co-published two important articles in GRA's HydroVisions magazine and organized an impactful workshop series that introduced AI modeling to our community.

1.3 AQAIX'S QUALIFICATIONS

Aqaix:

- ✓ Silicon Valley Tech Company
- ✓ Pioneer in DMS & MRV in Water
- ✓ Three Products Comprising a Cloud Data Platform
- ✓ Experienced Leaders with Strong FinTech Background
- ✓ Shared Vision and Strong Partnership with APEX for the Past Five Years
- ✓ A Tech Company Unique to Water and Environmental Industries

Aqaix is a Santa Cruz, CA Software-as-a-Service and professional services company founded in 2017. Aqaix designs and implements database management systems (DMS) typically used for Monitoring, Reporting, and Verification (MRV) in environmental finance. But the same systems are readily used in other data warehouse applications, such as ecosystem modeling situations, groundwater data warehouses, water accounting systems, Nature Based Solutions project catalogs, and utility operations databases. Aqaix offers three products, and works closely with partners offering other specialized products. The Aqaix products are Nimbus, an Excel-compatible cloud spreadsheet engine, Application Programming Interface (API) Store, a set of tools for implementing and managing APIs, and Finance, a smart project catalog used to manage portfolios of infrastructure investments.

Aqaix founders and leadership offer deep (30+ years) experience in software engineering, financial services, water, and other sectors. Leaders previously worked at organizations such as Borland, eBay, Apigee, GE Capital, Kidder Peabody, BNY Mellon, JPM Chase, and Citigroup.

One Aqaix forte is data integration and automated synchronization among databases via software technology known as APIs, for example allowing a DMS to be automatically synchronized with the Groundwater Ambient Monitoring and Assessment (GAMA) or another water databases. Aqaix systems leverage (but do not have to use) Aqaix software products when applicable and the client has approved. All software is implemented using standard open source software such as Angular, MySQL or PostGRES, and other open source products. Aqaix software is typically deployed and managed by Aqaix in the Aqaix cloud running on Google Cloud Platform (GCP), but available options are other clouds such as Amazon Web Service (AWS), or to deploy into a customer "on premise" data center or colo (a data center or telecommunications facility in which a business can rent space for servers, storage devices and other computing and networking hardware).

Like NOAH, for the last several years Aqaix and APEX have been working together to bridge technology and data related services to water management in California, where we envisioned software solutions to be utilized for regulatory compliance and water challenges issues. APEX, NOAH, and Aqaix (ANA) have organized an informative

workshop series titled “AI in Water Management”, where we introduce various AI concepts and explore how they can be related to water management challenges. The workshops are ongoing and the recording of the last two sessions can be found in these links: Workshop No. 1 & Workshop No. 2.

1.4 Quality Assurance/Quality Control Measures

Our process for developing models is to work with OCWD and our team’s experts and develop preliminary models in an iterative process with feedback from the US Army Corps of Engineers’ modelers and biologists, US Fish and Wildlife Services’ biologists, OCWD biologists, and Center for Western Weather & Water Extremes (CW3E) FIRO environmental working group on model performance. Machine learning models must be carefully assessed to ensure that the models are not simplify “over-fitting” the data. Therefore, care is taken to ensure that the training data and validation data both represent the range of system behavior. The training data is used for the learning process of the AI model; the validation data is used after training to ensure that the model has learned system behavior. This is assessed by compared relative model performance by numerous metrics like root mean square error under a variety of conditions. In addition, the models are assessed with the context of the conceptual understanding of the physical system and its dynamics as understood by the experts.

Additionally, as it is described in Section 2.2, we will follow closely the US Army Corps of Engineers (USACE) requirements for QA/QC measures of environmental modeling projects by reviewing and implementing – to the extent applicable – guidance documents such as: “Engineer Circular 1105-2-412: Assuring Quality of Planning Models, 31 Mar 2011” and “Bulletin 2013-02: Assuring Quality of Planning Models (EC 1105-2-412), 31 March 2013”.

1.5 Security and Safety

Data security is a critical aspect of any project involving environmental modeling, especially when dealing with sensitive information related to habitat conservation and critical infrastructure like the Prado Dam. APEX provides a focused approach on data security measures for the proposed project:

Encryption: Implement strong encryption protocols to secure data both in transit and at rest. Utilize industry-standard encryption algorithms to protect sensitive information collected during fieldwork, data processing, and storage.

Secure Data Storage: Utilize secure, encrypted databases and cloud storage solutions with multi-factor authentication (MFA) and robust access controls to safeguard sensitive data from unauthorized access, data breaches, or cyberattacks.

Regular Backups: Establish automated backup procedures to create regular, encrypted backups of all project data. Store backups in geographically diverse locations to ensure data integrity and availability in case of data loss, corruption, or natural disasters.

Access Controls: Implement strict access controls and user permissions to limit access to sensitive data to authorized personnel only. Utilize role-based access control (RBAC) to manage and monitor user access rights and permissions effectively.

Data Transmission Security: Use secure communication protocols (e.g., HTTPS, VPNs) and encrypted channels to transmit data between field teams, project stakeholders, and data processing centers securely. Avoid transmitting sensitive data over public or unsecured networks to minimize the risk of interception or unauthorized access.

Endpoint Security: Secure all endpoints (e.g., laptops, mobile devices) used for data collection, processing, and analysis with up-to-date antivirus/antimalware software, firewalls, and security patches to prevent malware infections, data breaches, or unauthorized access.

Incident Response Plan: Develop and implement a comprehensive incident response plan outlining the procedures and protocols to follow in case of a data breach, cybersecurity incident, or unauthorized access. Ensure all team members are trained and prepared to respond promptly and effectively to mitigate potential risks and minimize impact.

Regular Security Audits and Penetration Testing: Conduct regular security audits, vulnerability assessments, and penetration testing to identify and address potential security weaknesses, vulnerabilities, or gaps in the data security infrastructure proactively.

Compliance and Regulatory Requirements: Ensure compliance with relevant data protection regulations, standards, and guidelines (e.g., GDPR, CCPA, ISO) applicable to the project's location, stakeholders, and data subjects. Implement necessary controls, policies, and procedures to uphold data privacy, confidentiality, and integrity throughout the project lifecycle.

APEX will implement these data security measures to the extent necessary and required for this project by integrating them into the project's planning, implementation, and monitoring phases. This will ensure that we can effectively safeguard sensitive information, protect against data breaches, cyber threats, and unauthorized access, and maintain the integrity, confidentiality, and credibility of the project's findings, recommendations, and outcomes.

1.6 PROJECT TOOLS AND TECHNOLOGIES

APEX has access to variety of powerful tools that could be utilized for this project and showcases our organizational power in managing public interest projects. We will evaluate and select the most appropriate tools for the needs of this project for implementation. It should be emphasized that these tools are in APEX's toolbox and will be deployed as needed. Except Nimbus and DOMO, none of the other tools will impose cost to OCWD and will be considered internal costs of APEX. Depending on the need for data storage, processing capabilities, and real time access, we will utilize platforms such as Nimbus or DOMO in concurrence with OCWD's project manager.

Aqaix Nimbus:

Nimbus is a cloud-based data warehouse, coupled with a spreadsheet application that fully supports the Excel formula language. Nimbus also offers a powerful and rich "role-based access control" entitlements management system that makes it easy to create and manage classes of users, each with a specific set of privileges regarding access to data and formulas.

Nimbus is tailored specifically for companies that heavily rely on complex spreadsheets across various business functions. It has been used both by finance departments at organizations such as water utilities, and by environmental impact consultants who have developed complex models of environmental systems. Developed to address the limitations of traditional spreadsheet tools like Excel, Nimbus offers a robust solution for using financial and environmental models implemented as sets of Excel formulas and using those models to process data stored in the Nimbus cloud database. By centralizing data and facilitating access from any location—including mobile devices—Nimbus enables seamless collaboration and efficient management of cloud-based data. For situations with spreadsheets this also eliminates the hassle of back-and-forth emailing.

Data in the Nimbus cloud warehouse is accessible through the Nimbus application user interface, which enables using the Excel formula language to create dashboards and reports. Data is also accessible through standard "RESTful" APIs, allowing secure sharing of with other software systems and applications. (An API is a secure "valve" on data.) Nimbus can also be programmed to pull data from other databases via API calls, for integration and inclusion in the data warehouse.

Ways in which Nimbus might be utilized in this project include:

- Cloud importation of data residing currently in spreadsheets and .CSV files.
- Central cloud data warehouse for importing project data from various sources via API, and virtually joining the data sets for analysis and modeling.

- Creation of reports or dashboards or configuration consoles, as spreadsheets. These reports could include data, metadata, or output predictions from a neural net predictive run.
- Reuse of any existing Excel formulas describing and modeling things such as:
    - Computations of aggregates on event and raw data, for example mean, mode, standard deviation, or custom aggregates.
    - Timing of events such as release schedules
    - Environmental benefits or consequences of an action or event
    - Costs of an action or event

DOMO:

Another powerful data centralization platform that APEX has experience working with is Domo, a development infrastructure, and Business Intelligence (BI) tool, offering an automated, cloud-based system designed to revolutionize the way businesses manage their operations. Domo is a mobile-friendly, community-driven business intelligence platform with the capability to centralize data, making it more accessible and actionable across any organization.

This platform provides the following benefits:

- **Unified Data Dashboard**: Consolidate all data sources into a single, real-time or right-time dashboard, providing a comprehensive view of the operations metrics and performance indicators.
- **Self-Service Business Intelligence**: Empower users to connect to various datasets independently, enabling faster data exploration, analysis, and insights generation.
- **Performance Management**: Monitor and manage organizational performance effectively by tracking key metrics, identifying trends, and highlighting areas for improvement.
- **Timely Information Access**: Ensure timely access to relevant information when and where it is needed, facilitating informed decision-making and strategic planning.
- **Interactive Data Exploration**: Enjoy unlimited drill-down capabilities through multiple data layers of a metric or key performance indicators (KPI), enabling deeper insights and detailed analysis.
- **Visual Strategic Metrics**: Visualize your strategic metrics graphically through intuitive charts, graphs, and dashboards, making complex data easier to understand and interpret.

- **Activity and Process Monitoring**: Monitor, analyze, and manage key activities, processes, and workflows more efficiently, optimizing performance and productivity.
- **Accelerated Decision-Making**: Empower your team to make better decisions, faster, by providing access to accurate, timely, and actionable insights.
- **Collaboration and Accountability**: Foster collaboration among stakeholders by sharing insights, goals, and performance metrics, creating a culture of transparency, accountability, and shared responsibility.

DOMO can be utilized for this project to centralize data in one platform, connect data from various sources, provide advanced analytics, run scripts and modeling codes, visualize data and results, and provide dashboards and reports. As mentioned, APEX will assess various platforms and options for implementation for OCWD's operations that are suitable for this project. We will obtain written approval from OCWD's project manager before implementation. Tools like Aqaix Nimbus or DOMO are associated with licensing costs, which will be explored in later phases of this program, if needed.

ArcGIS:

ArcGIS, developed by Esri, stands out with its advanced data visualization capabilities, enabling users to create detailed, interactive maps and 3D scenes. These visual tools are not just limited to desktop applications but extend to web maps and apps through ArcGIS Online, making geographical data widely accessible and interactive. Additionally, the platform's spatial analysis tools, including a wide range of geoprocessing options and predictive modeling, allow for in-depth exploration and understanding of spatial patterns, trends, and predictions, facilitating informed decision-making in various fields.

On the data management front, ArcGIS excels with its geodatabase system designed for efficient spatial data storage and organization, complemented by robust data editing tools for precise data modification. Collaboration is a key feature, with options to share maps, data, and applications across teams or with the public, enhancing teamwork and data dissemination. Moreover, ArcGIS's interoperability with numerous data formats and its scalability, supported by customization options through ArcGIS for Developers, ensure that it can meet a wide range of user needs, from simple mapping projects to complex spatial analysis.

Some of the preliminary data we received from OCWD are presented in GIS files. GIS will be used as a tool to help assess the density and temporal coverage of geospatial data covering the focus area to help evaluate the potential of implementing machine-learning methods of characterizing and assessing environmental trends and

anthropogenic impacts in the area with respect the Least Bell's Vireo bird populations within the Prado Basin over time, which GIS will help with.

OpenAI Suite:

OpenAI's advanced machine learning and natural language processing (NLP) technologies offer transformative benefits for habitat modeling projects, particularly in the realms of ecosystem monitoring and management. By analyzing vast datasets from satellite imagery to sensor networks, AI models can identify crucial environmental patterns and changes, such as species distribution shifts or habitat degradation, with high accuracy and efficiency. This automated, precise monitoring capability enables real-time insights into ecosystem health, facilitating proactive conservation measures. Additionally, AI's ability to process and interpret complex data reduces human error, enhancing the reliability of habitat assessments and enabling more precise targeting of conservation efforts.

On the management side, OpenAI's technologies empower predictive modeling, providing foresight into potential habitat changes and helping in crafting forward-looking conservation strategies. These AI-driven models support decision-making by synthesizing complex data into actionable insights, optimizing resource allocation to prioritize high-impact conservation activities. Furthermore, OpenAI's NLP tools can streamline knowledge sharing among researchers and conservationists, digesting vast amounts of scientific literature to keep stakeholders informed. This not only aids in the formulation of evidence-based management plans but also enhances stakeholder engagement by making complex data more accessible and understandable, fostering collaborative and informed conservation initiatives.

For this project OpenAI Suite can be utilized for:

- **Research and Information Gathering:** Leverage OpenAI's advanced search capabilities to efficiently conduct comprehensive research on various project-related topics, ensuring access to the latest and most relevant information available.
- **Data Validation and Model Verification:** Utilize OpenAI's built-in AI modeling and data analysis tools to validate data integrity and verify modeling outputs, enhancing the accuracy and reliability of project results.
- **Automated Report Generation:** Employ AI-driven tools to automate the creation of technical reports, ensuring they are not only free from grammatical errors and formatting issues but also structured to enhance readability and professional presentation.
- **Predictive Analysis and Forecasting:** Implement OpenAI's predictive analysis tools for advanced forecasting of environmental impacts and water management

scenarios. We would like to emphasize that this will be utilized in conjunction with the Task 6 of the proposed scope of work and as a QA/QC measure for comparing these AI-generated forecasts with our modeling outputs to validate accuracy and improve decision-making processes.

2.0 PROJECT UNDERSTANDING AND APPROACH

2.1 PROJECT UNDERSTANDING

Key Understandings:

- ✓ **Multi Agencies Efforts with Various Stakeholders**
- ✓ **Compliance with FWS Regulatory Requirements for Prado Dam**
- ✓ **Modeling the Past Effects of Water Inundation on Habitat Response**
- ✓ **Utilizing AI/ML for Environmental Model**
- ✓ **Assess and Supply Data for Robust Analysis of Environmental Factors**

The Orange County Water District (OCWD) along with the United States Army Corps of Engineers (USACE) are operating the Prado Dam in Santa Ana Watershed area with the objectives of reducing the flood risks and conserving stormwater for beneficial use. The critical challenge of achieving regulatory compliance with the U.S. Fish and Wildlife Service (FWS) requirements, coupled with the absence of a meaningful correlation between diverse data sources, underlines the urgent need for a comprehensive understanding of water inundation effects behind the Prado Dam, particularly concerning the habitat of the Least Bell's Vireo. This scenario presents a complex issue where traditional methods fall short in offering actionable insights into the dynamic interplay between hydrological practices and ecological outcomes.

Addressing this pressing need, our initiative, "Integrated Environmental Modeling for Increased Water Conservation," proposes an innovative solution grounded in the seamless integration of advanced environmental modeling with predictive analytics. This project aims to construct a holistic model that fuses cutting-edge weather forecasting, continuous ecological monitoring, and the strategic management of stormwater retention to quantifiably assess the impacts on habitats and species, especially the Least Bell's Vireo.

Our methodology pivots around the utilization of Forecast-Informed Reservoir Operations (FIRO) for refined weather predictions, alongside the integration of real-time data on habitat conditions and species dynamics in the vicinity of the Prado Dam. By investigating the multifaceted effects of prolonged stormwater retention, the project seeks to develop a robust, data-driven framework that not only quantifies ecological impacts but also furnishes scenario-based predictions to inform conservation strategies and operational management decisions.

The core of our approach lies in harnessing a diverse array of data resources, including LiDAR and aerial imaging, satellite data, historical water elevation records, weather parameters, shallow groundwater elevations, and habitat condition data (such as bird

population and vegetation index), among others. Leveraging machine learning and artificial intelligence, the project aims to unearth patterns and trends that underpin habitat changes, facilitating a predictive analysis model that anticipates future scenarios and their potential impacts on critical species and their habitats.

In sum, this endeavor represents a forward-thinking leap towards integrating technological innovation with environmental conservation, setting a precedent for using predictive environmental modeling to navigate the complexities of water management and habitat conservation in compliance with regulatory mandates. The anticipated outcomes promise not only to advance our understanding of ecological responses to hydrological interventions but also to equip decision-makers with a powerful tool for informed, data-driven policy formulation and implementation.

2.2 Study Area

The Prado Basin, located behind the Prado Dam in Southern California, serves as a significant hydrological and ecological asset. Constructed in 1941, the dam is a crucial flood control and water conservation facility within the Santa Ana River Watershed. This area, managed by the U.S. Army Corps of Engineers and OCWD, encompasses about 4,300 acres of riparian habitat, which is the largest of its kind in Southern California. This habitat is part of the Prado Basin Management Zone, delineated by the Santa Ana Region Basin Plan, and includes critical habitat areas designated for several endangered or threatened species, including the Santa Ana sucker, the southwestern willow flycatcher, and the least Bell's vireo.

2.3 Overall Project Approach

APEX's approach in the "Integrated Environmental Modeling for Increased Water Conservation" project is multidisciplinary and innovative, designed to address the complex challenges of managing the Prado Dam while ensuring the conservation of critical habitats, particularly for the least Bell's vireo. In response to the need for a conceptual model by late fall, this project will prioritize the formulation of a comprehensive conceptual model that aligns with the goals set forth by OCWD, USACE and FWS. In collaboration with the CW3E, we will leverage their expertise and capabilities to ensure that the model is robust and meets the specified requirements.

This project consists of inter-connected tasks, namely data collection and assimilation, system conceptualization, and development and assessment of different predictive models. System conceptualization in large part determines the data and processing used for model development and testing. For example, the suitability of the vireo habitat may depend on a number of factors or variables like weather, hydrologic, and vegetation conditions. There may also be seasonal factors when certain variables become more significant than others on habitat suitability. Working with biologists and

other experts who are familiar with the species and habitats is essential for developing the conceptual model. Still, statistical analysis and machine learning can test the hypothesis and identify and quantify cause and effect relationships between the bird populations (i.e., habitat suitability) and influencing variables. The important element is that any models that are developed are based on a conceptual understanding of the system. However, the models may help refine the conceptual understanding and improve both data collection and model development strategies. The deliverables will include the system conceptualization as refined by the data analysis and machine learning using historical data and expert feedback, as well as preliminary machine learning models with an assessment of their performances; This project will also include recommendations for improved data collection and assimilation strategies for improved model development and performance. Working cooperatively with CW3E, who have extensive expertise in data management and modeling for OCWD's operations, will also be invaluable in improving system understanding, data assimilation and organization, and development and testing of models. Our approach involves developing and refining the models independently, and then cross-checking them with CW3E's output to ensure validity.

Opportunity for Further Development

Upon successful completion of this pilot program and proof of concept, there are opportunities to further enhance the conceptual model with additional data types and refine the visualization tools, focusing on predictive capabilities. We could also implement strategies to address the data gaps identified in pilot study. Furthermore, the predictive modeling tool could be integrated into OCWD's water control manual and ensure OCWD staff and partners (USACE, FWS, etc.) are equipped to use the tool independently. The tool could be utilized as a Decision Support System (DSS) for managing the habitat for increased water conservation. It is worth noting that access to real time data with dashboards that support decision making processes for Prado Dam operations requires a centralized platform that stores all the data in secure databases and provides flexibility for running advanced analytics and visualizing the results. Such a DSS requires investment in BI/AI Tools with licensing fees. If OCWD is already implementing these tools, we are open to utilizing the existing platforms for the future delivery. And as described in Section 1.6 we have powerful tools in our toolbox that can be implemented for Prado Dam's operations' management. Collaboration with your IT department and other stakeholders is necessary for making the right decision regarding the needed platform for data residence.

Conceptual Model Development and Initial Data Gathering

General Pilot Study Approach: It is our understanding that Forecast-Informed Reservoir Operation (FIRO) strategies are being implemented by the OCWD and the USACE along with other agencies in the Watershed Area. It will be beneficial to develop a comprehensive watershed AI model/visualization tool that connects the FIRO-driven data from various operations for better understanding the impacts of various inputs from different agencies and how operations at places like Seven Oaks Dam influence downstream habitats at Prado Dam area. For example, as part of the pilot study, one possibility is to develop surface water flow models based on weather and hydrologic variables that could be used to simulate and assess potential future impacts to the vireo habitat. This type of model may also be used for managing dam releases that reduce upstream environmental impacts and achieve other objectives like preserving downstream flows, etc.

The initial focus of this project is to deliver a model that helps OCWD and other stakeholders to better understand the historical effects of water conservation activities on the habitat behind the Prado Dam. This tool, central to the project's objectives, could be further developed in future potential phases for predictive analysis, improving flow modeling within the watershed, and providing predictive insights on the impacts to wetlands. Furthermore, the tool can be expanded to conduct sedimentation analysis within the riverbed and the dam for better operations management and dredging planning.

Looking ahead, while the immediate efforts focus on OCWD's needs, the potential for broader regional impacts and collaborative efforts will be considered in future developments. In particular, OCWD may explore opportunities for joint efforts with entities like San Bernardino Valley Municipal Water District to enhance regional water management strategies. These expansions, however, will be contingent upon separate discussions and potential funding agreements that prioritize OCWD’s strategic interests. Additionally, features of the tool, such as visualization and dashboarding, that support compliance with FWS guidelines will be developed as added-value features, ensuring that any expansion of capabilities to benefit external agencies aligns with OCWD’s strategic and financial goals, protecting OCWD’s primary mission and investments.

Comprehensive Data Integration: Our strategy involves aggregating and analyzing a wide array of data sources. This includes high-resolution spatial data from LiDAR and aerial imagery, satellite observations for broader environmental changes, historical water level records to understand past trends, analyze and involve in field data collection to understand the methodology and relation with other data sources, weather

parameters for historical, current and future conditions, shallow groundwater elevations which affect habitat wetness, and integrating Google earth and satellites data to monitor their changes during different condition. We are also focusing on habitat condition data, such as bird population metrics and vegetation indices, to get a clear picture of the ecosystem's health. The pilot study will prioritize the use of existing OCWD data to optimize resource allocation without necessitating additional data collection costs. Some readily available data such as satellite imagery, public data, aerial photos, etc. may be utilized during the pilot study to cover the gaps and support development of a robust model. This additional open-source data will not be any additional cost to OCWD and is already anticipated in the proposed cost.

In summary, some of the data sources that we acquired or will acquire for this project includes (but not limited to):

- Inflow and Outflow at Prado Dam
- Water Level Elevations of the Flood/Water Conservation Pools at Prado Dam
- Rainfall Data
- Shallow Groundwater Elevations
- Surface and Groundwater Water Quality Data
- Vegetation Distribution and Type
- OCWD Habitat Data, including Least Bell's Vireo Population and Distribution
- Maps showing extent of Fire Damage
- Satellite Data
- Weather and Temperature
- Light Detection and Ranging (LiDAR) and Aerial Imaging
- Diversion flows to OCWD Wetlands
- Existing Related Models such as Upper Santa Ana River Integrated Model
- Outside Agency Studies such as Prado Basin Habitat Sustainability Committee
- Western Riverside County Wastewater Authority Adaptive Management & Monitoring Program (WRCRWA AMMP) Reports
- Contour Map
- GIS Data

Machine Learning and AI: By applying machine learning algorithms and AI techniques to the integrated data sets, we aim to uncover patterns, correlations, and trends that are not immediately evident. This predictive analysis model will help us anticipate future habitat changes under various scenarios, including different stormwater retention strategies and climatic conditions.

There are different types of machine learning paradigms; for example, there are multi-layered neural networks or deep learning which predict explicit numerical values and there are classification neural networks that classify data into classes or numerical groups. The machine learning algorithm often depends on the system that is being modeled, the available data, target model output, and model performance. In some cases, different types of models can be used to collectively identify important relationships and provide predictive capabilities. As an example, for modeling algae blooms, our team used both explicit value prediction and classification models to predict algae counts in a complex surface water system. For this modeling project, because of the anticipated complexity of this biological system, multiple types of AI models or paradigms will be used, as well as multiple sets of input variables and types. This modeling will also guide improved data assimilation and processing as applicable and provide recommendations for improved or augmented data collection strategies, and improved modeling strategies. In addition, as mentioned under Section 2.3, there may be other predictive models developed during the study that can be used for future modeling and management efforts both related directly to this project as well as other needs; for example, predicting surface water flows or groundwater elevations based on weather and hydrologic conditions in collaboration with CW3E and other partners. However, the potential nature and extent of these possible (supportive) ancillary tools is impossible to determine at this time.

Scenario-Based Predictive Modeling: Utilizing the insights gained from AI and machine learning, we will develop a prototype scenario-based models to predict the future states of vireo in the habitat. This will enable us to simulate the effects of different water management practices on the ecosystem, providing a valuable tool for decision-making and strategic planning.

Client Engagement and Adaptive Management: Our approach is iterative and inclusive, involving US Army Corps of Engineers' modelers and biologists, US Fish and Wildlife Services' biologists, OCWD biologists, and CW3E FIRO environmental working group at every step to ensure that the project's outputs are relevant and actionable. We are committed to adapting our strategies based on ongoing findings and feedback, aiming for continuous improvement in habitat conservation efforts.

Through this comprehensive and forward-thinking approach, APEX aims to create a robust framework for managing the water resources in a way that balances risks reduction with the imperative of conserving vital habitats, ultimately contributing to the sustainability and resilience of the Santa Ana Watershed ecosystem. Below is the list of tasks and activities that will be completed by our team for this pilot study of the program and the corresponding cost has been provided in Section 4.

Task 1. Project Management

Task 1 focuses on Project Management, ensuring streamlined coordination and oversight of the project activities. This task includes organizing and conducting a kickoff meeting to align all stakeholders with the project goals and timelines, as well as facilitating two check-in meetings to discuss progress and address any emerging challenges. A kickoff meeting memorandum will be prepared that clearly documents the goals and milestones of the project as well communication lines between various parties. Additionally, three meetings with FWS and preparing presentation materials for those meetings have been anticipated in this task. The final meeting in the pilot phase will serve to review accomplishments and set the stage for potential subsequent phases. In addition to these critical meetings, Task 1 also covers all aspects of billing and administration, handled by APEX to maintain financial oversight, and ensure timely resource allocation throughout the project duration.

Deliverables:

- ✓ A Kickoff Meeting
- ✓ Kickoff Meeting Memorandum
- ✓ Two Check in Meetings
- ✓ Final Pilot Study Meeting
- ✓ Monthly Invoices and Admin

Task 2. Document Review and Requirements Gathering

Task 2 involves a meticulous Document Review and Requirements Gathering phase, crucial for acquiring foundational knowledge essential for the project's success. This task requires team members to engage deeply with key documents that provide insights and guidelines relevant to the project's objectives. The review process includes a thorough examination of various strategic documents, following closely established best practices and regulatory requirements. The documents that will be reviewed include:

Deliverables:

- ✓ No Product Deliverables
- ✓ Boost Understanding of the Project
- ✓ Incorporate Requirements in Future Activities

- USACE Engineer Circular 1105-2-412: Assuring Quality of Planning Models, 31 Mar 2011.

- USACE Planning Bulletin 2013-02: Assuring Quality of Planning Models (EC 1105-2-412), 31 March 2013.
- FIRO Final Viability Assessment, Nov 2023.
- ISARM Summary Report.
- Annual Report of the Prado Basin Habitat Sustainability Committee for Water Years 2016 to 2022.
- WRCRWA AMMP Annual Report 2018 to 2022.
- Other related documents as necessary

Task 3. Data Assimilation and Review

Deliverables:

- ✓ **Data Dictionary**
- ✓ **Data Gap Analysis Report and Response Plan**

Task 3 focuses on Data Assimilation and Review, a crucial component for ensuring the accuracy and relevancy of data that will be utilized throughout the project. This task involves gathering data from various sources, including OCWD and other relevant entities like satellite services and federal agencies. The team will meticulously review and structure digital data files, including hydrological and weather data, ensuring all features are accurately extracted from GIS, LiDAR, and Landsat sources. The development of a comprehensive data dictionary for all collected data is also a key element, facilitating clarity and consistency across the project. Additionally, a detailed data gap analysis will be conducted to identify and address any missing data, enhancing the robustness of the project's data framework. This task is essential for building a solid foundation of reliable data to support all subsequent analytical and modeling efforts.

Task 4. Site Visits and Interviews

Deliverables:

- ✓ **Site Visits**
- ✓ **Interviews**
- ✓ **Boost Team's Understanding of Data Collection Processes**

Task 4 involves conducting site visits and interviews, a critical step to gain firsthand insights into the data collection processes and to evaluate the technical infrastructure in place. This phase includes an initial site visit to observe and assess the data collection sources and API connections for data automation. This allows the team to directly interact with the operational aspects and

better understand the practical challenges and technical nuances. Additionally, meetings with staff are arranged to discuss their experiences and insights regarding data collection and evaluation processes. These interactions are pivotal for validating the data assimilation approach and ensuring that the project's data handling practices are both efficient and aligned with real-world conditions.

Task 5. Data Centralization and Platform

Deliverables:

- ✓ Platform Recommendations
- ✓ Data Warehouse and Automation Roadmap

Task 5 is designed to establish a robust infrastructure for handling the extensive data requirements of the project. This task involves evaluating various database hosting services, such as AWS, GCP, and Microsoft Azure, to determine the most suitable platform for secure and scalable data storage. The team will also assess different software options that can support the automation, centralization, processing, and visualization of data. This will be coordinated with OCWD's IT department and other project stakeholders. Developing a roadmap for the data warehouse and schema forms a crucial part of this task, ensuring that the data architecture supports the project's long-term goals. Strategic planning for data automation practices and conducting data quality analysis, followed by necessary cleansing activities, are also critical components. This task is fundamental in creating a centralized data management system that facilitates efficient data flow and accessibility, enabling advanced analytics and modeling capabilities required for the project.

Task 6. Preliminary Advanced Analytics and ANN Modeling

Deliverables:

- ✓ Conceptual AI Model
- ✓ Historical Correlation between Water Inundation and Habitat Indicators
- ✓ Animation of Historical and Simulated Patterns

Task 6 is significantly dependent on success of the previous tasks, where necessary data has been compiled and ready for conducting advanced analytics and AI modeling. We will harness statistical methods to dissect temporal and spatial patterns within the amassed data, identifying correlations that may influence the study area's habitat from Prado Dam operations. Our team will continuously engage the OCWD's experts in our data evaluation and modeling efforts, to ensure each step is aligned with the project goals and requirements. Moreover, we will develop preliminary AI models based on

existing patterns in accumulated data and utilize the calibrated model to simulate various scenarios impacting the project's ecological and hydrological concerns.

The iterative nature of this task allows for continuous refinement of models based on feedback and new data. Model validation is performed rigorously, using data sets not involved in the training phase to test model robustness and accuracy. Sensitivity analyses are also conducted to explore cause and effect relationships, providing deeper insight into the dynamics of the ecosystem and hydrological processes at play. Through repeated validation and sensitivity analysis cycles, the team ensures that the models are both accurate and reliable. We will be integrating updated data continuously into the models and developing new AI models as necessary, establishing a robust predictive framework that aids in decision-making and strategic planning for the Prado Dam operations. This task is pivotal in leveraging advanced analytics to anticipate future conditions and inform proactive management strategies.

We will utilize the existing data and the simulated data from AI model to develop animations that effectively communicates the relationship between the water inundation and habitat response over the past and simulated years.

Task 7. Other Related Support

Deliverables:

- ✓ **As-Needed Services**

Task 7 functions as an as-needed task that provides critical ancillary support to the core project activities. This task includes technical assistance for grant and funding applications, which is vital for securing the necessary financial resources to sustain and expand project efforts. Additionally, the team will participate in the development of a monitoring program tailored for the FWS, ensuring compliance and alignment with ecological conservation goals. Engineering estimates for potential future phases of the project are also prepared under this task, laying the groundwork for future expansions and continuity of the initiative. Task 7's flexible, demand-driven approach allows it to adapt and respond to the project's evolving needs, ensuring that all support functions are efficiently managed and implemented as required, thereby facilitating seamless project progression and achievement of overarching objectives. APEX did not anticipate any cost for this task in our cost estimate and the required activities will be billed on an as-needed basis with the established rates.

3.0 ANA TEAM ORGANIZATION

Table 1. Key Personnel at a Glance

Personnel	Role	Licenses	Rate	Years of Experience	Expertise	Select Clients	Education
Roohi Toosi, PE	Program Director	Registered PE CA #91825	$180.00	8+	Team Assembly & Management Subsurface Flow Modeling Regulatory Negotiation & Compliance Formal QA/QC Measures	Caltrans District 7 Southern California Edison Palo Verde Irrigation District State Funded Grant Projects	MSc 2016, Civil and Environmental Engineering, UC Irvine, Irvine,CA BSc 2013, Petroleum Engineering, Tehran University, Tehran
Pourya Sadeghi	Principal Product Developer	N.A.	$180.00	8+	Artificial Intelligence Business Intelligence Data Automation & Software Development Industrial Applications of Generative AI	Volkswagen-EuroCar Mobility AT&T Private Developers State Funded Grant Projects	MSc 2016, Industrial & System Engineering, Binghamton University, Binghamton, NY BSc 2013, Industrial & System Engineering, Tehran University, Tehran
Emery Coppola, PhD	Principal Hydrologist & Modeler	N.A.	$180.00	25+	Artificial Neural Network Based Modeling Machine learning Hydrology and Numerical Modeling Formal Optimization and Statistics	Nation of Malta USGS United States EPA New Jersey DEP	Ph.D. 2000, Hydrology and Water Resources, University of Arizona M.S. 1993, Engineering Geology, Drexel University B.S. 1986, Geology and Marine Science (Double Major),University of Miami
Michael Gardner	Principal DMS Consultant	N.A.	$180.00	40+	Cloud Data Systems Groundwater Accounting Project Co-Benefits Accounting Environmental Credits	The Water Tower at Gwinnett Grand Prairie Farm and Water Company Save Water Save Money United Nations Development Program	MA, 1980, Political Economy of Natural Resources, UC Berkeley
Mary Poulton, PhD	Director of Machine Learning	N.A.	$180.00	30+	Earth Science AI in Mining and Geology Artificial Intelligence & Optimization for Improved Water Management	U.S. Bureau of Reclamation World Bank NIOSH Spokane Mining Research Division KGHM International	Ph.D. 1990, Geological Engineering, University of Arizona M.S. 1987 in Geological Engineering, University of Arizona B.S. 1984, Geological Engineering, University of Arizona
Randy Solton	Systems Architect Systems Engineer	N.A.	$240.00	40+	Distributed Systems Computing API Design and Implementation ETL system design and Implementation Cybersecurity	The Water Tower at Gwinnett Kestrel EcoMetrics United Nations Development Program	BS, Computer Science, UC Berkeley
Suna Cinar, PhD	Principal Systems Analyst & Modeler	N.A.	$150.00	10+	AI in Water Resources Water Resources Management Models Optimization	Ankara Municipality Water Utility Department ITUNOVA TTO, A.S., Istanbul, Turkey Sadat Associates, Inc., Trenton, USA Environmental, Wichita, Kansas, USA	Ph.D. Industrial Engineering, Wichita State University, Wichita, KS M.S. Environmental Engineering, Lehigh University, Bethlehem, PA M.S. Environmental Science and Technology,Bogazici University, Turkey B.S. Chemical Engineering, Yildiz Technical University, Istanbul, Turkey
Anthony Ryan	Expert Biologist	N.A.	$160.00	30+	Endangered Species Least Bell Vireo Habitat Authorized Biologist GIS and Data Analysis	San Manuel Band of Mission Indians TRC Companies Caltrans District 8 JWC Ecological Consultants Inc.	BSc 2011, Wildlife Biology, Unity College, Unity, ME
Lynn Hsieh, PhD	Statistician and GIS Analyst	N.A.	$150.00	20+	Advanced GIS and remote sensing Environmental system analysis and modeling Consulting for governmental and private Expertise in hydrology and geology	Taiwan EPA Taiwan Shou University, Taiwan National Science and Technology Center Dapu Reservoir Management, Miaoli, Taiwan	Ph.D. Agricultural Engineering, University of Arizona,Tucson, AZ M.S. Water Resources Engineering, Tamkang University, Taiwan M.S. Physical Education, National Chiayi University, Chiayi, Taiwan B.S. Water Resources Engineering, Tamkang University, Taiwan
Greg Herman, PhD	GIS and Statistics Expert	N.A.	$170.00	30+	Advanced GIS and remote sensing Environmental system analysis and modeling Consulting for governmental and private Expertise in hydrology and geology	New Jersey DEP Rider University as an adjunct professor Amoco Production Company	Ph.D. 1997, Geology, Rutgers University, New Brunswick, NJ M.S. 1984, Geology, University of Connecticut, Storrs, CT B.S. 1982, Geology, Ohio University, Athens, OH
Lizbeth Stevenson	Full Stack Architect Full Stack Engineer	N.A.	$240.00	35+	Distributed Systems Computing API Design and Implementation ETL system design and Implementation UX Design	Kestrel EcoMetrics United Nations Development Program	BA, English, UC Riverside

Over the past five years, APEX, NOAH, and Aqaix (ANA) have cultivated a robust partnership, sharing a visionary commitment to the application of technology and AI tools for enhancing environmental and water management. Operating seamlessly as one team, our alliance is underpinned by formal agreements and memorandums of understanding that ensure a cohesive approach to our collaborative projects. We have made significant contributions to the field, authoring articles in well-respected industry journals, and hosting a series of impactful webinars designed to showcase the innovative applications of AI in water management. This strong foundation enables our team to lead and innovate within the industry, setting new standards for technological integration in environmental stewardship. We have gathered a strong team of consultants, who are presented in ***Table 1***. Full resumes of Key Personnel will be provided upon request, but a highlight and summary of their professional expertise is provided below:

Roohi Toosi, PE: Program Director & Principal Engineer

- ✓ 8+ Years of Experience in Groundwater Industry
- ✓ Subsurface Flow Expert and Modeler
- ✓ Developer of EXCAVATOR, a Soil Remediation Software for Remedial Design
- ✓ Team Management and Training Skills
- ✓ Site Assessment and Remediation Expert
- ✓ Member or Director of Several Water and Environmental Organizations

Mr. Roohi Toosi, PE is a passionate leader in the environmental and groundwater industry, who is bridging the gap between technology sector and traditional consulting services through utilization of Artificial Intelligence (AI) and data automation tools. Mr. Toosi established APEX to utilize his accumulated experience along with tech industry network to serve his clients more efficiently and cost-effectively. He started his career by developing a computer program for designing excavation limits as a soil remediation technique, which led to his employment at Rubicon Engineering Corporation. His passion and capabilities empowered him to grow fast within the company and during a short time he transitioned from a part time engineer to vice president of Rubicon. Over the course of his career, Mr. Toosi has conducted and managed projects for utilities, school districts, municipalities, military bases, private developers, contractors, farmers, water districts, and large consulting firms. His expertise encompasses all aspects of environmental engineering and hydrogeology, with emphasis on subsurface investigation and remediation, and application of AI in environmental and water management. He is also a Board Director for California's Groundwater Resources

Association (GRA) and is organizing the 2024 Western Groundwater Conference in beautiful Lake Tahoe for October of this year.

Role: Mr. Toosi will provide overall program management and serves as the QA/QC director for the project team.

Pourya Sadeghi: Principal Product Developer

- ✓ 8+ Years of Experience in Data Science
- ✓ Expert in GenAI, AI, BI, and ML
- ✓ Innovator and Startup Experience
- ✓ Hands on Experience with Environmental Projects
- ✓ 15 Scientific Papers in Renewable Energy Field
- ✓ Member of Several Water and Environmental Organizations

Mr. Pourya Sadeghi, Vice President of Technology and Engineering Development at APEX, blends expertise in data science, AI, and automation with conventional environmental engineering. With a background in space and automotive industries, he is passionate about utilizing cutting-edge tools like GenAI, AI, and ML to innovate in environmental sustainability. As an innovator, Mr. Sadeghi was one of the principals of SpaceGold, a startup specialized in detecting and mining rare earth metals on the moon surface for space utilization. He has a strong background in implementing BI tools for large organizations and automating data collection processes and analysis. He has more than 15 scientific publications in the field of renewable energy and space mining.

Role: Mr. Sadeghi serves as the principal product developer and provides his expertise for data automation and BI platforms. Additionally, he will conduct peer review and ensure QA/QC measures are implemented for this project.

Emery Coppola: Principal Hydrologist & Modeler

- ✓ 25+ Years of Experience in Hydrological Modeling
- ✓ Expert in AI Modeling for Water Management
- ✓ Applied AI Experience with Prominent Agencies
- ✓ International Experience in AI Consultation
- ✓ Numerous Scientific Papers in Application of AI for Water Management and Hydrological Issues
- ✓ Patented ANN Algorithm for Optimization

Dr. Emery Coppola is a pioneer in the application of AI to water resources modeling and management. Among other applications, he was the first to use real-world pumping and weather data to train AI models to predict groundwater elevations and salinity concentrations in groundwater systems. He co-developed NOAH's advanced patented AI-based system for real-time water resources management. Dr. Coppola has applied AI models and optimization to a variety of water management applications, including groundwater, surface water, and water distribution systems. He works in partnership with other team members to develop innovative products related to real-time data acquisition, improved data analyses and prediction, data visualization, and hardware-software integration. Dr. Coppola has over twenty-five years of technical and project management experience in hydrogeologic and water resources problems, including protection from both over-exploitation and contamination. He has consulted on AI related water resources modeling and management in the United States, Asia, Europe, Africa, and Australia. He has performed AI-related funded research for the United States National Science Foundation, the European Science Foundation, the United States Environmental Protection, the United States Geological Survey, and the New Jersey Department of Environmental Protection, among others. Dr. Coppola is the first author of a book chapter entitled "Artificial Neural Network Based Modeling of Hydrologic Processes" published by Taylor & Francis (CRC Press, March 2014) in the reference Handbook of Engineering Hydrology. He also is the first author for the book chapter entitled "Application of Optimization Models and Decision Support Systems in Drought published by Taylor & Francis (CRC Press) in the reference Handbook of Drought and Water Scarcity (June 2017).

Role: Dr. Coppola will serve as the AI Modeling Expert and will lead the team of researchers and developers that will develop the model for this project.

Michael Gardner: Principal DMS Consultant

- ✓ 40+ Years of Experience in Data Management
- ✓ Expert Ran Search Technology Group at eBay
- ✓ Ran Cloud Technology Research Center for 7th Largest Bank in the World
- ✓ Led Numerous Security Certification Projects
- ✓ Specialist in Several Environmental Finance Sectors Including Environmental Credits and Groundwater Accounting
- ✓ AI Track Content Chair, Western Groundwater Conference

Mr. Michael Gardner is Aqaix' Principal Consultant and leads Aqaix engagements to ensure stellar results and client satisfaction. Michael over the years has helped pioneer numerous software science and data science technologies that we today take for granted, including SQL and relational databases, IDEs and visual programming environments, dynamic compilers, highly-available and highly-scaled cloud systems, faceted search technologies, REST API management tools, and software for numerous water and infrastructure finance uses. Michael has had executive roles in a variety of organizations ranging from early-stage startups through to established technology companies such as Borland, eBay, and Apigee, and established financial services company such as BNY Mellon, the world's 7th largest bank. Michael has led groups of engineers ranging from small agile teams to organizations of up to 150 software engineers organized into multiple departments and teams. Michael also understands client needs, and while at eBay was himself a consulting client responsible for spending $15 million per year on engineering deliverables from consulting firms such as Accenture, Cognizant, and others. Michael has presented at numerous conferences globally, including conferences on water quality, groundwater management, infrastructure finance, blended finance, cloud computing, Fintech computing, environmental finance, and environmental credits.

Role: Michael will take a limited yet strategic role on Prado Basin Habitat AI Analysis. He will oversee delivery of the Aqaix software deliverables and will be the key client and prime contractor point of contact regarding project status. Michael also ultimately owns and is responsible for client satisfaction and success.

Mary Poulton: Director of Machine Learning

- ✓ 30+ Years of Experience in Applied AI
- ✓ Developed NOAH's AI Water Management System
- ✓ Published Authoritative AI Geophysics Book
- ✓ Managed multi-million-dollar AI Projects
- ✓ Over 100 Scholarly AI Publications
- ✓ Consulted for U.S. Bureau, World Bank

Dr. Mary Poulton is a recognized expert in the use of AI for earth science and other applications. She has published a book on AI and geophysical data analysis that has been widely used. She co-developed NOAH's advanced patented AI-based system for real-time water resources management and has significant expertise and experience in applying various AI architectures and algorithms to environmental problems, including water resources modeling and satellite data. As part of her AI related work for NOAH,

Dr. Poulton remains up to date on the rapidly expanding suite of available AI software and their integration with supporting software programs. As a former professor and department head in the Department of Mining and Geological Engineering with a joint appointment in Geosciences at the University of Arizona, she has procured and managed multi-million-dollar projects for AI related research performed in collaboration with major corporations and institutions. Dr. Poulton has published over 100 journal articles and conference papers on the application of AI to problems in the earth sciences, including hydrology, geophysics, and atmospheric science. Dr. Poulton has consulted for the U.S. Bureau of Reclamation and the World Bank. She was elected Secretary of the American Geosciences Institute. She has chaired the Committee on Earth Resources for the National Academies and served on several committees. She chaired the Board on Natural Resources for the Association of Public and Land Grant Universities. She was honored with the National Engineering Award from American Association of Engineering Societies in 2017.

Role: Dr. Poulton provides critical technical input into data analysis and machine learning strategies and techniques.

Ferenc Szidarovszky: Principal Scientist

- ✓ Internationally Recognized Mathematical Expert
- ✓ Co-Developer of NOAH's AI-Based System
- ✓ Expert In AI, Optimization, Economics
- ✓ Formulates Complex Optimization Models
- ✓ Collaborated With Nobel Prize Recipient
- ✓ Authored 27 Books, 400+ Papers

Dr. Ferenc Szidarovszky is an internationally recognized expert in mathematical theory and applications in numerous areas, including artificial intelligence (AI), optimization and multi-objective analysis, statistics, numerical methods, linear and non-linear system dynamics, and economics. He co-developed NOAH's advanced patented AI-based system for real-time water resources management. Dr. Szidarovszky applies advanced mathematical methods for supporting development of innovative methods and products; for example, his mathematical foundation for NOAH's innovative hybrid method that explicitly combines AI with numerical modeling methods. One of his primary roles for NOAH is mathematical formulation of complex dynamic multi-objective optimization models that include uncertainty. A former full-professor at the University of Arizona, with joint appointments in the Departments of Systems and

Industrial Engineering and Hydrology and Water Resources, Dr. Szidarovszky has collaborated extensively with Dr. Vernon Smith, co-recipient of the 2002 Nobel Prize in Economics. He was recognized with the prestigious awards (1998) “Dr. Habil in Engineering”, Budapest Technical University and (2014) "Doctor Honoris Causa", University of Pecs. He is the author of 27 books and over 400 papers in international journals.

Role: Dr. Szidarovszky provides expertise in advanced statistical analysis and other mathematical techniques.

Randy Solton: Systems Architect

- ✓ 40+ Years of Experience
- ✓ Inventor and patent holder on key strategic technologies
- ✓ Proficient in database design, systems security, cloud architectures, telephony, and language compiler
- ✓ Applied Specialist: Skilled in ecosystems co-benefits quantification and characterization

Mr. Randy Solton has worked at technology companies like Borland, Intertel, Liveops, Apigee, and financial firms such as BNY Mellon. Randy developed breakthrough technologies now mainstream in computing, including co-inventing the Javascript programming language. His expertise spans technology domains like telephony, programming tools, relational databases, contact centers, and financial services applications. Randy is skilled in modern REST API design, securely integrating data from disparate systems, and building efficient data warehouses. At BNY Mellon, he led a program to design secure APIs for legacy Wall Street financial systems, requiring custom data transformation. Randy is also a User Interface (UI) design expert for database and analytical applications. Working at various companies, he is a "hands on" architect who implements the systems he designs, ensuring they are clean, scalable, secure, performant, and maintainable.

Role: Mr. Solton will take the lead on overall distributed systems design and implementation, and on design of the specific Aqaix deliverables for the project.

Suna Cinar: Principal Systems Analyst

- ✓ 10+ Year of Experience in AI Modeling
- ✓ Co-Developed AI Optimization Models
- ✓ Expert In Water Quality Systems
- ✓ Authored Springer Book Chapter On AI
- ✓ Led National Water Management Initiative
- ✓ Research Engineer at Istanbul Tech

Dr. Suna Cinar has more than ten years of research and consulting experience, including in water resources with AI and optimization related modeling. As part of her work for NOAH, Dr. Cinar is responsible for data analysis, co-developing AI, and optimization models, and implementing the models in various software programs. In addition to her systems engineering and computer modeling background in water resources, Dr. Cinar has water quality expertise and co-developed a patented water treatment system for arsenic removal. She served as a Research Engineer at Istanbul Technical University's Technology Transfer Center in Turkey, where she was part of a major national initiative to develop advanced water resources management models for the country. She has numerous peer review publications in operations research and co-published a book chapter on AI and optimization entitled "A Decision Support System for Managing Water Resources in Real-Time Under Uncertainty" published by Springer in 2017 in their reference Optimization and Dynamics with Their Applications.

Role: Dr. Cinar will provide her expertise in machine learning during the modeling tasks.

Anthony Ryan: Expert Biologist

- ✓ 30+ Years of Experience as Biologist
- ✓ Expert In Continental-Scale Ecology Management.
- ✓ Authorized Biological Consultant, Riverside County.
- ✓ Led Projects for San Manuel Band.
- ✓ Extensive Experience with Endangered Species.
- ✓ Specialized In Desert and Riparian Ecology.

Mr. Anthony Ryan is a distinguished wildlife biologist whose technical expertise has significantly advanced the field of biological conservation, particularly regarding endangered species. His achievements include leading large-scale transportation and

renewable energy projects with a focus on mitigating environmental impacts. Anthony's work as an Authorized Biological Consultant in Riverside County has made substantial contributions to continental-scale ecology projects and regional desert ecology, helping bridge the gap between traditional field research and cutting-edge technology like GIS and remote sensing. His notable clients include prominent organizations such as the San Manuel Band of Mission Indians and TRC Companies, reflecting his respected status in the field. Anthony's ability to manage and direct complex environmental projects, coupled with his deep knowledge of systematic botany and species-specific ecology, has solidified his reputation as a leader and innovator in environmental and wildlife conservation.

Role: Mr. Ryan will provide his insight as a biologist on as needed basis for this project.

Lynn Hiseh: GIS and Data Assimilation Expert

- ✓ Authored GIS Textbook
- ✓ Developed Geospatial Contouring Algorithm
- ✓ Expert In AI, Statistics, Optimization
- ✓ Published On Climate Impact Modeling
- ✓ Analyzed Chemical Contaminants Statistically

Dr. Lynn Hiseh has the unique requisite combination of mathematical and modeling expertise in AI, statistics, and optimization with mastery of relevant computer languages and related data visualization programs, including Python, R, ArcGIS, Quantum GIS, Matlab, and SPSS. Even before she authored a published textbook on GIS, as a young Doctoral student, she developed a geospatial contouring algorithm with an interface that projected generated contour maps over ArcGIS maps. Dr. Hsieh ensures a smooth flow of data and model generated predictions and solutions that are provided in multiple formats as needed, including digital charts, graphs, and maps. Her published work includes geostatistical interpolation of space-time precipitation for a real-time hazard forecasting system, modeling the impacts of large-scale climatic conditions on localized hydrologic systems, statistical correlations between chemical contaminants and human health, and quantitative assessments of renewable energy sources.

Role: Dr. Hiseh will acquire, process, and assimilate GIS and remote sensing data and information.

Greg Herman: GIS and Statistics Expert

- ✓ Expert in GIS and Remote Sensing
- ✓ Developed Government Data Processing Tools
- ✓ Consulted For Google Earth
- ✓ Researched Geology, Hydrology, Land Use
- ✓ Served Public and Private Sectors

Dr. Greg Herman has decades of experience as an expert in GIS and remote sensing data. He has developed methods and tools for government agencies for efficiently and accurately processing these data sources for analysis and modeling of complex environmental systems. Dr. Herman has consulted Google Earth as well as other private and public sector entities, and has performed research on a variety of topics, including geology, hydrology, land use, and other related topics.

Role: Dr. Herman will apply statistical methods to data sets for improving system understanding and designing modeling approaches.

Lizbeth Stevenson: Full Stack Architect

- ✓ 35+ Years of Experience
- ✓ Lead engineer on numerous product and professional services implementation projects
- ✓ Deep capabilities in software implementation
- ✓ Expert at UX (User Experience) Design and User Interface Implementation

Ms. Lizbeth Stevenson has worked across many technology areas and on numerous types of systems, ranging from telephony to ecomm to environmental finance and ecosystem modeling and quantification. Lizbetgh is expert at the entire top-to-bottom software stack including the top-level user interface implementation, the object-relational and “business logic” layers, and the data storage and “back end” tiers. Lizbeth is expert in a wide variety of programming languages including C++, Java, Javascript, and others. Lizbeth has worked at a variety of companies including WordTech, Borland, Liveops, and BNY Mellon, as well as on numerous client projects for Aqaix.

Role: Ms. Stevenson will have an instrumental role in the detailed design and implementation of components on the project.

A team of developers, engineers, data scientists, hydrogeologists, and geologists are supporting the primary consulting team in delivering the tasks of this project.

4.0 EXAMPLE PROJECTS

Regulatory Negotiation and Compliance, Site Investigation and Remediation for Former Preco Site, Commerce, CA

The subject property has been a focal point of environmental scrutiny for over three decades, characterized by extensive remedial and investigative efforts. Initially utilized for metal manufacturing activities, the site transitioned through various industrial uses before its current redevelopment into a distribution center. Historical activities led to soil contamination primarily with hydrocarbons and metals, localized to shallow regions, without significant volatile organic compound (VOC) levels or clear migration pathways to groundwater. Despite the removal of underground storage tanks and contaminated soil, along with soil vapor extraction (SVE) efforts, residual groundwater contamination persists, complicating regulatory closure.

A significant challenge arose when regulatory compliance stalled for two years following the unexpected loss of the leading consultant. This hiatus not only delayed progress but also heightened regulatory scrutiny from the overseeing agency. In response, a proactive and transparent approach was adopted to reinvigorate site compliance efforts. Emphasis was placed on clear communication and collaborative strategy development with the regulatory body to navigate the complex remediation landscape.

Innovative remediation techniques, such as the implementation of a solar-powered SVE system, were introduced to address residual contamination while minimizing environmental impact. Moreover, a comprehensive review of historical data was undertaken to elucidate contamination sources and dynamics, revealing that off-site sources may significantly contribute to the observed groundwater contamination. This insight challenged the prevailing narrative that the site was the sole contributor to the contamination plume, thus reshaping the remediation strategy and regulatory discourse.

Collaboration with the regulatory agency led to the formulation of a remediation plan tailored to the site's unique challenges, incorporating natural attenuation's role in contaminant reduction and leveraging advanced modeling to support the site's closure strategy. This cooperative and evidence-based approach marked a pivotal shift towards achieving regulatory closure, setting a precedent for handling complex remediation projects where historical activities blur the lines of responsibility.

In summary, this case study underscores the critical role of adaptive management, innovative remediation technologies, and stakeholder collaboration in navigating the intricate path to site closure. It highlights the importance of re-evaluating historical data and assumptions in light of new evidence and changing site conditions, thereby paving the way for reasoned and equitable solutions in prolonged environmental remediation projects.

Optimal Management of Water Resources and Assets for a Water Stressed Mediterranean Nation using AI Prediction and Multi-Objective Optimization, Nation of Malta

In this project, our team member, NOAH, working with their European subsidiary, was awarded a groundbreaking contract by the European Union to help protect the future of an island nation.

Because of increasing water scarcity, many areas depend on a combination of different water sources when available. Different sources, however, typically have different costs and benefits relative to numerous factors, including environmental, financial, social, technological, and even cultural. Furthermore, there may be different risks or vulnerabilities associated with each water source. For example, while groundwater in coastal areas is often vulnerable to salt-water intrusion, surface water is often vulnerable to algae blooms. Climate change and the associated uncertainty that it imposes on both water demand and water supply is another complicating factor that must be considered to reduce risk and increase water security.

The objective of this project, executed under the contract, entitled Development of a Predictive Water Abstraction and Production Modeling Framework, was to study the feasibility of implementing NOAH's Patented water management decision support system to optimize conjunctive management of Malta's complex water assets and operations. NOAH executed the work in partnership with Malta's Energy and Water Agency (EWA) and Water Services Corporation (WSC).

Malta's vision is to implement a data driven AI and optimization decision support system for optimizing their complex water assets and operations. The system would help Malta's water managers identify the optimal balance between minimizing energy consumption costs, maximizing the quality of consumer provided water, and maximizing protection of the groundwater system from over-pumping.

As part of this study, NOAH:

- Assessed Malta's Supervisory Control and Data Acquisition System (i.e., SCADA) system for automatically measuring and transmitting critical resources and operational data to a centralized database.
- Assessed Malta's software system architecture for integration with a real-time AI and optimization-based decision support system.
- Analyzed data to increase understanding of critical relationships between different operating conditions and system responses.
- Assessed the existing data collection strategy within the context of Malta's natural water resources and water infrastructure assets for implementing a prediction and optimization modeling system necessary for optimal water management.
- Using representative Malta data sets, developed and assessed AI capability for predicting important time changing variables of interest like water demand and chloride concentrations in groundwater.
- Using representative Malta data sets, developed and assessed optimization models for reducing energy consumption costs, optimizing customer delivered water quality, and minimizing salt-water degradation of groundwater from over-pumping. Stochastic models included the element of weather uncertainty, which is becoming even more prevalent with climate change.

Algae Bloom Forecasting in a Complex Surface Water Supply System Using AI Prediction Models

Algal blooms (AB) in surface water bodies are a serious global water quality problem that pose significant risk not only to water supplies and their users but to society and the environment as a whole. AB events can cause taste and odor problems, damage the environment, and some algal classes like cyanobacteria (blue-green algae) may release toxins that can cause illness or even death in humans and animals. Treatment is expensive, and algae blooms can temporarily disrupt a critical water supply. When they occur in marine environments, they create "dead zones" that can devastate commercial fishing and render popular tourist destinations undesirable or even unsafe.

The modeling objective for this project was to demonstrate the feasibility of using AI as a real-time modeling and forecasting tool to accurately predict highly dynamic algae concentrations in a complex surface water supply system in response to variable water quality, biological, weather, hydrological, and water use conditions.

For the project, two types of AI models were used for predicting concentrations for three different algae species, cyanobacteria (blue-green algae), chrysophyta (gold algae) and chlorophyta (green algae).

For the first AI prediction type, AI models were developed to explicitly predict the actual algae count population. For the second AI prediction type, AI classification models were used to predict whether the algae count falls within one of four different pre-specified bins or numerical ranges. For this classification prediction problem, the following four bins or classification ranges were selected: 0 to 10 counts, 11 to 50 counts, 51 to 200 counts, and 201 and above counts. For both the AI explicit prediction and classification models, the algae count predictions were made one week and two weeks ahead.

The system consists of two rivers and a reservoir to supply water to the water treatment plant (LFWTP). River A flows into River B upstream of the LFWTP's intake canal, while River B water is gravity fed to the LFWTP intake by way of the canal. Rivers A and B have historically exhibited variable and unique water quality characteristics that impart different treatment challenges. River B is considered to be of lower water quality because of more numerous upstream contaminant sources. However, River A has a higher incidence of AB events. These source waters are highly variable in both quality and quantity with respect to seasonal changes and precipitation related events. Source water selection is based primarily on water quality conditions followed by economic factors such as treatment and pumping costs.

Because of their desire to forecast algae blooms and monitor overall water quality, the utility has an extensive watershed water quality monitoring program in place to assist with decision making for source water selection and prediction of water quality changes. Grab and online sample data are supplemented by United States Geological Survey flow and water quality monitoring stations located throughout the watershed.

The three-water quality monitoring or sampling stations, numbered 100, 101, and 612 shown on conceptual site plan were used in this study. Sampling Station 100 is located at the raw water intake point for the LFWTP and is representative of the water sources used to supply the treatment plant. The water source(s) entering the intake point at sampling Station 100 can at any given time originate from one or more of three possible sources; River A, River B, and Reservoir A. Water quality sampling Station 612, located at the intake for Pumping Station 2, is almost always representative of water quality on River A (in past years, some low flow extreme conditions coupled with high extractions at Pumping Station 2 captured some portion of River B for short periods). The third and last water quality sampling location, Station 101, located at the mouth of the canal that leads from River B to the LFWTP, is representative of water quality conditions on River B capturing conditions after the confluence of Rivers A and B.

A total of 302 measurement events consisting of water quality, biological, hydrologic, weather, pumping, and extraction data collected over a five-year period were used in the study. However, not all data were available in the same quantities. For example, some general water quality variables like phosphorous and nitrate were more limited. Different combinations of input variables were used for different AI models to assess prediction capability for a range of input data, foster increased system understanding, and thereby improve prediction performance.

Despite the relatively small number of data events available for learning, the AI models generally performed well during validation, achieving relatively high correlation coefficients and accurately predicting sudden and significant changes in algal populations. The models developed with both one-week and two-week ahead prediction periods accurately predicted formation and dissipation of AB events, as well as the relative increase and decrease in cell counts.

Managing a Public Supply Wellfield Subject to Groundwater Elevation Constraints with an AI Prediction Model

The modeling objective for this project, the first of its kind in the world, was to develop AI models with real-world data to accurately predict highly dynamic groundwater elevations in a groundwater system in response to variable pumping and weather conditions.

Tampa Bay, Florida, a booming metropolitan area with one of the fastest growing populations in the United States, is a well-known example of this. As profiled in the bestselling book “Water Follies”, high groundwater extractions of the groundwater system in this densely populated area have produced severe aquifer overdraft, resulting in adverse impacts, including wetlands dewatering, streamflow depletion, and land subsidence. The water utility which operates a high-capacity wellfield is under strict regulatory requirements to prevent groundwater elevations within the unconfined aquifer from declining below imposed target levels. These imposed target groundwater elevations are intended to prevent the above-mentioned environmental destruction of habitats. Failure by the utility to maintain groundwater elevations above these targets can result in steep regulatory fines.

At great financial cost, the water utility developed an extensively calibrated numerical groundwater flow and surface water simulation model, linked to an optimization management model. Using two-week management periods, the utility used this linked system simulator and management optimization model to compute optimal pumping rates for their wellfield that maximizes its total combined groundwater withdrawal without violating target water level constraints.

For this project, AI prediction models were developed using historical groundwater elevations measured at twelve monitoring wells, extraction rates from seven high-capacity production wells, and weather conditions from a nearby airport. Although the number of data events for model development and validation was relatively limited, using two week forecast periods, the AI model accurately predicted highly dynamic groundwater elevations in both the unconfined sedimentary aquifer and the deeper karst limestone aquifer. The AI model not only reproduced dramatic changes in groundwater elevations for two-week ahead prediction periods, but it also significantly outperformed the extensively calibrated numerical model developed by the utility.

To demonstrate the superior AI predictions, its groundwater elevation predictions at the twelve monitoring wells were compared against the utility's numerical model over a seventy-one-day validation period, consisting of ten consecutive seven-day stress periods. The absolute mean error between the AI predicted and the measured head at the twelve monitoring wells over this 71-day period is just 0.54 feet, compared to the 2.80 feet absolute mean error achieved with the numerical model for the same period.

Unlike the numerical model, the AI model accurately predicted the dynamic head responses to pumping and recharge in the complicated multi-layered groundwater system for each two-week ahead prediction period. Even more impressive, the AI model was able to accurately reproduce groundwater elevations in both aquifers over an extended 71-day validation period using ten consecutive seven-day stress periods. For each proceeding stress period prediction, the AI model was re-initialized with its predicted groundwater elevations from the previous stress period.

The AI sensitivity analysis demonstrated that over the relatively short two-week optimization periods, groundwater elevations in the shallow surficial aquifer are almost entirely affected by precipitation, while groundwater elevations in the deeper limestone aquifer are almost entirely affected by pumping of the municipal supply wells. These insights into critical cause and effect relationships can provide invaluable water resources management benefits. They include a more complete understanding of the system behavior, improved data collection strategies, improved models with increased prediction capability, an increased awareness of system vulnerabilities and risks, and a more fully informed and rational strategy for regulating and managing the resource.

For example, based on the sensitivity analysis, groundwater extraction rates clearly have nominal effect on groundwater elevations in the shallow aquifer over shorter two-week time periods, whereas weather variables are far more dominant factors. On this basis, then, the regulatory agency might consider modifying the water level targets to also account for weather conditions beyond the control of the utility. Related to this, the utility may increase spatial characterization of weather to improve their AI prediction

capability and minimize pumping in areas where AI shows a more direct hydraulic connection between the deeper limestone aquifer and the shallow unconfined aquifer.

The first of its kind, this groundbreaking study proved that AI could be trained using real-world pumping and weather data to accurately predict dynamic groundwater elevations in a highly complex multi-layered aquifer system; that it was also performed using multiple stress periods over an extended simulation period made the results even more impressive. Most importantly, it proved the benefit of using AI as a real-time decision support tool for effectively managing complex groundwater systems, as well as supporting related regulatory strategies and decisions.

Protecting a Public Supply Well from Saltwater Upconing with an AI Prediction Model

The modeling objective for this project, the first of its kind in the world, was to develop AI models using real-world data to accurately predict highly dynamic chloride concentrations in a coastal aquifer in response to variable pumping and weather conditions.

Provincetown, Massachusetts, a scenic coastal community and popular tourist destination located on the Cape Cod peninsula, has experienced saltwater upconing due to high groundwater extractions from its coastal aquifer. The community is located between Cape Cod Bay and the Atlantic Ocean, with its scarce fresh groundwater lens floating on top of denser seawater, which also laterally bounds the aquifer.

A single production well supplies the community with its water supply. Contrary to computer simulated predictions by government agencies, during higher pumping periods, the production well induces saltwater upconing, which significantly increases chloride concentrations in the drinking water that often exceed the acceptable drinking water quality limits. Therefore, the community required guidance on how to operate the production well to minimize the occurrence of these pumping induced salinity spikes.

For this project, AI models were developed to predict specific conductance (i.e., salinity) values in the production well one month, two months, and three months ahead. The AI models used a combination of specific conductivity, pumping rates, and weather conditions as the input variables used for predicting the future conductivity values.

Model accuracy was compared against measured/interpolated conductivity values and a linear regression model (LR). The AI models achieved excellent prediction performance. For example, although the average percent change of conductance over

90-day prediction periods was 39% of the previous value, the absolute mean prediction error achieved with the AI model was just 1.1%.

To assess AI's ability to perform long term predictions, AI was used to simulate monthly conductivity values over an extended 46-month prediction period using monthly stress periods. For this extended simulation, the AI model re-initialized itself with its previous prediction for each subsequent monthly prediction. In this way, AI's ability to perform an extended multi-year prediction using monthly weather and pumping data was evaluated. Model accuracy was compared against measured/interpolated conductivity values and a linear regression model (LR), and in general, excellent predictive performance with the ANN models was achieved.

As shown in Figure 3, for the 46-month extended period simulation, the AI model accurately reproduced the almost four-year period, accurately predicting individual measured conductance values measured at the end of the prediction period. In contrast, the LR model did not provide accurate predictions over the extended prediction period, significantly underestimating the measured conductance values over the final 1.5 years. Note that conductance values were not available for comparison for all time periods, but the valleys and peaks correspond with higher and lower pumping periods that are driven by seasonal variations in demand.

A sensitivity analysis was also performed with the AI model to identify the relative importance of different variables on salinity concentrations in the public supply well. Unlike traditional physical-based models, where model parameter compensation and non-unique solutions can render sensitivity analysis questionable, the AI models can clearly show direct cause and effect relationships.

Sensitivity analyses conducted with the AI models demonstrate that while weather is somewhat important for predicting conductance, pumping rates and initial conductance values are the most important variables for accurately predicting final conductance values. Interestingly, the effect of weather conditions like temperature and precipitation become more important over longer prediction periods (e.g., 90 days), which physically makes sense as their individual and combined effects on critical factors like groundwater recharge become more pronounced over longer time periods.

This project demonstrated the power of AI for accurately modeling salt-water upconing in a coastal aquifer in response to variable pumping and weather conditions. The higher predictive accuracy achieved with the ANN results in identification of superior management solutions that protect the drinking water supply against water quality degradation.

Water Utility Data Warehouse

For The Water Tower at Gwinnett, a non-profit adjunct of the Gwinnett County, Georgia, water utility, Aqaix built a data warehouse to hold various sets of Gwinnett water department data. The core data were aggregates from the SCADA Historian data set, aggregating fine grained time series event data from the water plant's treatment train. Aqaix wrote ETLs to query the Historian for the event data, and aggregate into higher level constructs useful for various analytics and to join to other data sets. The ETLs had to compensate for numerous quality control issues in the Historian data, and had to be very resilient to ensure runtime reliability in a challenging operations environment. Other data sets included lab data, some from spreadsheets, as well as water quality sample data from nearby Lake Lanier. Aqaix also designed and built a REST API to support secure queries to this data, and hosts and manages the API in a "white label" (branded) edition of the Aqaix API Store. Users of the data are typically conducting Data Science projects to analyze the data for predictive and policy purposes.

Monterey Bay Stormwater Management NBS Project Catalog

Aqaix built a software platform to support a coalition of Monterey Bay organizations - nonprofits, cities, and county organizations working together to plan and run a campaign to raise about $70M in funding for a portfolio of 16 stormwater management projects in the Monterey Bay area. These projects were primarily Nature Based Solutions (NBS) projects directed at reducing nutrient loading into Monterey Bay. The system was comprised of a project catalog offering a friendly user interface to browse projects and inspect attributes and investor/funder due diligence information. The project also included an interface to a second database, via API calls, containing water quality data built from over one million physical water quality samples obtained as part of the Central Coast Ambient Water Quality Monitoring Program (CCAMP). Innovations on this project included a unique scoring/tile system, to show a project's estimated environmental and social ROI, as well as construction and financial risk, and the display of a water quality dashboard along with GIS display of geospatial information.

5.0 PROPOSED COST AND SCHEDULE

Table 2. Cost Estimate Summary

#	Task/Activities	Personnel	Program Director	Principal Product Developer	Principal Modeler/ ML Director	GIS Expert	Aqaix Personnel	NOAH Personnel	Support Staff	Schedule (duration)			Cost per Task
		Rate (hr)	$180.00	$180.00	$180.00	$170.00	$240.00	$150.00	$120.00				
			Number of Hours/Subtotal										
1	Task 1 – Program Management												
2	Kickoff Meeting		2	2	2	2	2	0	0				$1,900.00
3	Two Check In Meetings for Progress Discussion		4	4	4	0	4	0	0				$3,120.00
4	Three Presentation Meetings with USFW		8	8	8	4	0	0	8	Entire Project, Eighteen Weeks			$5,960.00
5	Final Phase I Meeting		2	2	2	2	4	0	0				$2,380.00
6	Admin and Project Management		4	0	0	0	0	0	12				$2,160.00
7		Subtotal	$3,600.00	$2,880.00	$2,880.00	$1360.00	$2400.00	$0.00	$2400.00	--	--	--	$15,520.00
8	Task 2 – Document Review and Requirements Gathering												
9	Document Review and Requirements Gathering		4	4	4	0	4	0	24	Two Weeks after Kickoff			$6,000.00
10		Subtotal	$720.00	$720.00	$720.00	$0.00	$960.00	$0.00	$2,880.00	--	--	--	$6,000.00
11	Task 3 – Data Assimilation and Review												
12	Obtaining Data from OCWD Sources		2	4	0	0	0	0	4				$1,560.00
13	Obtaining Data from Applicable Sources		0	4	0	4	0	4	8				$2,960.00
14	Review Digital Data Files and Structure		0	4	4	4	18	0	0				$6,440.00
15	Review and Extract Necessary Features from Data		0	0	0	24	0	0	0	Eight Weeks, Start after Task 2			$4,080.00
16	Develop Data Dictionary for all Collected Data		0	8	0	0	18	0	0				$5,760.00
17	Data Gap Analysis and Data Enrichment		4	4	4	4	0	0	0				$2,840.00
18		Subtotal	$1,080.00	$4,320.00	$1,440.00	$6,120.00	$8,640.00	$600.00	$1,440.00	--	--	--	$23,640.00
19	Task 4 – Site Visits and Interviews												
20	Site Visits and Interviews		8	8	0	0	0	0	8	Two Weeks after Task 2			$3,840.00
21		Subtotal	$1,440.00	$1,440.00	$0.00	$0.00	$0.00	$0.00	$960.00	--	--	--	$3,840.00
22	Task 5 – Data Centralization and Platform												
23	Evaluate Various Database Hosting Services		2	8	0	0	8	0	0				$3,720.00
24	Evaluate Available Software Options for Platform Selection		2	8	0	0	2	0	0				$2,280.00
25	Develop A Roadmap For Data Warehouse And Schema		2	8	0	0	8	0	0	Eight Weeks, Concurrent with Task 3			$3,720.00
26	Strategize Data Automation Practices		2	8	0	0	2	0	0				$2,280.00
27	Data Quality Analysis, And Subsequent Cleansing		0	8	0	0	8	0	0				$3,360.00
28		Subtotal	$1,440.00	$7,200.00	$0.00	$0.00	$6,720.00	$0.00	$0.00	--	--	--	$15,360.00
29	Task 6 – Preliminary Advanced Analytics and ANN Modeling												
30	Statistically analyze data for temporal and spatial patterns and correlations		2	4	4	4	0	4	0				$3,080.00
31	Process Data for AI Model Development		0	4	8	8	8	20	0				$8,440.00
32	Develop Preliminary AI Models for Different Output Targets – Train the Models		2	4	10	0	0	16	0				$5,280.00
33	Assess Model Performance – Perform Validation with Data Not used For Training		0	2	4	0	0	4	0				$1,680.00
34	Perform Sensitivity Analysis to Quantify Cause and Effect Relationships		0	0	6	0	0	6	0	Eight Weeks, after Task 3			$1,980.00
35	Integrate updated data into the models.		2	4	4	2	8	8	0				$5,260.00
36	Develop New AI models, as Necessary.		2	4	8	0	0	8	0				$3,720.00
37	Repeat Validation, Sensitivity Analysis, and Share Results		0	2	8	0	0	4	0				$2,400.00
38	Iterate the Data Refinement, Model Development, Validation, and Sensitivity Analysis		0	2	10	0	0	10	0				$3,660.00
39		Subtotal	$1,440.00	$4,680.00	$11,160.00	$2,380.00	$3,840.00	$12,000.00	$0.00	--	--	--	$35,500.00
40	Total Labor Cost		$9,720.00	$21,240.00	$16,200.00	$9,860.00	$22,560.00	$12,600.00	$7,680.00	–	–	–	$99,860.00
41	Total Number of Hours		54	118	90	58	94	84	64	–	–	–	562
42												Total Project Cost	$99,860.00

AGENDA ITEM SUBMITTAL

Meeting Date: July 3, 2024

To: Board of Directors

From: John Kennedy

Staff Contact: J. Dadakis

Budgeted: No
Budgeted Amount: N/A
Cost Estimate: $25,000
Funding Source: General Fund
Program/ Line Item No.: 1010.51102
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: COALITION FOR ENVIRONMENTAL PROTECTION, RESTORATION AND DEVELOPMENT (CEPRD) REGIONAL RELIABILITY & SUSTAINABILITY PROJECT

SUMMARY

The Coalition for Environmental Protection, Restoration and Development (CEPRD) and its stakeholders seek to continue its ongoing Regional Reliability and Sustainability Project. The District and other peer utilities, along with State Water Resources Control Board staff, have developed a scope of work for the next 12 months to inform state policy for managing constituents of emerging concern (CECs), including PFAS, for water recycling projects and environmental discharges. CEPRD will help the state appropriately balance water quality protection with current state goals and utility plans for ongoing and expanded water recycling.

Attachments:
- Project Overview, CEPRD Regional Reliability and Sustainability Project – Phase 5.4
- Letter from State Water Resources Control Board – Division of Drinking Water in support of continued work with CEPRD

RECOMMENDATION

Authorize the General Manager to support the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000.

BACKGROUND/ANALYSIS

Support of CEPRD is worthwhile considering their unique collaboration of environmental decision makers in the water, regulatory, and industrial communities. This coalition of high-level decision makers from both the private and public sectors has been previously effective in the review and advocacy of water policies related to industrial contamination of aquifers, such as in the Orange County Groundwater Basin. Historical coalition members have included OCWD, Los Angeles Department of Water and Power

(LADWP), Honeywell, Lockheed-Martin, Metropolitan Water District of Southern California (MWD), Los Angeles County Sanitation District (LACSD) and the San Gabriel Basin Water Quality Authority. This group successfully worked with state Division of Drinking Water (DDW) staff to develop and implement a crucial User Guide document addressing the permitting of impaired water sources for drinking water (e.g., treated groundwater from a Superfund site) under the state's Process Memorandum 97-005. Prior to the User Guide, many proposed 97-005 projects struggled and stalled with the complexity of permitting and regulatory review.

The coalition's current focus is to continue working with both DDW and the State Board Division of Water Quality (DWQ) on designing regulatory strategies necessary to achieve the state's recycled water goals and create successful projects for the agencies developing them. One shared goal between CEPRD stakeholders, DDW, and DWQ is to develop a more unified and integrated approach for managing constituents of emerging concern (CECs), such as PFAS, in wastewater and in potable reuse projects. The planned scope of work for the next phase features collaborative work with the state to review the role of wastewater pre-treatment (i.e., sewer source control) programs in controlling CECs, as well as the existing National Pollutant Discharge Elimination System (NPDES) used for permitting environmental discharges from wastewater and some recycled water facilities. Current confirmed coalition members include LADWP, (City of) LA Sanitation & Environment, and Orange County Sanitation District (OC San). OC San's participation and perspective are especially valuable, given its experience in providing effective wastewater pretreatment for the Groundwater Replenishment System (GWRS).

PRIOR RELEVANT BOARD ACTION(S)

September 20, 2023. M23-101 – Authorizing support for the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000.

October 19, 2022. M22-108 – Authorizing support for the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000.

June 16, 2021. M21-61 – Authorizing support for the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000.

June 17, 2020, M20-67 – Authorizing support for the CEPRD Regional Reliability and Sustainability Project in the amount of $25,000.

June 19, 2019, R19-6-92 – Support the 97-005 CEPRD project in the amount of $25,000.

Draft Project Overview – For Discussion Purposes Only
CEPRD Regional Reliability and Sustainability Project – Phase 5.4

Achieving Results in the Effort to Develop Sustainable Local Water Supplies - DPR, CEC Challenges, the Role of POTWs and How We Make It Work

Goal: To develop collaborative opportunities for the effective implementation of recently adopted Direct Potable Reuse (DPR) regulations and related CEC issues. Particular attention will be devoted to how POTWs are being increasingly relied upon for augmenting regional drinking water supplies and how current regulations may impact such efforts.

Background: The Coalition for Environmental Protection, Restoration and Development (CEPRD), a 501(c)(3) corporation, and its Water Project Stakeholders (Stakeholders) have worked collaboratively to create a common framework of understanding for addressing CECs and putting impaired waters and groundwater basins to beneficial use. The September 2020 User Guide for DPH Memo 97-005 provides a tool for such action. The State Water Resources Control Board (SWRCB) has acknowledged the potential benefit of CEPRD's continued support for its efforts. In particular, there is a need to address shared concerns related to (1) the potential hurdles CECs pose to the beneficial use/reuse of wastewater and biosolids and development of new sources of water supply and (2) the use of regulatory thresholds for CECs in drinking water and other regulatory programs, including NPDES and related pretreatment programs. It has been determined that this is an effort which merits the continued involvement of CEPRD.

Methodology: In coordination with CEPRD members, Project Stakeholders, staff, and consultants, California Partnerships, Inc. on behalf of CEPRD will perform services in the following areas:

1) Convene a working group to meet on a regular basis to provide a vehicle for greater coordination among industry, regulatory agencies, and water purveyors for the purpose of implementing DPR regulations, with a focus on CECs and associated pretreatment responsibilities.
2) Provide a vehicle for coordination with the SWRCB Division of Drinking Water (DDW), Division of Water Quality (DWQ), and other regulatory agencies regarding the development and implementation of thresholds for CECs in conjunction with the state's DPR objectives.
3) Explore the development of a concurrent pilot project(s) based upon existing potable reuse plans and/or projects.
4) Develop a framework for targeted regulatory actions to address CECs and advance the development of an integrated and sustainable water supply strategy for the region.
5) Conduct a day and a half off-site to provide the parties with an opportunity to refine strategies in furtherance of project objectives and develop recommendations for future action.

Timetable: July 2024 – June 2025
Budget: $250,000

State Water Resources Control Board

May 10, 2024

Marty Adams
Chair, CEPRD
General Manager and Chief Engineer
Los Angeles Department of Water & Power
111 North Hope Streer, Room 1550
Los Angeles, CA 90051
(Delivered via email)

Dear Marty:

I am sending this note to you in your role as chair of CEPRD and as follow-up from our meeting back in January and our subsequent communications. The support and group input provided by CEPRD in the development of the updated Policy Memo 97-005 Guidance and subsequent training sessions in its application was invaluable and led to its success. Recent approval of the State's Direct Potable Reuse regulations presents another chance for creative engagement. Both the Divisions of Drinking Water and Water Quality welcome the opportunity to work with CEPRD as we move forward in designing regulatory strategies necessary to achieve the state's recycled water goals and create successful projects for the agencies developing them. We anticipate this could include evaluating use of the pretreatment program as part of an integrated approach to address CECs (e.g., PFAS compounds) in wastewater especially where this will impact direct potable reuse projects and their water treatment streams. We believe strong partnerships will need to be developed between drinking water and wastewater agencies as well as industrial dischargers for direct potable reuse to be successful.

Please feel free to share this message with those who may be interested.

Sincerely,

Darrin Polhemus, P.E.
Deputy Director, Division of Drinking Water

AGENDA ITEM SUBMITTAL

Meeting Date: July 3, 2024

To: Board of Directors

From: John Kennedy

Staff Contact: Lisa Haney

Budgeted: N/A
Budgeted Amount: N/A
Cost Estimate: $170,000
Funding Source: N/A
Program/Line Item No.: N/A
General Counsel Approval: N/A
Engineers/Feasibility Report: N/A
CEQA Compliance: N/A

Subject: OCWD SEDIMENT STRATEGIC PLANNING AND OBLIGATIONS

SUMMARY

Staff will provide an update on sediment management issues behind Prado Dam and at the Field Headquarters in Anaheim. The District is addressing sediment management challenges by developing a comprehensive Sediment Management Plan (SMP) to meet regulatory obligations and optimize water conservation at Prado. The SMP includes potentially working with other interested agencies and parties who are seeking sediment to reduce District expenses.

Attachment(s):

- Presentation
- Scheevel Engineering Scope of Work Proposal

RECOMMENDATION

Authorize agreement with Scheevel Engineering to assist in the Sediment Management Plan development and long-term planning needs for sediment removal within the Prado Basin for a total amount not to exceed $170,000.

BACKGROUND/ANALYSIS

Key components of the SMP involve developing a long-term sediment compliance plan, conducting sediment studies within Prado Basin to determine the effects of the compliance plan on upstream infrastructure such as the River Road Bridge, sediment transport and threats to the SARI line, and basin hydrology, as well as the impacts on constructed wetlands. Additionally, the SMP will include a plan for local and regional sediment removal opportunities and partnerships to maximize and maintain stormwater capture behind Prado as a reliable long-term source of water for groundwater recharge. OCWD is focusing on interagency collaboration, stakeholder engagement, and monitoring programs to track sediment levels and assess management effectiveness. Leveraging technology like LiDAR and GIS, OCWD aims to enhance sediment tracking capabilities long term and have adaptative management strategies to deal with changing conditions. By prioritizing innovation, collaboration, and effective monitoring, the SMP will ensure compliance and the protection of water resources, while maintaining transparency with regulatory bodies and the watershed partners.

Presentation Topics: Sediment Regulatory Obligations and Compliance Planning

1. Sediment Regulatory Obligations and Compliance Plan

The presentation will cover the sediment regulatory obligations that the Orange County Water District (OCWD) must adhere to. We will discuss our strategic approach to meeting these requirements, focusing on the collaborative efforts with Nate Scheevel for sediment removal planning and developing a long-term sediment compliance plan.

2. Studies with Nate Scheevel for Sediment Removal Planning

Alternatives Analysis: To develop a draft sediment removal compliance plan, data from ongoing studies, previous sediment studies, sediment transport models, and other available survey data will be utilized. Three plan alternatives will be developed and analyzed to meet sediment removal compliance requirements, and a draft technical memo summarizing these alternatives and findings from previous tasks will be prepared. This draft memo will undergo review, comments will be addressed, and a final revised memo will be produced, with assistance provided to OCWD in selecting the preferred alternative.

Sediment Removal Plan Development: Detailed plans and specifications for sediment removal activities will be created to guide OCWD or third-party contractors in conducting sediment removal. Assistance will also be provided to OCWD for any additional permitting required for these activities. The plans and specifications may be used by OCWD forces, third parties, or for implementing a public works project to remove the initial sediment volume.

Monitoring Plan Development: A draft monitoring plan will be developed for the sediment removal compliance efforts, outlining requirements for monitoring, sampling, and sediment profiling analysis during sediment removal activities. The plan will also include long-term monitoring requirements to ensure ongoing compliance and the effectiveness of sediment management strategies.

3. Long-term Planning for Sediment Removal to Maintain Stormwater Capture Volume

Following the discussion on regulatory compliance and sediment removal efforts, the discussion will move into the long-term planning necessary to maintain the volume for stormwater capture behind Prado Dam, which is critical for our water conservation efforts.

PRIOR RELEVANT BOARD ACTIONS:

3/15/23, R23-32: Approve Master Sediment Removal Agreement that can be executed by the General Manager with individual contractors for sediment removal at no cost to the District, subject to review as to form and content by the District’s General Counsel.

OCWD Prado Basin Sediment Strategic Planning Efforts

Lisa Haney/Shawn Nevill

Board of Directors

July 3, 2024

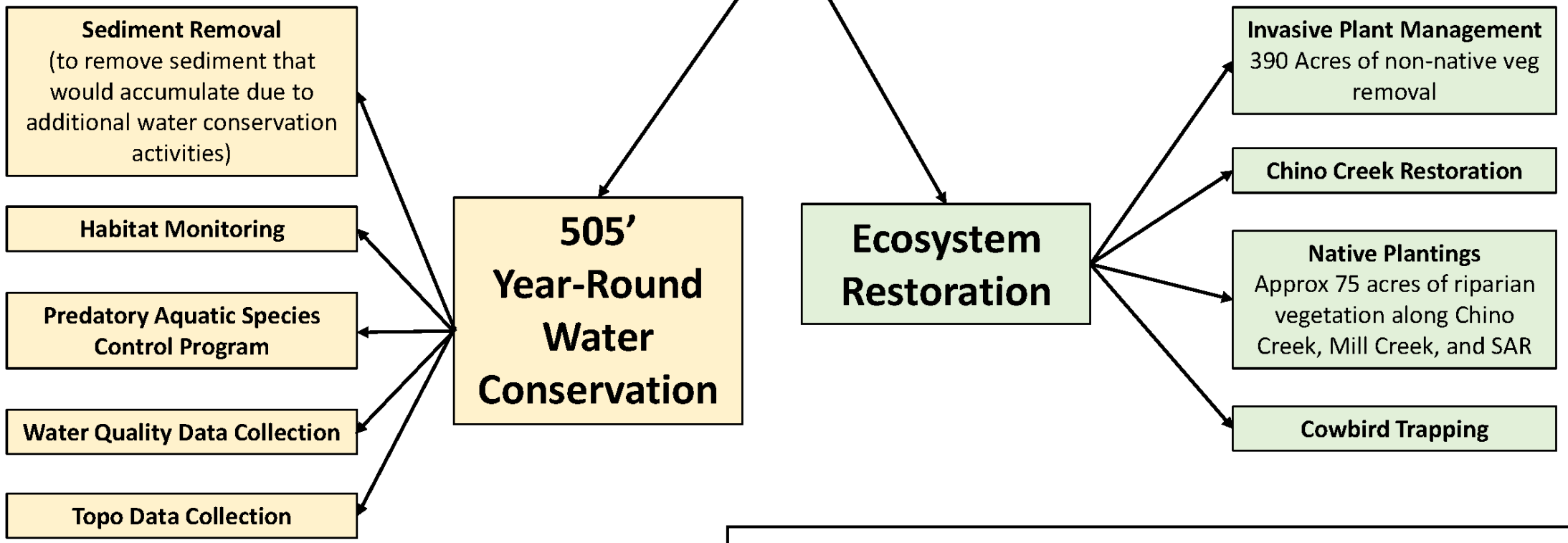
Developing a Strategic Plan

Regulatory Requirements

Increase/Maintain Water Conservation Volumes

Sediment Removal Obligations

PRADO FEASIBILITY STUDY (2020)

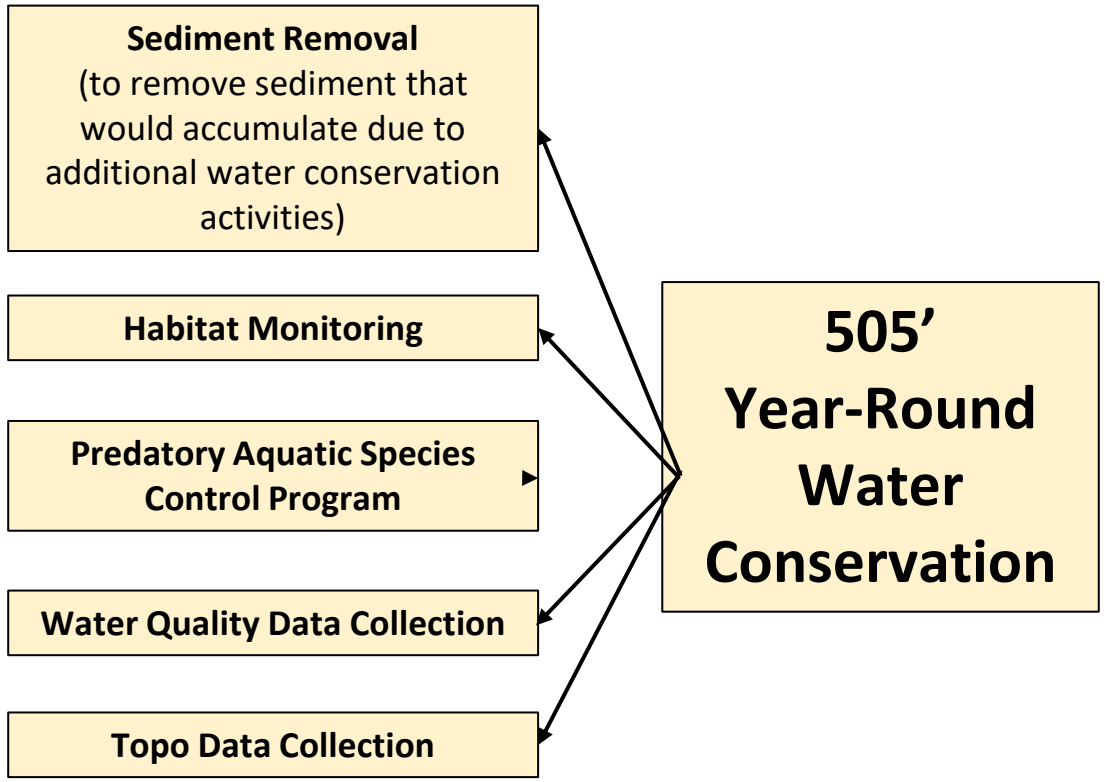


O&M Costs: 100% OCWD

Capital Costs: 65% USACE/35% OCWD
O&M Costs: 100% OCWD

PRADO FEASIBILITY STUDY

SEDIMENT REMOVAL



- **Sediment calculations originated from modeling conducted by Nate Scheeval in 2015** to determine how much additional sediment would accumulate in Prado Basin due to increased water conservation up to 505' year-round.

- USFWS Biological Opinion issued August 2020 states:

"OCWD proposes to perform two sediment removal events at the end of the discernable Santa Ana River channel upstream of Prado Dam to address any associated impacts. 125,000 cubic yards of sediment would be removed from the upstream reach of the Santa Ana River in each event for a total removal of up to 250,000 cubic yards of sediment excavated and placed in the sediment storage area"

Sediment Compliance Plan

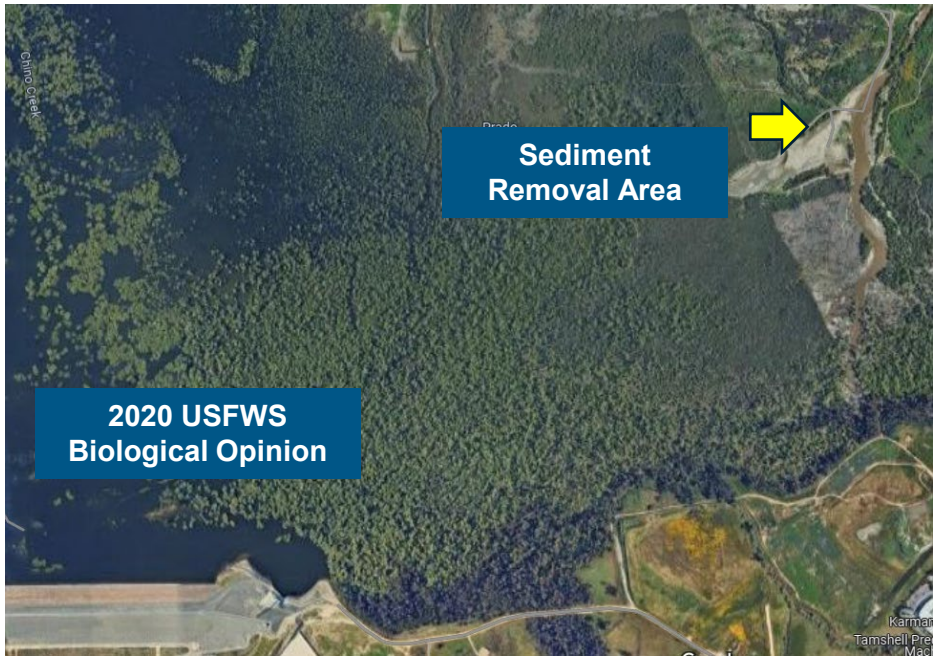
125k cy Year 1 = 2022

Project Cost: $10-12 Million

Sediment Demonstration Project (2020)

- Removed approximately 80,000 C.Y.
- Employed dredging and sluicing of sediment slurry to a storage site on USACE property
- Demonstrated that the removal methods were feasible but encountered significant levels of debris
- Created a “trap” location with road access
- Cost: $4.3m

Regulatory Obligations

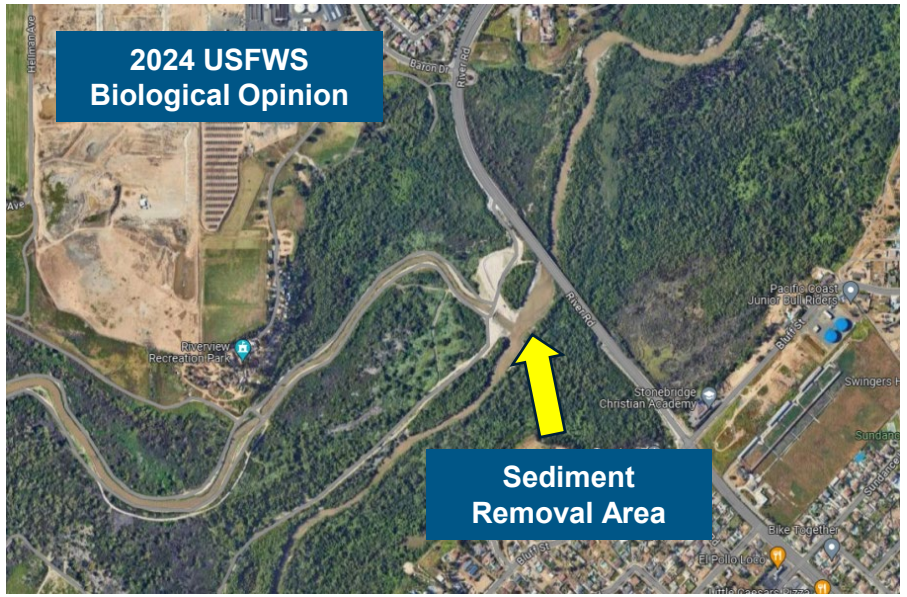


2020 USFWS Biological Opinion – Allowing 505' Year-Round Water Conservation

- **<u>125,000 C.Y. to be removed twice in a 50-year period (total of 250,000 CY)</u>**
- Removal to occur at location of former sediment demonstration project

2024 USFWS Biological Opinion – Minor Deviation Allowing Water Conservation to 508'

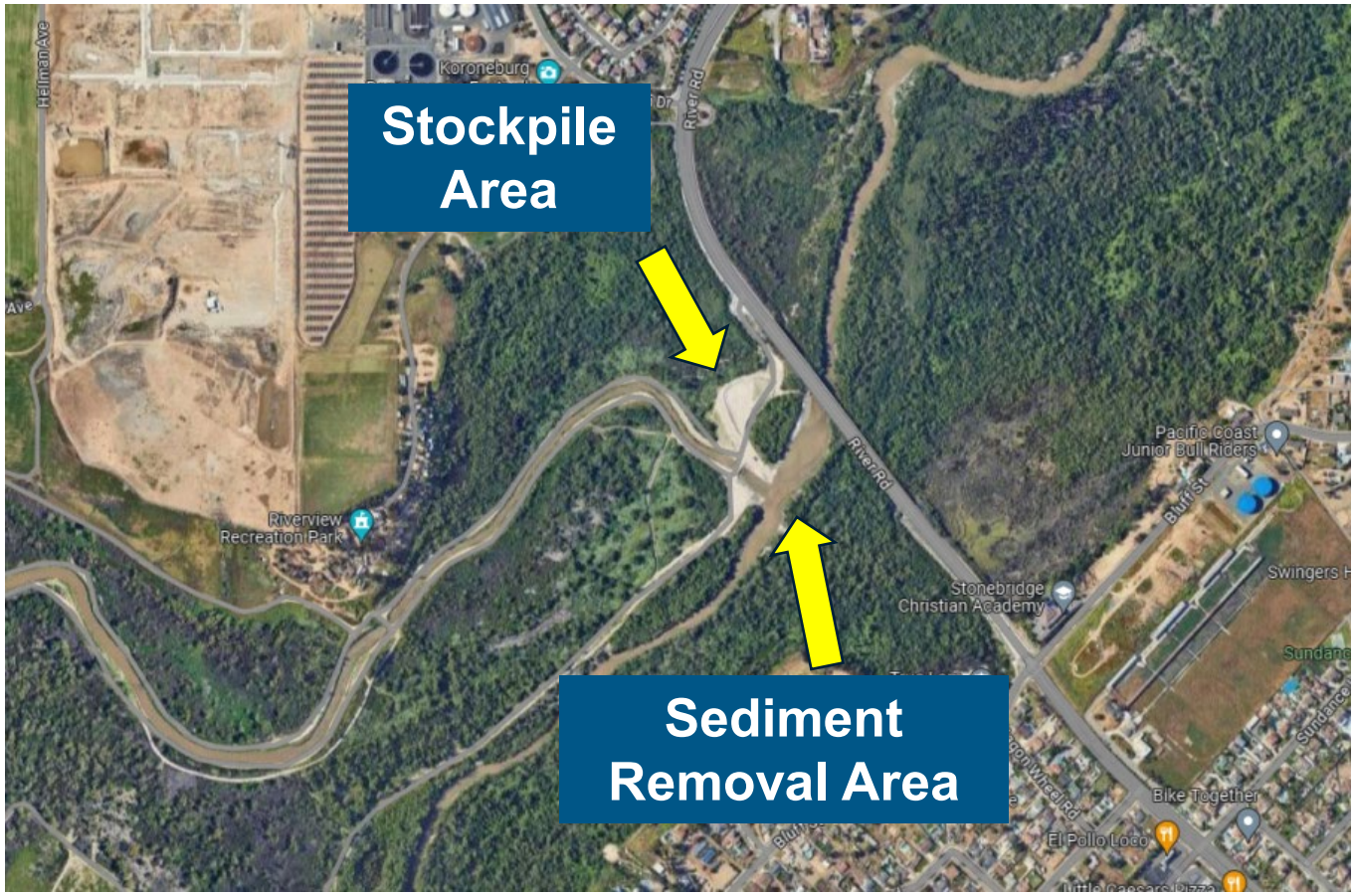
- **<u>1,200 C.Y. conducted annually for five years (2026-2030)</u>**
- Removals to be conducted just below River Road Bridge



Incidental Sediment Removals (Operations and Maintenance)

Approximately <u>5,000 C.Y.</u> of sediment removed each year near the River Road Bridge crossing of the Santa Ana River

- Mechanical removals to keep OCWD wetlands diversion channel cleared
- Sediment is stockpiled nearby
- Sediment is made available and intermittently removed by third parties



Obstacles Meeting Compliance

- *Covid*
- *Supply Chain*
- *Renegotiate Terms of Obligation*
- *Project Cost*
- *Transportation Cost*
- *Disposal or Storage Location*

Regional Interagency Coordination

- Participation in coordination meetings with beach communities, OC Parks, Orange County Transit Authority (OCTA), and OC Public Works with the goals of:
    - Sharing of information between agencies regarding existing and anticipated sediment stockpiles and the need for beach sand primarily at south County beaches
    - Understanding what will be needed to establish routine conveyances of sand to beach communities

NOAA Climate Resilience Regional Challenge Grant:
Implement Coordinated and Equitable Climate Adaptation Actions (2023)

Removing sediment from Prado and utilizing it for beach replenishment in coastal communities. Improving access to offloading or accessing sediment by creating a centralized stockpile hub – Implementation	
Funding Request	$15 million over a 5-year term
Collaborators	County of Orange, Orange County Transportation Authority, CA State Parks, City of San Clemente, City of Newport Beach, City of Huntington Beach, City of Dana Point, City of Seal Beach, City of Laguna Beach, and City of Irvine
Application status	Not awarded

Effects of Sea Level Rise Program (ESLR)
NOAA Planning Grant

Amplifying Ecological, Economic and Social Benefits of Sediment Reuse for Shoreline Stabilization in Southern California – Planning	
Funding Request	$1.5 million over 3 years
Partners	• Southern California Coastal Water Research Project – *Dr. Eric Stein (LEAD)* • University of California, Irvine - *Dr. Brett Sanders* • California State University, Chico – *Dr. Anita Chaudhry and Dr. Janine Stone* • Chapman University - *Dr. Richelle Tanner* • Orange County Water District – *Lisa Haney*
Application status	Not awarded

Planning tool developed by SFEI to assist bay area partners in identifying potential matches for beneficial reuse of sediment. *Adding a project does not obligate users to provide or accept sediment, or pay for transport costs.

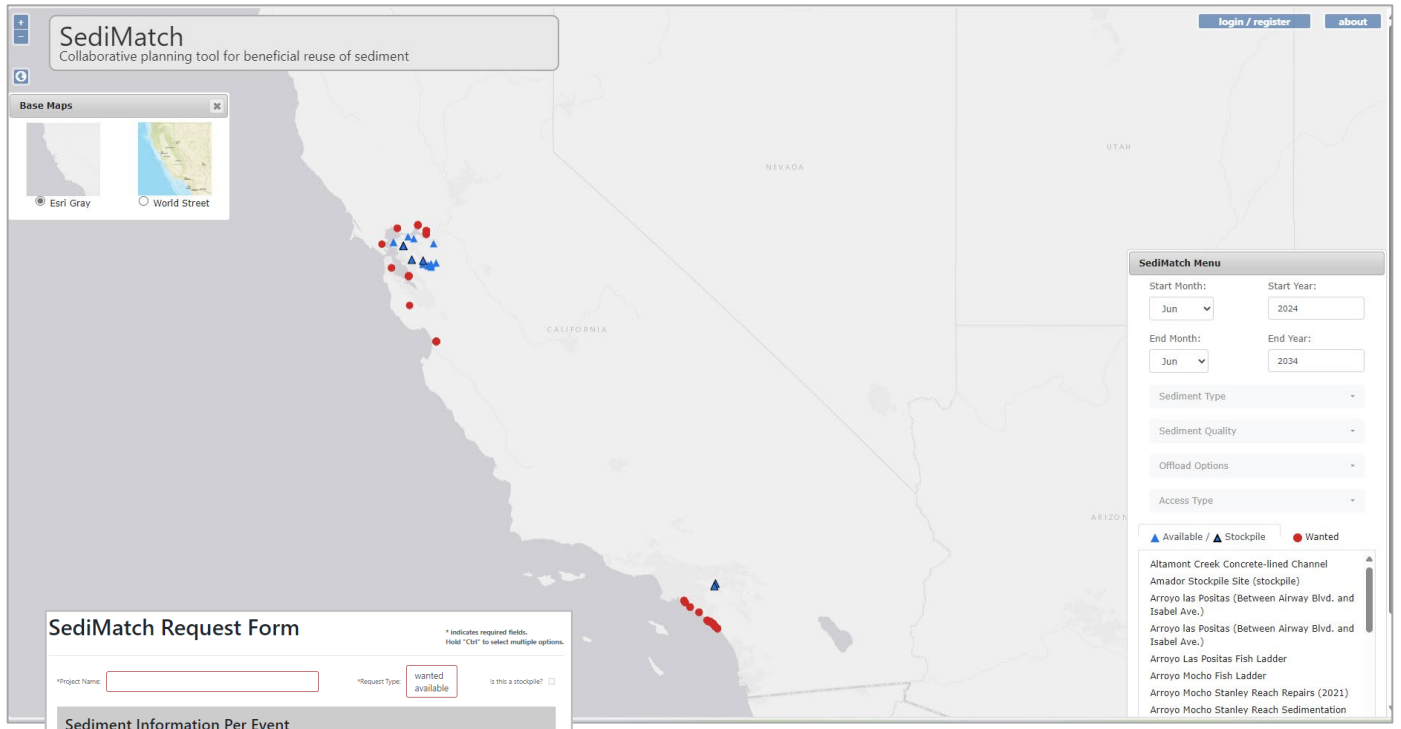
SFEI | AQUATIC SCIENCE CENTER
SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

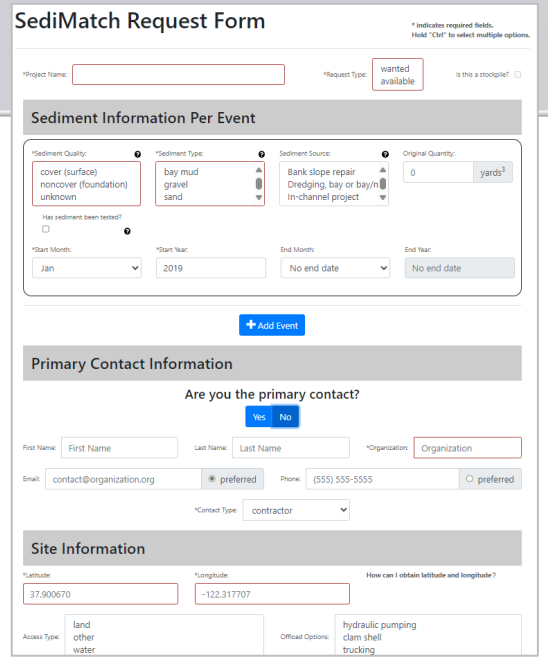
Goals are to (1) create healthy habitats while maximize beneficial sediment reuse, (2) develop a web tool for matching sediment needs with available sediment, and (3) provide opportunities for collaboration.

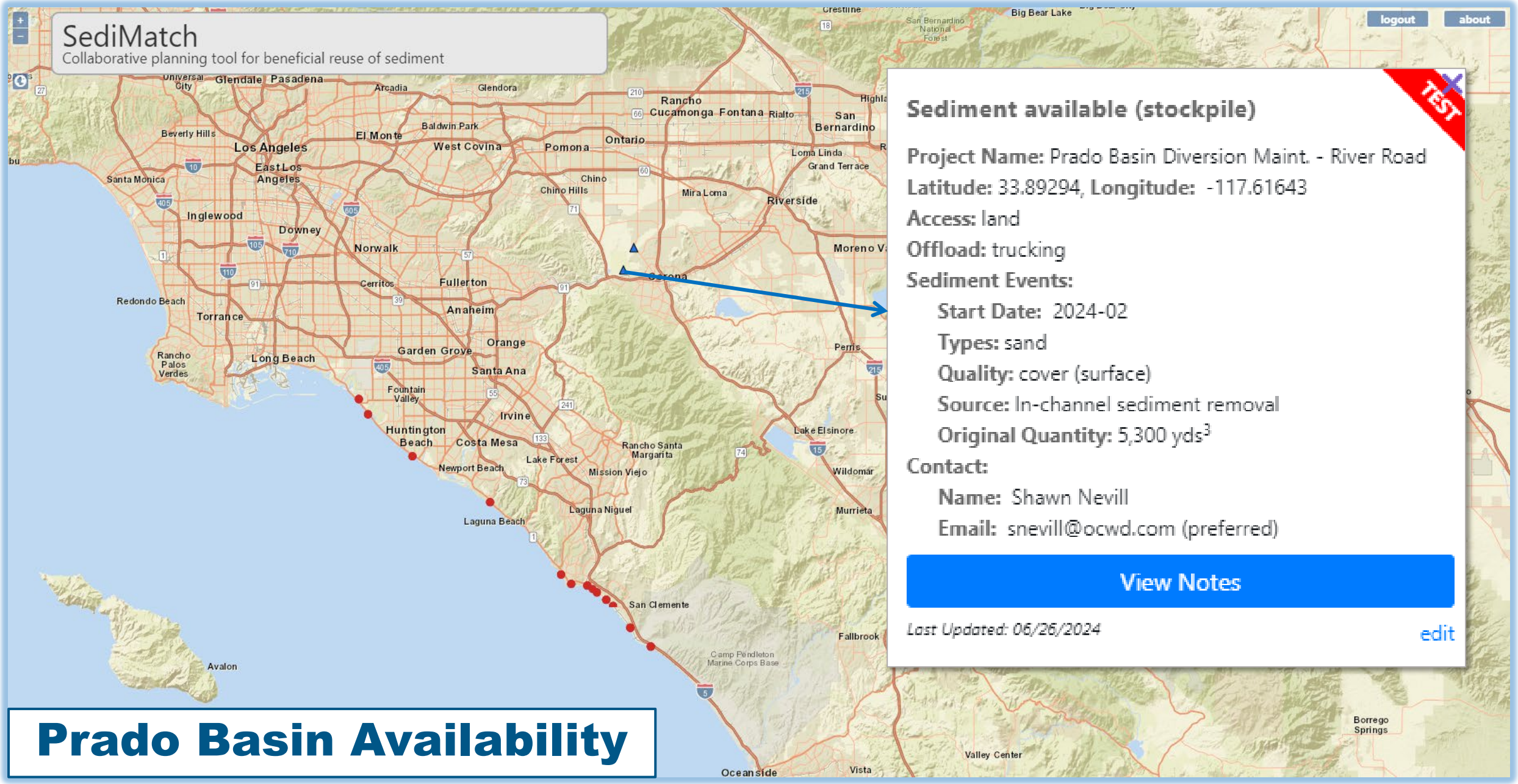
Collaborative program between wetland habitat restoration, flood control, and dredging communities to discuss mutually beneficial strategies for reuse of dredged sediment at habitat restoration sites.

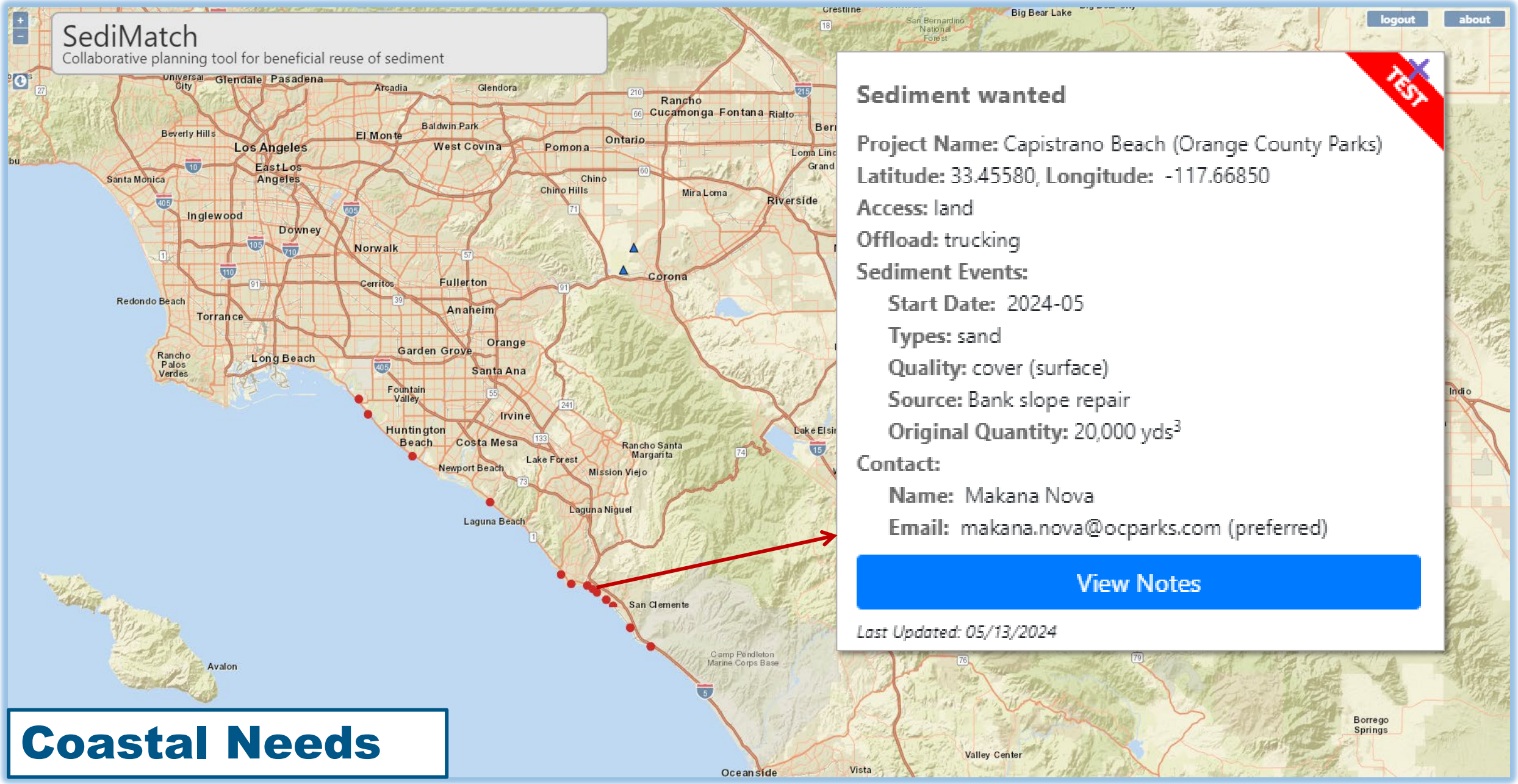
OCWD is working with SFEI to expand the use of SediMatch to Southern California.

Agencies with sediment stockpiles or needs can upload details about location, type, quality, amount and access options.






SediMatch
Collaborative planning tool for beneficial reuse of sediment
logout
about
Sediment available (stockpile)
TEST
Project Name: Prado Basin Diversion Maint. - River Road
Latitude: 33.89294, Longitude: -117.61643
Access: land
Offload: trucking
Sediment Events:
Start Date: 2024-02
Types: sand
Quality: cover (surface)
Source: In-channel sediment removal
Original Quantity: 5,300 yds3
Contact:
Name: Shawn Nevill
Email: snevill@ocwd.com (preferred)
View Notes
Last Updated: 06/26/2024
edit
Prado Basin Availability
https://sedimatch.sfei.org/


SediMatch
Collaborative planning tool for beneficial reuse of sediment
logout
about
TEST
Sediment wanted
Project Name: Capistrano Beach (Orange County Parks)
Latitude: 33.45580, Longitude: -117.66850
Access: land
Offload: trucking
Sediment Events:
Start Date: 2024-05
Types: sand
Quality: cover (surface)
Source: Bank slope repair
Original Quantity: 20,000 yds3
Contact:
Name: Makana Nova
Email: makana.nova@ocparks.com (preferred)
View Notes
Last Updated: 05/13/2024
Coastal Needs
https://sedimatch.sfei.org/

Stakeholders

- California State Parks
- Orange County Parks
- City of Huntington Beach
- City of San Clemente

Private/Public Partnership

GAIL MATERIALS

Gail Materials request to remove sediment from Prado Basin at no cost to OCWD

- 100,000 c.y. of sediment annually
- Removal and Transportation
- Can start now

Compliance Plan

Scope of work

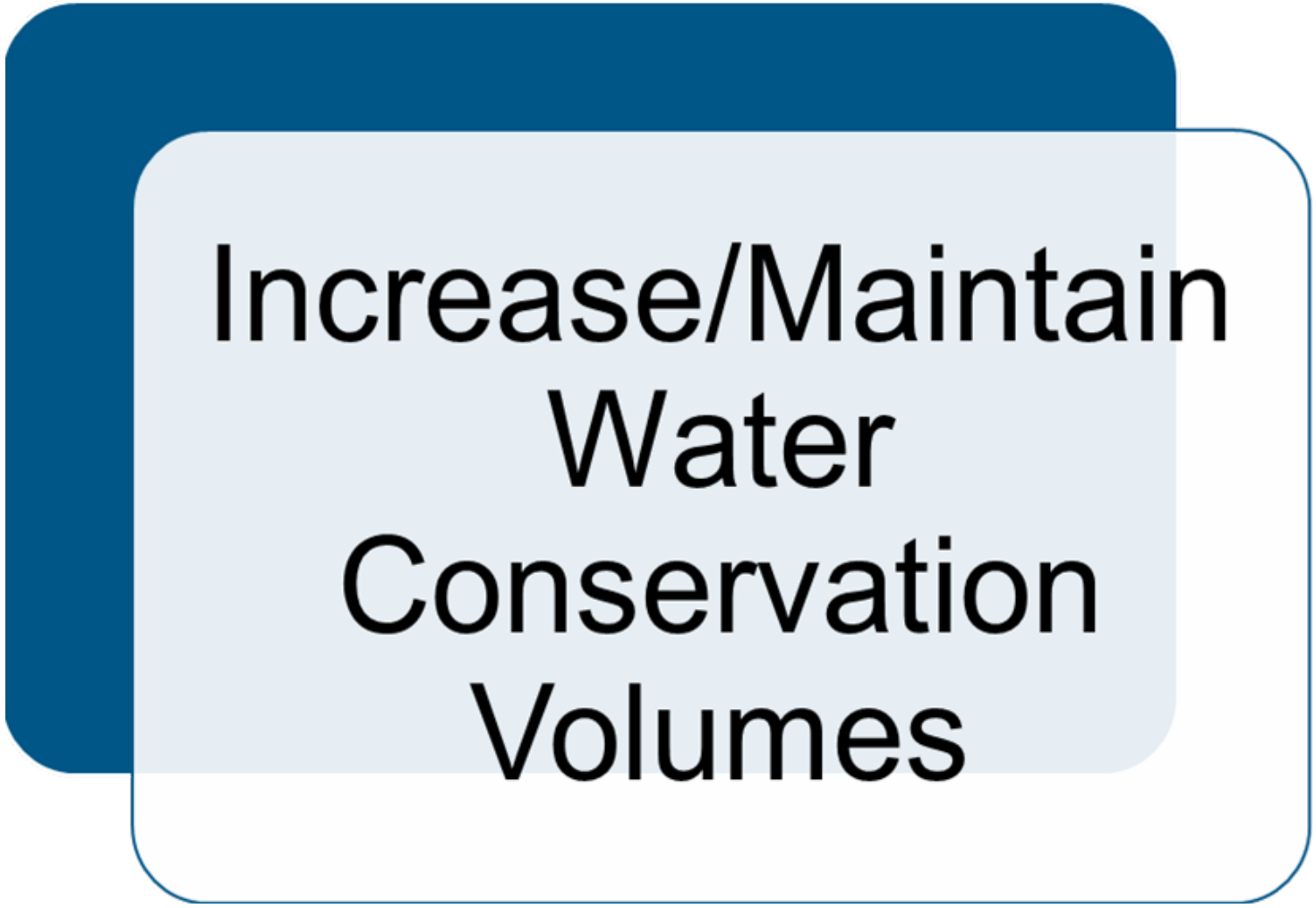
- Alternatives Analysis
- Sediment Removal Plan
- Monitoring Plan

How to Execute an Alternative Analysis

SCHEEVEL ENGINEERING

What’s next

- July 11 UCI Sediment Conference
- July 11 Army Corps and OCWD Sediment Collaboration
- July 12 US Fish and Wildlife Sediment Workshop at SAWPA facilitated by OCWD
- Renegotiation of OCWD Sediment Compliance Plan



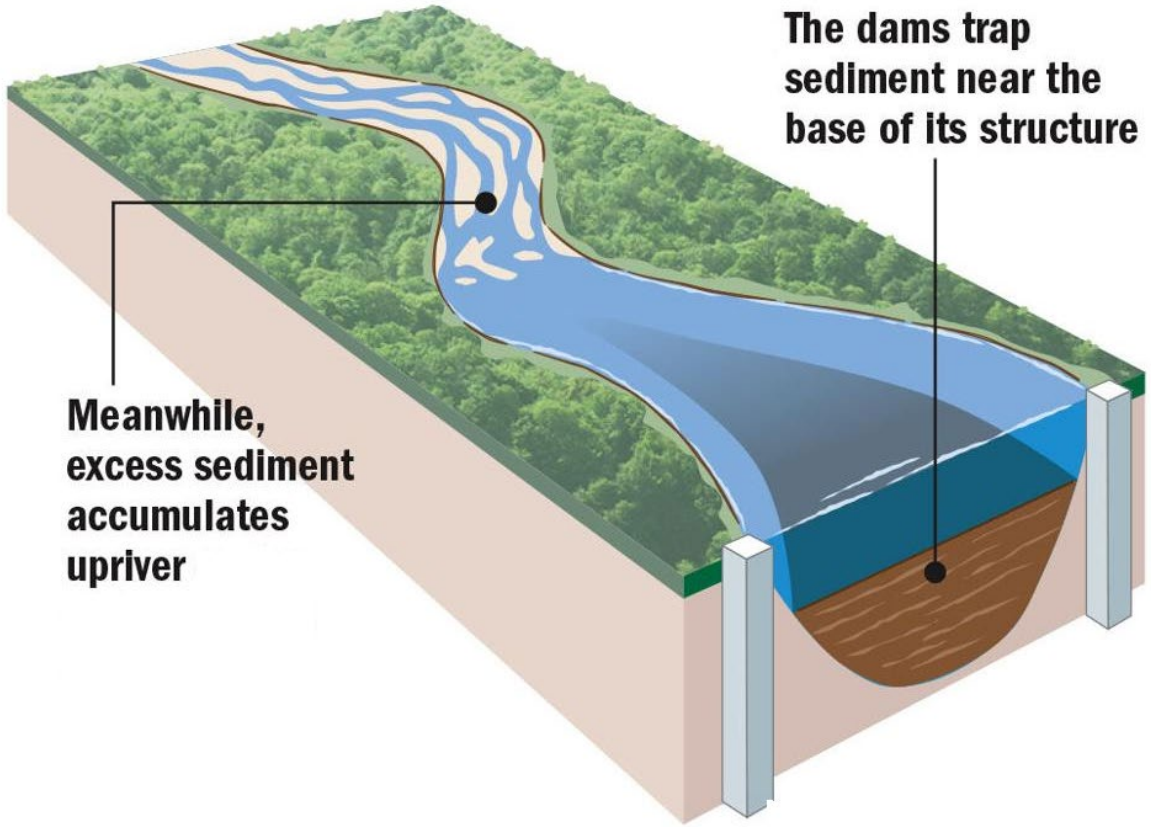
Long Term Strategic Planning

OCWD Sediment Master Plan

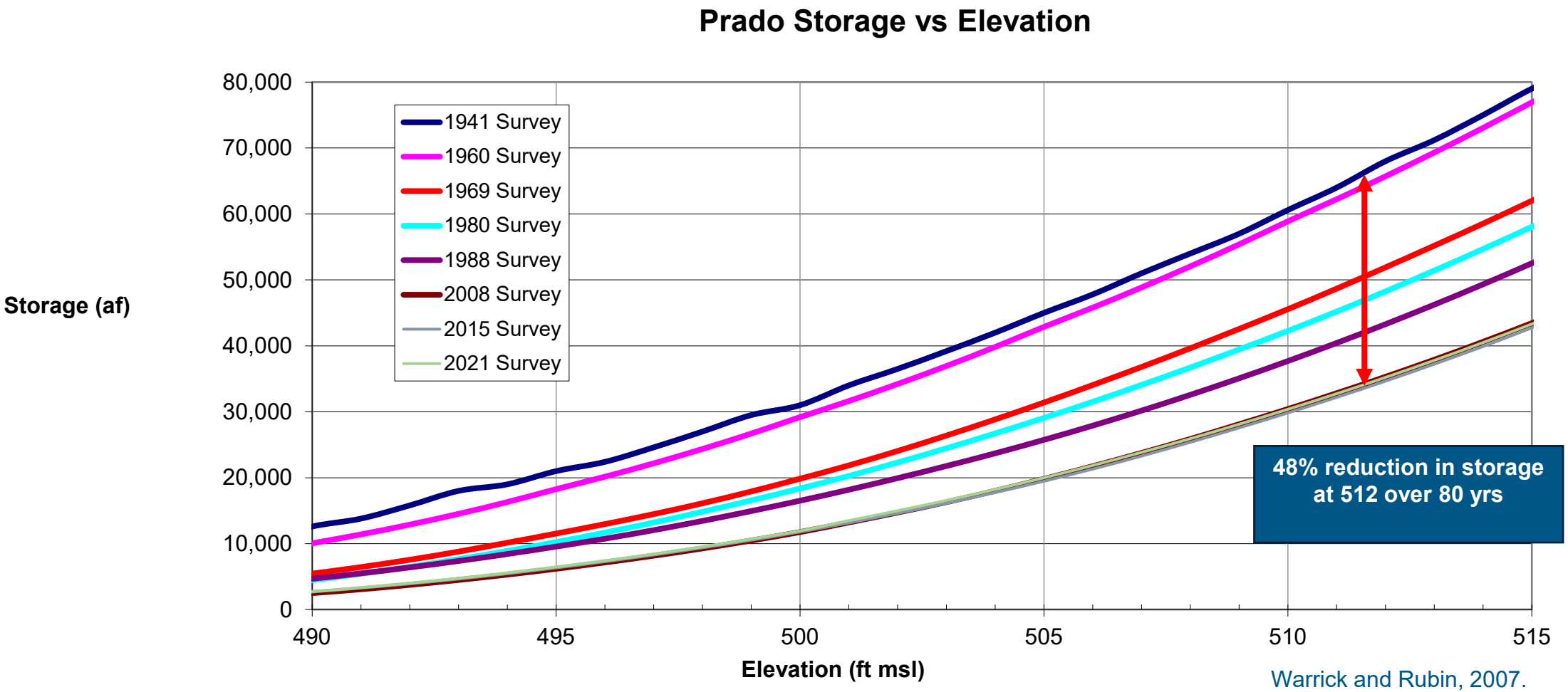
OCWD will prepare a Sediment Master Plan that will:

- Identify sediment management goals
- Characterize the challenges of managing sediment
- Study cost-effective and feasible alternative sediment management concepts

ALL DAMS TRAP SEDIMENT



Prado Dam Captures 97% Of Sediment From The Santa Ana River



Warrick and Rubin, 2007.

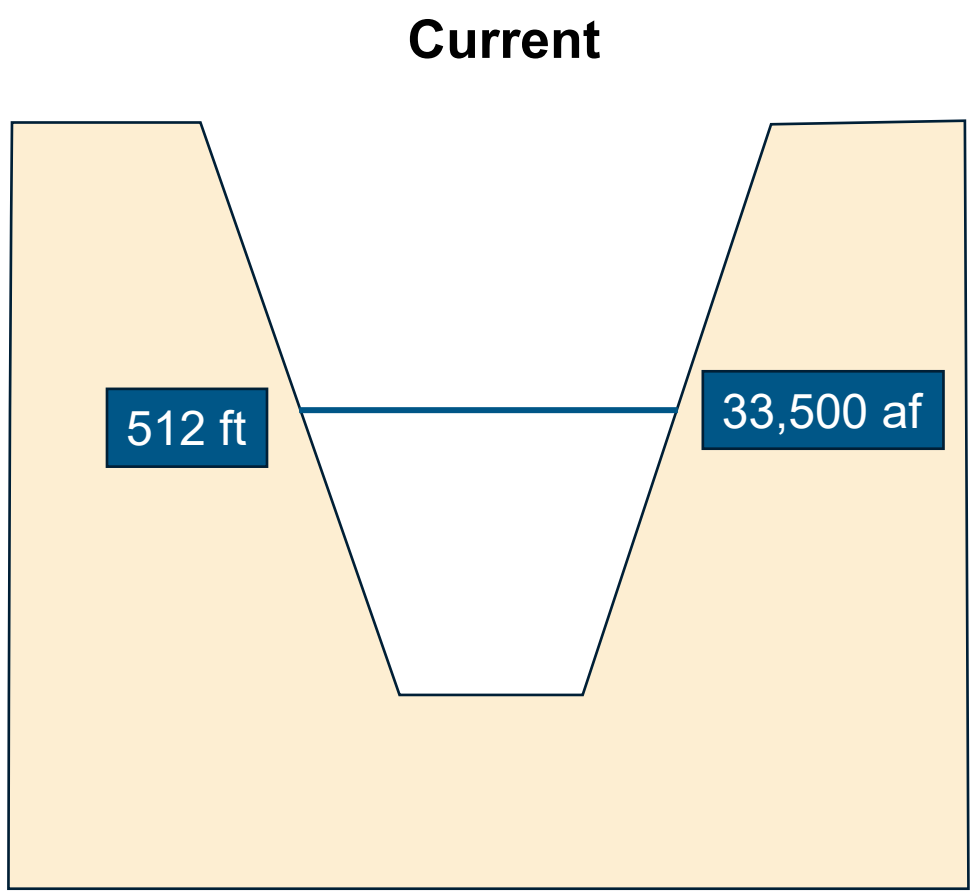
Sediment: By The Numbers

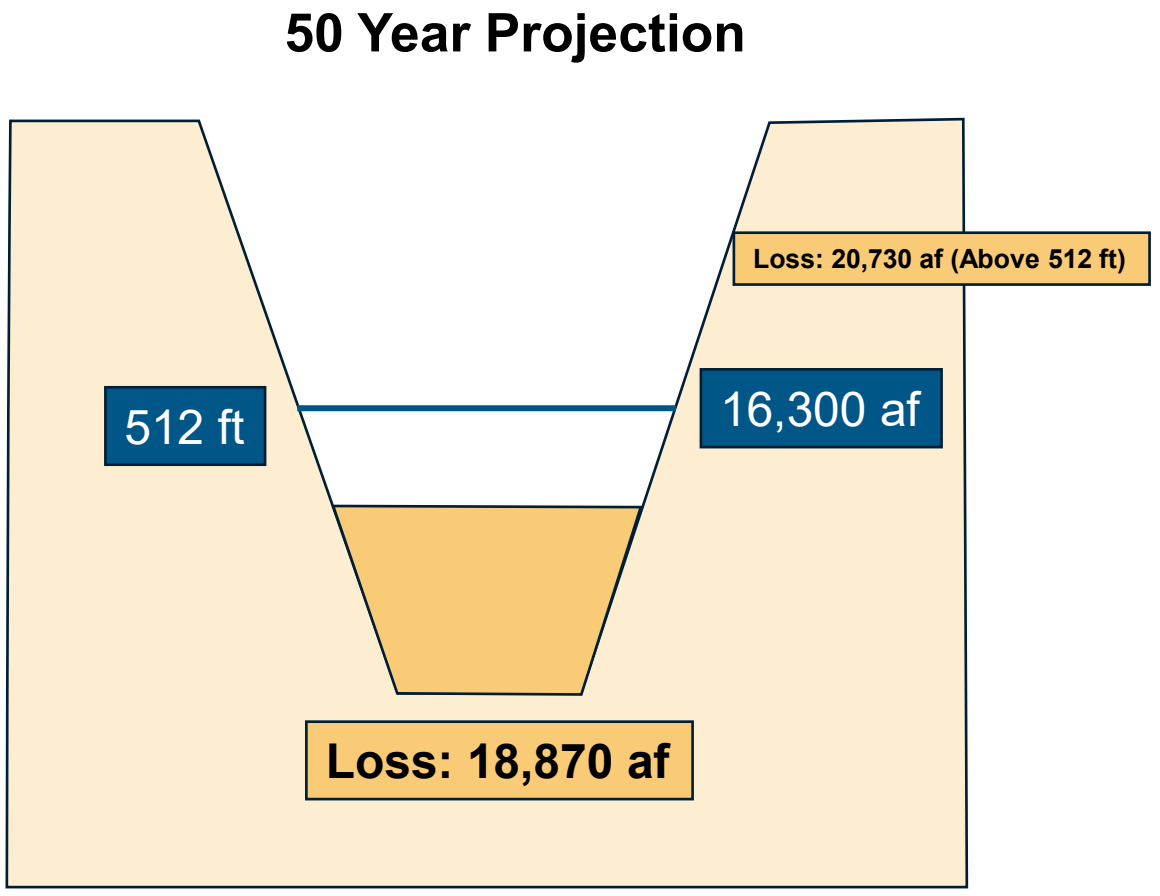
- Approximately **600,000 cubic yards (cy) of sediment** deposited each year in Prado Basin
- 1,600 cy of sediment = 1 acre foot of water
- Approximately **370 a.f.** of storage in Prado Basin is lost each year due to sedimentation
- **150 truck loads** of sediment is needed to remove a 1 a.f. equivalent
- **50,000 truck loads** would be needed to remove all sediment that accumulates each year!

Sediment Removal Costs

$150	Approximate Cost Per Truck to Haul to Local Storage Site (Within 30 Miles)
$20,000	Approximate Cost to Haul 1 Acre-Foot Equivalent to Local Storage Site
$7,500,000	Approximate Cost to Haul the Sediment That Accumulates Each Year in the Water Conservation Pool to Local Storage Site
Additional Costs	Additional costs for excavation and disposal (depending on end destination)

Sediment Trends – 50 Year Projection





OCWD Sediment Master Plan
Conceptual Alternatives

Active Management Alternatives

- Conveyance to Offsite Parcels
- Re-entrainment Below Prado Dam
- Construct Sediment Trap in OCWD Wetlands
- Public-Private Partnership
- Conveyance of Sediment By Rail

Stockpile To Offsite Parcels

Description:
- Dredge or mechanical excavation
- Convey sediment to adjacent offsite parcels (not owned by OCWD)
- Stockpiled sediment can be distributed to raise parcels to above the 566’ elevation

Rationale:
- Raised parcels can be made suitable for development, rendering them marketable
- Proximity to excavation can accommodate the use of slurry in lieu of trucking

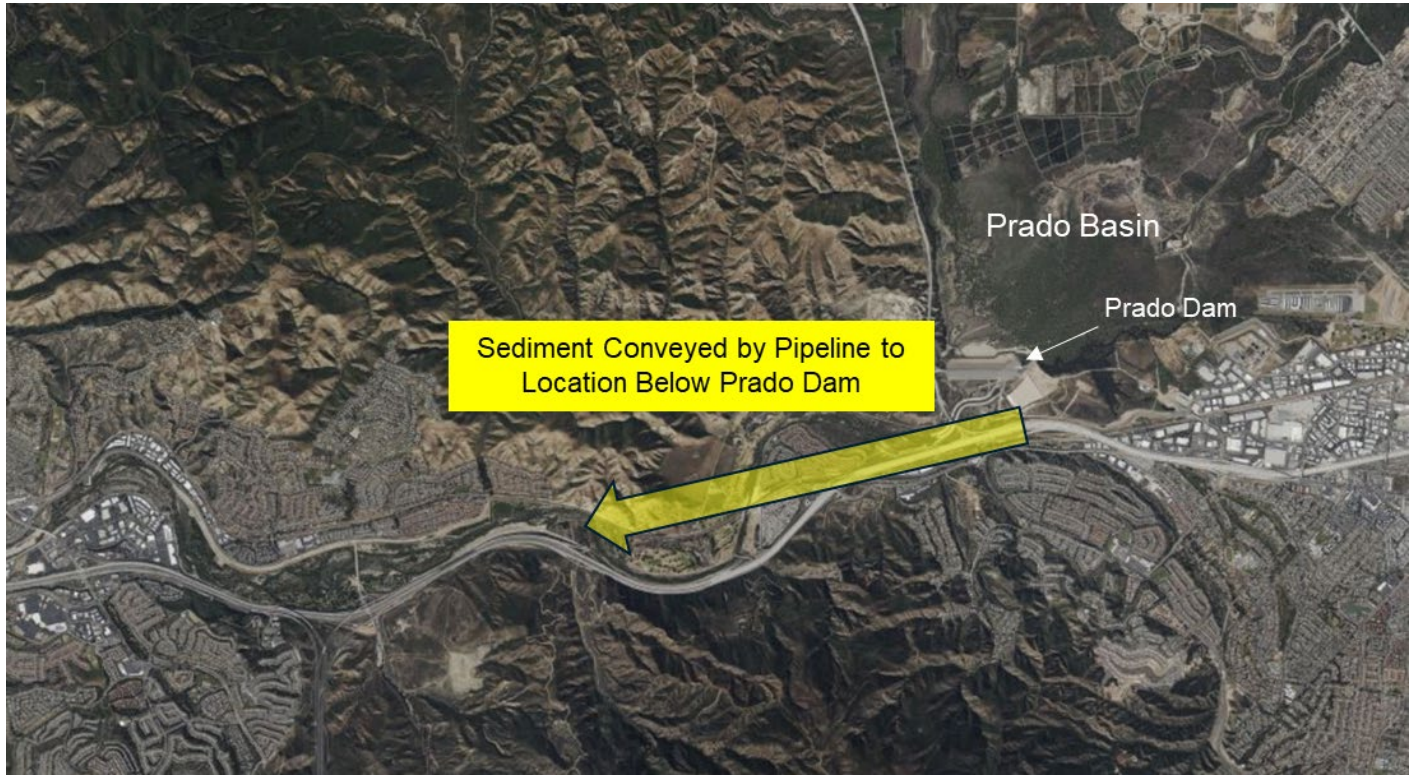
Re-Entrainment Below Prado Dam

Description:

- Sediment would be excavated in Prado Basin and conveyed as a slurry through a pipeline to a location in the SAR below Prado Dam
- Alternative was evaluated in Feasibility Study (2020) but was not carried forward due to high cost

Rationale:

- Re-entrainment would allow sediment to move beyond Prado Dam allowing it to ultimately flow to the ocean



Construct Sediment Trap in OCWD Wetlands

Description:

- Utilize a portion of existing wetlands area to create an engineered sediment trap
- Remove sediment and stockpile onsite to be made available for agencies in need of sediment

Rationale:

- Provides a readily available source of beach sand at a truck-accessible location

Public-Private Partnership

Description:

- Partner with private entities to conduct sediment removals at the former sediment removal site and/or at the River Road crossing
- Sediment is excavated and hauled away by the private entities
- OCWD would authorize these removals through a licensing agreement

Rationale:

- Sediment removals could be conducted at nominal cost to OCWD

Conveyance of Sediment By Rail

Description:

- Conduct sediment removals and convey to a stockpile site at a rail facility near Prado Basin
- Sediment to be hauled by rail to a location accessible to Orange County beach communities

Rationale:

- Reduces hauling costs while assisting beach communities in meeting beach sand replenishment needs

OCWD Sediment Master Plan
Conceptual Alternatives

Passive Management Alternatives

- Modify Corona Airport
- Seek Other Water Sources

Modify Corona Airport

Description:
- Modify Corona Airport facilities to allow for higher water conservation levels
- Raise elevation of water conservation pool
- Sedimentation continues at existing rates

Rationale:
- Avoids sediment removal costs while maintaining water conservation volumes.

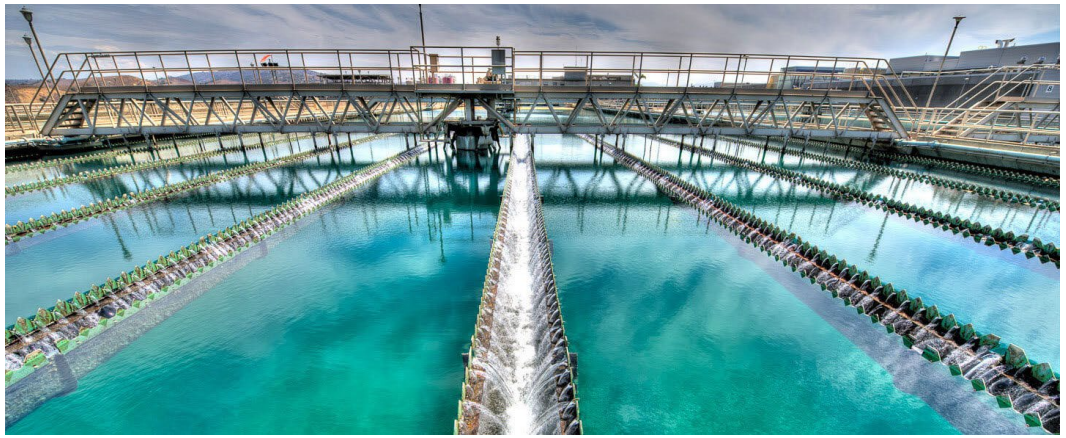
Seek Other Water Sources

Description:

- Sedimentation to occur at existing rates ultimately leading to a loss of a water conservation pool
- Continually monitor sedimentation and evaluate the cost-benefit-ratio of sediment removals
- OCWD utilizes other sources of water in lieu of capturing water stored in the water conservation pool

Rationale:

- As a “no-project alternative” this option would avoid any sediment removal or construction costs and dedicate OCWD resources to meeting basin replenishment needs elsewhere.



Questions?

June 27, 2024

Orange County Water District
Attn: Ms. Lisa Haney, Exec. Dir. of Planning and Natural Resources
18700 Ward Street
Fountain Valley, CA 92708

RE: Professional Engineering Consulting Services Proposal:
Prado Sediment Removal Compliance Plan Development

Dear Ms. Haney,

Scheevel Engineering is pleased to present this proposal to the Orange County Water District (OCWD) for professional engineering consulting services to develop an approach and plan to implement OCWD's current sediment removal compliance requirements. Scheevel will evaluate the current sediment transport characteristics in Prado Basin and locally in the Santa Ana River upstream of Prado, and use the information gathered, along with historical data and information, to develop a near-term compliance plan and monitoring program for sediment removal. The tasks described in this proposal will be collectively known as the "Project" for the purposes of this proposal letter. The Project scope includes services to perform field work/inspection/data collection as well as analysis, plan development, stakeholder outreach assistance and permitting support. Scheevel Engineering provides a wide variety of consulting and field services unique to water resource projects. These services include pilot field testing, field data collection, survey, streamflow measurements, sediment transport field data collection and analysis, hydraulic analysis, hydraulic modeling, 3D CFD modeling, preliminary design, final design, construction management, environmental planning and design, permitting support, extension of staff, construction support and operations and maintenance support services for water resource projects.

Scheevel Engineering has prepared this proposal to provide OCWD with professional consulting services for the Project. The specialized services offered by Scheevel Engineering will include the tasks outlined below in Table 1: Scope of Work.

Table 1: Scope of Work

Scope Item Description
1) Meetings & Coordination a. Meetings – Attend meetings as requested by OCWD to review data, coordinate with stakeholders, review plan milestones and address comments & questions. Meetings may include, but will not be limited to, office meetings, field meetings, stakeholder meetings and meetings with regulatory/permitting agencies. b. Coordination – Includes time to share data, communicate and discuss ideas and issues related to the Project with OCWD staff and project stakeholders. Includes time for emails and phone calls as needed.
2) Sediment Transport Field Data Collection a. Site Inspections & Spot Survey Checks – Perform visual inspection at key locations between Prado Dam and Hamner Avenue. Perform field surveys to spot check elevations at key locations between the discernible end of the Santa Ana River in Prado Basin, upstream, to Hamner Avenue. Key locations may

Scheevel Engineering ● P.O. Box 28745 ● Anaheim, CA 92809 ● Phone: (714) 470-9045 ● Email: nathanscheevel@yahoo.com

include, but not be limited to areas around the Inland Empire Brine Line, areas immediately upstream and downstream of the former SMDP trap, and at previous monitoring locations for the SMDP upstream to Hamner Avenue. Post process and analyze new field data (visual and survey data) and compare to previous data collection efforts in Prado Basin, upstream, to Hammer Avenue. This data will also be used to inform future efforts to manage long-term sediment management and water conservation sustainability planning.

b. Sediment Sampling & Analysis – Based on the site inspections and survey spot checks described above, select four locations for detailed sediment data collection and laboratory analysis. This will include stream flow measurements, bed load collection, bed material collection, suspended sediment concentration and photo documentation of each sampling location. Laboratory analysis will quantify the fines content, particle size/gradation and be used to calculate changes to the sediment transport capacity rating curves for the SAR near Prado. This data will also be used to quantify recent sediment inflow volume to the basin. This assumes one full sampling event at each of the four locations to be performed within the next two months (4 sampling events total). After the initial sampling event, Scheevel will perform monthly visual inspections to identify the appropriate timing of a follow-up elevation spot-check survey to track the SAR vertical movement until near-term sediment removal activities start. Scheevel will then perform a follow-up elevation spot-check survey to quantify the vertical changes in the SAR. Similarly to the survey data from task 2)a. above, this data will be used to inform future efforts to manage long-term sediment management and water conservation sustainability planning. This data will also provide critical information for future sediment transport modeling efforts for protecting Prado Basin storage volume for water conservation and provide useful information for OCWD's efforts to develop a digital clone of the basin and support ongoing FIRO efforts. Please note, this scope of work will be adjusted based on the findings from scope item 2)a. above.

3) Sediment Removal Planning (Near-Term) –

a. Sediment Removal Plan Development – Use data from tasks above, as well as data from OCWD's SMDP Project and other, previous, sediment studies, past sediment transport models and other available survey data to develop detailed plans and specifications to be used for compliance aimed sediment removal activities to progress towards compliance objectives. Assumes that sediment removal activities are generally located within the footprint of the previous SMDP Trap alignment. Provide assistance to OCWD for any additional permitting required to remove sediment. Plans and specifications developed by Scheevel may be used as the basis for a variety of project delivery methods which may be performed by a 3rd party for sediment removal, used to implement a public works project to remove the initial sediment volume or by OCWD forces to perform some or all of the access, clearing and/or sediment removal. Sediment removal plan development will include the evaluation of minor trap alignment adjustments to maximize the performance of the trap and provide opportunities to manage SAR channel response upstream of the trap. Provide 90% plans and specs, receive comments and provide revised final plans and specifications.

b. Monitoring & Mitigation Plan Development – Develop a monitoring and mitigation plan for the near-term sediment removal compliance efforts. The plan will include defining the monitoring, sampling and lab analysis requirements during sediment

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	removal activities as well as subsequent monitoring requirements to track the SAR response to the removal activities. The mitigation plan component will include methods to alter the SAR response to the sediment removal activity. This assumes OCWD will provide the monitoring and mitigation plan requirements for habitat and sensitive species. Provide a draft plan, receive comments and provide a revised final monitoring plan.

Upon your review of the above scope of work please let me know if you would like any additions or subtractions. Scheevel Engineering provides its services at an hourly rate of $300.00. Travel time is free of charge and no additional fees or charges apply unless approved by OCWD. The fee associated with the above scope of work equals **$170,400.00 (one-hundred seventy thousand and four hundred dollars)**. A breakdown of the fees associated with the proposed scope of work is illustrated in Table 2: Schedule of Fees. Scope items listed in Table 2 without an hour value or without an hourly rate value are provided as lump sum items.

Table 2: Schedule of Fees

Scope Item Description	Hours	Rate	Fee
Scope Items			
1) Meetings & Coordination	**56**		**$ 16,800**
a. Meetings	30	$300/hr	$ 9,000
b. Coordination	26	$300/hr	$ 7,800
2) Sediment Transport Field Data Collection	**260**		**$ 78,000**
a. Site Inspections & Spot Survey Checks	62	$300/hr	$ 18,600
b. Sediment Sampling & Analysis	198	$300/hr	$ 59,400
3) Sediment Removal Planning (Near-Term)	**252**		**$ 75,600**
a. Sediment Removal Plan Development	140	$300/hr	$ 42,000
b. Monitoring & Mitigation Plan Development	112	$300/hr	$ 33,600
Total	**568**		**$ 170,400**

This proposal is valid for 30 days. Scheevel Engineering is prepared to start work on the project immediately and can modify the scope, proposed fees and schedule to meet OCWD's needs. Thank you for the opportunity to provide professional consulting services to the Orange County Water District.

Sincerely,
Scheevel Engineering

Nate Scheevel, P.E.
President/Principal

Scheevel Engineering ● P.O. Box 28745 ● Anaheim, CA 92809 ● Phone: (714) 470-9045 ● Email: nathanscheevel@yahoo.com

S A W P A

SANTA ANA WATERSHED PROJECT AUTHORITY
11615 Sterling Avenue, Riverside, California 92503 • (951) 354-4220

Meeting Access Via Computer (Zoom):	Meeting Access Via Telephone:
• https://sawpa.zoom.us/j/88261801261	• 1 (669) 900-6833
• Meeting ID: 882 6180 1261	• Meeting ID: 882 6180 1261

This meeting will be conducted in person at the address listed above. As a convenience, members of the public may also participate virtually using one of the options set forth above. Any member of the public may listen to the meeting or make comments to the Commission using the call-in number or Zoom link above. However, in the event there is a disruption of service which prevents the Authority from broadcasting the meeting to members of the public, the meeting will not be postponed or rescheduled but will continue without remote participation. The remote participation option is provided as a convenience to the public and is not required. Members of the public are welcome to attend the meeting in-person.

REGULAR COMMISSION MEETING
TUESDAY, JULY 2, 2024 – 9:30 A.M.

AGENDA

1. CALL TO ORDER/PLEDGE OF ALLEGIANCE (Bruce Whitaker, Chair)

2. ROLL CALL

3. PUBLIC COMMENTS

Members of the public may address the Commission on items within the jurisdiction of the Commission; however, no action may be taken on an item not appearing on the agenda unless the action is otherwise authorized by Government Code §54954.2(b).

Members of the public may make comments in-person or electronically for the Commissions' consideration by sending them to publiccomment@sawpa.gov with the subject line "Public Comment". Submit your electronic comments by 5:00 p.m. on Monday, July 1, 2024. All public comments will be provided to the Chair and may be read into the record or compiled as part of the record. Individuals have a limit of three (3) minutes to make comments and will have the opportunity when called upon by the Commission.

4. ITEMS TO BE ADDED OR DELETED

Pursuant to Government Code §54954.2(b), items may be added on which there is a need to take immediate action and the need for action came to the attention of the SAWPA Commission subsequent to the posting of the agenda.

5. CONSENT CALENDAR

All matters listed on the Consent Calendar are considered routine and non-controversial and will be acted upon by the Commission by one motion as listed below.

A. APPROVAL OF MEETING MINUTES: JUNE 18, 2024
Recommendation: Approve as posted.

6. NEW BUSINESS

A. SAWPA BUILDING – LOBBY REMODEL (SECURITY IMPROVEMENTS) AND ADA UPGRADES PROJECT (CM#2024.36)
Presenter: David Ruhl
Recommendation: That the Commission:

1. Direct the General Manager to file a Notice of Exemption for the Lobby Remodel and ADA Upgrades project with the Riverside County Clerk's Office; and
2. Direct the General Manager to issue a Notice Inviting Bids, upon completion of the Final Plans and Specifications, for the Construction of the Lobby Remodel and ADA Upgrades Project.

B. LAKE ELSINORE AND CANYON LAKE TMDL TASK FORCE UPDATE (CM#2024.37)
Presenter: Rick Whetsel
Recommendation: Receive and file.

7. INFORMATIONAL REPORTS
Recommendation: Receive for information.

A. GENERAL MANAGER REPORT
Presenter: Jeff Mosher

B. COMMUNICATIONS REPORT
Presenter: Jeff Mosher

C. CHAIR'S COMMENTS/REPORT

D. COMMISSIONERS' COMMENTS

E. COMMISSIONERS' REQUEST FOR FUTURE AGENDA ITEMS

8. CLOSED SESSION
There were no Closed Session items anticipated at the time of the posting of this agenda.

9. ADJOURNMENT

PLEASE NOTE:

Americans with Disabilities Act: If you require any special disability related accommodations to participate in this meeting, call (951) 354-4220 or email svilla@sawpa.gov 48-hour notification prior to the meeting will enable staff to make reasonable arrangements to ensure accessibility for this meeting. Requests should specify the nature of the disability and the type of accommodation requested.

Materials related to an item on this agenda submitted to the Commission after distribution of the agenda packet are available for public inspection during normal business hours at the SAWPA office, 11615 Sterling Avenue, Riverside, and available at www.sawpa.gov, subject to staff's ability to post documents prior to the meeting.

Declaration of Posting

I, Sara Villa, Clerk of the Board of the Santa Ana Watershed Project Authority declare that on June 27, 2024, a copy of this agenda has been uploaded to the SAWPA website at www.sawpa.gov and posted at SAWPA's office at 11615 Sterling Avenue, Riverside, California.

2024 SAWPA Commission Meetings/Events

First and Third Tuesday of the Month
(NOTE: All meetings begin at 9:30 a.m., unless otherwise noticed, and are held at SAWPA.)

January	**February**
1/2/24 ~~Commission Workshop~~ [cancelled] 1/16/24 Regular Commission Meeting	2/6/24 Commission Workshop 2/20/24 Regular Commission Meeting
March	**April**
3/5/24 ~~Commission Workshop~~ [cancelled] 3/19/24 Regular Commission Meeting	4/2/24 Commission Workshop 4/16/24 ~~Regular Commission Meeting~~ [cancelled]
May	**June**
5/7/24 ~~Commission Workshop~~ [cancelled] 5/21/24 Regular Commission Meeting 5/7 – 5/9/24 ACWA Spring Conference, Sacramento, CA	6/4/24 Commission Workshop 6/18/24 Regular Commission Meeting
July	**August**
7/2/24 Commission Workshop 7/16/24 Regular Commission Meeting	8/6/24 Commission Workshop 8/20/24 Regular Commission Meeting
September	**October**
9/3/24 Commission Workshop 9/17/24 Regular Commission Meeting	10/1/24 Commission Workshop 10/15/24 Regular Commission Meeting
November	**December**
11/5/24 Commission Workshop 11/19/24 Regular Commission Meeting	12/3/24 Commission Workshop 12/17/24 Regular Commission Meeting 12/3 – 12/5/24 ACWA Fall Conference, Palm Springs, CA