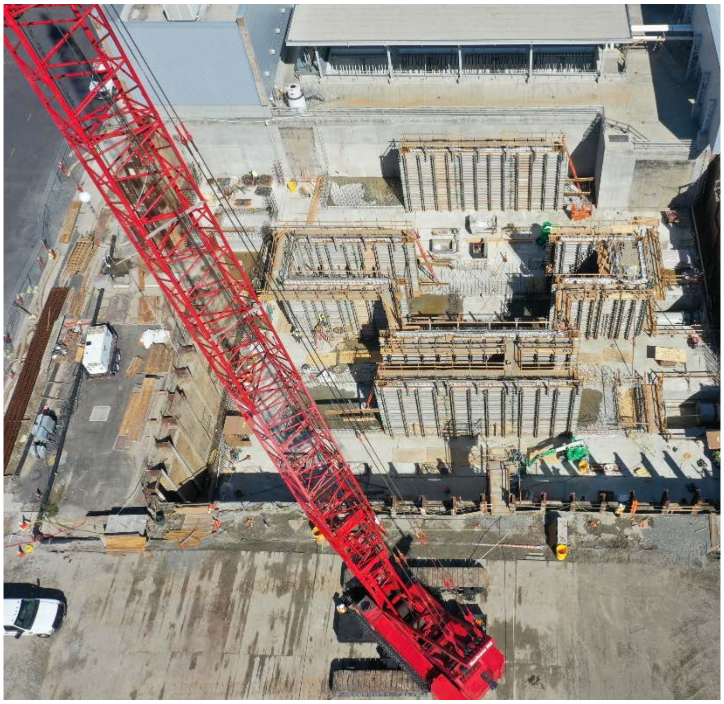
SINCE 1933

GROUNDWATER REPLENISHMENT SYSTEM

2021 ANNUAL REPORT



Groundwater Replenishment System
2021 Annual Report

Prepared for the
California Regional Water Quality Control Board, Santa Ana Region
Order No. R8-2004-0002, as amended by
Order Nos. R8-2008-0058, R8-2014-0054, R8-2016-0051, and R8-2019-0007
and Revised Monitoring and Reporting Program

by
Debra L. Burris, P.E.
Board Certified Environmental Engineer, American Academy of Environmental Engineers

1 Cavalier
Laguna Niguel, CA 92677
(949) 400-8575

June 17, 2022

TABLE OF CONTENTS

PAGE

PAGE

FIGURES

PAGE

PAGE

PAGE

PAGE

PAGE

TABLES

PAGE

PAGE

ACRONYMS

REFERENCES

APPENDICES

EXECUTIVE SUMMARY

The Groundwater Replenishment System (GWRS) is a water supply project jointly sponsored by Orange County Water District (OCWD) and Orange County Sanitation District (OC San) that supplements existing water supplies by providing a reliable, high-quality source of water to recharge the Orange County Groundwater Basin (the Basin), to protect it from degradation due to seawater intrusion, and to provide a water source for limited non-potable uses.

This Annual Report examines the GWRS operation and performance for calendar year 2021. This Annual Report fulfills the GWRS permit requirements set forth in California Regional Water Quality Control Board, Santa Ana Region (RWQCB) Order No. R8-2004-0002 (RWQCB, 2004) and as amended by Order Nos. R8-2008-0058, R8-2014-0054, R8-2016-0051, and R8-2019-0007, and revised Monitoring and Reporting Program (RWQCB, 2008, 2014a, 2016, 2019, and 2020). This Annual Report also describes GWRS purified recycled water used for non-potable purposes, as regulated by RWQCB Order No. R8-2021-0003 (RWQCB, 2021), as well as the GWRS permit allowing emergency discharges to the Santa Ana River (SAR) per RWQCB Order No. R8-2022-0002 (RWQCB, 2022).

Introduction

The GWRS, which is operated by OCWD, consists of five major components:

- **Advanced Water Purification Facility (AWPF)**, which features treatment processes and pumping stations designed to produce up to 100 million gallons per day (MGD) of purified recycled water;
- **Talbert Seawater Intrusion Barrier (Talbert Barrier)** comprised of a series of injection wells that are supported by an extensive network of groundwater monitoring wells;
- **Kraemer-Miller-Miraloma-La Palma Basins (K-M-M-L Basins)**, along with other nearby spreading basins, all of which are supported by numerous groundwater monitoring wells;
- **Mid-Basin Injection (MBI) Project** consisting of the Demonstration Mid-Basin Injection (DMBI) Project and MBI Centennial Park Project, which are injection wells supported by downgradient monitoring wells; and
- **Three non-potable end users**: Anaheim Canyon Power Plant (Anaheim CPP), Anaheim Regional Transportation Intermodal Center (ARTIC), and Anaheim Adventure Park.

Figure ES-1 shows the location of the GWRS in central Orange County, California. The AWPF receives secondary-treated wastewater from OC San Plant 1 and treats it to better than drinking water standards using full advanced treatment: membrane filtration (MF), reverse osmosis (RO), advanced oxidation/disinfection consisting of hydrogen peroxide addition and ultraviolet light exposure (UV/AOP), followed by partial decarbonation and lime stabilization. Pumping stations

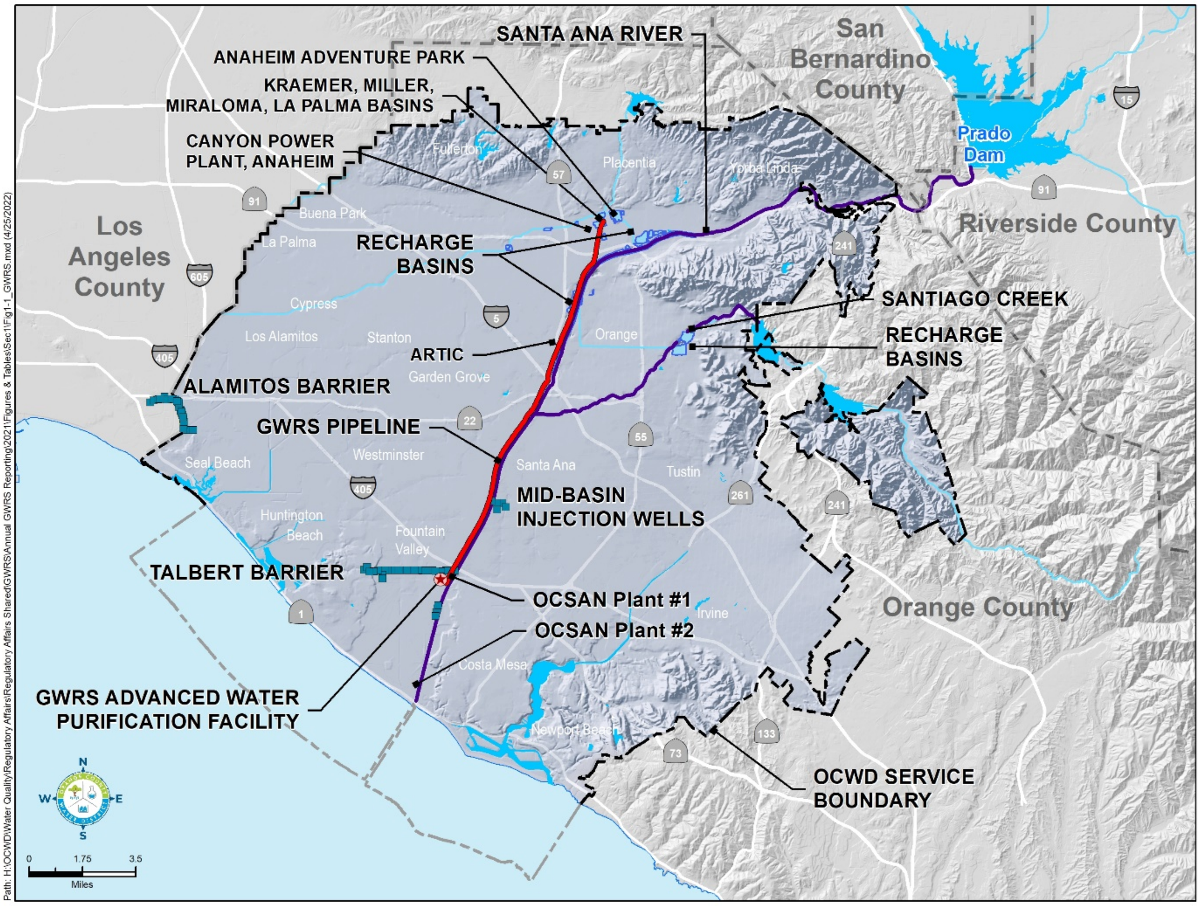


Figure ES-1. Groundwater Replenishment System Location Map

and pipelines convey purified recycled water from the AWPF to the Talbert Barrier, K-M-M-L Basins, MBI Project, and/or non-potable water users.

The original AWPF began operation in January 2008 and was designed to produce 70 MGD, or approximately 72,000 acre-feet per year (AFY) (243,000 cubic meters per day [m^3/day]), of purified recycled water based on a minimum on-line factor of 90%. The GWRS Initial Expansion began operation in May 2015, increasing the AWPF design production up to 100 MGD, or approximately 103,000 AFY (348,000 m^3/day), of purified recycled water based on a minimum on-line factor of 90%. During 2021, most of the purified recycled water produced by the AWPF was injected at the Talbert Barrier and percolated at K-M-M-L Basins; a lesser volume was injected at the MBI Project and supplied to non-potable water customers.

The Talbert Barrier consists of a series of 36 injection well sites, I1 through I36, that are supplied by pipelines from the AWPF Barrier Pump Station. OCWD constructed the injection barrier to form an underground hydraulic mound, or pressure ridge, that helps prevent seawater intrusion near the coast in the Talbert Gap area. Without the Talbert Barrier, seawater would migrate inland and contaminate the fresh groundwater supply of the Basin. In addition to providing seawater intrusion control, the Talbert Barrier also injects purified recycled water into the deeper Main aquifer with the primary purpose of replenishing the Basin. Potable drinking water may also be injected at the barrier, although blending is not required.

In the Anaheim Forebay area, GWRS purified recycled water and other waters are percolated at K-M-M-L Basins. Other waters may include SAR water and purchased imported water. Purified recycled water is conveyed from the AWPF to these four spreading basins by the 13-mile GWRS Pipeline installed along the west levee of the SAR channel. GWRS recharge at Kraemer and Miller Basins began in January 2008 along with start-up of the rest of the original GWRS components. Miraloma Basin began spreading purified recycled water in July 2012. La Palma Basin began spreading purified recycled water in November 2016. While recharge with purified recycled water is restricted to K-M-M-L Basins, other waters may be recharged at those four basins as well as nearby spreading basins Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin. Blending of purified recycled water with other waters is not required.

Turnouts from the GWRS Pipeline supply purified recycled water to the MBI Project, Anaheim CPP and ARTIC. The first component of the MBI Project (DMBI Project) began operation in April 2015 and consists of one injection well (MBI-1) near the SAR in Fountain Valley and Santa Ana. The second element of the MBI Project (MBI Centennial Park Project) began injecting purified recycled water at four injection wells (MBI-2 through MBI-5) in March 2020.

Purified recycled water deliveries to Anaheim CPP and to ARTIC for non-potable uses began in July 2011 and November 2014, respectively. A third non-potable water user, Anaheim Adventure Park, began operation at Miraloma Basin in July 2021.

Advanced Water Purification Facility Performance

During 2021 the AWPF produced a total of approximately 31,235 million gallons (MG), or 95,858 acre-feet (AF) (118,240,000 cubic meters [m^3]), of purified recycled water to prevent seawater intrusion, replenish the Basin, and supply non-potable users. A breakdown of the 2021 purified recycled water production and discharge by location is presented in Table ES-1 and illustrated on Figure ES-2.

In terms of average daily flows, the AWPF produced approximately 84.4 MGD (319,000 m^3/day) of purified recycled water in 2021. Overall, the AWPF was on-line approximately 344 days in 2021 (about 94.3% of the year). Figure ES-3 illustrates the average daily AWPF production by month with the reuse location.

Table ES-1. 2021 Summary of Purified Recycled Water Flows and Discharge Points

Purified Recycled Water Discharge Point	Annual Average Daily Flow Rate (Avg. MGD)	Annual Volume		Percent (rounded)
		Million Gallons (MG)	Acre-Feet (AF)	
Talbert Barrier	22.9	8,374	25,700	27.2%
Kraemer Basin	0.7	269	825	0.9%
Miller Basin	4.8	1,764	5,414	5.7%
Miraloma Basin[1]	18.5	6,761	20,748	22.0%
La Palma Basin	29.4	10,720	32,897	34.8%
MBI Project	7.9	2,889	8,867	9.4%
Anaheim CPP	<0.1	12	37	<0.1%
ARTIC	<0.1	4	12	<0.1%
Total	**84.4**	**30,793**	**94,500**	**100%**

[1] Flows and volumes include use by Anaheim Adventure Park, which is located at Miraloma Basin.

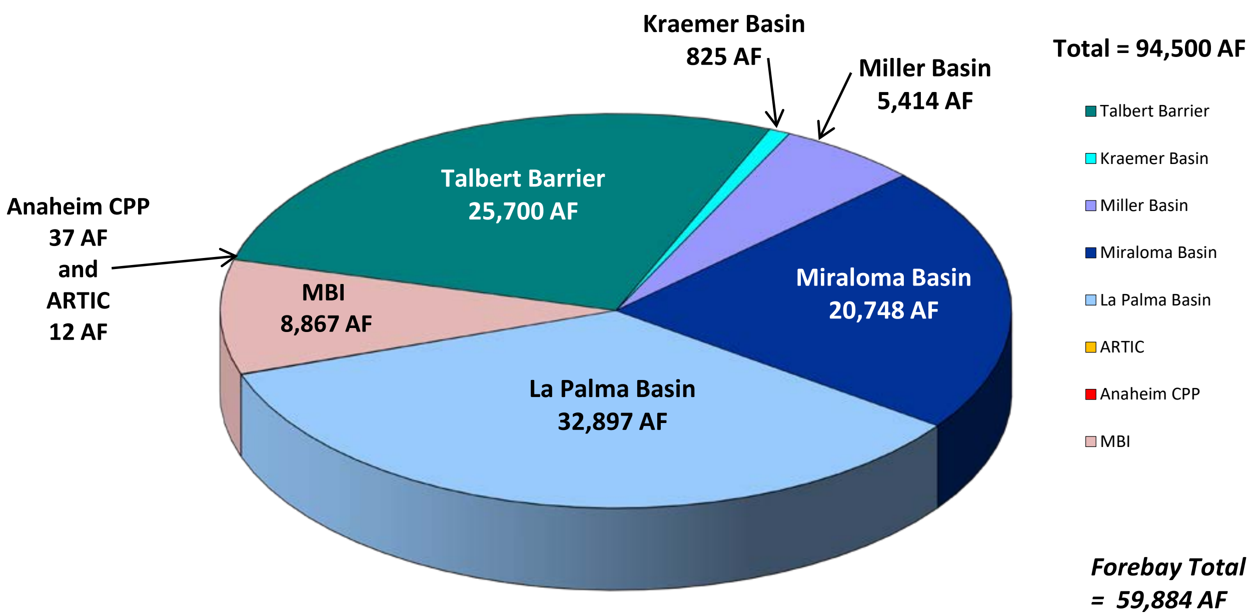


Figure ES-2. 2021 Purified Recycled Water Volume

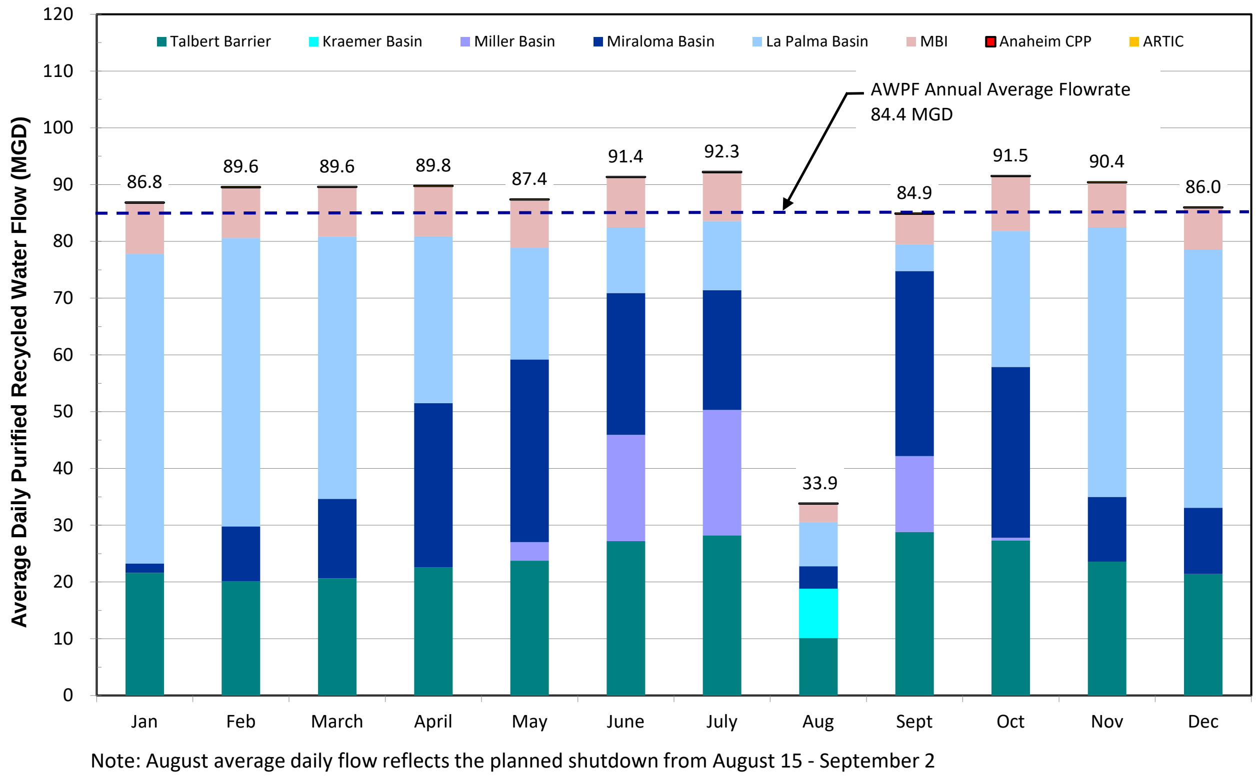


Figure ES-3. 2021 Average Daily Purified Recycled Water Flow By Month

In comparison with prior years, the 2021 purified recycled water production (30,793 MG, 94,500 AF, or 116,564,000 m^3) was only 1% lower than the 2020 production, recognizing that both years' production rates were impacted by AWPF shutdowns for the GWRS Final Expansion (GWRSFE) construction. Planned and unplanned power outages from time to time during 2021 caused brief AWPF production restrictions or complete shutdowns. As illustrated on Figure ES-4, the 2021 GWRS total purified recycled water production was on par with 2020 when production was restricted by the GWRSFE construction and GWRS Pipeline inspection work. In comparison, a record high purified recycled water production was achieved in 2019 (33,521 MG, 102,872 AF or 126,891,000 m^3) primarily due to the absence of extended shutdowns.

The AWPF treatment processes operated well during the year, producing high quality purified recycled water in compliance with all permit requirements. Table ES-2 summarizes the average purified recycled water, or finished product water (FPW), quality for selected parameters.

Concentrations of inorganic constituents in the purified recycled water, such as aluminum and chromium, were either non-detect or if detected, far below the permit limits. Concentrations of organic contaminants, such as volatile organic compounds, pesticides, and other synthetic organic compounds, were also non-detect or far below the permit limits. Analyses of purified recycled water for unregulated compounds and chemicals of emerging concern (CECs), such as endocrine disrupting chemicals and pharmaceuticals, were either non-detect or if detected, not found at levels currently thought to pose any significant public health risk. During 2021 the GWRS

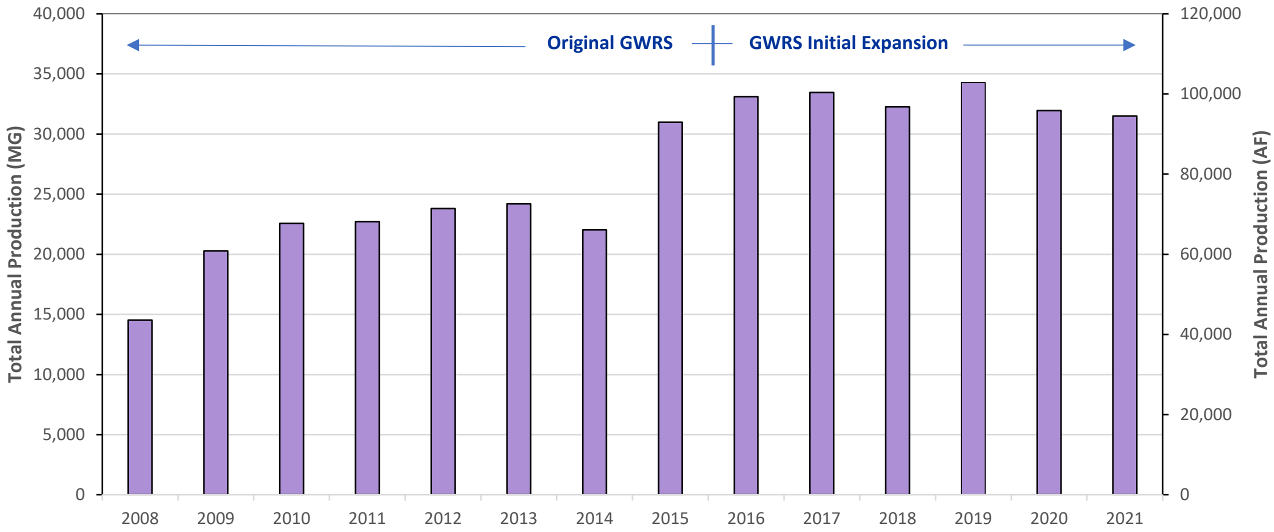


Figure ES-4. Historical GWRS Purified Recycled Water Production Since 2008

Table ES-2. 2021 Average Purified Recycled Water Quality

Parameter Name	Units [1]	FPW [2,3]	Permit Limit
Electrical Conductivity	µmhos/cm	100 [4]	900 [5]
Total Dissolved Solids	mg/L	50	500 [5]
pH	units	8.4 [4]	6 – 9
Chloride	mg/L	5.0	55
Total Nitrogen	mg/L	0.9	5
Arsenic	µg/L	<1 [6]	10
1,2,3-Trichloropropane (1,2,3-TCP)	µg/L	<0.005 [6]	0.005
N-nitrosodimethylamine (NDMA)	ng/L	1.0	N/A [7]
1,4-Dioxane	µg/L	<0.5 [6]	N/A
Perfluorooctanoic Acid (PFOA)	ng/L	<2 [6]	N/A
Perfluorooctane Sulfonic Acid (PFOS)	ng/L	<2 [6]	N/A
Total Organic Carbon (unfiltered)	mg/L	0.08	0.5 [8]
Total Coliform	MPN/100 mL	<1	2.2 [9]

1 See Acronyms list for units' abbreviations.

2 FPW is GWRS Finished Product Water (Purified Recycled Water).

3 Arithmetic average of all available data in 2021. For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. Number of significant digits shown matches those in raw data.

4 On-line average.

5 See Appendix A for more information.

6 If all data for the period were ND, then the average is shown as "<RDL."

7 Not applicable is abbreviated as N/A.

8 20-sample running average; see Section 2.2.8 and Appendix A for more information.

9 7-day median limit; see Appendix A for more information.

complied with pathogenic microorganism reduction requirements using the MF, RO, and UV/AOP processes at the AWPF, plus underground retention time as an environmental buffer. Table ES-3 summarizes the minimum daily total pathogen log reduction values achieved in 2021 in comparison to the requirements

Table ES-3. Summary of GWRS Minimum Pathogen Log Reduction Credits Achieved in 2021

Pathogen	Minimum Log Reduction Requirements[1]	Minimum Daily Pathogen Log Reduction Value Achieved in 2021[2]					
		OC San Plant 1[3]	MF and Cl_2[4]	RO[5]	UV/AOP[6]	Underground Retention Time[7]	Total[8]
Giardia cysts	10	0	3.37	2.01	6.00	0	11.5
Cryptosporidium oocysts	10	0	3.37	2.01	6.00	0	11.5
Viruses	12	0	0	2.01	6.00	4	12.0

1 Per Title 22 Water Recycling Criteria (CCR, 2018).

2 Minimum daily log reduction value achieved by each process in 2021. Daily minimums are not additive. Daily minimums for each process may occur on different dates such that the sum of the daily minimums does not reflect the total daily minimum. (e.g., MF+Cl_2 minimum LRV (3.37-log) occurred on 11/20/2021. RO LRV was 2.01-log on 9/16/2021.) See Appendix F for details.

3 No pathogen reduction credits awarded for secondary treatment.

4 Minimum daily LRVs for Giardia cysts and Cryptosporidium oocysts achieved by MF with chlorination occurred on 11/20/2021. All other days featured a minimum protozoa LRV ≥ 4.00. No virus reduction credit allowed for MF with chlorination. See Appendix F for details.

5 Minimum daily pathogen LRVs achieved by RO occurred on 9/16/2021. See Appendix F for details.

6 Minimum daily pathogen LRVs achieved by UV/AOP occurred on 1/1-12/31/2021. See Appendix F for details.

7 Minimum daily virus LRV credit of 4-log for underground retention time from 1/1-12/31/2021. See Appendix F for details.

8 Total daily minimum LRV for all processes in 2021. Totals are not additive per footnote 2. See Appendix F for details

Talbert Barrier Operations

The Talbert Barrier injection supply in 2021 was predominately purified recycled water produced by the AWPF, as shown in Table ES-4. Negligible volumes of potable water from the Metropolitan Water District of Southern California (MWD) OC-44 turnout and City of Fountain Valley (FV) potable water were also injected at the barrier. Of the total annual volume of approximately 8,377 MG (25,709 AF; 31,712,000 m^3) of injection water, the vast majority (99.96%), approximately 8,374 MG (25,700 AF; 31,701,000 m^3), was GWRS purified recycled water. Only about 2.9 MG (8.8 AF; 10,800 m^3) of potable water were injected at the barrier during 2021. The potable water supply helped maintain a full, pressurized barrier supply pipeline during AWPF shutdowns until the purified recycled water injection was resumed. The total average daily flow rate injected at the Talbert Barrier in 2021 was 23.0 MGD. Excluding the planned shutdown period, the average daily injection flow rate when the Barrier was on-line in 2021 was 24.28 MGD.

Blending of purified recycled water with potable water is no longer required at the Talbert Barrier. While the maximum allowable recycled water contribution (RWC) at the Talbert Barrier is 100%, potable water may still be injected at the barrier.

Operation of the Talbert Barrier was consistent and stable throughout 2021 due to a relatively constant purified recycled water supply and on-going rehabilitation and backwashing of the injection wells. On an annual basis, larger injection volumes were directed to the west end of the barrier than to the east end of the barrier. Several injection wells were kept off-line on stand-by for much of 2021 as they were not all needed to maintain groundwater elevations protective for seawater intrusion control due to relatively high Basin conditions.

Table ES-4. 2021 GWRS Injection at the Talbert Barrier

Water Source	Flow Rate	Volume (rounded)			Description
	(Avg. MGD)	(MG)	(AF)	(m^3)	
Purified recycled water	22.9	8,374	25,700	31,701,000	GWRS finished product water (FPW)
OC-44 Potable water	<0.1	2.3	7.0	8,600	Imported water from MWD OC-44 turnout
FV Potable water	<0.1	0.6	1.8	2,200	Blend of imported water and groundwater from City of Fountain Valley
Total	**23.0**	**8,377**	**25,709**	**31,712,000**	

Groundwater Monitoring at the Talbert Barrier

The GWRS permit requires quarterly groundwater monitoring near the Talbert Barrier at five OCWD multi-point monitoring well sites: M10, M11, M45, M46, and M47. The GWRS groundwater monitoring program began in mid-2004. The original 2004 GWRS permit groundwater monitoring requirements were modified in 2011-12, 2014, and 2018 based on OCWD's historic records; the approved modifications reduced the frequency and eliminated a few constituents (DDW, 2018; RWQCB, 2018). In November 2020, the RWQCB consolidated the modified monitoring requirements for GWRS (RWQCB, 2020). In addition to the five required monitoring well sites, OCWD continued to periodically sample a sixth monitoring well site, M19, because of its long history and proximity to the barrier. Groundwater level (piezometric elevation) measurements as well as groundwater quality monitoring for an extensive list of parameters were conducted during 2021 at these monitoring well sites in compliance with the GWRS permit.

Barrier compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2021, groundwater quality at all the

Talbert Barrier compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards. Groundwater quality testing at the compliance monitoring wells during 2021 revealed some results above the Federal and State Secondary Drinking Water Standards for apparent color and odor, similar to those in past years and unrelated to the injection of GWRS purified recycled water.

Dissolved chloride concentrations continued to be used as an intrinsic tracer to track the subsurface movement of injection water in 2021. Chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer, making it a relatively good, conservative tracer, especially since the chloride concentration of GWRS purified recycled water is much lower than both native groundwater and pre-GWRS injection water.

Testing for 1,4-dioxane and NDMA at monitoring wells near the Talbert Barrier continued quarterly in 2021. All barrier monitoring well sites except M47 had one or more aquifer zones with 1,4-dioxane concentrations that were above the DDW Notification Level (NL) of 1 μg/L during at least a portion of the year, but all samples at all six monitoring wells were significantly below the DDW Response Level (RL) of 35 µg/L for drinking water systems; these detections are a legacy of Water Factory 21 injection prior to GWRS. Concentrations of 1,4-dioxane have been generally decreasing at the barrier monitoring wells except for brief periods of gradient reversals causing older Water Factory 21 injection to migrate back to the wells. In contrast, NDMA was only detected during 2021 at one monitoring well, M46A/1, and was well below the DDW NL of 10 ng/L. In general, OCWD has observed 1,4-dioxane to be more persistent than NDMA in groundwater in the vicinity of the Talbert Barrier. Since the addition of more comprehensive industrial source control by OC San and UV/AOP treatment in 2001 after the discovery of 1,4-dioxane at Water Factory 21, the barrier injection has consistently been non-detect and/or below the DDW NL for 1,4-dioxane.

Kraemer-Miller-Miraloma-La Palma Basins Operations

Water from three sources was percolated at K-M-M-L Basins and nearby spreading basins (Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin) in 2021: (1) GWRS purified recycled water (only at K-M-M-L Basins); (2) SAR water; and (3) imported water.

Table ES-5 summarizes the volumes of various waters recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2021. A total volume of approximately 19,513 MG (59,884 AF; 31,712,000 m^3) of purified recycled water and other water (SAR water and imported water) was recharged at these seven basins.

During 2021, the GWRS purified recycled water discharge was divided between the four spreading basins as follows:

- Kraemer Basin: 269 MG (825 AF; 1,118,000 m^3), or 0.7 MGD on average;
- Miller Basin: 1,764 MG (5,414 AF; 6,677,000 m^3), or 4.8 MGD on average;
- Miraloma Basin: 6,761 MG (20,748 AF; 25,592,000 m^3), or 18.5 MGD on average; and
- La Palma Basin: 10,720 MG (32,897 AF; 40,578,000 m^3), or 29.4 MGD on average.

Table ES-5. 2021 GWRS Spreading in the Vicinity of Kraemer-Miller-Miraloma-La Palma Basins

Water Source[1]	Flow Rate	Volume (rounded)			Description
	(Avg. MGD)	(MG)	(AF)	(m^3)	
Purified recycled water[2]	53.5	19,513	59,884	73,865,000	GWRS finished product water (FPW) delivered
Other water[3]	43.6	15,930	48,887	60,302,000	SAR water and/or imported water percolated
Spreading basin storage[4]		121	370	456,000	Water in recharge basin storage at the end of calendar year
Total	**97.1**	**35,322**	**108,400**	**133,711,000**	

[1] Includes spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] Purified recycled water is recharged only at K-M-M-L Basins. Volume shown is based on AWPF production records.

[3] Other water volume is estimated based on total percolation and change in basin storage records from Forebay Operations.

[4] Storage is the estimated volume of water either retained in the spreading basins that has not yet percolated or drained from prior volumes in the spreading basins by the end of said calendar year based on percolation records from Forebay Operations.

In 2021, La Palma and Miraloma Basins received only GWRS purified recycled water. Historically, La Palma and Miraloma Basins have been dedicated almost exclusively to GWRS purified recycled water to minimize clogging and to maintain their exceptionally high percolation rates. Kraemer and Miller Basins typically receive both GWRS purified recycled water and other water.

Blending of purified recycled water with other water is no longer required for the Anaheim Forebay recharge operations. While the sources and volumes of spreading water continue to be reported, determination of the RWC is no longer required.

Groundwater Monitoring at the Anaheim Forebay

Groundwater monitoring near K-M-M-L Basins is required by the GWRS permit at five OCWD monitoring well sites: nested monitoring wells AMD-10 and AMD-12, plus single-point monitoring wells AM-7, AM-8, and AM-10. In addition to these required monitoring wells, OCWD continued to periodically sample another single-point monitoring well OCWD-KB1 because of its proximity to Kraemer Basin and long historical record. Groundwater level measurements as well as groundwater quality monitoring for an extensive list of parameters were conducted during 2021 at these monitoring well sites in compliance with the permit.

The inferred Shallow aquifer groundwater flow paths emanating from K-M-M-L Basins during June 2021 were towards the west-southwest, similar to those in prior years. Shallow aquifer groundwater elevations at the monitoring wells were 15-25 feet lower in June 2021 than in June 2020 due to: (1) decreased Basin storage, (2) cumulative effect of below average rainfall (less than 10 inches per year) during both 2020 and 2021, and (3) lower recharge during April through June 2021 as compared to those same months in 2020, even though annual recharge was 7% higher in 2021 than in 2020. Groundwater level trends during 2021 followed the typical seasonal pattern, rising in the winter and early spring, declining in the late spring and summer, and recovering in the late fall to the end of the year.

Anaheim Forebay compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of EPA Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2021, groundwater quality at all the Forebay compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards.

OCWD continued additional non-compliance (voluntary) monitoring for dissolved arsenic; increases in arsenic concentrations correlate to contemporaneous chloride concentration decreases with the sustained arrival of large percentages of GWRS water, and subsequent decreases in arsenic concentrations correlate to contemporaneous increases in chloride with arrival of non-GWRS other water. Although GWRS purified recycled water arrival is the cause of the increased arsenic concentrations, it is not the source of the arsenic. Historically, SAR water recharged with elevated arsenic concentrations adsorbed onto mineral surfaces in the aquifer; the higher initial pH or lower ionic strength of GWRS water relative to surrounding groundwater causes the arsenic to desorb. Due to mass removal of arsenic during each sustained near-100% GWRS arrival event, each successive GWRS arrival event has generally led to reduced arsenic peaks, eventually declining below ambient concentrations until arrival of other water brings new arsenic mass for adsorption once again. To limit arsenic mobilization in the aquifer, operation of the AWPF post treatment processes were modified in 2015-2016 to more closely control the FPW pH, targeting 8.5.

No detections of 1,4-dioxane or NDMA were found in groundwater at any of the Forebay monitoring wells in 2021. Groundwater quality testing during 2021 at four compliance monitoring well sites, AM-7, AM-8, AM-10, and AMD-10, revealed some constituents above the Federal Secondary Drinking Water Standards for apparent color, odor, and iron, as well as manganese and turbidity at monitoring well AMD-10/2. Corrosion of the mild steel well casings at these four monitoring well sites was likely the contributing factor causing the Secondary MCL exceedances for total iron. Manganese has been intermittently detected above the Secondary MCL at monitoring well AMD-10/2 since 2012. These short-term dissolved manganese spikes appear to be related to arrival of a non-GWRS other water manganese source or release trigger following a sustained GWRS arrival event as evidenced by the sharp increase in chloride during the manganese spike and subsequent chloride decrease back down near GWRS levels as the dissolved manganese also declines back to below the Secondary MCL. All the other Secondary MCL exceedances at AM-7, AM-8, AM-10, and AMD-10 during 2021 were consistent with the historic monitoring data and were not associated with the presence of GWRS purified recycled water.

MBI Project Operation

The MBI Project was implemented in two phases: DMBI Project and MBI Centennial Park Project. The DMBI Project began injection of purified recycled water that is delivered via the GWRS Pipeline to the MBI-1 site in April 2015. The DMBI Project provided operational and groundwater quality data to support the engineering design and permitting of the MBI Centennial Park Project. The MBI Centennial Park Project began operation in March 2020 and consists of four injection wells, MBI-2, MBI-3, MBI-4, and MBI-5, which are also supplied purified recycled water by the GWRS Pipeline. The primary objective of the collective MBI Project is to replenish a heavily pumped region of the Principal aquifer more locally and directly. Over 90% of groundwater production in the Basin occurs from the Principal aquifer system.

During 2021 approximately 2,889 MG (8,867 AF; 10,937,000 m^3) of purified recycled water was injected at all five MBI Project wells. Blending of purified recycled water with potable water is not required at the MBI Project, and no other water was injected in 2021. Periodic backwash pumping of the five MBI wells totaled approximately 18.3 MG (56 AF; 69,000 m^3) during 2021, representing 0.6% of the total injection. All water produced during backwash pumping of the MBI wells is discharged to adjacent channels near the SAR under RWQCB and County of Orange Flood Control permits.

The total monthly injection volume at the MBI Project was distributed somewhat evenly among the five MBI Project wells. During the first half of 2021, MBI-2 and MBI-5 received slightly more than the other injection wells; during the last half of 2021, MBI-5 received an increased portion of the injection volume as compared to the others. The target injection rates during 2021 ranged from: 1.75 MGD for MBI-1 and MBI-3; 1.75 to 2.25 MGD for MBI-4; 2.25 MGD for MBI-2; and 2.25 to 2.75 MGD for MBI-5. The total average daily injection rate was 7.9 MGD at the MBI Project during 2021. If only days when MBI wells were injecting are considered (i.e., excluding days with planned GWRS shutdowns), the average daily injection rate of the five MBI wells during 2021 was 8.4 MGD. Injection yields at all five MBI wells have decreased significantly relative to 2020.

Groundwater Monitoring at the MBI Project

Groundwater monitoring for the MBI Project began in 2012 and continued through 2021. Two monitoring wells, SAR-10 and SAR-11, are located downgradient from the DMBI Project (MBI-1) along the southeasterly flow path towards the closest downgradient drinking water production wells IRWD-12 and IRWD-17, which are operated by the Irvine Ranch Water District (IRWD). Two other monitoring wells, SAR-12 and SAR-13 were installed in late 2017 as part of the MBI Centennial Park Project. SAR-12 and SAR-13 are southeast and downgradient of SAR-10 and SAR-11 along a flow path from the MBI wells towards the nearest drinking water wells IRWD-12 and IRWD-17. SAR-12 and SAR-13 serve as the required downgradient compliance monitoring wells for the combined five injection well MBI Project (MBI-1 through MBI-5).

Commencement of the MBI Project in March 2020 with all five MBI wells fully on-line also represented the start of the GWRS intrinsic tracer test to determine the underground travel time of GWRS water to the downgradient compliance wells SAR-12 and SAR-13. Groundwater level and quality results from all four monitoring wells sites have been instrumental in determining groundwater flow patterns and velocities emanating from the MBI Project. Based on biweekly sulfate sampling, results of the tracer test estimate the fastest arrival of GWRS purified recycled water occurred in the deepest aquifer zone (Main 7) at SAR-12/4 and SAR-13/4 at 6.1 and 2.1 months, respectively. Table ES-6 summarizes the estimated arrival times of GWRS purified recycled water at the SAR-12 and SAR-13 sites. The arrival of GWRS purified recycled water is also evident at IRWD-12 and IRWD-17 based on declines in tracer concentrations. During 2021, both chloride and sulfate concentrations at IRWD-12 continued to steadily decline, supporting the preliminary interpretation described in last year's Annual Report that the first notable percentage of GWRS water arrived at this well in 2020. A chloride and sulfate reduction of at least 10% was first observed on the September 17, 2020, sample at IRWD-12, yielding a GWRS water arrival time of 182 days or approximately 6 months from the startup of the MBI Project

Table ES-6. GWRS Water Arrival Time Estimates to SAR-12 and SAR-13

Monitoring Well	Screened Interval (ft bgs)	Aquifer Name	Distance from nearest MBI Well (ft)	Sulfate[1] Arrival Time (days)	Sulfate[1] Arrival Time (months)
SAR-12/1	605 - 625	Lower Rho	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/2	755 - 775	Main 2	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/3	915 - 930	Main 4	1,025 (MBI-2)	379	12.6
SAR-12/4	1,045 - 1,055	Main 7	1,025 (MBI-2)	183	6.1
SAR-13/1	600 - 620	Lower Rho	725 (MBI-5)	155	5.2
SAR-13/2	750 - 770	Main 2	725 (MBI-5)	470	15.7
SAR-13/3	910 - 930	Main 4	725 (MBI-5)	155	5.2
SAR-13/4	1,045 - 1,055	Main 7	725 (MBI-5)	64	2.1

[1] Sulfate biweekly sampling with arrival times based on 10 to 20% reduction from most recent ambient.

tracer test. The declining trends in sulfate concentration at IRWD-17 during 2021 continued to be much more gradual than at IRWD-12. At IRWD-17, a sulfate reduction of at least 10% was first observed in April 2021, yielding a GWRS arrival time of 393 days or approximately 13 months from the startup of the MBI Project tracer test.

During 2021, OCWD continued to refine the Talbert Model in the MBI Project area, extending the model calibration period through May 2021 based on available information from the MBI tracer test; the Talbert Model flow and transport will be further refined and calibrated in 2022. The refined Talbert Model will be used along with the observed tracer test results to determine the required buffer areas at the MBI Project.

Groundwater quality monitoring for the MBI Project was similar to the Talbert Barrier and Anaheim Forebay: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. EPA Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2021, groundwater quality at all four monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 complied with all Federal and State Primary Drinking Water Standards. Results of groundwater analyses during 2021 indicated that arsenic remained below the Primary MCL (<10 µg/L) at all four monitoring wells. Three instances of Secondary MCL exceedance for Aluminum and iron occurred at SAR-10/1 in 2021. The likely cause of the brief elevated aluminum levels was the AWPF extended shutdown and subsequent restart that temporarily paused GWRS water injection and allowed native groundwater to move into and then away from the SAR-10/1 zone, causing an adsorption and subsequent desorption of aluminum. The brief elevated iron concentrations at SAR-10/1 were likely related to the arrival of GWRS purified recycled water in 2015, which released iron by oxidation of pyrite and other iron sulfide minerals, creating a localized effect similar to that observed for aluminum.

Groundwater at monitoring well sites SAR-10, SAR-11, SAR-12, and SAR-13 was sampled and analyzed for 1,4-dioxane and NDMA during 2021. The 1,4-dioxane results in 2021 continued to be non-detect at all zones at the four MBI Project monitoring wells. During 2021, NDMA concentrations in all zones of SAR-10 ranged from below the RDL (2 ng/L) to 9.5 ng/L, remaining below the NL (10 ng/L). The higher NDMA concentrations at SAR-10 during 2021 likely resulted from the return of older GWRS purified recycled water to that well with similar NDMA concentrations as injected during 2016-2019 at MBI-1. This return was likely caused by localized shifts in the groundwater flow direction due to mounding from the four MBI wells in Centennial Park.

Conclusions

The GWRS operated in compliance with its permits throughout 2021, producing a total of 30,793 MG, or 94,500 AF (116,564,000 m^3) of purified recycled water for injection at the Talbert Barrier, spreading at K-M-M-L Basins, injection at the MBI Project, and delivery to Anaheim CPP, ARTIC, and Anaheim Adventure Park for non-potable use. Of the purified recycled water produced, approximately 27% was injected at the barrier and nearly 64% was recharged at the spreading basins. Approximately 9% was injected at the MBI Project, and a negligible volume (0.1%) was used for non-potable water purposes. On an annual average daily basis, the AWPF produced 84.4 MGD (319,000 m^3/day) of purified recycled water and was on-line approximately 94.3% of the time in 2021. Purified recycled water production was primarily limited due to GWRSFE construction activities and inspection of the GWRS Pipeline.

During 2021, OCWD continued construction of the GWRSFE that will increase purified recycled water production up to 130 MGD (145,600 AFY; 179,630,000 m^3/year). When completed in 2023, GWRS purified recycled water will continue to supply the Talbert Barrier, replenish the Basin at the Anaheim Forebay and MBI Project, and be used for non-potable purposes at the Anaheim CPP, ARTIC, and Anaheim Adventure Park. OCWD plans to recharge GWRS purified recycled water at other sites in the future.

1. INTRODUCTION

The Groundwater Replenishment System (GWRS) is a water supply project jointly sponsored by Orange County Water District (OCWD) and Orange County Sanitation District (OC San). The GWRS supplements existing water supplies by providing a reliable high-quality source of water to recharge the Orange County Groundwater Basin (the Basin), to protect the Basin from degradation due to seawater intrusion, and to also provide a water source for non-potable uses.

This introductory section of the 2021 Annual Report for the GWRS presents the:

- Purpose of the Annual Report;
- Description of the GWRS and Advanced Water Purification Facility (AWPF);
- Description of the Talbert Seawater Intrusion Barrier (Talbert Barrier);
- Description of the Kraemer-Miller-Miraloma-La Palma Basins (K-M-M-L Basins);
- Description of the Mid-Basin Injection (MBI) Project;
- History of OCWD Water Recycling Facilities;
- Water Recycling Permit Requirements; and
- Overview of the Operation Optimization Plan (OOP).

1.1 Purpose of the Annual Report

This Annual Report for 2021 is prepared in fulfillment of the requirements specified in the *"Producer/User Water Recycling Requirements and Monitoring and Reporting Program for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Basins"* adopted as Order No. R8-2004-0002 by the California Regional Water Quality Control Board, Santa Ana Region (RWQCB), on March 12, 2004 (RWQCB, 2004), and four subsequent amendments: (1) Order Nos. R8-2008-0058 on July 18, 2008 (RWQCB, 2008); (2) R8-2014-0054 on December 12, 2014 (RWQCB, 2014a); (3) R8-2016-0051 on July 29, 2016 (RWQCB, 2016); and (4) R8-2019-0007 on March 22, 2019 (RWQCB, 2019). In November 2020, the RWQCB issued Revised Monitoring and Reporting Program requirements (RWQCB, 2020a), incorporating modifications to the 2004 permit made through amendments, correspondence, and updates for the Recycled Water Policy (SWRCB, 2018). OCWD is the lead agency for the GWRS and responsible for permit compliance. These RWQCB Orders specify permit requirements for the GWRS for purified recycled water for: (1) injection at the Talbert Barrier; (2) spreading at K-M-M-L Basins; (3) injection at the MBI Project; and (4) non-potable water uses. One of the permit requirements is submittal of an Annual Report.

On March 12, 2021, the RWQCB adopted Order No. R8-2021-0003 "*Waste Discharge Requirements and Master Recycling Permit for Orange County Water District Advanced Water*

Purification Facility." This order separately specifies requirements for the GWRS for purified recycled water for non-potable uses, including requiring an Annual Report. Discharge under this order did not occur until March 2021. This 2021 Annual Report for the GWRS is intended to fulfill the requirements of both Order Nos. R8-2004-0002 (as amended) and R8-2021-0003.

This Annual Report serves two overall purposes by providing: (1) an in-depth review and evaluation of the operation of the entire GWRS during 2021 in fulfillment of the permit requirements; and (2) a continuing historical record of the operations of the OCWD water reuse and groundwater recharge facilities.

Information for this report was based on: (1) review of laboratory and on-line water quality data; (2) review of operations reports and groundwater monitoring records compiled by OCWD; and (3) on-site and virtual observations by the authors.

1.2 Groundwater Replenishment System

The GWRS produces a reliable, high-quality source of purified recycled water, recharges the Basin, and protects it from further degradation due to seawater intrusion.

The GWRS consisted of the following major components during 2021:

- AWPF, which includes treatment processes and pumping stations;
- Talbert Barrier, featuring injection wells and pipelines;
- K-M-M-L Basins, which are surface percolation basins supplied by the GWRS Pipeline;
- MBI Project, consisting of five injection wells supplied by the GWRS Pipeline; and
- Three non-potable end users: Anaheim Canyon Power Plant (Anaheim CPP) and Anaheim Regional Transportation Intermodal Center (ARTIC), both of which are supplied by turnouts from the GWRS Pipeline, and Anaheim Adventure Park which operates at Miraloma Basin.

GWRS purified recycled water production by the AWPF, injection at the Talbert Barrier, and spreading at Kraemer-Miller Basins began in January 2008. Spreading at Miraloma Basin began in July 2012. GWRS purified recycled water injection at the DMBI injection well (MBI-1) began in April 2015, and four additional MBI injection wells were placed on-line in March 2020. Spreading at La Palma Basin began in November 2016. Purified recycled water service for non-potable purposes began at Anaheim CPP in July 2011 and at ARTIC in November 2014. The third non-potable water user, Anaheim Adventure Park, began operation in July 2021.

Secondary-treated wastewater is diverted from OC San Reclamation Plant No. 1 (Plant 1) to the GWRS AWPF, where it is treated to better than drinking water standards using membrane filtration (MF), reverse osmosis (RO), an ultraviolet light/advanced oxidation process (UV/AOP), decarbonation, and lime stabilization. Two pumping stations at the AWPF in Fountain Valley deliver the purified recycled water to the: (1) Talbert Barrier in Fountain Valley and Huntington

Beach, and (2) K-M-M-L Basins, with service connections to Anaheim CPP and ARTIC in Anaheim, plus the MBI Project in Fountain Valley and Santa Ana. Figure 1-1 schematically shows the location of the GWRS facilities in central Orange County, California.

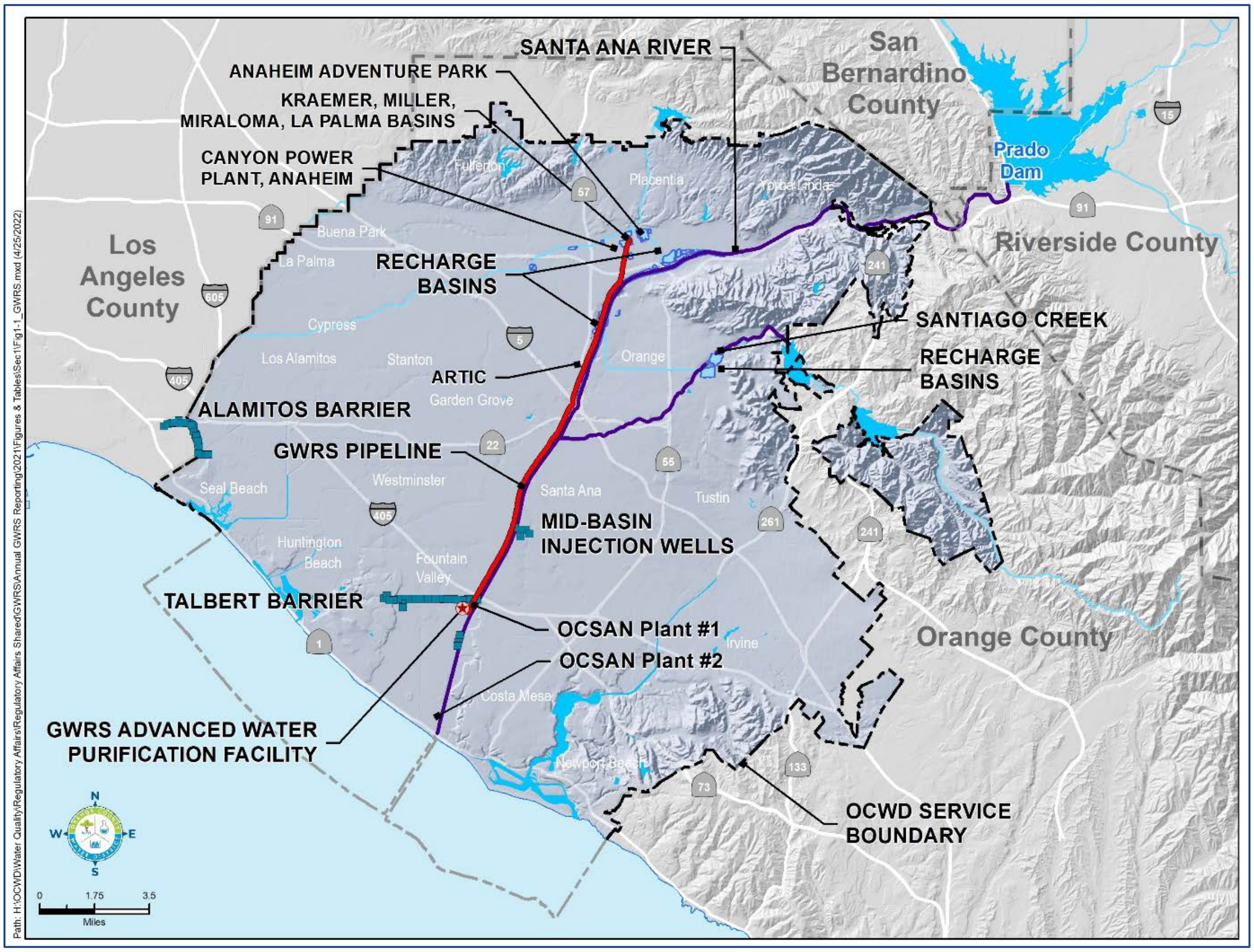


Figure 1-1. Groundwater Replenishment System Location Map

The existing AWPF design production capacity is 100 million gallons per day (MGD). Construction of the GWRS Initial Expansion was completed in 2015, increasing the AWPF design production capacity from 70 to the current 100 MGD and adding flow equalization facilities. AWPF source water flow equalization helped compensate for the diurnal fluctuation in secondary effluent from Plant 1, i.e., higher daytime flows and lower nighttime flows.

During 2021 the AWPF produced high-quality, purified recycled water averaging a finished water production rate of 84.4 MGD with daily flow rates ranging from 0.0 to 97.9 MGD. As listed in Table 1-1, the purified recycled water flow production in 2021 was discharged to multiple locations, with approximately 27% injected at the Talbert Barrier, nearly 64% pumped to K-M-M-L Basins, over 9% injected at the MBI area, and less than 1% used for non-potable purposes. Of the total purified recycled water produced by the AWPF in 2021, over one-third was recharged at La Palma Basin and over one-fifth was recharged at Miraloma Basin. Purified recycled water flow rates to the barrier and spreading basins vary seasonally.

Table 1-1. 2021 Summary of Purified Recycled Water Flows and Discharge Points

Purified Recycled Water Discharge Point	Annual Average Daily Flow Rate (Avg. MGD)	Annual Volume		Percent (rounded)
		Million Gallons (MG)	Acre-Feet (AF)	
Talbert Barrier	22.9	8,374	25,700	27.2%
Kraemer Basin	0.7	269	825	0.9%
Miller Basin	4.8	1,764	5,414	5.7%
Miraloma Basin[1]	18.5	6,761	20,748	22.0%
La Palma Basin	29.4	10,720	32,897	34.8%
MBI Project	7.9	2,889	8,867	9.4%
Anaheim CPP	<0.1	12	37	<0.1%
ARTIC	<0.1	4	12	<0.1%
Total	**84.4**	**30,793**	**94,500**	**100%**

[1] Flows and volumes include use by Anaheim Adventure Park, which is located at Miraloma Basin.

Besides water supply, another purpose of the GWRS is to provide peak flow relief for OC San during emergency, high wet weather flow conditions. During peak wastewater flow events, the AWPF can provide hydraulic relief for the OC San ocean outfall by discharging up to 100 MGD of membrane filtered, ultraviolet (UV)-disinfected, recycled water to the Santa Ana River (SAR) under RWQCB Order No. R8-2014-0069/NPDES CA8000408 (RWQCB, 2014b). This order expired on December 31, 2019, and was in the process of being reissued throughout 2020 and 2021. Alternatively, since the GWRS Initial Expansion was completed in 2015, the AWPF can provide similar hydraulic relief for the OC San ocean outfall by continuing normal operation and production of up to 100 MGD of purified recycled water for recharge. A new Santa Ana River emergency discharge permit, Order No. R8-2022-0002, became effective on April 1, 2022.

1.2.1 Source Water

Source water for the GWRS is secondary-treated wastewater, or secondary effluent, from the OC San Plant 1 in Fountain Valley. Located adjacent to the OCWD AWPF, Plant 1 currently has a rated secondary treatment capacity of 170 MGD. Plant 1 also provides secondary effluent for the Green Acres Project (GAP), which is a 7.5 MGD capacity tertiary treatment plant operated by OCWD that produces recycled water for non-potable irrigation and industrial uses. Modification projects at Plant 1 have recently been completed to improve its solids thickening and dewatering capability and support its liquid treatment capacity.

OC San also operates Treatment Plant No. 2 (Plant 2) in Huntington Beach near the coast. Plant 2 does not presently provide source water for the GWRS; secondary effluent from Plant 2 is discharged via an outfall to the Pacific Ocean.

OC San maintains an industrial pretreatment and source control program to manage contaminants entering the wastewater tributary to Plant 1 which may be harmful to the treatment facilities, environment, or to human health and drinking water supplies. The comprehensive OC San program fulfills the GWRS permit requirements and final Title 22 Water Recycling Criteria source control requirements for groundwater replenishment with recycled water (CCR, 2018), ultimately helping to protect GWRS purified recycled water quality.

Raw wastewater influent to Plant 1 passes through the metering and diversion structure, mechanical bar screens, and grit chambers, which comprise preliminary treatment. Following screening and grit removal, the wastewater receives advanced primary treatment using ferric chloride and anionic polymer addition and primary sedimentation. Primary effluent is then conveyed to the activated sludge (AS) plants or to trickling filters (TF) for secondary treatment. The existing TF and associated secondary clarifiers were upgraded and began operation in October 2006 with a design treatment capacity of 30 MGD. The older AS plant (OC San Project No. P1-82 or AS1), which consists of aeration basins and secondary clarifiers, was upgraded in August 2007 to include anoxic and oxic zones and has a design treatment capacity of 80 MGD. Historically, OC San operated the P1-82 AS plant in the carbonaceous biochemical oxygen demand (CBOD) mode. Since late 2009, the P1-82 AS plant has operated in the biological nitrification/partial denitrification (NdN) mode. The newer AS plant at Plant 1 (OC San Project No. P1-102 or AS2) was completed in July 2012 with a design capacity of 60 MGD and has operated in the NdN mode achieving partial denitrification.

Solids handling at Plant 1 consists of thickening centrifuges, anaerobic digestion, holding tanks, dewatering centrifuges, and truck loading facilities to haul stabilized solids to disposal. Support facilities include chemical addition, plant and city water systems, odor control, digester gas handling, and on-site power generation. Major upgrades to the biosolids thickening and dewatering facilities (OC San Project No. P1-101) completed in 2019 include two sets of centrifuges for: (1) co-thickening primary sludge and waste activated sludge, and (2) digested biosolids dewatering.

In mid-2009, OC San began operating the Steve Anderson Lift Station (SALS) that conveys up to 50 MGD of additional raw wastewater to Plant 1 to increase the amount of secondary effluent available for the GWRS. When operational, SALS increases the volume of wastewater treated at

Plant 1, which in turn, results in more secondary effluent flow being available as source water, thereby enabling the AWPF to perform closer to its full production capacity.

Secondary effluent flows by gravity to the GWRS AWPF, first passing through fine screens which are located at the Plant 1 site. While the ratio is variable, typically at least three times as much AS effluent as TF effluent is delivered to the AWPF as feedwater.

1.2.2 Advanced Water Purification Facility

The AWPF features MF, RO, and UV/AOP advanced water treatment processes applied to 100% of the influent flow stream, followed by decarbonation and lime stabilization post-treatment processes, with large pumping stations to convey the purified recycled water to the Talbert Barrier, K-M-M-L Basins, MBI Project, and three non-potable water customers. Figure 1-2 shows the entrance to the AWPF. The AWPF process flow diagram is shown on Figure 1-3, and Figure 1-4 shows the site layout.

Figure 1-2. Groundwater Replenishment System

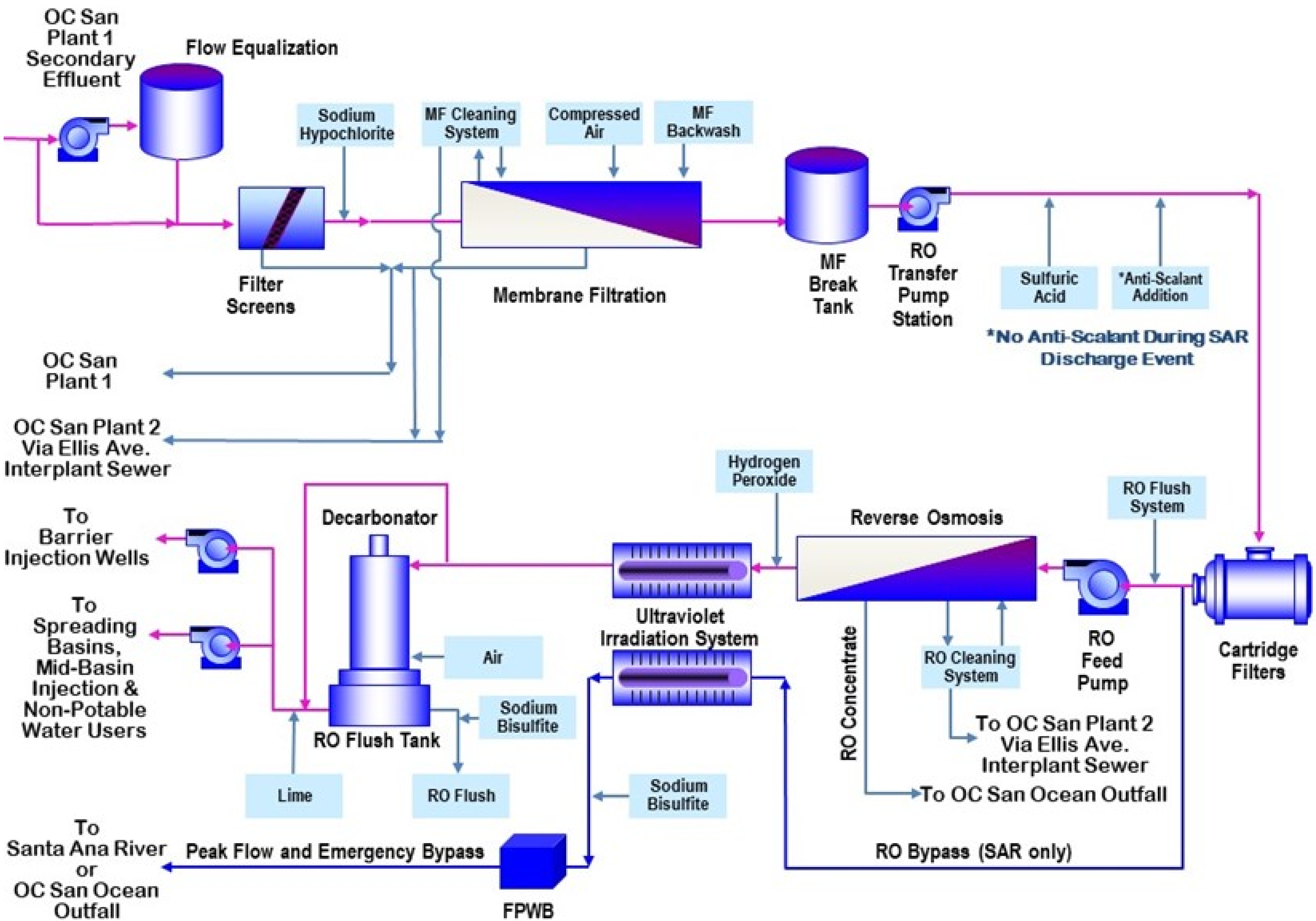


Figure 1-3. GWRS AWPF Process Flow Diagram

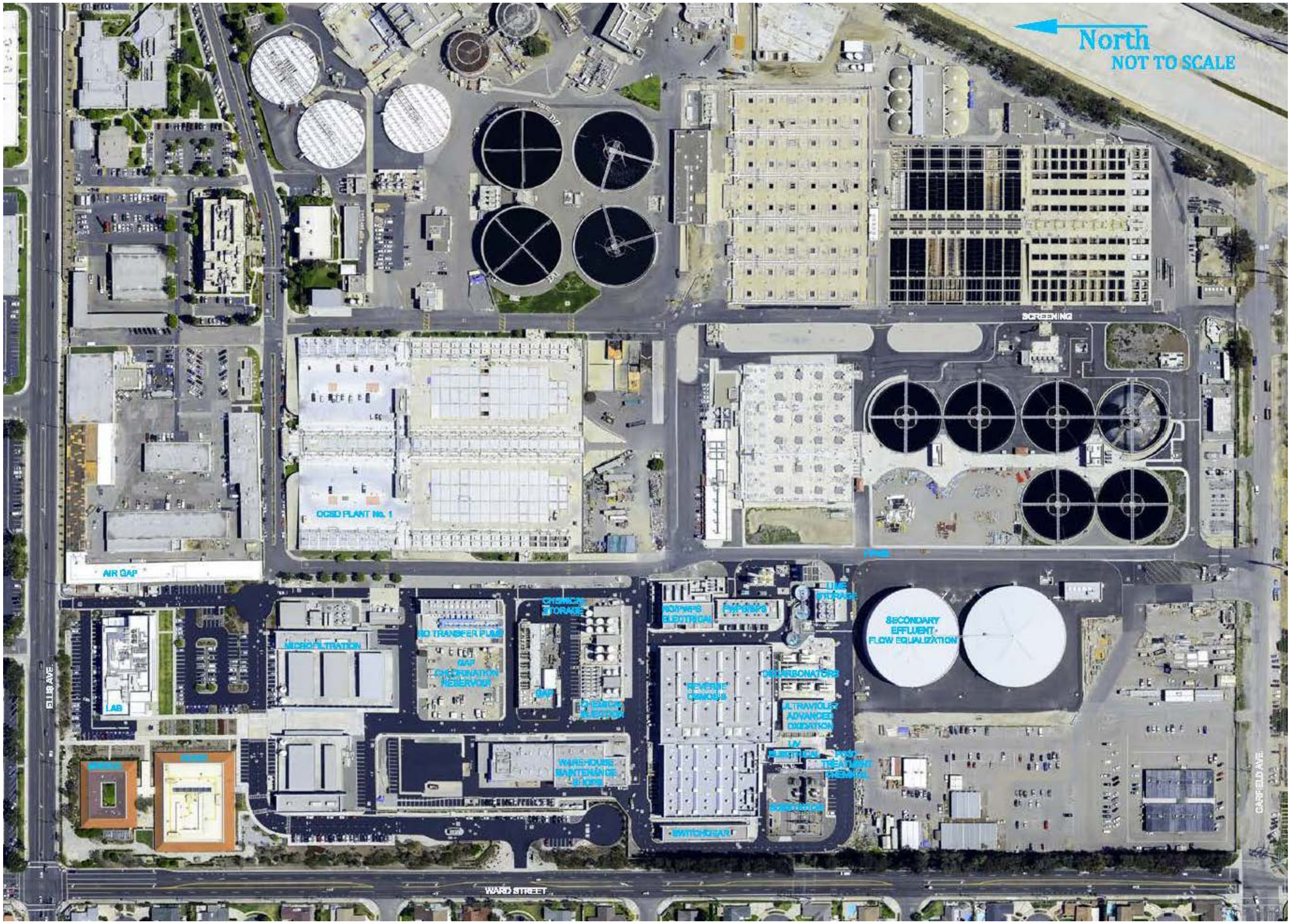


Figure 1-4. AWPF Site Layout

1.3 Talbert Barrier

The Talbert Gap is one of many geological features along the California coastline where freshwater aquifers are vulnerable to seawater intrusion from the Pacific Ocean. Historically, seawater intrusion has occurred in the Talbert Gap through the Talbert aquifer, which is the shallowest confined potable aquifer in the area and is comprised of sands and gravels deposited by the ancestral SAR. Early seawater intrusion in this area was studied by the California Department of Water Resources (DWR) and documented in *"Bulletin No. 147-1, Ground Water Basin Protection Projects, Santa Ana Gap Salinity Barrier, Orange County"* (DWR, 1966). Increasing freshwater demands and pumping from the Basin in the nearby coastal area accelerated this seawater intrusion condition. To mitigate this problem, OCWD initially constructed a series of 23 injection well sites to form a freshwater hydraulic mound, or pressure ridge, that helped prevent seawater intrusion in the Talbert Gap area.

OCWD gradually expanded and strengthened the Talbert Barrier, adding more injection well sites to offset increased groundwater production resulting from urbanization of the coastal area. Without the barrier, seawater would migrate inland via the relatively shallow Talbert aquifer and then dive into deeper potable aquifers in areas where they are hydraulically connected or merged with the Talbert aquifer. The brackish degraded groundwater would eventually reach municipal supply wells. By forming an underground hydraulic mound near the coast, the Talbert Barrier helps to prevent seawater intrusion and contamination of the fresh groundwater supply.

Illustrated on Figure 1-5, the current Talbert Barrier consists of a series of 36 injection well sites that are supplied by pipelines that emanate from the AWPF Barrier Pump Station. The injection wells are generally located along Ellis Avenue and along the SAR just north of Adams Avenue, within the cities of Fountain Valley and Huntington Beach. Of the 36 injection well sites, 23 are the original injection wells (OCWD-I1 through OCWD-I23) that were installed between 1968 and 1972 along Ellis Avenue between the Huntington Beach and Newport mesas, herein referred to as the "legacy injection wells." Five additional injection well sites (OCWD-I24 through OCWD-I28) were constructed between 1999 and 2004. As part of the GWRS project, eight more injection well sites (OCWD-I29 through OCWD-I36) were constructed between 2004 and 2007. Injection well sites I24 through I36 are herein referred to as the "modern injection wells."

Three sources of water may be injected at the Talbert Barrier:

1. **Purified recycled water** – advanced treated recycled water treated by MF, RO, UV/AOP, decarbonation and lime stabilization by the GWRS AWPF (FPW);
2. **Potable water blend** – City of Fountain Valley (FV) potable water comprised of a blend of groundwater and imported water; and

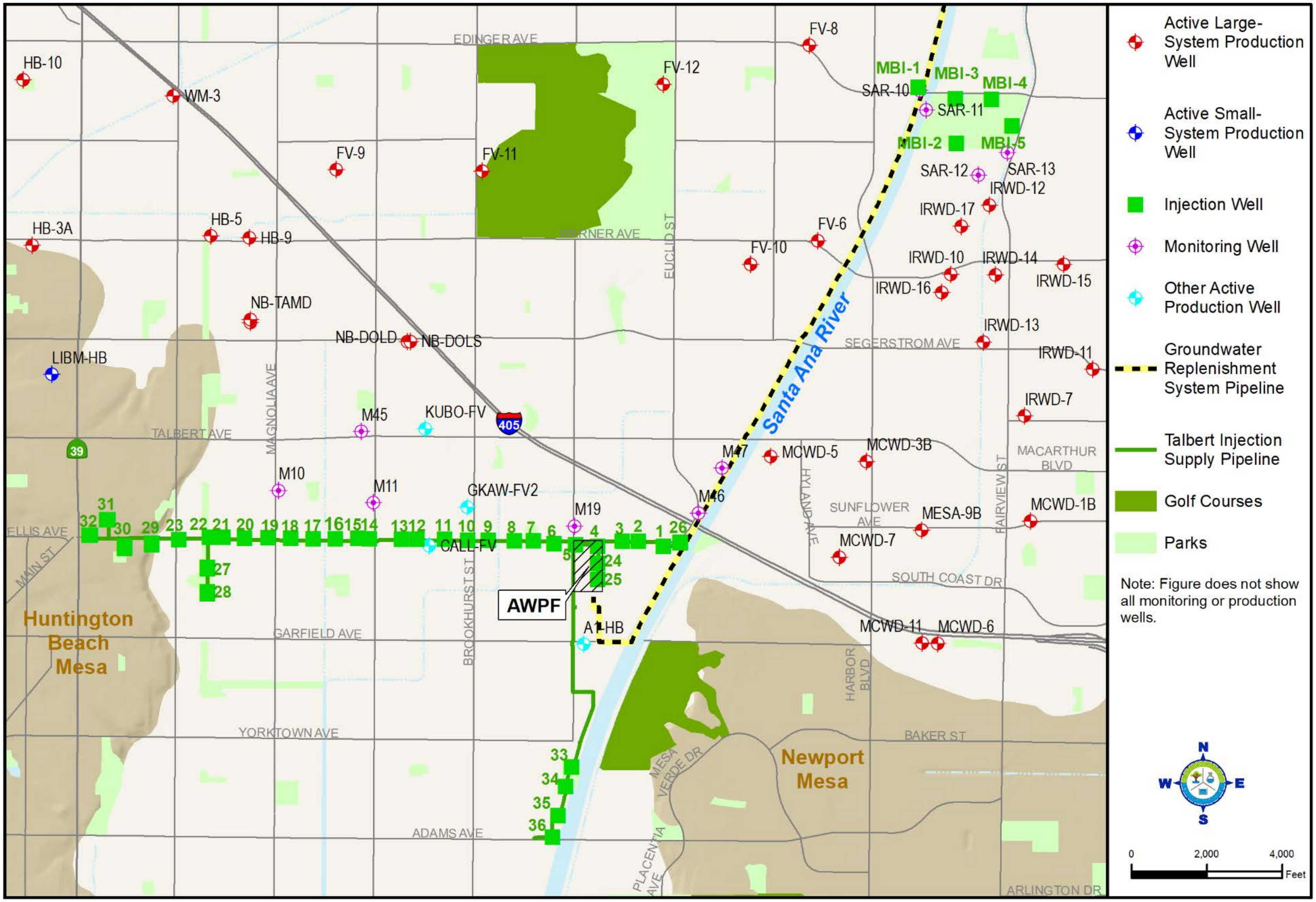


Figure 1-5. GWRS AWPF, Talbert Barrier and MBI Project Location Map

3. **Imported water** – potable water from the Metropolitan Water District (MWD) OC-44 turnout delivered via the City of Huntington Beach.

OCWD injects primarily GWRS purified recycled water at the Talbert Barrier, and occasional negligible amounts of potable and imported water to keep the barrier pipeline pressurized when the AWPF is off-line. The MWD OC-44 turnout and City of Fountain Valley system can provide up to 10 to 15 mgd of injection supply in the event of an extended AWPF shutdown, although typically a much lower volume of these sources is used due to the short duration of typical AWPF shutdowns.

The closest active municipal public water supply well to the Talbert Barrier is Mesa Water District (Mesa Water) Well MCWD-5. Well MCWD-5 is located approximately 3,300 feet northeast of injection well site OCWD-I26, which is at the far easterly end of the barrier. The underground retention time prior to extracting water of recycled origin at this domestic drinking water well was estimated at three to eight years.

The amended permit requires a primary boundary of 12 months underground travel time from the injection operation at the Talbert Barrier. Any new drinking water wells are to be constructed outside this primary boundary. The secondary boundary is defined as the area less than 12 months underground travel time from the Talbert Barrier injection operations. Generally, any new drinking water wells proposed to be constructed near the secondary boundary must be evaluated to assess any potential impact that the proposed well may have on the primary boundary, potentially changing the boundaries. In the case of the Talbert Barrier, the secondary boundary is coincident with the primary boundary; therefore, drinking water wells are to be constructed outside the secondary boundary.

The Talbert Barrier injection operation complies with the amended permit requirements for underground retention time. The primary boundary is supported by Resolution No. 05-4-40 adopted by the OCWD Board of Directors on April 20, 2005 (OCWD, 2005). OCWD has notified the Orange County Health Care Agency (OCHCA) and the City of Fountain Valley, which are the well permitting agencies in this area, of this buffer zone requirement. The Orange County Well Standards Advisory Board was also notified. No new drinking water wells have been installed in the 12-month underground retention area.

1.3.1 Monitoring Wells near the Talbert Barrier

OCWD has an extensive monitoring well network in the Talbert Gap, especially in the vicinity of the Talbert Barrier. These wells are monitored for both groundwater levels and groundwater quality to: (1) evaluate barrier effectiveness; (2) characterize seawater intrusion; and (3) track effects of the injection water on groundwater quality. Data from these monitoring wells and nearby drinking water production wells are also analyzed to estimate groundwater travel times along flow paths emanating from the barrier.

Two historic monitoring well sites, M10 and M11, and three newer monitoring well sites, M45, M46, and M47, are monitored for various water quality parameters specified in the permit (RWQCB, 2004). A third historic monitoring well site, M19, is voluntarily monitored for a subset of permit-required water quality parameters. Each site has three to five depth-specific casings for monitoring individual aquifer zones. Overall, a total of 23 distinct points at five of these monitoring well sites (M10, M11, M45, M46, and M47) are routinely sampled and tested for the full comprehensive test suite of analytes. At the sixth monitoring well site (M19), only Zone 3 (M19/3) is tested quarterly like GWRS compliance monitoring wells and annually for the full comprehensive suite of analytes; Zones 1 and 2 (M19/1 and M19/2) are tested twice a year for a reduced set of analytes for the assessment of seawater intrusion. As shown on Figure 1-5 presented earlier, these six sites are strategically located as follows:

- Monitoring well sites M46 and M47 (compliance wells) are between the easterly end of the barrier and the nearest domestic drinking water production well MCWD-5, which is owned and operated by Mesa Water;
- Monitoring well sites M10, M11, and M45 (compliance wells) are located north of the barrier between the barrier and the four City of Newport Beach domestic drinking water production wells (NB-TAMD, NB-TAMS, NB-DOLD, and NB-DOLS); and
- Monitoring well site M19 (voluntary non-compliance well) is located approximately 500 ft north of the barrier.

The permit requires that quarterly water quality sampling and analyses for each aquifer receiving injection water be conducted at five monitoring well sites near the barrier: M10, M11, M45, M46, and M47. Monitoring at well site M19 is not required under the current permit. However, since monitoring well site M19 has a long history of data as an original Water Factory 21 (WF-21) compliance monitoring well and is strategically located within 500 feet of the barrier, data continue to be collected at M19.

The RWQCB and State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) approved revisions to the monitoring plan in 2011 and 2018. In November 2020, the RWQCB consolidated these revisions in modified monitoring and reporting requirements for the original GWRS permit (RWQCB, 2020a). Frequency changes allow for selected analytes with no detections to be monitored on an annual basis in lieu of quarterly (RWQCB, 2011 and CDPH, 2010a). Since 2012, OCWD reduced the quarterly voluntary groundwater monitoring of chemicals of emerging concern (CECs) to semi-annually, annually, or discontinued at some monitoring wells based on review of the groundwater quality data and assessing the arrival of purified recycled water using its low chloride concentration as an intrinsic tracer. At a few of the monitoring wells, arrival of purified recycled water has not been observed based on chloride concentrations that have remained at levels consistent with pre-GWRS ambient conditions since 2008, which justifies the reduced monitoring frequency at some sites.

In 2018, the GWRS groundwater monitoring program approved by the RWQCB and DDW (RWQCB, 2018 and DDW, 2018a) represented an "alternative approach" to the requirements established in the groundwater recharge regulations (CCR, 2018) by recognizing OCWD's long-term history of groundwater monitoring. Since 2018, groundwater monitoring for total coliform is no longer required, and the required frequency for groundwater monitoring for total nitrogen (except for nitrate and nitrite), thiobencarb and foaming agents (methylene blue substances [MBAS]) has been reduced from quarterly to annually.

1.4 Kraemer-Miller-Miraloma-La Palma Basins

K-M-M-L Basins in Anaheim are components of the GWRS that are used to percolate purified recycled water, along with other waters to recharge the Basin. Figure 1-6 shows the location of these four recharge basins, which are located north of the SAR, near the Carbon Creek Diversion Channel, along with OCWD's other non-GWRS surface water recharge facilities. OCWD manages and operates a surface water recharge system located near the SAR and Santiago Creek comprised of 24 recharge facilities that cover nearly 1,100 wetted acres and have a total storage volume of more than 26,000 acre-feet (AF).

Earlier studies (DWR, 1934; DWR, 1967) have described the Forebay area of the Basin as an area characterized by highly permeable sands and gravels with relatively few discontinuous clay and silt deposits. The majority of recharge in the Basin occurs in the Forebay, primarily by percolation of SAR flows, GWRS purified recycled water, and purchased imported water.

Seven adjacent spreading basins form the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L Basins/La Jolla Basins recharge system. K-M-M-L Basins are components of the GWRS. Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin are not components of the GWRS (i.e., do not recharge purified recycled water). Kraemer and Miller Basins began spreading purified recycled water in January 2008. Miraloma Basin began spreading purified recycled water in July 2012. La Palma Basin began spreading purified recycled water in November 2016. Anaheim Lake and Mini-Anaheim Lake are adjacent to and upgradient of K-M-M-L Basins. La Jolla Basin is close to and downgradient of K-M-M-L Basins.

Three sources of water may be recharged at K-M-M-L Basins:

1. **Purified recycled water** – advanced treated recycled water treated by MF, RO, UV/AOP, decarbonation and lime stabilization by the GWRS AWPF (FPW);
2. **SAR water** – storm water and base flow captured and diverted from the SAR and local tributaries to the spreading basins (base flow is principally comprised of disinfected tertiary-treated wastewater effluent from upstream dischargers); and
3. **Imported water** – raw, untreated surface water from the State Water Project or Colorado River Aqueduct purchased from MWD.

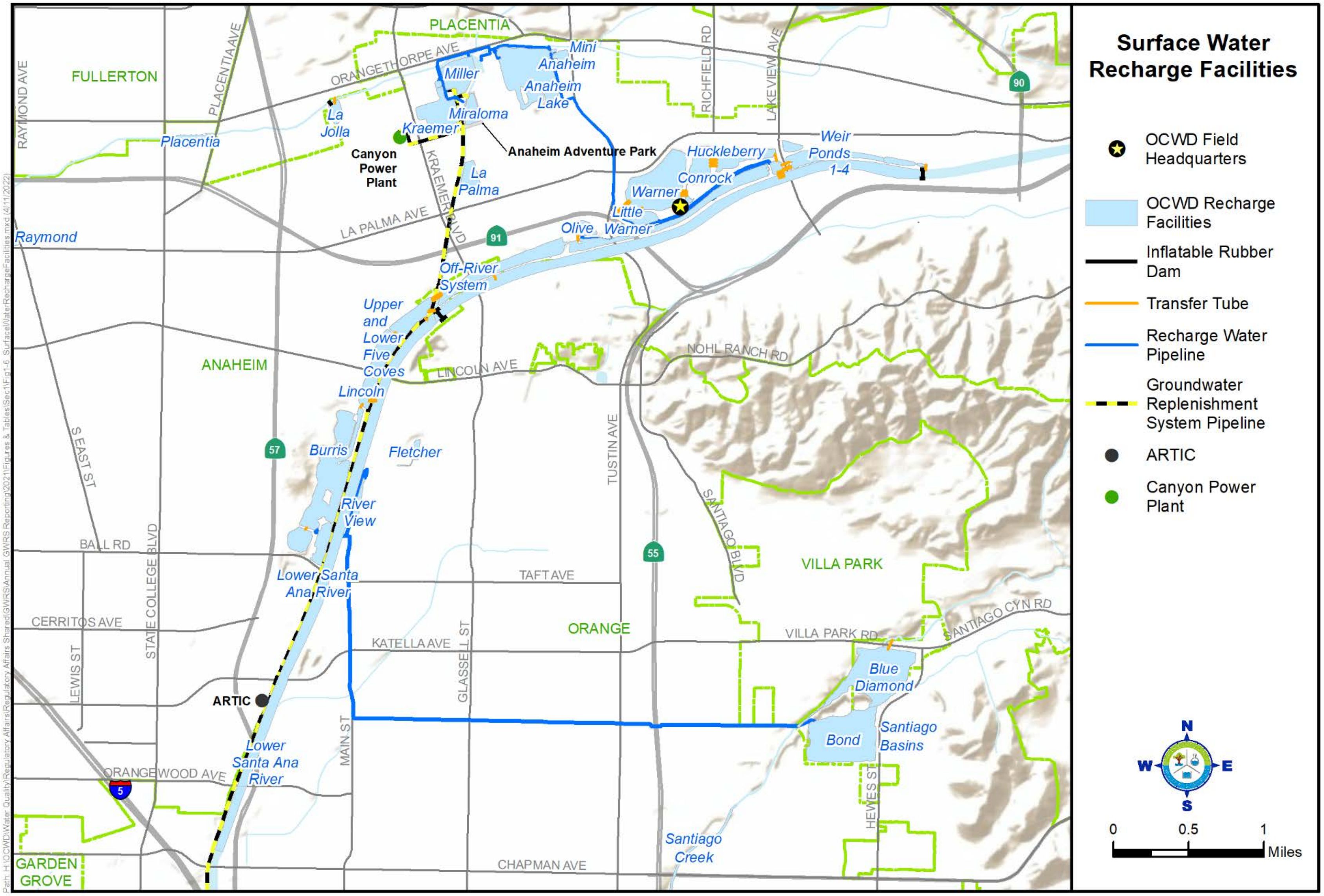


Figure 1-6. Surface Water Recharge Facilities

Purified recycled water is conveyed from the AWPF to K-M-M-L Basins by the GWRS Pipeline. This 13-mile transmission pipeline traverses an alignment along the west levee of the SAR through the cities of Fountain Valley, Santa Ana, Orange, and Anaheim, and then continues north along the Carbon Creek Diversion Channel to these four spreading basins.

The closest downgradient domestic drinking water well to K-M-M-L Basins is Well SCWC-PLJ2 (La Jolla Well), which is owned and operated by the Golden State Water Company (GSWC), formerly Southern California Water Company (SCWC). Well SCWC-PLJ2 is located approximately 5,300 feet downgradient from Kraemer Basin, the closest of the GWRS recharge basins. The underground retention time prior to extracting water of recycled origin at this domestic well is greater than six months (Clark, 2009).

The spreading operation complies with the amended permit requirements which specify that a primary boundary area be established to achieve four months of underground retention time downgradient of the K-M-M-L Basins for inactivation of microorganisms. Any new drinking water wells proposed to be established at the leading edge of the secondary boundary defined by the area with less than four months underground travel time must be evaluated to assess any potential impact that the proposed well may have on the primary boundary.

In compliance with the amended permit, no domestic drinking water supply wells are located within this 4-month underground retention primary/secondary boundary area. With the addition of La Palma Basin, the OCWD Board of Directors adopted Resolution No. 16-7-98 on July 20, 2016, establishing the boundary area for K-M-M-L Basins (OCWD, 2016). OCWD notified the OCHCA and the City of Anaheim, which are the well permitting agencies in this area, of this boundary requirement. The Orange County Well Standards Advisory Board was also notified.

1.4.1 Monitoring Wells near Kraemer-Miller-Miraloma-La Palma Basins

OCWD has numerous monitoring wells in the vicinity of K-M-M-L Basins. These monitoring wells are used to observe groundwater levels and examine water quality and associated impacts of the recharge water on groundwater quality. Data from these monitoring wells and nearby domestic drinking water production wells are also analyzed to estimate groundwater travel times along flow paths emanating from the spreading basins.

Shown on Figure 1-7, five monitoring well sites downgradient of K-M-M-L Basins are monitored for various water quality parameters specified in the permit (RWQCB, 2004, 2008, 2014, 2016, and 2019) and based on DDW's approval (CDPH, 2014) of the Title 22 Engineering Report Supplement (OCWD and DDB Engineering, Inc., 2014): AM-7, AM-8, AM-10, AMD-10, and AMD-12.

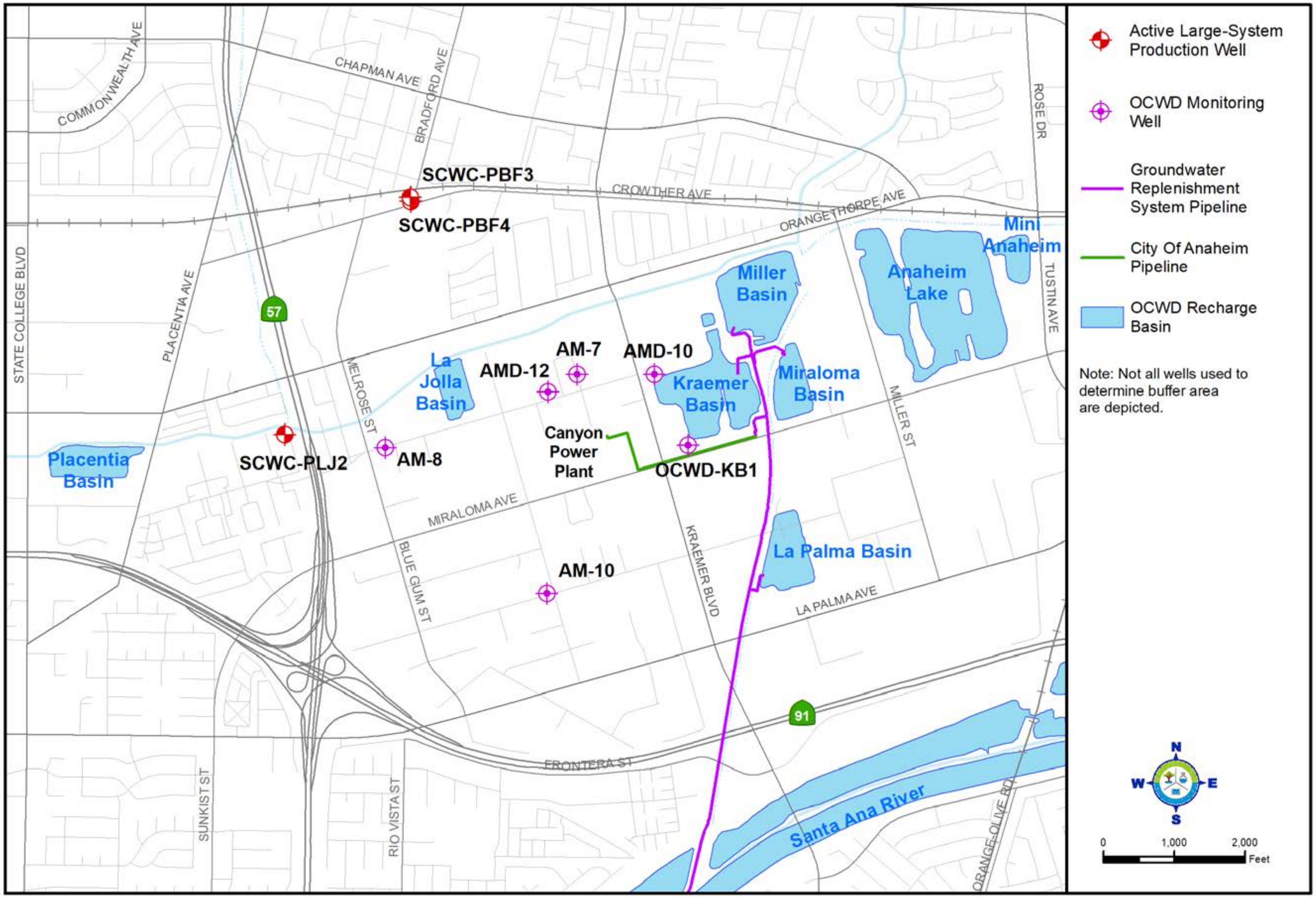


Figure 1-7. Selected Forebay Monitoring and Production Well Locations

Three of the sites, AM-7, AM-8, and AM-10 feature single-depth casings for monitoring one aquifer zone. The other sites, AMD-10 and AMD-12, each feature five depth-specific casings for monitoring five individual aquifer zones. A total of 13 distinct monitoring points at these five locations are sampled and tested in accordance with the permit and in accordance with the approved reduced monitoring frequency. The RWQCB and DDW allowed for a reduced monitoring frequency from quarterly to an annual basis for selected analytes with no detections (RWQCB, 2011 and CDPH, 2010a). The groundwater monitoring program for the Anaheim Forebay area was revised in 2018, when requirements for total coliform monitoring were eliminated and the frequency for monitoring other analytes was changed from quarterly to annually based on a long period of no detections (RWQCB, 2018 and DDW, 2018a). In addition to the above compliance wells, OCWD regularly samples one non-compliance monitoring well that is near the GWRS spreading basins, OCWD-KB1/1, to collect water level and quality data from the shallowest, upper aquifer that is not captured by deeper monitoring wells

1.5 Mid-Basin Injection Project

The MBI Project was implemented in two phases: DMBI Project and MBI Centennial Park Project. Located in the central area of the Basin in the cities of Fountain Valley and Santa Ana as shown on Figure 1-8, the MBI Project consists of the following key components:

- DMBI Project
  - One injection well, MBI-1; and
  - Two downgradient monitoring wells, SAR-10 and SAR-11.
- MBI Centennial Park Project
  - Four injection wells, MBI-2, MBI-3, MBI-4, and MBI-5; and
  - Two downgradient monitoring wells, SAR-12 and SAR-13.

GWRS purified recycled water is delivered to the MBI wells via a turnout from the GWRS pipeline, comprising the only source of water available to the wells.

OCWD had been operating the DMBI Project since 2015 to investigate the feasibility of injecting GWRS purified recycled water directly into the Principal aquifer in the central portion of the Orange County Groundwater Basin. The goals of the DMBI Project were achieved by collecting engineering, hydrogeological, water quality, and injection well operational data for designing the MBI well field in Centennial Park, which was placed on-line in March 2020.

Injection at MBI-1 began on April 15, 2015, replenishing the Principal aquifer at depths between approximately 500 and 1,200 ft bgs with approximately 1.5 MGD of GWRS purified recycled water supplied via a lateral off the GWRS Pipeline.

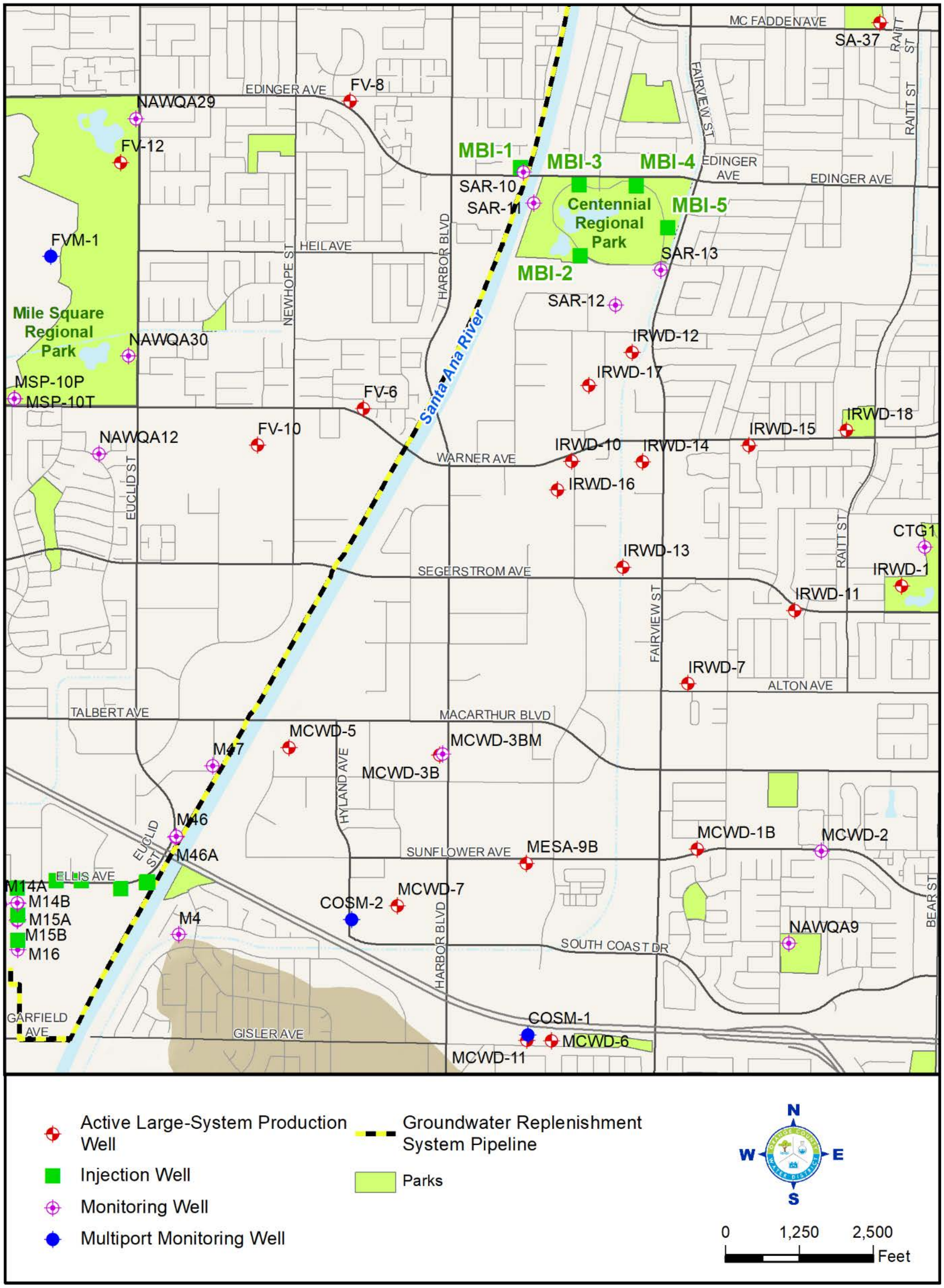


Figure 1-8. MBI Project Location Map

Information gained from the successful operation of the DMBI Project was used to support the design and permitting of four additional MBI wells that were constructed in Centennial Park in 2018-2019 just to the southeast of the DMBI Project (Figure 1-8). MBI-2, MBI-3, MBI 4, and MBI-5 were designed to inject 1.5 to 2.5 MGD each. The MBI Centennial Park Project began injection on March 18, 2020, directly recharging the Principal aquifer. After becoming fully operational, the four MBI Centennial Park wells were maintained near their operational target of 2.25 MGD each from March through October 2020, after which their injection rates were reduced to approximately 1.75 MGD each due to high groundwater levels. Collectively, the five MBI Project wells (including MBI-1) averaged approximately 8 MGD (1.6 MGD each) during 2021.

Two additional monitoring wells were constructed just south of Centennial Park in late 2017 to support the four MBI Centennial Park wells in accordance with the Title 22 Engineering Report Supplement (OCWD and DDB Engineering, Inc., 2018). These two monitoring wells, SAR-12 and SAR-13, are strategically located downgradient of the MBI Centennial Park wells along a flow path towards the nearest downgradient municipal production wells IRWD-12 and IRWD-17 (Figure 1-8). SAR-12 and SAR-13 are the compliance monitoring wells for the entire MBI Project as approved by DDW and the RWQCB (DDW, 2018b; RWQCB, 2019) and reflected in the modified monitoring and reporting requirements for the GWRS permit (RWQCB, 2020a).

1.6 History of OCWD Water Recycling Facilities

OCWD has a long history of water recycling for potable reuse, comprised of three recycled water groundwater recharge “eras”, which can generally be identified by the water reclamation facilities in service at the time:

- Water Factory 21 (WF-21) — October 1976 to January 2004
- Interim Water Factory 21 (IWF-21) — June 2004 to August 2006
- GWRS AWPF — January 2008 to present

These OCWD water recycling facilities have produced highly treated recycled water for groundwater recharge at the Talbert Barrier. During two transitional periods, roughly from February to May 2004, and again from September 2006 until January 2008, OCWD had no operational facilities producing recycled water for groundwater recharge due to construction at the site.

Presently, the GWRS AWPF produces purified recycled water for injection and recharge at the Talbert Barrier and DMBI Project and for recharge at K-M-M-L Basins to replenish the Orange County Groundwater Basin, plus limited non-potable uses.

1.6.1 Water Factory 21

OCWD operated WF-21 from October 1976 until January 2004 to produce recycled water for injection at the Talbert Barrier to help prevent the inflow of seawater into the Basin. Shown on Figure 1-9, WF-21 was originally designed as a 15-MGD capacity advanced water treatment (AWT) facility to reclaim secondary treated wastewater from OC San Plant 1.

Figure 1-9. Water Factory 21 in 1976

Over this initial era of recycled water recharge, which spanned nearly three decades, the WF-21 facilities and operations were periodically modified and adjusted. The original WF-21 AWT system consisted of lime clarification, ammonia stripping, recarbonation, filtration, granular activated carbon (GAC), chlorination, blending reservoir, and pumping station. In September 1977, a 5-MGD capacity RO system with cellulose acetate membranes was added to demineralize part of the recycled water flow stream. Later, when it was found that ammonia was removed by nitrification at the OC San plant and by the RO process, the ammonia stripping towers were taken out of service in 1987 and demolished in 1998. Lastly, a UV/AOP unit consisting of UV light exposure with hydrogen peroxide addition was added in 2001 to remove low molecular weight organic contaminants (e.g., NDMA and 1,4-dioxane).

Two types of recycled water produced by WF-21, AWT water and RO product water, were blended with deep well water and pumped to the Talbert Barrier injection wells until 2000. After that, only RO product was recharged, blending with groundwater from deep wells and potable water from the City of Fountain Valley and the OC-44 turnout (treated potable water from MWD).

Operation of WF-21 ceased on January 15, 2004 for construction of IWF-21 and the GWRS. Portions of WF-21, specifically the RO and UV/AOP processes as well as the blending reservoir and barrier pump station, were maintained for use in IWF-21. Other WF-21 facilities were demolished.

1.6.2 Interim Water Factory 21

Operation of IWF-21 began on June 21, 2004 and ceased on August 8, 2006, for relocation of portions of its equipment to the GWRS AWPF. Although this second era of water recycling for groundwater recharge was relatively brief, the purpose of IWF-21 was twofold: (1) produce up to 5 MGD of recycled water for the Talbert Barrier to help prevent seawater intrusion; and (2) serve as a training facility to allow operations and maintenance staff to gain experience with the same treatment train as that planned for the larger GWRS AWPF. Figure 1-10 shows the IWF-21 facilities.

Figure 1-10. Interim Water Factory 21 in 2006

Utilizing new treatment processes along with modified WF-21 facilities, IWF-21 featured MF, RO, decarbonation, and UV/AOP to treat secondary effluent from OC San's Plant 1. Recycled water was blended with diluent water, chlorinated, and pumped to the Talbert Barrier injection wells.

The RO system removed minerals, organics, viruses, and other contaminants. The original WF-21 RO System was retrofitted with new thin-film composite polyamide membranes in 2004, which offered improved mineral and contaminant rejection rates and operated at lower pressure, thereby conserving energy. The IWF-21 RO process followed MF and consisted of three steps: chemical pretreatment and cartridge filtration, RO membrane treatment, and post-treatment. Following RO, treatment included decarbonation for product water degasification and removal of carbon dioxide. The nominal rated permeate capacity of the IWF-21 RO system was 5 MGD. Concentrate from the RO process was discharged via a brine pipeline to the OC San ocean outfall for disposal.

The IWF-21 UV/AOP facilities provided photolysis, advanced oxidation, and disinfection using hydrogen peroxide and UV exposure. Hydrogen peroxide was added to the decarbonated RO permeate upstream of the UV light treatment. UV exposure was used for disinfection and destruction of UV-sensitive contaminants (e.g., NDMA). Hydrogen peroxide exposed to UV light produces hydroxyl radicals that result in advanced oxidation to destroy UV-resistant contaminants (e.g., 1,4-dioxane). The UV/AOP featured a closed, in-vessel type UV system with low-pressure high-output lamps. The UV unit's nominal rated capacity of 8.75 MGD was oversized for IWF-21 because it was designed to be relocated to the GWRS AWPF.

IWF-21 utilized the original WF-21 chlorination system to help prevent biofouling of the injection wells. The blending reservoir combined water from three sources (purified recycled water, potable water from the City of Fountain Valley, and deep well water) for injection and in-plant use. The barrier pump station conveyed water from the blending reservoir to the Talbert Barrier.

After IWF-21 was taken out of service in August 2006 until construction of the full-scale GWRS was completed in January 2008, only potable water from MWD via the OC-44 turnout and from the City of Fountain Valley was available for injection at the Talbert Barrier.

1.6.3 Groundwater Replenishment System

The third and most recent era of OCWD water reclamation for groundwater recharge is the GWRS. Described earlier in this section in detail, the GWRS is a significant achievement and sets OCWD apart as a world leader in water recycling and groundwater management. The GWRS is the largest potable reuse facility in the world.

The original purified recycled water production capacity of the GWRS was 70 MGD. Injection of purified recycled water produced by the AWPF at the Talbert Barrier began on January 10, 2008.

Recharge of purified recycled water produced by the AWPF at Miller Basin began on January 17, 2008. Purified recycled water recharge at Kraemer Basin began on February 19, 2008.

The GWRS Initial Expansion began operation, increasing the AWPF purified recycled water production capacity up to 100 MGD, on May 21, 2015. By adding 30 MGD of capacity, the GWRS Initial Expansion significantly enhanced the local water supply reliability within the Basin.

The GWRS Final Expansion construction began in 2019; when completed in 2023, the GWRS Final Expansion will increase the AWPF purified recycled water production capacity to 130 MGD.

1.7 Water Recycling Permit Requirements

During 2021 OCWD operated the Talbert Barrier and Kraemer-Miller-Miraloma Basins under the requirements of the *"Producer/User Water Recycling Requirements and Monitoring and Reporting Program for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Basins"* adopted by the RWQCB as Order No. R8-2004-0002 (RWQCB, 2004), and four subsequent amendments: RWQCB Order No. R8-2008-0058 (RWQCB, 2008); RWQCB Order No. R8-2014-0054 (RWQCB, 2014a); RWQCB Order No. R8-2016-0051 (RWQCB, 2016); and RWQCB Order No. R8-2019-0007 (RWQCB, 2019). A Revised Monitoring and Reporting Program for Order No. R8-2004-0002 was issued in November 2020 (RWQCB, 2020a). Collectively, these RWQCB Orders comprise the permit for the GWRS, incorporating groundwater recharge criteria, findings and conditions, and recommendations from DDW. Most recently, the RWQCB issued *"Order No. R8-2021-0003, Waste Discharge Requirements and Master Recycling Permit, for Orange County Water District Advanced Water Purification Facility, Orange County"*, which covers production and distribution of purified recycled water for non-potable reuse approved under Title 22 (CCR, 2018).

By way of background, the original GWRS permit specified requirements for blending purified recycled water with diluent water. For the blend, the 2004 permit specified an initial maximum recycled water contribution (RWC) of up to 75% recycled water and 25% diluent water at each recharge location. Compliance with this initial maximum RWC limit was determined monthly based on the running average over the prior 60-month period. Diluent water was defined as water of non-wastewater origin.

The permit also contained requirements that, when met, allowed the RWC limit to be increased at each location. Following these requirements, OCWD conducted an RWC Ramp-Up Demonstration to support increasing the RWC to 100% at the Talbert Barrier. The demonstration began in January 2008 and concluded in April 2009. The "RWC Ramp-Up Demonstration Report" (DDB Engineering, Inc., 2009a) was submitted to DDW and the RWQCB for review and approval of the increased RWC at the barrier. A similar demonstration was submitted to DDW and the

RWQCB for review and approval of an increased RWC at Kraemer-Miller-Miraloma Basins in 2014 (OCWD and DDB Engineering, Inc., 2014)

In November 2009, DDW approved injection of purified recycled water without blending at the Talbert Barrier (CDPH, 2009). The RWQCB confirmed the maximum 100% RWC limit at the barrier in December 2009 (RWQCB, 2009a). Blending at the Talbert Barrier is still allowed, but no longer required.

In December 2009, the RWQCB issued a "no-objection" letter authorizing GWRS water service to Anaheim CPP and future non-potable users (RWQCB, 2009b). These uses were to be regulated under the RWQCB master reclamation permit issued for the Green Acres Project (Order No. R8-2002-0077). In 2010, DDW approved use of GWRS water at CPP and regulation of this use under the GAP permit (CDPH, 2010c). In March 2021, the RWQCB issued a separate permit for non-potable uses of GWRS water, including Anaheim CPP, ARTIC, Anaheim Adventure Park, and future non-potable users (Order No. R8-2021-0003).

In 2010 DDW and the RWQCB issued "no-objection" letters for the DMBI Project and established the same 100% RWC limit for injection of unblended GWRS purified recycled water at MBI-1 (CDPH 2010b and RWQCB 2010).

The RWQCB approved purified recycled water recharge at Miraloma Basin via letter in 2012 (RWQCB, 2012). The formal permit amendment allowing recharge at Miraloma Basin and increasing the GWRS rated production capacity from 70 to 100 MGD was adopted in 2014 (RWQCB 2014a).

In June 2014, DDW approved the Title 22 Engineering Report Supplement (OCWD and DDB Engineering, Inc., 2014) and spreading of purified recycled water at Kraemer-Miller-Miraloma Basins without blending (CDPH, 2014). This DDW approval also supported implementation of La Palma Basin. Blending at K-M-M-L Basins with other waters is allowed, but no longer required as the maximum RWC is set at 100%.

In 2016, the RWQCB adopted an amendment to the GWRS permit that added purified recycled water recharge at La Palma Basin and modified the buffer area at the Anaheim Forebay spreading basins (RWQCB, 2016). Groundwater quality downgradient of La Palma Basin at monitoring well AM-10/1 reporting began in compliance with the DDW's approval of the Title 22 Engineering Report Supplement (DDW, 2014).

The most recent permit amendment was adopted by the RWQCB in March 2019 primarily for the MBI Centennial Park Project that began injection in March 2020 (RWQCB, 2019). This fourth permit amendment also incorporates the pathogen reduction requirements from the Title 22 Water Recycling Criteria and updates the buffer areas for GWRS to comply with groundwater recharge regulations for pathogen reduction.

In November 2020, the RWQCB issued a revised Monitoring and Reporting Plan for Order No. R8-2004-0002, incorporating the 2018 SWRCB Recycled Water Policy monitoring requirements for the AWPF. Initial phase monitoring per the Policy began in July 2021 based on the SWRCB's acceptance of the OCWD Quality Assurance Project Plan (QAPP) and validation of analytical methods, with the exception of one of the specified bioanalytical screening tools (aryl hydrocarbon receptor), which is awaiting laboratory approval for analysis. Results for samples collected have been uploaded to Geotracker as required.

In summary, the GWRS groundwater recharge permit includes:

- Purified recycled water quality specifications;
- Compliance determinations;
- Allowance for 100% RWC (at Talbert Barrier, MBI Project, and K-M-M-L Basins);
- Groundwater monitoring requirements;
- Buffer zone specifications near recharge areas;
- Operation, maintenance, and monitoring/reporting requirements;
- General requirements for injection and spreading of purified recycled water;
- Required notices and reports; and
- Provisions, which include requirements to comply with the Monitoring and Reporting Program, prepare an Operation Optimization Plan (OOP) (formerly called an Operation, Maintenance and Monitoring Plan [OMMP]), various prohibitions, and other obligations.

Water quality sampling, analyses, and reporting requirements are specified in the *Revised Monitoring and Reporting Program* (RWQCB, 2020a), which accompanies and is made part of the GWRS permit (RWQCB, 2004), and the subsequent amendments (RWQCB, 2008, 2014a, 2016, and 2019).

Table 1-2 on the following pages summarizes the water quality limits and monitoring and reporting requirements of the permit. A complete detailed list of water quality permit requirements and purified recycled water quality during 2021 can be found in Appendix A. Appendices B and C contain laboratory analysis methods used for water quality monitoring. All water quality analyses are performed by state-certified laboratories that operate in accordance with quality assurance plans. OCWD's state-certified water quality laboratory is pictured on Figure 1-11.

Figure 1-11. Philip L. Anthony Water Quality Laboratory

Table 1-2. Summary of GWRS Purified Recycled Water Quality and Monitoring Requirements

Parameter	Sample Flow Stream [1]	Sample Location [1]	Permit Requirement [1]
%UVT-254	GWRS-ROP	RO Permeate	≥90%
Turbidity	GWRS-ROP	RO Permeate	<0.2 / 0.5 NTU [2]
Total Recycled Water Flow	GWRS-FPW	Final Product [3]	≤100 MGD
Total Nitrogen	GWRS-FPW	Final Product	5 mg/L [4]
Total Organic Carbon	GWRS-FPW	Final Product	0.5 mg/L [5]
Total Coliform	GWRS-FPW	Final Product	2.2 / 23 / 240 MPN/100 mL [6]
pH	GWRS-FPW	Final Product	6.0 - 9.0
Electrical Conductivity	GWRS-FPW	Final Product	900 µmhos/cm [7]
Biochemical Oxygen Demand (5-day @20^{o} C)	GWRS-FPW	Final Product	20 /30 mg/L [8]
Total Suspended Solids	GWRS-FPW	Final Product	20 / 30 mg/L [8]
INORGANIC CHEMICALS			
Aluminum	GWRS-FPW	Final Product	200 ug/L [9]
Antimony	GWRS-FPW	Final Product	6 ug/L
Arsenic	GWRS-FPW	Final Product	10 ug/L
Asbestos (fibers >10 um in length)	GWRS-FPW	Final Product	7 MFL
Barium	GWRS-FPW	Final Product	1,000 ug/L
Beryllium	GWRS-FPW	Final Product	4 ug/L
Cadmium	GWRS-FPW	Final Product	5 ug/L
Chromium	GWRS-FPW	Final Product	50 ug/L
Cyanide	GWRS-FPW	Final Product	150 ug/L
Fluoride	GWRS-FPW	Final Product	2 mg/L
Hexavalent Chromium (dissolved)	GWRS-FPW	Final Product	10 ug/L
Mercury	GWRS-FPW	Final Product	2 ug/L
Nickel	GWRS-FPW	Final Product	100 ug/L
Nitrate (as NO_3)	GWRS-FPW	Final Product	45 mg/L [10]
Nitrate + Nitrite (as Nitrogen)	GWRS-FPW	Final Product	10 mg/L [10]
Nitrite (as NO_2)	GWRS-FPW	Final Product	3.3 mg/L
Nitrite (as Nitrogen)	GWRS-FPW	Final Product	1 mg/L
Perchlorate	GWRS-FPW	Final Product	6 ug/L
Selenium	GWRS-FPW	Final Product	50 ug/L
Thallium	GWRS-FPW	Final Product	2 ug/L
VOLATILE ORGANIC CHEMICALS (VOCs)			
All VOCs with MCLs (See Appendix A for list)	GWRS-FPW	Final Product	Drinking Water
NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS (SOCs)			
All SOCs with MCLs (See Appendix A for list)	GWRS-FPW	Final Product	Drinking Water

Table 1-2. Summary of GWRS Recycled Water Quality and Monitoring Requirements (continued)

Parameter	Sample Flow Stream [1]	Sample Location [1]	Permit Requirement [1]
DISINFECTION BYPRODUCTS			
Total THMs	GWRS-FPW	Final Product	80 ug/L
Monochloroacetic Acid	GWRS-FPW	Final Product	60 ug/L, total HAA5
Dichloroacetic Acid	GWRS-FPW	Final Product	60 ug/L, total HAA5
Trichloroacetic Acid	GWRS-FPW	Final Product	60 ug/L, total HAA5
Monobromoacetic Acid	GWRS-FPW	Final Product	60 ug/L, total HAA5
Dibromoacetic Acid	GWRS-FPW	Final Product	60 ug/L, total HAA5
Bromate	GWRS-FPW	Final Product	10 ug/L
Chlorite	GWRS-FPW	Final Product	1,000 ug/L
ACTION LEVELS			
Copper	GWRS-FPW	Final Product	1,000 ug/L [11]
Lead	GWRS-FPW	Final Product	15 ug/L
NOTIFICATION LEVELS AND UNREGULATED CHEMICALS			
Boron	GWRS-FPW	Final Product	N/A
n-Butylbenzene	GWRS-FPW	Final Product	N/A
sec-Butylbenzene	GWRS-FPW	Final Product	N/A
tert-Butylbenzene	GWRS-FPW	Final Product	N/A
Carbon disulfide	GWRS-FPW	Final Product	N/A
Chlorate	GWRS-FPW	Final Product	N/A
2-Chlorotoluene	GWRS-FPW	Final Product	N/A
4-Chlorotoluene	GWRS-FPW	Final Product	N/A
Diazinon	GWRS-FPW	Final Product	N/A
Dichlorodifluoromethane (Freon 12)	GWRS-FPW	Final Product	N/A
1,4-Dioxane	GWRS-FPW	Final Product	N/A
Ethylene glycol	GWRS-FPW	Final Product	N/A
Formaldehyde	GWRS-FPW	Final Product	N/A
HMX (Cyclotetramethylene tetranitramine)	GWRS-FPW	Final Product	N/A
Isopropylbenzene	GWRS-FPW	Final Product	N/A
Manganese	GWRS-FPW	Final Product	N/A
Methyl-isobutyl ketone (MIBK)	GWRS-FPW	Final Product	N/A
Naphthalene	GWRS-FPW	Final Product	N/A
N-Nitrosodiethylamine (NDEA)	GWRS-FPW	Final Product	N/A
N-Nitrosodimethylamine (NDMA)	GWRS-FPW	Final Product	N/A
N-Nitrosodi-n-propylamine (NDPA)	GWRS-FPW	Final Product	N/A
Perfluorobutanesulfonic acid (PFBS) [12]	GWRS-FPW	Final Product	N/A
Perfluorooctanoic Acid (PFOA)	GWRS-FPW	Final Product	N/A
Perfluorooctane Sulfonate (PFOS)	GWRS-FPW	Final Product	N/A
Propachlor	GWRS-FPW	Final Product	N/A
n-Propylbenzene	GWRS-FPW	Final Product	N/A
RDX (Cyclotrimethylene tetranitramine)	GWRS-FPW	Final Product	N/A
Tertiary butyl alcohol (TBA)	GWRS-FPW	Final Product	N/A
1,2,4-Trimethylbenzene	GWRS-FPW	Final Product	N/A
1,3,5-Trimethylbenzene	GWRS-FPW	Final Product	N/A
2,4,6-Trinitrotoluene (TNT)	GWRS-FPW	Final Product	N/A
Vanadium	GWRS-FPW	Final Product	N/A
Ethyl tert-butyl ether	GWRS-FPW	Final Product	N/A
Tertiary-amyl methyl ether	GWRS-FPW	Final Product	N/A
Remaining Priority Pollutants	GWRS-FPW	Final Product	See Appendix A
Endocrine disrupting chemicals & pharmaceuticals	GWRS-FPW	Final Product	See Appendix A

Table 1-2. Summary of GWRS Recycled Water Quality and Monitoring Requirements (continued)

Parameter	Sample Flow Stream [1]	Sample Location [1]	Permit Requirement [1]
RADIONUCLIDES			
Gross Alpha (excluding radon and uranium)	GWRS-FPW	Final Product	15 pCi/l
Uranium (natural)	GWRS-FPW	Final Product	20 pCi/l
Combined Radium-226 + Radium -228	GWRS-FPW	Final Product	5 pCi/l
Gross Beta particle activity	GWRS-FPW	Final Product	50 pCi/l
Total Radium 226	GWRS-FPW	Final Product	5 pCi/l
Total Radium 228	GWRS-FPW	Final Product	5 pCi/l
Strontium-90	GWRS-FPW	Final Product	8 pCi/l
Tritium	GWRS-FPW	Final Product	20,000 pCi/l
PERMIT TABLE II			
Aluminum	GWRS-FPW	Final Product	200 ug/L [9]
Color	GWRS-FPW	Final Product	15 Units
Copper	GWRS-FPW	Final Product	1,000 ug/L [11]
Corrosivity	GWRS-FPW	Final Product	Non-corrosive
Foaming Agents (MBAS)	GWRS-FPW	Final Product	0.5 mg/L
Iron	GWRS-FPW	Final Product	300 ug/L
Manganese	GWRS-FPW	Final Product	50 ug/L [13]
Methyl-tert-butyl ether (MTBE)	GWRS-FPW	Final Product	5 ug/L [14]
Odor Range Low	GWRS-FPW	Final Product	N/A
Odor Range High	GWRS-FPW	Final Product	N/A
Threshold Odor Number - Median	GWRS-FPW	Final Product	3 TON
Silver	GWRS-FPW	Final Product	100 ug/L
Thiobencarb	GWRS-FPW	Final Product	1 ug/L [15]
Zinc	GWRS-FPW	Final Product	5,000 ug/L
PERMIT TABLE III [16]			
Total Dissolved Solids	GWRS-FPW	Final Product	500 mg/L [17]
Nitrate nitrogen	GWRS-FPW	Final Product	3 mg/L [10]
Total Hardness (as CaCO3)	GWRS-FPW	Final Product	240 mg/L
Sodium	GWRS-FPW	Final Product	45 mg/L
Chloride	GWRS-FPW	Final Product	55 mg/L
Sulfate	GWRS-FPW	Final Product	100 mg/L
RECYCLED WATER POLICY [18]			
1,4-Dioxane	GWRS-FPW	Final Product	N/A
NDMA	GWRS-ROF and FPW[19]		N/A
n-Nitrosomorpholine (NMOR)	GWRS-FPW	Final Product	N/A
PFOS	GWRS-FPW	Final Product	N/A
PFOA	GWRS-FPW	Final Product	N/A
Sucralose	GWRS-ROF and FPW[19]		N/A
Sulfamethoxazole	GWRS-ROF and FPW[19]		N/A
Electrical Conductivity	GWRS-ROF and FPW[19]		N/A
Total Organic Carbon (TOC)	GWRS-ROF and FPW[19]		N/A
Estrogen receptor-α Bioassay	GWRS-FPW	Final Product	N/A
Aryl Hydrocarbon Receptor (AhR) Bioassay	GWRS-FPW	Final Product	N/A

Table 1-2. Summary of GWRS Recycled Water Quality and Monitoring Requirements (continued)

[1] Required by RWQCB Order Nos. R8-2004-0002, R8-2008-0058, R8-2014-0054, R8-2016-0051, R8-2019-0007, November 2020 revised monitoring and reporting program requirements for Order No. R8-2004-0002, and RWQCB Order No. R8-2021-0003. (The 2021 permit specifies reclamation requirements for Discharge Point 001 (DP-001) at monitoring location REC-001, which is the same as GWRS-FPW. The more stringent limits prevail.) See Appendix A for a complete list of permit requirements. See Appendices B and C for a list of laboratory methods of analyses.

[2] Turbidity shall not exceed 0.2 NTU more than 5% of the time in any 24-hr period and 0.5 NTU at any time.

[3] Final Product is also called Finished Product Water (FPW) and is full advanced treated recycled water.

[4] Total nitrogen compliance is based on the running average of all samples collected during the past 20 weeks.

[5] TOC limit is based on recycled water contribution of 100% at all recharge sites. TOC compliance is based on the running average of the last 20 samples.

[6] Total Coliform shall not exceed: 2.2 MPN/100 mL based on the 7-day median, and 23 MPN/100 mL in more than one sample in any 30-day period, and 240 MPN/100 mL at any time.

[7] Electrical conductivity limit shown is a secondary MCL recommended for consumer acceptance.

[8] Reclamation permit limits are 20 mg/L average monthly and 30 mg/L average weekly for BOD_5 and TSS.

[9] The permit requirement for aluminum is the lesser of the primary MCL (1,000 ug/L) and the secondary MCL (200 ug/L).

[10] The permit requirement for nitrate-nitrogen is a 12-month running average concentration limit of 3 mg/L.

[11] The permit requirement for copper is the lesser of the Action Level (1,300 ug/L) and the secondary MCL (1,000 ug/L).

[12] Notification Level for PFBS issued March 5, 2021. Final Title 22 Water Recycling Critieria requires monitorir for constituents having Notification Levels.

[13] The permit requirement for manganese is the lesser of the secondary MCL (50 ug/L) and the Notification Level (500 ug/L).

[14] The permit requirement for MTBE is the lesser of the primary MCL (13 ug/L) and the secondary MCL (5 ug/L).

[15] The permit requirement for thiobencarb is the lesser of the primary MCL (70 ug/L) and the secondary MCL (1 ug/L).

[16] Table III parameters are based on the RWQCB Basin Plan Water Quality Objectives.

[17] The permit limit for total dissolved solids is the lesser of the secondary MCL (500 mg/L) and the reclamation permit requirement (580 mg/L based on the 12-month running average).

[18] Monitoring began in July 2021 based on OCWD's Quality Assurance Project Plan per the 2018 SWRCB Recycled Water Policy. Aryl hydrocarbon receptor bioassay monitoring is pending approval for analysis.

[19] Monitoring locations: ROF = Reverse Osmosis Feed; GWRS-FPW = finished product water (final product)

One of the provisions of the permit requires that an Independent Advisory Panel (the Panel) provide on-going periodic scientific peer review of the GWRS. The permit specifies minimum qualifications for the Panel members and requires that the Panel meet at least annually during the first five years, and then every two years thereafter. The Panel is charged with reviewing the prior Annual Report(s) of plant operations, the OOP, purified recycled water and groundwater quality monitoring reports, and associated groundwater recharge issues. Based on its review, the Panel must issue a report with its recommendations at least every two years.

The Panel met on September 16-17, 2021. The Panel was appointed and is administered by the National Water Research Institute (NWRI). Panel members and their respective areas of expertise are listed in Table 1-3. Through NWRI, the Panel issued a report reviewing the GWRS (NWRI, 2021).

Table 1-3. GWRS Independent Advisory Panel

Panel Member[1]	Area of Expertise
James Crook, Ph.D., P.E. (Panel Chair)	Water/Wastewater Engineering
Amy Childress, Ph.D.	Water/Wastewater Engineering
Joseph A. Cotruvo, Ph.D.	Chemistry
Larry Honeybourne	OCHCA (Retired), Water Quality
Reed M. Maxwell, Ph.D.	Hydrogeology
Joan B. Rose, Ph.D.	Microbiology
George Tchobanoglous, Ph.D., P.E.	Water/Wastewater Engineering
Rhodes Trussell, Ph.D., P.E.	Environmental Engineering/Water Quality
David E. Williams, Ph.D.	Toxicology

[1] Panel members as of September 2021.

1.8 Operation Optimization Plan Overview

The GWRS OOP describes the operating parameters, critical control points, maintenance schedules, and troubleshooting guides for the AWPF, injection barrier and spreading basins. The permit requires that the OOP be reviewed by the Independent Advisory Panel, updated annually or as necessary, and submitted to DDW and the RWQCB.

The full OOP was revised and updated in 2015 to include Miraloma Basin and the GWRS Initial Expansion (OCWD and DDB Engineering, Inc., 2015). In 2018 an updated OOP reflecting procedures to demonstrate compliance with pathogenic microorganism control regulations (CCR, 2018) was submitted to DDW and the RWQCB (OCWD, 2018).

The OOP is being updated to reflect the GWRS Final Expansion, changes in GWRS facilities, and any permit revisions.

2. ADVANCED WATER PURIFICATION FACILITY PERFORMANCE

The GWRS AWPF continued to optimize performance and increase production during its fourteenth year of operation. This section summarizes the performance of the AWPF during 2021:

- Purified recycled water volume;
- Purified recycled water quality;
- Performance and compliance record; and
- Anticipated changes.

2.1 Purified Recycled Water Volume and Flows

During 2021 the AWPF produced a total of approximately 30,793 MG, or 94,500 AF, of purified recycled water to help prevent seawater intrusion and replenish the Basin. On an annual average basis, the AWPF produced approximately 84.4 MGD of purified recycled water for injection, recharge, and non-potable uses in 2021. As shown on Figure 2-1, more than half of the GWRS purified recycled water was delivered to the Anaheim Forebay and recharged at Miraloma and La Palma Basins. Over a quarter of the AWPF production was injected at the Talbert Barrier. Nearly one-tenth of the purified recycled water was injected at the MBI Project. Small amounts of purified recycled water were used for non-potable purposes at the Anaheim CPP and ARTIC. Non-potable use at Anaheim Adventure Park is included in the Miraloma Basin purified recycled water volume.

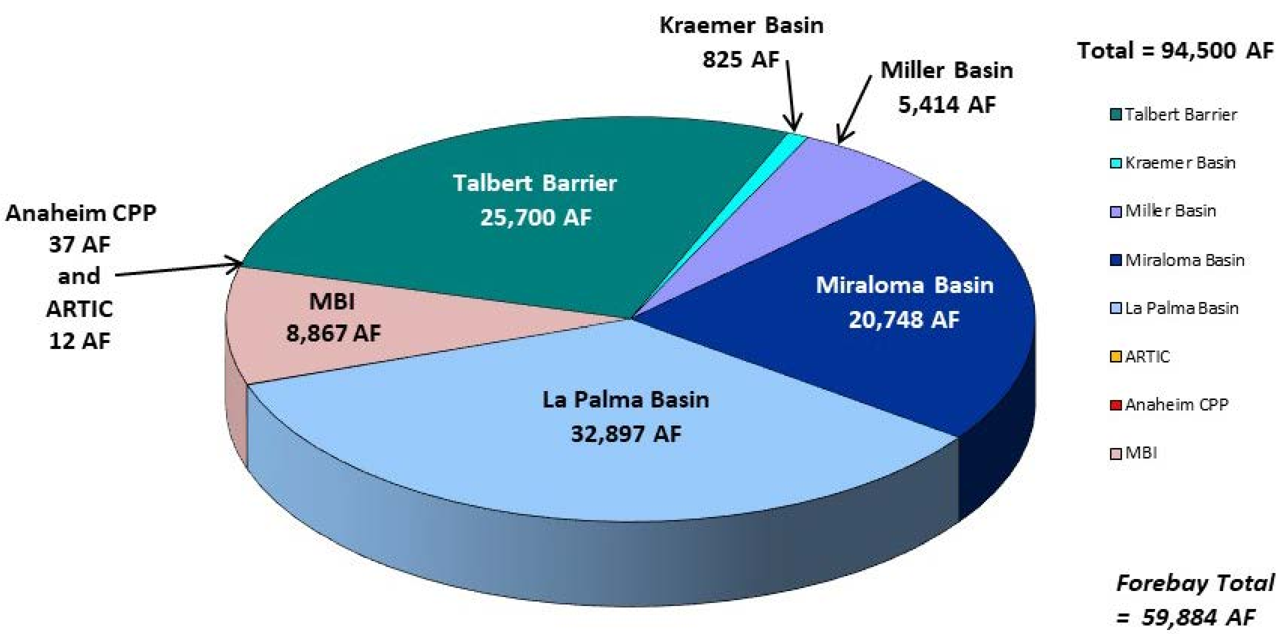


Figure 2-1. 2021 Purified Recycled Water Volume

Figure 2-2 illustrates the average daily AWPF deliveries by month with the reuse location. At times in 2021, the AWPF operated at reduced production rates or was off-line primarily due to GWRSFE construction work, GWRS Pipeline inspection, and power interruptions. AWPF operations are discussed in more detail in Section 2.3.1.

Overall, during 2021, the AWPF was on-line 94.3% of the time with daily average purified recycled water production ranging from 0.0 MGD (e.g., August 15 – September 2 for planned shutdowns) up to 97.9 MGD (on November 7) compared with its design production capacity of 100 MGD.

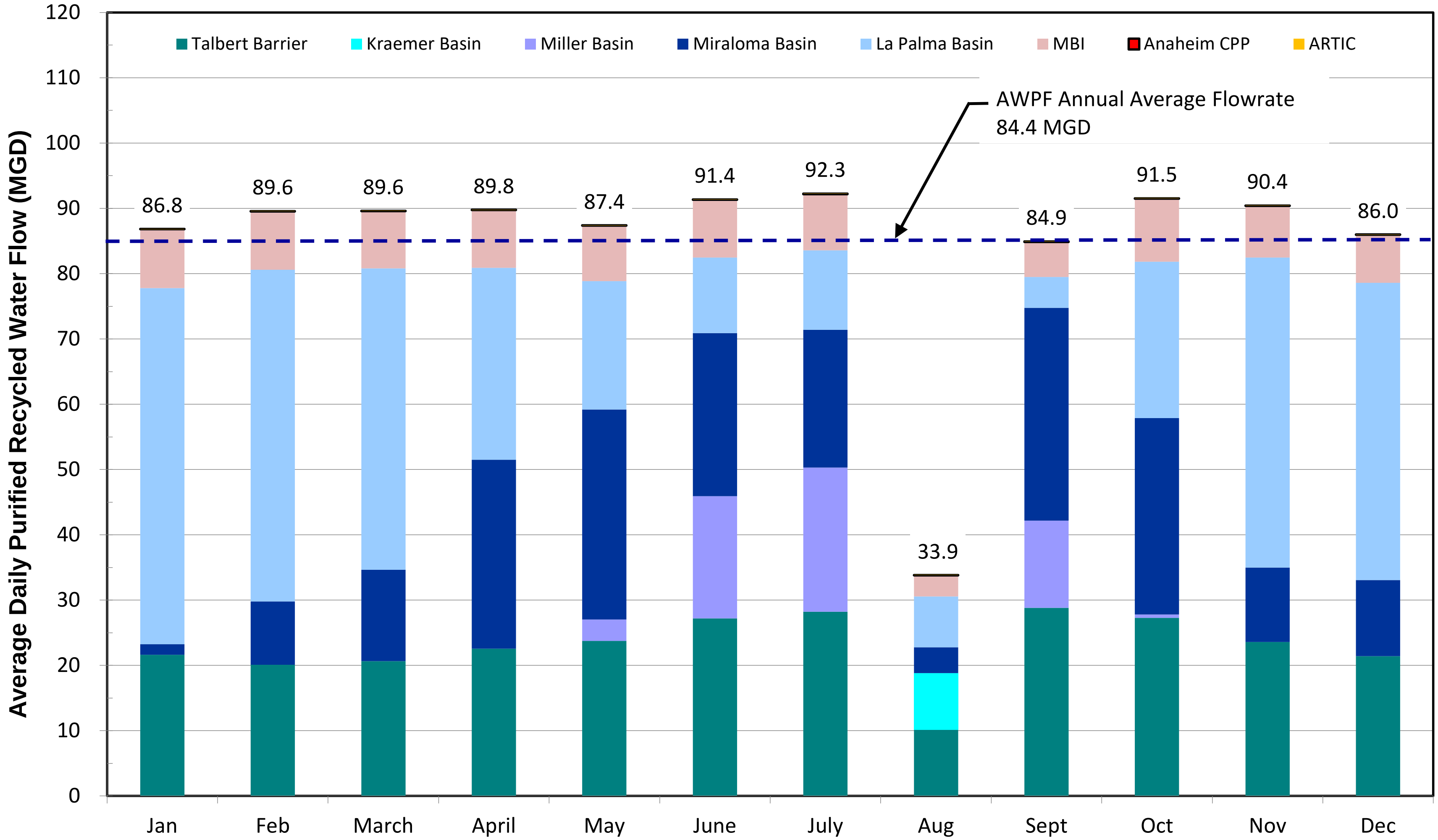
2.2 Purified Recycled Water Quality

Water quality is monitored throughout the AWPF treatment train to measure and optimize process performance. The AWPF process schematic and monitoring locations are illustrated on Figure 2-3. Water quality results are reported to the RWQCB in conformance with the permit requirements on a quarterly basis. Appendix A summarizes all available water quality data for the AWPF purified recycled water during 2021.

AWPF influent (Q1) flow is metered and its quality is monitored for selected constituents to control and optimize the operation of the treatment processes. The Q1 sampling point is at the screening facility influent chamber immediately downstream of the fine screens; this location provides a representative sample of the Q1 source water because it is downstream of the SEFE tanks and upstream of the sodium hypochlorite injection prior to the MF system. The AWPF influent is secondary effluent from OC San's Plant 1, which is a combination of clarified AS and TF effluents. The ratio of AS to TF effluent flows in the Q1 supply is variable, as described in detail in Section 2.2.1.2.

The performance of the MF system is monitored by comparing upstream water quality in the MF feed (MFF) after sodium hypochlorite addition with downstream water quality in the MF effluent (MFE). MFE turbidity is measured on-line directly downstream of the MF cells. Similarly, the performance of the RO system is monitored upstream at the RO feed (ROF), after acid and threshold inhibitor (antiscalant) are added, and then downstream where the RO product (ROP) leaves the process. On-line total organic carbon (TOC) and electrical conductivity (EC) analyzers monitor the ROF and ROP flow streams and provide continuous indication of the RO process performance. Monitoring the UV/AOP process feed (UVF) and product (UVP) streams are indicators of its disinfection and organics degradation performance.

Except for turbidity and transmittance, all permit-required final purified recycled water monitoring was performed on finished product water (FPW), also referred to as final product water, following post-treatment and just prior to pumping for distribution. Turbidity is monitored continuously on the ROP flow stream. Transmittance is measured continuously on



Note: August average daily flow reflects the planned shutdown from August 15 - September 2

Figure 2-2. 2021 Average Daily Purified Recycled Water Flow by Month

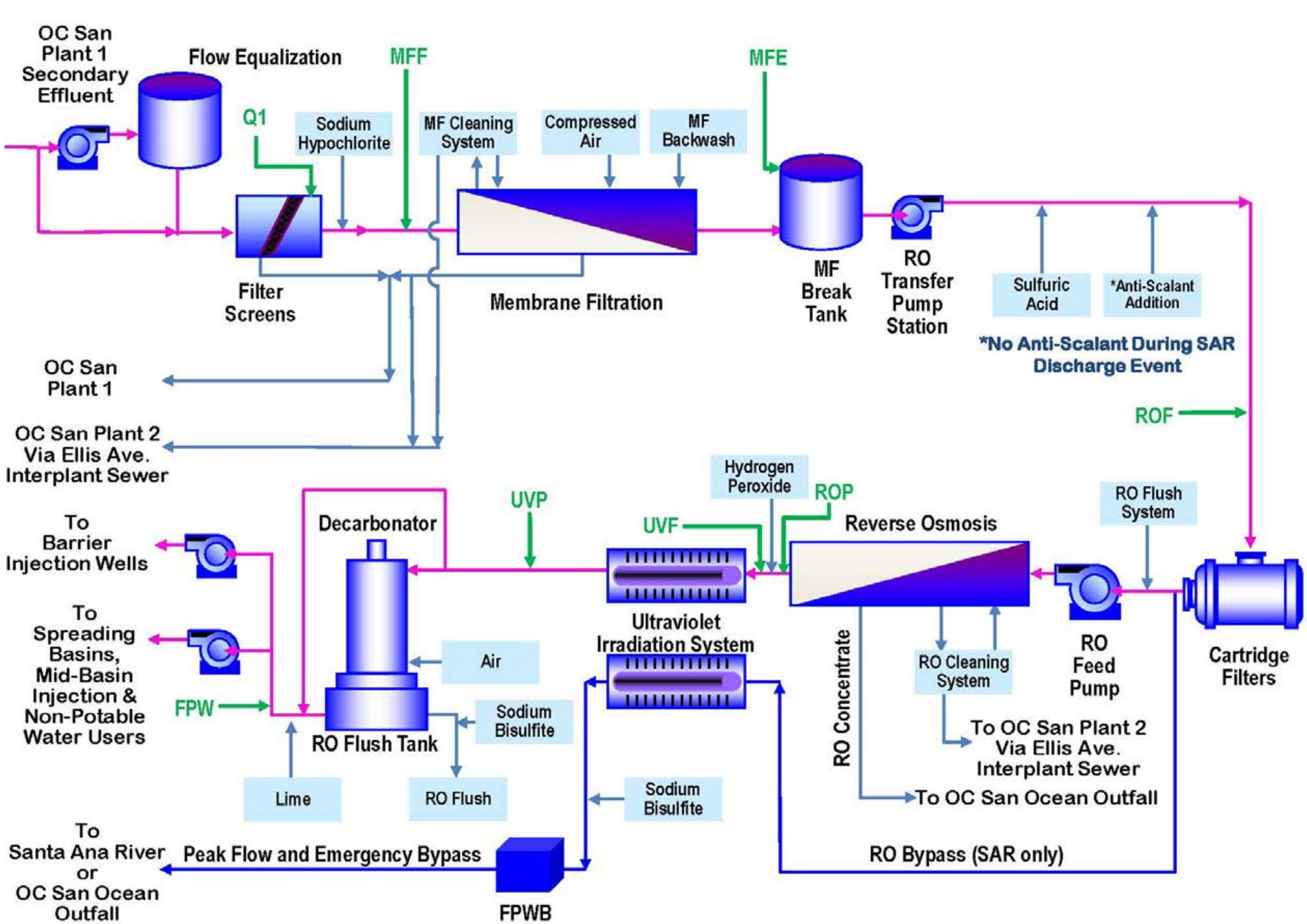


Figure 2-3. AWPF Process Sampling Locations Diagram

the UVF flow stream (UVF is immediately downstream of the hydrogen peroxide addition to the ROP). As a backup for the redundant on-line analyzers, daily composite sampling and laboratory analysis for transmittance is also conducted at the UVF station.

Table 2-1 summarizes the average purified recycled water quality for selected constituents during 2021 at various points in the AWPF treatment process. Drinking water standards as well as the GWRS permit requirements are shown for comparison. For other parameters, Appendix A contains the quarterly monitoring results for 2021. The performance of individual treatment processes measured by water quality is discussed later in this section.

It is interesting to compare 2021 average Q1 and FPW quality for selected constituents with average values in 2020 to monitor for any trends. Table 2-2 compares these two years' results and shows that some changes occurred in the average water quality of Q1 and FPW in 2021 as compared to the previous year.

The average Q1 total dissolved solids (TDS) concentration decreased from 2020 (1,017 mg/L) to 2021 (981 mg/L), though still falling within the range of average Q1 TDS concentrations observed during operation of the GWRS (902-1,035 mg/L) since 2008. The average Q1 chloride levels were essentially the same in 2020 (279 mg/L) and 2021 (277 mg/L). For the FPW quality, average TDS levels decreased somewhat from 2020 (55 mg/L) to 2021 (50 mg/L). Average FPW chloride concentrations slightly decreased from 2020 (5.6 mg/L) to 2021 (5.0 mg/L).

Average Q1 total suspended solids levels increased from 2020 (5.4 mg/L) to 2021 (6.7 mg/L). Likewise, average Q1 turbidity slightly increased from 2020 (1.1 Nephelometric Turbidity Units (NTU)) to 2021 (1.3 NTU).

The average Q1 total nitrogen concentration remained about the same in 2020 (11.2 mg/L) and 2021 (11.4 mg/L. The average FPW total nitrogen concentration was identical in both 2020 and 2021 (0.9 mg/L).

As determined by laboratory analysis, the average Q1 TOC concentration rose from 2020 (9.7 mg/L) to 2021 (10.9 mg/L), while the average FPW TOC concentration decreased slightly from 2020 (0.09 mg/L) to 2021 (0.08 mg/L).

The annual average concentration of N-nitrosodimethylamine (NDMA) in the Q1 source water was relatively unchanged from 2020 (45.9 nanograms per liter [ng/L]) to 2021 (44.7 ng/L). The FPW average NDMA concentration was essentially unchanged from 2020 (1.1 ng/L) to 2021 (1.0 ng/L). None of the FPW samples analyzed for NDMA in 2021 exceeded the DDW Notification Level (NL) of 10 ng/L.

Table 2-1. 2021 Average Water Quality[1]

Parameter Name	Units	Q1	MFF	MFE	ROF	ROP	UVP	FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,655	1,685[2]	1,680	1,685[2]	33[2]	43	100[2]	900[3]
Total Dissolved Solids	mg/L	981	na	na	1,002	18	na	50	500[3]
Total Suspended Solids	mg/L	6.7	18.3	<2.5	na	na	na	<2.5	N/A
Turbidity	NTU	1.3	3.25[2]	0.03[2]	0.02[2]	0.02[4]	na	0.03[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	68.5	na	97.56[4]	na	na	≥90
pH	UNITS	7.22	7.18[2]	7.22	6.90[2]	5.42[2]	5.52	8.42[2]	6 - 9
Total Hardness (as CaCO3)	mg/L	307	na	na	302	<1	na	34.7	240[3]
Calcium	mg/L	76.7	na	na	75.7	<0.5	na	13.7	N/A
Magnesium	mg/L	28.0	na	na	27.4	<0.5	na	<0.5	N/A
Sodium	mg/L	217	na	na	216	6.2	na	6.0	45
Potassium	mg/L	18.9	na	na	18.6	0.3	na	0.3	N/A
Bromide	mg/L	na	na	na	na	na	na	0.01	N/A
Chloride	mg/L	277	na	na	271	4.6	na	5.0	55
Sulfate	mg/L	191	na	na	197	0.3	na	0.3	100
Hydrogen Peroxide	mg/L	na	na	na	na	na	2.5	2.4	N/A
Bicarbonate (as CaCO3)	mg/L	na	na	na	188	8.4	na	38.9	N/A
Nitrate Nitrogen	mg/L	7.29	na	na	na	0.64	na	0.63	3[3]
Nitrite Nitrogen	mg/L	1.137	na	na	na	0.0004	na	0.047	1[3]
Ammonia Nitrogen	mg/L	2.1	na	na	na	0.3	na	0.2	N/A
Organic Nitrogen	mg/L	1.0	na	na	na	0.12	na	0.04	N/A
Total Nitrogen	mg/L	11.4	na	na	na	na	na	0.9	5
Phosphate Phosphorus	mg/L	0.43	na	na	na	na	na	<0.01	N/A
Iron	ug/L	449	na	na	116	<5	na	2.8	300
Manganese	ug/L	50.8	na	na	51.0	<1	na	<1	50
Aluminum	ug/L	10.2	na	na	3.1	0.4	na	1.9	200[3]
Arsenic	ug/L	0.4	na	na	0.4	<1	na	<1	10
Barium	ug/L	58.8	na	na	56.3	<1	na	<1	1,000
Boron	mg/L	0.42	na	na	0.42	0.26	na	0.23	N/A
Cadmium	ug/L	<1	na	na	<1	<1	na	<1	5
Chromium	ug/L	<1	na	na	<1	0.26	na	<1	50
Copper	ug/L	7.0	na	na	8.6	<1	na	<1	1,000[3]
Cyanide	ug/L	<5	na	na	1.9	<5	na	<5	150
Fluoride	mg/L	0.90	na	na	na	na	na	<0.1	2
Lead	ug/L	<1	na	na	2.3	<1	na	<1	15
Mercury	ug/L	<1	na	na	<1	<1	na	<1	2
Nickel	ug/L	5.9	na	na	5.7	<1	na	<1	100
Perchlorate	ug/L	na	na	na	na	na	na	<2	6
Selenium	ug/L	1.4	na	na	1.4	<1	na	<1	50
Silica	mg/L	19.6	na	na	19.5	<1	na	1.0	N/A
Silver	ug/L	<1	na	na	<1	<1	na	<1	100
Zinc	ug/L	16.4	na	na	29.1	0.2	na	0.5	5,000
1,2,3-Trichloropropane	ug/L	<0.005[5]	na	na	<0.005[5]	<0.005[5]	<0.005[5]	<0.005[5]	0.005
N-nitrosodimethylamine	ng/L	44.7[6]	na	na	15.7[6]	7.6[6]	<2[6]	1.0[6]	N/A
1,4-Dioxane	ug/L	1.2	na	na	1.2	<0.5	<0.5	<0.5	N/A
Perfluorooctanoic Acid	ng/L	na	na	na	9.3	<2	na	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	na	na	na	9.1	<2	na	<2	N/A
Total Trihalomethanes	ug/L	0.4	na	na	10.4	3.7	3.3	2.6	80
Dibromoacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Dichloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Monobromoacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Monochloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Trichloroacetic Acid	ug/L	na	na	na	na	na	na	<1	60,total HAA5
Apparent Color (unfiltered)	UNITS	na	na	na	25	<3	na	<3	15
Total Organic Carbon (unfiltered)	mg/L	10.94	10.31	na	8.36	0.09	0.16	0.08	0.5[3]
Surfactants (MBAS)	mg/L	0.25	na	na	0.26	<0.02	na	<0.02	0.5
Total Coliform	MPN/100 mL	318,036	33,315	<1	na	<1	na	<1	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	82,613	3,934	<1	na	<1	na	<1	N/A

Q1 Secondary Effluent (AWPF Influent); MFF Microfiltration Feed; MFE Microfiltration Effluent; ROF Reverse Osmosis Feed; ROP Reverse Osmosis Product; UVF Ultraviolet UV/AOP Feed; UVP Ultraviolet UV/AOP Product; FPW Finished Product Water; na Not analyzed; N/A Not applicable

[1] For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the period were ND, then the average is shown as "<RDL". Number of significant digits shown match those in raw data.

[2] On-line average

[3] See Appendix A for more information

[4] On-line average shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.

[5] Four methods were used for 1,2,3-trichloropropane with three RDLs: (1) In-house 14DIOX with RDL = 0.005 ug/L; (2) 524M-TCP with RDL = 0.005 ug/L; (3) 504.1 with RDL = 0.05 ug/L, and (4) 524.2 with RDL = 0.5 ug/L. All results were non-detectable.

[6] Average results shown using In-house Method NDMA-LOW with RDL = 10 ng/L for Q1 and ROF, and In-house Method NDMA-LOW with RDL = 2 ng/L for ROP, UVP, and FPW. See Appendix A.

Table 2-2. Comparison Between 2020 and 2021 Average Water Quality[1]

Parameter Name	Units	2020 Q1	2021 Q1	2020 FPW	2021 FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,675	1655	101[2]	100[2]	900[3]
Total Dissolved Solids	mg/L	1,017	981	55	50	500[3]
Total Suspended Solids	mg/L	5.4	6.7	na	<2.5	N/A
Turbidity	NTU	1.1	1.3	0.05[2]	0.03[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	na	na	≥90
pH	UNITS	7.14	7.22	8.47[2]	8.42[2]	6 - 9
Total Hardness (as CaCO3)	mg/L	332	307	34.2	34.7	240[3]
Calcium	mg/L	81.9	76.7	13.8	13.7	N/A
Magnesium	mg/L	30.9	28.0	<0.5	<0.5	N/A
Sodium	mg/L	228	217	6.1	6.0	45
Potassium	mg/L	19.1	18.9	0.2	0.3	N/A
Bromide	mg/L	na	na	0.01	0.01	N/A
Chloride	mg/L	279	277	5.6	5.0	55
Sulfate	mg/L	205	191	0.3	0.3	100
Hydrogen Peroxide	mg/L	na	na	2.3	2.4	N/A
Bicarbonate (as CaCO3)	mg/L	na	na	36.9	38.9	N/A
Nitrate Nitrogen	mg/L	8.26	7.29	0.69	0.63	3[3]
Nitrite Nitrogen	mg/L	0.540	1.137	0.034	0.047	1[3]
Ammonia Nitrogen	mg/L	0.9	2.1	0.2	0.2	N/A
Organic Nitrogen	mg/L	1.5	1.0	0.02	0.04	N/A
Total Nitrogen	mg/L	11.2	11.4	0.9	0.9	5
Phosphate Phosphorus	mg/L	0.54	0.43	<0.01	<0.01	N/A
Iron	ug/L	351	449	<5	2.8	300
Manganese	ug/L	48.4	50.8	<1	<1	50
Aluminum	ug/L	7.5	10.2	0.3	1.9	200[3]
Arsenic	ug/L	0.3	0.4	<1	<1	10
Barium	ug/L	53.2	58.8	<1	<1	1,000
Boron	mg/L	0.42	0.42	0.2275	0.23	N/A
Cadmium	ug/L	<1	<1	<1	<1	5
Chromium	ug/L	0.2	<1	<1	<1	50
Copper	ug/L	6.9	7.0	<1	<1	1,000[3]
Cyanide	ug/L	<5	<5	<5	<5	150
Fluoride	mg/L	0.91	0.90	<0.1	<0.1	2
Lead	ug/L	<1	<1	<1	<1	15
Mercury	ug/L	<1	<1	<1	<1	2
Nickel	ug/L	5.1	5.9	<1	<1	100
Perchlorate	ug/L	na	na	<2 - 2.5[4]	<2	6
Selenium	ug/L	1.4	1.4	<1	<1	50
Silica	mg/L	20.2	19.6	0.6	1.0	N/A
Silver	ug/L	<1	<1	<1	<1	100
Zinc	ug/L	16.8	16.4	<1	0.5	5,000
1,2,3-Trichloropropane	ug/L	<0.005	<0.005[5]	<0.005	<0.005[5]	0.005
N-nitrosodimethylamine	ng/L	45.9	44.7[6]	1.1	1.0[6]	N/A
1,4-Dioxane	ug/L	1.2	1.2	<0.5 - 1[7]	<0.5	N/A
Perfluorooctanoic Acid	ng/L	12.9	na	<2	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	16.5	na	<2	<2	N/A
Total Trihalomethanes	ug/L	0.5	0.4	3.9	2.6	80
Dibromoacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Dichloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Monobromoacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Monochloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Trichloroacetic Acid	ug/L	na	na	<1	<1	60,total HAA5
Apparent Color (unfiltered)	UNITS	na	na	<3	<3	15
Total Organic Carbon (unfiltered)	mg/L	9.69	10.94	0.09	0.08	0.5[3]
Surfactants (MBAS)	mg/L	0.24	0.25	<0.02	<0.02	0.5
Total Coliform	MPN/100 mL	211,065	318,036	0.10	<1	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	60,792	82,613	<1	<1	N/A

Q1 Secondary Effluent (AWPF Influent) na Not analyzed
FPW Finished Product Water N/A Not applicable

1 For purposes of calculating annual averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the period were ND, then the average is shown as "<RDL". Number of significant digits shown match those in raw data.

2 On-line average

3 See Appendix A for more information

4 RDL for Perchlorate 2.5 ug/L for January 2020 and April 2020 and 2 ug/L for July 2020 and October 2020.

5 Four methods were used during 2021 for 1,2,3-trichloropropane with three RDLs: (1) In-house 14DIOX with RDL = 0.005 ug/L; (2) 524M-TCP with RDL = 0.005 ug/L; (3) 504.1 with RDL = 0.05 ug/L, and (4) 524.2 with RDL = 0.5 ug/L. All results were non-detectable.

6 Average 2021 results shown using In-house Method NDMA-LOW with RDL = 10 ng/L for Q1, and In-house Method NDMA-LOW with RDL = 2 ng/L for FPW. See Appendix A.

7 RDL for 1,4-Dioxane 1 ug/L from January through June 2020 and 0.5 ug/L from July through December 2020.

The annual average Q1 concentrations of 1,4-dioxane remained consistent from 2020 (1.2 ug/L) to 2021 (1.2 ug/L). While it should be noted that midway through 2020, the OCWD laboratory's 1,4-dioxane RDL changed (<1 µg/L from January through June and <0.5 µg/L from July through December, continuing through 2021), this change appeared to have negligible impacts on the results. The FPW average 1,4-dioxane concentrations in both 2020 and 2021 were below the RDL of either 1 µg/L (used in early 2020) or 0.5 µg/L (used since mid-2020); furthermore, all individual FPW sample results during 2020 and 2021 were below the DDW NL of 1 µg/L for 1,4-dioxane.

2.2.1 Source Water in 2021

The AWPF feedwater (Q1) was a variable blend of AS and TF effluents from OC San Plant 1. In 2021, source water exhibited consistently low turbidity and nitrogen levels because of the NdN operation of the AS facilities.

2.2.1.1 Secondary Effluent Flow Equalization and Influent Screening

Like other wastewater treatment plants, OC San Plant 1 experiences a daily diurnal flow pattern, peaking during the daytime and declining to minimal levels at night. Secondary effluent flow equalization (SEFE) facilities located adjacent to the AWPF store secondary effluent during the day when flows are higher and release it during the night when flows are lower, thereby enabling the AWPF to operate at a more constant flow rate. Pictured on Figure 2-4, the SEFE facilities consist of two 7.5 million gallon (MG) above-ground tanks and a pump station located at the Plant 1 site. During the day, secondary effluent flows exceeding the AWPF production rate setpoint are pumped to the SEFE tanks for storage; at night and during the early morning, SEFE flows are released by gravity to the GWRS influent screening facility.

Secondary effluent flows by gravity to the influent screening facility, which consists of five fine screens that remove suspended solids larger than 2 millimeters (mm). Influent screening helps protect and extend the life of the downstream treatment processes at the AWPF. Screened secondary effluent flows from the influent screening facility to the MF system. Solids with screen wash wastewater are returned to Plant 1 for treatment and disposal with other OC San solids.

Figure 2-4. Secondary Effluent Flow Equalization (SEFE) Tanks and Pump Station

2.2.1.2 TF Effluent Fraction

The OC San secondary effluent is typically a blend of AS effluent and TF effluent. The blend is variable, with typically more secondary effluent flow from the AS facilities. During 2021, the Q1 source water to the AWPF consisted of 37,209 MG of AS effluent and 9,205 MG of TF effluent, as illustrated on Figure 2-5, for a total annual influent flow of 46,415 MG (rounded). On an annual average daily flow basis, the AWPF had available approximately 101.9 MGD of AS effluent and 25.2 MGD of TF effluent, for a total of 127.2 MGD of available source water. The volume of TF effluent made up approximately 19.8% of the total influent during 2021; however, the day-to-day operation varied with the daily proportion of TF effluent in AWPF source water ranging from 14.1% (September 6) to 23.6% (December 9). The average proportion of TF effluent in the AWPF source water during 2021 (19.8%) was slightly lower than that in 2020 (20.3%).

Figure 2-6 shows the average daily flow rate of AS effluent and TF effluent for each month during 2021. Of the 2021 influent flow stream, about 4,805 MG, or 13.2 MGD on average, was not recycled and was returned to OC San via the influent weir overflow at the screening facility. The return flow in 2021 was higher than that in 2020 (2,396 MG or 6.5 MGD on average), primarily due to the AWPF's reduced production during shutdowns for the GWRSFE construction and inspection of the GWRS Pipeline. The monthly influent weir overflow (not recycled) during 2021 ranged from approximately 121 MG, or 4.0 MGD on average, in June to 2,178 MG, or 70.2 MGD, in August. The daily influent weir overflow rates in early August 2021 prior to the AWPF planned shutdown were as low as 1.7 MGD; during the AWPF planned shutdown (August 15 – September 2), the daily influent weir overflow rates were up to 122.9 MGD. The net total MFF flow during 2021 was approximately 41,610 MG or an annual average daily flow of 114.1 MGD.

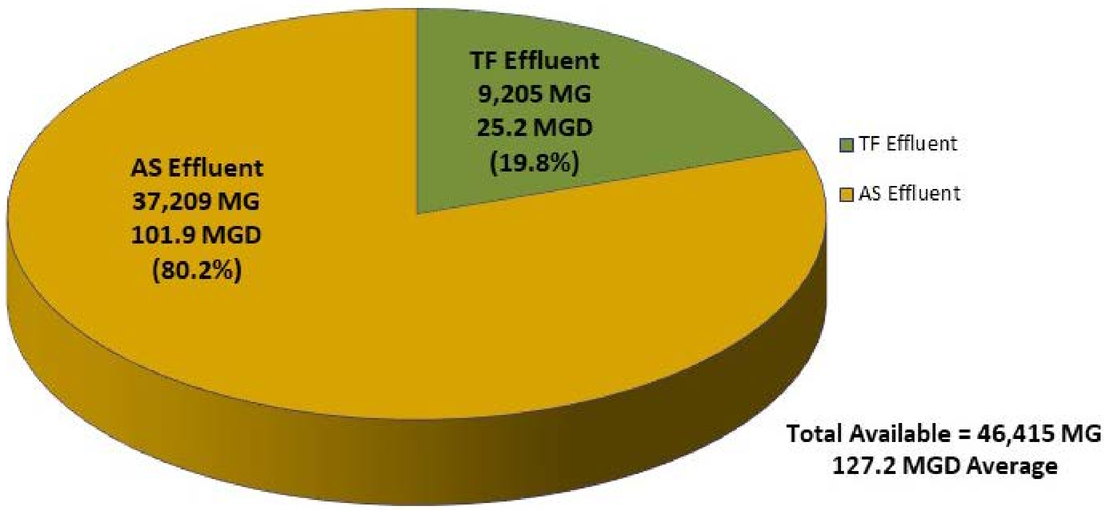


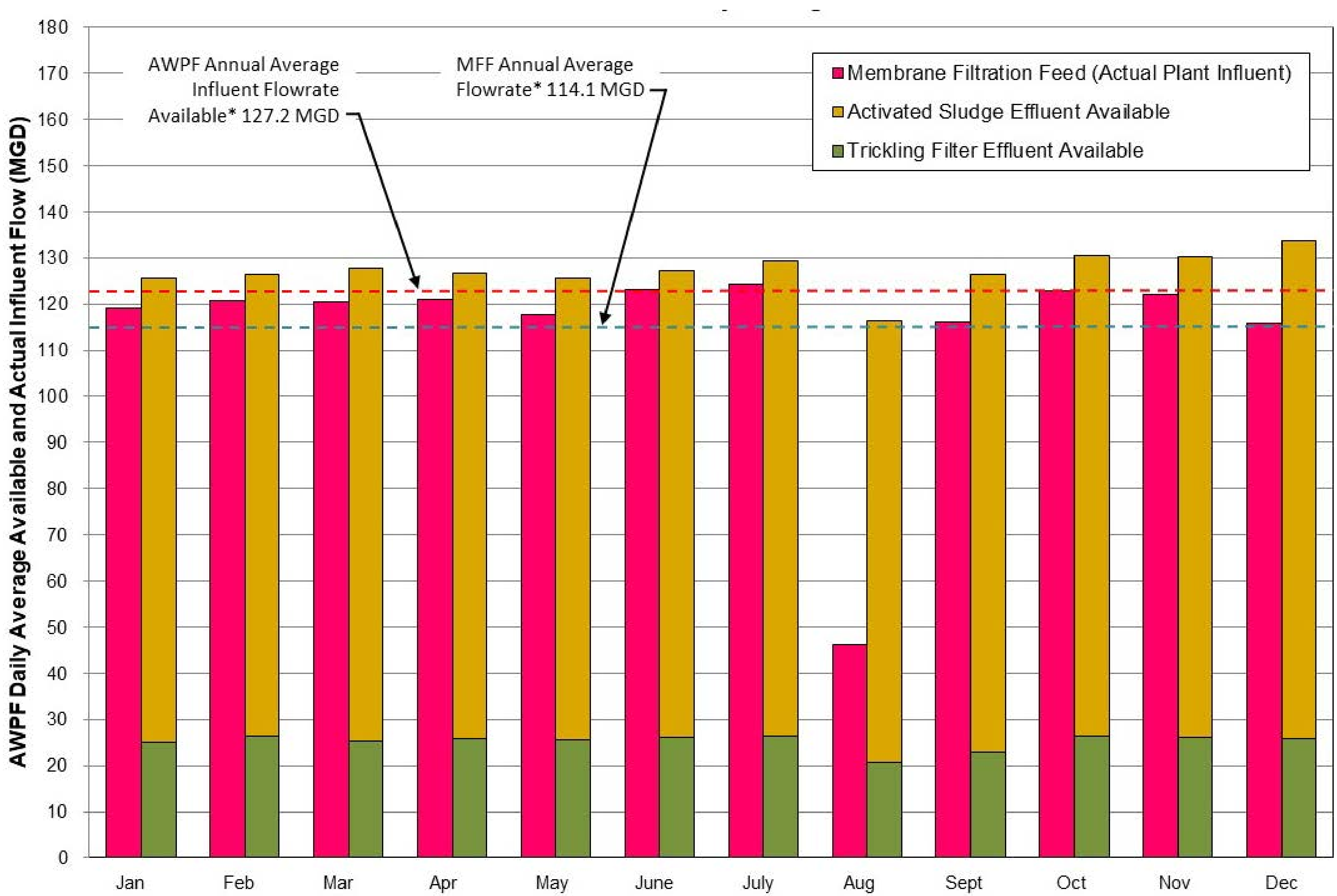
Figure 2-5. 2021 AWPF Average Influent Flow Sources and Volumes

2.2.1.3 Source Water Turbidity and Ammonia-Nitrogen

In 2021 the AWPF feedwater (Q1) turbidity ranged between 0.8 and 2.8 NTU (based on grab samples), averaging 1.3 NTU, indicating consistent Plant 1 operations. Similarly, total suspended solids concentrations in the AWPF feedwater (Q1) ranged from 5.8 to 7.9 mg/L, which is excellent for secondary effluent.

The average Q1 total nitrogen level remained relatively low (11.4 mg/L) and the corresponding ammonia-nitrogen concentration was 2.1 mg/L due to the blend of non-nitrified TF effluent and AS effluent from the OC San AS facilities operating in the NdN mode. Indigenous ammonia is necessary for formation of chloramine in the MFF when sodium hypochlorite is added to the Q1 stream. Lower ammonia levels increase the potential for free chlorine to be formed, which can damage the MF and RO membranes. The MFF total chlorine residual operational target is between 3 and 5 mg/L as chloramine.

A low concentration of ammonia remained in the Q1 source water when TF effluent was included in the AWPF source water, which favored chloramine formation over free chlorine, thereby protecting the membranes. Q1 ammonia-nitrogen concentrations varied between 0.6 to 7.5 mg/L during 2021. In response, the sodium hypochlorite dose in the MFF was adjusted to minimize the ROF free chlorine residual level. The MFF sodium hypochlorite dose was typically 8 to 9 mg/L in 2021; the dose was occasionally reduced to as low as 7 mg/L for intermittent periods to control the UVF transmissivity (%UVT). The MFF and ROF free chlorine residual concentrations were consistently maintained below the operating target of 0.1 mg/L established to avoid breakpoint chlorination and membrane damage.



*Available flow includes weir overflow returned to OC San. Difference between available flow and MFF flow is weir overflow return.

Figure 2-6. 2021 AWPF Influent Sources and Average Flows by Month

2.2.2 MF System Performance in 2021

2.2.2.1 MF System Facilities

MF removes suspended and colloidal solids, including bacteria and protozoa, and serves as a pretreatment step before the RO process. Screened secondary effluent flows by gravity to below-grade MF cells, pictured on Figure 2-7. Of the total 36 submerged MF cells, 34 cells feature polypropylene hollow-fiber membranes with a nominal pore size of 0.2 micrometers (microns), while two cells feature polyvinylidene difluoride (PVDF) hollow-fiber membranes with a nominal pore sizes of 0.1 micron (Cell E03) and 0.04 micron (Cell E04) (See Section 2.3.5). Each MF cell contains 684 in-basin submerged membrane elements. Filtrate pumps, operating in a vacuum mode, continuously pull water through the MF membranes using a piping manifold and discharge the filtrate, or MF effluent, to the MF Break Tank. The maximum rated instantaneous filtrate production capacity of the MF system is 157 MGD with one cell out of service or in backwash. The design average filtrate production capacity of the MF system is 118 MGD based on 90% recovery to account for backwashing and clean-in-place (CIP) cycles and to enable the RO system to produce 100 MGD of ROP. The MF cells are regularly backwashed using filtrate from the MF

Figure 2-7. MF System

using citric acid and sodium hydroxide with a proprietary chemical to remove foulants and restore membrane performance. The PVDF membranes are periodically cleaned-in-place using sodium hypochlorite and citric acid with maintenance washes. Waste backwash is returned to OC San Plant 1 for treatment. MF CIP spent cleaning solutions are sent to OC San Plant 2.

2.2.2.2 MF System Performance

Table 2-3 summarizes the monthly MF system performance for 2021 in terms of turbidity reduction. The daily average MFF turbidity ranged from 2.08 to 5.19 NTU based on daily averages of on-line turbidimeter readings taken upstream of the MF process. The annual average on-line MFF turbidity was 3.25 NTU. The OC San Plant 1 original AS1 plant (Project P1-82) and the newer AS2 plant (Project No. P1-102) have operated in the NdN mode achieving nitrification and partial denitrification since 2010 and 2012, respectively; as a result of these operational changes at Plant 1, low MFF turbidity has been reliably achieved, demonstrating the benefits of biological NdN.

Table 2-3. 2021 MF Performance

Month	Turbidity			
	MF Feed MFF[1]		MF Effluent MFE[1]	
	Avg. (NTU)	Max (NTU)	Avg. (NTU)	Max (NTU)
January	3.44	3.85	0.03	0.04
February	3.77	4.62	0.03	0.03
March	3.52	4.18	0.02	0.03
April	3.43	3.80	0.03	0.03
May	2.99	3.87	0.03	0.04
June	3.18	4.39	0.04	0.05
July	2.99	3.99	0.04	0.05
August	2.98	4.02	0.04	0.04
September	2.83	3.68	0.03	0.05
October	3.11	4.41	0.04	0.05
November	3.25	4.49	0.04	0.04
December	3.42	5.19	0.03	0.04
Annual Average	3.25	---	0.03	---
Maximum	---	5.19	---	0.05
Average % Removal	99.0%			

[1] Based on daily average turbidity readings from MFF and MFE on-line turbidimeters. Values shown represent the monthly average for all MF cells. Shown above, bulk MFE is monitored as it enters the MF Break Tank. Daily average MFE turbidity readings from individual MF banks (4 cells/bank) are used in determining compliance with pathogen reduction requirements and can be found in Appendix F..

Continuous readings from nine turbidimeters (one per bank of four MF cells) are averaged to determine the daily average MFE turbidity. The daily average MFE turbidity during 2021 ranged from 0.02 to 0.05 NTU, with an annual average turbidity of 0.03 NTU based on on-line turbidimeter readings taken from nine MFE turbidimeters (one per bank of four MF cells). This represents an average turbidity removal rate for the MF process of 99.0% during 2021.

The 2021 MFE turbidity readings were based on high resolution laser turbidimeters that yielded more accurate MFE turbidity readings than the original incandescent turbidimeters used prior to mid-2020. Continuous readings from nine MFE turbidimeters (one per bank of four MF cells) were also used to determine compliance with pathogen removal requirements for MF (Section 2.3.5.2). In addition to the nine MFE turbidimeters, MFE turbidity is also monitored continuously on the bulk MFE stream entering the MF Break Tank.

Figure 2-8 presents the annual average turbidity reduction achieved by the MF system in 2021 and compares it with the MF system performance during 2020. Overall, the average turbidity removal rate of 99.0% in 2021 was greater than the 98.6% removal rate in 2020. Replacement of the original incandescent turbidimeters with new laser turbidimeters in mid-2020 could be a factor in this apparent year-over-year improvement. Review of the average monthly performance reveals consistently stable average MFF turbidities with minor seasonal variation throughout 2021. Indicated by the black bars representing the minimum and maximum daily average turbidities by year on Figure 2-8, the range in MFF turbidity was somewhat wider in 2021 (2.08 to 5.19 NTU) as compared with that in 2020 (1.71 to 4.42 NTU).

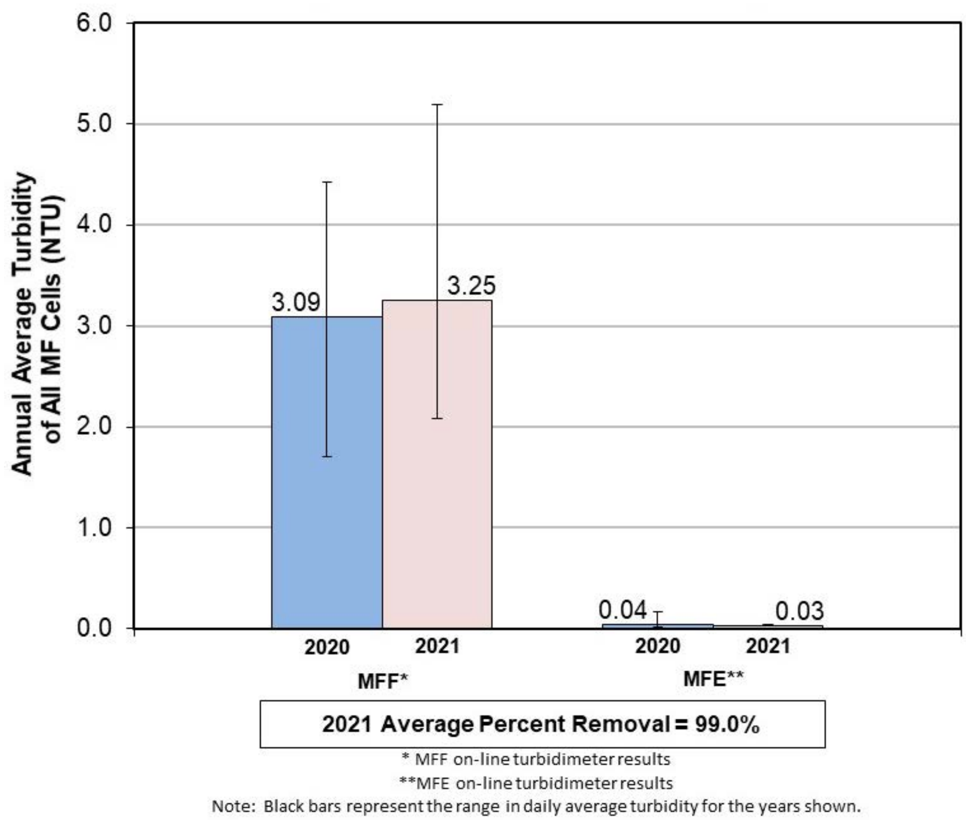


Figure 2-8. 2021 MF Turbidity Removal Performance

2.2.3 RO System Performance in 2021

2.2.3.1 RO System Facilities

The RO process demineralizes water and removes inorganics, organics, viruses, and a wide range of other contaminants using spiral-wound, thin-film composite polyamide membranes. MF effluent is pumped from the MF Break Tank to the RO system by the RO Transfer Pump Station. The RO process features pretreatment chemical addition using sulfuric acid and antiscalant (threshold inhibitor), cartridge filtration, and high-pressure feed pumps that supply the pressure vessels containing the RO membranes. Immediately upstream of the RO system are 14 cartridge filters using 10-micron filters. The RO system features 21 units (20 duty units and one standby unit), each rated at 5 MGD permeate capacity.

Shown on Figure 2-9, each RO unit consists of 150 pressure vessels arranged in three banks (stages). The original 15 RO units are configured in a 78:48:24 array; the six GWRS Initial Expansion RO units are configured in a 77:49:24 array with turbocharger energy recovery devices (ERDs) that also provide interstage flux balancing and monitoring capabilities. At a design recovery rate of 85%, the total nominal rated permeate capacity of the RO system is 100 MGD. Concentrate (i.e., reject) from the RO process is sent to the OC San ocean outfall for disposal. The RO system would be bypassed during a peak wet weather SAR discharge event.

Figure 2-9. RO System

2.2.3.2 RO System Performance

The three-stage RO process is designed to remove inorganic and organic compounds as well as bacteria and virus pathogens, producing up to 100 MGD of product water at a recovery rate of approximately 85%. Monthly performance data for the RO process in 2021 for key constituents, EC and TOC, are summarized in Table 2-4. Regarding salinity removal in 2021, the bulk ROF EC averaged 1,678 µmhos/cm, and the bulk ROP EC averaged 46 µmhos/cm based on semi-weekly grab samples. This represents an average salinity removal rate for the RO process of 97.7% during 2021.

Table 2-4. 2021 RO Performance

Month	Electrical Conductivity[1,2]				Total Organic Carbon[3]			
	RO Feed ROF		RO Product ROP		RO Feed ROF		RO Product ROP	
	Avg. (umhos/cm)	Max. (umhos/cm)	Avg. (umhos/cm)	Max. (umhos/cm)	Avg. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Max. (mg/L)
January	1678	1700	30	39	8.16	8.74	0.08	0.14
February	1663	1680	29	38	8.64	9.44	0.09	0.19
March	1618	1640	29	36	8.63	9.20	0.08	0.12
April	1690	1730	45	65	8.63	9.07	0.08	0.17
May	1705	1720	38	41	8.34	8.70	0.08	0.14
June	1697	1770	39	44	8.48	8.89	0.08	0.14
July	1690	1710	40	48	8.35	8.84	0.09	0.15
August	1755	1770	48	49	8.34	8.79	0.09	0.13
September	1678	1710	46	52	8.06	8.63	0.09	0.20
October	1700	1720	39	42	8.21	8.74	0.10	0.23
November	1690	1720	45	48	8.27	11.00	0.08	0.13
December	1637	1700	39	45	8.25	10.30	0.09	0.57
Annual Average	1678	---	39	---	8.36	---	0.09	---
Maximum	---	1770	---	65	---	11.00	---	0.57
Average % Removal	97.7%				99.0%			

[1] Electrical Conductivity (EC) data for RO are not normalized with respect to ROF pressure or temperature

[2] EC semi-weekly grab sample results

[3] TOC daily grab sample results

Figure 2-10 presents the 2021 annual average EC reduction performance of the RO system and compares it with the RO system's average EC reduction the previous year. The EC reduction was effectively the same in 2021 and 2020 at 97.7% and 97.6%, respectively.

Figure 2-11 presents the annual average TOC removal performance of the RO system, comparing 2020 and 2021 laboratory-analyzed grab sample results. The average TOC removal of 99.0% in 2021 was essentially identical to the 98.8% average TOC removal rate achieved in 2020. In general, this TOC removal performance indicates rejection rates remained fairly constant over this period.

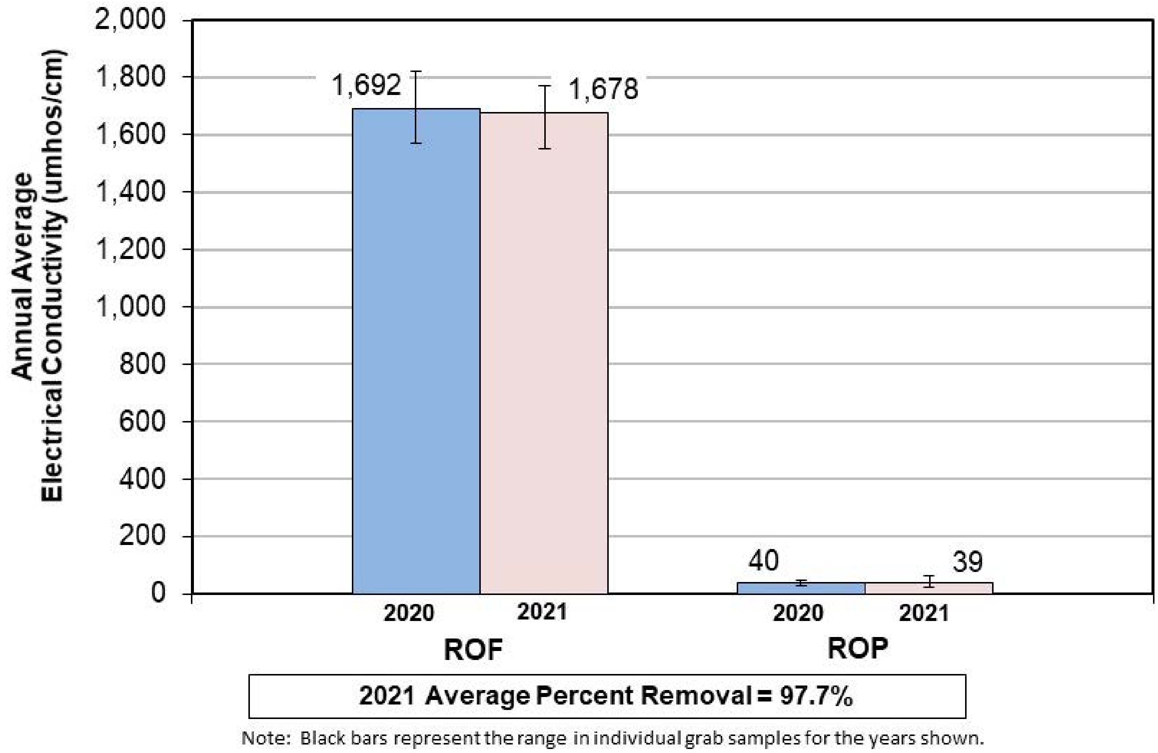


Figure 2-10. 2021 RO Electrical Conductivity Removal Performance

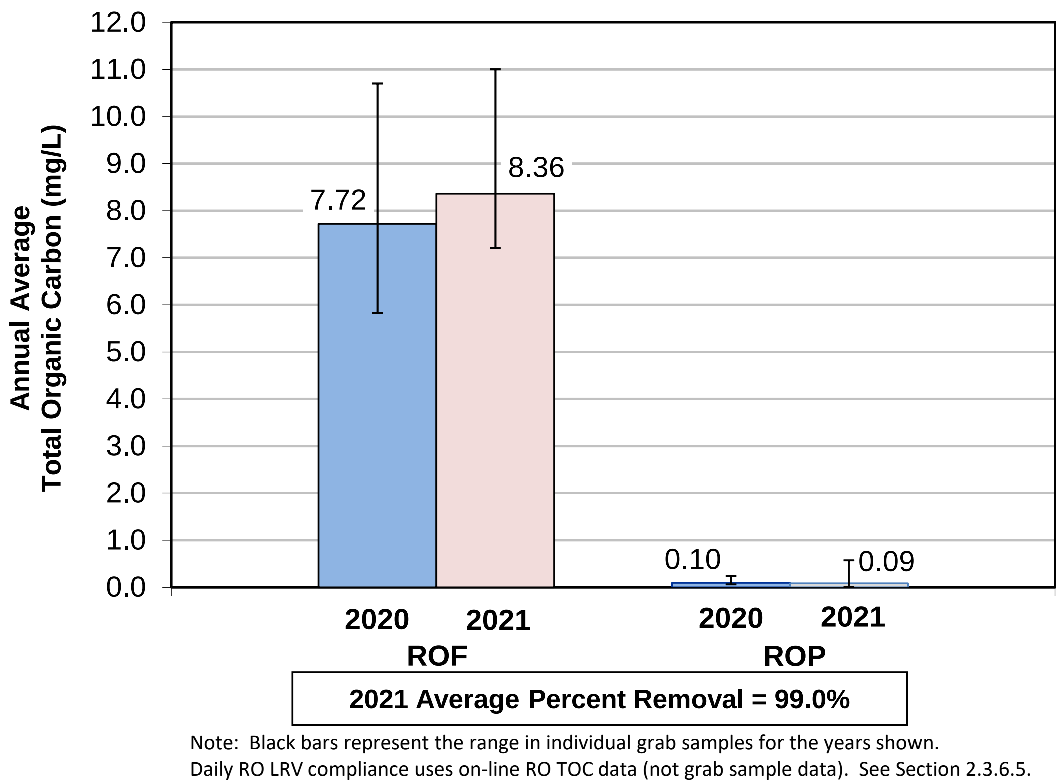


Figure 2-11. 2021 RO Total Organic Carbon Removal Performance

The TOC concentration in the ROF based on daily grab samples averaged 8.36 mg/L in 2021, which is greater than the 7.72 mg/L average observed in 2020. The ROF TOC concentration range in 2021 was narrower than in the prior year, from 7.20 to 11.00 mg/L as shown by the vertical black bars on Figure 2-11. Throughout 2021, the ROP TOC concentration was consistently below the 0.5 mg/L permit limit (20-sample running average and 4-sample average). The TOC concentration in the ROP based on daily grab samples averaged 0.09 mg/L during 2021, ranging from less than the 0.05 mg/L RDL to 0.57 mg/L. Available operating records are not indicative of the reason for the single elevated ROP TOC value (December 14, 2021); the ROF TOC on that date was unremarkable (7.9 mg/L). Furthermore, on-line ROP TOC results ranged from a minimum of 0.051 mg/L to a maximum of 0.068 mg/L, with a daily average of 0.056 mg/L on December 14. The daily ROP TOC sample is composited from 8 aliquots, with one aliquot collected every three hours throughout the 24-hr period. OCWD Operations staff believe a sampling error occurred during collection of one of the daily aliquots for the December 14 sample, and that the 0.57 mg/L TOC result is erroneous. With the exception of the one-day elevated ROP TOC lab result, the daily grab samples yielded ROP TOC concentrations ranging from less than 0.05 to 0.23 mg/L, indicating the dependable performance of the RO system in 2021.

2.2.4 UV / AOP Performance in 2021

The UV/AOP (hydrogen peroxide advanced oxidation and UV light exposure) system performance is demonstrated by the UVP results as compared with those in the UV/AOP influent, or feed water stream (UVF).

2.2.4.1 UV/AOP System Facilities

The UV/AOP system consists of two steps: hydrogen peroxide addition and UV light treatment. UV light exposure is used for primary disinfection and for photolysis of UV light-sensitive contaminants such as N-nitrosodimethylamine (NDMA). Hydrogen peroxide exposed to UV light produces hydroxyl radicals that result in an advanced oxidation process to destroy UV-resistant contaminants such as 1,4-dioxane. The hydrogen peroxide design dosage is 3 mg/L. The closed, in-vessel type UV system utilizes low-pressure high-output lamps. The UV system is arranged with 13 trains. Each train contains six reactors and has a rated maximum capacity of 8.75 MGD for a total of 113.75 MGD with all trains in service. Figure 2-12 shows a photo of two UV trains.

2.2.4.2 Disinfection

Regarding disinfection through the entire AWPF, total coliform levels in the Q1 averaged approximately 318,000 MPN/100 mL in 2021. (See Table 2-1 presented earlier.) Sodium hypochlorite addition upstream of MF reduced the total coliform levels in the MFF to an average of approximately 33,300 MPN/100 mL, representing an average total coliform removal of 1.0-log. MF treatment further reduced the average total coliform levels to less than 1 MPN/100 mL

Figure 2-12. UV/AOP System

in the MFE. Total coliform levels were less than 1 MPN/100 mL through the RO and UV/AOP processes. The FPW complied at all times with the permit limit for total coliform, which requires that the FPW shall not exceed 240 MPN/100 mL in any single sample, 23 MPN/100 mL in more than one sample in any 30-day period, and the 7-day median shall not exceed 2.2 MPN/100 mL. Total coliform levels in the FPW were consistently less than 1 MPN/100 mL throughout 2021.

Concentrations of *E. coli* were diminished by adding sodium hypochlorite upstream of the MF process in 2021. (See Table 2-1 presented earlier.) The Q1 *E. coli* level averaged 82,613 MPN/100 mL, and the MFF *E. coli* levels averaged 3,934 MPN/100 mL following disinfection. Confirming the MF and RO expected performance, the average MFE and ROP results for *E. coli* were less than 1 MPN/100 mL consistently in 2021.

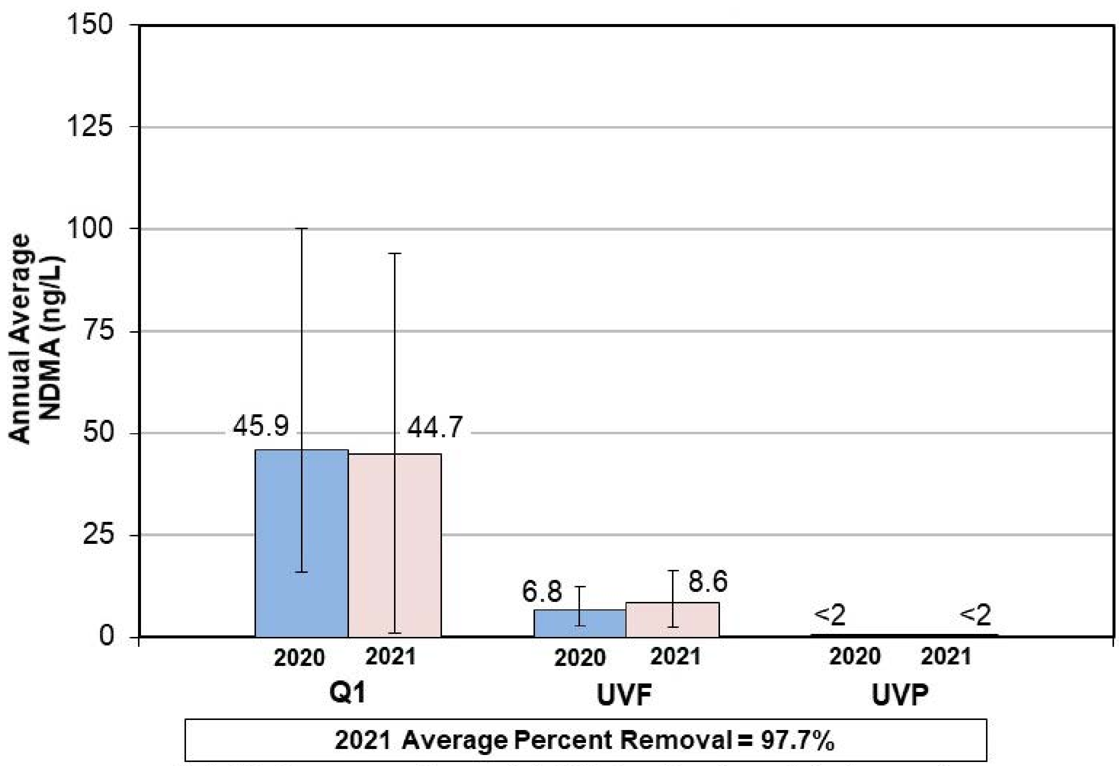
2.2.4.3 NDMA Removal

Besides disinfection, a key performance criterion for the UV/AOP system relates to destruction of NDMA as shown in Table 2-5 and illustrated on Figure 2-13. The 2021 average concentration

Table 2-5. 2021 UV/AOP NDMA Removal Performance

Month	NDMA Secondary Effluent Q1 Avg.[1] (ng/L)	Secondary Effluent Q1 Max. (ng/L)	UV Influent UVF Avg.[1] (ng/L)	UV Influent UVF Max. (ng/L)	UV Effluent UVP Avg.[1] (ng/L)	UV Effluent UVP Max. (ng/L)
January	33.5	57.8	4.7	7.0	<2	<2
February	61.1	87.1	6.7	10.8	<2	<2
March	51.2	93.9	8.6	15.7	<2	<2
April	54.3	94.2	9.2	9.9	<2	<2
May	41.0	64.9	8.7	10.8	<2	<2
June	66.3	82.3	10.6	12.9	<2	<2
July	50.1	71.1	11.7	15.6	<2	<2
August	44.9	52.9	12.9	15.4	<2	<2
September	28.7	40.1	8.8	11.2	<2	<2
October	27.9	51.7	6.1	11.7	<2	<2
November	47.1	66.2	12.0	16.2	<2	<2
December	36.4	53.0	6.5	8.7	<2	<2
Annual Average	44.7	---	8.6	---	<2	---
Maximum	---	94.2	---	16.2	---	<2
Average % Removal (by UV/AOP)	97.7%					
Average Log Removal (by UV/AOP)	1.6					

[1] Average of weekly grab samples. For purposes of calculating monthly averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the month were ND, then the average is shown as "< RDL".



Note: Black bars represent the range in individual weekly grab samples for the years shown.

Figure 2-13. 2021 UV/AOP NDMA Removal Performance

of NDMA in the UVF was approximately 8.6 ng/L, based on weekly grab samples ranging from 2.3 to 16.2 ng/L (using OCWD's in-house NDMA-LOW laboratory method with an RDL of 2 ng/L). UVF NDMA results reflect net effects of formation via chlorine addition and partial removal via RO treatment. For comparison purposes, the average concentration of NDMA in the Q1 stream during 2021 was approximately 44.7 ng/L, ranging from non-detect to 94.2 ng/L (using OCWD's in-house NDMA-LOW laboratory method with an RDL of 10 ng/L).

All UVP NDMA results in 2021 were non-detect (using OCWD's in-house NDMA-LOW laboratory method with an RDL of 2 ng/L). Overall, comparison of the average UVF and UVP NDMA concentrations in 2021, the UV/AOP system attained an average NDMA removal rate of 97.7%, or a 1.6 log reduction if 10% of the detection limit is assigned to the non-detect values. The average NDMA removal rate from the AWPF source water (Q1) through the UV/AOP system (UVP) during 2021 was 99.6%, or a 2.3 log reduction (assigning 10% of the detection limit to non-detect values).

In 2021, all FPW NDMA results were below the DDW notification level for NDMA (10 ng/L). The highest NDMA concentration in the Q1 influent, 94.2 ng/L, occurred on April 16, 2021. The NDMA concentration in the FPW on that date was 2.4 ng/L. The UVP NDMA concentration on that day was non-detect (less than 2 ng/L), demonstrating the efficacy of the UV/AOP process. While the Q1 NDMA concentration on that day was elevated and the corresponding UVP NDMA concentration was non-detect, it is suspected that the slightly higher FPW value was due to NDMA rebound occurring after UV treatment in the post-treatment FPW stabilization processes.

Comparing the available raw data for NDMA concentrations in FPW and UVP revealed that detectable levels were found more frequently in FPW than in UVP. For example, the highest daily concentration of NDMA in the FPW (5.1 ng/L, based on OCWD's in-house NDMA-LOW laboratory method) occurred on September 3, yet NDMA was non-detectable in the UVP stream (less than 2 ng/L). Low concentrations of NDMA in the FPW, below the DDW notification level (10 ng/L), were detected periodically throughout 2021, whereas UVP NDMA concentrations were consistently non-detect throughout the year.

Potential causes for rebound during post-treatment include reformation of NDMA from previously photolyzed NDMA and/or formation of "new" NDMA from precursor compounds, both of which are likely dependent on the combined chlorine (chloramine) concentration. Investigations by OCWD into this NDMA rebound have revealed that the lime used during post-treatment is not a likely source of NDMA or precursor material, but the increase in pH caused by the lime allows for greater formation of NDMA in the presence of combined chlorine and precursors. Accordingly, the post-treatment pH target of 8.5 attempts to limit NDMA formation while also managing cement mortar-lined distribution pipeline stability and aquifer metals mobilization. It is also believed that removal of NDMA precursors may be a function of RO membrane age.

2.2.4.4 1,4-Dioxane Removal

Performance of the UV/AOP system, as well as that of the RO system, can also be measured based on removal of 1,4-dioxane. Table 2-6 and Figure 2-14 show how well 1,4-dioxane was removed by both the RO and UV/AOP processes.

Following UV/AOP treatment with the addition of hydrogen peroxide, the 1,4-dioxane concentration in the UVP was consistently non-detect (<0.5 µg/L). The UVF 1,4-dioxane concentrations were also non-detect. The Q1 concentrations of 1,4-dioxane averaged 1.2 µg/L, ranging from 1 to 1.6 µg/L.

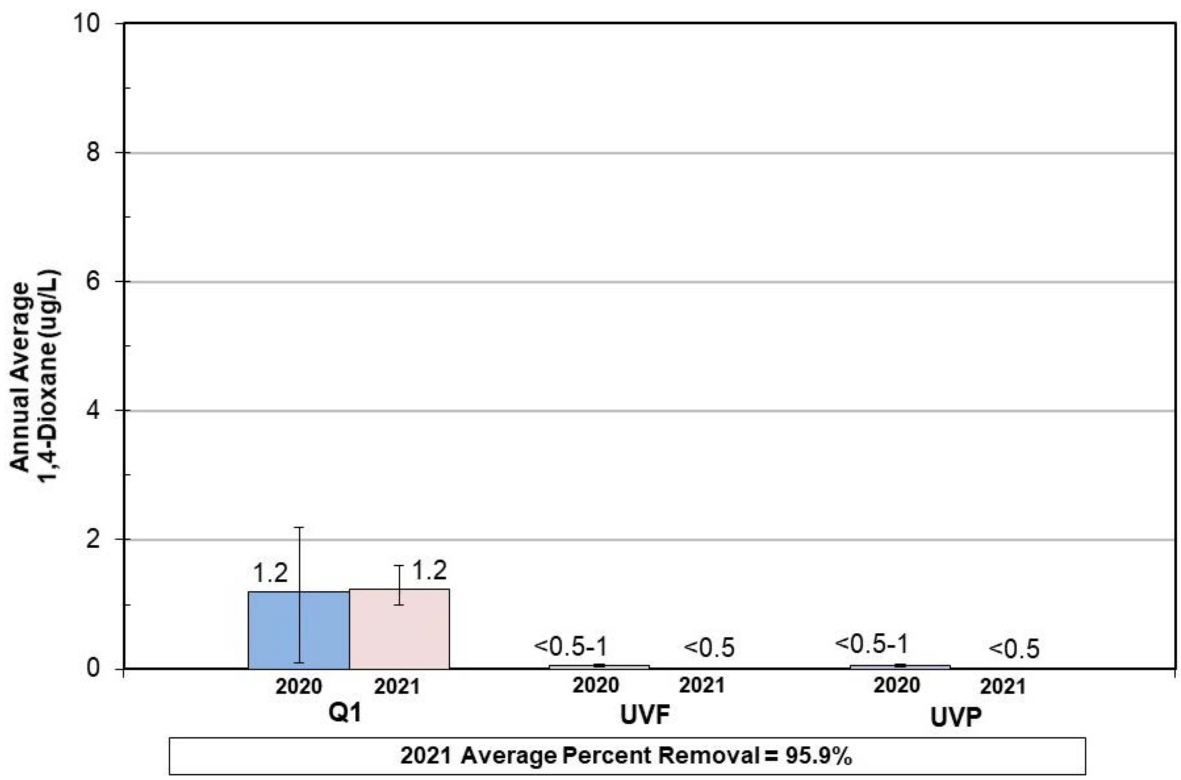
As illustrated by the black vertical bars on Figure 2-14, the 2021 average of 1.2 µg/L from all weekly Q1 grab samples was effectively the same as the corresponding average of 1.2 µg/L in 2020 (both values rounded to 1.2 µg/L). The FPW 1,4-dioxane concentrations during 2021 and 2020 were consistently non-detect (<0.5 µg/L throughout 2021, and <1 µg/L from January through June and <0.5 µg/L from July through December with the RDL change midway through 2020). Overall, the combined RO + UV/AOP processes achieved an average 95.9% removal of 1,4-dioxane during 2021 (Q1 through UVP streams) when assigning 10% of the RDL to the non-detect values. Given that all UVF 1,4-dioxane concentrations were also non-detect, it appears that the RO process effectively removed detectable 1,4-dioxane in 2021. The overall percent removal was slightly higher in 2021 (95.9%) in comparison with that in 2020 (93.9%); this was likely related to the change in 1,4-dioxane RDL mid-way through 2020. The Q1 average 1,4-dioxane concentration in 2021 (1.2 µg/L) was the same (rounded) as that that in 2020 (1.2 µg/L), and the UVP 1,4-dioxane concentrations were non-detect. The RO + UV/AOP processes achieved a 1.4 log removal of 1,4-dioxane during 2021.

Table 2-6. 2021 RO/UV/AOP 1,4-Dioxane Removal Performance

Month	1,4 Dioxane					
	Secondary Effluent Q1		UV Influent UVF		UV Effluent UVP	
	Avg. [1] (µg/L)	Max. (µg/L)	Avg. [1] (µg/L)	Max. [1] (µg/L)	Avg. [1] (µg/L)	Max. [1] (µg/L)
January	1.5	1.6	<0.5	<0.5	<0.5	<0.5
February	1.3	1.4	<0.5	<0.5	<0.5	<0.5
March	1.3	1.4	<0.5	<0.5	<0.5	<0.5
April	1.3	1.4	<0.5	<0.5	<0.5	<0.5
May	1.2	1.3	<0.5	<0.5	<0.5	<0.5
June	1.2	1.3	<0.5	<0.5	<0.5	<0.5
July	1.2	1.5	<0.5	<0.5	<0.5	<0.5
August	1.3	1.4	<0.5	<0.5	<0.5	<0.5
September	1.2	1.4	<0.5	<0.5	<0.5	<0.5
October	1.1	1.3	<0.5	<0.5	<0.5	<0.5
November	1.1	1.2	<0.5	<0.5	<0.5	<0.5
December	1.1	1.3	<0.5	<0.5	<0.5	<0.5
Annual Average	1.2	---	<0.5	---	<0.5	---
Maximum	---	1.6	---	<0.5	---	<0.5
Average % Removal (RO/UV/AOP System) [2]	95.9%					
Average Log Removal (RO/UV/AOP System) [2]	1.4					

[1] Average of weekly grab samples. For purposes of calculating monthly averages, 10% of the Reportable Detection Limit (RDL) was used for all non-detect (ND) values. If all data for the month were ND, then the average is shown as "<RDL".

[2] Average % removal and log removal calculated based on non-detect (ND) = 10% of RDL.



Note: Black bars represent the range in individual weekly grab samples for the years shown.

Figure 2-14. 2021 RO/UV/AOP 1,4-Dioxane Removal Performance

2.2.5 Decarbonation and Lime Stabilization Systems

Post-treatment consists of decarbonation and lime stabilization. The combination of decarbonation and lime stabilization raises the pH and adds hardness and alkalinity to make the purified recycled water less corrosive and more stable. Following the UV/AOP system, a portion of the excess residual carbon dioxide is removed by six forced-draft decarbonators to raise the pH of the FPW.

Figure 2-15 shows a decarbonation tower. The decarbonation system has a total design capacity of 72 MGD, allowing for part of the UV-disinfected purified water to be treated by the decarbonators and bypassing the remaining flow. Decarbonated water is blended with the bypassed flow prior to lime stabilization in the FPW channel.

Hydrated lime (calcium hydroxide) is added to neutralize the remaining carbon dioxide, add alkalinity, raise pH, and thereby stabilize the FPW. Figure 2-16 shows a photo of the lime system, which features lime storage silos, slaker mixing tanks, slurry aging tanks, pumps, and saturators that prepare and deliver a saturated lime solution to the FPW channels. The lime system employs gravimetric feeders (based on weight) to control the amount of lime delivered. Anionic polymer is added to the saturators as a coagulant aid to reduce lime particle carryover. Lime sludge is pumped to OC San's Ellis Avenue Interplant Sewer and conveyed to Plant 2 for treatment and disposal.

Figure 2-15. Decarbonation System

Figure 2-16. Lime Post-Treatment System

2.2.6 Purified Recycled Water Pumping

Purified recycled water, or FPW, is conveyed by the Barrier Pump Station to the Talbert Barrier and by the Product Water Pump Station to K-M-M-L Basins, MBI Project, and non-potable uses. The Barrier Pump Station features four 600-horsepower pumps discharging FPW to the Talbert Barrier injection wells. The Product Water Pump Station features four 2,250-horsepower pumps discharging FPW to K-M-M-L Basins via the 13-mile GWRS Pipeline. Laterals from the GWRS Pipeline convey purified recycled water to the MBI Project and two non-potable water customers, Anaheim CPP and ARTIC. A third non-potable water customer, Anaheim Adventure Park, is located at Miraloma Basin. Both pump stations are housed in the building shown on Figure 2-17. Purified recycled water flows discharged to the Talbert Barrier, K-M-M-L Basins, MBI Project, Anaheim CPP, and ARTIC are metered, totalized, and recorded.

Figure 2-17. Barrier and Product Water Pump Stations

2.2.7 Total Nitrogen Removal in 2021

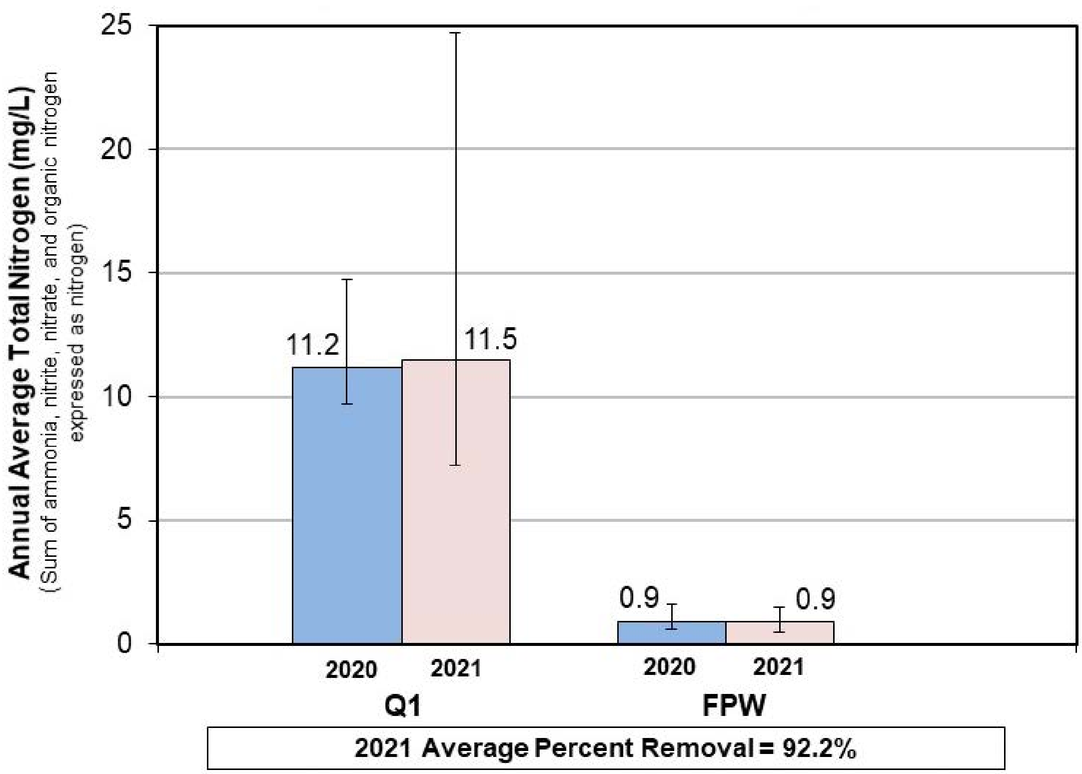
Monthly performance data for AWPF total nitrogen removal are summarized in Table 2-7 and Figure 2-18. On an annual basis, the Q1 total nitrogen concentration (sum of ammonia, nitrite, nitrate, and organic nitrogen, all expressed as nitrogen) averaged approximately 11.5 mg/L during 2021, which was essentially the same as the 2020 average (11.2 mg/L). Low total nitrogen concentrations in the Q1 flow stream were an indication of OC San's NdN operation of the AS facilities at Plant 1. Comparison of the pre-NdN operation (before late 2009) with the post-NdN operation (after 2010-2011) reveals that secondary effluent total nitrogen concentrations decreased by about 50% as compared with average Q1 total nitrogen levels in 2008-2009 of approximately 26 to 28 mg/L. In 2021, this lower influent total nitrogen concentration helped the AWPF to achieve consistently low concentrations of total nitrogen levels in the FPW, ranging from approximately 0.5 to 1.5 mg/L based on individual samples. Removal of total nitrogen occurs primarily, if not exclusively, via the RO process. Overall, the annual average FPW total nitrogen concentration remained consistently low over the past two years, 0.9 mg/L in 2020 and 2021. In comparison, before OC San switched the AS Plant to the NdN mode of operation in late 2009, the annual average FPW total nitrogen concentration was generally above 2 mg/L. Additionally, the nitrogen species comprising the FPW total nitrogen has changed from being predominately ammonia (pre-NdN) to being mostly nitrate (post-NdN). Figure 2-18 presents the 2021 annual average total nitrogen reduction performance of the AWPF and compares it with that achieved in the previous year.

Table 2-7. 2021 AWPF Total Nitrogen Removal Performance

Month	Total Nitrogen [1,2]			
	Secondary Effluent Q1		AWPF Effluent FPW	
	Avg. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Max. (mg/L)
January	12.5	14.7	0.7	0.9
February	11.4	11.7	0.7	0.8
March	11.3	12.3	0.7	1.0
April	14.6	24.7	0.7	1.0
May	10.9	11.8	0.8	0.9
June	9.0	10.5	1.0	1.3
July	9.6	10.9	0.9	1.1
August	12.1	12.9	1.1	1.2
September	12.0	14.3	1.0	1.3
October	10.9	11.8	0.9	1.5
November	10.6	14.1	1.2	1.5
December	12.6	16.7	1.0	1.2
Annual Average	11.5	---	0.9	---
Maximum	---	24.7	---	1.5
Average % Removal	92.2%			

[1] Total nitrogen is based on the sum of ammonia, nitrite, nitrate, and organic nitrogen, all expressed as nitrogen.

[2] Total nitrogen data based on weekly Q1 and semi-weekly FPW individual grab sample results.



Note: Black bars represent the range in individual grab samples for the years shown.

Figure 2-18. 2021 AWPF Total Nitrogen Removal Performance

Figure 2-19 illustrates the FPW total nitrogen concentration during 2021, showing it was typically less than 1.0 mg/L, which was well below the total nitrogen GWRS permit limit of 5 mg/L. Total nitrogen concentrations of 1.1 to 1.5 mg/L were found in 22 of the total 111 samples, which again was well below the permit limit. The FPW sampling frequency for total nitrogen analyses is semi-weekly, generally about three days apart.

2.2.8 Total Organic Carbon Removal in 2021

Figure 2-20 shows the TOC concentration in the FPW during 2021 based on daily 24-hour composite samples. The maximum individual daily composite FPW TOC result in 2021 was 0.19 mg/L (October 4). Another elevated individual daily composite FPW TOC result was 0.18 mg/L (May 11). The running 20-sample average TOC concentration in the FPW was generally about 0.08 mg/L. The running 4-sample average TOC concentration in the FPW was also approximately 0.08 mg/L. The overall FPW average TOC concentration was 0.08 mg/L as well (Table 2-1).

Compliance with the permit TOC limit is determined monthly based on the running average TOC concentration in the most recent 20 composite samples of FPW. The TOC limit is calculated based on the DDW-specified maximum RWC at each recharge location. The TOC limit for all recharge sites (Talbert Barrier, K-M-M-L Basins, and MBI Project) is 0.5 mg/L (determined by dividing 0.5 mg/L by the DDW-specified maximum allowable RWC at that location, which is 100% for all sites).

During 2021, the running 20-sample average FPW TOC was consistently well below 0.5 mg/L and in compliance with the permit requirements.

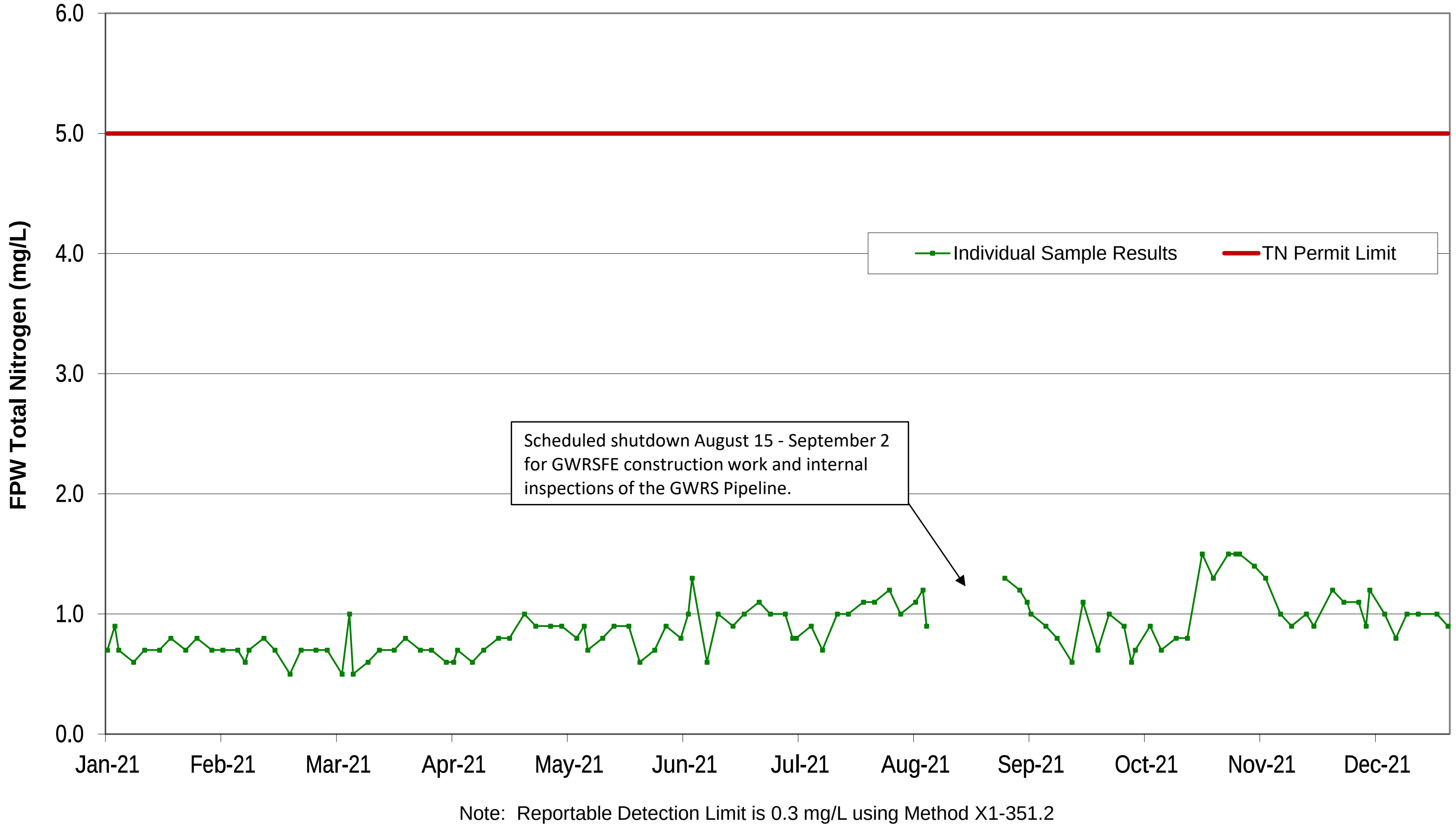


Figure 2-19. 2021 Purified Recycled Water Total Nitrogen

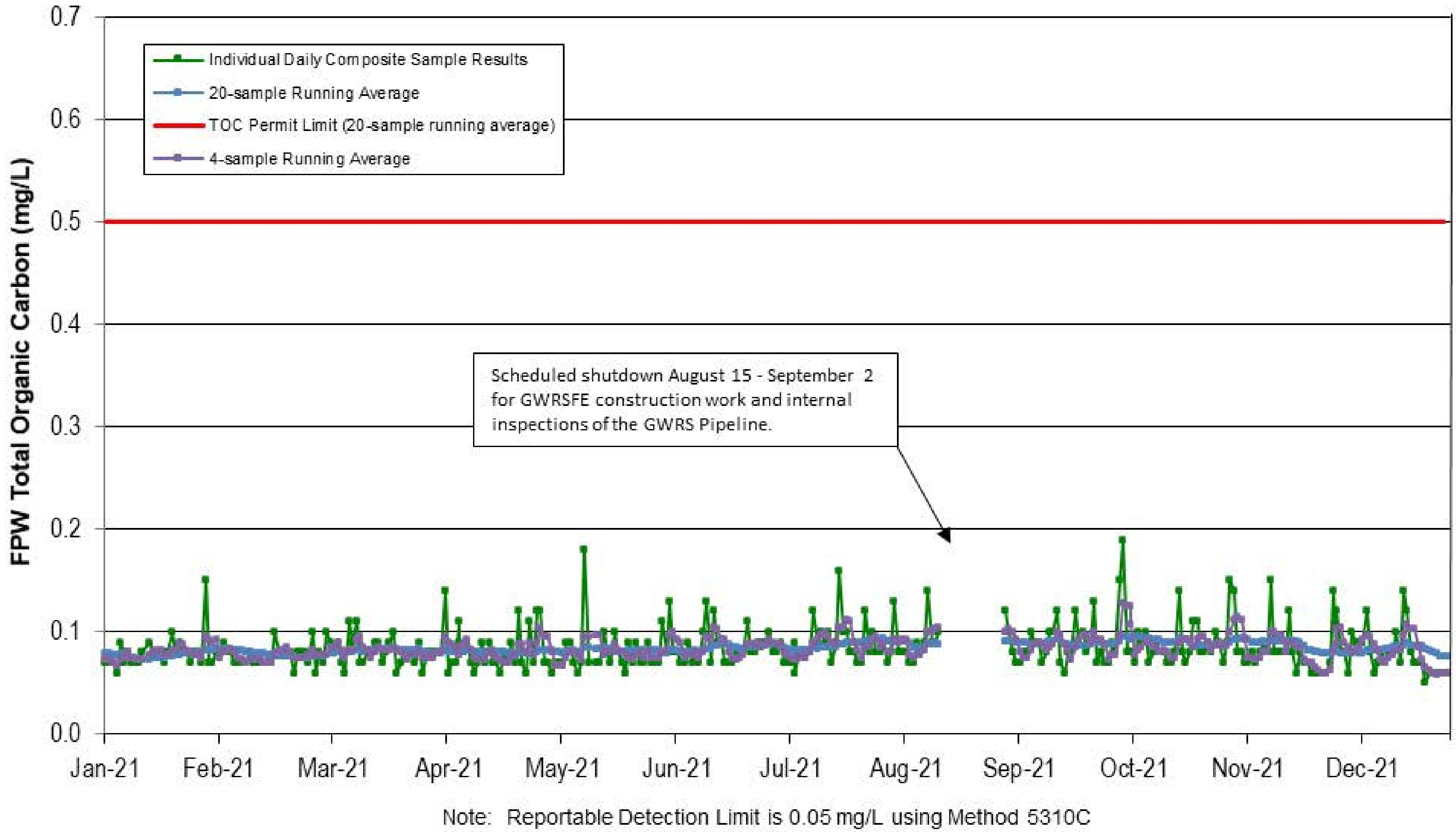


Figure 2-20. 2021 Purified Recycled Water Total Organic Carbon

2.3 Performance and Compliance Record

The overall performance and compliance record of the AWPF are summarized below in terms of general operating records, including start/restart issues, downtimes, operator certifications, compliance with critical control points, and focused studies to optimize performance and increase water production.

2.3.1 General Operational Performance

The AWPF continued to successfully operate and produce purified recycled water for groundwater recharge through 2021. The original AWPF began operation on January 10, 2008, with a 70 MGD design production capacity, following a rigorous commissioning and acceptance testing period. The GWRS Initial Expansion began operation on May 21, 2015, first enabling the AWPF to produce up to 85 MGD and later up to 100 MGD of purified recycled water; final acceptance and completion of the GWRS Initial Expansion construction project followed on July 31, 2015.

The AWPF was on-line just over 344 days in 2021 (94.3% of the year). Appendix D contains descriptions of all plant shutdowns during the year. The average daily purified recycled water production was below average in August due to a planned shutdown of the AWPF from August 15 to September 2 for GWRSFE construction work and inspection of the interior of the GWRS Pipeline Segment 2. The AWPF experienced other brief shutdowns due to GWRSFE construction work and unplanned power outages.

On January 12-13, the AWPF shutdown for approximately 30 hours while the three new GWRSFE UV trains were commissioned. Later in January, the AWPF unexpectedly shut down for a brief period (1.2 hours on January 21) due to a RO transfer pump pressure controller communication interruption. Another unplanned AWPF shutdown occurred on March 24 (2.7 hours) when the influent screens were clogged after OC San Plant 1 operators washed secondary clarifier effluent launders causing a slug of solids to flow to the influent screening facility.

The AWPF experienced two unexpected Southern California Edison (SCE) power interruptions that lasted 3.0 hours (July 9) and 8.9 hours (October 9-10).

The July 9 power interruption event was in response to calls from Enel X for the AWPF to reduce its power demand to be under 5.048 Megawatts (MW). The AWPF operated at reduced production (approximately 15 MGD) for the 3-hour power curtailment event. Mandatory load reduction events are conducted by SCE as part of the Enel X Demand Response Program that allows SCE to request periodic reductions in electrical power consumption during peak demand periods. OCWD's agreement with Enel X (formerly known as EnerNOC), the regional Demand Response Program provider, requires a load reduction of 5 MW or less during a load shedding event. The AWPF can maintain production at a low level (15-20 MGD) during these periods, while still delivering the required power reduction for the Enel X program. Flows during these periods of lowered production are typically distributed to the Talbert Barrier only. OCWD receives financial compensation for participating in this program.

Another unexpected power outage occurred on October 9 that caused the AWPF to shut down; while the actual power interruption was brief, multiple power and equipment issues followed which required extensive assistance from I&E and barrier operations staff to bring the AWPF back on-line on October 10.

Lastly, on December 9, a planned AWPF shutdown was scheduled for coordination with GWRSFE construction work (11.25 hours).

Appendix D includes a list of OCWD operators with their grades of certification as well as summaries of equipment calibration records for 2021. OCWD had approximately 60 water production staff in 2021, of which 22 are certified operators and five have the highest certification level (V). The AWPF control room is staffed 24 hours per day, 7 days per week.

2.3.2 Critical Control Points

Operation of the AWPF involves performance monitoring at multiple points or steps along the entire treatment process. This performance monitoring enables the operators to track how the system is doing at each step and gives them ample time to take corrective actions if necessary. Such performance monitoring ensures that the purified recycled water is safe, complies with regulatory requirements, and may be recharged and/or reused.

Critical control points and critical limits are shown in Table 2-8, as well as important process monitoring and control criteria used to operate the AWPF. Developed over time, the critical control points and critical limits were originally identified in the OOP (OMMP in 2008) and later modified in 2015-2016 with review and oversight by the Panel (NWRI, 2017). At the request of the Panel and in compliance with the groundwater recharge regulations (CCR, 2018), pressure decay test (PDT) results were added as an indicator of MF membrane integrity. Since 2017 and in response to new requirements from DDW (DDW, 2017), the critical control points and critical limits have been adapted to demonstrate daily pathogen log reduction values for compliance with the groundwater recharge regulations (CCR, 2018). OCWD submitted an updated OOP to DDW in 2018 (OCWD, 2018) documenting the criteria for pathogen log reduction values and adding electrical energy dose (EED) as an indicator of UV/AOP performance. Evaluation of operating records for each critical control point with respect to the associated critical limit provides an indication of performance during the year.

Appendix E contains plots of data from the AWPF process control system (PCS) showing how the AWPF operation compared with the critical limits listed above during 2021. Except for PDT monitoring, the critical control point readings are from continuous on-line analyzers rather than sampling and laboratory analyses. The plots in Appendix E are based on daily averages of the continuous data recorded at least every 15 minutes. Exceedance of a critical control point triggers alarms in the AWPF PCS for the operators to take corrective actions if a limit is exceeded. The critical control points and corresponding critical limits are used for operating the AWPF and were not historically used for permit compliance. However, in order to comply with updated DDW regulations, some of the critical control points have been adopted for the demonstration of pathogen log reduction values (LRVs) by each unit process; this is described in Sections 2.3.5.2 (MF), 2.3.6.5 (RO), and 2.3.7.2 (UV/AOP).

Table 2-8. Summary of Critical Control Points and Critical Limits

Parameter		Flow Stream or Process	Target Operating Range
1.	Combined Chlorine Residual	MFF	3 to 5 mg/L
2.	Combined Chlorine Residual	ROF	< 5 mg/L
3.	Turbidity	MFF	< 5 NTU optimum ≤ 20 NTU for membrane warranty > 20 NTU for no more than 4 hours < 50 NTU at all times
4.	Turbidity	MFE	< 0.15 NTU optimum > 0.20 NTU for no more than 4 hours ≤ 0.5 NTU at all times
5.	Turbidity	ROP	0.1 to 0.15 NTU
6.	Transmembrane Pressure (TMP)	MF	3 to 12.5 psi
7.	Pressure Decay Test (PDT) based on daily testing	MF	LRV calculation from PDT result < 4.00 LRV triggers shutdown of cell and work order to be issued < 0.5 psi/minute PDT at all times
8.	Electrical Conductivity	ROP	< 95 µmhos/cm[1] (< 110 µmhos/cm for individual units)
9.	Total Organic Carbon	ROP	≤ 0.1 mg/L
10.	UV Transmittance	UV/AOP	95% minimum (at 254 nanometers)
11.	Electrical Energy Dose (EED)	UV/AOP	0.23 kWh/kgal minimum[2]
12.	UV Train Power	UV/AOP	74 kW per train minimum
13.	Calculated UV Dose per Train	UV/AOP	111 mJ/cm^2 minimum[3]
14.	pH	FPW	< 9 units

[1] CCP in the OOP is 60 µmhos/cm. A 2015 statistical analysis of the on-line conductivity data resulted in a change of the CCP value to 95 µmhos/cm.

[2] EED is used to demonstrate compliance with 6-log virus reduction.

[3] Calculated UV dose per train is significantly greater than the minimum and is based on the equation shown below in performance paragraph #13.

Performance evaluation of the 2021 AWPF operations with respect to critical control points yields the following observations:

1. **MFF chlorine residual** (as chloramine) averaged 4.1 mg/L during 2021 (average of the daily averages of continuous on-line results) (See Appendix E, Figure E-1). While high and low values were detected, MFF chlorine residual readings primarily held steady within the target range between 3 and 5 mg/L to maintain chloramination and minimize the risk of breakpoint chlorination which can damage the membranes. Several MFF daily average chlorine residual readings below the 3 mg/L target (lowest was 2.5 mg/L) were periodically observed during 2021. Numerous MFF daily average chlorine residual readings above 5 mg/L (highest was 7.6 mg/L) were observed, particularly from late January to late February; the sodium hypochlorite dosage was increased to 9 mg/L in those months to mitigate winter MF membrane fouling and control MF process residuals (backwash and cleaning wastes). The sodium hypochlorite dose was adjusted from time to time to control MF membrane fouling and maintain a sufficiently high downstream %UVT.

2. **ROF chlorine residual** (as chloramine) was consistently less than the 5 mg/L maximum target throughout 2021 (See Appendix E, Figure E-2). The 2021 average chlorine residual was 3.1 mg/L (average of the daily averages of continuous on-line results). The maximum daily average ROF chlorine residual was approximately 4.8 mg/L in early November. The minimum daily average ROF chlorine residual was 2.5 mg/L in mid-October when a power interruption caused the AWPF to shut down. In general, the ROF chlorine residual trended slightly downwards during 2021. This may be an indication of increased chlorine demand in the feed water to GWRS or from fouling in the cartridge filters. Periodic cartridge filter cleanings with sodium hypochlorite soaks are performed to help prevent such issues.

3. **MFF turbidity** was consistently well below the operating target maximum of 20 NTU on a daily average basis; in fact, the daily average MFF turbidity was less than 5 NTU with only one exception (5.2 NTU) (based on daily averages of continuous on-line results) (See Appendix E, Figure E-3, and Section 2.2.2.2). The MFF turbidity averaged 3.2 NTU and ranged from 2.1 to 5.2 NTU (based on daily averages of continuous on-line results), indicative of the superior AWPF feedwater quality received from OC San's Plant 1 during 2021.

4. **MFE turbidity** was always well below the target of 0.15 NTU during 2021 (See Appendix E, Figure E-4, and Section 2.2.2.2). The maximum MFE turbidity (daily average of the nine turbidimeters on the 4-cell banks) was 0.05 NTU on three days in mid-June, early

September, and mid-October (the latter two occurred when the AWPF was restarted following shutdowns). The daily average MFE turbidity (average of continuous readings of nine MFE turbidimeters, one per bank of four MF cells) ranged between 0.02 and 0.05 NTU and averaged 0.03 NTU in 2021 (based on daily averages of continuous on-line results).

5. **ROP turbidity** was consistently in the target optimum operating range of less than 0.15 NTU in 2021 (based on daily averages of continuous on-line results) (See Appendix E, Figure E-5). The ROP turbidity averaged 0.02 NTU and ranged between 0.01 and 0.03 NTU during 2021.

6. **MF TMP** readings were within the target operating range of 3 to 12.5 pounds per square inch (psi) in 2021, except for readings that fell below the minimum range due to the AWPF shutdown from mid-August to early September (See Appendix E, Figure E-6). At the beginning and end of the lengthy shutdown period, several low daily average TMP readings (average for all operational MF cells) were observed, approximately 1.6 to 2.0 psi, as the AWPF shut down and restarted. The highest daily average TMP reading (average for all operational MF cells) was approximately 8.4 psi in February. The annual average TMP for all operational MF cells in 2021 was 6.7 psi (average of daily averages of continuous on-line results). In 2021 the daily average TMP readings of individual operating MF cells ranged from a minimum of 0.5 psi to a maximum of 11.4 psi.

7. **Daily average MF PDT** results across all operational cells were supportive in maintaining the targeted minimum pathogen log reduction value (LRV) of 4.00 by the MF process and less than the 0.5 psi/minute maximum throughout 2021 (See Appendix E, Figure E-7). OCWD continued to maintain an operational procedure to not operate any individual cell if its calculated LRV resulted from a PDT was less than 4.00. Daily average MF PDT results (average of all MF cells) ranged from 0.25 to 0.32 psi/minute, with one outlier of 0.16 psi/minute, during 2021. Individual MF cell PDT challenges are discussed in Section 2.3.5.1. Section 2.3.5.2 discusses MF PDT readings as they pertain to LRV calculations achieved by the MF process. The LRV reports are included in Appendix F.

8. **ROP electrical conductivity** (EC) exhibited minor seasonal changes during 2021 with all readings well below the maximum 95 µmhos/cm target (See Appendix E, Figure E-8). During 2021 the daily average ROP EC typically varied from lows near 23 µmhos/cm from January through March, then gradually increased to highs of approximately 45 µmhos/cm in mid-August, with one spike at 60 µmhos/cm just prior to the AWPF shutdown. Following the AWPF restart, the ROP EC was variable ranging from 32 to 48 µmhos/cm before decreasing to 27 µmhos/cm in late December. In general, the ROP EC followed

the seasonal trend of lower EC values in the cooler winter-spring months and higher EC values in the warmer summer-fall months. Overall, the ROP EC ranged between 23 and 60 µmhos/cm during 2021. On an annual average basis, the ROP EC was 33 µmhos/cm in 2021.

9. **ROP TOC** daily average levels were consistently below the maximum target of 0.1 mg/L (See Appendix E, Figure E-9) during 2021. The daily average ROP TOC concentration ranged from 0.04 to 0.09 mg/L based on on-line readings. The annual average ROP TOC concentration was 0.06 mg/L in 2021. RO TOC analyzer performance is discussed in Section 2.3.6.2. Section 2.3.6.5 discusses on-line ROP TOC monitoring for purposes of pathogen LRV calculations.

10. **UV transmittance** was greater than the minimum 95% (at 254 nanometers) target throughout 2021 (See Appendix E, Figure E-10). On-line %UVT values in 2021 ranged between 96.3% and 98.7%. The overall average %UVT in 2021 was 97.6%.

11. **UV EED** was consistently greater than the minimum target of 0.23 kWh/kgal established for the UV/AOP system (See Appendix E, Figure E-11). During 2021 the UV system EED varied from a low of 0.237 kWh/kgal to a high of 0.373 kWh/kgal (based on daily averages of continuous on-line readings). Elevated EED levels (0.30 to 0.373 kWh/kgal) occurred in mid-August as the AWPF prepared for a scheduled shutdown. The overall annual average EED was 0.255 kWh/kgal in 2021.

12. **UV train power levels** were above the minimum 74 kW consumption level for all trains (A through P) throughout 2021 (See Appendix E, Figure E-12). The individual UV trains generally operated at average power levels between 74 and 87 kW.

13. **Calculated UV dose per train** was significantly above the minimum 111 millijoules per square centimeter (mJ/cm^2) target (See Appendix E, Figure E-13). The lowest calculated UV dose of 249 mJ/cm^2 occurred in mid-July; the highest calculated UV dose of 410 mJ/cm^2 occurred mid-August as the AWPF was preparing to shut down for an extended period for GWRSFE construction. The average calculated UV dose during 2021 was 269 mJ/cm^2. The UV dose per train is calculated using the following equation:

Calculated Dosage per UV Train = (R * LP * 111 mJ/cm^2 * 5 MGD) / (100 * Q)

Where:

R	=	Number of reactors in service for a UV train
LP	=	Reactor Lamp Output is a function of the Reactor Ballast Power Level (BPL) as indicated in the SCADA system (values range from 60% to 100%) according to the relation LP = (-1.0674) + (0.0358 * BPL) – (0.000172 * BPL) and assumes lamps are at the end of their life
Q	=	Flow in MGD to a UV train

The GWRS OOP shows a minimum calculated UV dose per train CCL of 101 mj/cm^2 based on a pilot test indicating that this is the minimum dose required to provide 4-log inactivation of MS-2 phage. A more conservative UV dose of 111 mj/cm^2 is based on collimated beam testing at a UV transmittance of 90%. The AWPF UV system operates at a higher UV transmittance of 95% or more and a much higher UV dose.

UV/AOP critical control points applied for determining pathogen LRVs are discussed in Section 2.3.7.2.

14. **FPW pH** was consistently within the allowable range of 6 to 9 on a daily average basis (See Appendix E, Figure E-14). The daily average FPW pH measured on-line ranged from approximately 7.1 to 8.9; the annual average FPW pH was 8.4.

2.3.3 Source Water Availability

The availability of source water from OC San Plant 1 supplied as feedwater to the AWPF has largely supported purified recycled water production approaching its 100 MGD design production capacity since 2015. Two factors were responsible for improving source water availability: (1) the GWRS Initial Expansion SEFE facilities have managed the diurnal flow pattern of Plant 1 secondary effluent, delivering a more constant feedwater flow rate to the AWPF; and (2) OC San has operated the SALS to convey more raw wastewater to Plant 1 for treatment.

2.3.3.1 SALS Operation

During 2021 OC San Plant 1 delivered adequate volumes of secondary effluent to the AWPF, albeit the AWPF's purified recycled water production levels were limited at times by GWRSFE construction. The SALS reliably operated with three of the four pumps in service except for three one day events in October, November, and December when SALS was off-line for scheduled preventive maintenance.

2.3.3.2 SEFE Operation

Beginning in late 2020 and continuing through 2021, operation of the SEFE was modified to better optimize source water availability by more closely matching the SEFE operation to the diurnal flow curve. The SEFE storage tanks fill slowly with the goal of reaching a full level just prior to the Plant 1 diurnal flow curve decline. This operating plan provides adequate daytime source water flows to the AWPF, limits excess flow discharges to the outfall, and stores sufficient secondary effluent volumes in the SEFE tanks to supplement nighttime deliveries to the AWPF.

In late January 2021, SEFE Tank A01's drain valve actuator experienced problems that prevented it from being able to properly control the flowrate leaving the tank. Investigations determined that the actuator was not repairable and would need be replaced; the manufacturer was contacted in March and indicated that a new actuator was out-of-stock. In the meantime, both SEFE tanks' drain valves were set in a fixed 80% open position, and operation was changed to exclusively rely on a flow control valve to modulate stored flow returning from both tanks and maintain normal operation of the SEFE. At the end of 2021, the replacement drain valve actuator remained a long-lead item without an estimated delivery date.

In April 2021 one of the SEFE mixers failed and apparently needed a new battery. Installation of the new battery in May led to discovery that the mixer in SEFE Tank A01 had a damaged power cord. Further work on the mixer was postponed until the SEFE tank could be drained during the AWPF shutdown scheduled for late August. Inspections showed that the SEFE A01 mixer had become entangled in its suspended power cord and its collapsible draft suction chute was in poor condition; the SEFE A02 mixer was operable but had broken parts. While the manufacturer was contacted, neither mixer could be repaired within the AWPF shutdown period; both SEFE tanks were placed back in service without mixers in September. At the end of October, the SEFE tanks were again drained for the mixer manufacturer make repairs; the SEFE system with mixers was returned to service.

Draining the SEFE tanks during the AWPF shutdown (August 15-September 2) revealed approximately two to three inches of solids accumulation. SEFE Tank A01 was cleaned and placed back in service on September 3; SEFE Tank A02 remained off-line until it could be cleaned the following week and was returned to service on September 10. Both SEFE tanks continued to operate the remainder of 2021 without mixers, with their drain valves in fixed 80% open positions, and using the flow control valve to modulate flow.

2.3.3.3 Influent Screening Facility Operation

The source water flow (Q1) to the AWPF was severely restricted on March 24 when the influent screens became overloaded and obstructed by solids, causing the AWPF to shut down. The unexpected Q1 solids were the result of OC San staff simultaneously washing too many secondary clarifier weirs and launders at the same time. OCWD coordinated with OC San to limit the number of clarifiers cleaned to no more than two at a time, which resolved the influent screen clogging issues.

In November 2021, the influent screening facility experienced erratic level readings after the stilling well in the influent wet well became partly detached. OCWD maintenance staff shortened the stilling well and secured it to the wall with a security chain to prevent it from falling into the wet well and damaging the influent screens should it become completely detached. This effort resolved the influent level readings.

2.3.4 Source Water Quality

Source water quality was outstanding in 2021. The Plant 1 AS process generally produces secondary effluent with low nitrogen and turbidity levels because of the NdN operation. Brief source water availability issues also impacted water quality; for example, elevated solids levels caused by Plant 1 clarifier weir and launder washings blinded the influent screens. Recognizing the importance of influent screening to support source water quality, the downstream MFF turbidity did not noticeably decline as a result of this event.

In February 2021, OCWD replaced the Q1 original AS influent incandescent turbidimeter with a new higher resolution laser turbidimeter.

In June 2021, a special total suspended solids (TSS) sampling study was conducted on the Q1 and MFF streams in an effort to explore differences between the weekly MFF grab sample results (consistently higher TSS values) and the quarterly Q1 composite samples. Possible factors responsible for the difference were solids accumulations in the SEFE tanks that influenced the weekly MFF grab samples normally collected in the early morning (i.e., SEFE tanks draining). The special sampling study developed a schedule of six sampling dates and two times for each flow stream to compare the results (i.e., SEFE tanks filling and draining). Results of the special sampling study were inconclusive in verifying that the source of the higher TSS was the SEFE tanks. While changes to the sampling schedule were proposed, OCWD operations decided to wait until the SEFE tanks draining, cleaning, and inspection scheduled during the AWPF shutdown (August 15 – September 2) had been completed. Regardless of the cause of the elevated MFF TSS values, concentrations appeared to decline following the AWPF shutdown (25.0 mg/L average MFF TSS prior to shutdown vs. 6.4 mg/L average MFF TSS following shutdown).

OC San continued conducting TF clarifier cleanings at night up to four times per month throughout 2021. Since 2016 the practice of caustic treatments to control odors, snails, and birds at the TFs proved successful, and the timing of the events diluted the slug of caustic TF effluent with stored secondary effluent being released from the SEFE tanks during the night. Little or no change in the source water TOC concentration was observed at the AWPF during OC San's TF clarifier cleaning events.

OC San chlorinated the Plant 1 activated sludge processes secondary effluent channels for algae control periodically between May and July. No discernable impacts on the AWPF were observed.

2.3.5 MF System Operation and Performance

2.3.5.1 MF System Operation

The MF system operated well during 2021 and produced exceptional MF effluent (MFE) water quality that was fully compliant with Title 22 water recycling criteria. Various cells were temporarily taken off-line for normal pressure decay testing (PDT), preventive maintenance on valves and instruments, and clean-in-place (CIP) procedures. Some temporary cell downtimes were required to investigate and correct elevated PDT values, adjust vales, repair piping, and instrument communication issues.

Beginning in late 2020 and continuing through March 2021, all of the MF Train C cells received complete polypropylene membrane replacements. Originally installed with the GWRSIE in 2015, the Train C membranes were the oldest of the MF system prior to the replacements.

Various MF cells with older membranes continued to experience higher TMPs and PDTs, and lower LRV issues. OCWD Operations staff continued to follow the PDT retesting protocol that began in December 2020 and involved performing up to two additional PDT tests on any cell that showed a value of greater than 0.40 psi/min after its normal programmed PDT was completed each day. Retesting protocol steps are:

- Any cell with a daily PDT result greater than 0.40 psi/min is retested up to two times;
- If the first retest still shows a PDT greater than 0.40 psi/min, then a second retest is conducted.
- If the cell's second retest PDT exceeds 0.40 psi/min, but the cell has a calculated LRV above 4.0, the cell would remain in normal operation.
- If the cell's second retest PDT is above 0.40 psi/min, and its calculated LRV is below 4.0, the cell must remain out of service until a full CIP is completed before performing another PDT and LRV calculation.

The PDT retesting protocol commonly corrected a cell's low daily LRV test result. MF cells that were unable to achieve the PDT value necessary for an LRV calculation of at least 4.0-log for *Giardia* cysts or *Cryptosporidium* oocysts were taken out of service until the issue had been corrected. The PDT retesting protocol appeared to help control the MF operational issues commonly encountered during cold winter months. In addition, operators could switch struggling cells from automatic to manual fixed filtration rates to enable them to improve upon low LRV values.

Due to accelerated TMP gains, the MF CIP management regime was readjusted to keep TMPs under 12-13 psi. The Tier I CIP management plan called for performing full CIPs after each cell reached 408 hour/17 days of runtime, which was less than the standard 504 hours/21 days of runtime. In early 2021 as more MF cells struggled to maintain low TMPs, the winter period Tier

II CIP management plan was implemented; Tier II further reduced the CIP interval to 360 hours/15 days to control the TMPs and maximize each cells' production capability. In addition, MF cells experiencing issues were switched from automatic filtration rate mode to manual/fixed filtration rate mode to keep their TMPs below 12-13 psi until the cells came due for their 360 hours/15 days runtime CIPs; the lowest allowable fixed filtration rate was established at 2400 gpm before resorting to performing an even earlier full CIP to either correct a cell's high TMP or low LRV issue.

OCWD Operations performed numerous adjustments to manage the MF system PDTs, TMPs, and LRVs. Several of the Train A, B, D, and E cells experienced intermittent lower LRV results after completing their programmed PDTs. The low LRVs were predominately caused by (1) older polypropylene membranes (installed 2016-2017), (2) higher than normal PDT results (>.40 psi/min), and (3) cold feedwater temperatures (<78$^oF/25^oC$). Train C stopped experiencing these issues by March 2021 because all of its eight cells had received full membrane replacements. Adjusting the MF CIP management plan to decrease runtimes and perform more frequent CIPs helped manage the winter/cold water seasonal issues. By May 2021, Train C cells discontinued the Tier II CIP management approach and reverted to the standard 504 hours/21 day runtime CIP intervals; Trains A, B, D, and E remained on the Tier II winter period CIP management plan with more frequent CIPs.

Since 2018, performance tests have been conducted comparing operational parameters for polypropylene membranes and PVDF membranes. Two cells, E03 and E04, have been operating with PVDF membranes from Dupont-FilmTec and Scinor, respectively. While some winter period TMP gains were observed in the PVDF membrane cells, cell E04 continued to operate in the automatic filtration mode, maximizing production, and cell E03 operated at a reduced fixed filtration rate to help control the TMP gains; both achieved the full CIP interval (30 days). The GWRSFE will add 12 more PVDF cells (E05-E08 and F01-F08) with the goal to achieve continuously high filtration rates and support the AWPF's total design FPW production capacity of 130 MGD.

From July to October 2021, the feedwater temperature was warmer (above 81.7$^oF/27^oC$), which helped, but did not completely eliminate the low LRV events in various cells in Trains A, B, D, and E following the programmed PDTs. These cells with older polypropylene membrane cells were promoted to the Tier I CIP management schedule (408 hours/17 day runtimes) at reduced fixed filtration rates. Another key influence for the improvements were the early full CIPs followed by cell preservations that were made in early August prior to the scheduled AWPF shutdown. In September following the shutdown for GWRSFE construction work, the older polypropylene membrane cells in Trains A, B, D, and E remained at the Tier I CIP management level. Cell A03 was taken offline in late October after experiencing an exceptionally high PDT (greater than 60 psi/min); investigations found clover racks were leaking, and once these had been isolated and taken out of service, Cell A03 passed the next PDT test and returned to service in early November.

Beginning in mid-September 2021, Train B cells' membranes were gradually replaced with new polypropylene membranes in a sequential manner. After the membrane replacements, the Train B cells returned to the automatic mode and standard CIP schedule (504 hours/21-days runtime). Cells B03 and B04 were fitted with new polypropylene membranes in September; Cells B01 and B02 followed in October, and Cell B08 was completed in December.

With cooling water temperatures beginning November 2021, the older polypropylene membrane cells in Trains A, B (Cells B05-B08), D, and E were switched from the Tier I CIP management plan to the Tier II CIP management plan (full CIPs scheduled for 360 hours/15-day runtime intervals). The newer polypropylene membrane cells in Train C and Cells B01, B02, B03, and B04 remained on standard full CIP intervals of 504 hours/21-days.

In December 2021, OCWD worked with Dupont-FilmTec to conduct a special PVDF membrane cleaning study. It was hypothesized cooler winter temperatures contributed to higher levels of biological foulants in the MF feedwater. The CIP trial evaluated using extended sodium hypochlorite soaks on Cell E03's PVDF membranes to help reduce their operating pressures. Results of the special study indicated only a short-lived improvement in operating pressures was achieved before the pressure gains reverting to the prior levels, which necessitated lowering Cell E03's fixed filtration set point to control TMPs.

2.3.5.2 MF System Pathogen Log Reduction Monitoring

The MF process receives pathogen log reduction credits for *Giardia* cysts and *Cryptosporidium* oocysts in accordance with the updated OOP (OCWD, 2018). No credit for reduction of enteric virus is attributed to the MF process. A combination of on-line turbidimeters and daily PDT results are used to show compliance with pathogen removal requirements. The critical control points and critical limits designated for MFE turbidity and MF PDT (Table 2-8) establish the criteria that enable the MF process to demonstrate at least 4-log reduction of *Giardia* cysts and *Cryptosporidium* oocysts.

Continuous MFF and MFE turbidity readings, plus daily MF PDT results are critical control points and compliance with those critical limits supports the pathogen reduction by the MF process. (See Appendix E, Figures E-3, E-4, and E-7, respectively.) The MFE turbidity and MF PDT results are recorded and used to calculate the pathogen log removal credit achieved by the MF process in accordance with the *Membrane Filtration Guidance Manual* (USEPA, 2005). The calculated pathogen log removal is automatically displayed in the GWRS PCS and recorded as explained in the OOP (OCWD, 2018). If a log removal result based on the PDT calculation for an individual cell is less than 4-log based on the retesting protocol described in Section 2.3.5.1, the affected cell is taken out of service until the cell can comply with the 4-log reduction requirement. Any daily PDT result above 0.40 psi/minute requires retesting of that cell (up to two retests as outlined in the previous section).

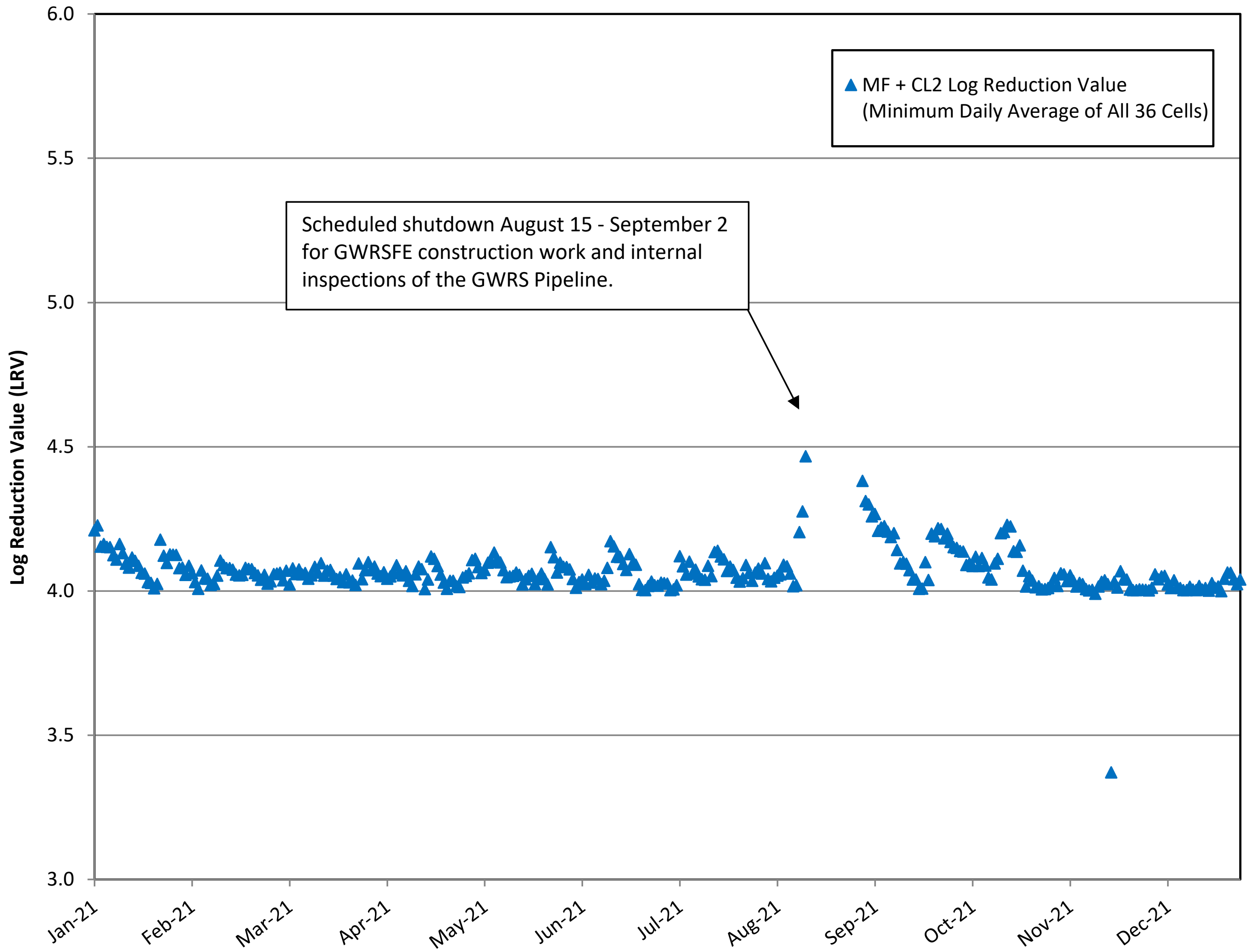
Monthly reports are submitted to DDW documenting the daily pathogen log reduction values achieved by the MF process. Appendix F contains copies of the 2021 monthly reports submitted to DDW and the RWQCB documenting pathogenic microorganism control achieved by GWRS.

MF membrane integrity is monitored continuously with on-line turbidimeters on the MFF and MFE flow streams. The MFE turbidity is continuously measured using nine individual turbidimeters, each assigned to a group of four MF cells. In addition, one bulk MFE turbidimeter continuously tracks the combined MFE flow stream. As noted in Table 2-8, OCWD's critical limit for MFE turbidity as a critical control point for optimum MF performance is 0.15 NTU.

On an annual average basis, the MFF turbidity of 3.25 NTU was consistently reduced through the MF process to an MFE turbidity of 0.03 NTU, which is equivalent to a 99.0% reduction (See Table 2-3, Figure 2-8, and Appendix F). The maximum MFE turbidity reading of 0.05 NTU was reached on several days in mid-June and again in early September, demonstrating membrane integrity, i.e., the MFE turbidity was consistently less than 0.2 NTU throughout 2021.

Corresponding daily average PDT results for all cells confirm MF membrane integrity based on pressure decay results were within the target range throughout 2021 (See Appendix E, Figure E-7). OCWD tracks the daily PDT results for each MF cell to recognize trends and confirm membrane integrity.

Figure 2-21 graphically illustrates the minimum log reduction values for *Giardia* cysts and *Cryptosporidium* oocysts achieved by the MF process (lowest PDT-based daily log reduction value achieved by any single MF cell) in 2021. (See Appendix F for monthly reports). The lowest minimum log reduction value achieved in 2021 for these pathogens by the MF process (all 36 MF cells) was 3.4-log (November 20). Operations staff re-ran the PDT to confirm the low value on the MF cell with reported LRV below 4.0-log (cell A03). The second PDT also resulted in an LRV below 4.0-log, so the cell was secured for repairs; cell A03 was returned to service on November 22. The annual average minimum log reduction value achieved in 2021 for these pathogens was 4.1-log (based on the daily minimum log reduction value of all 36 MF cells). Collectively, the MFE turbidity and PDT data demonstrate that the MF process achieved greater than the target of 4-log reduction for both *Giardia* cysts and *Cryptosporidium* oocysts, except on one day during 2021; the MF deficit on that day was made up by the RO and UV/AOP processes to achieve over 12-log total reduction of both *Giardia* cysts and *Cryptosporidium* oocysts.



Giardia cysts and *Cryptosporidium* oocysts LRV based on USEPA Membrane Filtration Guidance Manual (USEPA, 2005) and sensitive at less than 3 microns.

Figure 2-21. MF Log Reduction Values in 2021: *Giardia* Cysts and *Cryptosporidium* Oocysts (Minimum Daily Value of All 36 MF Cells)

2.3.6 RO System Operation and Performance

The RO system performed well during 2021. Beginning in mid-2015 and continuing through 2021, the three-stage RO system operated at an ROF pH of 6.9 and recovery rate of 85%. No RO membranes were replaced in 2021. Table 2-9 lists the RO membrane types and dates installed in each of the 21 RO units. Highlights of the RO system operation in 2021 are discussed below.

Table 2-9. RO System Membranes

RO Train[1]	RO Unit	Membrane Type[2]	Installation Date
A	A01	LG Chemical	October 2018
	A02	LG Chemical	October 2018
	A03	LG Chemical	October 2018
B	B01	Dupont-FilmTec BW30XFRLE	October 2020
	B02	Hydranautics ESPA2-LD	February 2016[3]
	B03	Hydranautics ESPA2-LD	January 2017[3]
C	C01	Dow BW30XFRLE	October 2020
	C02	Hydranautics ESPA2-LD	February 2016[3]
	C03	Hydranautics ESPA2-LD	January 2017[3]
D	D01	Dupont-FilmTec BW30XFRLE	October 2020
	D02	Hydranautics ESPA2-LD	January 2016[3]
	D03	Hydranautics ESPA2-LD	February 2017[3]
E	E01	Hydranautics ESPA2-LD	March 2017[3]
	E02	Hydranautics ESPA2-LD	March 2017[3]
	E03	Hydranautics ESPA2-LD	March 2017[3]
F	F01	Dupont-FilmTec XFRLE-400	April 2015
	F02	Dupont-FilmTec XFRLE-400	April 2015
	F03	Dupont-FilmTec XFRLE-400	April 2015
G	G01	Dupont-FilmTec XFRLE-400	May 2015
	G02	Dupont-FilmTec XFRLE-400	May 2015
	G03	Dupont-FilmTec XFRLE-400	May 2015

[1] Trains F and G have ERDs. Trains A through E do not have ERDs.
[2] Thin Film Composite Polyamide RO Membranes.
[3] Limited "stage-only" membrane replacements with newer used membranes from other RO units were completed in 2020.

2.3.6.1 RO System Cartridge Filters

The 10-micron cartridge filters on the ROF stream that had been installed in July 2020 were systematically soaked with sodium hypochlorite solution in February, April, May, and June 2021 to decrease the differential pressure loss. During each event, pairs of cartridge filters were removed from service, soaked in sodium hypochlorite solution for approximately six to eight hours, flushed, and then soaked again for another six to eight hours, gradually cleaning all 14 cartridge filters. Each soaking event reduced the differential pressure drop across the cartridge filters; however, each successive differential pressure recovery period gained by the soaks became shorter and shorter, indicating that the year-old cartridge filters were spent and due for replacement. All 14 cartridge filters were replaced with new 10-micron filters in early July 2021. No unusual accumulations of foulant, debris, of filter degradation was observed on the old cartridge filters.

More sodium hypochlorite soaks were performed in August 2021 to prevent biofouling during the scheduled AWPF shutdown period. In late September two new cartridge filters installed with the GWRSFE were placed into service increasing the total number of cartridge filter units to sixteen.

2.3.6.2 RO System TOC Analyzers

For the most part, the pairs of redundant ROF and ROP on-line TOC analyzers installed in early 2018 operated well and within in acceptable deviation ranges (3-5%) in their respective readings throughout 2021. The two redundant ROF and two redundant ROP TOC analyzers exhibited only brief spikes of false high and low TOC readings, which was a significant improvement over prior years' instability issues.

One reason for the improvement was a change in the post-CIP flush procedure beginning in January 2021. OCWD Operations followed the standard procedure of performing 60-90 minute post-CIP unit permeate flushes to waste, and then drained the RO unit(s) and flushed them again for another 45 minutes to waste before placing the RO unit(s) back in service. The extra draining and flushing to waste steps appeared to eliminate the brief ROP TOC spikes that commonly occurred while bringing RO unit(s) back online after RO CIPs.

Brief ROP TOC spike events above the internal CCP target (0.10 mg/L) occurred in February, September, and December. The first elevated ROP TOC event occurred on February 16 and lasted 3.8 hours; the maximum ROP TOC was 0.16 mg/L. Following the TOC Response Matrix, OCWD Operations contacted the OC San operations control center to inquire if Plant 1 may have had any activities associated with the elevated TOC. During this period, the two ROF TOC analyzers registered slightly higher than normal TOC levels, 9.8 and 9.2 mg/L. OC San operations noted that the Plant 1 primary treatment processes had suffered an unexpected SCADA/PLC communication issue, which had been resolved. They also confirmed that a scheduled caustic cleaning release into the collection system had migrated through Plant 1 and had likely impacted the secondary effluent quality. OCWD collected special samples for laboratory analysis during the TOC spike event; results of the analyses revealed higher than normal concentrations of acetone; the elevated ROP acetone concentration was 137 µg/L during the TOC spike event as compared with the typical ROP acetone concentration of 1 µg/L. In the past, similar OC San scheduled caustic cleaning events have appeared to be cause of elevated acetone levels and ROP

TOC spikes. While elevated, the ROP TOC never exceeded or approached the 0.50 mg/L permit limit. Furthermore, the elevated ROP acetone concentration during the spike event was well below the EPA non-cancer toxicity value (Reference Dose [RfD]) for acetone, which is translated to a drinking water equivalent level (DWEL) of 6,300 µg/L (USEPA, 2003).

Two elevated ROP TOC events occurred in September 2021. An elevated ROP TOC event occurred on September 3 and lasted for 4.3 hours; the maximum ROP TOC was 0.12 mg/L. Another elevated ROP TOC event occurred on September 16 and lasted for 5.5 hours; the maximum ROP TOC was 0.2 mg/L. OCWD collected special samples for laboratory analysis during these events and the test results indicated higher than normal levels of acetone. On September 3, the elevated ROP acetone concentration was 15 µg/L; on September 16, the elevated ROP acetone concentration was 256 µg/L; both of which were higher than the typical ROP acetone concentration of 1 µg/L, and well below the EPA RfD and DWEL discussed above. The OCWD Operations contacted OC San Plant 1 operations, and they were unaware of any related process issues. Nonetheless, OCWD Operations concluded the ROP TOC spike events had been caused by the source water to the AWPF. Again, while elevated above normal conditions and triggering procedures in the TOC Response Matrix, the ROP TOC levels remained well below the 0.50 mg/L permit limit.

On December 9, the bulk ROP TOC analyzer readings exceeded the CCP target of 0.1 mg/L twice. The initial event lasted 34 minutes with a maximum ROP TOC of 0.22 mg/L; after returning to normal levels (below the CCP), a subsequent event occurred when the ROP TOC reached a maximum of 0.11 mg/L for two minutes. Both events occurred while restarting the AWPF after a scheduled shutdown for GWRSFE work and the ROP TOC stayed well below the 0.50 mg/L permit limit.

On December 14, the ROP 24-hour composite samples analyzed by the OCWD laboratory showed elevated TOC results of 0.57 and 0.59 mg/L in the standard and duplicate samples. Review of the continuous bulk ROP TOC analyzers results that day showed stable readings with a maximum of 0.07 mg/L. OCWD staff believe that the wrong composite-grab sample was inadvertently deposited into the primary ROP composite sample bottle during one of the process composite sampling rounds that occur on 3-hour intervals.

Lastly, an elevated bulk ROP turbidity event that very briefly exceeded the permit limit occurred on October 10 while the AWPF was being restarted after an unexpected power outage. The bulk ROP turbidity exceeded 0.2 NTU for 12 minutes, which is below the 72 minutes within 24 hours permit limit, and 0.5 NTU for one minute. No bulk ROP TOC or EC excursions were observed.

2.3.6.3 RO System Third-Stage Fouling

Studies of third-stage fouling and comparisons of cleaning regimes continued during 2021. OCWD worked with an antiscalant supplier, American Water Chemicals (AWC) to evaluate new cleaning chemicals and procedures to control silica scale. Results of AWC's cleaning tests showed the AWC C-227 high pH membrane cleaner effectively recovered the pre-CIP membrane's permeability by using a solution of pH 12. In January 2021 OCWD changed the CIP procedures to use AWC's C-227 followed by standard citric acid washes to continue the evaluation. In December 2021, results of OCWD's CIP studies and flow tests performed on RO units F01 and G01 continued to show that the AWC C-227 cleaning product appeared to provide better results than the Avista P-111 cleaning product.

AWC offered other suggested products for consideration and testing by OCWD, which led to a cleaning trial specific to the Dupont-FilmTec XFLRE 3rd stage membranes in RO units F01, F03, G01, and G03. The trial tests compared two cleaning methods using AWC C-227 2% solution (at 12 pH/95 ^{o}F) followed by either (1) 2% citric acid washes (2.0-2.5 pH at ambient temp) in RO units F01 and G01, and (2) citric acid combined with AWC's new C-291 fluoride-based liquid silica remover cleaning solution in RO units F03 and G03. After completing the trial tests, two third-stage tail-end membranes were removed from RO units F03 and G03 in February and sent to AWC for autopsies to assess the new C-219 silica remover's effectiveness. Results of the third-stage cleaning trial showed no remaining presence of silica scale.

A subsequent cleaning trial evaluated the potential of another new AWC chemical, Oxysperse. AWC's theory was that dichloramines could affect the chemical properties of thin film composite RO membranes, ultimately causing them to lose permeability, and that Oxysperse could reduce the permeability loss. OCWD supported AWC's trial tests by sending AWC post CIP membranes from RO unit C02 (newly cleaned first-stage tail-end membranes (Hydranautics ESPA2-LD) and after a week of operation, another first stage tail-and lead membrane).

AWC's initial permeability recovery test results for the membranes from RO unit C02's first-stage showed that a 1% Oxysperse solution effectively recovered the membranes' permeabilities. In July 2021 OCWD provided more membranes from RO unit C02 (second- and third-stage lead and tail-end membranes) to support AWC's continuing tests of Oxysperse, hypothesizing that each stage would likely have different levels of dichloramine exposure. The goal of the tests were to optimize the specific concentration of Oxysperse for recovering permeabilities without negatively affecting the membranes' salt rejection. Test results were promising, indicating that Oxysperse treatment could noticeably improve membrane recovery (flow) while minimizing salt rejection loss. The test membranes were returned in August to OCWD where they were inventoried as spares for future use. Further testing was postponed due to GWRSFE construction activities and planned membrane replacements scheduled for three RO units (B02, C02, and D02).

2.3.6.4 RO System Energy Recovery Devices

All six of the Train F and Train G ERDs were in service operating at their design set points from January until mid-April 2021 when the ERD motor replacements scheduled with GWRSFE construction began (changing from 50 to 100 Hp). The ERDs from RO Train G were off-line from for almost six weeks; RO units G01, G02, and G03 continued operation without their ERDs during this period. The ERDs from RO Train F were taken off-line in early May for scheduled replacement with GWRSFE. Similarly, RO units F01, F02, and F03 remained in operation without their ERDs until the new motors were installed the ERDs returned to service in early June. All six ERDs operated normally at their design set points for the remainder of 2021.

2.3.6.5 RO System Pathogen Log Reduction Monitoring

The RO process receives a nominal pathogen log reduction credit of 2-log each for *Giardia* cysts, *Cryptosporidium* oocysts, and enteric virus, and monitoring is conducted in accordance with the updated OOP (OCWD, 2018) to determine the actual daily credit achieved. Two redundant on-line TOC analyzers (one duty and one standby) continuously monitor the bulk (common header) ROF flow stream, providing full redundancy; likewise, two redundant on-line TOC analyzers (one duty and one standby) continuously monitor the bulk (common header) ROP flow stream, providing full redundancy. Minimum, maximum, and average results are recorded daily along with the calculated average percent daily TOC removal. Monthly reports are submitted to DDW and the RWQCB documenting the daily pathogen log reduction values achieved by the RO process.

The RO process performance for pathogen reduction is measured using TOC removal (OCWD and DDB Engineering, Inc., 2014). DDW has approved this methodology that uses on-line TOC as a surrogate for RO membrane integrity and pathogen reduction (CDPH, 2014). TOC removal as a continuous indicator of membrane integrity in 2021 compared on-line ROF and ROP TOC data. (See also critical control points discussion in Section 2.3 and Appendix E, Figure E-9 for ROP TOC results.)

Figure 2-22 shows the daily average on-line ROF and ROP TOC results in 2021.

Figure 2-23 illustrates the minimum daily average pathogen log reduction values achieved by the RO process based on TOC monitoring in 2021 as reported to DDW and the RWQCB; Appendix F includes monthly pathogen reduction reports in 2021.

The pathogen log reduction values demonstrated by the RO process were equal to or greater than 2.00-log based on on-line TOC readings in 2021. The lowest pathogen log reduction value was 2.01-log on September 16. The maximum demonstrated pathogen log reduction value was 2.37-log on January 31.

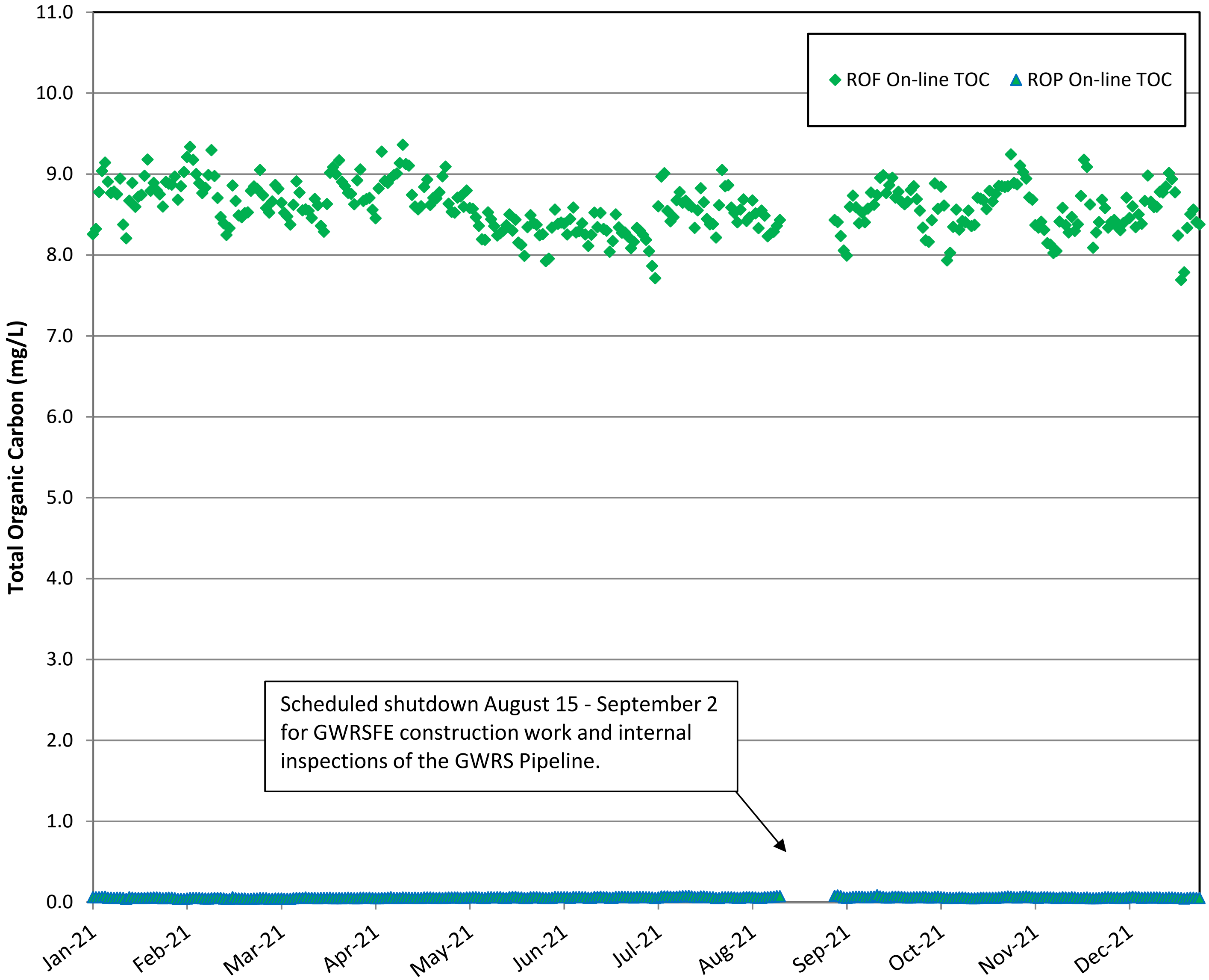


Figure 2-22. TOC Reduction Achieved by the RO Process in 2021

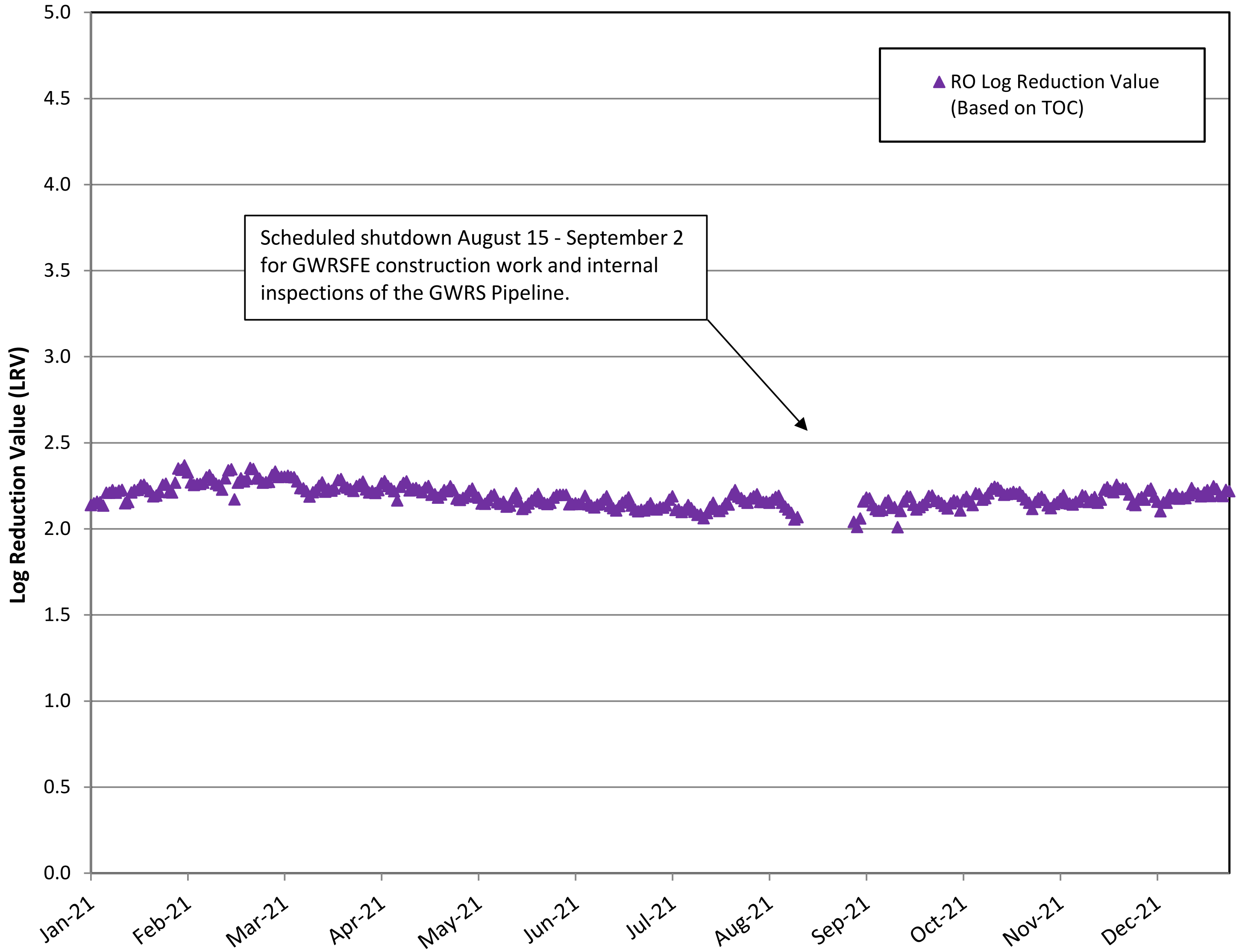


Figure 2-23. RO Log Reduction Values in 2021: *Giardia* Cysts, *Cryptosporidium* Oocysts, and Virus

2.3.7 Ultraviolet/Advanced Oxidation Process Operation and Performance

2.3.7.1 UV/AOP System Operation

The three new UV trains - N, O, and P – were installed with the GWRSFE and completed the 30-day commissioning period in February 2021. As a whole, the UV/AOP system operated fairly well during 2021, but periodically experienced various issues that I&E staff were able to correct.

Several UV train reactors experienced low UV intensity readings that were corrected by (1) replacing the UV intensity meter transmitter, (2) tightening loose wiring connections, (3) installing a new UV intensity sensor, or (4) replacing UV lamps. UV intensity is not a CCL for the AWPF as the SCADA/PCS shows individual lamp failures, which are more directly applicable to UV dose. OCWD staff continued replacing UV lamps according to the normal preventive maintenance schedule.

Standby reactors came on-line when necessary. For example, in early August, the UV train G reactor 3:2 power distribution center failed and standby reactor 2:2 automatically came on-line. Later that same day, I&E staff corrected the issue by cycling the local power supply breaker for reactor 3:2. Another corrective maintenance issue involved replacing ballasts in UV trains G and O (the latter was still under warranty). Other issues required replacement of a blown fuse to correct a power inverter alarm condition in UV train P; cycling power on and off corrected a communication issue in UV train K.

In September, multiple chiller pumps experienced air entrainment issues primarily related to the extended AWPF shutdown (August 15 – September 2), during which the UV trains were drained. Upon restart, it was necessary to bleed entrained air from the chiller pumps' supply and return lines. One chiller pump for UV train H was replaced due to extensive air entrainment issues.

Normally the hydrogen peroxide metering pumps operate in a two-duty, one-standby arrangement. Operators staff on each shift check the accuracy of the pump feed rates using calibration columns (target is 3 mg/L). In mid-January, one of the hydrogen peroxide metering pumps (A-12) was found to be underdosing and repeated adjustments failed to correct the issue; the problematic pump was sent to the manufacturer for repairs. A replacement hydrogen peroxide metering pump was installed in mid-May, and it, too, exhibited dosing stability issues. Adjustment of the stroke length from standard 70% to 90% appeared to improve its dosing stability. Another hydrogen peroxide metering pump (A-13) had leaks from its pressure relief valve; maintenance staff cleaned and rebuilt the pump to correct the issue. Further investigations about dosing stability continued. In July, the main issue for new metering pump (A-12) was identified and attributed to a failed pressure gauge leaking glycerin; the high viscosity glycerin prevented the pump diaphragms from operating properly. After the pressure gauge was repaired and the pump was cleaned, operations was able to reduce its stroke length to the standard 70% and dosing stability was regained in July. However, in September the same metering pump (A-12) was again underdosing; maintenance staff replaced the leaking pressure gauge, cleaned the pump, and returned it to service.

2.3.7.2 UV/AOP Pathogen Log Reduction Monitoring

The UV/AOP system receives up to 6-log pathogen log reduction credit each for *Giardia* cysts, *Cryptosporidium* oocysts, and enteric virus in accordance with the updated OOP (OCWD, 2018). The on-line UV transmittance analyzer and ballast power level are used to verify the 6-log pathogen removal. By continuously monitoring critical control points, a UV transmittance of at least 95% combined with a minimum UV power level of 74 kW per train ensure that a minimum EED of 0.23 kWh/kgal achieves the required 6-log pathogen reduction.

The UV/AOP system continuously monitors UV transmittance, UV train power levels, calculated UV dose, and EED, which are all critical control points (See Appendix E, Figures E-10, E-11, E-12, and E-13). The pathogen reduction credits achieved by the UV/AOP process are based on these critical control points (OCWD and DDB Engineering, Inc. 2014) with the approval of DDW (CDPH, 2014).

Operating records for 2021 show that the monthly average calculated EED ranged from 0.237 to 0.373 kWh/kgal, which is greater than the minimum EED of 0.23 kWh/kgal approved by DDW for the UV system.

The daily average on-line UV transmittance values during 2021 were above the minimum 95% target at all times. Brief operating issues associated with the UV intensity analyzers were corrected as discussed in Section 2.3.7.2.

The on-line UV train power was greater than the minimum critical limits for each UV train, with the exception of the new UV trains N, O, and P primarily during their 30-day commissioning period in February. The calculated UV dose was always more than two times the minimum UV dose of 111 mJ/cm^2 required for disinfection; and the EED was consistently greater than the minimum 0.23 kWh/kgal for virus reduction. Furthermore, the log reduction of 1,4-dioxane (Table 2-6) was consistently well above the minimum 0.5-log requirement.

On this basis, the UV/AOP system can be credited for 6-log reduction of *Giardia* cysts, *Cryptosporidium* oocysts, and viruses during 2021. Figure 2-24 illustrates the daily LRV credits achieved by the UV/AOP system in 2021.

2.3.8 Decarbonation and Lime System Operation and Performance

Post-treatment systems include decarbonation and lime addition for pH adjustment and corrosivity control prior to recharging the finished product water. Post-treatment is required to stabilize the ROP stream because excess carbon dioxide builds up through the RO system as a

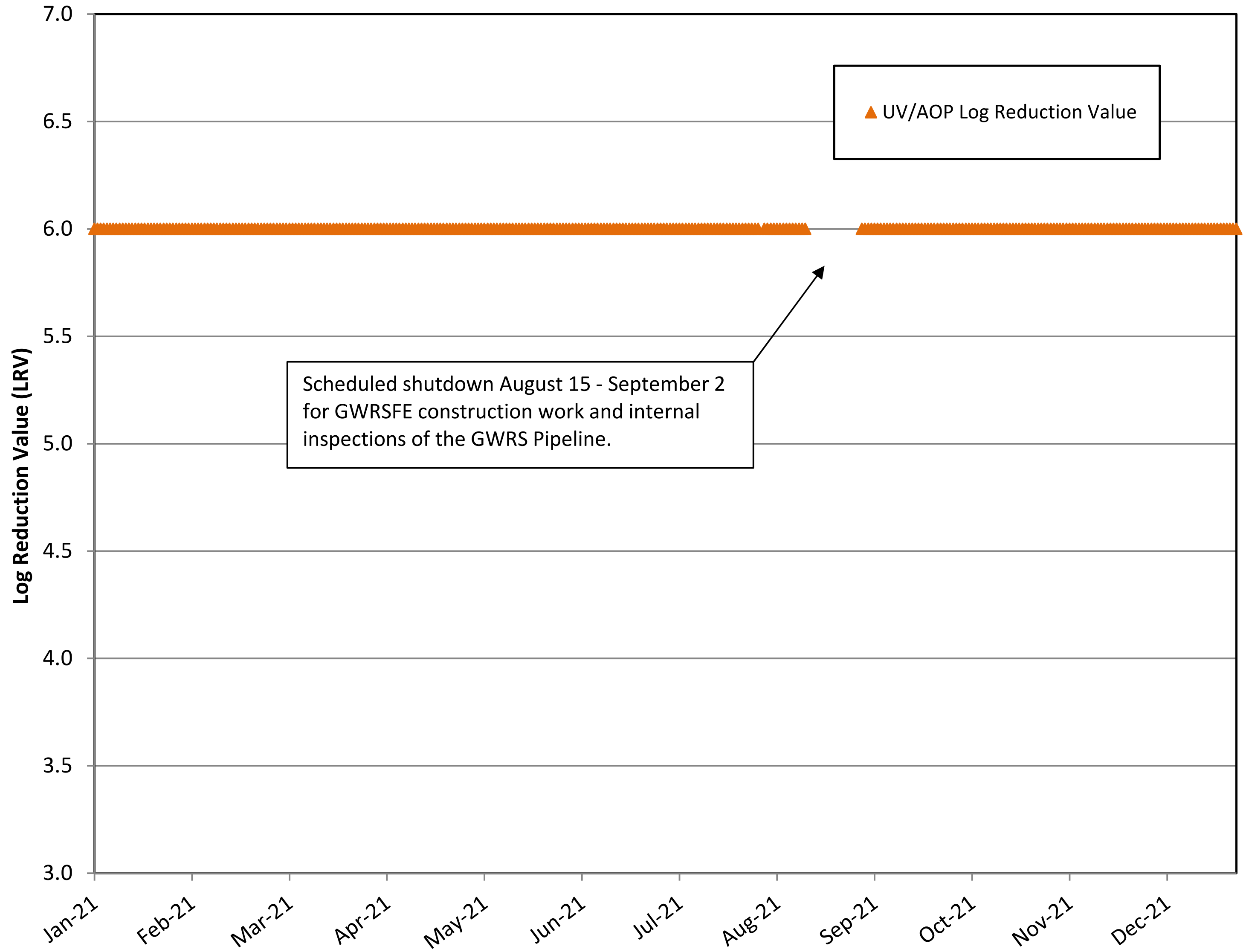


Figure 2-24. UV/AOP Log Reduction Values in 2021: *Giardia* Cysts, *Cryptosporidium* Oocysts and Virus

result of the lower ROF pH. The excess carbon dioxide and removal of alkalinity drives down the pH of the ROP water. In order to remove excess carbon dioxide, which remains through the closed UV/AOP process, a portion of UVP is sent to decarbonation towers. These towers are filled with plastic media and the water being treated is trickled down over the media while a counter-current fan blows air onto the water, off-gassing, or releasing, the excess carbon dioxide and yielding decarbonated product water (DPW). To ensure that not all of the carbon dioxide is removed, a portion of the UVP is bypassed around the decarbonation process and then mixed with the DPW. Adjusting the percentage of UVP that is bypassed around the decarbonation process helps to control the FPW pH and alkalinity.

Hydrated lime (in the form of calcium hydroxide) addition is the final post-treatment step, adding minerals back into the RO/UV/AOP-treated water in the form of calcium and alkalinity to help stabilize the water and reduce its corrosivity.

A Tekkem lime delivery system began operation in late 2014 replacing the original GWRS lime delivery system. The Tekkem system is gravimetric, meaning that it uses weight to ensure the correct lime slurry concentration is maintained. The lime system consists of several components including: bulk storage of hydrated lime in silos; screw feeders moving dry lime to slaker tanks where it is mixed with water before being transferred; slurry aging tanks with loop pumps that convey slurry to a dosing assembly that feeds the saturators; polymer feed system to control lime particle carryover; and saturators acting as solids contact clarifiers to feed saturated lime solution to the FPW channel.

OCWD continued to optimize flow patterns through the decarbonation towers and RO flush supply tanks to stabilize the DPW prior to introducing DPW to the lime stabilization process. Operation of the lime saturators is enhanced by using fully decarbonated DPW because decarbonation expels carbon dioxide which can cause excess calcium carbonate precipitation in the saturators. One RO flush supply tank (A01) receives fully decarbonated DPW and supplies DPW to the RO flush pumps, dilution water for hydrogen peroxide, and dilution water for all lime processes (slurry production, polymer dilution, and saturator dilution). The other RO flush supply tank (A02) receives a blend of decarbonated and bypassed flow. The RO flush tanks discharge to segregated, parallel FPW channels where their respective amounts of lime saturated water are added and mixed. These streams are then blended in the common FPW channel.

The decarbonation bypass flow rate is adjusted for continuous management of the FPW pH (i.e., more bypass decreases the FPW pH; less bypass increases the FPW pH). The lime dose is also reduced to control high FPW pH periods when the decarbonation bypass flow rate cannot be further decreased. The partially decarbonated bypass flow (from RO flush tank A02) is the primary variable used to maintain FPW pH stability; most of the lime-saturated water is added to the partially decarbonated bypass stream under normal operating conditions.

Adjustments to the ROP/decarbonation bypass flow were made from time to time during 2021 by changing the decarbonation tower feed valve settings; the purpose of these adjustments was to limit back pressure on the UV and RO processes while maintaining the FPW pH near the target pH of 8.5. The decarbonation bypass flow ranged from 70% to 90% of the AWPF production in 2021.

The lime dose averaged 26 mg/L, with brief intermittent reductions to as low as 22 mg/L for FPW pH control. The FPW pH was maintained between 7.5 and 8.9, with an average of 8.5 based on grab samples in 2021. On January 12-13, the AWPF was operated in the bypass mode, sending all FPW to the OC San ocean outfall system, while the new UV trains (N, O, and P) were being commissioned. Accordingly, the lime dose was reduced to 20 mg/L with a target FPW pH of 7.0 to 7.5 to avoid causing OC San any high pH discharge compliance issues.

In early March, a temporary polymer tote system was used while the GWRSFE contractor replaced the smaller bulk storage tank and four existing polymer blend units with larger units. The new larger bulk polymer storage tank was fully commissioned in August and the four polymer blend units began commissioning in April, albeit with low pressure issues on the DPW dilution water. On April 23, the dilution water for all four polymer blend units was switched from DPW to industrial water as an interim solution. Industrial water is potable water purchased from the City of Fountain Valley and delivered via an air gap connection. Using industrial water for the polymer system increased the FPW particle counter readings from approximately 2,000 to 2,500 up to 6,000 to 6,500, most likely due to the industrial water's higher carbon dioxide content as compared with DPW; the higher carbon dioxide level can cause lime saturated water to precipitate into fine particles. Although the particle counter registered the change, the FPW turbidity showed no significant effects. Operations increased the DPW operating pressure on June 14 and changed the dilution water supply for the polymer system back to DPW. By the end of June, the FPW particle counter exhibited improved, lower readings. The return to DPW was also a cost savings by reducing the demand for industrial water (FV potable). The new polymer system (storage tank and four blending units) completed commissioning and was placed in service in early August.

One of the decarbonation bypass valves experienced an actuator oil/grease leak beginning in late 2020. While that type of actuator had become obsolete, it was possible to order a seal replacement kit to correct the leak in lieu of replacing the actuator. The seal replacement kit was back-ordered for months and was finally received and installed in September 2021, correcting the leak.

2.3.9 Summary of GWRS Pathogen Log Reduction Monitoring in 2021

Table 2-10 summarizes the minimum daily total pathogen log reduction credits achieved by GWRS in 2021, demonstrating compliance with the Title 22 Water Recycling Regulations (CCR, 2018). Figure 2-25 illustrates the minimum daily total pathogen log reduction values.

GWRS complies with pathogen reduction requirements using the MF, RO, and UV/AOP processes at the AWPF as discussed above plus underground retention as an environmental barrier. Although allowed by the regulations (CCR, 2018), no credit is currently granted for primary and secondary treatment.

Table 2-10. Summary of GWRS Minimum Pathogen Log Reduction Credits Achieved in 2021

Pathogen	Minimum Log Reduction Requirements[1]	Minimum Daily Pathogen Log Reduction Value Achieved in 2021[2]					
		OC San Plant 1[3]	MF and Cl_2[4]	RO[5]	UV/AOP[6]	Underground Retention Time[7]	Total[8]
Giardia cysts	10	0	3.37	2.01	6.00	0	11.5
Cryptosporidium oocysts	10	0	3.37	2.01	6.00	0	11.5
Viruses	12	0	0	2.01	6.00	4	12.0

[1] Per Title 22 Water Recycling Criteria (CCR, 2018).

[2] Minimum daily log reduction value achieved by each process in 2021. Daily minimums are not additive. Daily minimums for each process may occur on different dates such that the sum of the daily minimums does not reflect the total daily minimum. (e.g., MF+Cl_2 minimum LRV (3.37-log) occurred on 11/20/2021. RO LRV was 2.01-log on 9/16/2021.) See Appendix F for details.

[3] No pathogen reduction credits taken for secondary treatment.

[4] Minimum daily LRVs for *Giardia* cysts and *Cryptosporidium* oocysts achieved by MF with chlorination occurred on 11/20/2021. No virus reduction credit taken for MF with chlorination. See Appendix F for details.

[5] Minimum daily pathogen LRVs achieved by RO occurred on 9/16/2021. See Appendix F for details.

[6] Minimum daily pathogen LRVs achieved by UV/AOP occurred on 1/1-12/31/2021. See Appendix F for details.

[7] Minimum daily virus LRV credit of 4-log for underground retention time from 1/1-12/31/2021. See Appendix F for details.

[8] Total daily minimum LRV for all processes in 2021. Totals are not additive per footnote 2. See Appendix F for details.

In addition to the pathogen log reduction achieved by the MF, RO, and UV/AOP systems, GWRS provides a minimum underground retention time prior to withdrawal at the nearest drinking water well of more than four months via established primary and secondary buffer areas at the Talbert Barrier and Anaheim Forebay that were confirmed by tracer studies; the Mid-Basin Injection area has approved buffer areas based on groundwater modeling which is being verified via an intrinsic tracer test. Currently all drinking water wells are located outside these buffer areas with more than six months (typically many years) of subsurface travel prior to the extraction of GWRS water recharge or injection. Based on the 1-log virus reduction credit per

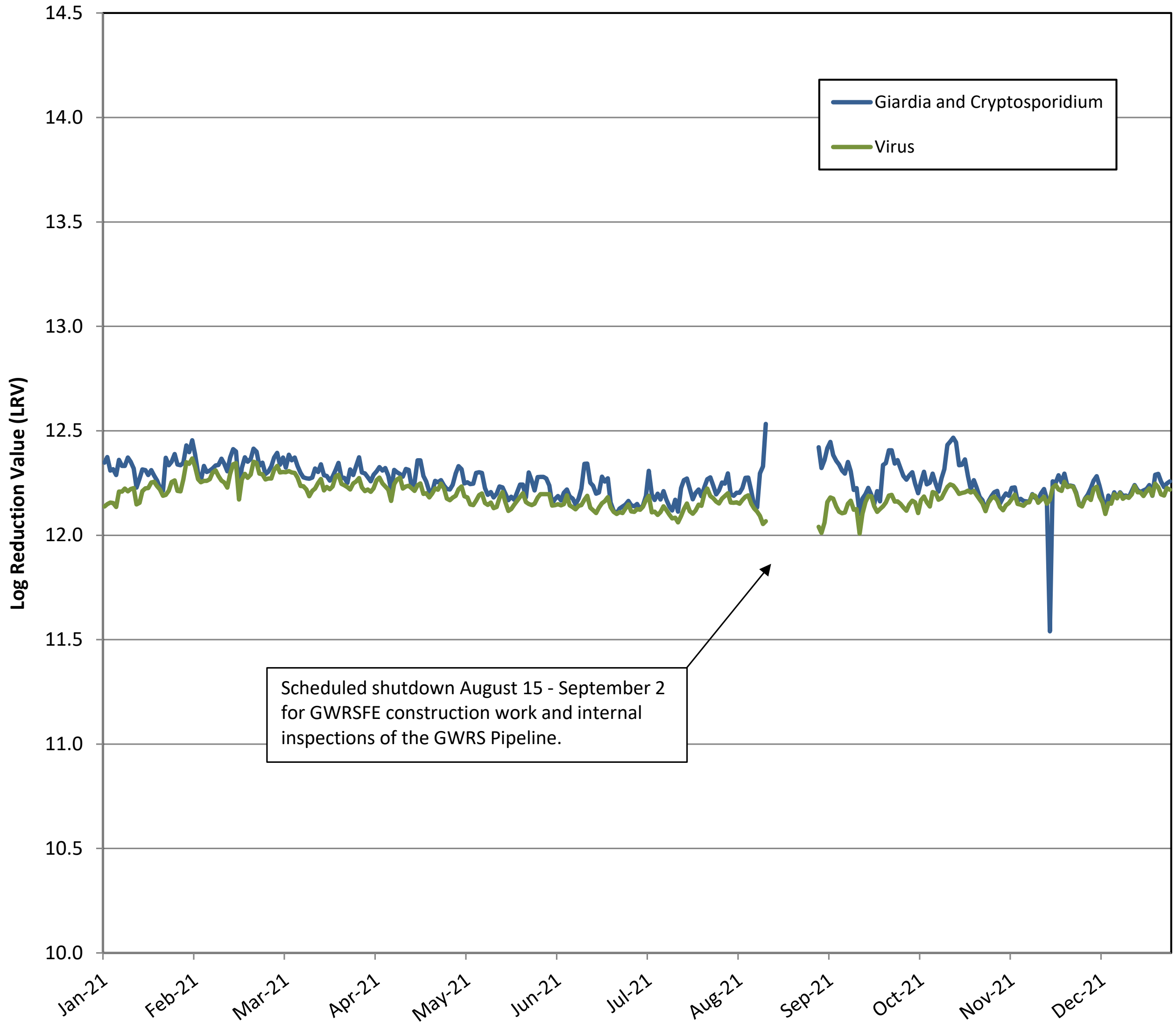


Figure 2-25. Summary of Minimum Daily GWRS Pathogen Log Reduction Credits Achieved in 2021

month of underground retention time allowed by the Title 22 Water Recycling Criteria for groundwater recharge (CCR, 2018), GWRS therefore provides at least 4-log reduction of viruses after surface spreading and direct injection.

2.3.10 CEC Monitoring and Compliance with SWRCB Recycled Water Policy

The SWRCB adopted an updated Water Quality Control Policy for Recycled Water in 2018 (SWRCB, 2018). The RWQCB issued GWRS modified monitoring and reporting requirements in November 2020 to comply with the latest SWRCB provisions (RWQCB, 2020a).

OCWD submitted the Quality Assurance Project Plan (QAPP) in December 2020 to the SWRCB and RWQCB in compliance with the Recycled Water Policy monitoring and reporting requirements. The SWRCB approved the OCWD QAPP in June 2021, with the exception of the Aryl Hydrocarbon Receptor (AhR) bioassay because it lacked an approved lab method (SWRCB, 2021a). In early 2021, the SWRCB approved the OCWD in-house laboratory methods for several analytes for purpose of monitoring outlined in the Recycled Water Policy, namely 1,4-dioxane, NDMA, NMOR, sucralose, and sulfamethoxazole (SWRCB, 2021b-d).

Initial phase quarterly monitoring of CECs and surrogates were conducted per the approved QAPP and GWRS revised monitoring and reporting requirements beginning in July 2021 as follows:

- CECs (relevance/indicator type shown in parentheses)
  - 1,4-Dioxane (health) in FPW;
  - NDMA (health and performance) in ROF and FPW;
  - Perfluorooctane sulfonate (PFOS) (health) in FPW;
  - Perfluorooctanoic acid (PFOA) (health) in FPW;
  - N-nitrosomorpholine (NMOR) (health) in FPW;
  - Sucralose (performance) in ROF and FPW; and
  - Sulfamethoxazole (performance) in ROF and FPW.
- Surrogates for CECs
  - Electrical conductivity (EC) in ROF and ROP; and
  - Total Organic Carbon (TOC) in ROF and ROP.
- Bioanalytical screening tools
  - Estrogen receptor-α in FPW;
  - Aryl hydrocarbon receptor in FPW (pending approval of a lab method).

Table 2-11 summarizes the monitoring requirements for groundwater recharge projects and presents the results for GWRS in 2021.

Table 2-11. Summary of CEC and Surrogate Monitoring for GWRS in 2021

Constituent	Constituent Group	Relevance/Indicator Type		Required Reporting Limit	OCWD RDL	Units	ROF		ROP		UVP		FPW		Removal Percentages (%) (Between ROF and FPW)			
		Health	Performance[1]				No. Of Samples	Average[2]	No. Of Samples	Average[2]	No. Of Samples	Average[2]	No. Of Samples	Average[2]	Average	Minimum	Maximum	Target[3]
CECs to be monitored[3]																		
Groundwater Recharge Reuse - Subsurface Applications																		
1,4-Dioxane	Industrial chemical	✓		0.5[4]	0.5	µg/L	NR	NR	NR	NR	NR	NR	55	<0.5	NR	NR	MR	N/A
NDMA	Disinfection byproduct	✓	✓	2	2	ng/L	56	15.7	55	7.6	51	<2	55	1.0	91.4%	-- [5]	99.2%	>80%
NMOR	Industrial chemical	✓		2	2	ng/L	NR	NR	NR	NR	NR	NR	55	<2	NR	NR	NR	N/A
PFOS	Consumer/industrial chemical	✓		6.5	2	ng/L	NR	NR	NR	NR	NR	NR	5	<2	NR	NR	NR	N/A
PFOA	Consumer/industrial chemical	✓		7	2	ng/L	NR	NR	NR	NR	NR	NR	5	<2	NR	NR	NR	N/A
Sucralose	Food additive		✓	100	1000/100/100 ROF/ROP/FPW	ng/L	5	56,140	4	<100	na	na	4	<100	100.0%	100.0%	100.0%	>90%
Sulfamethoxazole	Antibiotic		✓	10	10/1/1 ROF/ROP/FPW	ng/L	5	740	4	<1	na	na	4	<1	100.0%	100.0%	100.0%	>90%
Surrogates to be monitored[3]																		
Groundwater Recharge Reuse - Subsurface Applications																		
Electrical Conductivity (EC) [6,7]				N/A	1	µm/cm	350	1,824	52	39	na	na	350	97	94.7%	92.5%	96.4%	>90%
Total Organic Carbon (TOC) [6,7]				N/A	0.05	mg/L	351	8.36	351	0.09	3	0.16	352	0.08	99.0%	97.4%	99.5%	>90%
Bioanalytical Screening Tools for CECs																		
Groundwater Recharge Reuse - Subsurface Applications																		
Estrogen receptor-α [8]				0.5	0.5	ng/L[8]	na	na	na	na	na	na	2	<0.5	N/A	N/A	N/A	N/A

[1] Results shown for initial assessment monitoring phase and may be refined for subsequent monitoring phases.
[2] Average of all available 2021 data based on using 10% of the RDL for non-detectable readings unless noted otherwise.
[3] GWRS compliance with the 2018 Recycled Water Policy is based on monitoring and reporting requirements for subsurface application (SWRCB, 2018) and the 2020 GWRS Revised Monitoring and Rporting Requirements (RWQCB, 2020).
[4] Recycled Water Policy required reporting limit is 0.1 µg/L. A higher reporting may be approved, as long as the ratio between the reporting limit and the monitoring trigger limit of 0.1 µg/L is no less than two. A reporting limit of 0.5 µg/L has been approved for GWRS.
[5] The calculated minimum removal percentage for NDMA (between ROF and FPW) is skewed by the minimum ROF NDMA concentration <RDL.
[6] Based on grab sample results. On-line measurements are also taken and available results are reported in Appendix E.
[7] Percent removals for EC and TOC shown for ROF to FPW.
[8] Estrogen receptor-α results shown as the required bioanalytical equivalent concentration (BEQ) of agonist 17-beta Estradiol measured in ng/.L. The Monitoring Trigger Level (MTL) is 3.5 ng/L The calculated BEQ/MTL ratio is less than the 0.15 threshold that would require a response action.
na = Not analyzed
N/A = Not applicable
NR - Not required

2.4 Santa Ana River Discharges

The AWPF did not discharge to the Santa Ana River to provide peak flow relief for OC San at any time during 2021. The emergency peak flow/rain event system was tested on January 12-13, 2021, when the AWPF discharged all treated water to the OC San 66-inch diameter Interplant Line, which conveyed it to the OC San ocean outfall. No purified recycled water was produced for recharge during the test.

Discharges to the Santa Ana River are covered by a separate permit, RWQCB Order No. R8-2022-0002 NPDES No. CA8000408, entitled *"Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the Orange County Water District Groundwater Replenishment System Advanced Water Treatment Facility Emergency Discharge to Reach 1 of the Santa Ana River,"* which was adopted by the RWQCB on March 18, 2022 (RWQCB, 2022).

Since completion of the GWRS Initial Expansion in 2015, the AWPF is capable of producing up to 100 MGD of purified recycled water. It is feasible for the AWPF to continue normal purified recycled water production and provide similar emergency peak flow relief for the OC San ocean outfall without having to discharge to the Santa Ana River. The maximum daily purified recycled water production by the AWPF reached 97.9 MGD in November 2021.

2.5 Non-Potable Water Quality

A small portion of GWRS purified recycled water is used for non-potable use and supplied to three customers as described earlier in this section: Anaheim CPP, ARTIC, and Anaheim Adventure Park. Recycled water for non-potable use is regulated under RWQCB Order No. R8-2021-0003 (RWQCB, 2021). The GWRS purified recycled water complied with the requirements for non-potable water use throughout 2021. Section 2.2 and Appendix A present the GWRS purified recycled water quality during 2021 including the constituents monitored for non-potable water use.

2.6 Anticipated Changes

Construction of the GWRS Final Expansion that will increase the AWPF purified recycled water production capacity from 100 to 130 MGD began in late 2019 and continued through 2021. The project schedule calls for construction of facilities to be completed by early 2023.

The GWRSFE consists of the following components:

- AWPF expansion of existing treatment processes;
- Plant 2 effluent pump station;
- Plant 2 flow equalization tanks;
- Rehabilitated conveyance pipeline between Plant 2 and Plant 1; and
- Plant 2 headworks modification to segregate reclaimable wastewater.

3. TALBERT BARRIER OPERATIONS

Talbert Barrier operations in 2021 focused on optimizing injection of the purified recycled water supply both for preventing seawater intrusion and replenishing the Basin. Operation of the barrier injection facilities is presented in this section:

- Barrier Injection Facilities;
- Injection water sources;
- Injection water volumes; and
- Barrier operations.

3.1 Barrier Injection Facilities

Table 3-1 lists the Talbert Barrier injection wells with their associated aquifers and injection depths. Sites OCWD-I1 through OCWD-I23 feature nested injection wells with up to four individual casings in one large borehole, each injecting into a different aquifer. These legacy injection wells are nested as illustrated on Figure 3-1. Site OCWD-I24 is a modern nested injection well. Modern injection well sites OCWD-I26 through OCWD-I32 feature clustered injection wells with up to three individual, single-point wells at each site that are spaced approximately 20 feet apart. Modern well sites OCWD I-25 and OCWD-I33 through OCWD-I36 are single point wells. Figure 3-2 illustrates these newer cluster-type well sites.

Eight of the modern injection well sites (OCWD-I24 and OCWD-I26 through OCWD-I32) each have a deeper Main aquifer injection zone primarily for replenishing the groundwater Basin, in addition to injection zones in shallower aquifers susceptible to seawater intrusion. One of the modern clustered injection well sites (OCWD-I26) is pictured on Figure 3-3.

3.2 Injection Water Sources

Three types of water were injected at the Talbert Barrier during 2021:

1. Purified recycled water produced by the AWPF;
2. Imported potable water from the MWD OC-44 turnout delivered via the City of Huntington Beach; and
3. Fountain Valley (FV) potable water comprised of a blend of groundwater and imported water.

The injection supply was predominately GWRS purified recycled water conveyed to the injection wells from the AWPF by the barrier pump station and pipeline. Negligible volumes of potable water were used periodically during AWPF shutdowns, which are described in Appendix D.

Table 3-1. Talbert Barrier Injection Well Design Criteria

<table>
<tr><th colspan="7">Aquifers and Perforated Intervals at Talbert Barrier</th></tr>
<tr><th rowspan="2">Injection Well No.</th><th rowspan="2">No. of Casings</th><th colspan="5">Aquifers and Perforated Interval Depth in feet below ground surface (ft bgs)</th></tr>
<tr><th>Talbert</th><th>Alpha</th><th>Beta</th><th>Lambda</th><th>Main</th></tr>
<tr><td>OCWD-I1</td><td>4</td><td>65-100</td><td>150-200</td><td>235-350</td><td>365-400</td><td>---</td></tr>
<tr><td>OCWD-I2</td><td>4</td><td>64-96</td><td>147-210</td><td>225-325</td><td>350-390</td><td>---</td></tr>
<tr><td>OCWD-I3</td><td>4</td><td>65-96</td><td>145-200</td><td>225-325</td><td>340-380</td><td>---</td></tr>
<tr><td>OCWD-I4</td><td>4</td><td>65-95</td><td>120-190</td><td>215-310</td><td>330-355</td><td>---</td></tr>
<tr><td>OCWD-I5</td><td>4</td><td>70-90</td><td>115-180</td><td>210-265</td><td>320-245</td><td>---</td></tr>
<tr><td>OCWD-I6</td><td>4</td><td>70-100</td><td>120-175</td><td>195-250</td><td>315-335</td><td>---</td></tr>
<tr><td>OCWD-I7</td><td>4</td><td>70-95</td><td>110-150</td><td>165-250</td><td>315-336</td><td>---</td></tr>
<tr><td>OCWD-I8</td><td>4</td><td>60-95</td><td>110-165</td><td>180-240</td><td>300-325</td><td>---</td></tr>
<tr><td>OCWD-I9</td><td>4</td><td>65-90</td><td>110-150</td><td>175-235</td><td>300-330</td><td>---</td></tr>
<tr><td>OCWD-I10</td><td>4</td><td>60-90</td><td>105-185</td><td>205-290</td><td>305-330</td><td>---</td></tr>
<tr><td>OCWD-I11</td><td>3</td><td>65-95</td><td>115-180</td><td>200-225</td><td>---</td><td>---</td></tr>
<tr><td>OCWD-I12</td><td>4</td><td>60-95</td><td>110-165</td><td>180-260</td><td>290-310</td><td>---</td></tr>
<tr><td>OCWD-I13</td><td>4</td><td>77-100</td><td>120-160</td><td>175-250</td><td>280-305</td><td>---</td></tr>
<tr><td>OCWD-I14</td><td>4</td><td>70-95</td><td>115-150</td><td>175-250</td><td>265-300</td><td>---</td></tr>
<tr><td>OCWD-I15</td><td>4</td><td>70-93</td><td>115-145</td><td>70-235</td><td>262-285</td><td>---</td></tr>
<tr><td>OCWD-I16</td><td>3</td><td>63-120</td><td>---</td><td>145-210</td><td>245-285</td><td>---</td></tr>
<tr><td>OCWD-I17</td><td>3</td><td>62-130</td><td>---</td><td>150-215</td><td>250-275</td><td>---</td></tr>
<tr><td>OCWD-I18</td><td>3</td><td>57-125</td><td>---</td><td>150-210</td><td>260-275</td><td>---</td></tr>
<tr><td>OCWD-I19</td><td>3</td><td>57-127</td><td>---</td><td>145-200</td><td>235-270</td><td>---</td></tr>
<tr><td>OCWD-I20</td><td>3</td><td>90-125</td><td>---</td><td>140-170</td><td>230-250</td><td>---</td></tr>
<tr><td>OCWD-I21</td><td>3</td><td>55-125</td><td>---</td><td>150-170</td><td>230-250</td><td>---</td></tr>
<tr><td>OCWD-I22</td><td>2</td><td>60-160</td><td>---</td><td>---</td><td>250-275</td><td>---</td></tr>
<tr><td>OCWD-I23</td><td>2</td><td>70-155</td><td>---</td><td>---</td><td>215-252</td><td>---</td></tr>
<tr><td>OCWD-I24</td><td>2</td><td>---</td><td colspan="3">120-330</td><td>420-605</td></tr>
<tr><td>OCWD-I25</td><td>1</td><td>---</td><td colspan="3">120-320</td><td>---</td></tr>
<tr><td>OCWD-I26</td><td>3</td><td colspan="2">56-195</td><td colspan="2">271-400</td><td>476-660</td></tr>
<tr><td>OCWD-I27</td><td>3</td><td colspan="2">78-148</td><td colspan="2">210-260</td><td>355-420</td></tr>
<tr><td>OCWD-I28</td><td>3</td><td colspan="2">80-140</td><td colspan="2">185-235</td><td>360-460</td></tr>
<tr><td>OCWD-I29</td><td>3</td><td>---</td><td>90-120</td><td colspan="2">200-250</td><td>365-475</td></tr>
<tr><td>OCWD-I30</td><td>3</td><td>---</td><td>95-160</td><td colspan="2">230-295</td><td>425-650</td></tr>
<tr><td>OCWD-I31</td><td>3</td><td>---</td><td>90-165</td><td colspan="2">235-295</td><td>440-590</td></tr>
<tr><td>OCWD-I32</td><td>3</td><td>---</td><td>90-155</td><td colspan="2">226-295</td><td>425-670</td></tr>
<tr><td>OCWD-I33</td><td>1</td><td>61-156</td><td>---</td><td colspan="2">See Note 1</td><td>---</td></tr>
<tr><td>OCWD-I34</td><td>1</td><td>60-135</td><td>---</td><td colspan="2">See Note 1</td><td>---</td></tr>
<tr><td>OCWD-I35</td><td>1</td><td>60-115</td><td>---</td><td colspan="2">See Note 1</td><td>---</td></tr>
<tr><td>OCWD-I36</td><td>1</td><td>60-110</td><td>---</td><td colspan="2">See Note 1</td><td>---</td></tr>
</table>

[1] OCWD-I33 through OCWD-I36 each has one casing perforated in the merged Talbert/Beta/Lambda Aquifers

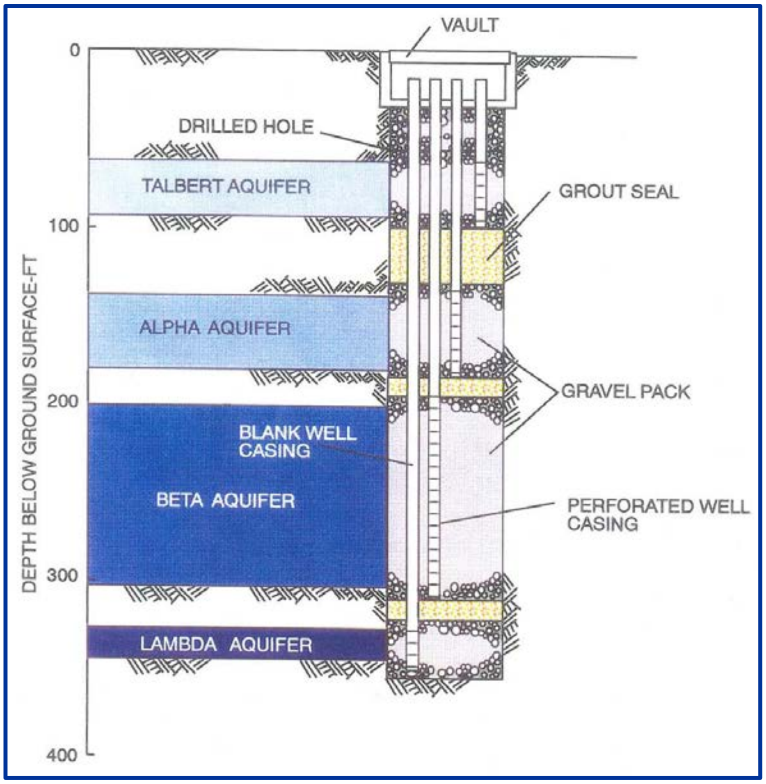


Figure 3-1. Typical Legacy Injection Well

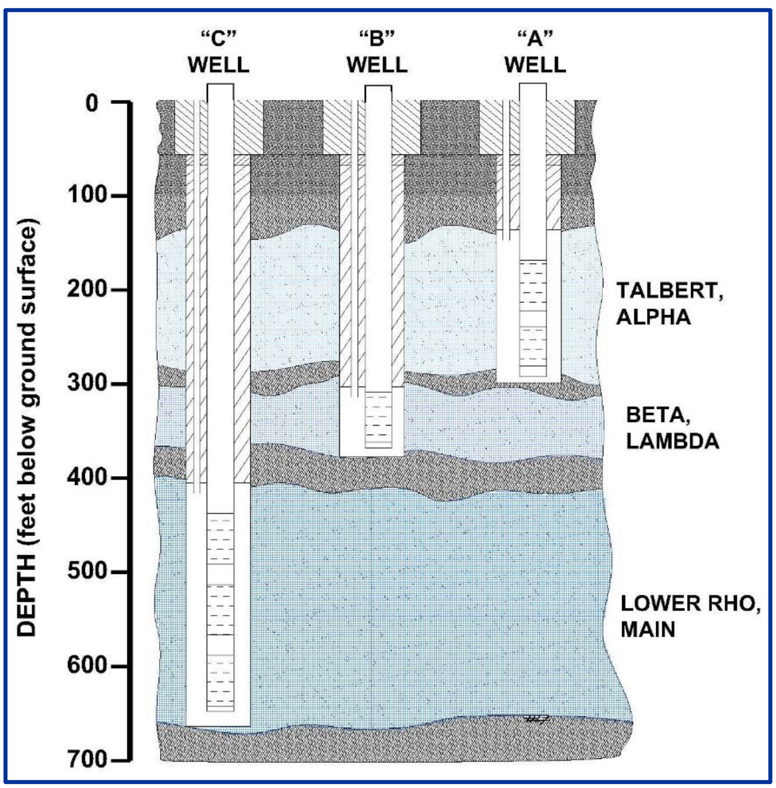


Figure 3-2. Typical Modern Cluster-Type Injection Well

Figure 3-3. Modern Injection Well Site OCWD-I26

OC-44 potable water was supplied via a reduced pressure principle backflow prevention device and a pressure reducing valve into the barrier pipeline supplying the injection wells. A limited volume of OC-44 potable water was used on nine days in 2021, primarily to keep the barrier pipeline pressurized and to maintain small injection flow into selected wells for operational purposes. A limited volume of FV potable water was utilized to pressurize the barrier pipeline on four days in 2021. OC-44 and FV potable water was used in 2021 as summarized in Table 3-2.

Table 3-2. 2021 OC-44 and FV Potable Water Use at Talbert Barrier

Month	Duration	Cause(s) for Potable Water Use
OC-44 Potable Water		
January	1 day	GWRSFE construction
March	1 day	OC San Plant 1 weir washing increased solids load, plugged influent screens, and reduced AWPF feedwater flow
May	2 days	GWRSFE construction
September	1 day	AWPF restart following planned shutdown for GWRSFE construction
October	2 days	Power outage and subsequent AWPF and barrier instrumentation and equipment issues upon restart
December	2 days	GWRSFE construction
Fountain Valley Potable Water		
January	3 days	GWRSFE construction
November	1 day	AWPF MF operational issues limited production

The highest daily usage of OC-44 potable water was 0.74 MG on October 9 when the AWPF experienced an unscheduled power interruption followed by AWPF and barrier restart issues.

The highest daily usage of FV potable water was 0.18 MG on January 21 when the AWPF unexpectedly shut down due to RO transfer pump communication issues.

3.3 Injection Water Volumes and Flow Rates

The volume of water injected at the Talbert Barrier in 2021 is presented below and compared with historical barrier injection.

3.3.1 2021 Injection Water Volumes and Flow Rates

The total annual average daily flow rate of all sources (purified recycled water, OC-44 potable water and FV potable water) injected at the Talbert Barrier in 2021 was 23.0 MGD (including periods of low or no injection during AWPF outages). On a volumetric basis, a total volume of approximately 8,377 MG (25,709 AF) of purified recycled water, OC-44 potable water, and FV potable water was injected at the Talbert Barrier during 2021.

Figure 3-4 illustrates the volumes and average daily flow rates of each of the water sources injected at the Talbert Barrier during 2021. As noted above, essentially all the barrier injection, approximately 22.94 MGD on average (rounded to 8,374 MG or 25,700 AF), was GWRS purified recycled water. Nearly 0.01 MGD on average (rounded to 2.3 MG or 7.0 AF) of OC-44 potable water was injected at the barrier during 2021. Less than 0.01 MGD on average (rounded to 0.6 MG or 1.8 AF) of FV potable water was injected at the barrier during 2021.

Table 3-3 summarizes the 2021 monthly average daily flow rates and quantities of purified recycled water and potable water injected at the barrier, and Figure 3-5 illustrates the monthly 2021 injection water supply volumes and average daily flow rates. As discussed above, potable water was used when the AWPF was temporarily off-line due to brief shutdowns to keep the barrier pipeline pressurized until purified recycled water production resumed.

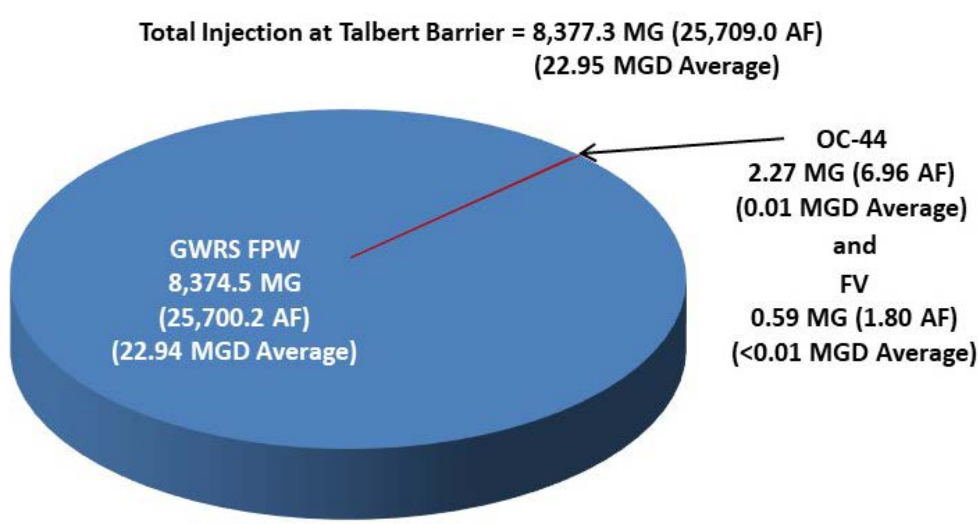


Figure 3-4. 2021 Talbert Barrier Injection Water Sources: Volumes and Flow Rates

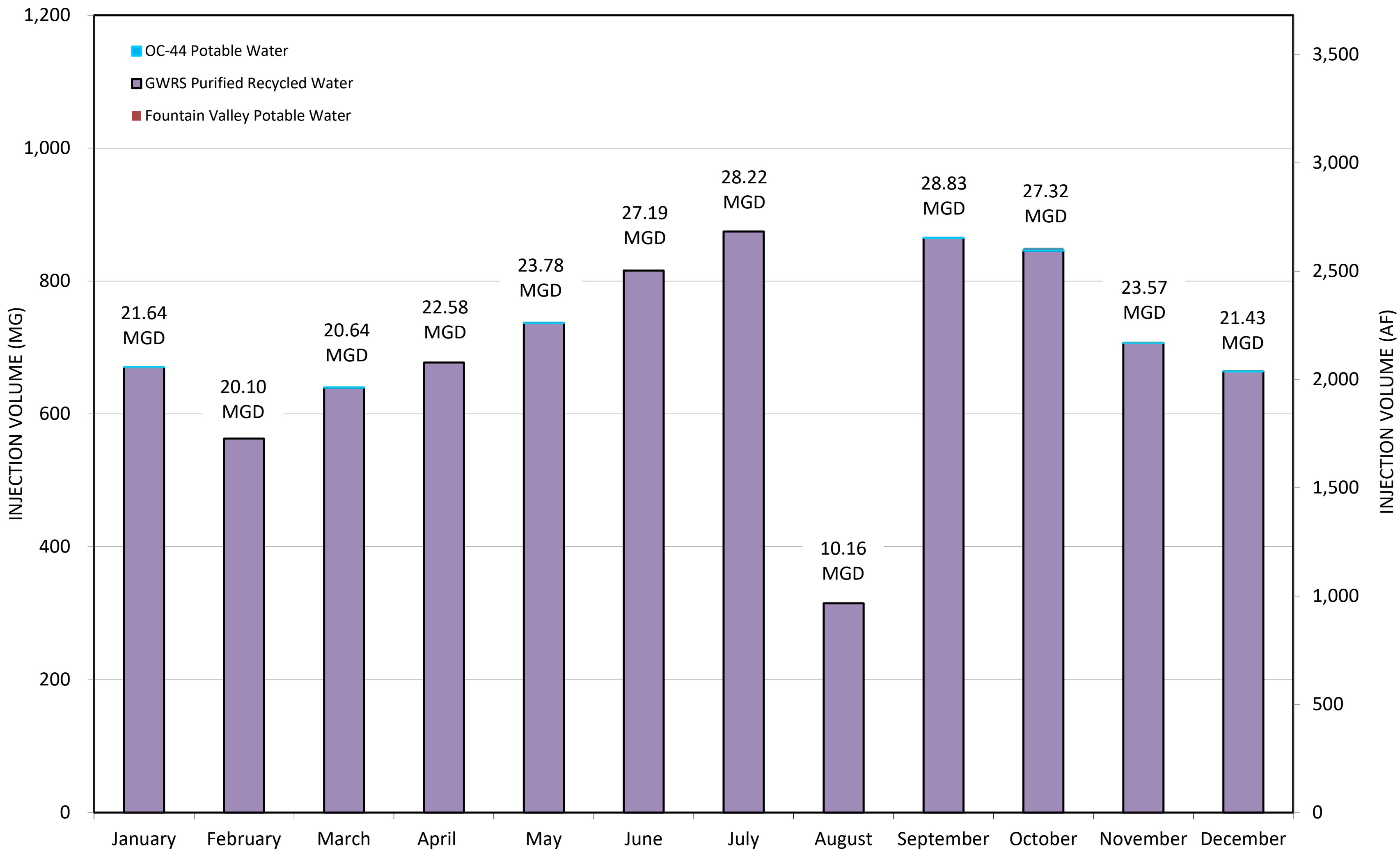
Table 3-3. 2021 Monthly Injection Water Quantity at Talbert Barrier

Month	GWRS FPW		OC-44		FV		Total Injection Flow Rate and Volume			
	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(Avg. MGD)	(MG)	(AF)	(m^3)
January	21.62	670.22	0.00	0.12	0.01	0.43	21.64	670.77	2,058.53	2,539,162
February	20.10	562.92	0.00	0.00	0.00	0.00	20.10	562.92	1,727.53	2,130,878
March	20.64	639.69	0.01	0.25	0.00	0.00	20.64	639.94	1,963.89	2,422,424
April	22.58	677.31	0.00	0.00	0.00	0.00	22.58	677.31	2,078.60	2,563,919
May	23.77	736.97	0.01	0.30	0.00	0.00	23.78	737.27	2,262.60	2,790,878
June	27.19	815.75	0.00	0.00	0.00	0.00	27.19	815.75	2,503.45	3,087,965
July	28.22	874.70	0.00	0.00	0.00	0.00	28.22	874.70	2,684.35	3,311,108
August[1]	10.16	315.04	0.00	0.00	0.00	0.00	10.16	315.04	966.82	1,192,559
September	28.83	864.95	0.00	0.10	0.00	0.00	28.83	865.05	2,654.73	3,274,564
October	27.29	845.84	0.03	1.08	0.00	0.00	27.32	846.92	2,599.10	3,205,957
November	23.57	707.07	0.00	0.00	0.01	0.16	23.57	707.23	2,170.41	2,677,164
December	21.42	664.00	0.01	0.42	0.00	0.00	21.43	664.42	2,039.02	2,515,102
Total	**22.94**	**8,374.46**	**0.01**	**2.27**	**0.00**	**0.59**	**22.95**	**8,377.32**	**25,709.01**	**31,711,681**

[1] Injection volume was limited by planned AWPF shutdown, August 15 - September 2.

Abbreviations:

GWRS FPW	Groundwater Replenishment System Finished Product Water (Purified Recycled Water)
OC-44	MWD Turnout OC-44 via Huntington Beach (Imported Potable Water)
FV	City of Fountain Valley (Potable Water - groundwater and imported water)
MGD	Million Gallons per Day shown as an average (avg.) flow rate
MG	Million Gallons
AF	Acre-feet
m^3	Cubic Meters



Note: August injection volume was limited by the planned AWPF shutdown, August 15 - September 2.

Figure 3-5. 2021 Monthly Injection Water Quantity at Talbert Barrier

3.3.2 Historical Injection Water Quantity

OCWD has operated the Talbert Barrier, injecting recycled water and potable water, since 1976. As discussed in Section 1, OCWD has historically injected water from six sources at the Talbert Barrier. Recycled water produced by WF-21, IWF-21, and the GWRS AWPF has been injected at the barrier. Diluents injected at the barrier have included deep well groundwater, potable water from the City of Fountain Valley, and imported potable water from the MWD OC-44 turnout.

Table 3-4 and Figure 3-6 summarize the history of annual quantities of water from the six available sources that have been injected at the Talbert Barrier since the OCWD water reclamation projects began operation. In the 14 years since GWRS has been in operation, the average total injection at the Talbert Barrier has been approximately 29,416 AFY, with the annual total injection volumes ranging from a low of 24,155 AF in 2020 to a high of 38,531 AF in 2010. The maintenance of groundwater elevations protective against seawater intrusion drives the demand for injection water at the Talbert Barrier, and these demands can vary seasonally and annually based on both the Basin accumulated overdraft condition and local groundwater pumping demands. Overall, the annual injection volumes from 2008 through 2021 have been significantly greater than pre-GWRS injection volumes.

The injection wells were supplied high quality recycled water by WF-21 from 1976 to 2004. Purified recycled water from IWF-21 was injected at the Talbert Barrier from 2004 to 2006. Injection of GWRS purified recycled water began in January 2008. The specific treatment processes of these water reclamation facilities differed as follows:

1. **AWT water** – WF-21 recycled water consisting of secondary effluent treated by lime clarification, ammonia stripping (discontinued in 1987), recarbonation, filtration, GAC, and chlorination (all WF-21 treatment processes, except for ammonia stripping after 1987 and not including RO); AWT water produced by WF-21 was injected from 1976 to 2000.

2. **RO product water** – recycled water consisting of WF-21 AWT product water that bypassed GAC and was treated instead by RO at WF-21 from 1977 until 2004, and later recycled water produced by IWF-21 from 2004 to 2006. After mid-1981, GAC was not used for RO pretreatment because the fine carbon particles clogged the RO membranes and RO demonstrated superior organics removal compared to GAC. From 1981 until 2001, the WF-21 RO treatment train was comprised of lime clarification, ammonia stripping (1981-1987), recarbonation, chlorination, filtration, and RO. In 2001, a UV/AOP unit was added downstream of the RO process, replacing chlorination for disinfection and adding treatment for the removal of low molecular weight organics. From 2004 until 2006, MF replaced the pretreatment train upstream of RO when the IWF-21 facility supplied the barrier.

Table 3-4. Historical Injection Water Quantity at Talbert Barrier

Year	Injection Quantity								Q-10[1] or GWRS Average Quality[4] (mg/L)		OC-44[2] Average Quality[4] (mg/L)		FV[3] Average Quality[4] (mg/L)		Total Flow-Weighted Average Quality[4] (mg/L)	
	AWT (MG)	RO (MG)	GWRS (MG)	Well (MG)	FV (MG)	OC-44 (MG)	Total (MG)	Total (AF)	Cl⁻	TDS	Cl⁻	TDS	Cl⁻	TDS	Cl⁻	TDS
1976	290.15	0.00		542.80			832.95	2,556.06								
1977	1,192.30	235.30		2,875.30			4,302.90	13,204.25	80	415					80	415
1978	1,760.60	1,368.20		1,575.40			4,704.20	14,435.71	103	442					103	442
1979	1,695.20	1,338.50		1,487.00			4,520.70	13,872.61	78	400					78	400
1980	258.50	1,311.00		1,054.30			2,623.80	8,051.62	57	231					57	231
1981	90.60	1,107.30		1,344.30			2,542.20	7,801.21	50	204					50	204
1982	4.60	1,179.90		1,166.90			2,351.40	7,215.71	47	174					47	174
1983	0.00	1,220.56		1,173.21			2,393.77	7,345.73	37	154					37	154
1984	231.71	313.22		488.40			1,033.33	3,170.97	79	339					79	339
1985	476.18	568.12		577.26			1,621.56	4,976.06	103	389					103	389
1986	630.73	519.38		772.42			1,922.53	5,899.64	102	379					102	379
1987	408.50	469.46		590.04			1,468.00	4,504.83	93	366					93	366
1988	968.37	1,187.03		1,213.41			3,368.81	10,337.82	89	319					89	319
1989	949.27	1,098.75		1,814.02			3,862.04	11,851.39	87	342					87	342
1990	785.13	1,267.19		1,837.44			3,889.76	11,936.45	90	320					90	320
1991	1,084.19	1,226.75		2,967.16			5,278.10	16,196.83	109	380					109	380
1992	1,257.92	1,338.84		2,413.57			5,010.33	15,375.13	89	336					89	336
1993	860.11	1,494.87		2,026.14			4,381.12	13,444.28	85	328					85	328
1994	157.31	947.22		896.85			2,001.38	6,141.61	50	248					50	248
1995	203.47	655.98		740.20			1,599.65	4,908.82	49	243					49	243
1996	56.73	741.22		521.84			1,319.79	4,050.02	26	151					26	151
1997	16.40	690.27		545.54			1,252.21	3,842.64	22	129					22	129
1998	5.44	776.08		578.51			1,360.03	4,173.51	23	127					23	127
1999	450.08	1,327.24		1,191.98			2,969.30	9,111.85	57	239					57	239
2000	207.50	771.75		1,863.75			2,843.00	8,724.27	37	233					37	233
2001		1,071.62		2,166.06	1,350.83		4,588.51	14,080.70	33	252					33	252
2002		1,367.55		1,180.56	1,576.61		4,124.72	12,657.47	34	226					34	226
2003		1,053.38		751.59	1,591.85	33.73	3,430.55	10,527.28	38	237	98	374			39	238
2004[5]		935.30		421.22	1,321.64	2,559.46	5,237.62	16,072.61	32	230	93	390			62	308
2005		1,238.02		4.84	953.44	2,703.43	4,899.73	15,035.73	24	177	78	464			54	336
2006[6]		663.01			551.37	1,658.75	2,873.13	8,816.73	19	127	67	386			47	276
2007					0.00	2,245.52	2,245.52	6,890.80			89	474			89	474
2008[7]			7,247.08		0.00	1,712.25	8,959.33	27,493.37	4	40	97	560			21	140
2009			11,011.23		0.00	55.21	11,066.44	33,959.43	5	46	97	653			5	49
2010			12,465.25		0.00	44.62	12,509.86	38,393.98	4	43	89	532			5	45
2011			8,384.84		0.15	2.27	8,387.26	25,741.30	5	43	83	539	54	391	5	44
2012			7,978.15		0.09	0.97	7,979.21	24,488.96	7	45	83	479	67	410	7	45
2013			9,804.46		0.00	1.83	9,806.30	30,096.46	7	50	84	559			7	50
2014[8]			10,734.25		0.00	2.46	10,736.71	32,949.80	7	54	na	na			7	54
2015			11,820.22		0.00	5.52	11,825.74	36,291.90	11	64	na	na			11	64
2016			11,288.83		0.36	2.39	11,291.58	34,652.64	7	57	na	na	na	na	7	57
2017			8,554.73		0.00	5.06	8,559.78	26,269.04	5	50	na	na			5	50
2018			8,096.61		0.00	7.38	8,103.99	24,870.25	5	53	na	na	na	na	5	53
2019			8,613.03		0.13	1.83	8,614.98	26,438.44	5	49	na	na	na	na	5	49
2020			7,865.47		0.45	5.12	7,871.05	24,155.33	6	55	na	na	na	na	6	55
2021			8,374.46		0.59	2.27	8,377.32	25,709.01	5	50	na	na	na	na	5	50
TOTALS	**14,040.99**	**29,483.01**	**132,238.60**	**36,782.01**	**7,347.51**	**11,050.06**	**230,942.18**	**708,689.08**								

Abbreviations:

- AWT - Granular Activated Carbon Effluent disinfected using chlorine (Recycled Water)
- RO - RO Effluent disinfected using chlorine prior to March 2001 and using UV/AOP from March 2001 until August 2006
- GWRS - Groundwater Replenishment System Finished Product Water (Purified Recycled Water)
- Well - Deep Well Water (Colored Groundwater)
- FV - City of Fountain Valley Potable (Domestic) Water (groundwater and potable water)
- OC-44 - MWD Turnout OC-44 Potable Imported Water (via City of Huntington Beach and Southeast Barrier Pipeline)
- Cl⁻ - Chloride
- TDS - Total Dissolved Solids
- mg/L - milligrams per liter
- MG - million gallons
- AF - acre-feet
- na - not analyzed (because blending is no longer required)

Notes:

1 Q-10 water was mixed in the WF-21 and IWF-21 blending reservoir from multiple sources prior to injection into the barrier: AWT, RO, Well and FV.

2 OC-44 water is provided directly into the barrier (via backflow prevention and pressure reduction devices).

3 FV water is provided directly into the barrier (via backflow prevention device and a pressure reduction valve).

4 Chloride and TDS concentrations shown for each year are based on a 12-month flow-weighted average of available samples.

5 WF-21 ceased operation on January 15, 2004. IWF-21 began operation on June 21, 2004.

6 IWF-21 ceased operation on August 8, 2006.

7 GWRS began operation on January 10, 2008.

8 Beginning in 2009, injection water quality was essentially the same as GWRS water because only limited volumes of OC-44 and FV water were used. OC-44 and FV water quality not analyzed beginning in 2014 because blending no longer required.

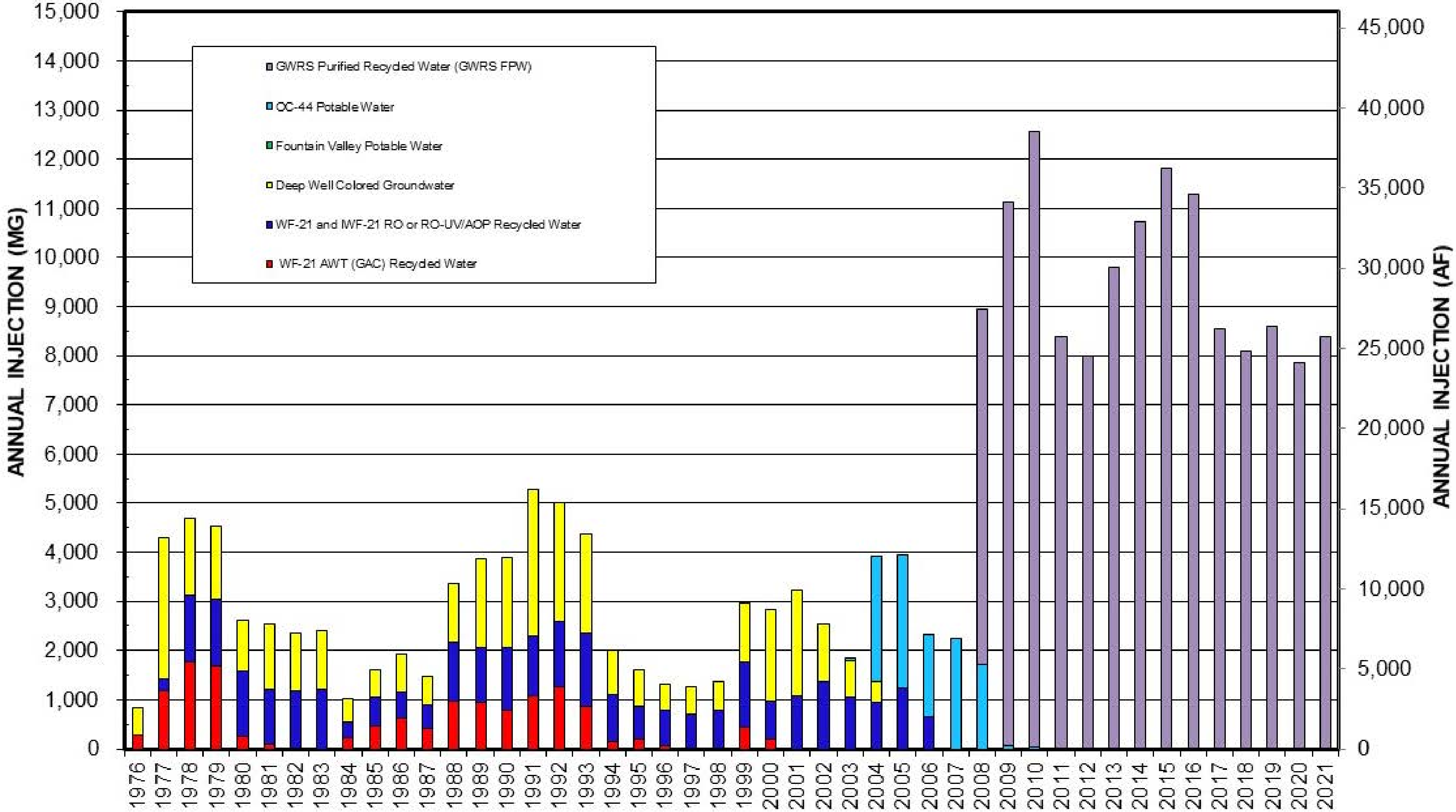


Figure 3-6. Historical Injection Water Quantity at Talbert Barrier

3. **GWRS water** – purified recycled water consisting of secondary effluent treated by MF, RO, UV/AOP, decarbonation and lime stabilization (GWRS AWPF FPW, or purified recycled water); injection of GWRS water produced by the AWPF began in January 2008.

The three diluent water sources that have been historically injected at the barrier are listed below:

1. **Deep Well water** – groundwater that is low in salts but high in color and TOC and produced from deep aquifers that are not susceptible to seawater intrusion; deep well water was injected from 1976 to 2005.

2. **Potable water from the City of Fountain Valley** – variable blend of groundwater and potable imported water that was injected primarily from 2001 to 2006. Since then, small amounts of potable water from the City of Fountain Valley have been sporadically used to maintain pressure in the injection conveyance system when purified recycled water was unavailable during brief periods when the AWPF was off-line. Negligible volumes of this water source (less than 1 MG) were used during 2011, 2012, 2016, 2019, 2020, and 2021.

3. **Potable water from the MWD OC-44 turnout** – imported water from the MWD OC-44 turnout delivered via the City of Huntington Beach that was injected from late 2003 through 2021. As shown in Table 3-4, only minor amounts of MWD OC-44 water (less than 8 MG/year) have been used over the last ten years, primarily for maintaining pressure in the barrier pipeline during AWPF shutdowns.

3.4 Barrier Operations

Injection of purified recycled water produced by the AWPF began on January 10, 2008. During 2021, AWPF purified recycled water was the primary injection water source, comprising essentially 100% of the water injected. Potable imported water from the MWD OC-44 and FV connections was used as back-up injection supplies during AWPF and Barrier Pump Station (BPS) shutdowns and for refilling and pressurizing the barrier distribution system just prior to plant startup after such shutdowns. During calendar year 2021, the MWD OC-44 connection was used for brief periods on nine days and the FV connection was briefly used on four days during or immediately following AWPF shutdowns, which were primarily related to GWRSFE construction and short-term power outage or operational issues. For both the OC-44 and FV connections since 2009, minimal volumes of potable water have been used for filling and pressurizing the barrier pipeline, as shown by the small annual totals discussed in Section 3.3.1.

Annual barrier injection in 2021 was 25,709 AF, representing an increase of 6.4% from 2020 which had the lowest barrier injection since the GWRS came on-line in 2008. Injection demand was relatively low during both 2020 and 2021 due to relatively high groundwater conditions throughout the Basin, as well as in the Talbert Gap area where groundwater levels were effectively maintained at or above protective elevations without becoming excessively high or above ground surface during both years. Similar to 2020, annual barrier injection during 2021 was further reduced due to being off-line for 21 days (August 12 to September 2) due to a planned AWPF shutdown for GWRSFE construction activities. As shown in Figure 3-6, annual barrier injection has remained relatively stable for the last five years due to higher Basin conditions resulting from above average rainfall in 2016-17, a Basin-wide In-Lieu Program in 2017-18, above average rainfall again in 2018-19, and reduced Basin pumping in 2019-20 and 2020-21 due to PFAS issues. During an In-Lieu Program, local retail water agencies take additional direct deliveries of treated MWD potable water in lieu of pumping groundwater, thereby increasing groundwater stored in the Basin.

The 6.4% increase in annual barrier injection from 2020 to 2021 was required to maintain protective elevations in response to a moderate decline in groundwater storage throughout the Basin. From June 2020 to June 2021, groundwater storage decreased by about 48,000 AF throughout the Basin. The Basin accumulated overdraft was 248,000 AF as of June 30, 2021, still representing a favorable Basin condition within the District's normal operating range. Groundwater elevations were able to be maintained slightly above mean sea level seaward of the barrier throughout 2021 to protect against seawater intrusion, as discussed in more detail in Section 4.

Operation of the barrier was consistent and stable during 2021 due to a constant, reliable AWPF water supply with very low turbidity. As discussed in the previous section, an insignificant volume of potable water was used on 9 days from the MWD OC-44 connection and 4 days from the FV connection due to brief AWPF shutdowns. During 2021, there was only one AWPF shutdown that lasted longer than one day: a planned shutdown August 15 – September 2 (barrier off-line 21 days from August 12 to September 2) related to GWRSFE construction activities. Potable OC-44 water was used to pressurize the barrier pipeline during AWPF restart activities on September 2.

As shown in Table 3-3 and on Figure 3-5, monthly injection flow rates during 2021 ranged from a low daily average flow rate of 10.16 MGD in August to a high daily average flow rate of 28.83 MGD in September, with the highest monthly injection volume occurring in July (874.70 MG or 2,684.35 AF). Typically, the volume of injection required to achieve and maintain protective groundwater elevations is greater in the summer months when municipal pumping is greater. This was generally the case in 2021 except for August due to the planned shutdown. Excluding the planned shutdown period, the average daily injection flow rate when the Barrier was on-line in 2021 was 24.28 MGD.

Operationally, injection was intermittently maintained at relatively high rates at the operating injection wells during 2021. Like 2020 however, many injection wells were kept off-line on stand-by for several months or the entire year during 2021 because they were not needed to maintain protective elevations for seawater intrusion control and to prevent shallow groundwater issues in nearby low-lying areas. Taking injection wells off-line for these reasons usually occurs in the winter and early spring months when groundwater levels are typically higher, and such was the case during 2021, but like 2020 several legacy wells were not needed at all and thus remained off-line on stand-by throughout 2021.

In some years when injection requirements are relatively high due to low groundwater levels, a few injection wells must be taken off-line during the peak injection summer months because of hydraulic restrictions in the barrier pipeline. During 2021, three west-end modern injection wells (I30C, I31C, and I32C) were taken off-line for three weeks from mid-September through early October during the peak demand period due to hydraulic restrictions. These three wells are only used for replenishing the Basin rather than seawater intrusion control. When Talbert Barrier injection is reduced due to high groundwater elevations as during 2021, the surplus GWRS water can generally be pumped up to K-M-M-L Basins for surface recharge and to the five MBI wells to maintain the AWPF operating at or near full capacity.

3.4.1 Vertical Distribution of Injection

Figure 3-7 shows the monthly amount of injection into each aquifer zone. For operational reasons related to the hydrogeology of the area, the aquifer zones that receive injection have been grouped into three major categories:

- Shallow Zone: Talbert and Alpha aquifers;
- Intermediate Zone: Beta, Lambda, Omicron, and Upper Rho aquifers; and
- Deep Zone: Lower Rho and Main aquifers.

These aquifers are described in more detail in Section 4 – Groundwater Monitoring at the Talbert Barrier. The shallow and intermediate zones are both susceptible to seawater intrusion. The 23 legacy injection well sites only inject into the shallow and intermediate zones. Most of the modern injection well sites constructed since 2000 inject into all three zones, with deep zone injection being primarily intended for replenishing the Basin rather than for seawater intrusion control. Therefore, injection into the deep zone is a lower priority when surplus injection supply and pipeline capacity are available over and above what is needed for seawater intrusion control in the shallow and intermediate zones.

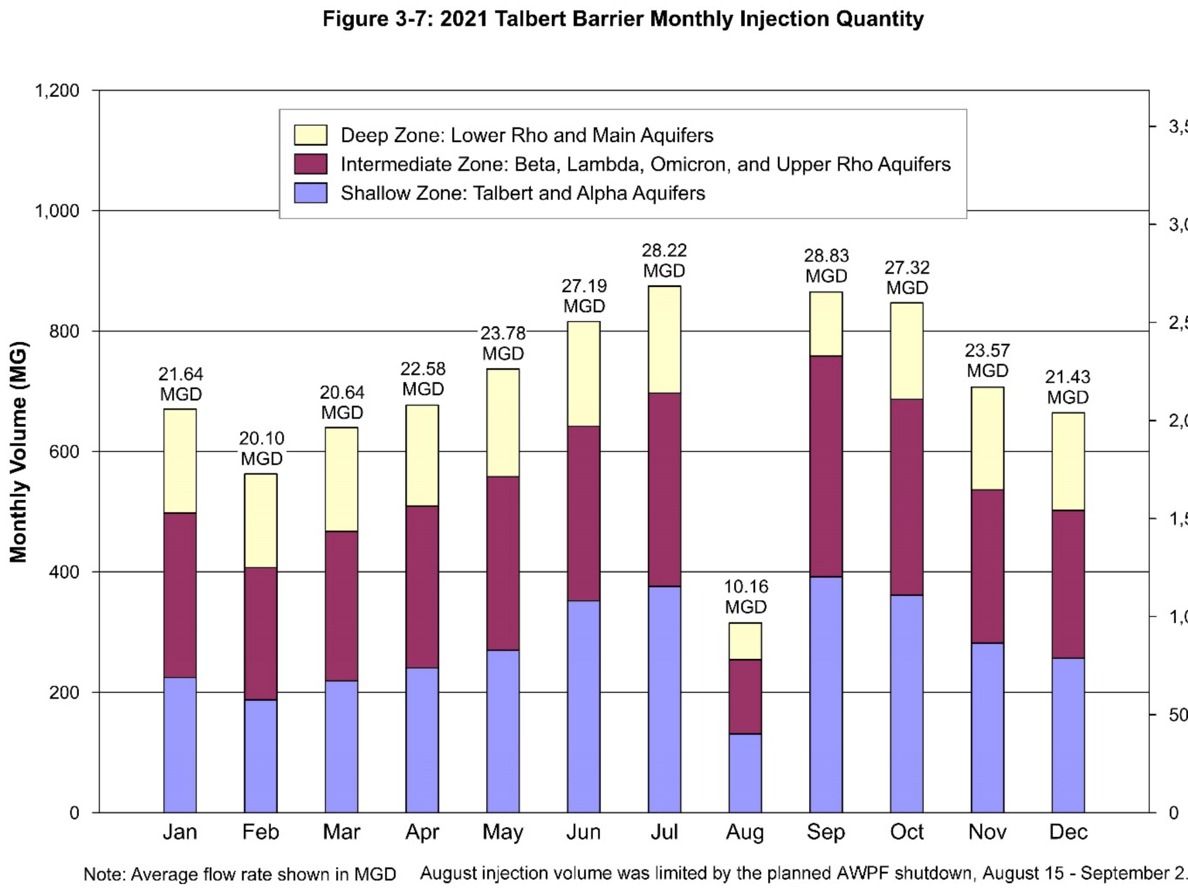


Figure 3-7. 2021 Talbert Barrier Monthly Injection Quantity by Aquifer Zone

As shown on Figure 3-7, 2021 monthly injection into the combined shallow and intermediate zones was relatively low throughout the winter and early spring months from January through April. Monthly injection into the combined shallow and intermediate zones was steadily increased over the late spring and summer months from May through September and reached an annual high of approximately 750 MG (2,300 AF) in September, before declining slightly for the remainder of the year as the weather cooled and coastal area pumping declined. The lower injection volumes during the January through April period were attributable to higher groundwater elevations in the shallow and intermediate zones during those months in which a few shallow zone modern injection wells and several legacy wells were secured and placed on stand-by to prevent unnecessarily elevated shallow groundwater elevations in low-lying areas. During the May through September period, more of the injection wells were on-line and injection into the combined shallow and intermediate zones was increased to keep pace with lower or falling groundwater levels as pumping increased during these warmer months. However, these May through September monthly injection volumes were still relatively low, as several legacy wells were off-line on stand-by all year during 2021 since they were not needed to achieve protective elevations.

the lower priority deep zone injection wells due to the lower shallow and intermediate zone injection totals. Deep zone injection was slightly less in September however as three west-end modern injection wells (I30C, I31C, and I32C) were taken off-line for three weeks from mid-September through early October during the peak demand period due to hydraulic restrictions. Deep zone groundwater elevations are typically lower than in the shallow and intermediate zones, and therefore, deep zone injection rates can often be maintained year-round.

During 2021, 39% of all injection was into the shallow zone, 39% into the intermediate zone, and 22% into the deep zone, as shown on Figure 3-8. Therefore, 78% of barrier injection during 2021 was collectively into the shallow and intermediate zones for the primary purpose of seawater intrusion control, slightly increased from the 74% in 2020. The percentage of shallow zone injection was 6% higher in 2021 due to a few more legacy wells being on-line, while the intermediate zone injection was 2% less than in 2020 primarily due to I24/1 being off-line for maintenance repairs during all of 2021.

Several shallow and intermediate zone injection wells were off-line on stand-by throughout much or all of 2021 due to the relatively high groundwater conditions, while all deep zone injection wells were on-line throughout 2021 (with the exceptions of I24/2 due to maintenance issues and the aforementioned three-week shutdown of I30C, I31C, and I32C). As mentioned previously, deep zone injection can typically be maintained year-round during relatively high groundwater conditions due to its groundwater levels being generally lower than in both the shallow and intermediate zones.

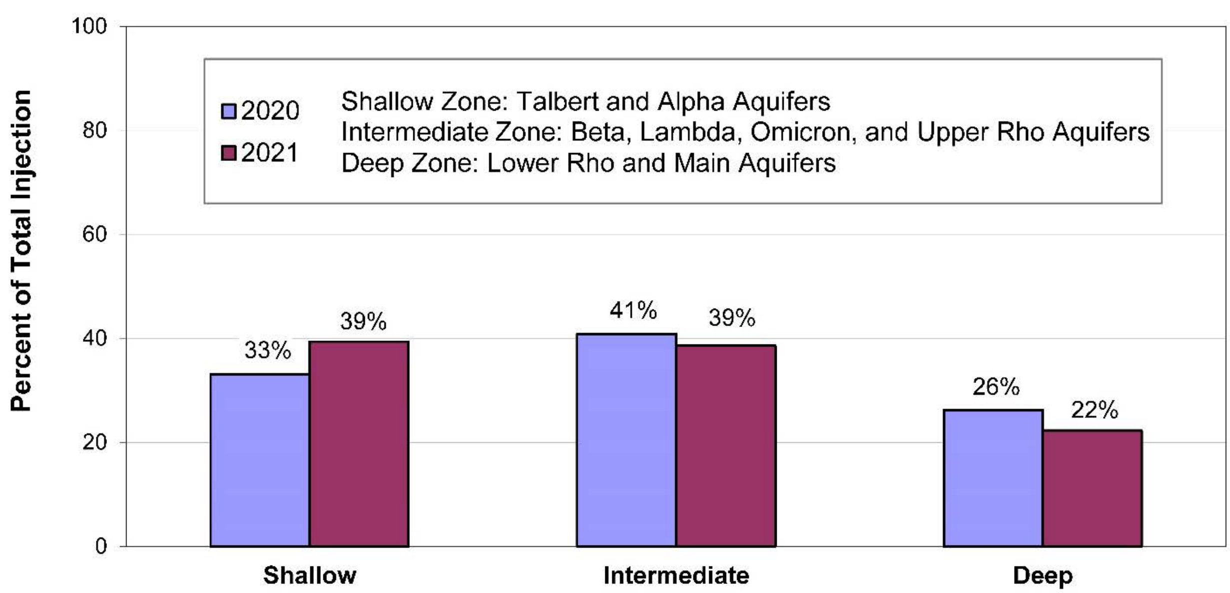


Figure 3-8. 2020 and 2021 Annual Average Injection Percentages for Each Depth Zone

3.4.2 Spatial Distribution of Injection along the Barrier

During 2021, injection rates and daily injection volumes at every injection point were measured using the process control system (PCS) that was installed as part of the GWRS. Flow was continuously monitored for each injection well so that precise daily and monthly injection volumes were directly obtained for each injection well casing. The monthly volumes for each injection well casing were downloaded to spreadsheets, checked, adjusted slightly to match reported total barrier injection, and uploaded to the OCWD Water Resources Management System (WRMS) database.

Table 3-5 shows the annual volume injected into each of the 36 injection well sites during 2021. Each well site consists of one to four discretely measured injection casings (installed at different depth zones). Table 3-5 is a summary of the total injection at each site but is divided into the three different aquifer zones that were previously described above (shallow, intermediate, and deep). The flow volumes in Table 3-5 represent adjusted values. The measured monthly per well casing flow volumes were adjusted so that the sum of all individual wells for each month exactly equals the total barrier injection reported in Table 3-3 for that month (recorded from the AWPF Barrier Pump Station flow meter). For all injection well points, the raw transmitter injection measurements were multiplied by a small correction factor each month to obtain the values shown in Table 3-5. For a given month, all well points were adjusted by the same factor. During 2021, the monthly adjustments ranged from approximately 1.2% to 1.8% and within expected standards for comparing the Barrier Pump Station flow meter totals with the sum of all individual injection well transmitter readings over the course of each month. To keep the discrepancy acceptably small, OCWD staff frequently run diagnostic checks on flow meters and transmitters and re-calibrate them, as necessary.

Figure 3-9 graphically depicts the annual volume injected into each of the 36 injection well sites during 2021. The injection volumes are divided into the same three depth zones described above: shallow, intermediate, and deep. The 36 well sites on Figure 3-9 are generally ordered geographically from west to east (left to right) on the bar graph (rather than by well number) as to give a visual sense of how the injection is spatially distributed along the barrier alignment. Notice the large annual injection amounts for the west-end modern well sites I27, I28, I29, I30, I31, and I32, as is characteristic every year. East-side modern well I26 also had a large annual injection volume due primarily to the deep zone contribution at that site, while east-side modern well I25 had relatively high intermediate zone injection. Amongst the legacy wells, I5 and I7 were the top two performers with the highest annual injection totals, while I1, I11, I12, I13, and I17 also had relatively high injection totals during 2021.

Table 3-5. 2021 Injection Quantity at Talbert Barrier Well Sites

	Well Site	Shallow Zone [1] (AF)	Intermediate Zone [2] (AF)	Deep Zone [3] (AF)	Total [4] (AF)	Total [4] (MG)
West	I32	1,021.12	533.88	810.65	2,365.65	770.85
	I31	621.82	680.30	894.14	2,196.26	715.65
	I30	950.31	677.81	976.87	2,604.99	848.84
	I29	162.60	721.26	576.68	1,460.54	475.92
	I23	13.68	13.58	–	27.26	8.88
	I28	511.08	749.34	996.42	2,256.84	735.39
	I27	413.32	711.41	845.39	1,970.12	641.97
	I22	125.88	78.01	–	203.89	66.44
	I21	–	98.60	–	98.60	32.13
	I20	116.24	174.37	–	290.61	94.70
	I19	–	122.49	–	122.49	39.91
	I18	15.88	98.03	–	113.91	37.12
	I17	339.98	440.93	–	780.92	254.46
	I16	0.00	0.00	–	0.00	0.00
	I15	0.00	0.00	–	0.00	0.00
	I14	193.23	36.35	–	229.58	74.81
	I13	374.47	384.59	–	759.06	247.34
	I12	559.26	316.00	–	875.26	285.20
	I11	621.66	189.35	–	811.01	264.27
	I10	0.00	0.00	–	0.00	0.00
	I9	0.00	0.00	–	0.00	0.00
	I8	0.00	0.00	–	0.00	0.00
	I7	896.87	277.24	–	1,174.11	382.58
	I6	66.98	145.01	–	211.98	69.07
	I5	440.83	832.83	–	1,273.66	415.02
	I25	–	1,104.27	–	1,104.27	359.83
	I24	–	0.00	0.00	0.00	0.00
	I4	180.64	314.19	–	494.83	161.24
	I3	0.00	0.00	–	0.00	0.00
	I2	0.00	202.53	–	202.53	65.99
	I1	394.06	388.15	–	782.21	254.88
East	I26	589.60	611.28	603.47	1,804.35	587.95
Southeast Barrier	I33	327.43	–	–	327.43	106.69
	I34	209.38	–	–	209.38	68.23
	I35	468.60	–	–	468.60	152.69
	I36	488.75	–	–	488.75	159.26
	Total:	10,103.67	9,901.80	5,703.62	25,709.08	8,377.32
	Percent:	39.30%	38.51%	22.19%		

1. Shallow Zone: Talbert and Alpha aquifers.
2. Intermediate Zone: Beta, Lambda, Omicron, and Upper Rho aquifers.
3. Deep Zone: Lower Rho and Main aquifers
4. Per well injection totals above represent adjusted values (by month) to reconcile with the reported total barrier injection in Table 3-1.

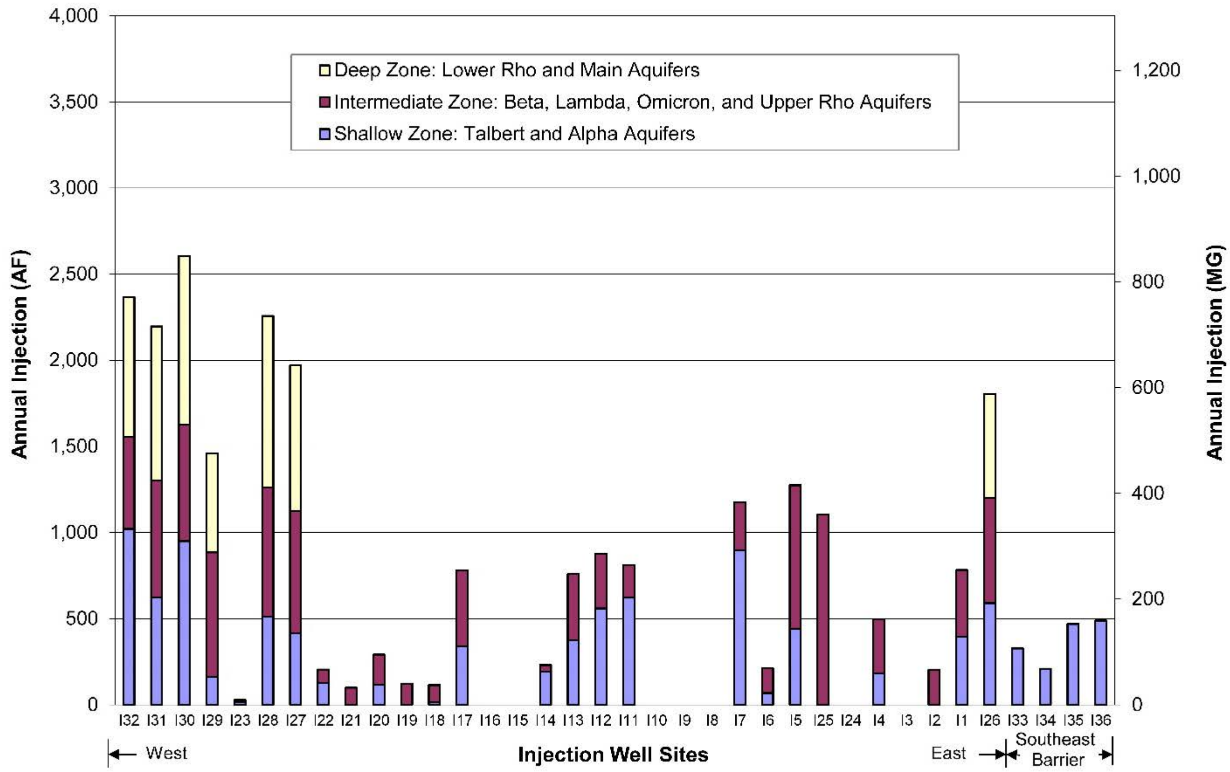


Figure 3-9. 2021 Talbert Barrier Injection Quantity at Each Well Site

As shown on Figure 3-9, west-end modern injection well I29 had very low shallow zone injection during 2021 because I29A was off-line on stand-by for seven months since it was not needed for much of the year to maintain groundwater levels above protective elevations and to avoid groundwater levels from becoming unnecessarily elevated in the low-lying area farther to the west near Huntington Lake.

Southeast barrier modern injection wells I33 and I34 had lower annual injection totals than I35 and I36 during 2021 because they were both off-line on stand-by for approximately 4.5 months, whereas I35 was on stand-by for only 3 months and I36 was on-line all year. The stand-by time at the southeast barrier wells was primarily during the winter and early spring months as they were not needed then to maintain protective elevations due to higher groundwater levels.

The older legacy well sites (I1 through I23) tend to have lower injection capacities than the modern wells. However, I5 and I7 performed comparably with shallow and intermediate zone injection totals at the modern injection wells during 2021 (Figure 3-9). Of all the active legacy wells during 2021, I5 had the highest combined shallow and intermediate zone annual injection of nearly 1,300 AF, slightly outperforming I7 which had annual injection of nearly 1,200 AF. Both I5 and I7 were on-line all year except for the planned shutdown in August, equating to daily average injection into the combined shallow and intermediate zones of 1.2 MGD at I5 and 1.1 MGD at I7. During 2021, I1, I11, I12, I13, and I17 also had relatively high combined shallow and intermediate annual injection ranging from approximately 700 to 900 AF, while the other legacy injection wells had relatively low combined shallow and intermediate zone annual injection volumes ranging from zero to 500 AF, with the lower end of this range mostly due to legacy wells being off-line on stand-by for several months or for the entire year.

Similar to 2020, legacy wells I2 and I21 had very low annual injection in 2021 of approximately 100 to 200 AF even though they were both on-line all year; these two wells, in addition to I3 which was off-line during 2021, are poor performers and have lost capacity over the years due to leaky well seals and/or irreversible clogging. These three wells are planned to be replaced within the next few years. A total of seven legacy wells had zero or negligible injection during 2021 (I3, I8, I9, I10, I15, I16, and I23) as compared to 13 wells in 2020; these wells were off-line on stand-by nearly the entire year and were not needed to maintain protective elevations (Figure 3-8). In the case of I8, it is typically not used since its access hatch is in the traffic lane on Ellis Avenue, making access both difficult and unsafe for OCWD Barrier Operations staff.

Table 3-5 shows which wells were off- or on-line on a weekly basis during 2021, including an explanation for inactive status. An injection well site is only shown to be off-line if it was secured for the majority of the specified week (4 days or more). Since the legacy wells are each typically operated with all zones at that site being on or all zones off (except for I2 in which only the intermediate zones are operable), Table 3-5 only shows a status entry for each entire legacy site. For the modern injection well sites I26 through I32 featuring a cluster of three separate injection wells (shallow “A”, intermediate “B”, and deep “C”), each individual injection zone is operated independently. Modern well I24 features I24/1 for the upper casing (intermediate zone) and I24/2 for the lower casing (deep zone) due to its nested well construction with two casings in the same borehole but both can be operated independently. Modern well I25 is a single-point well screened primarily in the intermediate zone and is designated I25/1. Therefore, Table 3-5 shows a separate status entry for each individual injection zone for these modern wells. As described above, several legacy injection wells remained off-line for either all or a major portion of 2021 due to relatively high groundwater conditions. Nine legacy wells were on-line for the majority of 2021: I1, I2, I5, I7, I11, I12, I13, I17, and I21, as indicated in Table 3-5. Protective elevations were maintained throughout the year with the use of these nine legacy wells, intermittent use of other legacy wells, and most of the modern injection wells.

Due to the reduced injection into the shallow and intermediate zones during 2021, all deep zone modern injection wells were on-line throughout 2021, except for I24/2 which was off-line all year due to maintenance issues and west-end wells I30C, I31C, and I32C were briefly off-line for three weeks from mid-September to early October during peak demand due to pipeline hydraulic restrictions (Table 3-6). In years with lower groundwater levels and a higher injection requirement for seawater intrusion control in the shallow and intermediate zones, deep zone modern injection wells commonly need to be taken off-line during peak summer months due to pipeline hydraulic restrictions, i.e., to maintain acceptably low flow velocities at critical points along the barrier pipeline identified as bottlenecks based on operational data. Barrier pipeline improvements are currently planned to remove these bottlenecks to maximize injection during years with lower Basin conditions and higher injection requirements.

3.4.3 Injection Well Repairs and Redevelopment

The Talbert Seawater Intrusion Barrier consists of 100 individual injection well points arranged into 36 injection well sites. During 2021, 29 of the 36 injection well sites were operated over the course of the year, with 6 of the 23 legacy well sites off-line on stand-by for the entire year since they were not needed to maintain protective elevations and modern injection well site I24 was off-line all year due to maintenance issues. In general, various injection wells are typically placed off-line for either brief or extended periods during the year for the following reasons:

- Well redevelopment and backwash pumping to restore and improve injection rates;
- Maintenance repairs (plumbing, electrical, communications, well vaults, pipeline, etc.);
- Availability of injection water supply, including AWPF shutdowns;
- Optimize distribution of injection for controlling seawater intrusion and maintaining protective groundwater elevations;
- Reduce or redistribute injection to avoid overly high groundwater conditions;
- Hydraulic restrictions on the barrier pipeline and appurtenances (bottlenecks); and
- OCWD and OC San construction activities requiring localized dewatering in the vicinity of the injection barrier.

As shown in Table 3-6, only I24/1 and I24/2 were off-line for an extended period due to maintenance issues during 2021. These two on-site modern injection wells both have inoperable down-hole flow control valves. Replacement with a more reliable type of flow control valve used on most of the other modern injection wells is planned, along with upsizing the drop pipe within the well. These two wells were off-line all year because the required maintenance repairs are currently on hold due to access issues related to GWRSFE construction activities. In addition, legacy well I4 was off-line from January through August of 2021 due to GWRSFE construction activities making this well temporarily inaccessible.

During 2021, minor maintenance repairs were conducted on other injections wells while those wells were off-line on stand-by, thus not requiring any injection downtime. For selected modern injection wells, replacement of the flow tube on the flow sensor apparatus continued during 2021, as the flow tube polypropylene linings continued to wear out. The new flow tubes have a Teflon lining. To date, a total of eight modern injection wells have had flow tube replacements.

Table 3-6. 2021 Injection Wells Operational Status

West (I32A) → East (I26C); Southeast Barrier: I33A, I34A, I35A, I36A

Well	JAN				FEB				MAR				APR				MAY				JUN				JUL				AUG				SEP				OCT				NOV				DEC			
I32A																															Z	Z																
I32B																															Z	Z																
I32C																															Z	Z			P	P	P											
I31A																															Z	Z																
I31B																															Z	Z																
I31C																															Z	Z			P	P	P											
I30A																															Z	Z																
I30B																															Z	Z																
I30C																															Z	Z			P	P	P											
I29A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S											Z	Z								S	S	S	S	S	S	S	S	S
I29B																															Z	Z																
I29C																															Z	Z																
I23	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S			S	S	S	S	S	S	S	S	S	S	S
I28A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S												Z	Z																
I28B																															Z	Z																
I28C																															Z	Z																
I27A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S											Z	Z																
I27B																															Z	Z																
I27C																															Z	Z																
I22	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										Z	Z							S	S	S	S	S	S	S	S	S	S
I21																															Z	Z																
I20	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										Z	Z						S	S	S	S	S	S	S	S	S	S	S
I19	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					Z	Z							S	S	S	S	S	S	S	S	S	S
I18	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S			Z	Z								S	S	S	S	S	S	S	S	S
I17																															Z	Z																
I16	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I15	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I14	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										Z	Z									S	S	S	S	S	S	S	S
I13					S	S	S	S	S	S	S	S																			Z	Z																
I12																															Z	Z																
I11																															Z	Z	S	S														
I10	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I9	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I8	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I7																															Z	Z																
I6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S					Z	Z		M					S	S	S	S	S	S	S	S	S	S
I5																															Z	Z																
I25/1																															Z	Z																
I24/1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	Z	Z	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
I24/2	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	Z	Z	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
I4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Z	Z	C															
I3	S	S	S	S	S	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Z	Z	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
I2						C																									Z	Z																
I1						C																									Z	Z																
I26A						C																									Z	Z																
I26B						C																									Z	Z																
I26C						C																									Z	Z																
I33A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S																Z	Z															S	S
I34A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S															Z	Z															S	S
I35A		S	S	S	S	S	S	S	S	S	S	S	S	S																	Z	Z																
I36A																															Z	Z																

West ↓ East; Southeast Barrier

☐ Well in Operation: GWRS Recycled Water
Well in Operation: OC-44 Potable Water
Well in Operation: City Fountain Valley
M Maintenance Repair
R Redevelopment
Z GWRS off-line
P Pipeline Restriction
C Construction
S Stand-by

Wells were specified as off-line if non-operational for the majority of the specified week or longer. Letters designate the reason for the well being off-line (not all letters are used in every year).

No legacy wells were redeveloped during 2019, 2020, or 2021. All legacy wells except I2 and I8 were redeveloped during 2018; I2 is a perennial poor performer and is planned to be replaced, and I8 is rarely used due to traffic control access issues. Since implementing GWRS purified recycled water as the primary injection source, a legacy redevelopment cycle of approximately 2 to 3 years of on-line run time has been sufficient to maintain injection flow rates without significant reductions in well efficiency and thus maintain overall barrier capacity. Since many of the legacy injection wells were off-line for either all or a significant portion of 2019-2021, no legacy redevelopment is currently planned for 2022.

Redevelopment of each legacy well typically takes one day per well casing, or less than one week to complete each well site. Legacy well redevelopment requires disassembly of the injection well header plumbing, followed by airlift pumping and surging to remove accumulated fine material that causes well clogging near the formation interface with the gravel pack. Airlift pumping flows are discharged to the sewer after settling tanks sufficiently remove the fine-grained material. During the 2018 redevelopment, approximately 15 cubic yards of fine-grained material were removed from the 21 legacy wells, leading to an average injection capacity increase of 65% per well site.

None of the modern injection wells have required an extensive redevelopment to date. Modern injection well sites I24, I25, and I26 were constructed and placed on-line over 20 years ago in 1999-2000, while I27 and I28 went on-line in 2004, and finally I29 through I36 went on-line in 2008 with the commencement of GWRS. Sustained injection capacity over the life of these wells thus far has largely been attributed to regularly scheduled short duration backwash pumping of these injection wells, either by the airlift pumping method using a portable compressor (most modern wells) or backwash pumping with dedicated submersible pumps (only I24 and I25 sites). Airlift pumped flows from the modern injection wells are desilted before being discharged to the storm drain under a "*de minimis*" permit from the RWQCB (RWQCB, 2020b), whereas backwash pumping from the on-site modern injection wells (I24/1, I24/2, and I25/1) is discharged to the AWPF RO concentrate (brine) line sending flows to the OC San outfall.

The three on-site modern injection wells (I24/1, I24/2, and I25/1) are equipped with dedicated submersible pumps allowing for regular backwash pumping. The submersible pump backwash frequency is based on the cumulative volume injected similar to the other injection wells. During the first few years of GWRS operations, the volume injected between submersible pump backwash events was only 9 to 10 MG. More recently, the backwash frequency has been extended and ranges from an injection volume of 20 to 40 MG between backwash events without any detrimental long-term loss of injection capacity. This typically translates to a frequency of approximately one to two months. Backwash pumping is controlled by OCWD Operations staff from the AWPF control room. A relatively short duration of 5-15 minutes is typically required for each submersible pump backwash event to restore the well's injection capacity. The submersible pump backwash pumping rate is maintained considerably higher than each well's rate of injection to better remove any particulate material that may have been introduced into the gravel pack or out into the formation. During 2021, I24/1 and I24/2 were off-line all year and the submersible backwash pumping rate for I25/1 was approximately 2,100 gpm.

The other modern injection wells (sites I26 through I36) are equipped with dedicated air lines and are regularly backwashed using the airlift pumping method, which requires a portable air compressor to be transported to each site.

Since 2011, OCWD Barrier Operations staff have used a 750 cubic feet per minute (cfm) high-pressure air compressor to regularly airlift backwash these modern wells lacking dedicated pumps.

The airlift backwash frequency for these modern injection wells is also based on the cumulative volume injected since the previous backwash and varies considerably from well to well. Well performance is monitored closely to determine the optimal time to backwash. The volume injected between modern well airlift backwash events typically varies from 15 to 40 MG, which usually translates to a frequency ranging from one to two months. Modern wells that are airlift backwashed require minimal header plumbing disassembly and typically take one day per injection well site to complete. Therefore, these backwash events are not typically shown on the injection well status table (Table 3-5) since each well site is only off-line for one day.

Historically, there has been some evidence of erosion of barrier distribution pipeline materials via the presence of measurable amounts of sand found at the west-end pipeline terminus during maintenance blow-off activities and on in-line bypass filters. In fact, I32C located at this west-end terminus of the barrier pipeline is the first modern injection well showing initial signs of requiring more extensive redevelopment, since ongoing airlift pumping may not be removing all the injected fine-grained material from the lower portion of its screened interval.

To help limit potential pipeline erosion, historically the quality of the lime used during post-treatment operations has been improved and specific post-treatment stability targets have been adjusted. Barrier Operations and AWPF Operations staff continue to closely monitor the lime post-treatment process and operating parameters (e.g., pH) to help minimize the potential for well clogging.

There were no significant changes to the post-treatment process or the associated operating parameters during 2021. However, as part of GWRSFE construction activities, four new polymer feeder skids and a larger polymer storage tank were installed for the post-treatment system during 2021. The new polymer skids are expected to make polymer addition to the clarifiers more efficient at settling out the lime solution.

Bypass filter monitoring at I32 and periodic pipeline inspections will continue during 2022.

4. GROUNDWATER MONITORING AT THE TALBERT BARRIER

OCWD has maintained a comprehensive groundwater monitoring program in the vicinity of the Talbert Barrier for decades as part of the operation of its water recycling program as well as the assessment of the effectiveness of the barrier in preventing seawater intrusion. This section presents the following for 2021:

- Description of Talbert Gap aquifers;
- Overview of groundwater monitoring program;
- Groundwater elevations and directions of flow; and
- Groundwater quality.

4.1 Talbert Gap Aquifers

Earlier studies (DWR, 1966) delineated numerous discrete aquifer units comprising the Talbert Gap area of the Orange County Groundwater Basin. In general, from shallowest to deepest, these include:

- Talbert aquifer;
- Alpha aquifer;
- Beta aquifer;
- Lambda aquifer;
- Omicron aquifer;
- Upper Rho aquifer;
- Lower Rho aquifer;
- Main aquifer; and
- Lower Main aquifer.

The Talbert aquifer is the primary conduit for inland migration of seawater. Being the shallowest of the potable aquifers listed above, it is also the youngest and therefore has not been appreciably folded or uplifted by the Newport-Inglewood Fault system that runs roughly parallel to the coastline through the Talbert Gap area as shown on Figure 4-1. Therefore, the Talbert aquifer is relatively horizontal, continuous, and in direct hydraulic connection with the Pacific Ocean. The Talbert aquifer is approximately 50 to 80 feet thick within the Talbert Gap area and is comprised of relatively coarse sands and gravels that were deposited by the ancestral SAR. The Talbert Gap was formed by the contemporaneous erosional processes of the ancestral SAR between the uplifted areas now known as the Huntington Beach Mesa and the Newport Mesa. Therefore, the Talbert aquifer is non-existent beneath these mesas.

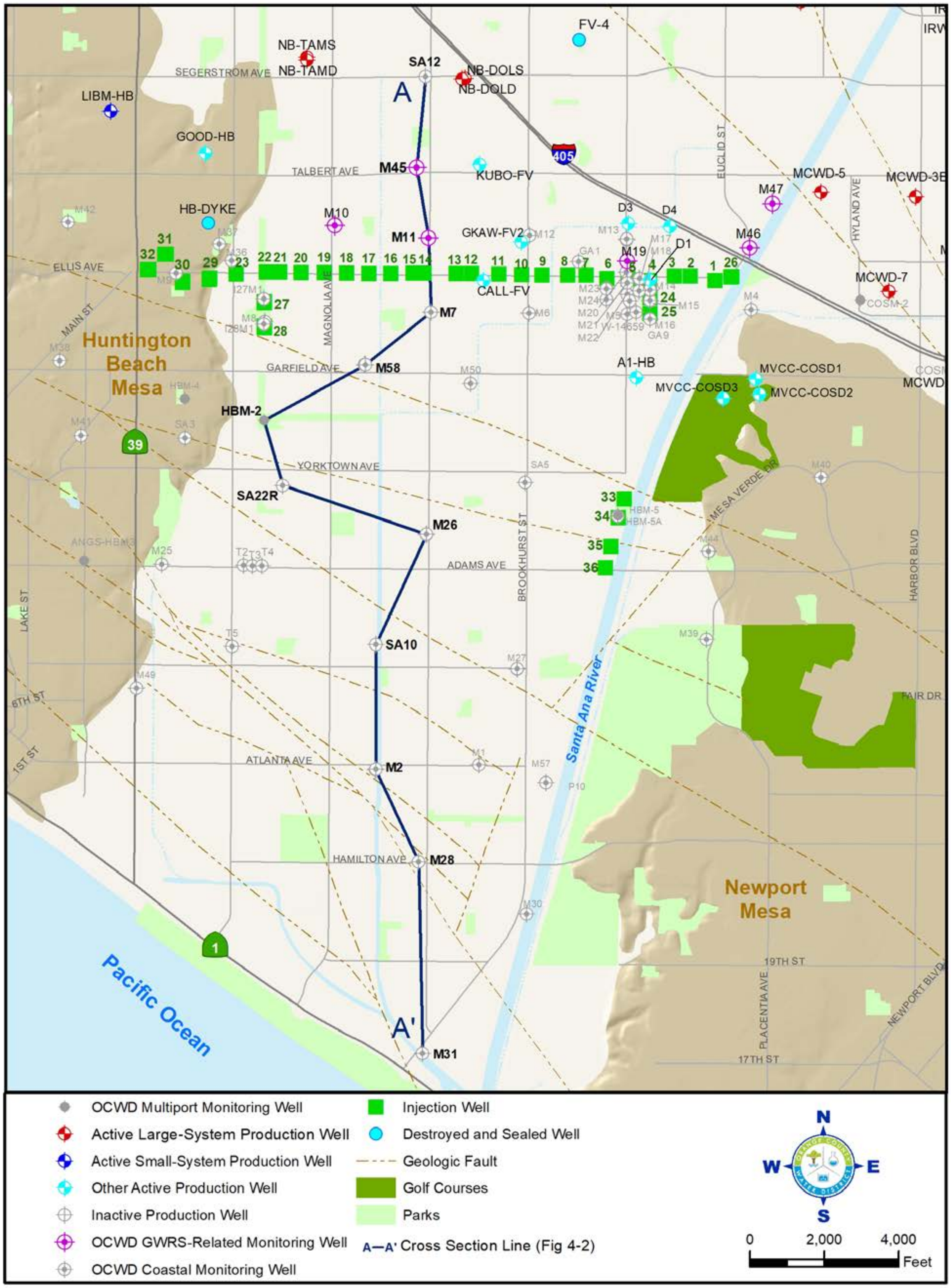


Figure 4-1. Talbert Gap Study Area and Well Location Map

The potable aquifers below the Talbert aquifer are considerably older and have thus been uplifted and offset to varying degrees by the Newport-Inglewood Fault system illustrated on Figure 4-2. Unlike the Talbert aquifer, these deeper aquifers exist not only within the Talbert Gap but also extend beneath the mesas. As discussed later in this section, the Alpha, Beta, Lambda, Omicron, and Upper Rho zones are all susceptible to seawater intrusion via hydraulic connection with the Talbert aquifer. That is, seawater migrating inland within the Talbert aquifer can flow into deeper aquifers via mergence zones where there is no depositional or hydraulic separation between horizontally or vertically adjacent (i.e., merged) aquifers.

The Main and Lower Main aquifers were not previously considered to be susceptible to seawater intrusion within the Talbert Gap area due to their considerable depth and vertical isolation from the shallower aquifers (DWR, 1966). Furthermore, due to the higher degree of faulting and offset, the Lower Main aquifer is thought to be non-existent seaward of approximately Yorktown Avenue. The Main aquifer is discontinuous and offset across the Newport-Inglewood Fault system, and thus largely hydraulically isolated from the ocean. Seaward of this fault zone, the Main aquifer is brackish and isolated from the inland portion of the Basin. However, with increased groundwater withdrawals from the Main aquifer in the coastal area over the last 20 to 30 years, lower groundwater elevations in the coastal area could increase the potential for leakage of saline water inland across the Newport-Inglewood Fault system within the Main aquifer (Herndon and Bonsangue, 2006).

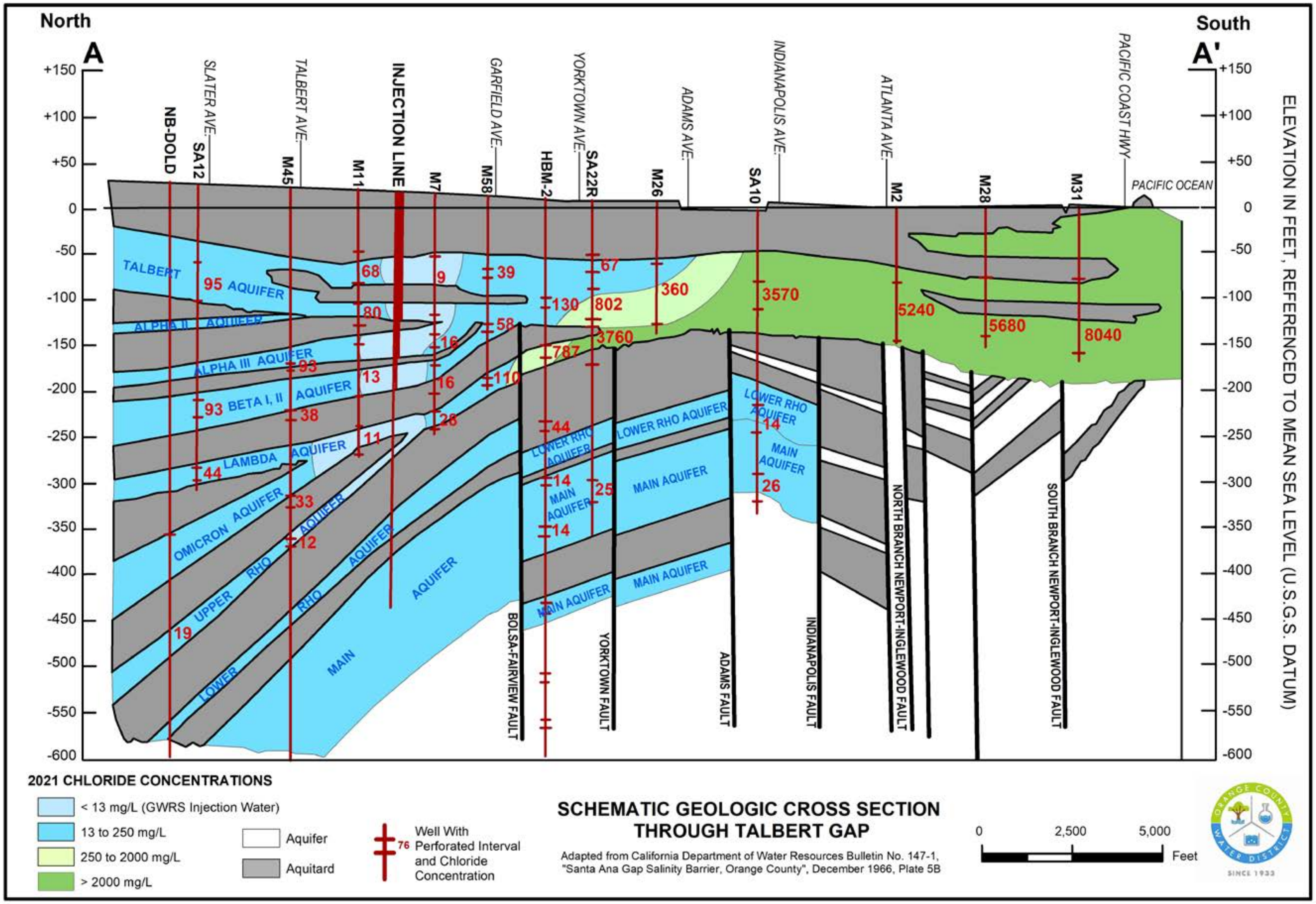


Figure 4-2. Schematic Geological Cross Section Through Talbert Gap

4.2 Groundwater Monitoring Program

As part of the groundwater monitoring program required by the current permit for the GWRS and latest Monitoring and Reporting Program (RWQCB, 2004, 2008, 2014a, 2016, 2019, 2020), OCWD-owned monitoring wells and several municipal and private wells in the Talbert Barrier area were sampled in 2021. OCWD performs coastal groundwater monitoring at numerous additional wells on a semi-annual basis for the purposes of monitoring seawater intrusion. The locations of OCWD's GWRS permit compliance wells, other coastal monitoring wells, private wells, and municipal production wells in the Talbert Gap area are shown on Figure 4-1.

Under the previous WF-21 permit, OCWD monitoring well sites M9, M10, and M19 were sampled monthly. These wells were constructed between 1967-68, prior to injection of WF-21 recycled water. Under the current GWRS permit, quarterly compliance monitoring is required from OCWD monitoring well sites M10, M11, M45, M46, and M47. The three newer GWRS compliance monitoring wells M45, M46, and M47 were constructed during 2004-05. The GWRS monitoring program began in mid-2004. Table 4-1 summarizes the screened interval depths and aquifer zones for the five compliance monitoring wells and M19.

Sampling of monitoring well site M19 is not required under the current GWRS permit. However, this monitoring well site continued to be monitored voluntarily through 2021, and the associated data for M19 are reported herein because this well is in a strategic location just north of the Talbert Barrier near the east end. At monitoring well site M19, only Zone 3 (M19/3) is tested quarterly like GWRS compliance wells and annually for the full comprehensive suite of analytes; Zones 1 and 2 (M19/1 and M19/2) are tested twice a year for a reduced set of analytes for the assessment of seawater intrusion.

Monitoring well site M45 is located approximately halfway between the Talbert Barrier Ellis Avenue alignment and the City of Newport Beach municipal wells (NB-TAMS, NB-TAMD, NB-DOLS, and NB-DOLD) located north of the barrier (Figure 4-1). Well sites M46 and M47 are located approximately one-quarter and one-half the distance, respectively, between injection well site I26 and the nearest municipal production well MCWD-5, which is owned and operated by Mesa Water. These three newer compliance monitoring wells were each constructed with five nested casings designed to monitor the individual aquifers tapped by the nearby production wells.

4.3 Groundwater Elevations and Directions of Flow

Groundwater flow directions in the vicinity of the Talbert Barrier vary considerably due to barrier injection and seasonal fluctuations in coastal pumping as well as historical changes in pumping patterns, such as new well fields coming on-line. Also, due to the vertical distribution of coastal pumping, each of the aquifers receiving injection water has a somewhat different groundwater flow path.

Table 4-1. Monitoring Wells at the Talbert Barrier

OCWD Well Name	*Date Completed*	*Nearest Injection Well [1]*	*Approximate Distance and Direction from Barrier*	*Nearest Drinking Water Well(s)*	*Well Depth (ft bgs)*	*Aquifer Name(s)*
OCWD-M10/1	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	80-160	Talbert and Alpha
OCWD-M10/2	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	175-195	Beta
OCWD-M10/3	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	215-240	Beta
OCWD-M10/4	11/01/1967	OCWD-I19	1,300 ft N	NB-TAMS, NB-TAMD	280-305	Lambda, Omicron and Upper Rho
OCWD-M11/1	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	70-105	Talbert
OCWD-M11/2	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	125-150	Talbert and Alpha
OCWD-M11/3	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	170-225	Beta
OCWD-M11/4	10/01/1967	OCWD-I14	950 ft N	NB-DOLS, NB-DOLD	260-290	Lambda and Omicron
OCWD-M19/1[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	60-110	Talbert
OCWD-M19/2[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	130-195	Alpha
OCWD-M19/3[2]	01/01/1968	OCWD-I5	500 ft N	MCWD-5	215-265	Beta
OCWD-M45/1	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	195-205	Alpha and Beta
OCWD-M45/2	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	250-260	Beta
OCWD-M45/3	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	335-345	Omicron
OCWD-M45/4	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	380-390	Upper Rho
OCWD-M45/5	02/28/2005	OCWD-I15	2,900 ft N	NB-DOLS, NB-DOLD	780-790	Main
OCWD-M46A/1	11/02/2005	OCWD-I26	900 ft NE	MCWD-5	350-370	Lambda and Omicron
OCWD-M46/2	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	420-430	Upper Rho
OCWD-M46/3	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	515-535	Lower Rho
OCWD-M46/4	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	640-660	Main
OCWD-M46/5	07/29/2004	OCWD-I26	900 ft NE	MCWD-5	890-910	Main
OCWD-M47/1	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	355-375	Beta
OCWD-M47/2	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	470-480	Upper Rho
OCWD-M47/3	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	580-600	Lower Rho
OCWD-M47/4	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	745-765	Main
OCWD-M47/5	05/13/2005	OCWD-I26	2,250 ft NE	MCWD-5	940-960	Main

[1] The closest injection well is not necessarily the fastest source of injection water based on estimated arrival times and inferred groundwater flow directions.
[2] Monitoring well site OCWD-M19 is not a compliance well per the existing GWRS permit but is monitored voluntarily.

4.3.1 Talbert and Alpha Aquifers

Figure 4-3 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the shallow Talbert and Alpha aquifers for June 30, 2021, in the Talbert Gap area. The contours not overlying the Huntington Beach and Newport Mesas (i.e., within the Talbert Gap) represent groundwater elevations for the Talbert aquifer. A more-detailed one-foot contour interval was used in the Talbert Barrier area and seaward to better illustrate the groundwater flow patterns. On the mesas, the contours represent Alpha aquifer groundwater elevations since the Talbert aquifer does not exist beneath the mesas as was described earlier in Section 4.1; however, the Talbert aquifer is in lateral hydraulic connection with the Alpha aquifer beneath the Huntington Beach Mesa, such that they behave as one aquifer system. Figure 4-3 also shows the Talbert aquifer mergence zones, which can act as drains transmitting water from the Talbert aquifer into the deeper Alpha, Beta, and Lambda aquifers due to a typically downward vertical gradient.

As shown on Figure 4-3, groundwater elevations in the Talbert aquifer were at or above mean sea level both along Ellis Avenue near the barrier as well as farther seaward near the southeast portion of the barrier and along Adams Avenue. Groundwater elevations were approximately 7 feet above mean sea level at the southernmost end of the southeast barrier injection wells near the intersection of Adams Avenue and the Santa Ana River. Seaward of Adams Avenue, Talbert aquifer groundwater elevations within the Talbert Gap were 3 to 6 feet above mean sea level, indicating no inland migration of seawater during the June 2021 time frame.

The Shallow aquifer groundwater elevations shown on Figure 4-3 for June 2021 were similar to the prior year for June 2020, due to similar barrier injection and relatively high coastal groundwater conditions. The only notable difference is a more pronounced mound surrounding the southeast barrier injection wells near Adams Avenue and the Santa Ana River, in which groundwater elevations were approximately 2 to 3 ft higher in June 2021 than in June 2020.

During both 2020 and 2021, sustained barrier injection resulted in a local hydraulic mound above mean sea level and thus helped to minimize brackish water seaward of Adams Avenue from migrating and draining into the mergence zones, thus preventing it from migrating inland. Without sustained Talbert Barrier injection, a below sea level depression within the Shallow aquifer in the Talbert Gap would occur seaward of Ellis Avenue due to the draining effect of the mergence zone; this condition occurred more regularly prior to the operation of the GWRS facilities and was also evident temporarily during June 2014 when the barrier was off-line for approximately one month due to GWRS Initial Expansion construction activities (Figure 4-3 of 2014 Annual Report). Without the Talbert Barrier supplied by GWRS , such a depression would be a more permanent condition, thereby drawing inland migrating seawater into potable aquifers tapped by municipal production wells farther inland.

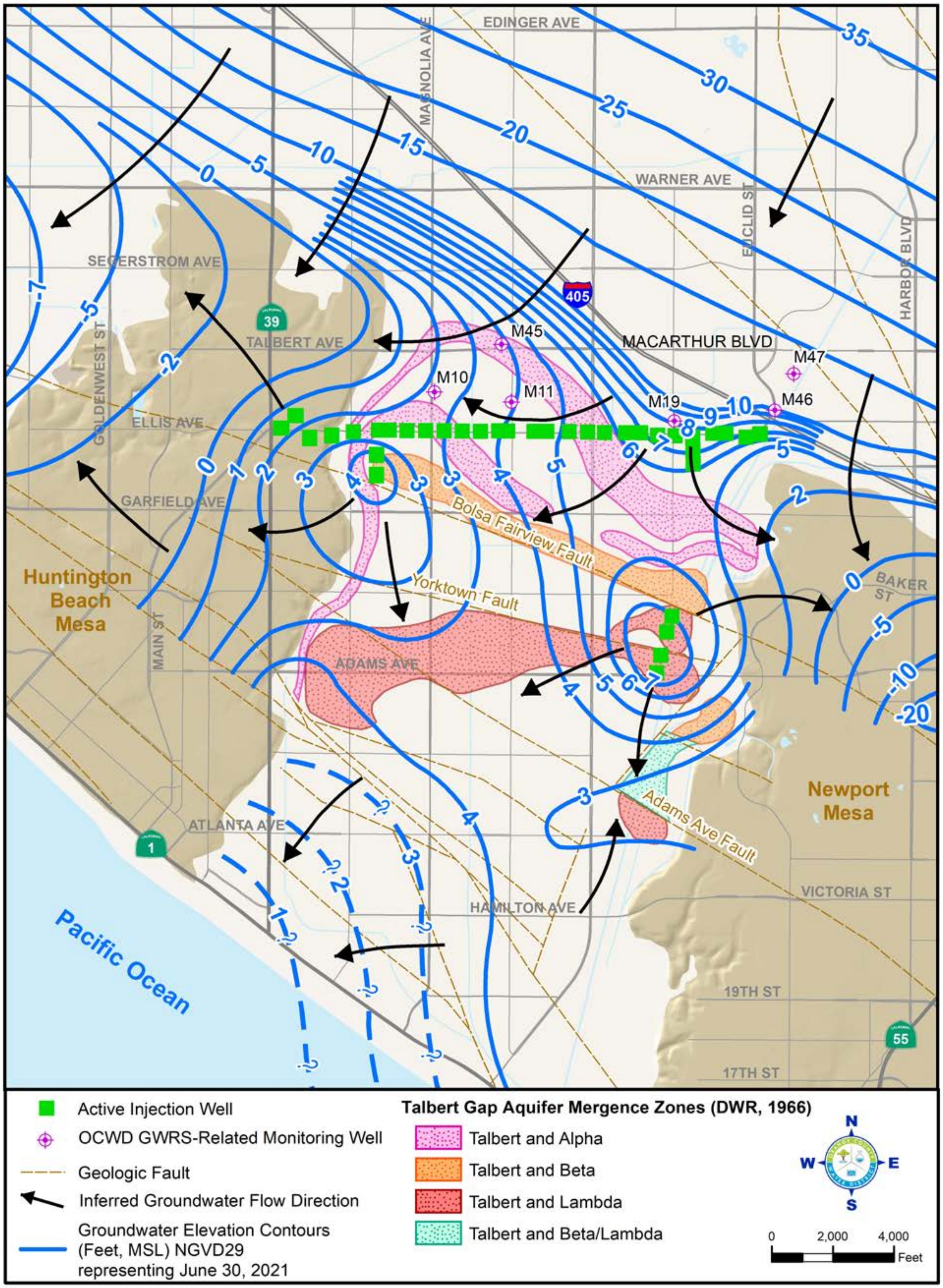


Figure 4-3. Shallow Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2021

Figure 4-3 also shows groundwater flow directions inferred from the groundwater elevation contours for the shallow Talbert and Alpha aquifers for June 2021. The inferred groundwater flow direction was predominantly to the southwest, or seaward, within the Talbert Gap area, except for the western half of the Talbert Barrier along Ellis Avenue just north of the injection wells where the inferred groundwater flow direction in the Talbert aquifer was to the west and northwest towards the Huntington Beach Mesa and was likely caused by local mergence between the Talbert and Alpha aquifers. The inferred flow directions shown on Figure 4-3 for the Shallow aquifer during June 2021 were very similar to those the prior year during June 2020 and are representative of normal barrier operating conditions.

As groundwater flows laterally within the Talbert aquifer to the southwest in the Talbert Gap area, groundwater also flows vertically from the Talbert aquifer down into the Alpha, Beta, and Lambda aquifers due to their respective mergence zones as discussed above. As shown on Figure 4-3 for June 2021, a relatively steep and uniform seaward gradient existed in the Talbert aquifer north of the barrier but largely flattened out south of the barrier due to vertical flow losses to the mergence zones. This June 2021 condition represents sufficient barrier injection to overcome these vertical losses to the mergence zones while still maintaining a somewhat flat but slight seaward gradient with groundwater levels above mean sea level south of Ellis Avenue. That is, the Talbert aquifer groundwater elevations were at an optimal level in which they were high enough to be protective of seawater intrusion but with only minimal losses to the ocean. A seaward gradient in this area has the added benefit of displacing existing brackish water past the crucial Talbert-Lambda mergence zone along Adams Avenue.

4.3.1.1 Key Monitoring Well M26

Monitoring well M26 is strategically located seaward of the barrier in the Talbert-Lambda mergence zone in the middle of the Talbert Gap (Figure 4-1) and is screened across both the Talbert and Lambda aquifers. Therefore, M26 is a key monitoring well for evaluating barrier injection requirements versus seawater intrusion potential. M26 is located approximately 1,000 feet north of Adams Avenue, which approximately represents the farthest seaward line at which the goal is to achieve protective groundwater elevations of approximately 3 feet above mean sea level (ft msl). This protective elevation is based on the Ghyben-Herzberg relation (Ghyben, 1888; Herzberg, 1901; Freeze and Cherry, 1979, pp. 375-376), which accounts for the depth of the Talbert aquifer at that location along with the density difference between saline and fresh groundwater. If this protective elevation is achieved along Adams Avenue for at least the majority of each year, then there would be net annual seaward movement of groundwater; brackish water in the Talbert aquifer would be maintained slightly seaward of the mergence zone and thus prevented from migrating down into the Lambda aquifer that is tapped by inland production wells.

Figure 4-4 shows the historical inter-relationship between coastal groundwater production, Talbert Barrier injection, and groundwater elevations at M26 over the last 14 years since the commencement of GWRS in January 2008. Groundwater elevations at M26 were approximately 15 feet below mean sea level at the beginning of 2008. This represented the lowest conditions at this well over the last 13 years because barrier injection supply was limited during 2007 before GWRS AWPF startup. Also, Basin pumping reached a historical maximum during 2007.

With the startup of several new injection wells in January 2008 with commencement of GWRS, the injection volume was significantly increased from previous years, causing groundwater elevations at M26 to rise over a two-year period to reach protective elevations by the beginning of 2010 (Figure 4-4). Since then, groundwater elevations at M26 have consistently been maintained at or above protective elevations except for brief periods related to AWPF shutdowns, such as in June 2014.

4.3.2 Lambda Aquifer

Figure 4-5 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the intermediate depth Lambda aquifer for June 30, 2021, during a typical on-line barrier condition. The June 2021 Lambda inferred flow directions shown on Figure 4-5 are very similar to those for June 2020 presented in the prior year's Annual Report.

The June 2021 Lambda groundwater elevations in Figure 4-5 near the Talbert Barrier and in the mergence zones seaward of the barrier were nearly the same as in June 2020, due to slightly greater barrier injection offsetting the slightly lower Basin storage conditions.

Inland of the Talbert Barrier, the June 2021 Lambda groundwater elevation contours (Figure 4-5) were very similar in shape to those from the prior June. However, the June 2021 Lambda groundwater elevations were approximately 10 ft lower than the prior year in the Huntington Beach area northwest of the barrier and 10-20 ft lower than the prior year in the IRWD Dyer Road Well Field (DRWF) area of Santa Ana northeast of the barrier. These lower groundwater elevations were likely caused by decreased groundwater storage conditions throughout the Basin in June 2021 as compared to June 2020.

When the barrier is on-line as in June 2021, there is typically a localized area of higher groundwater elevations in the Lambda aquifer, albeit below sea level, in the central portion of the Ellis Avenue barrier alignment. The lack of a more pronounced injection mound along Ellis

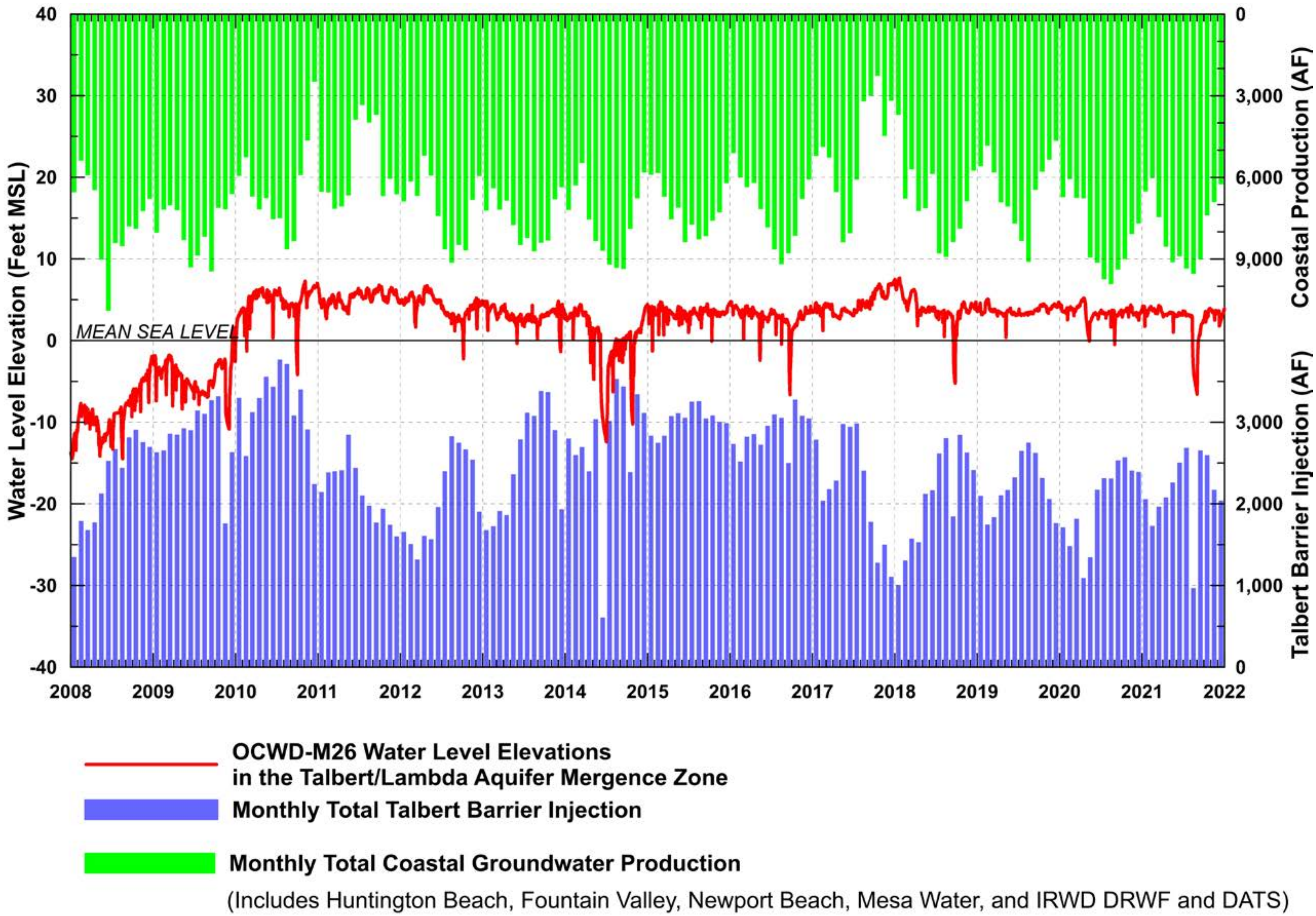


Figure 4-4. Talbert Barrier Injection, Coastal Production, and M26 Groundwater Levels

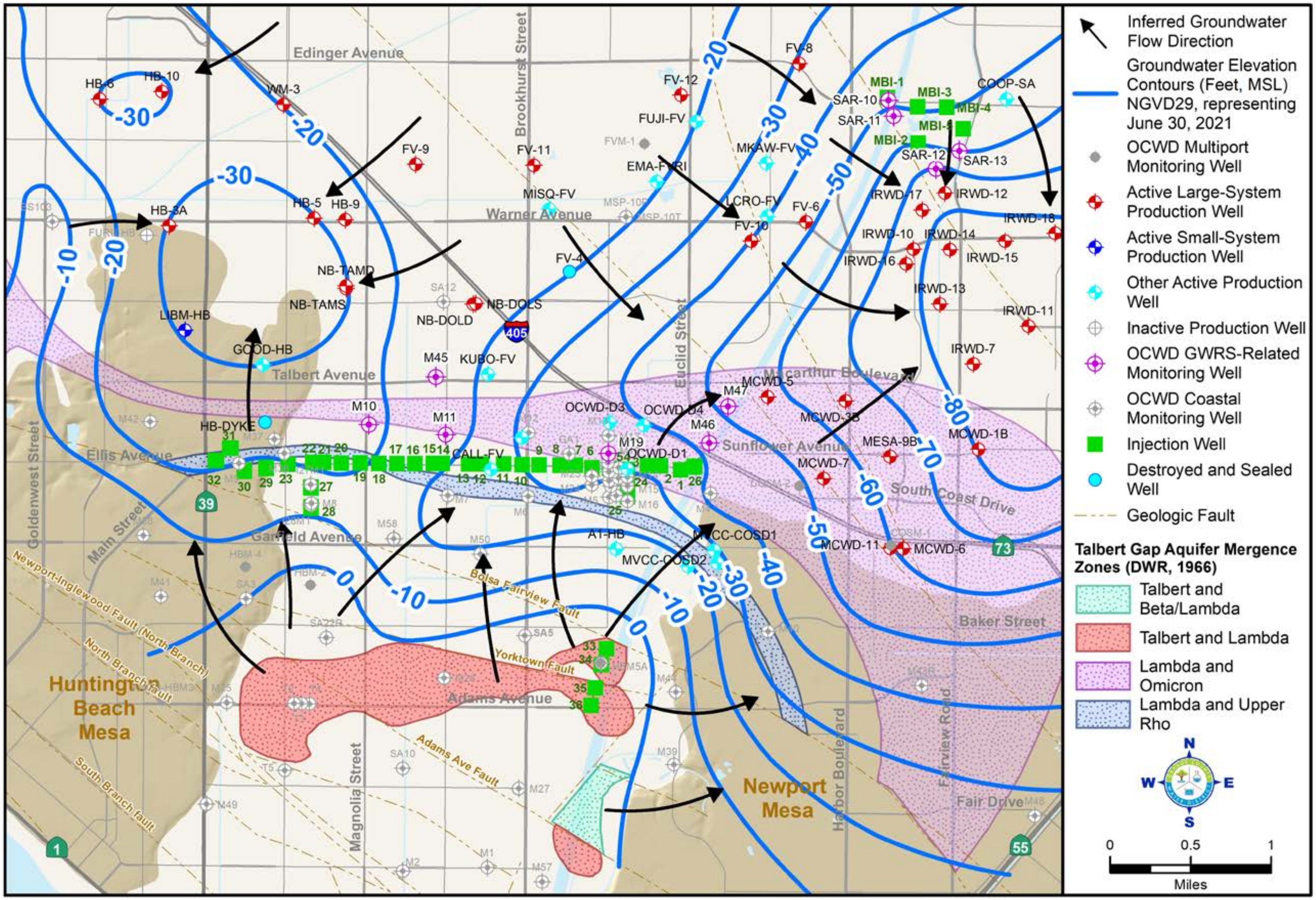


Figure 4-5. Lambda Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2021

Avenue is likely due to: (1) the limited amount of injection into the legacy well Lambda zones (previously shown on Figure 3-9), and (2) the presence of mergence zones between the Lambda aquifer and the deeper Omicron and Upper Rho aquifers in the vicinity of the barrier, causing groundwater injected into the Lambda aquifer to quickly drain down into these deeper aquifers due to a downward vertical gradient induced by coastal production wells screened in these aquifers. In other words, the Lambda-Omicron and Lambda-Upper Rho mergence zones drain the Lambda aquifer, thus preventing Lambda groundwater levels from mounding higher. As such, the groundwater flow arrows shown on Figure 4-5 in this area only depict the inferred lateral flow directions within the Lambda aquifer, but do not show the downward vertical flow lost into the Omicron and Upper Rho aquifers.

As previously discussed, the Talbert-Lambda mergence zone located approximately 1.5 miles seaward of the barrier acts as a groundwater source for the Lambda aquifer, as groundwater flows from the Talbert aquifer down into the Lambda aquifer, from where it then flows inland within the Lambda aquifer due to groundwater gradients caused by production wells.

Landward of the Talbert Barrier near monitoring well site M45 (and also M11) exists a seasonally variable east-west groundwater flow divide in the Lambda aquifer (and also within the other intermediate depth aquifers Beta-III, Omicron, and Upper Rho) due to being near the geometric center of the Ellis Avenue injection barrier alignment as well as being flanked to the northwest by the Huntington Beach and Newport Beach production wells and to the east/northeast by the Mesa Water wells and the IRWD DRWF. This groundwater flow divide was again evident in the Lambda aquifer based on the June 2021 groundwater elevation contours shown on Figure 4-5. Therefore, the direction of groundwater flow at monitoring well site M45 in the Lambda aquifer and the other intermediate depth aquifers may vary both seasonally and from year to year and depend largely on the timing and amount of municipal well production and to a lesser extent on the distribution and amount of barrier injection.

Figure 4-5 shows that Lambda aquifer groundwater elevations near the Talbert-Lambda mergence zone along Adams Avenue were at or slightly above mean sea level and have approximately the same levels as the shallower Talbert aquifer in this same area on Figure 4-3. However, Figure 4-5 has a coarser contour interval of 10 ft. Lambda groundwater elevations decrease with distance away from the Talbert-Lambda mergence zone moving north towards the barrier and towards production wells. As is typical, Lambda groundwater elevations were lowest to the northeast of the Talbert Barrier, at approximately -60 to -80 ft msl near the Mesa Water production wells and IRWD DRWF at the end of June 2021. Lambda groundwater elevations were approximately -20 to -30 ft msl to the north/northwest of the Talbert Barrier near Huntington Beach and Newport Beach production wells at the end of June 2021, as groundwater pumping was less concentrated in that area.

4.3.3 Main Aquifer

Figure 4-6 shows interpreted groundwater elevation contours and inferred groundwater flow directions within the lower portion of the Principal aquifer system for June 30, 2021. Over 90% of Basin pumping occurs from the Principal aquifer system, which vertically from top to bottom includes the Beta, Lambda, Omicron, Upper Rho, Lower Rho, and Main aquifers. The groundwater elevation contours shown on Figure 4-6 most closely represent the lower portion of the Principal aquifer system and will thus for convenience will be referred to herein more specifically as Main aquifer groundwater elevations. The Main aquifer typically has the lowest groundwater elevations in the area.

The June 2021 Main aquifer groundwater elevations shown on Figure 4-6 indicated a large pumping depression to the north/northeast of the barrier as in previous years, with the southernmost portion of the depression encompassing the Mesa Water production wells. The northern extent of this pumping depression encompassed the majority of the IRWD DRWF. June 2021 Main aquifer groundwater elevations were approximately 10 ft lower than the prior June in the Mesa Water and IRWD DRWF areas (-80 ft msl).

North/northwest of the barrier, production wells owned by the cities of Huntington Beach and Newport Beach are relatively fewer and more spread out, and therefore create a less pronounced pumping depression. June 2021 Main aquifer groundwater elevations were approximately -50 ft msl (Figure 4-6), approximately 10 ft lower than the prior June.

Figure 4-6 shows a localized mound of raised Main aquifer groundwater elevations at approximately -20 ft msl at the west end of the Talbert Barrier. All six of the Talbert Barrier west-end deep injection wells were on-line throughout 2021, but nearby June 2021 Main aquifer groundwater elevations were 10 ft lower than the prior June due to lower Basin storage conditions in 2021. As shown in Figure 4-6, the inferred groundwater flow direction from the west-end of the barrier was predominantly inland to the north/northeast towards the Newport Beach well field and Huntington Beach wells HB-5 and HB-9.

On the east end of the barrier, there are only two Main aquifer injection wells I24/2 and I26C. As illustrated on Figure 4-6, their combined injection is typically not substantial enough to create a noticeable mound in the Main aquifer, especially with the pumping influence of the nearby OCWD Deep wells (D1, D3, and D4) used periodically for GAP blending supply. These two deep injection wells are typically kept on-line throughout the year since Main aquifer groundwater levels are much lower on the east end of the barrier than on the west end, but I24/2 was off-line throughout 2021 (see Section 3). Although Main aquifer groundwater elevations shown on Figure 4-6 were well below sea level, the Main aquifer is not considered to be directly susceptible to seawater intrusion in this area due to the Newport-Inglewood Fault Zone acting as an effective

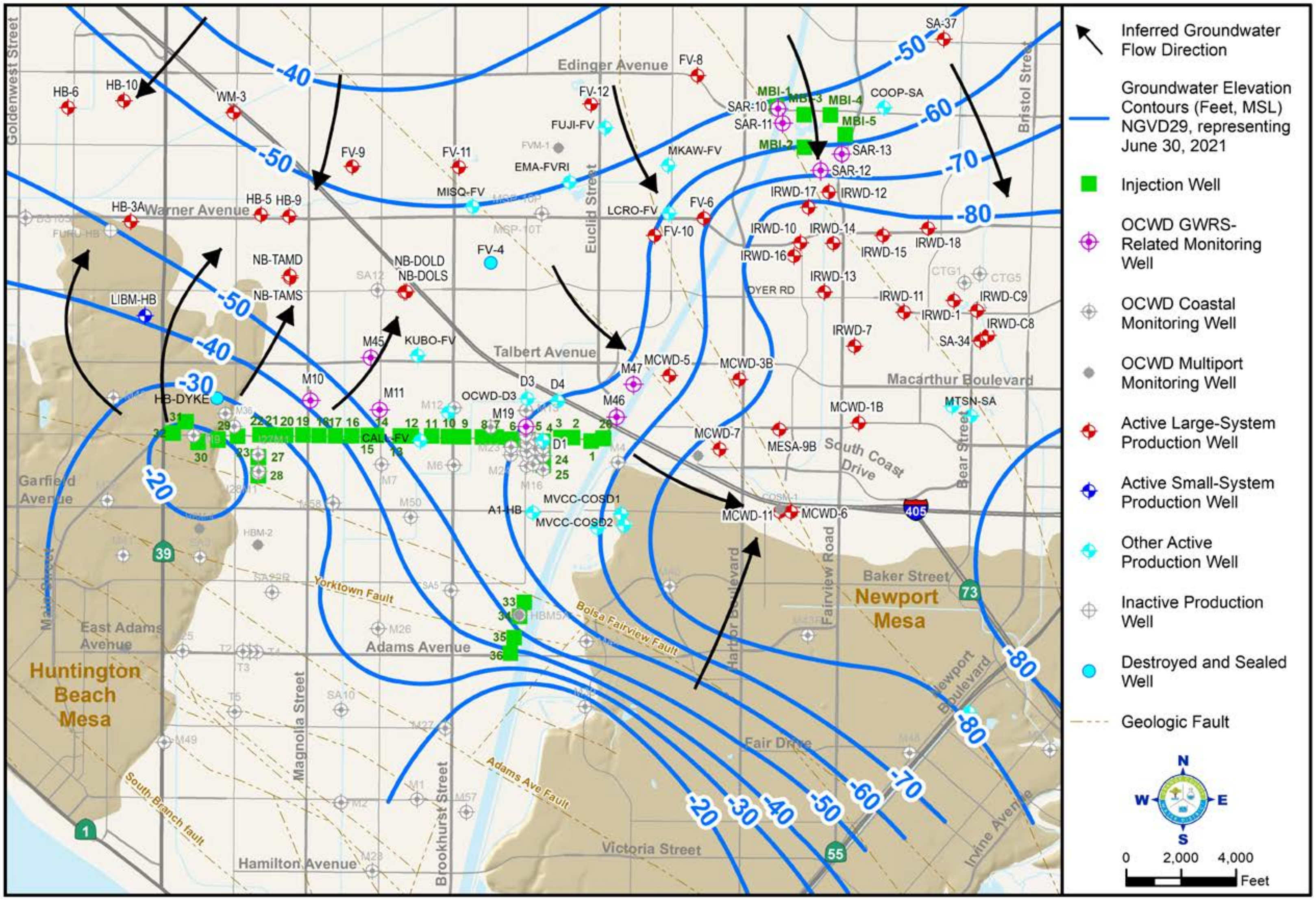


Figure 4-6. Main Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2021

barrier to inland groundwater flow in the Main aquifer. All eight Main aquifer injection wells are primarily used for Basin replenishment.

4.3.4 Compliance Monitoring Well Trends

Groundwater level hydrographs for the 10-year period 2012-2021 for well sites M10, M11, M19, M45, M46, and M47 are shown on the upper graph of Figure 4-7 through Figure 4-12, respectively. These figures also show chloride and 1,4-dioxane concentrations, which are discussed in Section 4.4. The seasonal fluctuations in groundwater levels indicate that the potable aquifers in the Talbert Barrier area – especially the Principal aquifer system – are influenced heavily by groundwater production, which typically varies considerably from winter to summer based on seasonal water demands.

The discussion that follows describes the seasonal groundwater level trends during 2021 at the barrier compliance monitoring wells for the following three aquifer depth categories: (1) shallow Talbert and Alpha aquifers, (2) intermediate depth Beta, Lambda, Omicron, and Upper Rho aquifers, and (3) deeper Lower Rho and Main aquifers. Only the shallow and intermediate depth aquifers are susceptible to seawater intrusion and have thus historically received injection prior to GWRS.

Overall, groundwater levels in all barrier compliance monitoring wells in 2021 were very similar to their 2020 seasonal counterparts, except for the late summer months when groundwater levels were 10-20 ft lower than the prior summer primarily due to the planned barrier shutdown from August 12 to September 2 (barrier shutdown preceded the planned AWPF shutdown, which began on August 15). Despite the planned barrier shutdown, the 6% increase in annual barrier injection from 2020 to 2021 locally offset the decrease in groundwater storage conditions throughout the Basin from June 2020 to June 2021 along with a slight decrease in coastal pumping. Groundwater level trends in all barrier compliance monitoring wells in 2021 exhibited a typical season pattern: (1) rising or remaining relatively high during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering in the late fall months to the end of the year. In the coastal area, these seasonal groundwater level trends are largely controlled by seasonal coastal pumping and to a lesser degree by barrier injection.

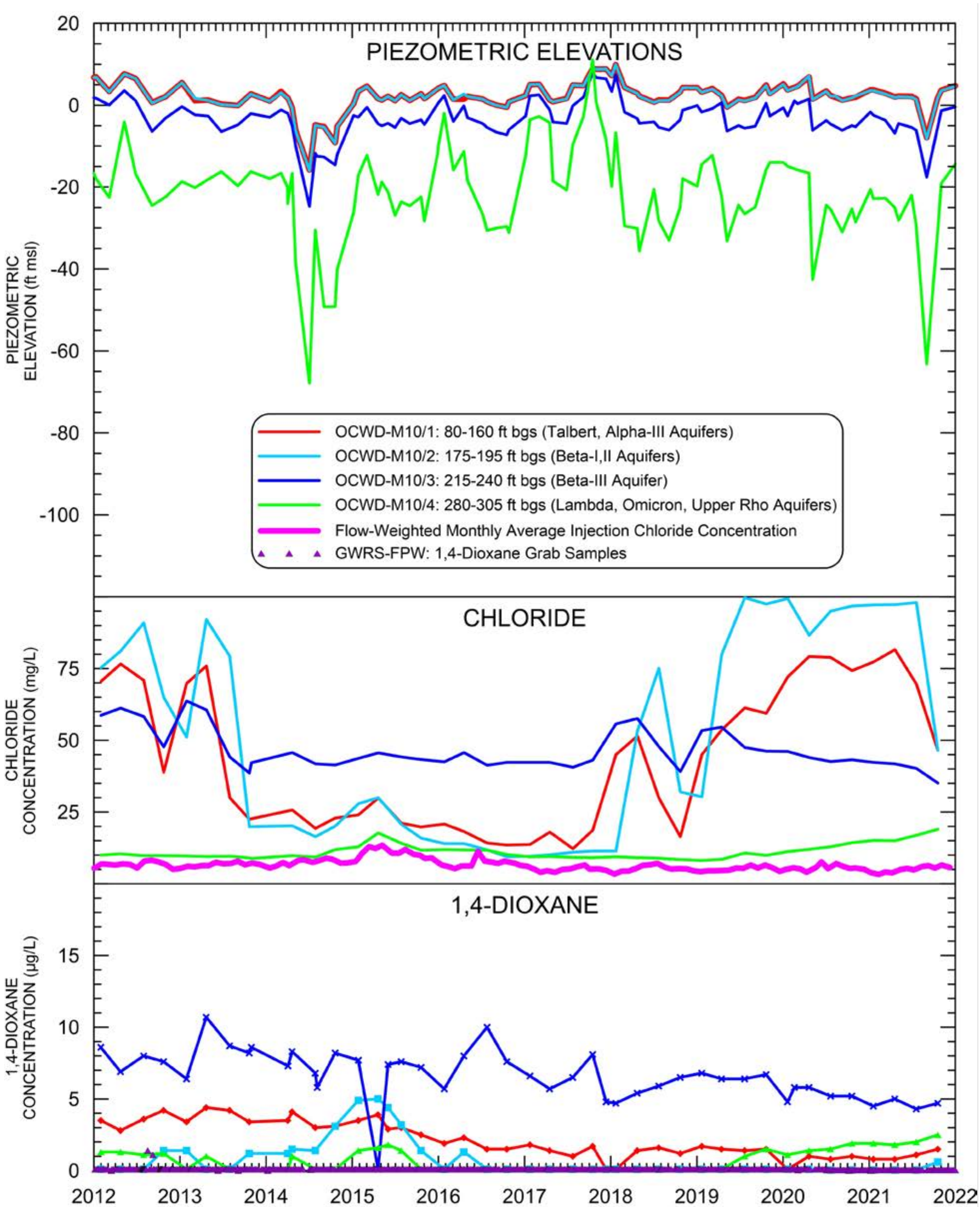


Figure 4-7. Monitoring Well OCWD-M10 Piezometric Elevations and Chloride Concentration

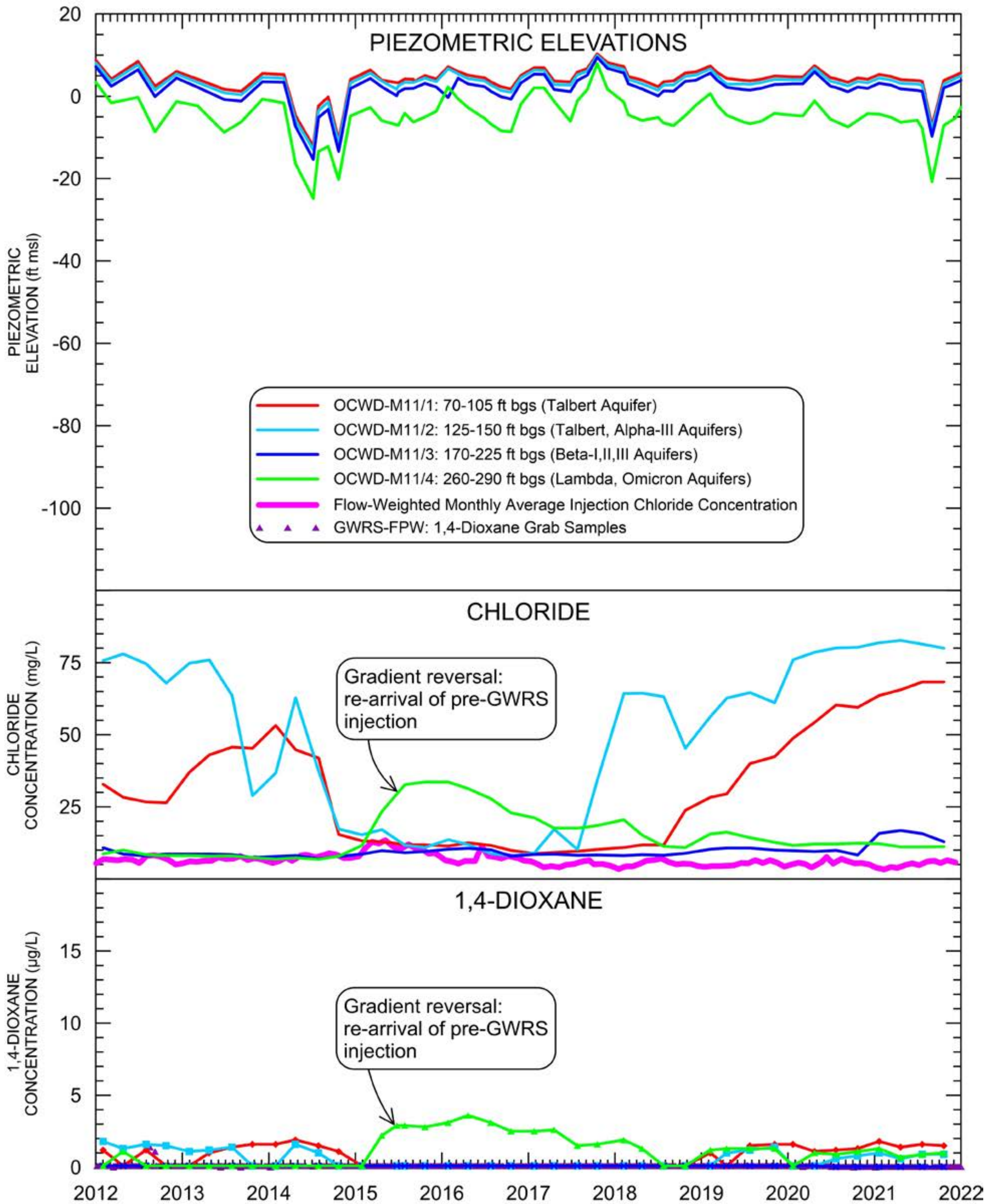


Figure 4-8. Monitoring Well OCWD-M11 Piezometric Elevations and Chloride Concentration

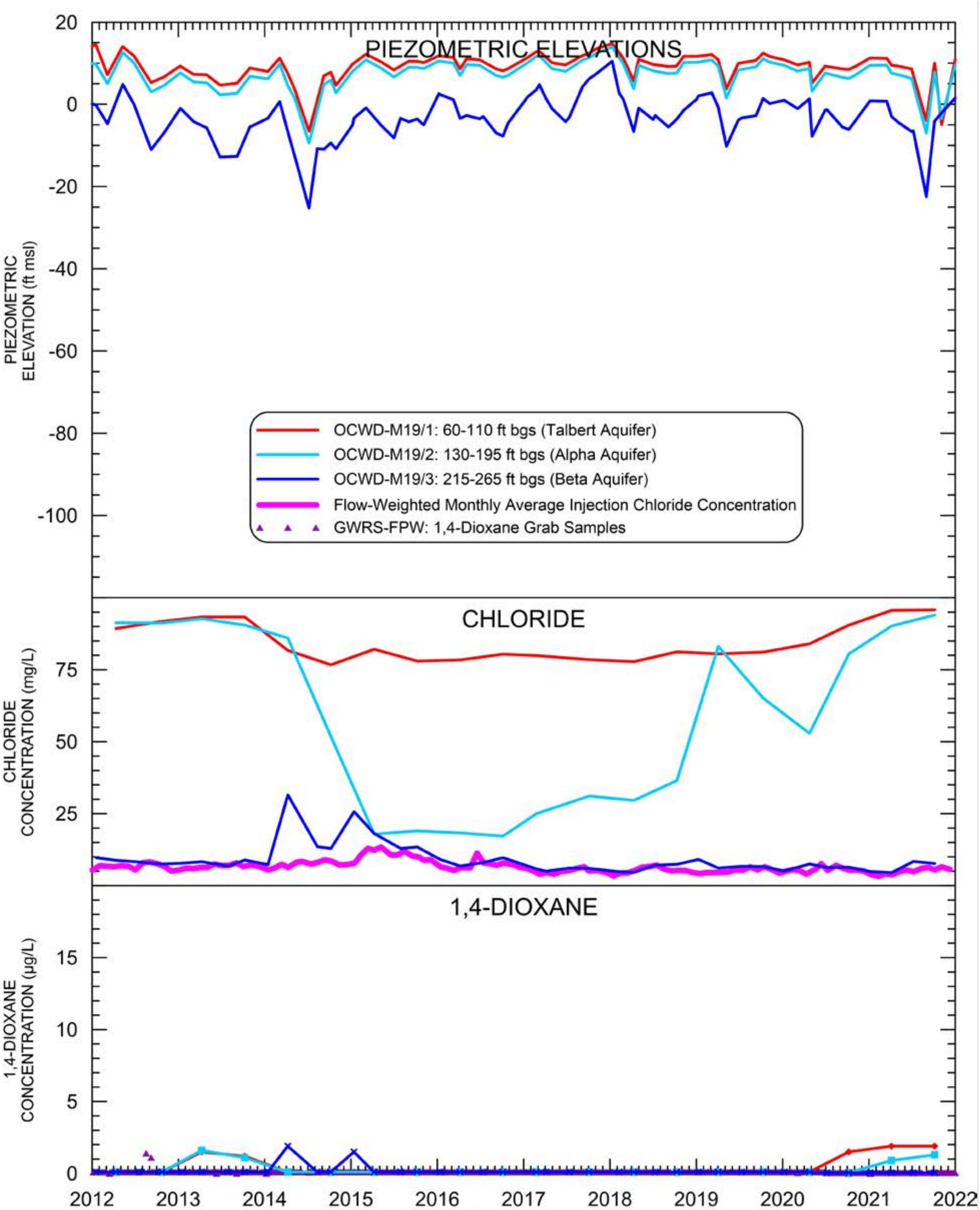


Figure 4-9. Monitoring Well OCWD-M19 Piezometric Elevations and Chloride Concentration

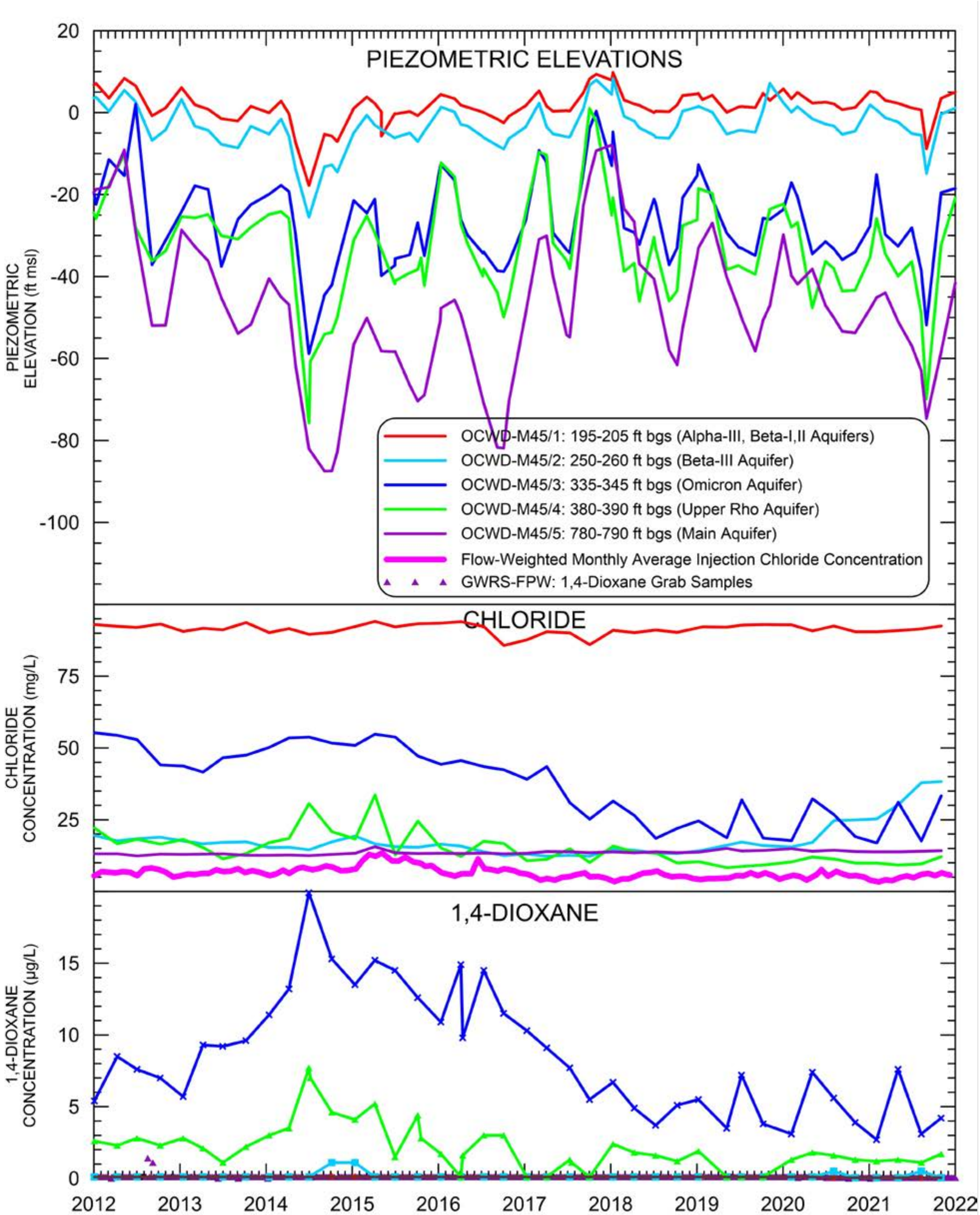


Figure 4-10. Monitoring Well OCWD-M45 Piezometric Elevations and Chloride Concentration

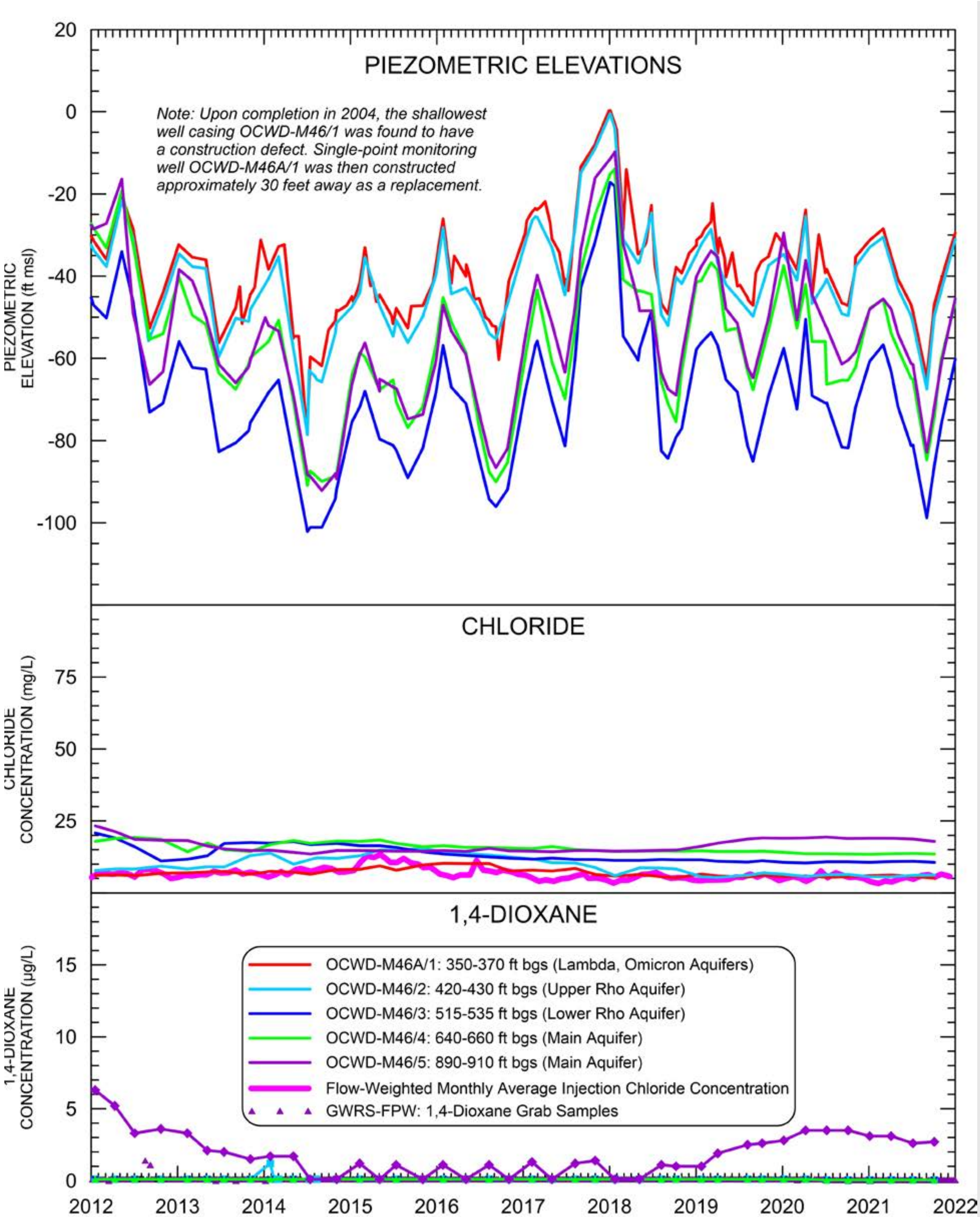


Figure 4-11. Monitoring Well OCWD-M46 and -M46A Piezometric Elevations and Chloride Concentration

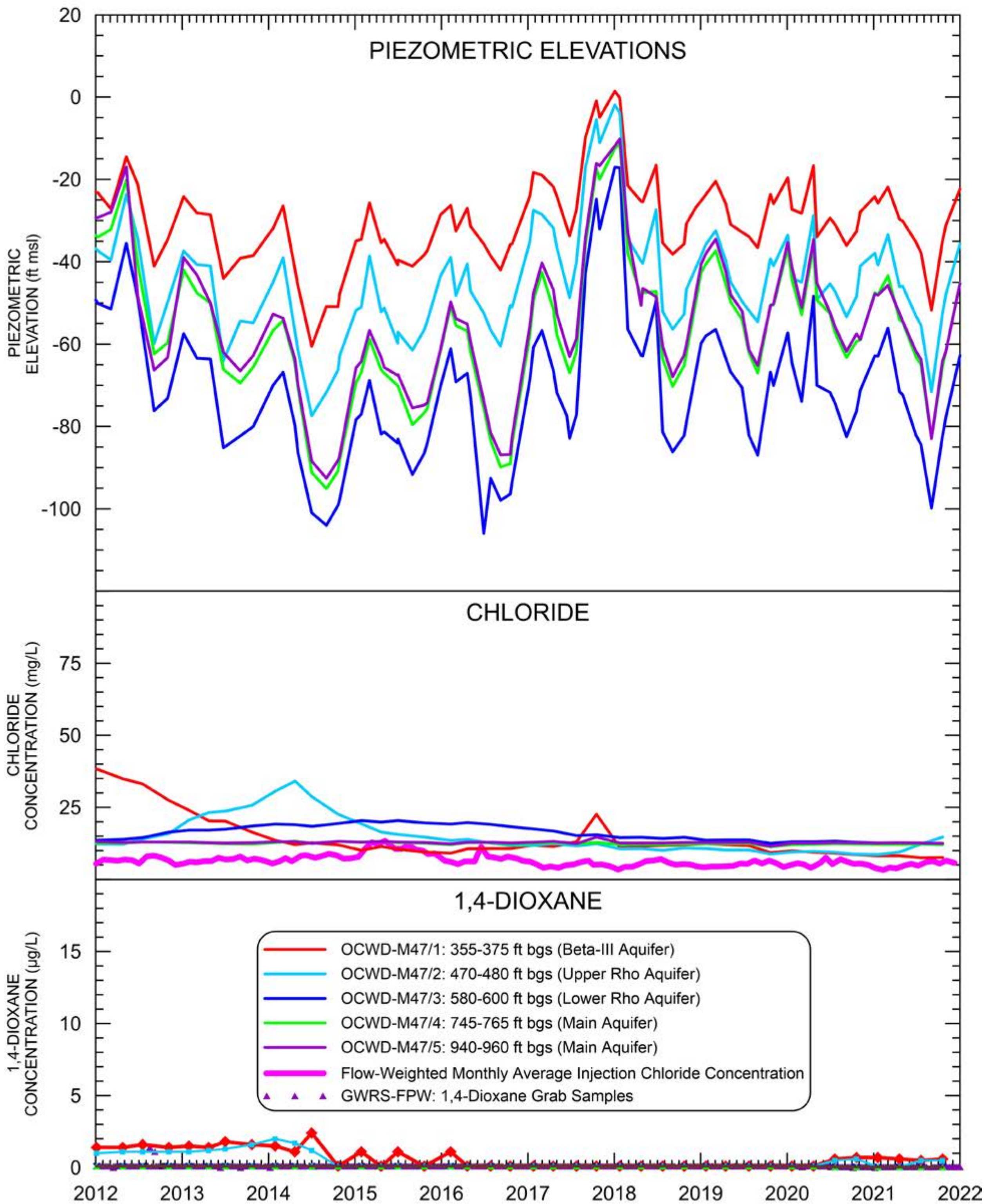


Figure 4-12. Monitoring Well OCWD-M47 Piezometric Elevations and Chloride Concentration

4.4 Groundwater Quality

This section describes monitoring well groundwater quality for general constituents, 1,4-dioxane, and NDMA in the vicinity of the Talbert Barrier. Groundwater quality for production wells in the vicinity of the Talbert Barrier is also summarized.

4.4.1 Monitoring Wells – General Water Quality

Quarterly compliance groundwater quality data for 2021 are presented in Appendix G for the Talbert Barrier monitoring wells. General groundwater quality data for the past five years (2017-21) are summarized in Appendix H for the Barrier compliance monitoring wells. Barrier compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA.

During 2021, groundwater quality at the compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards. Some analyses revealed constituents above the EPA Secondary MCL in 2021 (color and odor), similar to past years and unrelated to purified recycled water injection. It is suspected that the elevated color and odor levels may be due to the presence of Deep aquifer groundwater containing naturally occurring organic matter.

No changes to the Talbert Barrier groundwater compliance monitoring program occurred in 2021. A former permit requirement for total coliform monitoring at GWRS groundwater compliance monitoring wells was rescinded by the RWQCB in February 2018 (RWQCB, 2018). GWRS-FPW is consistently non-detect for total coliform based on permit-required daily testing (Table 2-1). Both the NWRI GWRS Independent Advisory Panel and DDW concurred with the removal of the total coliform groundwater monitoring requirement (DDW, 2018a).

Other previous changes in the GWRS groundwater monitoring program reduced the required frequency for some analytes from quarterly to annually based on a history of no detections (RWQCB 2011 and CDPH, 2010a; RWQCB 2018 and DDW, 2018a). The GWRS permit allows for review of the monitoring program every two years or sooner if necessary. The latest GWRS permit Monitoring and Reporting Program issued by the RWQCB in November 2020 formally incorporated both the removal of the total coliform monitoring requirement and the select monitoring frequency reductions (RWQCB, 2020).

4.4.2 Monitoring Wells – Intrinsic Chloride Tracer, 1,4-Dioxane, and NDMA

Dissolved chloride concentrations can be used to trace the subsurface movement of injection water because chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer. Thus, chloride is a relatively good conservative tracer. Groundwater flow paths determined from groundwater level monitoring are also verified by comparing groundwater quality changes at nearby monitoring wells with injection water quality, primarily using chloride concentrations, chloride/bromide ratios, and electrical conductivity. These methods have proven useful for estimating travel times of injection water to reach Talbert Barrier monitoring wells. These same methods were also used in tracking injected water from the DMBI Project and more recently for the 2020 MBI Project intrinsic tracer test as discussed in Section 8.

Fortunately for tracking purposes, GWRS-FPW has a very low chloride concentration with an annual average ranging from 4-11 mg/L since 2008 and more recently ranging from 5-6 mg/L over the last five years, which is considerably lower than older pre-GWRS (WF-21) injection water which predominantly ranged from approximately 50 to 100 mg/L (with a few sporadic years slightly lower in the 20 to 50 mg/L range as shown in Table 3-2). Native groundwater inland of the barrier typically possess chloride concentrations within the range of older pre-GWRS injection water in the shallow zones; lower than pre-GWRS injection water but still noticeably greater than GWRS water in the intermediate depth zones; and just slightly greater than GWRS water chloride concentrations in the deep zones (15-20 mg/L).

In 2000-2001, OCWD discovered elevated levels of 1,4-dioxane and NDMA present in injection water produced by WF-21. Subsequently, OCWD began frequent monitoring for 1,4-dioxane and NDMA at several locations: in the WF-21 source water, intermediate treatment steps, final product water, and monitoring and production wells located near the Talbert Barrier. By 2001, OC San and OCWD implemented additional source control measures and installed a UV/AOP treatment process as part of WF-21 to produce injection water in compliance with drinking water guidance levels for 1,4-dioxane and NDMA. Figure 4-13 shows the 1,4-dioxane and NDMA concentrations in injection water since 2000; GWRS-FPW has been tested for NDMA and 1,4-dioxane at least weekly since 2008. In March 2002, DDW reduced the Notification Level (known as the Action Level prior to January 1, 2005) for NDMA to the current level of 10 ng/L. The Notification Level (NL) for 1,4-dioxane was originally set at 3 μg/L but was subsequently reduced to 1 μg/L in November 2010. DDW recommends that a drinking water production well be taken out of service if the Response Levels (RL) of 300 ng/L for NDMA or 35 μg/L for 1,4-dioxane are exceeded. While these NLs are not formal permit limits for GWRS, OCWD consistently produces purified recycled water for injection and recharge with concentrations below detection and/or below these NLs (Figure 4-13). No drinking water production wells in the vicinity of the Talbert Barrier have NDMA or 1,4-dioxane concentrations remotely approaching their respective RLs.

Testing for NDMA and 1,4-dioxane at monitoring wells and production wells near the Talbert Barrier continued during 2021. In mid-2020, the Reportable Detection Limit (RDL) for 1,4-dioxane was lowered from 1.0 to 0.5 μg/L for both AWPF and groundwater samples analyzed by the OCWD Laboratory. The revised laboratory method for 1,4-dioxane was recently approved by the SWRCB's Division of Water Quality in a letter dated April 5, 2021 (SWRCB, 2021) to comply with the updated Recycled Water Policy CEC monitoring requirements incorporated into the latest

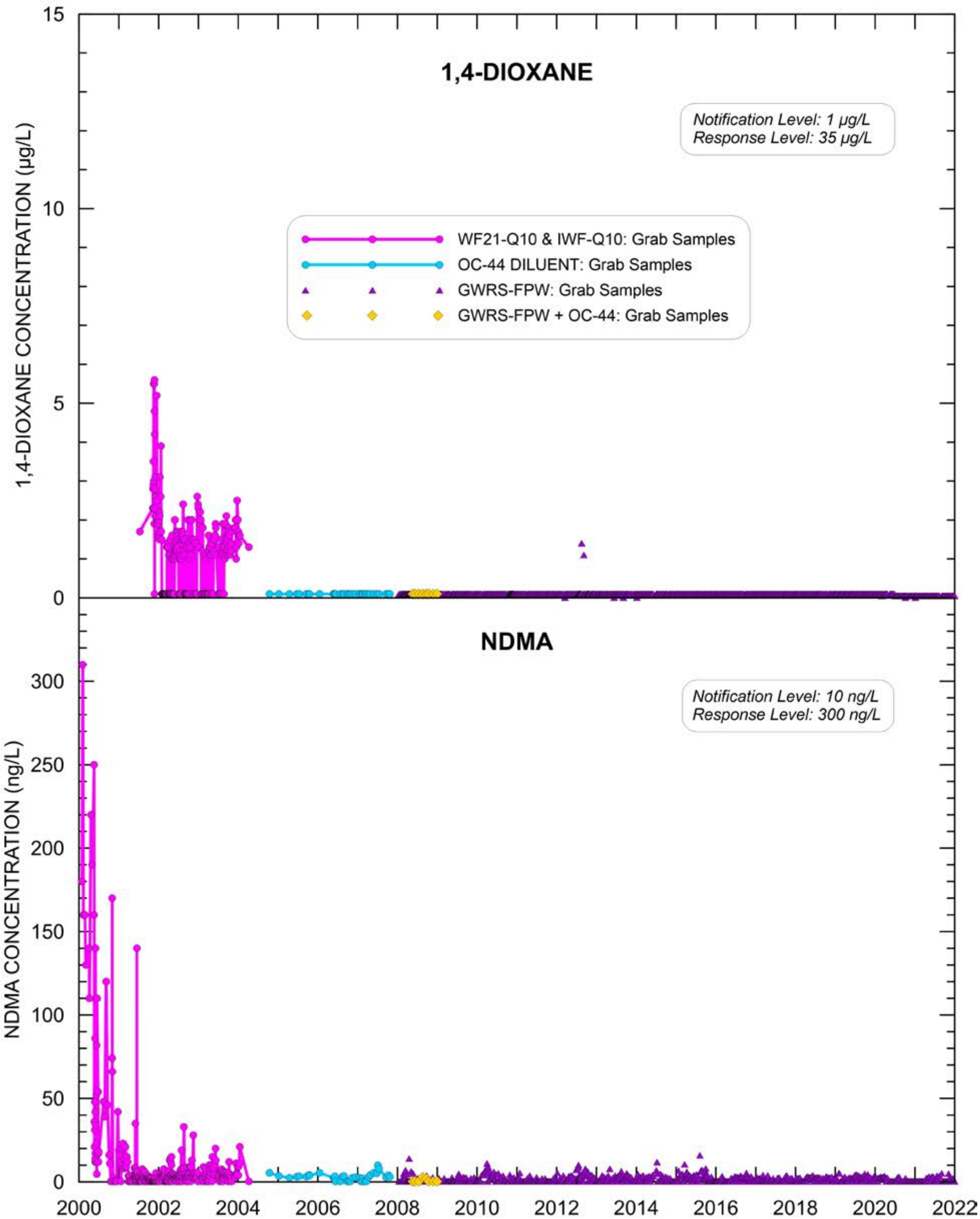


Figure 4-13. Talbert Barrier Injection Water 1,4-Dioxane and NDMA Concentrations

GWRS permit Monitoring and Reporting Program (RWQCB, 2020). NDMA and 1,4-dioxane concentrations from the monitoring wells are presented in Appendix H.

During 2021, all barrier compliance monitoring wells except M47 had one or more aquifer zones with 1,4-dioxane concentrations that were above the DDW NL of 1 μg/L during at least a portion of the year, but all samples at all six monitoring wells were significantly below the DDW RL for drinking water systems; these detections are a legacy of WF-21 injection. In contrast, NDMA was only detected in one monitoring well during 2021 at M46A/1 and was well below the DDW NL of 10 ng/L. In general, OCWD has observed 1,4-dioxane to be more persistent than NDMA in groundwater in the vicinity of the Talbert Barrier. Therefore, time-series plots for NDMA were not included herein but can be found in prior year's annual reports for historical trends when NDMA was more prevalent.

NDMA concentrations at M46A/1 remained low during 2021 and ranged from 2.6 to 3.5 ng/L, remaining well below the NL of 10 ng/L all year. In comparison, NDMA concentrations in GWRS-FPW ranged from non-detect (<2 ng/L) to approximately 5 ng/L during 2021.

Figure 4-7 through Figure 4-12 show observed chloride concentrations in the middle graph and observed 1,4-dioxane concentrations on the lower graph over the 10-year period 2012-2021 for barrier monitoring wells M10, M11, M19, M45, M46, and M47, respectively.

For illustrative purposes, these graphs have been kept to a running 10-year history for each successive Annual Report. For comparison, the chloride graphs also show historical flow-weighted monthly average injection water chloride concentrations. Observed chloride concentrations at these compliance wells were influenced by a variety of factors, including: (1) recycled water injection volumes, (2) nearby individual injection well operational status, (3) coastal groundwater production, and (4) overall groundwater storage conditions in the Basin.

Since the 10-year period shown in Figure 4-7 through Figure 4-12 does not include the commencement of GWRS injection in 2008, the efficacy of tracking injection water by using chloride concentrations and first arrival of the low-chloride GWRS signal at many of these monitoring wells is more thoroughly described in Section 4.4.2 of prior years' Annual Reports. As part of the permitting process for the GWRS and GWRSFE, OCWD plans to evaluate historical tracer data for the Talbert Barrier to validate the existing underground travel time. This process is discussed in more detail in Section 4.4.3.

Figure 4-7 through Figure 4-12 show the relationship between chloride and 1,4-dioxane when comparing the middle graph to the lower graph of each figure. During GWRS arrival at a well, antecedent higher chloride concentrations characteristically decrease; this is typically accompanied by a contemporaneous decrease in the antecedent 1,4-dioxane concentrations that were often previously elevated due to the historical impact of WF-21 injection. The chloride concentration decline upon GWRS arrival does not always reach GWRS levels due to mixing along longer and/or more dispersive flow paths, depending on distance from the barrier and depth. During high Basin conditions, several of the wells often exhibit a shift or reversal in the typically inland hydraulic gradient, causing older pre-GWRS (WF-21) water to migrate back to these wells; therefore, these gradient reversals typically lead to an increase in both chloride and 1,4-dioxane concentrations back towards pre-GWRS levels. At some of the wells however, a gradient reversal indicated by increasing chloride concentrations may not lead to an increase in 1,4-dioxane concentrations if the pre-GWRS antecedent condition was native groundwater devoid of 1,4-dioxane. The chloride versus 1,4-dioxane relationship can be summarized as follows:

a) GWRS arrival – decrease in both chloride and 1,4-dioxane (if the latter is present in the pre-GWRS background condition);
b) Re-arrival of WF-21 water (gradient reversal) – increase in chloride and 1,4-dioxane (if the latter is present in the pre-GWRS background condition); and
c) Re-arrival of native groundwater (gradient reversal) – chloride increase without any increase in 1,4-dioxane.

Figure 4-8 for OCWD-M11/4 (Lambda and Omicron aquifers) presents an illustrative example of the correlation between chloride and 1,4-dioxane. From 2012-2014, chloride concentrations at M11/4 were low and stable at GWRS levels, indicating approximately 100% GWRS arrival during that time. During that same time, 1,4-dioxane concentrations were also low and stable and were largely non-detect, confirming the 100% GWRS water arrival. During 2015, both chloride and 1,4-dioxane concentrations increased notably, signaling some proportion of older WF-21 water migrating back to this well due to a reversal in the gradient from landward to seaward.

4.4.2.1 Monitoring Well M10

At M10/1 (Talbert and Alpha-III aquifers) and M10/2 (Beta-I and Beta-II aquifers), Figure 4-7 shows that chloride concentration trends have been very similar at these two wells over the last 10 years, with the chloride signal being lagged by approximately two months at M10/2 as compared to M10/1, likely related to a slightly deeper, slower flow path at M10/2.

Chloride concentrations at M10/1 and M10/2 were high from mid-2019 to mid-2021, nearing 80 mg/L at M10/1 and 100 mg/L at M10/2. For both M10/1 and M10/2, the sustained higher chloride concentrations during this period resulted from higher groundwater conditions causing a temporary gradient reversal from landward to seaward. At M10/1, concentrations of 1,4-dioxane during this same period remained low and stable, likely indicating that the gradient reversal primarily brought native groundwater back to this well. At M10/2, concentrations of 1,4-dioxane during this period increased from non-detect to approximately 2 μg/L, likely indicating that the gradient reversal in this case brought some combination of older WF-21 injection water and native groundwater back to this well. During the second half of 2021, chloride concentrations at both M10/1 and M10/2 declined sharply down to 47 mg/L at both wells by the fourth quarter, indicating a temporary gradient shift back to a more landward direction likely due to the 21-day barrier shutdown in August causing lower groundwater levels. However, 1,4-dioxane levels remained low with a slight increase during the second half of 2021 to just below 2 μg/L at M10/1 and just below 3 μg/L at M10/2, as GWRS injection had not likely reached these zones due to the barrier shutdown.

At M10/3 (Beta-III aquifer), Figure 4-7 shows that chloride concentration trends were similar to but much more dampened than at M10/1 and M10/2 over the entire period shown. Since the second quarter of 2019, chloride concentrations at M10/3 have gradually declined from 55 mg/L down to 35 mg/L by the fourth quarter of 2021, likely indicating an inland gradient, albeit relatively flat, in the Beta aquifer at this location. However, only a relatively small portion of GWRS water has likely arrived at this well based on chloride concentrations remaining significantly higher than GWRS water while 1,4-dioxane concentrations during this same period also remained elevated with only a very gradual decrease down to just below 5 μg/L by the end of 2021. The relatively low proportion of GWRS water at this well is likely due to a less permeable and/or a more dispersive flow path.

At M10/4 (Lambda, Omicron, and Upper Rho aquifers), Figure 4-7 shows that chloride concentrations have mostly remained stable and low near GWRS levels from first arrival in 2010 until 2019, indicating a prolonged predominance of GWRS purified recycled water at this well due to a consistently landward gradient in these aquifers confirmed by low and mostly non-detect 1,4-dioxane concentrations during that time. Since late 2019, chloride concentrations at M10/4 have gradually increased from 10 mg/L in the fourth quarter of 2019 to 19 mg/L by the fourth quarter of 2021, still indicating a predominance of GWRS water at this well but less than 100% possibly due to a subtle shift in the gradient direction or many of the legacy injection wells being off-line for the last three years because of high Basin conditions. Consistent with the gradual chloride increase since 2019, concentrations of 1,4-dioxane at M10/4 gradually increased from below the RDL in the second quarter of 2019 to 2.5 μg/L by the fourth quarter of 2021, confirming the subtle shift in the gradient and return of a small portion of pre-GWRS injection water to this well in the Lambda aquifer.

4.4.2.2 Monitoring Well M11

At M11/1 (Talbert aquifer) and M11/2 (Talbert and Alpha-III aquifers), Figure 4-8 shows that chloride concentrations increased in both wells during 2019-2021, with M11/1 peaking in the fourth quarter of 2021 at 68 mg/L and M11/2 peaking in the second quarter of 2021 at 83 mg/L. At both wells, the sustained chloride concentration increases likely indicated a seaward gradient reversal from late 2018 through 2021 in the Talbert and Alpha aquifers at this location, confirmed by the slight increase in 1,4-dioxane concentrations at both wells from below the RDL in 2018 to just above the RDL in the 1 to 2 μg/L range throughout 2019-2021. Similar to the aforementioned gradient reversal during this same time at M10/1 and M10/2 in these shallow Talbert and Alpha aquifers, the gradient reversal at M11/1 and M11/2 likely brought a combination of native groundwater (devoid of 1,4-dioxane) and pre-GWRS injection water back to these wells. Inspection of Figure 4-3 shows that the June 2021 inferred groundwater flow direction in the Talbert aquifer near the M11 location was to the southwest, thus confirming the seaward gradient during this time.

At M11/3 (Beta-I, Beta-II, and Beta-III aquifers), Figure 4-8 shows that chloride concentrations increased slightly from GWRS levels of 8 mg/L in the fourth quarter of 2020 to 17 mg/L in the second quarter of 2021 and then gradually down to 13 mg/L in the fourth quarter of 2021 , still indicating a significant percentage of GWRS water at this well but likely signaling a subtle seaward shift in the gradient during the first half of 2021 and then back to landward during the second half of the year in the Beta aquifer at this location. This subtle seaward shift in the gradient was likely not significant enough to bring older WF-21 water back to this well, as concentrations of 1,4-dioxane at M11/3 have remained below the RDL since 2008, indicating a predominance of GWRS purified recycled water at this well for several years and through 2021.

At M11/4 (Lambda and Omicron aquifers), Figure 4-8 shows that chloride concentrations remained low and stable at approximately 11 to 12 mg/L during 2021, indicating a continued landward gradient and a predominance of GWRS water at this well but somewhat less than 100%. This is confirmed by the low but detectable 1,4-dioxane concentrations just above the RDL during 2021 at M11/4 which indicate a small percentage of pre-GWRS injection water still arriving at this well due to mixing via dispersive transport or persistent shifts in the gradient direction in this central portion of the barrier flanked to the northeast and northwest by municipal production wells.

4.4.2.3 Monitoring Well M19

At M19/1 (Talbert aquifer), Figure 4-9 shows that chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L. These chloride levels are significantly higher than GWRS water, thus indicating that no GWRS water has ever reached this well within the shallow Talbert aquifer, consistent with the observed seaward gradient at this location on Figure 4-3. Concentrations of 1,4-dioxane at M19/1 increased slightly above the RDL in the fourth quarter of 2020 and remained low and stable during 2021. The small 1,4-dioxane increase in late 2020 and 2021 occurred during high Basin conditions like the prior 1,4-dioxane detections during 2013, likely causing a slight shift in the typically seaward gradient. High chloride concentrations of over 90 mg/L during both the 2013 and 2020-2021 periods likely indicate a blend of older pre-GWRS injection water and native groundwater (devoid of 1,4-dioxane) arriving at M19/1 during those high Basin conditions.

At M19/2 (Alpha aquifer), Figure 4-9 shows that chloride concentrations suggest gradient reversals based on the increasing and decreasing trends. Chloride concentrations at M19/2 increased from early 2020 to 94 mg/L by the fourth quarter of 2021, likely indicating a return to the dominant seaward gradient and indicating no GWRS water at this well in the Alpha aquifer by the end of 2021. Concentrations of 1,4-dioxane increased slightly above the RDL in the first quarter of 2021 and remained low during 2021. Like at M19/1, the small 1,4-dioxane increases at M19/2 in 2013 and 2021 occurred when high Basin conditions possibly caused a slight shift in the seaward gradient to move a blend of older pre-GWRS injection water and native groundwater (devoid of 1,4-dioxane) to M19/2.

At M19/3 (Beta aquifer), Figure 4-9 shows that chloride concentrations have remained low at or near GWRS levels since 2017, while 1,4-dioxane concentrations have contemporaneously remained below the RDL since 2017, indicating a persistent landward gradient from the barrier to this well since then. During 2021 chloride concentrations at M19/3 remained below 10 mg/L, indicating 100% GWRS water.

4.4.2.4 Monitoring Well M45

At M45/1 (Alpha-III, Beta-I, and Beta-II aquifers), Figure 4-10 shows that chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L. These chloride levels are significantly higher than GWRS water, thus indicating that no GWRS water has reached M45/1, consistent with the observed seaward gradient at this location in the Alpha aquifer. Figure 4-10 also shows that at M45/1, 1,4-dioxane has never been detected above the RDL, as expected by stable chloride concentrations trends indicating native groundwater (devoid of 1,4-dioxane) at this well.

At M45/2 (Beta-III aquifer), Figure 4-10 shows that chloride concentrations were relatively low from 2012-2019, indicating the sustained arrival of some percentage of GWRS water at this well. Chloride concentrations at M45/2 increased slightly in the first half of 2020 and again in the first half of 2021, ending the year at 38 mg/L, likely indicating a seasonal seaward gradient reversal at M45/2 in the Beta aquifer during both 2020 and 2021 due to the relatively high Basin conditions over the last two years. Concentrations of 1,4-dioxane had remained below the RDL since 2015 until having one detection at the new RDL of 0.5 µg/L during the third quarter of both 2020 and 2021, confirming the seasonal seaward shift in the gradient both years bringing a small portion of older WF-21 water back to this well.

At M45/3 (Omicron aquifer), Figure 4-10 shows that chloride concentrations remained relatively high within a range of approximately 40 to 50 mg/L until finally beginning to decline for the first time during 2017 with a continued decline down to 18 mg/L in the first quarter of 2020. Chloride concentrations at M45/3 increased slightly to 32 mg/L during the second quarter of 2020 before decreasing back down to 17 mg/L by the first quarter of 2021. Chloride concentrations at M45/3 similarly increased again in the second quarter of 2021 to 31 mg/L and then decreased to 18 mg/L in the third quarter before rising again to 33 mg/L in the fourth quarter. These overall lower chloride concentrations with brief seasonal rises over the last two to three years likely indicate some proportion of GWRS water arriving at this well in the Omicron aquifer but with seasonal interruptions due to shifts in the gradient direction likely caused by M45/3 being flanked locally by the City of Newport Beach production wells to the northwest and northeast. Concentrations of 1,4-dioxane here have consistently been the highest of all zones at M45 since 2012. Similar to the chloride increases at this well during the second quarter of both 2020 and 2021, concentrations of 1,4-dioxane increased to just over 7 µg/L in the second quarter of 2020 and again in the second quarter of 2021, decreasing thereafter in the third quarter in both years. These two short-term increases in 2020 and 2021 confirmed the aforementioned seasonal shifts in the gradient direction at this well, likely caused by seasonal pumping patterns at nearby City of Newport Beach production wells.

At M45/4 (Upper Rho aquifer), Figure 4-10 shows that chloride concentrations were relatively low from 2012-2019, indicating the sustained arrival of some percentage of GWRS water in this zone. Since the nearest legacy injection wells are not screened in the Upper Rho aquifer, GWRS arrival at M45/4 requires vertical migration from the Lambda aquifer down into the Upper Rho aquifer, likely from their zone of mergence in the vicinity of the central portion of the barrier (Figure 4-5). During 2020-2021 chloride concentrations at M45/4 remained low and stable at 10-12 mg/L, indicating a predominance of GWRS water but less than 100%. Concentrations of 1,4-dioxane were low and stable during 2020-2021, remaining consistently above the RDL but below 2 µg/L. These low 1,4-dioxane detections during 2020-2021 confirm a small proportion of older pre-GWRS injection water present at this well in the Upper Rho aquifer, likely resulting from the variable gradient direction in this central area inland of the barrier.

At M45/5 (Main aquifer), GWRS arrival is inconclusive based on the low and stable chloride concentrations (Figure 4-10) since prior to the commencement of GWRS injection. This well is located over a mile downgradient to the northeast from the nearest Main aquifer deep injection wells on the west end of the barrier. As shown on Figure 4-10, 1,4-dioxane has never been detected above the RDL at M45/5, consistent with the stable chloride concentrations trends indicating native groundwater (devoid of 1,4-dioxane) at this well.

4.4.2.5 Monitoring Well M46

At M46A/1 (Lambda and Omicron aquifers), chloride concentrations began declining during the fourth quarter of 2008, reaching GWRS levels in 2011, where they have remained through 2021. Figure 4-11 shows chloride concentrations at M46A/1 have remained low and stable at GWRS levels for the last ten years while 1,4-dioxane concentrations have remained below the RDL, both indicating the continued presence of 100% GWRS purified recycled water in the Lambda aquifer at this location.

In the four other deeper zones at the M46 monitoring well site, the arrival of GWRS water was indicated by the chloride concentration decline in each well occurring at various times prior to 2012 and were illustrated in Figure 4-11 of prior year's annual reports. The chloride decline becomes more delayed and dampened with depth due to dispersive transport and a weaker GWRS injection signal from only two injection wells (I24/2 and I26C) screened in the Lower Rho and Main aquifers on the east end of the barrier.

At M46/2 (Upper Rho aquifer), Figure 4-11 shows that chloride concentrations slightly declined to GWRS levels in 2019 and remained at those low levels through 2021, indicating 100% GWRS water at this well and confirmed by 1,4-dioxane concentrations remaining below the RDL.

At the two deeper zones M46/3 (Lower Rho aquifer) and M46/4 (Main aquifer), Figure 4-11 shows that chloride concentrations during 2020-2021 remained low and stable ranging from 10-14 mg/L, just slightly higher than GWRS water, while concentrations of 1,4-dioxane remained below the RDL in these two wells.

At M46/5 (Main aquifer), Figure 4-11 shows that the decreasing trends from 2012 through 2014 for both chloride and 1,4-dioxane indicated that some percentage of GWRS water has likely reached this well, but the declines were too gradual to reliably infer a mean arrival time. Chloride concentrations experienced a subtle increase to 19 mg/L in the second half of 2019 and then remained slightly elevated at 18 to 19 mg/L throughout 2020-2021, possibly indicating a very subtle shift in the gradient and/or a weaker Main aquifer injection signal since I24/2 was off-line during 2019-2021. Consistent with a contemporaneously subtle chloride increase, concentrations of 1,4-dioxane rose gradually from the old RDL of 1 µg/L in the first quarter of 2019 to 3.5 µg/L in the fourth quarter of 2020 and remained slightly elevated at 2.7 to 3.1 µg/L during 2021, confirming a more sustained gradient shift during 2019-2021 bringing a larger proportion of older WF-21 injection back to this well in the Main aquifer.

4.4.2.6 Monitoring Well M47

At M47/1 (Beta-III aquifer), Figure 4-10 shows that chloride concentrations declined to GWRS levels in 2015. During 2020-2021, chloride concentrations were low and relatively stable but with a very subtle decline from 10 mg/L in the first quarter of 2020 to 8 mg/L by the fourth quarter of 2021, indicating nearly 100% GWRS water at this well. Concentrations of 1,4-dioxane at M47/1 gradually decreased to below the RDL for the first time in late 2014, consistent with the contemporaneously gradual chloride decline to nearly GWRS levels, indicating a landward gradient from the barrier and nearly 100% GWRS water at this well since 2015. During the second half of 2020 and throughout 2021, low 1,4-dioxane concentrations just above the new RDL of 0.5 µg/L were detected but remained at or below 0.7 µg/L at M47/1. Based on the contemporaneously low and stable chloride concentrations at M47/1 below 10 mg/L, these 1,4-

dioxane detections during 2020-2021 were likely a result of the lower RDL and continued mixing via dispersive transport rather than a shift in the gradient direction.

At M47/2 (Upper Rho aquifer), chloride concentrations first began to gradually decline in late 2008 much sooner than at the shallower M47/1, likely indicating that the GWRS arrival time to M47/2 was faster than M47/1. Figure 4-12 shows that chloride concentrations at M47/2 were low and stable at 9 to 10 mg/L during 2020, indicating nearly 100% GWRS water at this well, but then increased slightly to 15 mg/L by the fourth quarter of 2021, possibly indicating a slight shift in the gradient or a reduced GWRS signal due to I24/2 being off-line during 2019-2021. Like at M47/1, low 1,4-dioxane concentrations at or just above the new RDL of 0.5 µg/L were detected at M47/2 during the second half of 2020 and during the second half of 2021, likely due to the lower RDL of 0.5 µg/L but possibly due to very subtle shifts in the gradient or a reduced GWRS signal based on the contemporaneously small chloride increase.

At the three deeper zones M47/3 (Lower Rho aquifer), M47/4 (Main aquifer), and M47/5 (Main aquifer), GWRS arrival is inconclusive based on the low and stable chloride concentrations since prior to GWRS injection. As shown on Figure 4-12, chloride concentrations at M47/3, M47/4, and M47/5 continued to be low and stable throughout 2021, while concentrations of 1,4-dioxane have never been detected, likely due to a lack of WF-21 injection into these aquifers in the central and east end of the barrier. Also, the inferred groundwater flow direction at M47 in the Lower Rho and Main aquifers appears to consistently be to the east as was shown on the Main aquifer groundwater elevation contour map in Figure 4-6. Based on the Figure 4-6 contours, groundwater arriving at M47 in these deeper aquifers may either be native groundwater originating from north of the barrier or GWRS injection water originating from the west end of the barrier, both devoid of 1,4-dioxane. Going forward, confirmation of GWRS arrival at M47 in the Lower Rho and Main aquifers may never be conclusive since native groundwater chloride concentrations at M47/3, M47/4, and M47/5 are relatively low ranging from approximately 12 to 20 mg/L (Figure 4-12) and thus are only marginally higher than GWRS water.

4.4.3 Production Wells

Groundwater quality data for water samples collected during 2021 from several potable and non-potable production wells in the vicinity of the Talbert Barrier are summarized in Table 4-2.

As discussed in Section 1, the GWRS permit requires a primary boundary of 12 months underground travel time from the injection operation at the Talbert Barrier. Any new drinking water wells are to be constructed outside this primary boundary. The secondary boundary is defined as the area less than 12 months underground travel time from the Talbert Barrier injection operations. Generally, any new drinking water wells proposed to be constructed near the secondary boundary must be evaluated to assess any potential impact that the proposed well

Table 4-2. 2021 Water Quality for Potable and Non-Potable Wells Within the Influence of the Talbert Barrier

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Injection Site (ft)[2]	Concentration[3,4]								
				Arsenic (As) ug/L	Chloride (Cl) mg/L	Bromide (Br) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodi-methylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Wells												
MCWD-5	960	400 - 940	3,300	1.9 (1.8 - 2.0)	12.7 (12.2 - 13.2)	ND	162 (135 - 186)	1.17	0.002 (ND - 0.003)	0.12 (0.09 - 0.18)	ND	1.1 (0.9 - 1.1)
MCWD-7	793	363 - 753	4,200	0.6 (ND - 1.2)	47.4 (47.1 - 47.7)	0.08 (ND - 0.15)	296 (274 - 318)	0.65 (0.61 - 0.70)	0.002 (0.002 - 0.003)	0.28 (0.24 - 0.31)	ND	1.9 (1.7 - 2.2)
NB-DOLD	739	399 - 729	5,300	1.8 (1.5 - 2.1)	19.0 (18.8 - 19.2)	ND	235 (210 - 276)	0.20 (0.18 - 0.21)	0.002 (ND - 0.003)	0.14 (0.12 - 0.17)	ND	2.0 (1.8 - 2.2)
NB-DOLS	366	201 - 356	5,300	ND	53.1 (51.0 - 54.4)	0.06 (ND - 0.16)	426 (401 - 458)	2.35 (2.31 - 2.43)	0.002 (ND - 0.003)	0.20 (0.18 - 0.24)	ND	0.8 (0.7 - 0.9)
MCWD-3B	592	242 - 572	5,400	1.9	25.9	ND	229	1.05 (1.04 - 1.06)	0.004 (0.003 - 0.004)	0.13	ND	3.5 (3.2 - 3.7)
NB-TAMD	700	395 - 690	5,700	2.9 (2.6 - 3.2)	9.7 (9.6 - 9.9)	ND	138 (135 - 142)	0.55 (0.53 - 0.57)	ND	0.10 (0.09 - 0.10)	ND	0.6 (0.5 - 0.7)
NB-TAMS	370	170 - 360	5,800	0.9 (ND - 1.5)	71.4 (69.1 - 74.2)	0.23 (0.15 - 0.29)	552 (528 - 583)	3.02 (2.84 - 3.27)	0.003 (ND - 0.007)	0.28 (0.27 - 0.29)	ND	0.9 (0.6 - 1.2)
FV-10	990	460 - 980	7,600	Well not operational in 2021								
HB-3A	660	370 - 640	7,600	1.9	43.9 (42.2 - 45.6)	0.18 (0.11 - 0.24)	232	0.12 (0.12 - 0.13)	0.003	0.49	ND	0.6 (ND - 0.9)
HB-5	820	223 - 800	8,000	1.9	27.3 (23.4 - 31.2)	ND	304	1.41 (1.39 - 1.43)	0.003	0.17	ND	0.1 (ND - 0.6)
HB-9	996	556 - 996	8,000	ND	14.1 (13.7 - 14.5)	ND	198	0.06 (ND - 0.11)	0.004 (0.003 - 0.004)	0.56	ND	ND
Small System and Private Wells												
GKAW-FV2	125	120 - 125	700	ND	113 (108 - 118)	0.27 (0.17 - 0.36)	634 (602 - 666)	3.5	ND	0.24 (0.23 - 0.26)	ND	3.9 (3.8 - 4.0)
KUBO-FV	133	122 - 132	2,900	0.6 (ND - 1.7)	85 (83.3 - 86.8)	0.25 (0.14 - 0.3)	625 (614 - 636)	4.22 (4.18 - 4.27)	ND	0.24 (0.23 - 0.26)	ND	ND
LIBM-HB		NA	4,100	ND	84 (59.4 - 125)	0.19 (ND - 0.37)	360 (278 - 562)	3.28 (2.82 - 4.46)	0.002 (ND - 0.003)	0.17 (0.12 - 0.23)	ND	ND
Private Irrigation Wells												
CALL-FV		NA	400	1.9 (1.7 - 2.2)	5.9 (5.2 - 6.7)	ND	68 (65.0 - 74.5)	1.13 (1.06 - 1.21)	0.002 (ND - 0.003)	0.09 (0.06 - 0.11)	ND	ND
A1-HB	305	188 - 300	1,800	1.2	27.2 (27.1 - 27.3)	ND	260 (244 - 276)	1.35	ND	0.13 (0.12 - 0.14)	ND	1.0 (0.8 - 1.1)

[1] ft bgs: Feet below ground surface

[2] Distance from Injection: Straight line shortest distance to the nearest Talbert Barrier injection well, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit

may have on the primary boundary, potentially changing the boundaries. In the case of the Talbert Barrier, the secondary boundary is coincident with the primary boundary; therefore, drinking water wells are to be constructed outside the secondary boundary.

The Talbert Barrier injection operation complies with the GWRS permit requirements for underground retention time. The primary boundary is supported by Resolution No. 05-4-40 adopted by the OCWD Board of Directors on April 20, 2005 (OCWD, 2005). OCWD has notified the OCHCA and the City of Fountain Valley, which are the well permitting agencies in this area, of this buffer zone requirement. The Orange County Well Standards Advisory Board has also been notified. No new drinking water wells have been installed in the 12-month underground retention area.

The existing GWRS permit predates boundary zone requirements in the 2018 Title 22 Water Recycling Criteria. As part of the new permit anticipated for the GWRS and GWRSFE, OCWD plans to evaluate historical tracer data for the Talbert Barrier to validate the existing underground travel time used to establish the primary zone of controlled drinking water well construction and the secondary boundary in accordance with Title 22 Section 60320.208(d) tracer evaluation methodology (CCR, 2018). If necessary, OCWD will revise the primary and secondary boundaries establishing control zones at the Talbert Barrier and notify the local well permitting agencies. It is anticipated that the Talbert Barrier boundary zone reevaluation will be completed by spring 2023.

The active municipal well closest to the Talbert Barrier is MCWD-5, which is owned and operated by Mesa Water and located approximately 3,300 feet northeast of the eastern end of the barrier. OCWD staff previously estimated the travel time for injection water to reach MCWD-5 to be between three and eight years (depending on the specific aquifer screened by the multi-aquifer production well) based on groundwater level conditions and injection operations over the last several years. NDMA concentrations at MCWD-5 decreased below the RDL in early 2010 and remained below the RDL of 2 ng/L through 2021. To reduce final drinking water concentrations of NDMA, a UV treatment system was previously operated at the MCWD-5 well site from 2001-2010. The steady decline in NDMA levels below the RDL led to a DDW-approved shutdown of the UV system in 2010 via an accepted amendment to Mesa Water’s Domestic Water Supply Permit.

Concentrations of 1,4-dioxane and chloride for MCWD-5 and injection water for the 10-year period 2012-2021 are shown on Figure 4-14. Concentrations of 1,4-dioxane at MCWD-5 have gradually decreased over time since 2010 except for minor intermittent increases in some years likely related to shifts in the gradient direction based on groundwater level variations as was explained in the previous section for the GWRS compliance monitoring wells based on comparing 1,4-dioxane and chloride concentration trends. Figure 4-14 shows that one such temporary

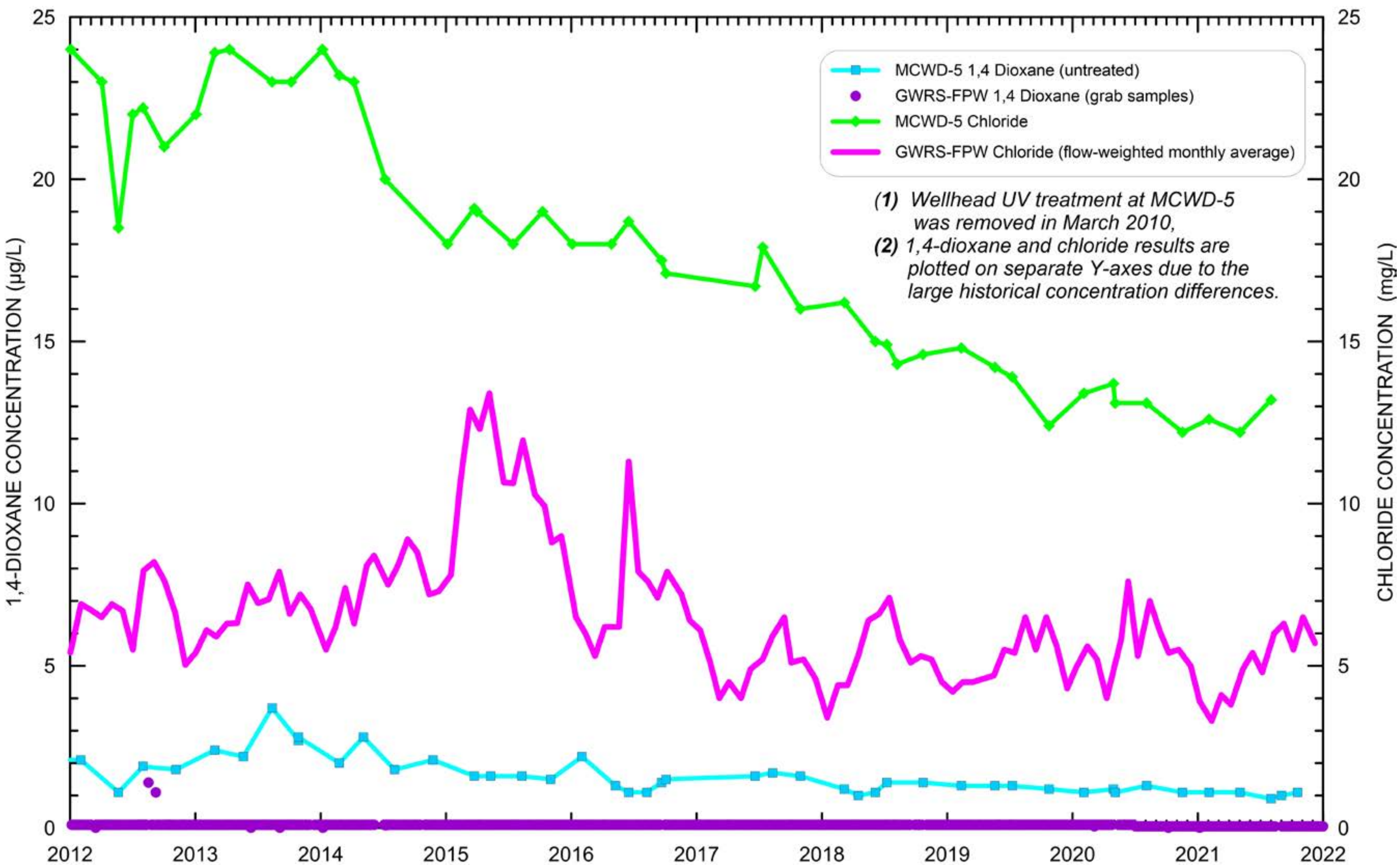


Figure 4-14. MCWD-5 Pre-Treatment and Injection Water 1,4-Dioxane and Chloride Concentrations

increase in both 1,4-dioxane and chloride occurred during late 2012 and 2013, likely resulting from high Basin conditions during that time causing a shift in the gradient direction and likely bringing older pre-GWRS water back to this well. Concentrations of 1,4-dioxane have remained well below the DDW RL of 35 μg/L at MCWD-5 since sampling began in 2002. During 2021, concentrations of 1,4-dioxane gradually declined below the DDW NL of 1 μg/L for the first time and remained low and stable at 0.9-1.1 μg/L, just above the new RDL of 0.5 μg/L.

Since 1,4-dioxane concentrations at MCWD-5 did not quite drop below the new RDL during 2021, GWRS arrival at this well is likely still blended with at least some small percentage of older pre-GWRS injection water. Due to the vertical blending in the well from the various screened intervals at MCWD-5, travel times for the individual aquifer zones screened at MCWD-5 are not discernable based on the vertically blended 1,4-dioxane concentrations from the pumped samples. The low 1,4-dioxane concentrations at MCWD-5 over the last couple years (Figure 4-14) could possibly represent a blend of nearly 100% GWRS injection water from one or more of the screened aquifer zones along with older pre-GWRS injection water from one or more of the other screened aquifer zones. Except for the temporary increase in 2012-2013, chloride concentrations at MCWD-5 have decreased steadily since 2011 and ranged from 12-13 mg/L during 2021, still slightly higher than GWRS injection water chloride concentrations (Figure 4-14). These declining chloride concentrations confirm the progressive arrival of greater proportions of GWRS water but still less than 100% and are consistent with the decline in 1,4-dioxane concentrations just slightly above the RDL.

Municipal wells HB-5 and HB-9 owned and operated by the City of Huntington Beach are both located approximately 8,000 feet north of the Talbert Barrier near each other (Figure 4-1) but display distinctly different water quality characteristics due to their different screened interval depths (Table 4-2). HB-9 is screened exclusively in the Main aquifer, while HB-5 is screened across both the Main aquifer and the shallower intermediate depth aquifers that have historically received injection water directly from the Talbert Barrier legacy wells. HB-5 had chloride concentrations ranging from approximately 20-60 mg/L over the last several years and had detectable concentrations of 1,4-dioxane from 2002-2008 (above the DDW NL but well below the RL), while HB-9 had lower chloride concentrations ranging from approximately 10-30 mg/L and 1,4-dioxane has never been detected there. However, with the commencement of injection directly into the Main aquifer at the I27 and I28 sites in 2004, and at the newer I29 through I32 sites in 2008, HB-9 will likely receive GWRS injection water in the future.

Since these two production wells are approximately 8,000 feet north of the barrier, a travel time in the range of 10-20 years would be expected (assuming an average groundwater velocity of 1 to 2 feet per day). From inspection of older historical chloride concentrations at HB-5 from 1970-1990, it appears that historical barrier injection from WF-21 arrived at HB-5 during 1986-1988. During this two-year period, chloride concentrations increased from a background native groundwater chloride concentration of approximately 20 mg/L to approximately 50 mg/L by late 1988, indicating arrival of some percentage of WF-21 water. Since barrier injection first began in 1976, this would imply an average groundwater travel time of 10 to 12 years under the gradient conditions of that time, corresponding to the upper end of the estimated 1 to 2 feet per day groundwater velocity.

At HB-5, the chloride concentration range of 23 to 31 mg/L in 2021 (Table 4-2) was similar to 2020 and still within the lower end of the historical range for that well. Further decline of chloride concentrations at HB-5 closer to GWRS levels would signal arrival of GWRS injection water. At HB-9, the chloride concentration during 2021 remained stable at approximately 14 mg/L throughout the year (Table 4-2), which is still within the lower end of the historical range for this well; continued decline of chloride concentrations below 10 mg/L at HB-9 could signal arrival of GWRS water. At HB-9, neither NDMA nor 1,4-dioxane were detected during 2021. At HB-5, NDMA was not detected during 2021 but 1,4-dioxane was detected in one January 2021 sample at 0.6 μg/L, just above the new RDL of 0.5 μg/L, and then remained below the RDL for the remainder of 2021 (Table 4-2).

In 2012, OCWD became aware that existing private well GKAW-FV2/1 near the Talbert Barrier was being used to supply water to an occupied residence in Fountain Valley. Historically, this well had been used only for irrigation purposes. More recent inquiries with the owner have revealed that, beginning in approximately 2011, the well water is also being used for potable purposes with a reverse osmosis treatment system. Well GKAW-FV2/1 is located approximately 700 feet north of injection well site I10 and is perforated from 120 to 125 ft bgs in the Talbert aquifer. The underground retention time prior to extracting GWRS purified recycled water at this private drinking water well is estimated to be greater than 14 years; this is based on groundwater samples taken from this well since GWRS began operation in January 2008 which indicate that GWRS purified recycled water has not yet reached Well GKAW-FV2/1 despite its proximity to the barrier. During 2021, the chloride concentration at GKAW-FV2/1 ranged from 108 to 118 mg/L while 1,4-dioxane concentrations ranged from 3.8 to 4 μg/L (Table 4-2), both indicative of pre-GWRS injection water and likely some proportion of ambient groundwater. Since the inception of GWRS however, the groundwater flow direction in the Talbert aquifer at GKAW-FV2/1 has predominantly been seaward to the southwest towards the barrier, similar to what was shown in Figure 4-3 for the Talbert aquifer during June 2021 in the vicinity of this well. All water quality sample results reported by the OCWD Laboratory are reviewed by OCWD Water Quality Department staff and then sent to the well owner. This is consistent with typical practice by OCWD Water Quality staff for both public and private wells but is of particular importance for well GKAW-FV2 since this well is in close proximity to the Talbert Barrier.

5. KRAEMER-MILLER-MIRALOMA-LA PALMA BASINS OPERATIONS

During 2021 OCWD spread GWRS purified recycled water at Kraemer-Miller-Miraloma-La Palma (K-M-M-L) Basins to recharge the Orange County Groundwater Basin (Figure 1-6 and Figure 1-7). Operation of the recharge facilities is presented in this section:

- Spreading facilities;
- Spreading water sources;
- Spreading water volumes; and
- K-M-M-L Basins operations.

5.1 Spreading Facilities

Table 5-1 summarizes the area, storage capacity and potential recharge water source(s) for each surface recharge facility owned or operated by OCWD. K-M-M-L Basins are the only spreading basins that receive GWRS purified recycled water.

Table 5-1. Area and Storage Capacities of Recharge Facilities

Facility	Wetted Area (acres)	Maximum Storage Capacity (AF)	Possible Recharge Sources			
			GWRS Purified Recycled Water	Captured Storm Water	Imported Water	SAR Base Flow
Anaheim Lake	72	2,260		✓	✓	✓
Kraemer Basin	31	1,170	✓	✓	✓	✓
La Jolla Basin	6.5	26		✓	✓	✓
Miller Basin	25	300	✓	✓	✓	✓
Mini-Anaheim Lake	5	13		✓	✓	✓
Miraloma Basin[1]	11	110	✓	✓	✓	✓
La Palma Basin[2]	14	140	✓	✓	✓	✓
Other Basins[3,4]	935	22,446		✓	✓	✓

[1] Miraloma Basin is for practical purposes dedicated for GWRS purified recycled water recharge since coming on-line in 2012 to minimize basin clogging and maintain high percolation rates (A small amount of non-GWRS water was recharged in 2017).

[2] La Palma Basin continues to be dedicated for only GWRS purified recycled water recharge since coming on-line in 2016 to minimize basin clogging and maintain high percolation rates.

[3] OCWD owns and/or operates a total of 24 surface water recharge basins near the SAR and Santiago Creek. These other basins are outside the influence of the current GWRS recharge system operation.

[4] Quagga mussel control requirements restrict the recharge of imported Colorado River water in some of the other basins.

Kraemer Basin is one of eleven deep basins used for percolation. Figure 5-1 shows a photo of Kraemer Basin, which first recharged GWRS purified recycled water on February 19, 2008. Kraemer Basin covers an area of approximately 31 acres and has a maximum storage capacity of about 1,170 AF. Based on percolation tests with low turbidity water, its maximum percolation rate is estimated at 65 MGD (100 cubic feet per second [CFS]).

Figure 5-1. Kraemer Basin

Miller Basin is a flood control basin owned by the County of Orange and conjunctively used by OCWD as a recharge basin through a cooperative agreement. Miller Basin covers an area of approximately 25 acres and has a maximum storage capacity of about 300 AF. In winter, its usable storage capacity (and thus recharge potential) is reduced for flood control purposes. More storage capacity is available at Miller Basin in the summer. Its estimated maximum percolation rate is 29 MGD (45 CFS), assuming percolation of low turbidity GWRS and/or imported water. Shown on Figure 5-2, GWRS purified recycled water recharge first began at Miller Basin on January 17, 2008.

Figure 5-2. Miller Basin with GWRS Purified Recycled Water in 2008

Miraloma Basin is located immediately southeast of Kraemer-Miller Basins and along Carbon Creek Diversion Channel. Pictured on Figure 5-3, Miraloma Basin covers an area of approximately 11 acres and has a maximum storage capacity of about 110 AF. Based on the observed percolation of GWRS purified recycled water, its maximum percolation rate is estimated at 30 MGD (46 CFS). GWRS purified recycled water recharge first began at Miraloma Basin on July 26, 2012. Since then, OCWD has predominately recharged purified recycled water at Miraloma Basin, though the recharge was briefly supplemented with a small amount of non-GWRS water in 2017. Non-GWRS water may be recharged at Miraloma Basin in future years. The Anaheim Adventure Park is located at Miraloma Basin and began operation in July 2021.

La Palma Basin is the newest spreading basin located south of Kraemer and Miraloma Basins along Carbon Creek Diversion Channel as shown on Figure 5-4. La Palma Basin covers an area of approximately 14 acres and has demonstrated exceptional percolation capabilities, achieving an estimated maximum percolation rate of 65 MGD (100 CFS). GWRS purified recycled water spreading first began at La Palma Basin on November 9, 2016. Since then, La Palma Basin has been dedicated to recharging purified recycled water and recharged more than a third of all GWRS production during 2021.

Figure 5-3. Miraloma Basin with GWRS Purified Recycled Water in 2012

Figure 5-4. La Palma Basin with GWRS Purified Recycled Water in 2016

5.2 Spreading Water Sources

Water from three sources was percolated at K-M-M-L Basins in 2021: (1) GWRS purified recycled water; (2) SAR water including captured storm water and baseflow; and (3) imported water.

Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin are located in the vicinity of K-M-M-L Basins and all can be grouped together as part of the same hydrogeologic system (Figure 1-6 and Figure 1-7). As discussed in Section 1.4, Anaheim Lake and Mini-Anaheim Lake are adjacent to and upgradient of K-M-M-L Basins; La Jolla Basin is located downgradient of Kraemer-Miller-Miraloma Basins and downgradient/crossgradient of La Palma Basin, which is located further south. SAR water and imported water recharged at Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin supplement and effectively blend with the purified recycled water recharged at K-M-M-L Basins. While purified recycled water may only be recharged at K-M-M-L Basins, they may also receive other water sources (SAR water and imported water). Except for a minor volume of other water recharged at Miraloma Basin in 2017, both Miraloma Basin and La Palma Basin have been dedicated to recharging GWRS purified recycled water since their inception to prevent long-term clogging and maintain their exceptionally high percolation rates.

Prior to 2014, the volume of diluent water (recharge water of non-wastewater origin) was formally recorded for determining compliance with the maximum allowable Recycled Water Contribution (RWC), which was 75% at Kraemer-Miller-Miraloma Basins (La Palma Basin was not in operation at that time). Diluent consisted of SAR captured storm flow and imported water; SAR base flow was not classified as a diluent because the year-round base flow was principally comprised of tertiary treated wastewater effluent from upstream dischargers.

In 2014 DDW approved a maximum RWC at K-M-M-L Basins of 100%, eliminating the blending requirement (CDPH, 2014). The volumes of spreading water from the aforementioned sources are still reported herein, but determination of the RWC and compliance with the RWC limit are no longer required.

In summary, GWRS purified recycled water, SAR water, and imported water were the spreading water sources utilized at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins recharge system during 2021. Since determination of the RWC is no longer required, the two non-GWRS sources are grouped together herein as "other water."

5.3 Spreading Water Volumes and Flow Rates

Spreading water volumes recharged in the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins recharge system in 2021 are presented below and compared with historical spreading amounts in this area.

5.3.1 2021 Spreading Water Quantities

Table 5-2 presents the monthly recharge volumes at each of the individual recharge basins in this area. A total volume of approximately 35,322 MG (108,400 AF) of GWRS purified recycled water and other water, comprised of SAR water and imported water, was recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2021.

Table 5-3 summarizes the monthly volumes of water that were recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during calendar year 2021 based on OCWD Forebay Operations' percolation records. The percolation records typically differ slightly from the AWPF purified recycled water production records due to storage effects in the spreading basins, GWRS Pipeline, flow measurement/metering inaccuracies, and unmeasured rainfall and local runoff to the basins. Based on AWPF flow meter records during 2021, the following volumes and average daily flow rates of GWRS purified recycled water were delivered to the Anaheim Forebay:

- Kraemer Basin received approximately 269 MG (825 AF), or 0.74 MGD on average;
- Miller Basin received approximately 1,764 MG (5,414 AF), or 4.83 MGD on average;
- Miraloma Basin received approximately 6,761 MG (20,748 AF), or 18.52 MGD on average; and
- La Palma Basin received approximately 10,720 MG (32,897 AF), or 29.37 MGD on average.

The total volume of GWRS purified recycled water recharged at the K-M-M-L Basins during 2021 was 19,513 MG (59,884 AF). The annual average daily flow rate of GWRS purified recycled water spread in 2021 was 53.46 MGD. No GWRS purified recycled water was recharged at Anaheim Lake, Mini-Anaheim Lake, or La Jolla Basin; spreading GWRS purified recycled water at these three sites is not allowed under the current GWRS permit. Furthermore, the hydraulics of the water conveyance system at the Anaheim Forebay are such that delivery of GWRS purified recycled water to Anaheim Lake, Mini-Anaheim Lake, or La Jolla Basin is not physically possible.

Captured flow was diverted from the SAR and recharged at Miller Basin as well as Anaheim Lake, Mini-Anaheim Lake and La Jolla Basin. Imported water was purchased and recharged at these same basins. In 2021, a total of approximately 15,930 MG (48,887 AF) of the two other (non-GWRS) sources was recharged in this area of the Anaheim Forebay. Kraemer and Miller Basins received primarily non-GWRS water during 2021. Miraloma and La Palma Basins received only GWRS purified recycled water during 2021 (excluding any unmeasured rainfall or site runoff). Miraloma and La Palma Basins have been dedicated almost exclusively to GWRS water to minimize clogging and to maintain their exceptionally high percolation rates.

Table 5-2. 2021 Summary of Spreading Water Locations and Volumes [1]

Month	Kraemer Basin				Miller Basin				Miraloma Basin				La Palma Basin				Anaheim Lake	Mini-Anaheim Lake	La Jolla Basin	TOTAL PERCOLATION
	GWRS Water (AF)	Other Water[3] (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	GWRS Water (AF)	Other Water (AF)	Change in Storage (AF)	Total Percolation (AF)	Total Percolation (AF)[2]	Total Percolation (AF)[2]	Total Percolation (AF)[2]	(AF)
Jan	0	2,068	224	1,844	0	1,185	12	1,173	156	0	9	147	5,187	0	11	5,176	2,809	246	321	11,716
Feb	0	1,890	53	1,837	0	1,335	71	1,264	832	0	1	831	4,364	0	8	4,356	2,438	244	476	11,446
Mar	0	2,860	405	2,455	0	1,998	95	1,903	1,335	0	11	1,324	4,389	0	6	4,383	2,689	222	149	13,125
Apr	0	1,109	-612	1,721	0	787	-178	965	2,661	0	8	2,652	2,706	0	-25	2,731	1,875	140	671	10,755
May	0	0	-14	14	310	96	45	361	3,058	0	7	3,050	1,871	0	-17	1,888	765	0	55	6,133
Jun	0	0	0	0	1,724	11	-5	1,740	2,300	0	4	2,296	1,067	0	5	1,062	384	0	40	5,522
Jul	0	0	0	0	2,103	0	7	2,096	2,005	0	4	2,001	1,159	0	1	1,158	217	0	15	5,487
Aug	825	-825[3]	0	0	0	755	-47	802	375	0	-488	863	743	0	313	430	51	0	34	2,180
Sep	0	0	0	0	1,227	0	5	1,222	3,004	0	27	2,977	433	0	3	430	0	0	0	4,629
Oct	0	2,769	210	2,559	50	2,327	57	2,320	2,860	0	-17	2,877	2,279	0	15	2,264	1,988	414	760	13,182
Nov	0	3,919	314	3,605	0	2,105	33	2,072	1,052	0	-1	1,053	4,371	0	-4	4,375	1,889	128	1,090	14,212
Dec	0	1,614	-122	1,736	0	494	-90	584	1,109	0	9	1,100	4,330	0	17	4,313	1,972	106	202	10,013
TOTAL	825	15,404	458	15,771	5,414	11,093	5	16,502	20,748	0	-426	21,171	32,897	0	333	32,566	17,077	1,500	3,813	108,400

[1] Volumes include:

GWRS purified recycled water (GWRS water) data are based on AWPF flow meter records and Forebay Operations' records for flows discharged to individual spreading basins.

Other water volumes are estimated based on Forebay Operations' total percolation records and include:

- Santa Ana River (SAR) water
- Imported water

Total percolation volumes are based on Forebay Operations' percolation records.

Change in storage volume represents water retained in the basin that has not yet percolated based on Forebay Operations records. Changes in storage volumes are estimated values that may be positive (increase) or negative (decrease).

[2] Total percolation volumes shown for Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin are other water (non-GWRS water).

[3] Negative value is a result of Kraemer Basin being prepared for maintenance work when water was delivered to and then transferred from Kraemer Basin.

Table 5-3. 2021 Summary of Spreading Water Sources and Quantities [1]

Month	GWRS Purified Recycled Water[2]		Other Water[3]		Total Spreading Water		Total Change in Storage[4]	TOTAL PERCOLATION	
	(Avg. MGD)	(AF)	(Avg. MGD)	(AF)	(Avg. MGD)	(AF)	(AF)	(AF)	(MG)
January	56.2	5,343	69.7	6,629	125.8	11,972	256	11,716	3,818
February	60.5	5,196	74.3	6,383	134.8	11,579	133	11,446	3,730
March	60.2	5,723	83.2	7,918	143.4	13,641	517	13,125	4,277
April	58.3	5,367	49.8	4,582	108.1	9,949	(807)	10,755	3,505
May	55.1	5,240	9.6	916	64.7	6,155	21	6,133	1,998
June	55.3	5,091	4.7	435	60.0	5,526	4	5,522	1,799
July	55.4	5,267	2.4	232	57.8	5,499	12	5,487	1,788
August	20.4	1,943	0.2	15	20.6	1,958	(222)	2,180	710
September	50.7	4,663	(0.0)	(0)	50.6	4,663	35	4,629	1,508
October	54.5	5,189	86.8	8,258	141.3	13,447	265	13,182	4,295
November	58.9	5,423	99.2	9,131	158.1	14,554	342	14,212	4,631
December	57.2	5,439	46.1	4,388	103.3	9,827	(186)	10,013	3,263
TOTAL	**53.5**	**59,884**	**43.6**	**48,887**	**97.1**	**108,771**	**370**	**108,400**	**35,322**

[1] Spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] GWRS purified recycled water inflows are based on AWPF and Forebay Operations' flow records.

[3] Other water is Santa Ana River (SAR) water and/or imported water based on percolation records from Forebay Operations.

[4] Change in storage represents water retained in the basin that has not yet percolated at K-M-M-L Basins based on Forebay Operations records. Change in storage volume are estimated values that may be positive (increase) or negative (decrease).

Figure 5-5 illustrates the total 2021 water supply volumes recharged in the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins area. As noted above, a total of approximately 19,513 MG (59,884 AF) of GWRS purified recycled water was recharged at K-M-M-L Basins. Approximately 55% of the GWRS purified recycled water pumped to the Anaheim Forebay was recharged at La Palma Basin during 2021.

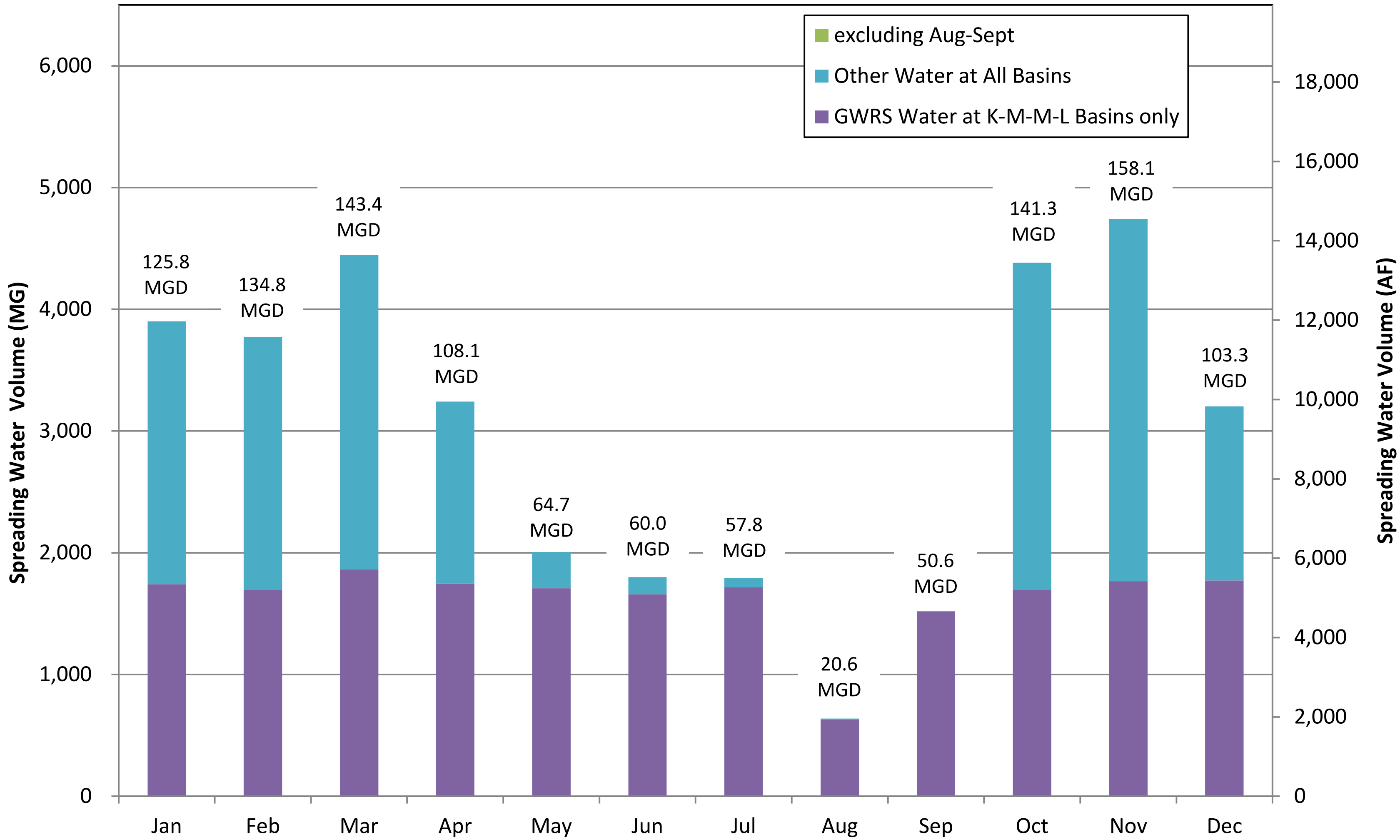
Figure 5-5 shows how the recharge of GWRS purified recycled water at the basins varied on a month-to-month basis. The monthly volume of purified recycled water delivered to the Anaheim Forebay varied throughout 2021, ranging from 1,943 AF in August to 5,723 AF in March, with the low volume in August being due to a planned AWPF shutdown. The amounts of other water (SAR water and imported water) varied seasonally depending on availability. Other water monthly volumes ranged from approximately zero to 9,131 AF. The monthly volume of GWRS purified recycled water exceeded the monthly volume of other water in seven months during 2021: April through September, and December.

The average daily flow rate of GWRS purified recycled water recharged at K-M-M-L Basins was 53.5 MGD during 2021. Excluding the planned extended GWRS shutdown period in 2021 (August 15 at 1245 hours– September 2 at 0815 hours), the average daily flow rate of purified recycled water recharged at K-M-M-L Basins was 56.2 MGD. The combined average daily flow rate of other water (SAR water and imported water) recharged at Anaheim Lake/Mini-Anaheim Lake/Kraemer-Miller/La Jolla Basins was approximately 43.6 MGD.

5.3.2 Historical Spreading Water Quantity

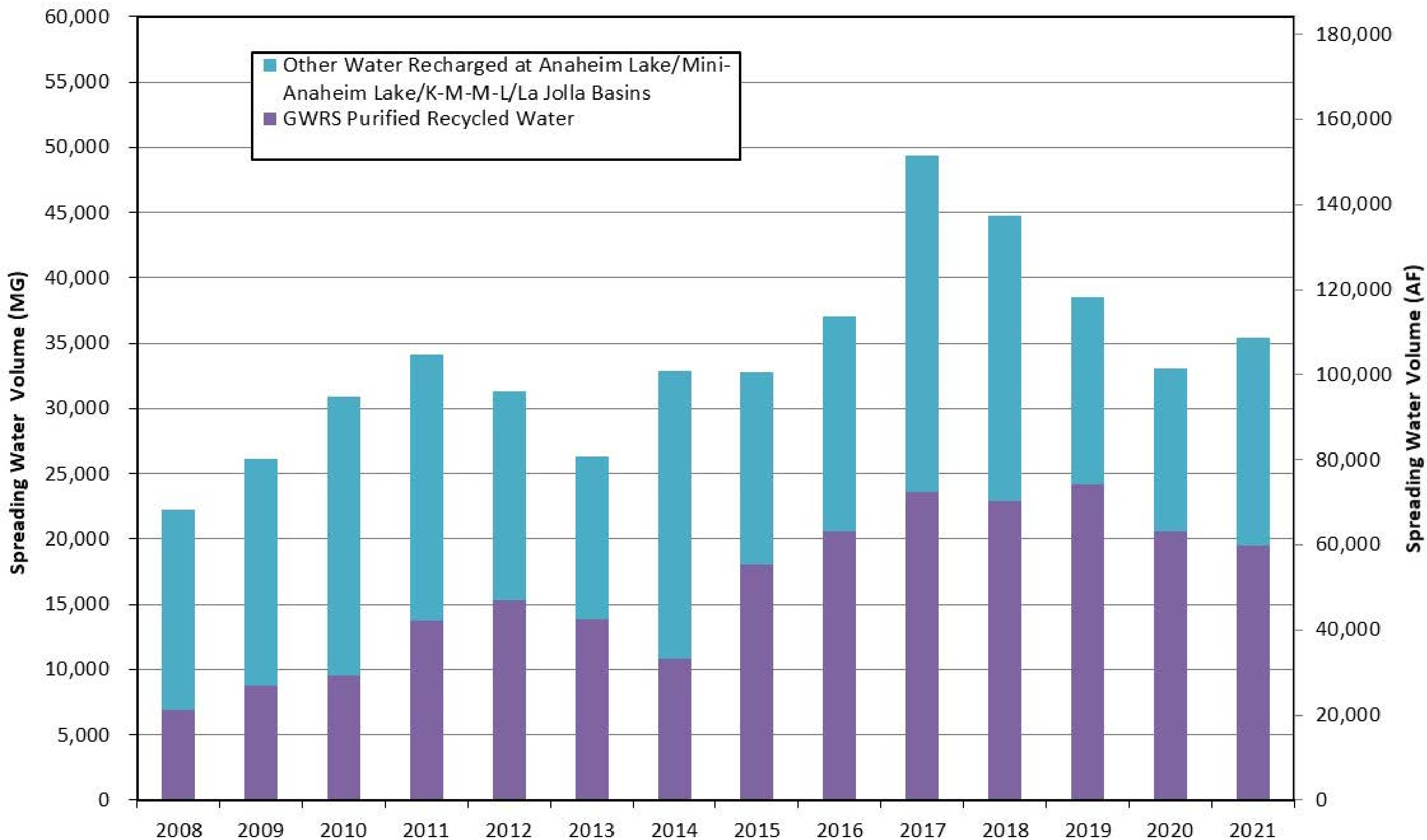
Prior to 2008, only SAR water and imported water were recharged at Kraemer-Miller Basins. GWRS purified recycled water spreading began at Kraemer Basin in January 2008 and continued through 2021. Purified recycled water spreading began at Miller Basin in January 2008 and continued through 2017, resumed in 2020, and continued in 2021; while allowed, Miller Basin was not used for GWRS recharge in 2018 or 2019. Purified recycled water spreading began at Miraloma Basin in July 2012 and continued through April 2020; following an eight-month pause for Anaheim Adventure Park construction, Miraloma Basin spreading resumed in January 2021 and continued through the end of 2021. Purified recycled water spreading began at La Palma Basin when this basin first became operational in November 2016 and continued through 2021.

Figure 5-6 compares the volume of purified recycled water and other water recharged at K-M-M-L Basins in 2021 with historical recharge data since the GWRS began operation in January 2008. Since 2008, the highest purified recycled water volume that was delivered to K-M-M-L Basins occurred in 2019 (24,240 MG or 74,391 AF). The purified recycled water volumes delivered to K-M-M-L Basins in 2020 and 2021 were approximately 15% to 20% less than the 2019 volume due to the four new MBI wells coming on-line in 2020, as well as AWPF shutdowns for GWRSFE construction, GWRS Pipeline inspection, and power outages that restricted deliveries to the Forebay.



Note: Other water consists of SAR water and imported water.
Spreading water average flow rate shown in MGD.
August spreading volume was limited by the planned AWPF shutdown, August 15 - September 2.

Figure 5-5. 2021 Monthly Spreading Water Sources and Volumes in Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins



Note: Other water consists of SAR water and imported water

Figure 5-6. Annual Spreading Water Sources and Volumes Since 2008

Figure 5-6 also shows that the combined total of 108,400 AF (GWRS and other water) recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2021 was approximately 7% greater than the 2020 volume. More imported replenishment water was purchased and recharged during late 2021 (20,000 AF) than in 2020 (0 AF), leading to a reduction in Basin storage of 48,000 AF from June 2020 to June 2021.

Table 5-4 summarizes the historic volumes of all waters recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins since the GWRS began operation. Regarding other water sources (SAR water and imported water), approximately 27% more non-GWRS water was recharged at the Anaheim Forebay in 2021 (48,887 AF) than in 2020 (38,357 AF) due primarily to increased purchases of imported water in October, November, and December 2021.

5.4 K-M-M-L Basins Operations

Purified recycled water produced by the AWPF was pumped to the Anaheim Forebay and spread at K-M-M-L Basins in 2021. La Palma Basin was the primary site used for recharging purified recycled water during 2021 except for May through September, as detailed in Table 5-5 and illustrated on Figure 5-7. Comparatively, more purified recycled water was recharged at Miller Basin or Miraloma Basin than at La Palma Basin from May through September 2021; Miraloma Basin required a higher flowrate to ensure a proper water level for Anaheim Adventure Park, which opened in July, and La Palma Basin was being prepared for cleaning. In total, La Palma Basin received more purified recycled water than the other three GWRS basins combined. A minimal volume of purified recycled water was recharged at Kraemer Basin. Miller Basin recharged purified recycled water during the dry-season months of 2021; Miraloma Basin recharged purified recycled water throughout 2021. Kraemer and Miller Basins were primarily utilized to recharge other water during 2021.

OCWD does not have a regularly scheduled cleaning cycle for K-M-M-L Basins. The need for a basin to be taken out of service and cleaned depends on the percolation performance.

Table 5-4. Summary of Annual Spreading Water Sources and Volumes since 2008 in the Anaheim Forebay [1]

Year	Other Water[2,3] (AF)	GWRS Purified Recycled Water[4] (AF)	TOTAL PERCOLATION[5] (AF)	
			(AF)	(MG)
2008	46,871	21,307	68,178	22,216
2009	53,304	27,023	80,327	26,175
2010	65,457	29,473	94,930	30,933
2011	62,396	42,283	104,678	34,109
2012	49,204	46,865	96,070	31,304
2013	38,213	42,478	80,691	26,293
2014	67,740	33,091	100,831	32,856
2015	44,993	55,472	100,465	32,737
2016	50,685	63,048	113,407	36,955
2017	78,984	72,458	151,448	49,349
2018	67,017	70,307	136,659	44,530
2019	43,940	74,391	118,454	38,598
2020	38,357	63,097	101,706	33,141
2021	48,887	59,884	108,400	35,322
TOTAL	**756,048**	**701,177**	**1,456,244**	**474,519**

[1] Spreading at Anaheim Lake, Mini-Anaheim Lake, Kraemer Basin, Miller Basin, Miraloma Basin, La Palma Basin, and La Jolla Basin.

[2] Other water is captured/recharged Santa Ana River (SAR) water and/or imported water. Total water flows are based on percolation records measured by OCWD Forebay Operations staff. Other water is calculated by subtraction: (Other water = Total - GWRS water) with adjustments for estimated storage in basin (water not yet percolated).

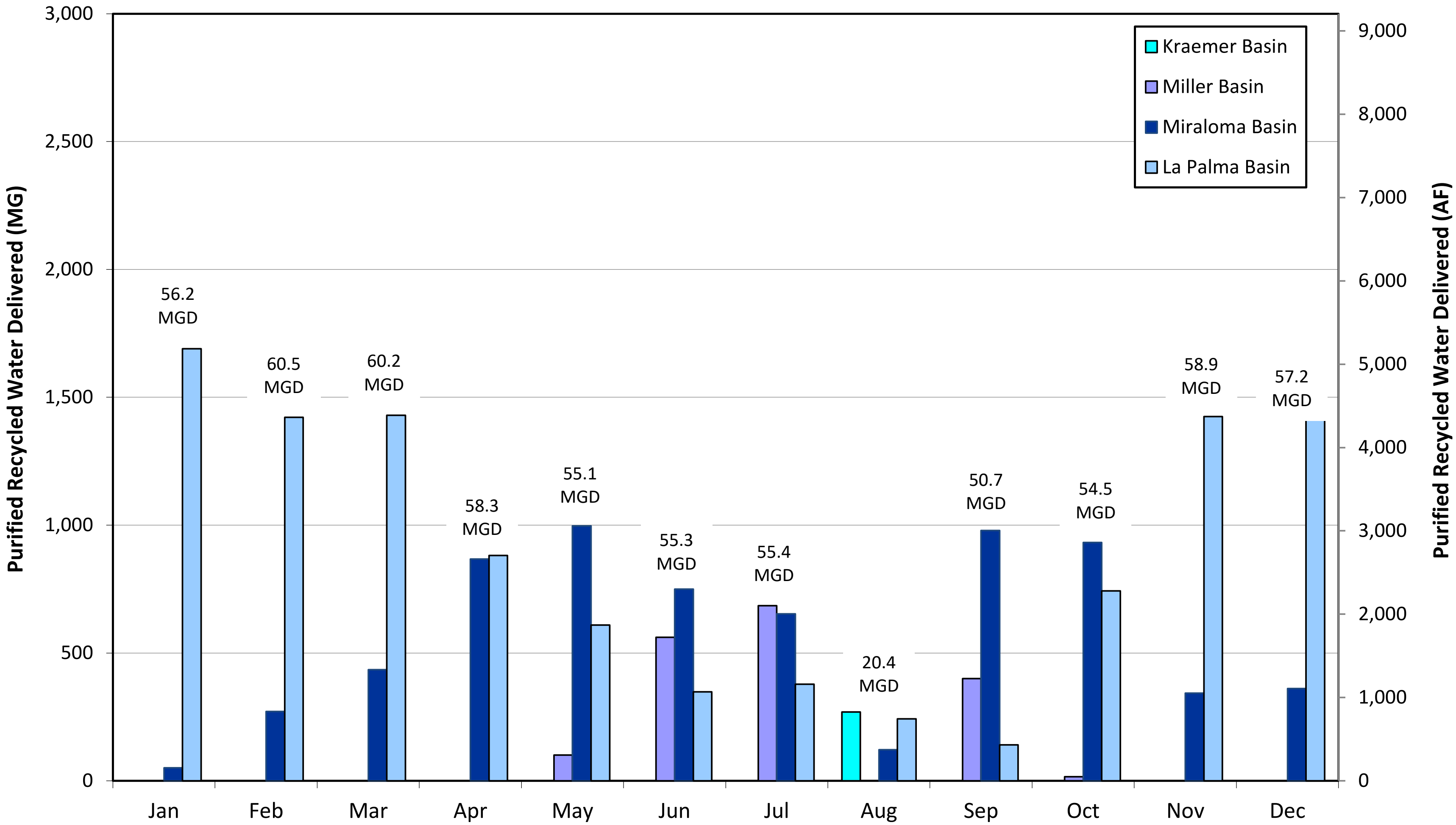
[3] Other water shown for 2015 represents a corrected volume based on OCWD flow records.

[4] GWRS purified recycled water flows are based on AWPF flow records.

[5] Totals based on percolation records from Forebay Operations.

Table 5-5. 2021 Monthly Purified Recycled Water Spreading Volumes and Flow Rates at K-M-M-L Basins

Month	Kraemer Basin			Miller Basin			Miraloma Basin			La Palma Basin			TOTAL		
	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)	(AF)	(MG)	(Avg. MGD)
January	0	0	0.0	0	0	0.0	156	51	1.6	5,187	1,690	54.5	5,343	1,741	56.2
February	0	0	0.0	0	0	0.0	832	271	9.7	4,364	1,422	50.8	5,196	1,693	60.5
March	0	0	0.0	0	0	0.0	1,335	435	14.0	4,389	1,430	46.1	5,723	1,865	60.2
April	0	0	0.0	0	0	0.0	2,661	867	28.9	2,706	882	29.4	5,367	1,749	58.3
May	0	0	0.0	310	101	3.3	3,058	997	32.1	1,871	610	19.7	5,240	1,707	55.1
June	0	0	0.0	1,724	562	18.7	2,300	749	25.0	1,067	348	11.6	5,091	1,659	55.3
July	0	0	0.0	2,103	685	22.1	2,005	653	21.1	1,159	378	12.2	5,267	1,716	55.4
August	825	269	8.7	0	0	0.0	375	122	3.9	743	242	7.8	1,943	633	20.4
September	0	0	0.0	1,227	400	13.3	3,004	979	32.6	433	141	4.7	4,663	1,520	50.7
October	0	0	0.0	49	16	0.5	2,860	932	30.1	2,279	743	24.0	5,189	1,691	54.5
November	0	0	0.0	0	0	0.0	1,052	343	11.4	4,371	1,424	47.5	5,423	1,767	58.9
December	0	0	0.0	0	0	0.0	1,109	361	11.7	4,330	1,411	45.5	5,439	1,772	57.2
TOTAL	**825**	**269**	**0.7**	**5,413**	**1,764**	**4.8**	**20,748**	**6,761**	**18.5**	**32,897**	**10,720**	**29.4**	**59,884**	**19,513**	**53.5**



Note: Average Flow Rate in MGD to All Basins.
August spreading volume was limited by the planned AWPF shutdown, August 15 - September 2.

Figure 5-7. 2021 Purified Recycled Water Spreading Operations

6. GROUNDWATER MONITORING AT THE ANAHEIM FOREBAY

OCWD has maintained a comprehensive groundwater monitoring program in the Anaheim and Orange Forebay areas for decades as part of its recharge operations and to monitor ambient groundwater quality. Much of OCWD's current Forebay groundwater monitoring program was initially developed as part of the Santa Ana River Water Quality and Health (SARWQH) Study, which was conducted from 1994-2004 in the Anaheim Forebay (OCWD, 2004a; NWRI, 2004). The SARWQH Study assessed the use of SAR surface water as a recharge source for the Basin, given the potential groundwater quality impacts of the significant treated wastewater fraction in base flow, as well the agricultural and urban runoff components of storm flow.

For the purposes of GWRS permit compliance, OCWD began groundwater monitoring activities in the Anaheim Forebay downgradient of the GWRS spreading basins in 2005, well in advance of the initial delivery and spreading of GWRS purified recycled water in 2008. This annual report for 2021 marks 14 years of Forebay compliance monitoring at the well sites specified in the GWRS permit (RWQCB, 2004, 2008, 2014a, 2016, and 2019) and Monitoring and Reporting Program (RWQCB, 2020). This section describes the following for calendar year 2021:

- Anaheim Forebay aquifer system;
- Groundwater monitoring program;
- Groundwater elevations and directions of flow; and
- Groundwater quality.

6.1 Anaheim Forebay Aquifer System

Earlier studies (DWR, 1934; DWR, 1967) divided the alluvial Orange County Groundwater Basin (the Basin) into the Pressure and Forebay areas. The Forebay refers to the inland area of intake or recharge generally characterized by higher permeability sediments (e.g., sands and gravels) and unconfined aquifer conditions. In contrast, the Pressure area refers to the coastal and central regions of the Basin where the presence of low-permeability clay and silt deposits limits surface percolation and creates confined or pressurized aquifer conditions at depth.

During the SARWQH Study, OCWD gained valuable insight into the local hydrogeology in the vicinity of K-M-M-L Basins through: (1) the installation of several multi-depth nested monitoring wells; (2) extensive groundwater quality testing; and (3) the performance of large-scale artificial tracer tests from various recharge basins (OCWD, 2004a; LLNL, 2004). These studies generally confirmed that the vast majority of sediments down to approximately 1,000 ft bgs are coarse-grained, high-permeability sands and gravels, with only a minimal presence of intervening low-permeability sediments that do not appear to be laterally extensive.

For the purposes of the OCWD Basin-wide Groundwater Flow Model (Phraner, 2001; OCWD, 2004b) and the Annual Groundwater Storage Change calculation (OCWD, 2007), the Basin has been vertically characterized into three distinct aquifer systems: (1) Shallow, (2) Principal, and (3) Deep. Over 90% of groundwater production in the Basin occurs from the Principal aquifer. The approximate vertical intervals of the three aquifer systems in the immediate vicinity of K-M-M-L Basins are presented in Table 6-1. It should be noted that the Principal and Deep aquifers rapidly thicken and deepen to the west/southwest of this area, conforming to the Basin's overall synclinal structure (Herndon and Bonsangue, 2006).

Table 6-1. Approximate Aquifer System Depths in the Vicinity of K-M-M-L Basins

Shallow Aquifer (ft bgs)	Principal Aquifer (ft bgs)	Deep Aquifer (ft bgs)
0 – 250	250 – 1,250	1,250 – 1,750

As required by state regulations (CCR, 2018), OCWD has established retention time buffer areas for the control of pathogenic microorganisms and response retention time in the area downgradient of K-M-M-L Basins that are illustrated on Figure 6-1; potable drinking water wells are prohibited in these areas. The buffer areas are based on an artificial tracer test conducted in Kraemer Basin (Clark, 2009), with sequential modifications via numerical modeling and GIS to incorporate Miraloma Basin (OCWD, 2011; OCWD, 2012, CDPH, 2012; RWQCB, 2012; RWQCB, 2014a) and La Palma Basin (OCWD and DDB Engineering, Inc., 2014, RWQCB 2016, OCWD, 2016). No existing public water supply wells are located inside the existing buffer areas. Due to changes into the GWRS Pathogen Log Reduction Requirements (Section 2.3.9, Table 2-9) following the state's adoption of the Final Groundwater Recharge Reuse Project (GRRP) regulations (CCR, 2018), the four-month buffer area now serves as both the primary and secondary project boundary. The buffer areas are enforced by the City of Anaheim and Orange County Health Care Agency well permitting authorities, as well as DDW.

6.2 Groundwater Monitoring Program

As part of the comprehensive groundwater monitoring program required by the current permit and its Monitoring and Reporting Program for the GWRS (RWQCB, 2004, 2008, 2014a, 2016, 2019, and 2020), the following OCWD monitoring well sites in the vicinity of K-M-M-L Basins were sampled in 2021: nested monitoring wells AMD-10 and AMD-12, plus single-point monitoring wells AM-7, AM-8, and AM-10. Although not required under the permit, another single-point monitoring well, OCWD-KB1, was also sampled in 2021 because of its proximity to the Kraemer Basin recharge site.

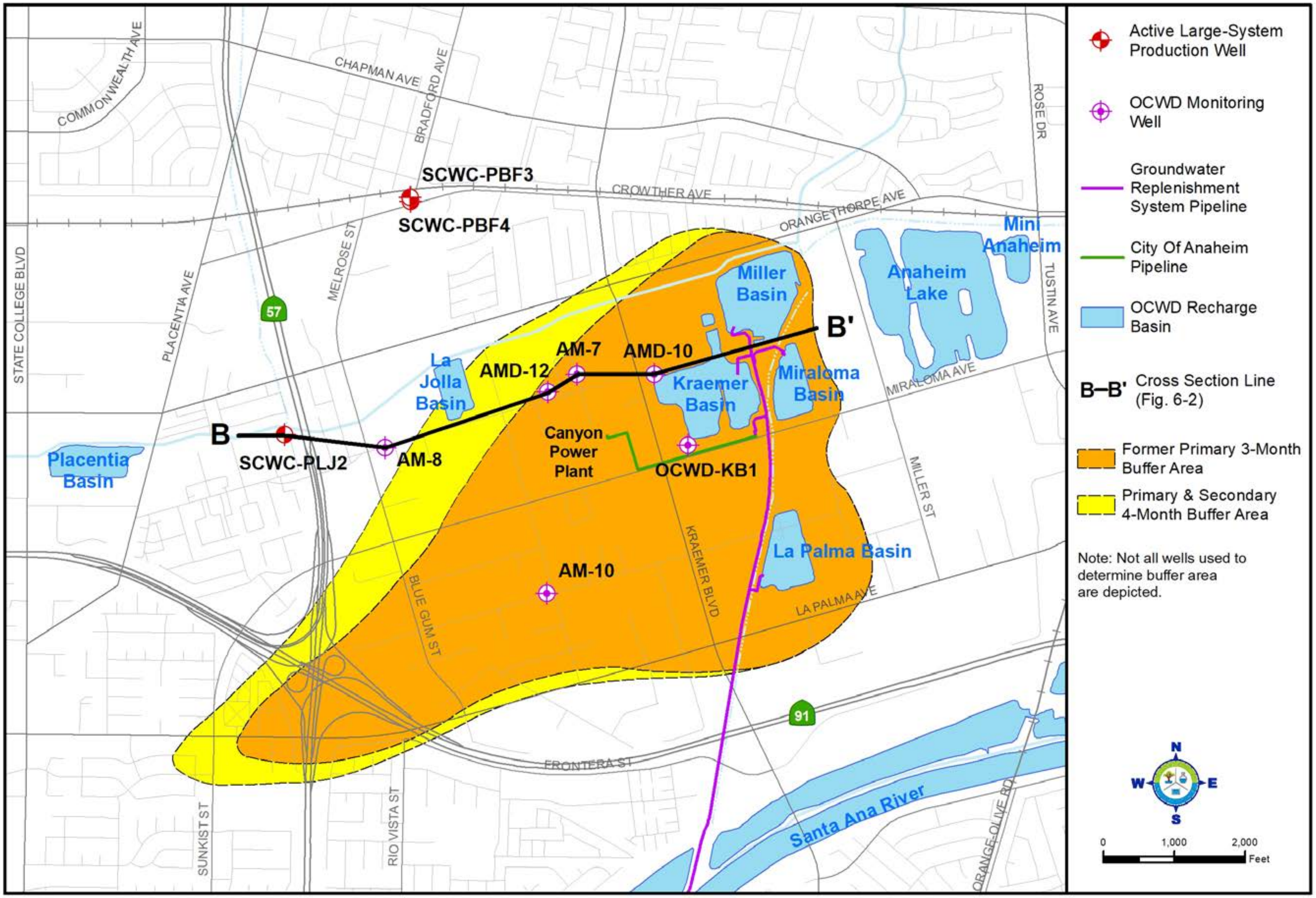


Figure 6-1. Selected Forebay Monitoring Well Locations and Buffer Areas

The locations of these wells and nearby municipal production wells are shown on Figure 6-1. A generalized geologic cross-section showing these wells in relation to the nearby recharge basins is presented on Figure 6-2. Note compliance well AM-10 is not shown on the cross-section since it is located farther south along the flow path emanating from La Palma Basin. Table 6-2 summarizes the screened interval depths and aquifer zones for the five compliance monitoring wells and OCWD-KB1.

Groundwater levels are measured at least quarterly for the monitoring wells shown on Figure 6-1, as well as at several other monitoring wells in the general vicinity to determine groundwater flow directions in this area and to track changes in groundwater storage, as this unconfined area represents the majority of the Basin's available groundwater storage capacity.

6.3 Groundwater Elevations and Directions of Flow

Figure 6-3 illustrates the inferred groundwater flow paths within the Shallow aquifer near K-M-M-L Basins, based on the groundwater elevation contours representing June 30, 2021. As shown by the inferred flow arrows on Figure 6-3, the dominant groundwater flow direction was west-southwest away from the recharge basins as in previous years.

Although groundwater levels at individual wells rise and fall over time, they generally behave similarly in this area. Thus, the shape of the groundwater elevation contours, and the resulting groundwater gradient and flow directions do not change significantly from year to year in the Anaheim Forebay. The June 2021 contour patterns in Figure 6-3 are similar to those shown for June 2020 presented in last year's Annual Report. However, the June 2021 contours in Figure 6-3 do not show a prominent mound around La Palma Basin as in June 2020 because La Palma Basin recharge in June 2021 was only 1,067 AF (Table 5-2) as compared to 5,258 AF in June 2020. The Shallow aquifer groundwater flow direction was still westerly from La Palma Basin towards compliance monitoring well AM-10 in June 2021 for the fifth straight year since commencement of operations at that basin. Prior to recharge at La Palma Basin, the groundwater flow direction towards AM-10 typically originated from Kraemer Basin, as in June 2016 just prior to new La Palma Basin being placed on-line as presented on Figure 6-3 of the 2016 GWRS Annual Report.

The June 2021 Shallow aquifer groundwater elevations shown in Figure 6-3 were lower than in June 2020, by as much as 25 feet surrounding La Palma Basin, by 18 feet downgradient of La Palma Basin at AM-10, by approximately 15 feet at Kraemer Basin and downgradient at AM-8, and by only 5 feet or less upgradient of K-M-M-L Basins near Anaheim Lake. The June 2021 Shallow aquifer groundwater levels were lower than in June 2020 in the vicinity of the OCWD spreading grounds in Anaheim for the following reasons: (1) decreased Basin storage from June 2020 to June 2021, (2) cumulative effect of below average rainfall in both CY2020 (9.16 inches) and CY2021 (9.62 inches), and (3) lower recharge from April through June of 2021 as compared

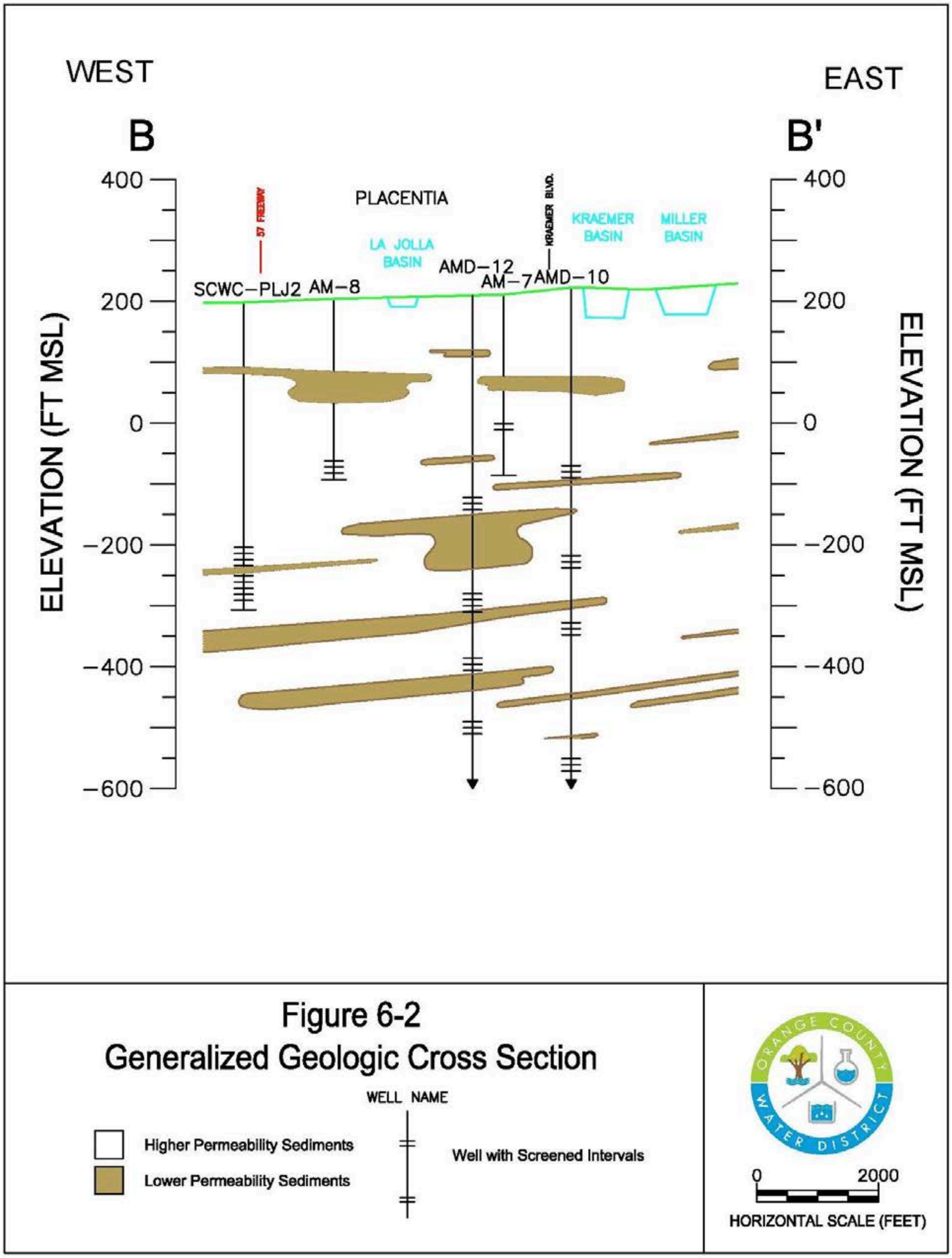


Figure 6-2. Generalized Geologic Cross Section in the Anaheim Forebay

Table 6-2. Monitoring Wells Near K-M-M-L Basins

OCWD Well Name	Date Completed	Nearest GWRS Recharge Basin [1]	Approximate Distance and Direction from Basin	Well Depth (ft bgs)	Aquifer Name	Nearest Drinking Water Well
AM-7/1	09/19/1990	Kraemer	1,135 ft W	210-225	Shallow	SCWC-PLJ2
AM-8/1	09/22/1990	Kraemer	3,900 ft SW	268-285	Shallow	SCWC-PLJ2
AMD-10/1	10/13/1997	Kraemer	55 ft NW	292-312	Principal	SCWC-PLJ2
AMD-10/2	10/13/1997	Kraemer	55 ft NW	440-460	Principal	SCWC-PLJ2
AMD-10/3	10/13/1997	Kraemer	55 ft NW	550-570	Principal	SCWC-PLJ2
AMD-10/4	10/13/1997	Kraemer	55 ft NW	774-794	Principal	SCWC-PLJ2
AMD-10/5	10/13/1997	Kraemer	55 ft NW	934-954	Principal	SCWC-PLJ2
AMD-12/1	11/30/2004	Kraemer	1,510 ft W	300-350	Principal	SCWC-PLJ2
AMD-12/2	11/30/2004	Kraemer	1,510 ft W	490-520	Principal	SCWC-PLJ2
AMD-12/3	11/30/2004	Kraemer	1,510 ft W	595-615	Principal	SCWC-PLJ2
AMD-12/4	11/30/2004	Kraemer	1,510 ft W	725-745	Principal	SCWC-PLJ2
AMD-12/5	11/30/2004	Kraemer	1,510 ft W	940-960	Principal	SCWC-PLJ2
AM-10/1	09/12/1990	La Palma	3,000 ft SW	217-235	Shallow	SCWC-PLJ2
OCWD-KB1/1[2]	10/13/1987	Kraemer	100 ft SW	180-200	Shallow	SCWC-PLJ2

[1] The closest GWRS recharge basin is not necessarily the source of GWRS water arrival at each well based on the inferred groundwater flow paths.
[2] Monitoring well site OCWD-KB1/1 is not a compliance well per the existing GWRS permit but is monitored voluntarily due to its proximity to Kraemer Basin.

to those three months in 2020, even though annual recharge was 7% higher in 2021 than in 2020 from the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Table 5-4 and Figure 5-6).

From June 2020 to June 2021, Shallow aquifer groundwater elevations dropped by approximately 15 feet near AMD-10 adjacent to Kraemer Basin, as well as downgradient at AM-8. The Shallow aquifer groundwater elevation difference from the western edge of Kraemer Basin near AMD-10 to downgradient monitoring well AM-8 was approximately 30 feet in June 2021 (Figure 6-3), which was the same as in June 2020, indicating that the gradient in this area remained unchanged even though the water levels were lower. Farther south, the groundwater elevation difference from the northwest corner of La Palma Basin to downgradient compliance well AM-10 was approximately 25 feet in June 2021 (Figure 6-3) as compared to 33 feet in June 2020, indicating

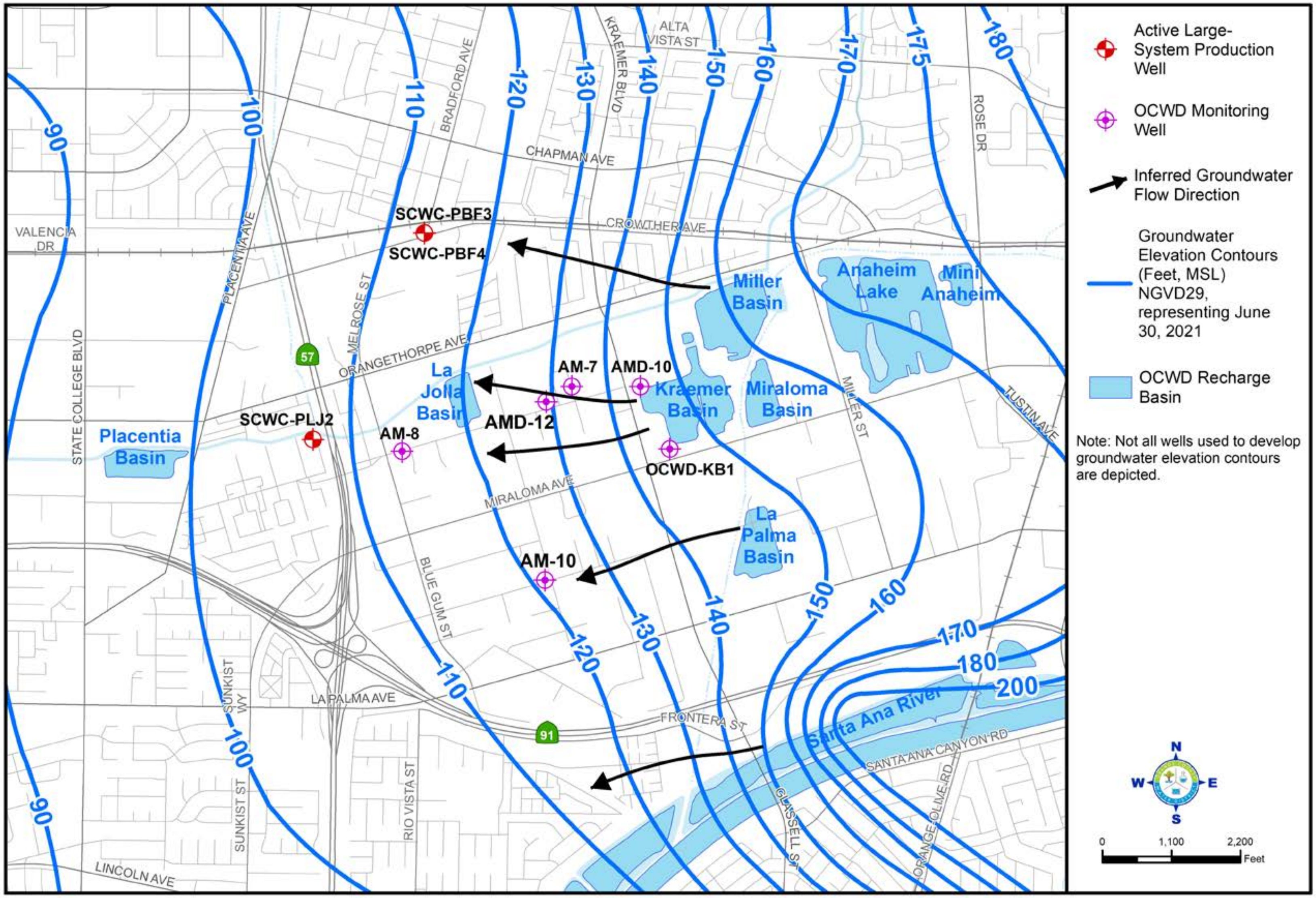


Figure 6-3. Shallow Aquifer Groundwater Elevation Contours and Inferred Groundwater Flow Directions in the Anaheim Forebay Area During 2021

that the gradient flattened somewhat along this southerly flow path due to less recharge at La Palma Basin in June 2021 as compared to June 2020. The generally similar gradients in June 2021 were likely due to lower overall recharge in the area in April through June of 2021, as compared to the prior year.

Groundwater level (piezometric elevation) hydrographs for monitoring well sites OCWD-KB1, AMD-10, AM-7, AMD-12, AM-8, and AM-10 are shown on the upper graphs of Figure 6-4 through Figure 6-9, respectively. These figures also show chloride concentrations on the lower graphs, which are discussed in Section 6.4. All five graphs show the 10-year period from 2012-2021. The groundwater level fluctuations over this period evident in the hydrographs reflect the effects of OCWD's managed recharge activities, local precipitation, groundwater production, and the Basin's overall groundwater storage condition.

Groundwater level trends at all six monitoring wells typically follow a seasonal pattern: (1) rising during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering somewhat in the late fall months near the end of the year. These seasonal trends are typically caused by a combination of increased recharge (both natural and managed) from local rainfall and captured SAR storm flows during the winter months and increased groundwater pumping during the warmer and drier summer months.

During 2021, groundwater level trends at all six monitoring wells followed the typical seasonal pattern described above and had a relatively large seasonal amplitude of 20-40 feet from the spring high to the summer low.

During the first quarter of 2021, groundwater levels began the year low due to the prior's years annual low occurring atypically at the end of the year in December but then rose sharply by 15-30 feet by the end of the quarter at all six wells from increased recharge at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 6-1) due to SAR storm flows and lower pumping during the winter months.

During the second quarter of 2021, groundwater levels at all six wells initially increased in mid-April to approximately 5 feet lower than the prior year's spring peak but then subsequently declined sharply by 10-20 feet for the remainder of the quarter due to very low monthly recharge in May and June (Figure 5-5) at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex from limited SAR flows and no imported MWD replenishment water.

During the third quarter of 2021, groundwater levels continued to decline an additional 10-20 feet in response to continued low monthly recharge at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 5-5) due to limited SAR flows, no imported MWD replenishment water, and a planned GWRS shutdown (August 15 – September 2). The decline in groundwater levels was also due to the typical increase in basin-wide summer pumping, even

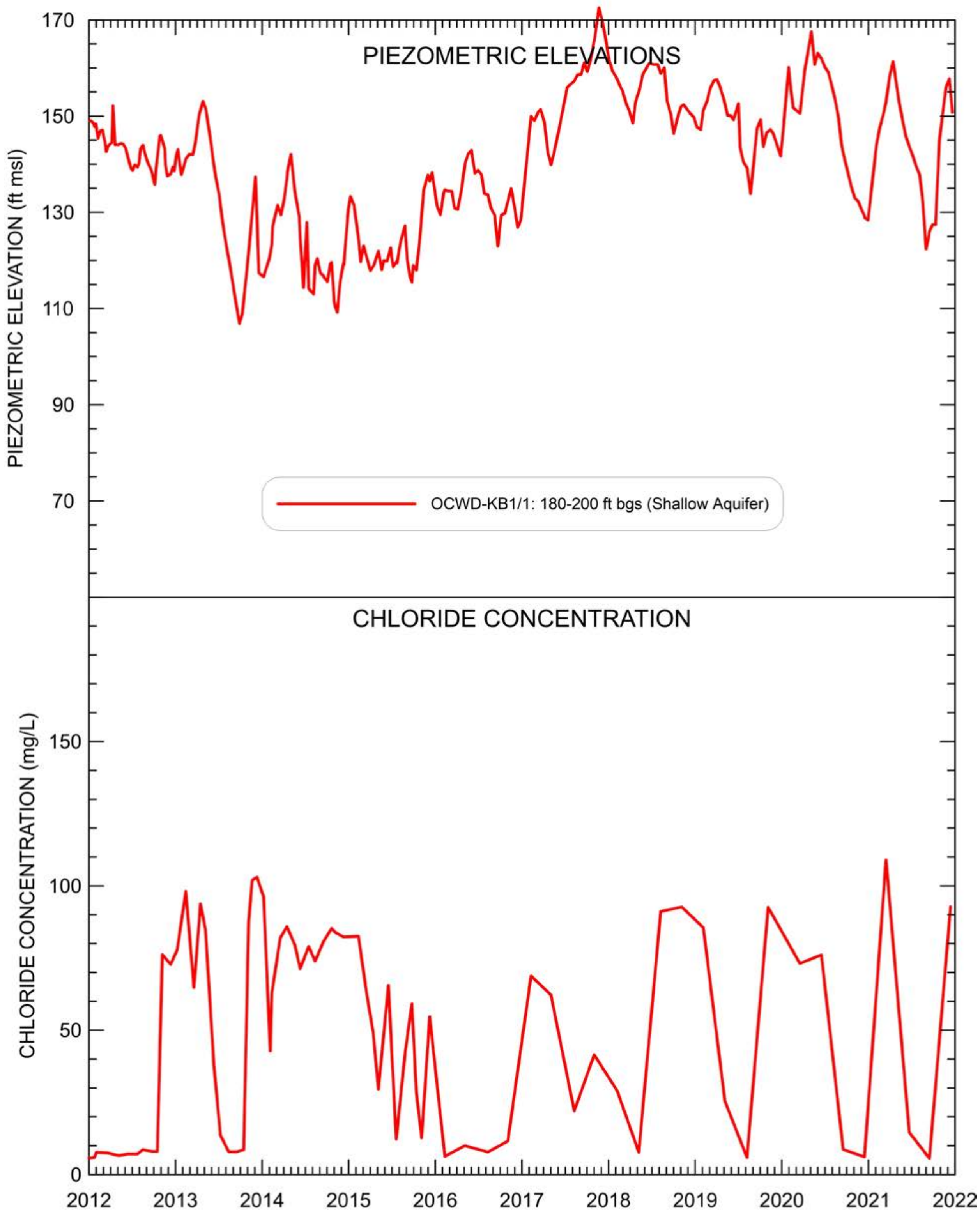


Figure 6-4. Monitoring Well OCWD-KB1 Piezometric Elevations and Chloride Concentration

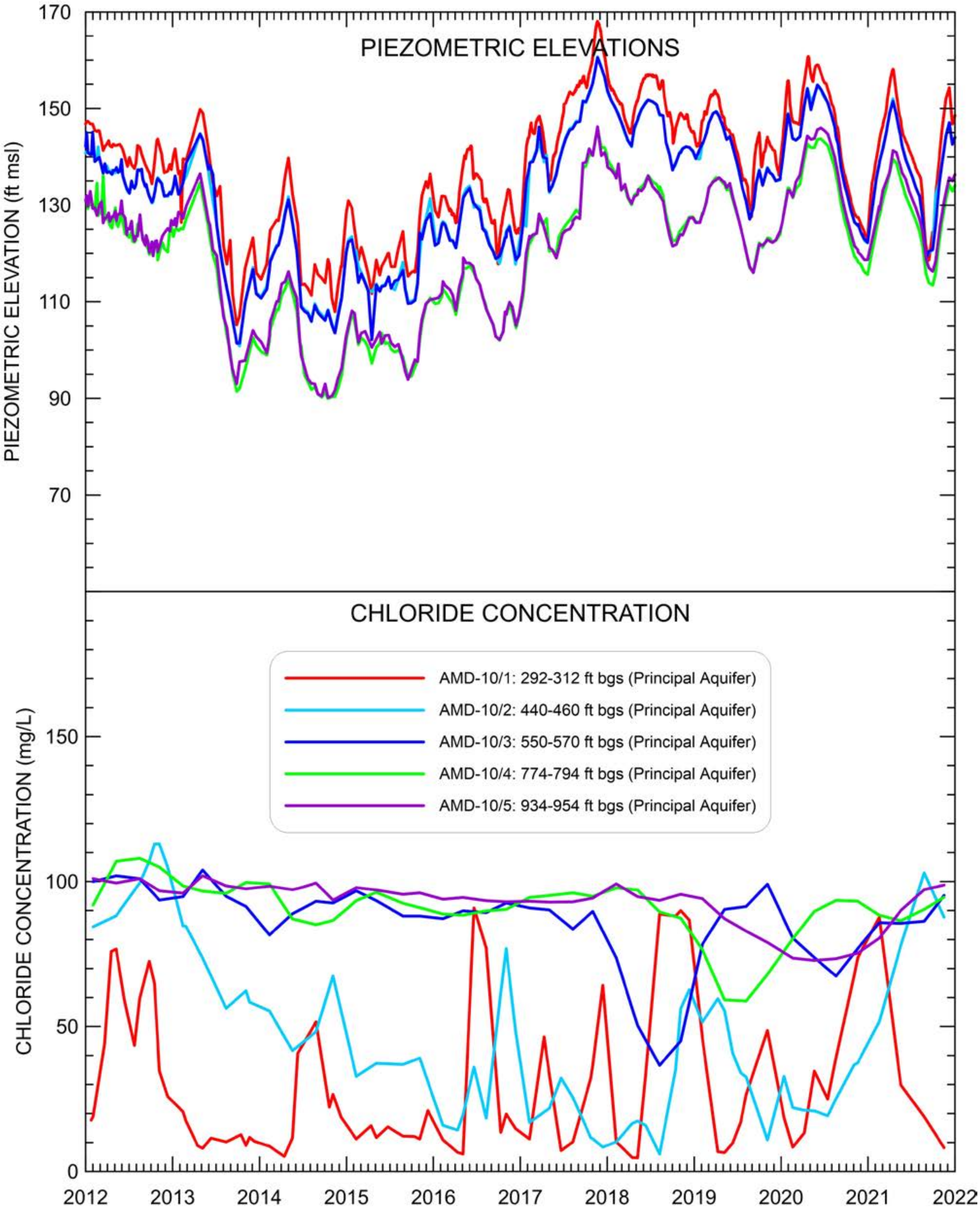


Figure 6-5. Monitoring Well AMD-10 Piezometric Elevations and Chloride Concentration

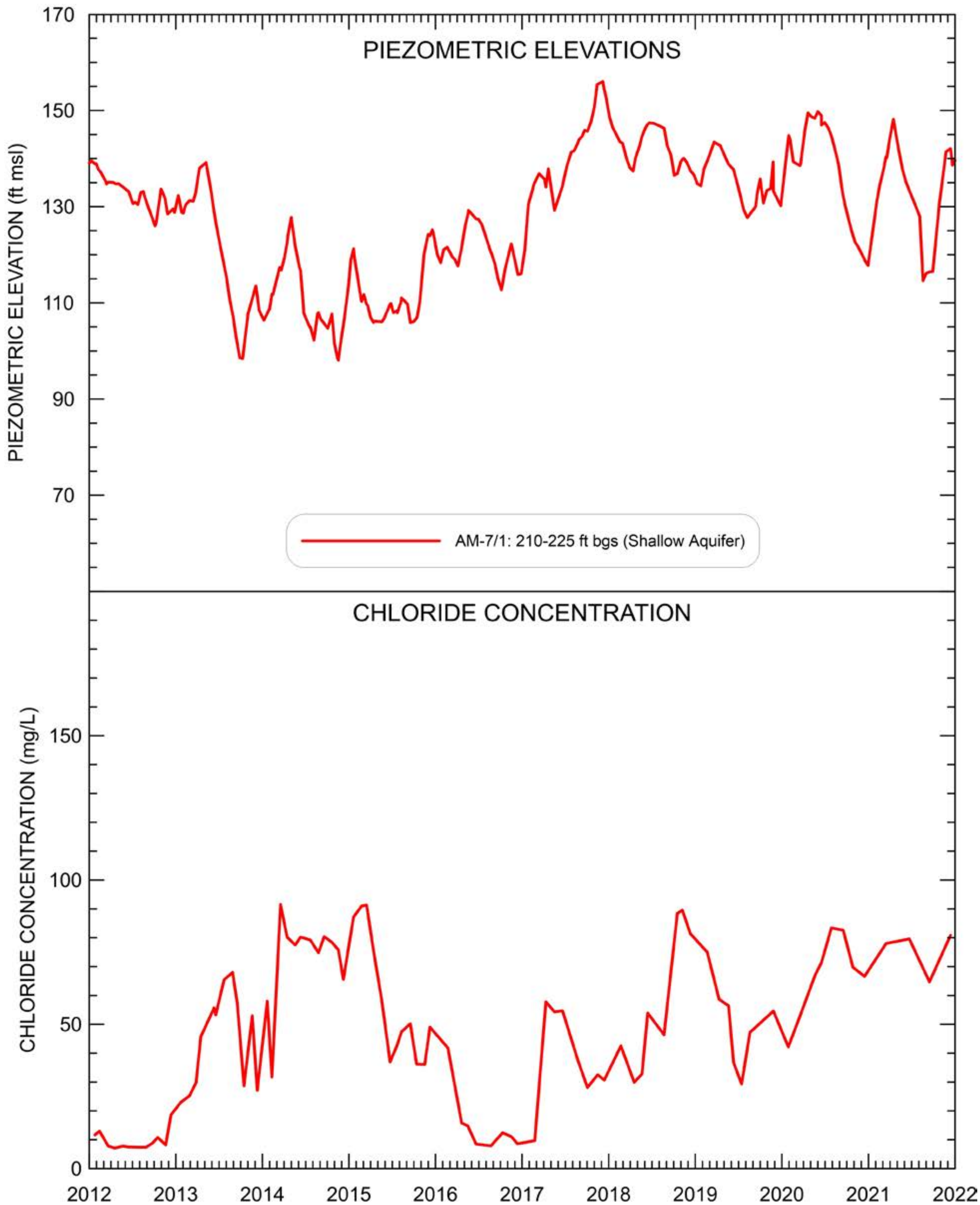


Figure 6-6. Monitoring Well AM-7 Piezometric Elevations and Chloride Concentration

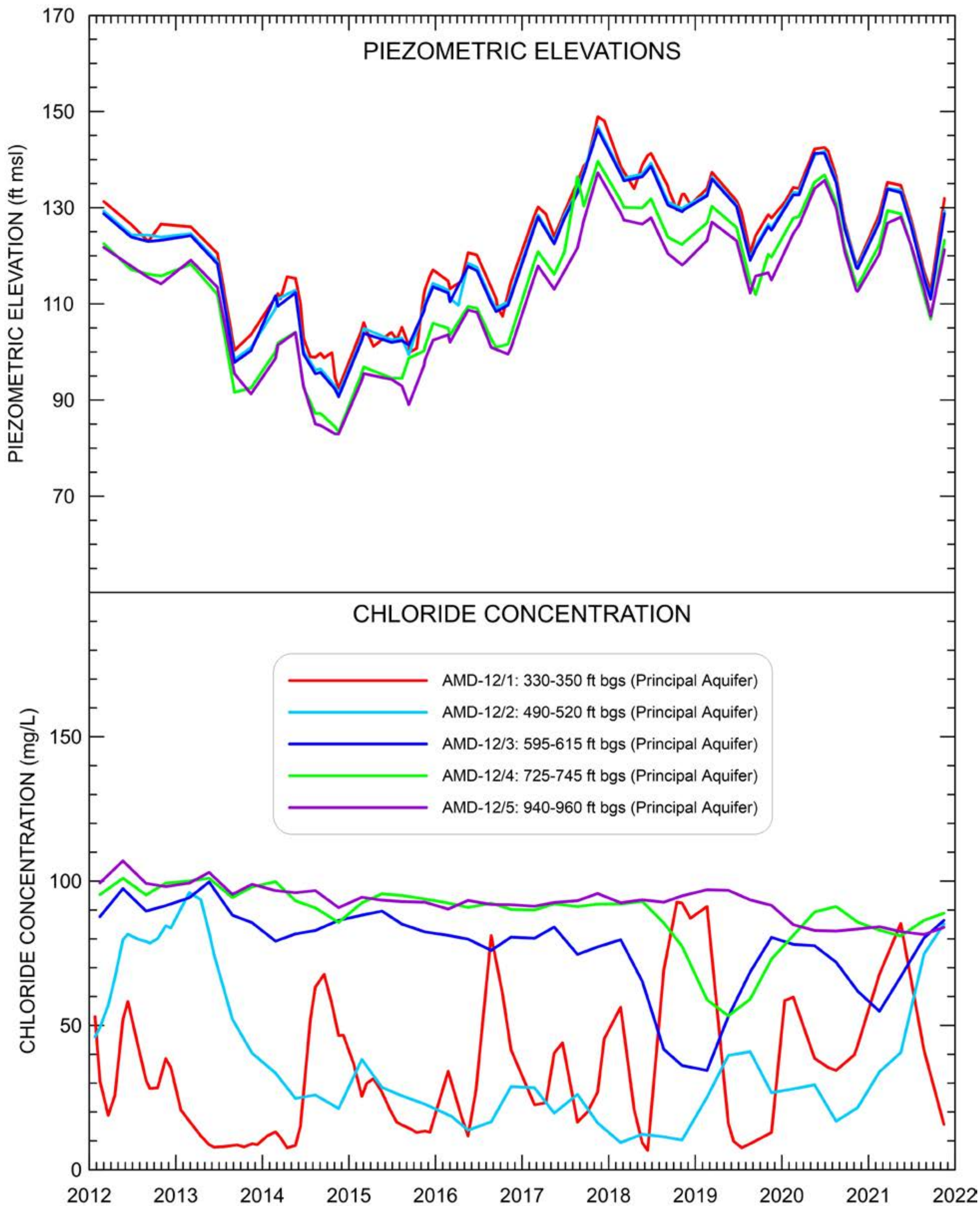


Figure 6-7. Monitoring Well AMD-12 Piezometric Elevations and Chloride Concentration

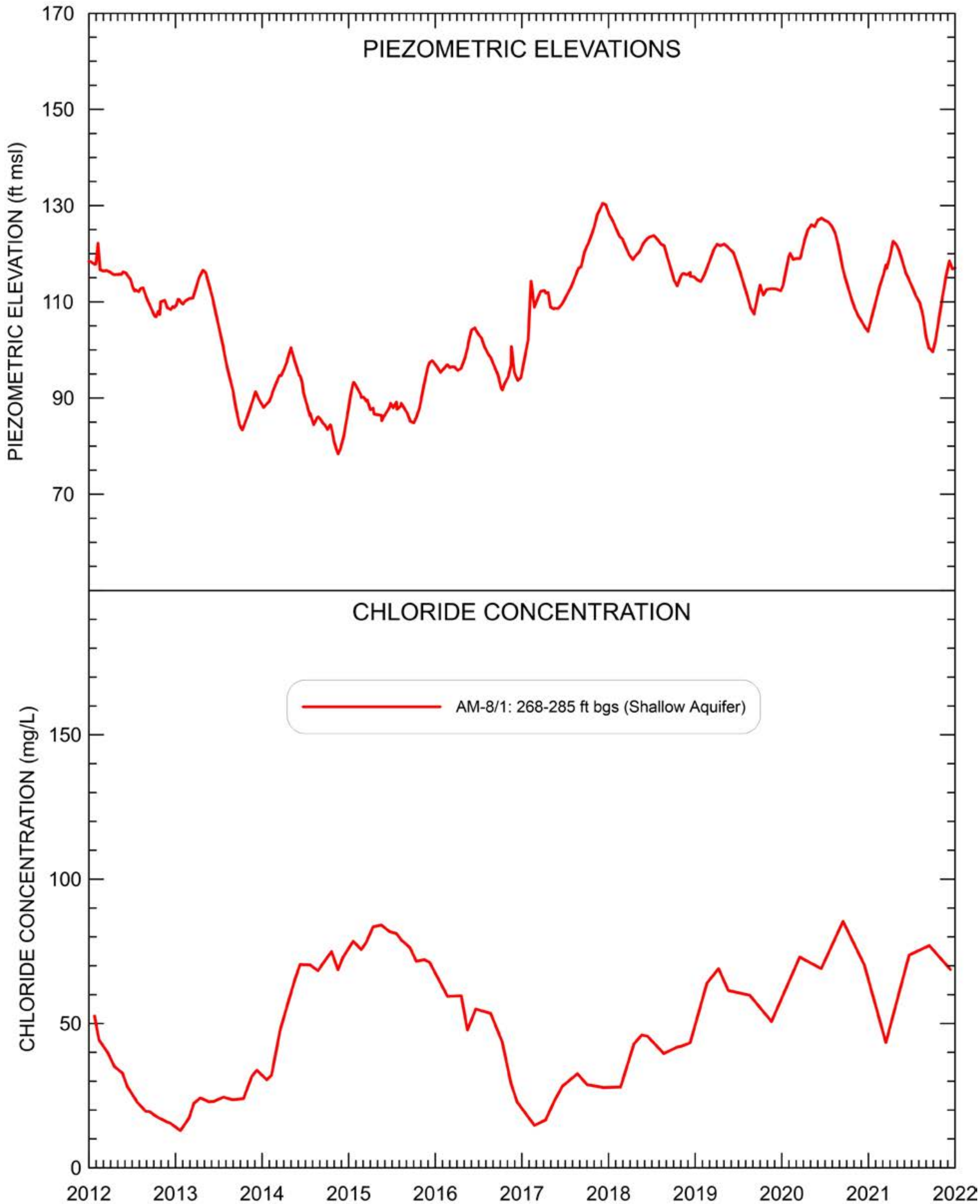


Figure 6-8. Monitoring Well AM-8 Piezometric Elevations and Chloride Concentration

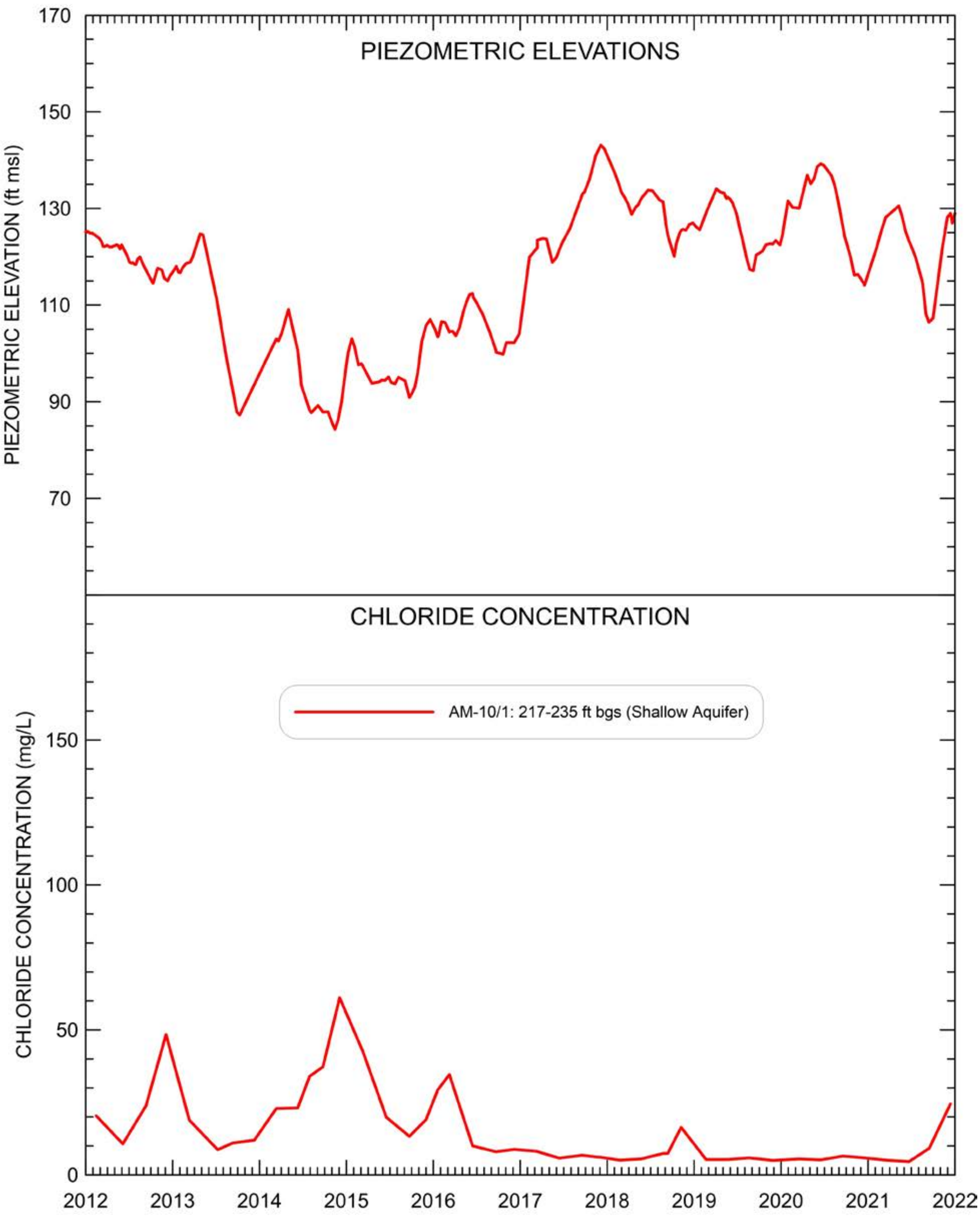


Figure 6-9. Monitoring Well AM-10 Piezometric Elevations and Chloride Concentration

though locally several City of Anaheim and Yorba Linda Water District production wells remained off-line in 2021 due to PFAS contamination. Groundwater levels dropped to an annual low in September and were approximately 5-10 feet lower than the prior year's annual low in December of 2020.

During the fourth quarter of 2021, groundwater levels rose sharply once again by 20-35 feet at all six monitoring wells and peaked in mid-December within 5 feet of the spring annual high. This significant fourth quarter rise was due to the typical seasonal decline in groundwater pumping but was enhanced by the large volume of imported MWD replenishment water (20,000 AF) recharged in October, November, and early December, followed by nearly 5 inches of local rainfall in late December. At all six monitoring wells, groundwater levels at the end of 2021 were approximately 10-20 feet higher than at the beginning of the year.

Of the six monitoring wells shown on Figure 6-4 through Figure 6-9, the four single-point wells (OCWD-KB1, AM-7, AM-8, and AM-10) are screened in the Shallow aquifer, whereas all casings for the two nested wells (AMD-10 and AMD-12) are individually screened entirely in the Principal aquifer. However, all six monitoring wells have very similar groundwater elevation trends; only small differences are seen with depth within the Principal aquifer at nested monitoring wells AMD-10 and AMD-12. As mentioned earlier, the Anaheim Forebay area in the vicinity of K-M-M-L Basins is largely devoid of any laterally extensive low-permeability aquitards. Therefore, the Shallow and Principal aquifers behave quite similarly, and relatively rapid vertical transport of recharge water occurs as evidenced by water quality trends in the next section.

6.4 Groundwater Quality

This section describes monitoring well groundwater quality for general constituents and arsenic in the Anaheim Forebay area in the vicinity of K-M-M-L Basins.

6.4.1 Monitoring Wells – General Water Quality

Quarterly compliance groundwater quality data for 2021 are presented in Appendix J. General groundwater quality data for the past five years (2017-2021) are also summarized in Appendix J for the compliance monitoring wells. Compliance monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA.

During 2021, groundwater quality at the compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards. All 1,4-dioxane and NDMA results were non-detect in 2021. During 2021, some of the analyses at monitoring well sites AM-7, AM-8, AM-10 and AMD-10 revealed constituents above the EPA Secondary MCL for apparent color, odor, and iron, as well as manganese and turbidity at AMD-10/2. At these monitoring wells, iron was detected above the Secondary MCL, however dissolved iron concentrations were relatively low and well below the Secondary MCL, except for occasional increases both prior to and after commencement of GWRS recharge, confirming that particulate iron from corrosion of the mild steel monitoring well casing is likely the primary contributing factor causing any Secondary MCL exceedances for total iron. The particulate iron from the corroding well casings may also cause increased levels of apparent color and odor at these well sites.

At AMD-10/2, manganese has intermittently been detected at or slightly above the Secondary MCL of 50 μg/L since 2012. Unlike iron, dissolved manganese concentrations were approximately the same as total manganese. During 2021, dissolved manganese increased from 41 μg/L in the first quarter to slightly above the Secondary MCL at 77 μg/L in the second quarter, before dropping just below the Secondary MCL at 49 μg/L by the fourth quarter. This short-term dissolved manganese spike was contemporaneous with a sharp increase in chloride concentrations at this well, likely implying a non-GWRS manganese source or release trigger, such as SAR recharge. Similar to the dissolved manganese spike in 2021, three other spikes occurred in 2012, 2016, and 2018-19, all at or slightly above the Secondary MCL and all during a contemporaneous chloride increase that followed a period of low chloride concentration indicative of a high percentage of sustained GWRS water at this well prior to the observed increase.

All other Secondary MCL exceedances at AM-7, AM-8, AM-10, and AMD-10 during 2021 were consistent with the prior monitoring data collected from 2008-2021 and were not associated with the presence of GWRS purified recycled water.

The RWQCB and DDW approved a revised groundwater monitoring frequency beginning in 2011 and 2010, respectively. The revised monitoring frequency allows for selected analytes with no detections to be monitored on an annual basis in lieu of quarterly (RWQCB, 2011 and CDPH, 2010a). In 2018, the groundwater monitoring program was revised to monitor annually in lieu of quarterly for total nitrogen, thiobencarb, and foaming agents and eliminate total coliform monitoring (RWQCB, 2018 and DDW, 2018a). These changes were formalized as part of the revised GWRS permit Monitoring and Reporting Program issued by the RWQCB in November 2020 (RWQCB, 2020).

6.4.2 Monitoring Wells – Intrinsic Chloride Tracer

As shown earlier in Section 4 for the Talbert Barrier area, dissolved chloride concentrations can be used to trace the subsurface movement of groundwater because chloride is relatively unaffected by sorption, chemical, or biological reactions in the aquifer. Thus, chloride is a good conservative tracer. Groundwater flow paths determined from groundwater level monitoring are also verified by comparing groundwater quality changes and trends in the recharge source water with nearby monitoring wells, primarily using chloride concentrations and EC. However, since applied recharge in the Anaheim Forebay comes from multiple sources (see Section 5), water quality responses at the monitoring wells discussed in this section do not always follow a single source water trend.

Chloride concentration time series for the 10-year period 2012-2021 for the six monitoring wells near K-M-M-L Basins are shown on the lower graph on Figure 6-4 through Figure 6-9. Since the running 10-year period shown in these figures begins in 2012, the first arrival of the low-chloride GWRS signal at many of these monitoring wells is not shown in these figures and is discussed more thoroughly in Section 6.4.2 of prior years' Annual Reports.

Prior to GWRS start-up in January 2008, chloride concentrations in all six wells had similar overall trends, fluctuating somewhat from year to year but remaining within a range of approximately 80-120 mg/L, reflective of SAR water and MWD imported supplies from the Colorado River, which historically have been OCWD's primary source of recharge water in the Anaheim Forebay. Occasional decreases below this range prior to GWRS start-up were indicative of periods of greater SAR storm water recharge and/or greater recharge of MWD imported supplies from the State Water Project (SWP), both of which feature relatively lower EC, TDS, and chloride concentrations, but still significantly higher than for GWRS purified recycled water. Since the initial deliveries of GWRS water in January 2008 to Kraemer-Miller Basins, in July 2012 to Miraloma Basin, and in November 2016 to La Palma Basin, the migration of this purified recycled water in the subsurface was evidenced by chloride concentrations decreasing below 60 mg/L at all six monitoring well sites: OCWD-KB1, AMD-10, AMD-12, AM-7, AM-8, and AM-10. These chloride concentrations below 60 mg/L were lower than the bulk of historical recharge source waters (e.g., SAR water). Furthermore, the timing of these chloride concentration decreases corresponded well with previously established groundwater travel times away from Kraemer-Miller Basins (LLNL, 2004; Clark, 2009). The annual average chloride concentration of GWRS water has ranged from 4-11 mg/L since 2008 and more recently from 5-6 mg/L over the last five years and is largely dependent on the collective performance and age of the AWPF RO membranes, as well as OC San feed water quality.

Comparing Table 5-2, Table 5-3, and Figure 5-5 presented in Section 5 provides a temporal sense of the volume and proportion of GWRS purified recycled water in the vicinity of K-M-M-L Basins relative to other recharge sources in 2021. These factors influence the strength of the GWRS low chloride signal, as well as where and when it is tracked in surrounding groundwater.

OCWD-KB1/1 is screened in the Shallow aquifer (screened from 180 to 200 ft bgs) adjacent to the southwest corner of Kraemer Basin (Figure 6-3). A review of chloride concentration trends at OCWD-KB1/1 (Figure 6-4) indicate that this location is dominated by Kraemer Basin recharge with a travel time estimate of approximately one month whenever Kraemer Basin recharge volumes are sufficiently large. Conversely, when Kraemer Basin is empty or operated a monthly recharge volume less than approximately 1,000 AF, the GWRS water recharged at upgradient Miraloma Basin migrates laterally within the Shallow aquifer to OCWD-KB1/1 within approximately four months. Example historic and recent monitoring well chloride trends at OCWD-KB1/1 demonstrating these flow paths include (Figure 6-4):

- Sustained low chloride concentrations of approximately 10 mg/L in 2016 indicated sustained arrival of GWRS water from the large volumes of GWRS water recharged in Kraemer Basin beginning in January 2016 and lasting nearly the entire year. This was followed by chloride concentrations increasing sharply to nearly 70 mg/L in February 2017 due to the large volume of non-GWRS recharge in Kraemer Basin beginning one month prior, confirming the approximately one-month travel time from Kraemer Basin.

- Chloride concentrations decreased sharply during the first half of 2019 to 6 mg/L by early August, indicating the arrival of GWRS water from the large volumes recharged in Miraloma Basin four months prior in January through April while Kraemer Basin was contemporaneously filled with low volumes of non-GWRS recharge water averaging less than 1,000 AF per month.

- During 2021, chloride concentrations increased sharply to 109 mg/L during the first quarter, indicating arrival of relatively large volumes of non-GWRS water recharged in Kraemer Basin from January through March. Chloride concentrations subsequently dropped sharply during the second and third quarters to 6 mg/L in September, indicating arrival of 100% GWRS water from upgradient Miraloma Basin, as Kraemer Basin had no significant recharge from May through September. During the fourth quarter of 2021, chloride concentrations sharply increased to 93 mg/L in December, again demonstrating the one-month arrival of large non-GWRS recharge volumes in Kraemer Basin during October through December.

AMD-10/1 is screened in the uppermost Principal aquifer (screened from 292 to 312 ft bgs) adjacent to the northwest corner of Kraemer Basin (Figure 6-3). As documented in previous Annual Reports, chloride concentrations at AMD-10/1 (Figure 6-5) historically were not found to be influenced by Kraemer Basin recharge, which likely remained in the Shallow aquifer at this location. Since Miraloma Basin came on-line in July of 2016, when both Kraemer and Miraloma Basins are fully operational, chloride concentrations at AMD-10/1 typically indicate arrival of GWRS recharge from upgradient Miraloma Basin due to hydraulic interference of Kraemer Basin recharge in the Shallow aquifer; this forces Miraloma Basin recharge to first migrate downward into the uppermost Principal aquifer, before migrating westward beneath Kraemer Basin.

During 2021, Figure 6-5 shows that chloride concentrations at AMD-10/1 started the year high (88 mg/L) in the first quarter due to the lack of substantial GWRS recharge at K-M-M Basins during the second half of 2020, with GWRS recharge primarily occurring at La Palma Basin during that time. Chloride concentrations subsequently decreased sharply for the remainder of the year to a low of 8 mg/L in November, indicative of nearly 100% GWRS water likely originating from Miraloma Basin which was on-line with GWRS water throughout most of 2021.

AM-7/1 is screened in the Shallow aquifer (screened from 210 to 225 ft bgs) and is located approximately 2,000 feet west or downgradient of Kraemer Basin (Figure 6-3). Chloride concentration trends at AM-7/1 (Figure 6-6) have been very similar to those at OCWD-KB1/1 (Figure 6-4) but are typically lagged by 2 to 3 months and often dampened (i.e., greater dispersion) due to its farther distance downgradient from Kraemer Basin. This pattern is exemplified by the sustained arrival of GWRS water at AM-7/1 during the second half of 2016 (Figure 6-6), nearly identical to the declining chloride trend at OCWD-KB1/1 (Figure 6-4) but lagged by 2 to 3 months. During 2021, chloride concentration trends at AM-7/1 (Figure 6-6) were once again consistent with those at OCWD-KB1/1 but more dampened and lagged by 2 to 3 months

AMD-12/1 is located slightly downgradient from AM-7/1 (Figure 6-3) and is screened in the uppermost Principal aquifer (screened from 330 to 350 ft bgs), analogous to AMD-10/1 discussed above. Consistent with historical observations, Figure 6-7 shows that chloride concentration trends at AMD-12/1 during 2019 mimicked those at AMD-10/1 but were delayed by 2 to 3 months due to AMD-12/1 being farther downgradient from Kraemer and Miraloma Basins. For example, chloride concentrations at AMD-12/1 decreased sharply from May through August of 2019 down to GWRS levels, correlative with a similar chloride decline to GWRS levels at AMD-10/1 (Figure 6-5) three months prior. During 2021, chloride trends at AMD-12/1 were once again similar to those at AMD-10/1 but lagged by approximately three months, increasing during the first half of the year to 85 mg/L in May and then decreasing sharply for the remainder of the year down to 16 mg/L in November, indicating GWRS water arriving at this well once again during the second half of 2021 and likely originating from Miraloma Basin as was discussed above for AMD-10/1.

At AM-8/1 (Figure 6-8), screened in the Shallow aquifer (screened from 268 to 285 ft bgs) and representing the compliance monitoring well located farthest downgradient from K-M-M-L Basins (Figure 6-3), chloride concentration trends are typically consistent with those at AM-7/1 (Figure 6-6), but lagged by about 2 months and typically more dampened due to dispersive transport along this more distant flow path. Example historic and recent chloride trends at AM-8/1 demonstrating this phenomenon include (Figure 6-8):

- Chloride concentrations declined during late 2016 to a low of 15 mg/L by early 2017, indicating a relatively large proportion of GWRS water and corresponding to the observed chloride decline at AM-7/1 approximately 2 months prior. These observations are consistent with the recharge of GWRS water in Kraemer Basin from the second half of 2015 and throughout most of 2016.

- During 2021, chloride concentrations decreased in the first quarter to a low of 43 mg/L by March, before increasing once again in the second and third quarters to 77 mg/L in September, corresponding to the chloride response at AM-7/1 observed three months earlier. Based on the estimated travel time of 3-4 months at AM-7/1 and 5-6 months at AM-8/1 from Kraemer Basin, these observations are consistent with the large volumes of non-GWRS water recharged in Kraemer Basin during January through April of 2021.

AM-10/1 is located approximately 3,000 feet downgradient of both Kraemer and La Palma Basins (Figure 6-3) and screened in the Shallow aquifer (screened from 217 to 235 ft bgs). Figure 6-9 shows that chloride concentrations at AM-10/1 typically remained below 10 mg/L from the second half of 2016 through the first half of 2021, indicating essentially 100% sustained GWRS water arrival at this well in the Shallow aquifer during that time. The brief increase in chloride concentrations at AM-10/1 to 16 mg/L in November 2018 indicated the arrival of some proportion of non-GWRS water at AM-10/1, likely resulting from the lack of GWRS recharge at La Palma Basin two months prior during September 2018 (when there were no GWRS flows to K-M-M-L Basins). Similarly, the increase in chloride concentrations at AM-10/1 during the second half of 2021 to 25 mg/L by December was likely due to La Palma Basin being off-line with no recharge from August 15 to September 21 during a planned AWPF shutdown in August and cleaning of La Palma Basin in September. Previous tracer tests indicated that the travel time from Kraemer Basin to AM-10/1 (prior to La Palma Basin being on-line) was approximately 2 months for first arrival and nearly 5 months for peak arrival.

At the slightly deeper nested monitoring wells AMD-10/2, AMD-10/3, AMD-12/2, and AMD-12/3 (Figure 6-5 and Figure 6-7, respectively), chloride concentration trends reflecting the operational and recharge source history at K-M-M-L Basins are more delayed and dampened compared to the shallowest zone at these two well sites due to extended transport through less permeable vertical flow paths and the associated mixing via dispersive transport. The typical flow path relationships observed at these wells are described below.

- At AMD-10/2 (screened from 440 to 460 ft bgs), chloride concentration trends in this Principal aquifer zone were very similar to the shallower AMD-10/1 from 2014-2021 but were somewhat dampened and lagged by approximately 3-6 months (Figure 6-5). The most recent example is demonstrated from the second half of 2020 through the first three quarters of 2021, when chloride concentrations at AMD-10/2 increased sharply to a high of 103 mg/L in August 2021, before beginning to decrease slightly in the fourth quarter of 2021, consistent with the chloride trend at AMD-10/1 and lagged by nearly 6 months.

- At AMD-10/3 (screened from 550 to 570 ft bgs), since 2018 the proportion of GWRS water present appears to be influenced by the magnitude of GWRS recharge at Miraloma Basin relative to nearby basins. During periods of greater overall recharge (e.g., 2017-2018) at K-M-M-L Basins, chloride concentrations experienced their first meaningful decrease indicating GWRS water arrival (Figure 6-5). It is hypothesized that under these conditions, GWRS recharge at Miraloma Basin may vertically migrate deeper near the basins than previously, taking the path of least resistance if the Shallow and uppermost Principal aquifers are largely mounded and thus creating hydraulic interference in this immediate area. During subsequent periods of relatively lower recharge at K-M-M-L Basins, the chloride concentrations at AMD-10/3 increased to levels indicating only residual or no GWRS water present, consistent with the presence of non-GWRS water originating from upgradient recharge (e.g., Anaheim Lake).

- At AMD-12/2 (screened from 490 to 520 ft bgs), Figure 6-7 shows that chloride concentration trends in this somewhat deeper Principal aquifer zone appeared to correlate with the shallower AMD-12/1 from 2014-2021 but were usually dampened and delayed by approximately 5-6 months. More recent periods of lesser dampening (i.e., greater similarity) of the AMD-12/2 trend relative to AMD-12/1 may correspond to the lack of any significant GWRS recharge in K-M-M Basins during the second half of 2020 (GWRS recharge in only La Palma Basin during that time).

- At AMD-12/3 (screened from 595 to 615 ft bgs), Figure 6-7 shows that chloride concentration trends were much more dampened than at AMD-12/2 but not as stable as the progressively deeper zones at this well site. These trends are most consistently correlated with those observed upgradient at AMD-10/3, but lagged by approximately three months, as evidenced by the increasing chloride trend in 2019, slight decline in 2020, and subsequent increase in 2021.

At the deeper monitoring wells AMD-10/4 (screened from 774 to 794 ft bgs) and AMD-12/4 (screened from 725 to 745 ft bgs), Figure 6-5 and Figure 6-7, respectively, show that chloride concentrations were relatively stable and remained at high background levels for several years ranging from approximately 90-110 mg/L until the second half of 2018 when chloride concentrations began to finally decrease enough to signal the arrival of GWRS water. This likely reflects the influence of GWRS recharge at La Palma Basin, which began in 2016 after GWRS Initial Expansion was completed in 2015, as well as the aforementioned period of greater overall K-M-M-L Basins recharge from 2017-2018. The chloride trends from 2018-2021 at both AMD-10/4 and AMD-12/4 are similar to but more dampened than the corresponding chloride trends at their shallower counterparts AMD-10/3 and AMD-12/3, as well as lagged by 3-6 months.

At the deepest monitoring wells AMD-10/5 (screened from 934 to 954 ft bgs) and AMD-12/5 (screened from 940 to 960 ft bgs), chloride concentrations were also relatively stable and remained at high background levels until mid to late 2019 when chloride concentrations began to finally decrease enough to signal the arrival of some percentage of GWRS water. At AMD-10/5, Figure 6-5 shows that chloride concentrations decreased notably from mid-2019 down to

73 mg/L by mid-2020; this could be related to the trend observed at the slightly shallower AMD-10/4 observed approximately one year prior. At AMD-12/5, Figure 6-7 shows a similar but even more dampened chloride decline from mid-2019 down to 83 mg/L by mid-2020; this could be related to the trend observed at the slightly shallower AMD-12/4 observed approximately one year prior. During 2021, chloride concentrations at AMD-10/5 rose gradually to background levels of nearly 100 mg/L by year's end, while chloride concentrations at AMD-12/5 experienced a subtle decline to 84 mg/L by year's end just slightly below pre-GWRS background levels. These 2021 chloride trends at both AMD-10/5 and AMD-12/5 were once again consistent with but more dampened than their shallower counterparts at AMD-10/4 and AMD-12/4 and lagged by approximately one year.

6.4.3 Monitoring Wells - Arsenic

Previous studies have indicated the potential for surface spreading of reverse osmosis purified wastewater to mobilize metals from alluvial aquifer sediments (Li, et al., 2006). In addition to the metals testing for the quarterly compliance monitoring, OCWD implemented a supplemental monthly sampling program of selected monitoring wells downgradient of K-M-M-L Basins to coincide with the first GWRS purified recycled water deliveries to the basins in January 2008.

Of all the metals analyzed, arsenic represents the greatest public health concern and has a Primary MCL of 10 μg/L. Figure 6-10 through Figure 6-12 feature grouped time series plots of total arsenic concentrations measured quarterly at: (1) single-point monitoring wells AM-7/1, AM-8/1, and AM-10/1; (2) multi-depth nested monitoring well site AMD-10; and (3) multi-depth nested monitoring well site AMD-12, respectively. During 2021, either non-detect, low stable concentrations, or decreases in total arsenic were generally observed in all these monitoring wells, with the following exceptions:

- AMD-10/1 – increased slightly during the second half of 2021 from below the RDL of 1 μg/L in the first and second quarters to 3.3 μg/L in the fourth quarter; and
- AMD-12/1 – increased slightly during the second half of 2021 from just above the RDL at 1.3 μg/L in the first and second quarters to 3.1 μg/L in the fourth quarter.

Over the course of the GWRS groundwater monitoring program, an inverse relationship between the chloride concentration (representing percentage of GWRS water present) and the observed arsenic concentration at monitoring wells has been observed, i.e., arsenic concentrations have been shown to increase non-linearly as chloride concentrations decrease with the sustained arrival of large percentages of GWRS water. This is graphically presented on time series plots of dissolved arsenic at AMD-10/1 and AM-7/1 as shown on Figure 6-13 and Figure 6-14, respectively. The additional non-compliance (voluntary) monitoring for dissolved arsenic has been performed as frequently as bimonthly, as compared to the quarterly compliance monitoring

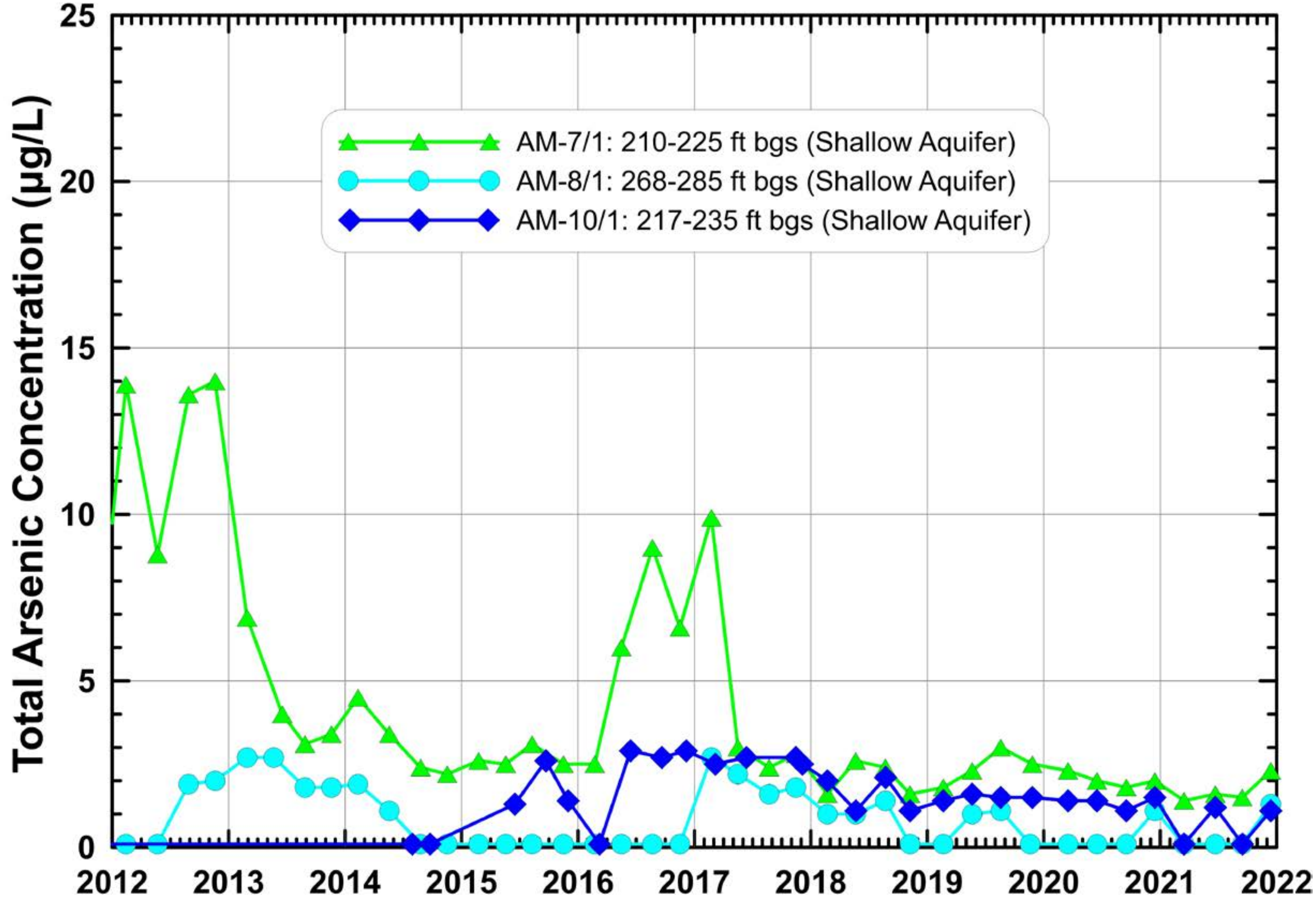


Figure 6-10. Monitoring Wells AM-7, AM-8, and AM-10 Total Arsenic Concentrations

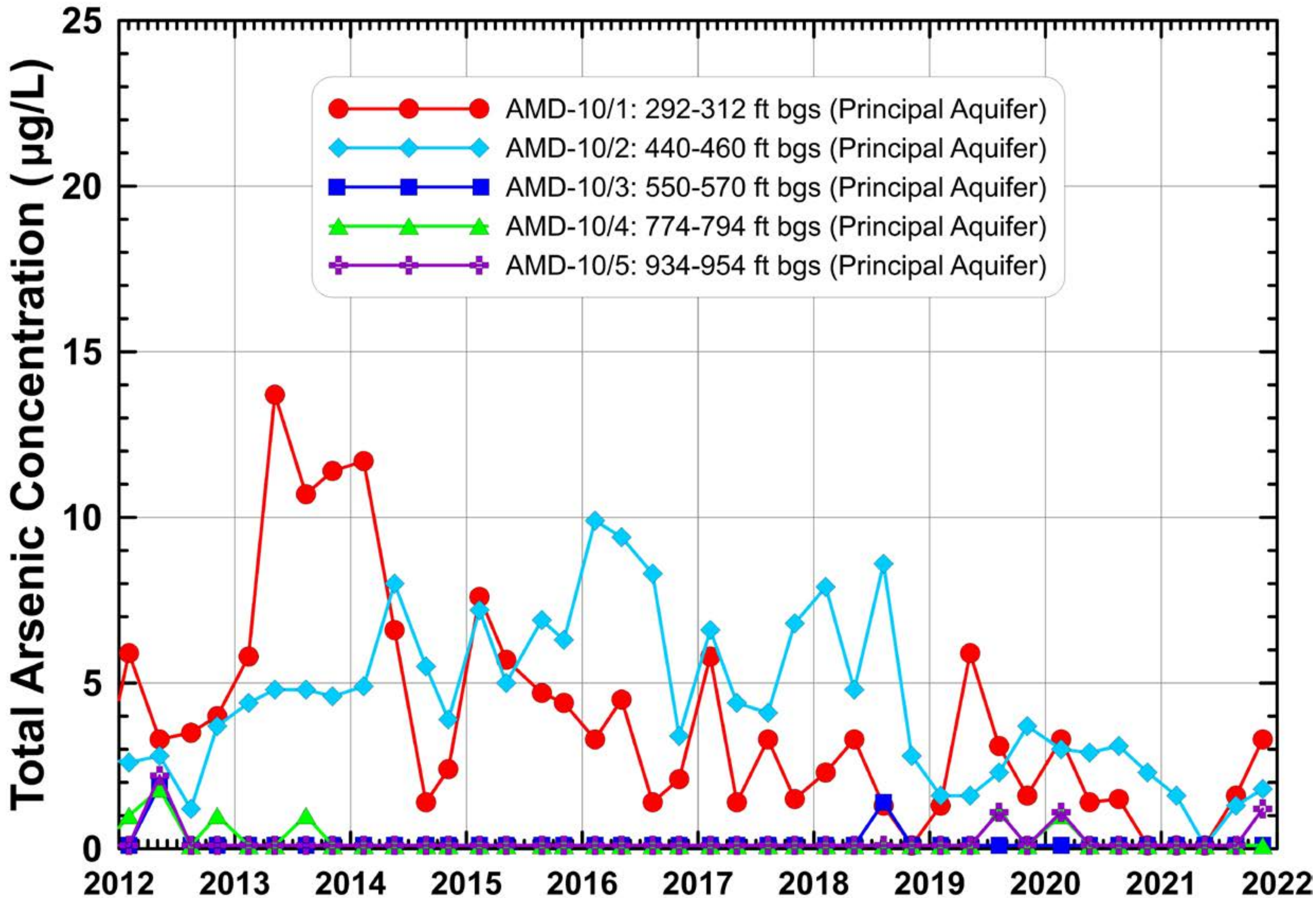


Figure 6-11. Monitoring Well AMD-10 Total Arsenic Concentrations

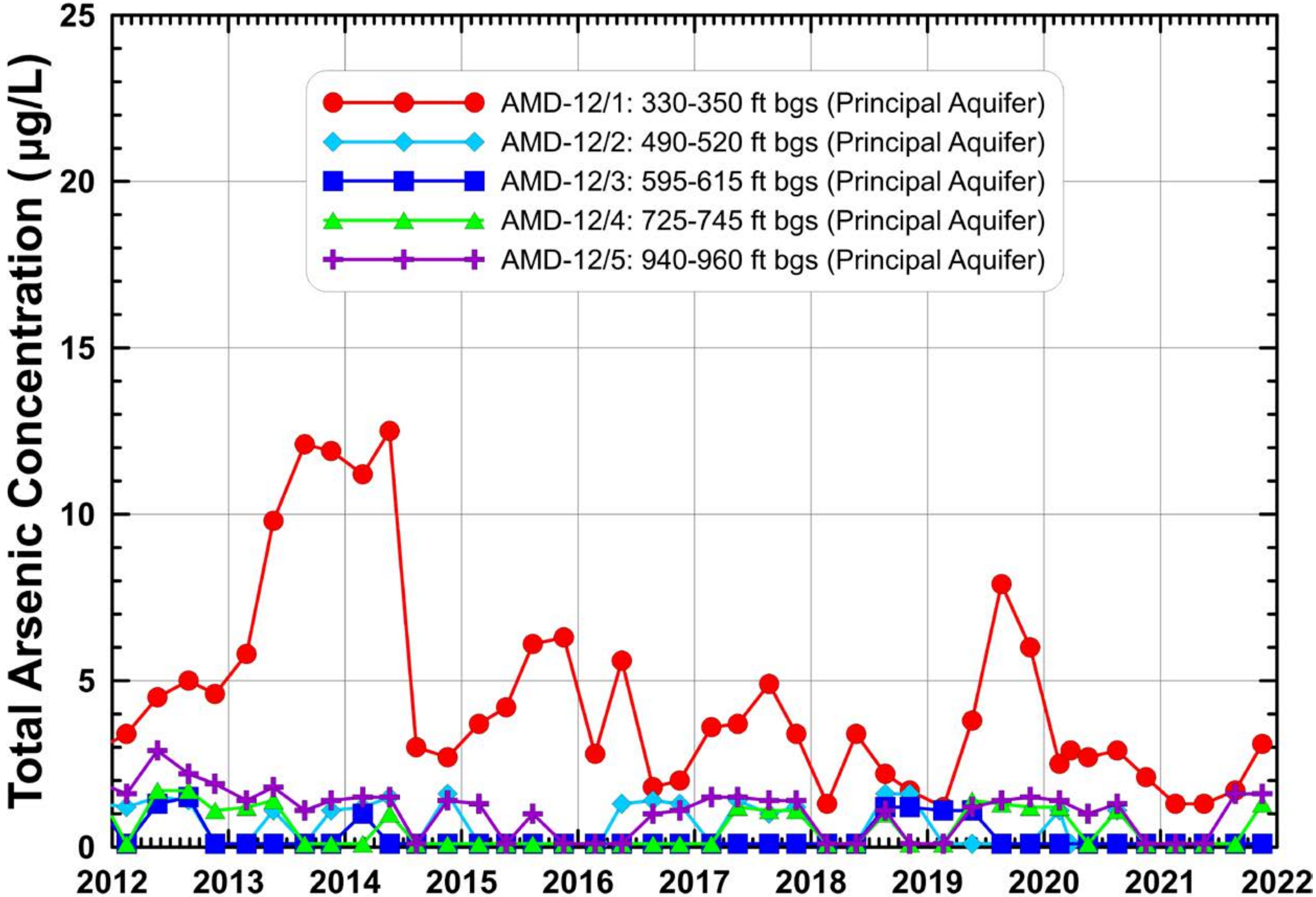


Figure 6-12. Monitoring Well AMD-12 Total Arsenic Concentration

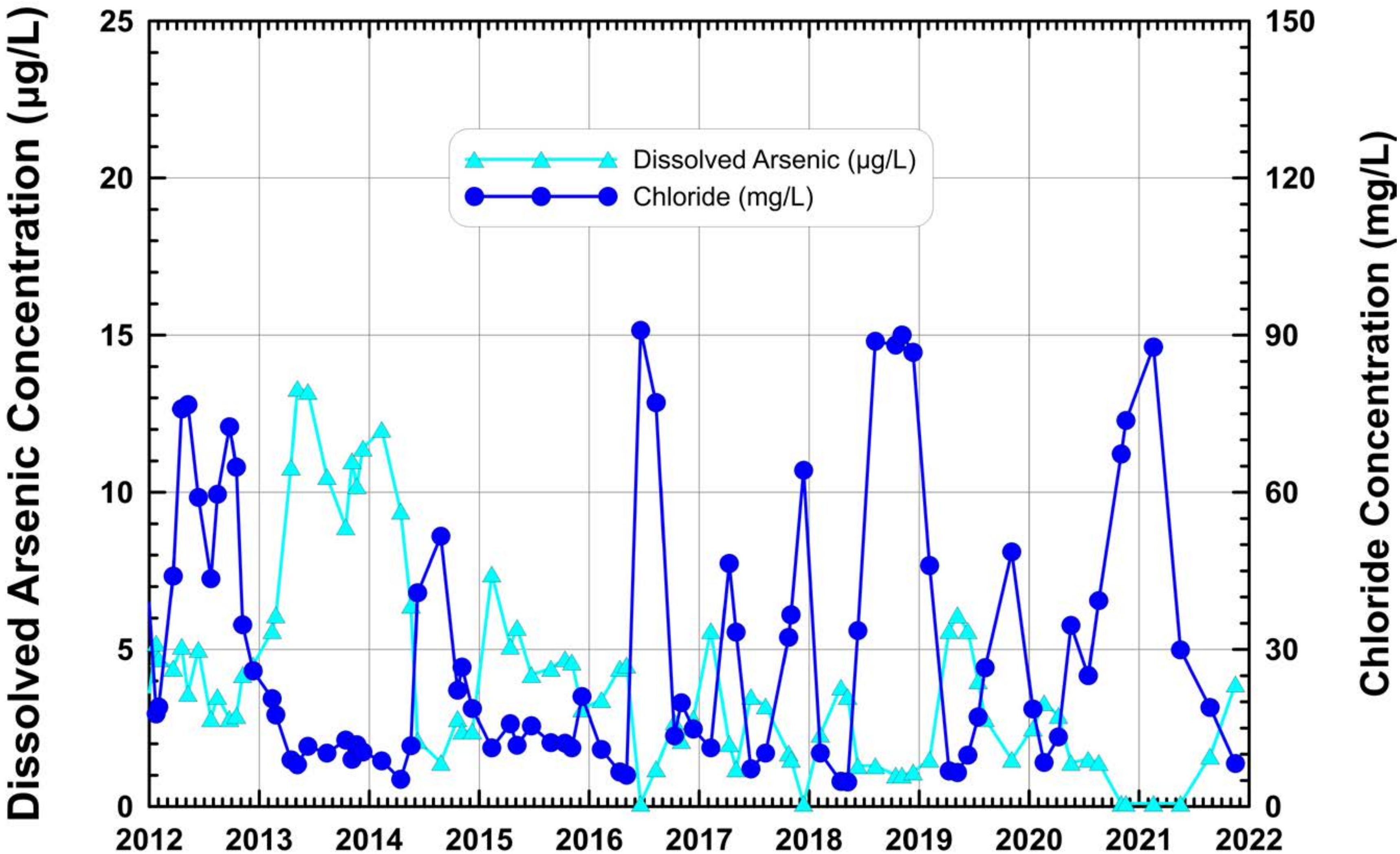


Figure 6-13. Monitoring Well AMD-10/1 Chloride and Dissolved Arsenic Concentrations

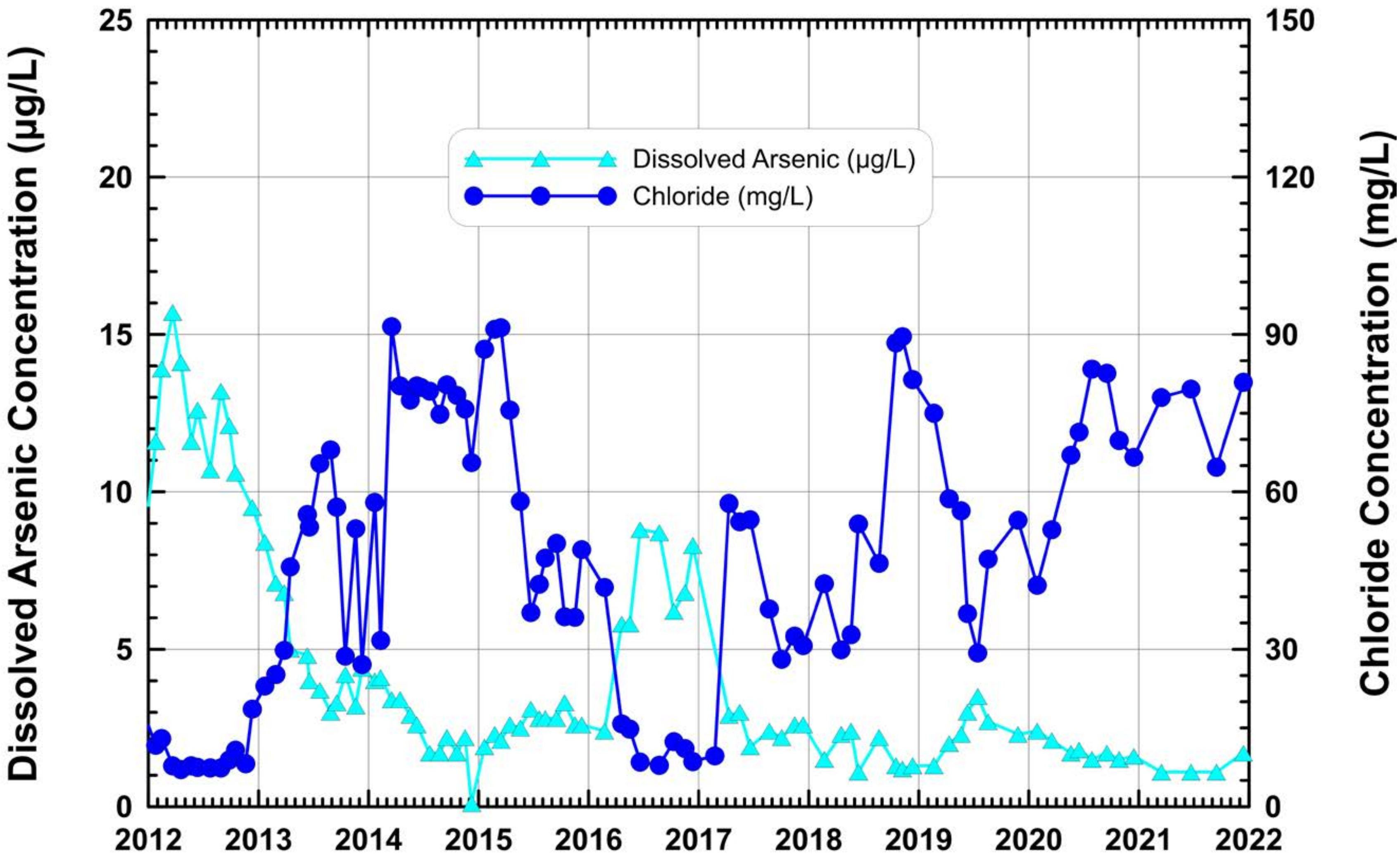


Figure 6-14. Monitoring Well AM-7 Chloride and Dissolved Arsenic Concentrations

for total arsenic. Increases in arsenic concentrations are clearly associated with decreases in chloride concentrations, and vice versa. These trends confirmed that the arsenic increases were related to the arrival of GWRS water, whereas the arsenic decreases were due to the arrival of other recharge sources (SAR storm flows or imported water).

A review of the chloride and dissolved arsenic concentration trends for wells AMD-10/1 and AM-7 (Figure 6-13 and Figure 6-14) indicated a generally non-linear and spatially variable relationship between the percentage of GWRS water and arsenic concentration in groundwater, after a minimum threshold percentage of GWRS water reached the monitoring well. The threshold percentage of GWRS water required to cause an initial arsenic concentration rise above background appears to increase with travel distance downgradient from K-M-M-L Basins, implying a greater degree of geochemical stabilization within the aquifer with increased travel distance and/or less available arsenic for mobilization at locations farther downgradient from the recharge basins.

Although the GWRS purified recycled water was the likely cause of the increased arsenic concentrations, it is not the arsenic source. The mechanism leading to the arsenic increases are the result of complex geochemical interactions between the GWRS water and arsenic bound to and/or comprising the aquifer matrix. A historical review of SAR water quality analyses showed arsenic concentrations during the late 1980s as high as 8 to 16 µg/L, which is similar in magnitude to the maximum arsenic peaks observed at the compliance monitoring wells in prior years corresponding to the first arrival of sustained 100% GWRS recharge events. More recent SAR arsenic concentrations generally range between 2 and 5 µg/L. Arsenic is known to adsorb onto naturally occurring alumina, iron, or manganese oxyhydroxides found on mineral surfaces within an alluvial aquifer matrix (Bowell, 1994).

The higher initial pH or lower ionic strength of GWRS water relative to surrounding groundwater has the potential to release this adsorbed arsenic by altering the surface charge of these mineral surfaces relative to their isoelectric point (Welch and Stollenwerk, 2003).

Repeated cycles of sustained 100% GWRS recharge arrival events have resulted in diminishing arsenic peaks with each subsequent sufficiently sustained event due primarily to arsenic mass removal from the aquifer matrix. Similarly, following each sustained 100% GWRS event, low arsenic concentrations due to the subsequent arrival of other recharge sources (SAR flows and imported water) have generally been below the pre-GWRS baseline arsenic concentrations due to arsenic mass removal during the prior sustained 100% GWRS events. For example, dissolved arsenic concentrations at AMD-10/1 (Figure 6-13) declined to a low point below the RDL of 1 µg/L (well below pre-GWRS baseline levels) for the first time in June 2016 after three successive GWRS water arrival cycles in 2010 to early 2011, 2013, and 2015 to early 2016. Dissolved arsenic concentrations at AMD-10/1 declined below the RDL in December 2017, down to the RDL in late

2018, and most recently below the RDL again from November 2020 to May 2021, all three occurring after GWRS water arrival cycles.

The decline in dissolved arsenic concentrations at AMD-10/1 to at or below the RDL in mid-2016, late-2017, late-2018, and late-2020/early-2021 likely coincided with the arrival of other recharge sources as indicated by the contemporaneous chloride increase in all four cases (Figure 6-13). The most recent event at AMD-10/1 from November 2020 to May 2021 had dissolved arsenic concentrations below the RDL for much longer (7 months) than the previous events which only had one quarterly sample below the RDL. Figure 6-13 shows that another non-GWRS event of other water arrived at AMD-10/1 during the second half of 2018 with high chloride concentrations of nearly 90 mg/L similar to the late-2020/early-2021 event but with low dissolved arsenic concentrations remaining at or just slightly above the RDL rather than below the RDL. Therefore, the dissolved arsenic concentrations remaining below the RDL during the late-2020/early-2021 other water event was likely due to additional arsenic mass removal since the 2018 event.

At AM-7/1, Figure 6-14 shows that dissolved arsenic concentrations also declined to a low point below the RDL (below pre-GWRS baseline levels) during December 2014 likely due to the arrival of other recharge sources having higher chloride concentrations following the sustained 100% GWRS event at this well during 2012. These other recharge sources typically have dissolved arsenic concentrations slightly higher than these low reported concentrations at or below the RDL, but due to arsenic desorption during the preceding GWRS sustained arrival events, arsenic in these other recharge sources is likely being adsorbed onto the aquifer matrix surfaces, only to be desorbed again (albeit at much lower peak concentrations) with subsequent GWRS arrival events.

At AM-7/1, dissolved arsenic concentrations peaked at just over 8 µg/L during mid-2016 and remained relatively high for the remainder of the year (Figure 6-14), consistent with the total arsenic trends at that well (Figure 6-10). The sustained dissolved arsenic peak was consistent with the contemporaneous low chloride concentrations at GWRS levels at this well, indicating a 100% GWRS recharge event sustained for approximately 8 to 9 months. As discussed above in relation to arsenic mass removal with each successive sustained 100% GWRS arrival event, the arsenic peak in 2016 was much lower in magnitude than the prior peak in 2012. Dissolved arsenic concentrations at AM-7/1 peaked again at 3.5 µg/L in mid-2019, consistent with a contemporaneous chloride concentration decrease but not down to GWRS levels, indicating the arrival of some percentage of GWRS water but much less than 100%. Therefore, the mid-2019 dissolved arsenic peak at AM-7/1 was much lower than the previous peak in 2016 likely because the 2019 GWRS arrival event was not sustained for long enough and never reached 100% GWRS water rather than being solely due to arsenic mass removal from the prior 2016 GWRS arrival event.

During 2021, dissolved arsenic concentrations remained low and relatively stable at AM-7/1 but had a minor increase from 1.1 µg/L in the first three quarters up to 1.7 µg/L in the fourth quarter, likely related to a relatively small chloride decrease late in the third quarter. This was likely caused by a minor percentage of GWRS water briefly arriving at this well but at much less than 100% and not sustained for long enough to cause a more significant increase in dissolved arsenic.

In the case of AMD-10/1 and AMD-12/1 (Figure 6-11 and Figure 6-12, respectively), both screened in the uppermost Principal aquifer, it is possible that the higher arsenic peaks in 2013 through early 2014 were not only the result of a longer sustained 100% GWRS recharge event, but also the result of first arrival of newly mobilized arsenic from aquifer sediments directly beneath Miraloma Basin once this basin was first put into operation in July 2012. Prior arsenic peaks at these two wells were likely due to GWRS arrival events from a flow path originating from Kraemer-Miller Basins. As previously discussed in Section 6.4.2, the long duration 100% GWRS recharge event that arrived at AMD-10/1 and AMD-12/1 in 2013 through early 2014 (Figure 6-5 and Figure 6-7, respectively) was likely due to the consistent GWRS recharge from new Miraloma Basin migrating directly down into the uppermost Principal aquifer before laterally migrating downgradient to these two wells because of hydraulic interference from concurrent Kraemer Basin recharge into the Shallow aquifer. In summary, the arsenic peaks in 2013 through early 2014 at both AMD-10/1 and AMD-12/1 likely represent the first arrival of 100% GWRS recharge from this newer and somewhat deeper flow path.

The smaller arsenic peaks that subsequently occurred in 2015, early 2016, 2017, 2018, and 2019 at both AMD-10/1 and AMD-12/1 (Figure 6-11 and Figure 6-12, respectively), as well as the subtle arsenic increases in early 2020 at AMD-10/1 and again in late 2021 at both AMD-10/1 and AMD-12/1, were significantly reduced from the prior 2013-2014 peaks. These arsenic peak reductions were likely not only due to arsenic mass removal from the prior sustained 100% GWRS water arrival event in 2013-14 but were also due to these GWRS arrival events not being sustained for a sufficiently long period for full arsenic desorption and/or never reaching 100% GWRS water.

At AMD-12/1, the arsenic peak of 7.9 µg/L in the third quarter of 2019 (Figure 6-12) was noticeably higher than the prior peaks during the 2015 to 2018 period at this well and was also slightly higher than the analogous peak of 5.9 µg/L in the second quarter of 2019 at AMD-10/1. Although the duration of the 2019 GWRS arrival event at both wells was much shorter than the 2013-14 event, it is likely that the slightly longer duration at AMD-12/1 based on low chloride concentrations for 3 to 5 months (Figure 6-7) as compared to two to three months at AMD-10/1 (Figure 6-5) led to the higher arsenic peak at AMD-12/1, despite its farther downgradient distance along the same flow path.

At AMD-10/1, the very subtle arsenic peak of 3.3 µg/L in early 2020 (Figure 6-11) was due to a brief near-100% GWRS arrival event based on the contemporaneous low chloride concentration of 8 mg/L at this well in February. Since this GWRS arrival event was not sufficiently sustained at

AMD-10/1, it was even weaker at AMD-12/1 farther downgradient as evidenced by chloride concentrations at AMD-12/1 decreasing much less than at AMD-10/1 and not getting down to near-GWRS levels; thus, arsenic concentrations at AMD-12/1 had just a nearly imperceptible increase at AMD-12/1 during 2020. Arsenic concentrations at AMD-10/1 increased slightly again during the second half of 2021 to 3.3 µg/L, the same concentration as the subtle peak in early 2020. The AMD-10/1 arsenic increase in the second half of 2021 was consistent with contemporaneously decreasing chloride concentrations at this well (Figure 6-13) which had just gotten down to GWRS levels by the end of the year and thus had not yet been sustained for a sufficient period, explaining the relatively small magnitude of the arsenic increase similar to 2020. At AMD-12/1, a similarly small increase in arsenic concentrations occurred in the second half of 2021 to 3.1 µg/L.

To limit arsenic mobilization, the operation of the AWPF post-treatment decarbonation and lime stabilization processes were modified during 2010-2015. Completion of the GWRS Initial Expansion post-treatment system upgrades in 2015 improved the ability to more closely control the FPW pH, targeting 8.5. During 2016-2020, there were no notable changes to post-treatment operations.

During 2021, the four polymer delivery skids at the AWPF were replaced in April and May to add polymer more efficiently to the clarifiers to settle out the lime solution. Also, the existing polymer storage tank was replaced with a larger one to accommodate GWRS Final Expansion flows. These new additions are not expected to affect the post-treatment operations or GWRS-FPW quality.

OCWD's supplemental metals monitoring will continue to evaluate the effects of any operational changes and the DDW, RWQCB, and NWRI GWRS Independent Advisory Panel will continue to be informed of any pertinent findings.

OCWD performed a laboratory study in 2012 with Stanford University aiming to identify the geochemical controls governing metals mobilization with GWRS purified recycled water as well as optimizing post-treatment operating parameters such as pH. Findings revealed the important role of divalent cations in controlling the mobilization of arsenic and that the magnitude of observed arsenic desorption is directly correlated to the concentrations of calcium and magnesium in GWRS water (Fakhreddine et al., 2015). Cation bridging within finer-grained portions of the aquifer is thought to be the mechanism controlling arsenic mobilization, along with pH-mediated sorption also playing a role.

6.4.4 Production Well

The closest downgradient potable production well is SCWC-PLJ2 (Figure 6-3) owned and operated by Golden State Water Company (formerly Southern California Water Company). As was shown previously on Figure 6-1, this well is located farther downgradient outside of the former primary three-month and new primary and secondary four-month buffer areas.

Other potable production wells are located outside the area influenced by the GWRS spreading operations at K-M-M-L Basins.

Table 6-3 summarizes 2021 water quality data at large system production well SCWC-PLJ2, which complied with all federal and state drinking water standards in 2021.

Well SCWC-PLJ2 is screened in the Principal aquifer and likely has never received 100% GWRS water as indicated by chloride concentrations in the well having never decreased to GWRS levels.

Historically, chloride concentrations in this well ranged from 80 to 100 mg/L prior to the commencement of GWRS recharge in Kraemer-Miller Basins in 2008 and then significantly decreased upon arrival of GWRS water from these basins in 2009 to nearly 20 mg/L. Since then, chloride concentrations at SCWC-PLJ2 have generally cycled within a range of 20 to 75 mg/L. Like the upgradient monitoring wells discussed previously, the proportion of GWRS water at this well fluctuates with recharge operations and supplies.

As shown in Table 6-3, there were no detections of arsenic at SCWC-PLJ2 during 2021; arsenic has not been detected at this well since 2014. Previously, arsenic concentrations at SCWC-PLJ2 were low since the inception of GWRS recharge at Kraemer-Miller Basins in 2008, ranging from below the RDL of 1 µg/L to a one-time maximum of 2 µg/L. During 2021, there were also no detections of either NDMA or 1,4-dioxane at SCWC-PLJ2 (Table 6-3).

Table 6-3. 2021 Water Quality for Potable Well Within the Influence of K-M-M-L Basins

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Recharge Site (ft)[2]	Concentration [3,4]								
				Arsenic (As), ug/L	Chloride (Cl) mg/L	Bromide (Br) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodimethylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Well												
SCWC-PLJ2	504	402 - 492	5,300	ND	57.5 (53.5 - 66.0)	0.04 (ND - 0.11)	317 (296 - 362)	1.31 (1.21 - 1.45)	0.001 (ND-0.003)	0.32 (0.27 - 0.42)	ND	ND

[1] Feet below ground surface

[2] Distance from purified recycled water spreading: Straight line shortest distance to eastern edge of Kraemer Basin, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit

7. MBI PROJECT OPERATIONS

The overall MBI Project was implemented in two parts: an initial DMBI Project and subsequent MBI Centennial Park Project (See Figure 1-1). Operation of these two project facilities is presented in this section:

- DMBI Project facilities and operations that began on April 15, 2015;
- MBI Centennial Park Project facilities and operations that began on March 18, 2020; and
- MBI Project total injection water source, volumes and flow rates.

The DMBI Project was intended to provide operational and groundwater quality data to support the engineering design and regulatory permitting of a multi-well injection project in the central portion of the Basin. The primary objective of the larger MBI Centennial Park Project is to directly replenish a heavily pumped region of the Principal aquifer with available purified recycled water from the existing GWRS AWPF and ultimately from the GWRSFE. The MBI Centennial Park Project also increases the recharge capacity of the Basin while preserving needed recharge capacity in the OCWD Forebay spreading grounds for available SAR and imported water flows. Together, the DMBI Project (injection well MBI-1) and MBI Centennial Park Project (injection wells MBI-2, MBI-3, MBI-4, and MBI-5) comprise the MBI Project. Figure 7-1 shows the location of the MBI Project.

7.1 MBI Project Components: DMBI Project and MBI Centennial Park Project

The DMBI Project consisted of a full-scale injection well (MBI-1) along with two nearby multi-depth nested compliance monitoring wells (SAR-10 and SAR-11), located approximately three miles north of the Talbert Barrier, along the GWRS Pipeline at the Santa Ana River and Edinger Avenue (Figure 1-8). All three wells were drilled between 2011 and 2012; MBI-1 operations began in April 2015 after well equipping and connection to the GWRS Pipeline, using 100% GWRS purified recycled water. Figure 7-2 shows a generalized well construction diagram representing MBI-1 and the four Centennial Park injection wells. The specific screened interval depths of MBI-1 and the four Centennial Park injection wells can be found in Table 7-1. MBI-1 is equipped with an electric vertical turbine pump and motor assembly dedicated for frequent backwashing of the well; other infrastructure at the DMBI site include pipelines and appurtenances for GWRS injection water supply and backwash discharge. All water produced during backwash pumping of MBI-1 is discharged directly to the SAR channel under RWQCB and County of Orange Flood Control permits. Injection well MBI-1 was operated as a demonstration well until the MBI Centennial Park wells came on-line in March 2020, at which time MBI-1 operation was integrated into the larger MBI Project with the new injection wells.

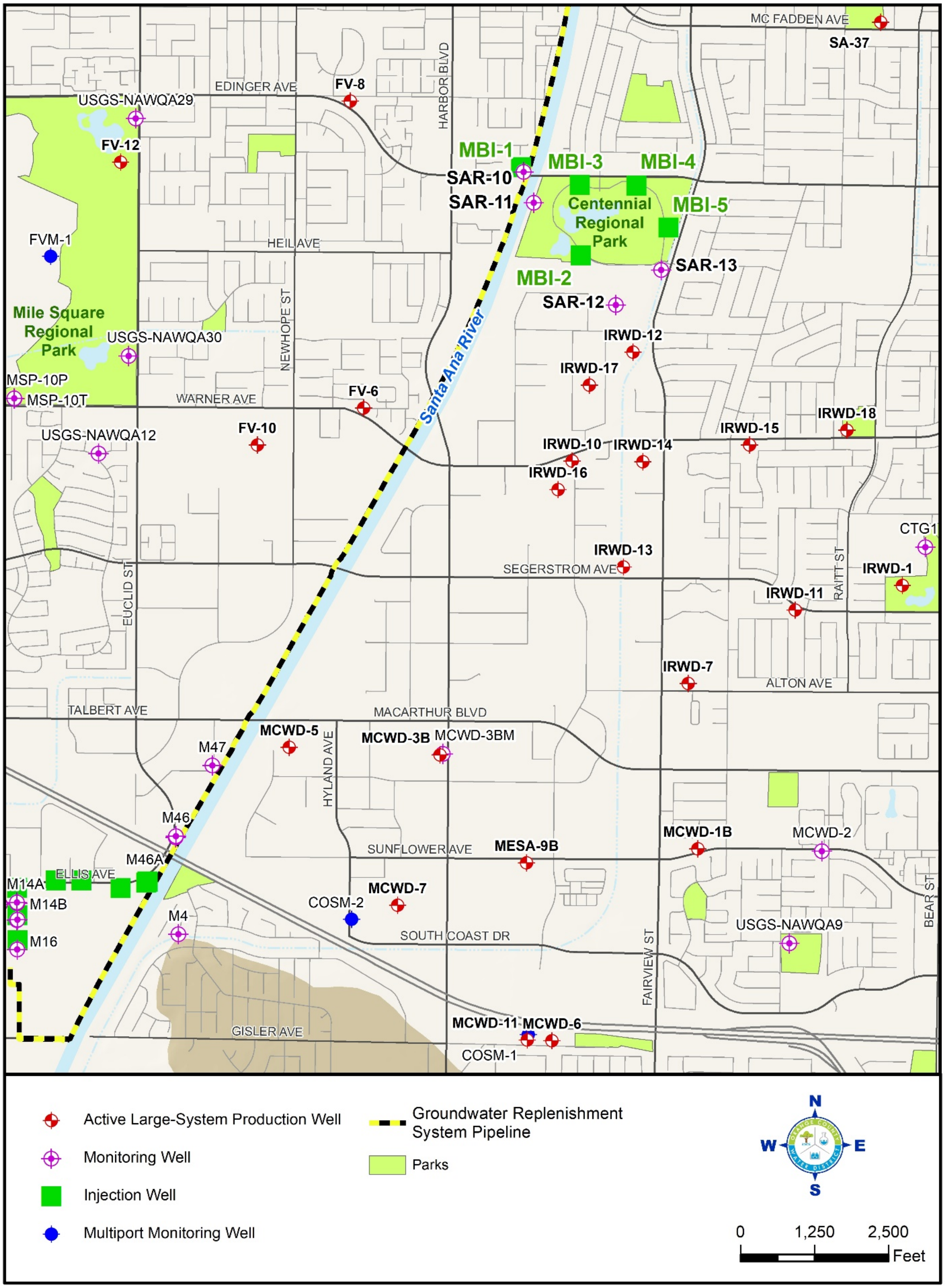
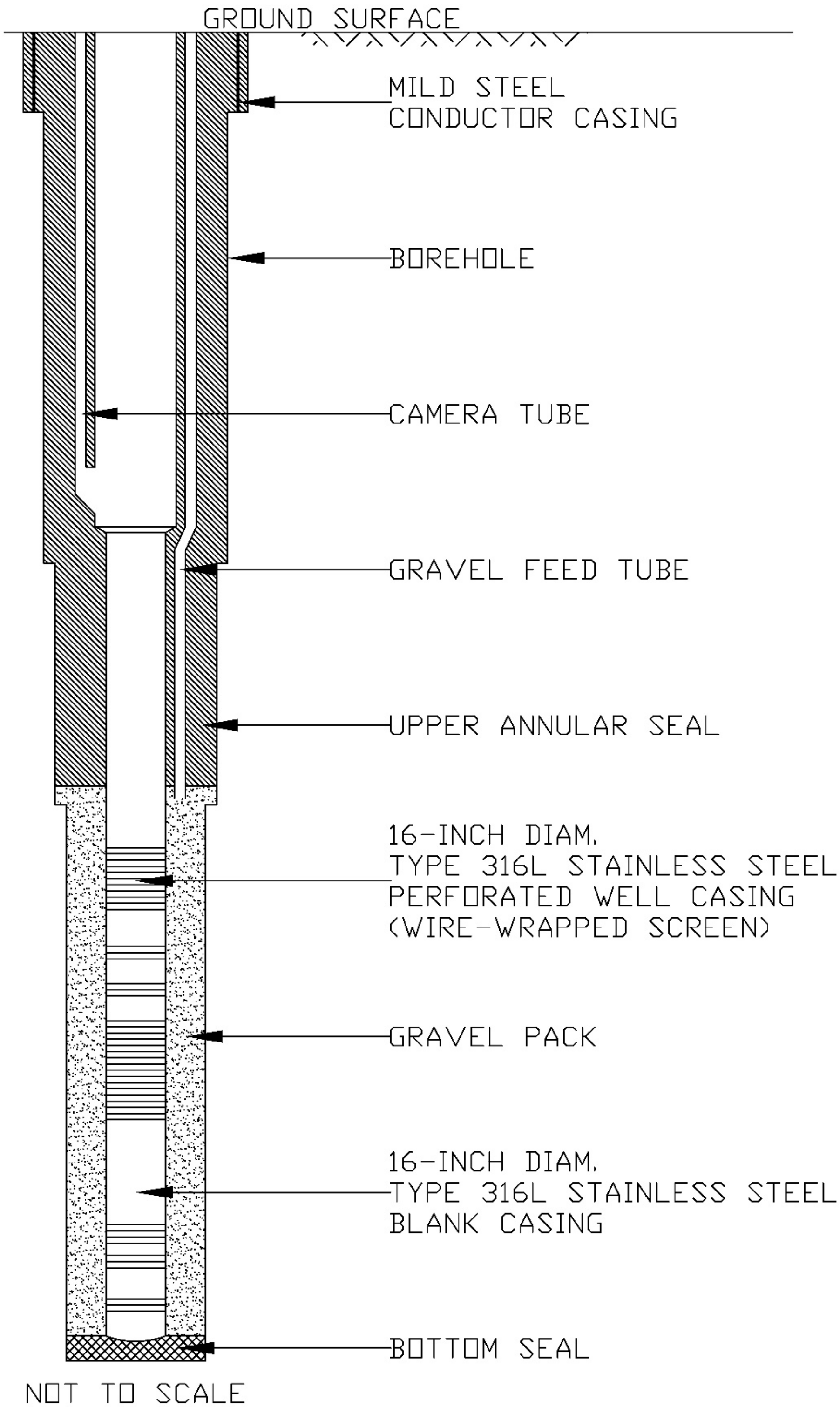


Figure 7-1. MBI Project Location Map



Note: Well construction details generalized to represent all MBI wells. For screened interval depths, refer to Table 7-1 and for specific as-built diagrams of each injection well, refer to 2020 GWRS Annual Report.

Figure 7-2. Generalized MBI Well Construction Diagram

Table 7-1. MBI Well Construction Summary

MBI-1		MBI-2		MBI-3		MBI-4		MBI-5		
Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Aquifer Unit
530-540 595-605	10 10	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	Upper Rho
660-710	50	645-675	30	655-680	25	650-675[1]	25	610-620[1] 630-665[1]	10 35	Lower Rho
----	----	695-720	25	715-735	20	702-722	20	680-715[1]	35	Upper Main
770-780	10	735-745	10	756-766	10	745-755	10	----	----	Main 1
800-830[2]	0	750-760 800-810	10 10	780-815	35	775-830	55	760-800[1]	40	Main 2
----	----	----	----	----	----	----	----	----	----	Main 3
970-980	10	920-930	10	945-965 975-985	20 10	930-940 955-975	10 20	915-935[1]	20	Main 4
990-1,000	10	980-995	15	1,005-1,015	10	----	----	----	----	Main 5
----	----	1,050-1,060	10	1,048-1,058	10	1,030-1,040	10	1,005-1,030[1]	25	Main 6
1,100-1,120	20	1,070-1,085	15	1,095-1,115	20	1,074-1,089	15	1,045-1,060[1]	15	Main 7
1,175-1,190	15	----	----	----	----	----	----	----	----	Main 8
Total:	135		135		160		165		180	

[1] Screened interval depths listed here are based on post-construction downhole video survery and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

[2] The screened interval from 800-830 ft bgs at MBI-1 was swaged off with a liner due to sand production during test pumping.

The MBI Centennial Park Project is located on the east side of the Santa Ana River and south of Edinger Avenue, just to the southeast of MBI-1 in the City of Santa Ana (see Figure 7-1). In late 2018, OCWD completed drilling and construction of four injection wells, designated as MBI-2, MBI-3, MBI-4, and MBI-5, that are strategically located to help raise depressed groundwater levels in the Principal aquifer. Figure 7-3 shows a photo of an MBI Centennial Park injection well. After completing construction of the wellhead facilities, appurtenances, and associated pipelines within Centennial Park and after extensive startup testing and commissioning, OCWD placed the four MBI wells in Centennial Park on-line on March 18, 2020 along with continued operation of MBI-1, thus beginning the operational stage of the five-well MBI Project. The concurrent operation of all five wells also marks the commencement of the full-scale intrinsic tracer test, as required by state regulations (CCR, 2018) and discussed further in Section 8.

The Centennial Park injection wells were constructed similarly to MBI-1 (Figure 7-2), but without the uppermost two screens and the lowermost screen (Table 7-1). However, additional screened footage was added to the other intervening depth interval to the extent practicable based on the local geology encountered during drilling, such that the total screened footage for each of the four new injection wells is either the same or greater than MBI-1.

Figure 7-3. MBI Centennial Park Injection Well

Two new nested monitoring wells, designated as SAR-12 and SAR-13, were constructed in December and October of 2017, respectively, as part of the MBI Centennial Park Project. These two monitoring wells are strategically located downgradient to the south of Centennial Park to comply with requirements (RWQCB, 2019) to track the injected GWRS water as it migrates toward the nearest downgradient drinking water production wells IRWD-12 and IRWD-17 (Figure 7-1). Monitoring wells SAR-12 and SAR-13 serve as compliance wells for the entire MBI Project (all five MBI wells). Groundwater level and quality data at all four MBI Project monitoring wells are presented in Section 8

7.2 MBI Project Injection Water Source, Volumes and Flow Rates

Purified recycled water produced by the GWRS AWPF and delivered via the GWRS Pipeline was the only source of water injected at the five MBI wells (MBI-1 through MBI-5) during 2021. No other water sources are available at the MBI well sites. Blending with other sources is not required (RWQCB, 2019). Therefore, when the AWPF or the GWRS Pipeline are off-line, the MBI wells are also off-line.

A total volume of approximately 2,889 MG (8,866 AF) of purified recycled water was injected at the MBI Project wells during 2021. A minor volume of approximately 18.3 MG (56 AF) was pumped from the MBI wells during 2021 during the regularly occurring backwash events throughout the year to remove any build-up of particulate matter in the wells and thereby maintain the injection capacity. The total backwash volume during 2021 represented only 0.6% of total MBI injection. Monthly quantities of GWRS purified recycled water injected and backwash pumped at the MBI Project are summarized in Table 7-2 and illustrated on Figure 7-4.

As shown in Table 7-2, the average daily injection rate for the MBI Project during 2021 was 7.92 MGD and ranged from 3.23 MGD in August to 9.66 MGD in October. The MBI Project injection volumes and average daily injection rates were less in August and September because the MBI wells were off-line from August 13 through September 13 related to a planned AWPF shutdown.

Table 7-2 shows a total MBI backwash volume of 18.26 MG (56.02 AF) in 2021, more than double the 8.54 MG (26.22 AF) backwashed the prior year. The greater backwash volume during 2021 is attributed to an increase in backwash frequency at MBI-1 from bi-weekly to weekly as well as the four MBI Centennial Park wells being on-line for the entire year, whereas in 2020 the four MBI Centennial Park wells (MBI-2 through MBI-5) were not placed on-line until mid-March. During both 2020 and 2021, the four MBI Centennial Park wells were backwashed approximately monthly.

As shown on Figure 7-4, the 2021 total monthly injection volumes were distributed somewhat evenly among the five MBI Project wells for the first six months of the year, with MBI-2 and MBI-5 receiving slightly more injection than the others. During the second half of 2021, MBI-5 and to

Table 7-2. 2021 Monthly Injection and Backwash Quantities at MBI Project

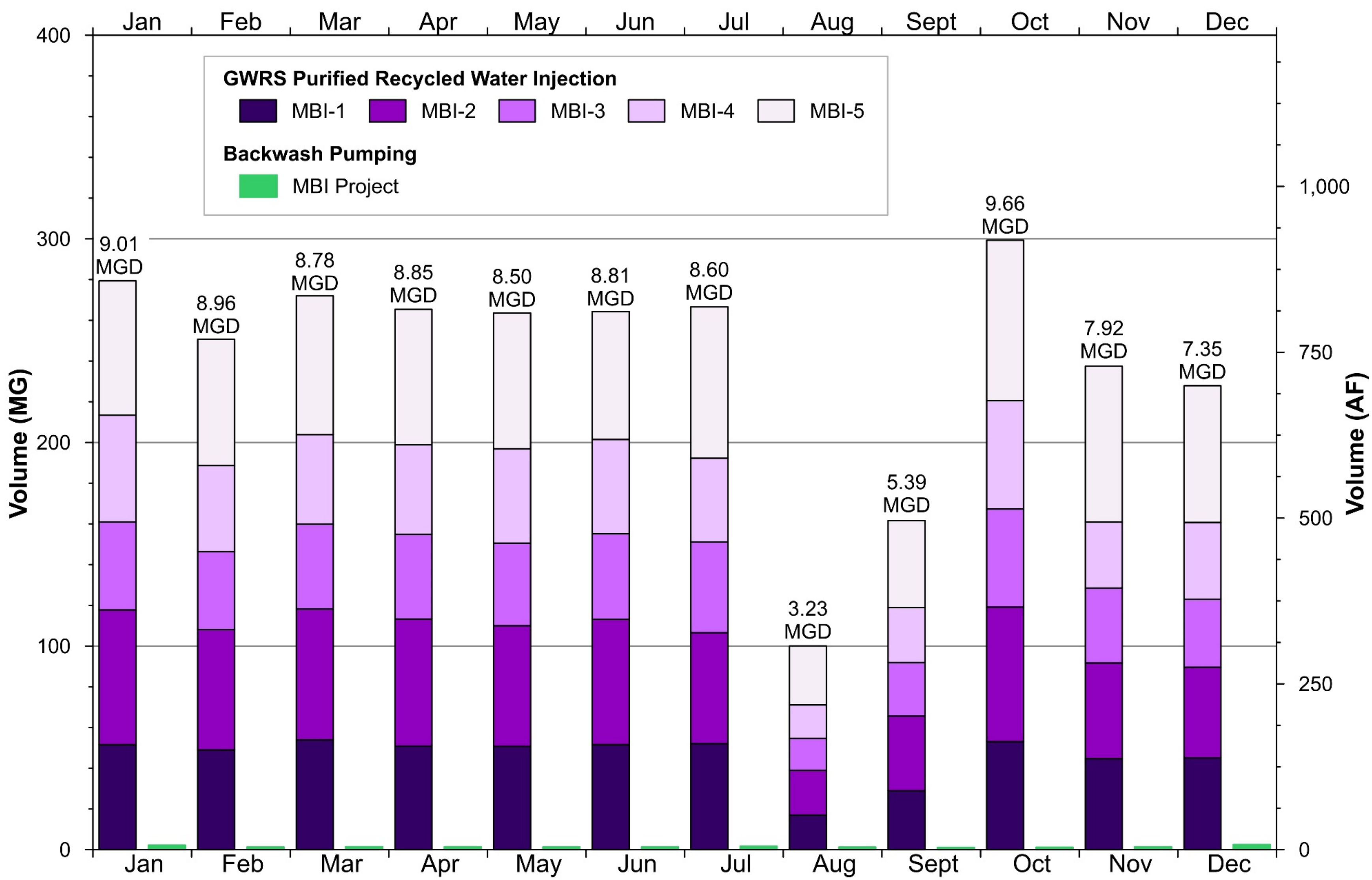
Month	Total MBI GWRS FPW Injection[1]			Total MBI Backwash Pumping[1]	
	(Avg. MGD)	(MG)	(AF)	(MG)	(AF)
January	9.01	279.45	857.61	2.25	6.89
February	8.96	250.78	769.61	1.28	3.93
March	8.78	272.09	835.01	1.48	4.53
April	8.85	265.47	814.71	1.44	4.42
May	8.50	263.64	809.08	1.36	4.17
June	8.81	264.35	811.25	1.36	4.18
July	8.60	266.69	818.45	1.69	5.18
August[2]	3.23	100.18	307.45	1.24	3.81
September[2]	5.39	161.62	496.00	1.11	3.42
October	9.66	299.41	918.86	1.16	3.56
November	7.92	237.54	728.97	1.39	4.26
December	7.35	227.92	699.46	2.49	7.65
Totals	**7.92**	**2,889.15**	**8,866.46**	**18.26**	**56.02**

[1] All MBI wells (MBI-1, MBI-2, MBI-3, MBI-4, and MBI-5). Average daily injection rates are based on the total number of days in each month. Refer to Table 7-3 for on-line daily average injection rates.

[2] Injection volume was limited by the planned AWPF shutdown, August 15 - September 2.

a lesser degree MBI-2 received an increased proportion of injection, with the monthly injection volume at MBI-5 nearly equaling (and in November overcoming) the combined monthly injection volumes at MBI-3 and MBI-4. Figure 7-4 shows that the MBI Project injection volumes and average daily injection rates were less in August and September because the MBI wells were off-line from August 13 through September 13. This off-line period was due initially to an AWPF shutdown for GWRSFE construction and GWRS Pipeline inspection then upon restart of the AWPF on September 2, the operational decision was made to keep the MBI wells off-line for an additional 11 days while the Talbert Barrier and Forebay recharge basins received GWRS flow. The purpose of the extended off-line period was to allow any accumulated particulate matter within the GWRS pipeline that could be carried by the higher velocity during startup to bypass the MBI Project wells and exit the GWRS pipeline at the Forebay recharge basins, thus preventing any additional clogging of the wells.

During 2021, Figure 7-4 also shows that the average injection rate was relatively high and stable from January through July, ranging from approximately 8.5 to 9 MGD, and reached a high of 9.66 in October following start-up after the one-month MBI shutdown. As previously mentioned, it is common to see injection rates and yields increase immediately following a prolonged shutdown



Note: Average injection flow rates shown in MGD. August injection volume was limited by the planned AWPF shutdown, August 15 - September 2.

Figure 7-4. 2021 Monthly Injection and Backwash Quantities at MBI Project

as it takes time for the injection mound and any air entrainment to build up. In November and December, the average injection rates were noticeably lower than the first half of the year, likely due primarily to well clogging as groundwater levels were lower as compared to the earlier part of the year when higher injection rates could be maintained.

7.3 MBI Project Injection Rates and Yields

Figures 7-5a and 7-5b show MBI Project injection rates during 2020-2021. Injection operations were continuous throughout 2021 except for the following interruptions: (1) AWPF shutdown on January 12 for GWRSFE UV train commissioning, (2) unplanned shutdown of MBI-1 only on April 12 due to local power interruption, (3) AWPF shutdown on May 19 for GWRSFE construction activities, (4) AWPF shutdown from August 15 through September 2 related to GWRS Pipeline inspection and GWRSFE construction activities and then off-line an additional two weeks from September 2 through September 13 to avoid potential clogging upon AWPF startup and to increase injection yields as described above in Section 7.2, (5) unplanned AWPF shutdown on October 10 due to power interruption, and (6) AWPF shutdown on December 9 for GWRSFE construction activities. Each of the above shutdowns were one day or less except for the 32-day planned shutdown in August and September and the approximate 36-hour planned shutdown in December.

OCWD Operations staff continuously monitors operational data from the MBI Project injection wells to target optimal and sustainable operating conditions throughout the year. The approximate target injection rates during 2021 were as follows:

- MBI-1: 1,215 gpm (1.75 MGD) all year;
- MBI-2: Initially 1,565 gpm (2.25 MGD), then reduced to 1,215 gpm (1.75 MGD);
- MBI-3: 1,215 gpm (1.75 MGD) all year;
- MBI-4: Initially 1,215 gpm (1.75 MGD), then increased to 1,565 gpm (2.25 MGD); and
- MBI-5: Initially 1,565 gpm (2.25 MGD), then increased to 1,910 gpm (2.75 MGD).

To avoid irreversible injection well fouling and otherwise avoid elevated operating pressures, if the measured injection level within an MBI well casing rises to higher than 10 feet bgs, the injection rate is automatically reduced through adjustments to the downhole flow control valve. The target backwash frequency during 2021 was weekly at MBI-1 and monthly at MBI-2, MBI-3, MBI-4, and MBI-5.

Figures 7-5a and 7-5b show that in early 2021 all five MBI wells were operating steadily near initial target rates. Subsequently, at different times during the year injection rates at each well began to decrease intermittently and then fluctuated significantly below their initial target levels. The trend of variable and diminished injection rates during 2021 was caused by injection levels within each MBI well rising to the operational threshold of 10 feet bgs, at which point the automated down-hole flow control valves scaled back the injection rate to maintain the 10 ft bgs injection level until a backwash is done. The automated reduction in injection rates began in April at MBI-1, in March at MBI-2, in January at MBI-3, in February at MBI-4, and in November at MBI-5. The rise in injection levels to the operational threshold within each MBI well at various times during 2021 was likely due to well clogging, as regional groundwater levels at the MBI monitoring wells were generally lower in 2021 than during the same months in 2020.

The average daily injection at MBI-1 during 2021 was 1,044 gpm (1.50 MGD), representing a decrease of 7% relative to the prior year. However, if only days when MBI-1 was injecting are considered, the average daily injection at MBI-1 during 2021 was 1,144 gpm (1.65 MGD), representing a decrease of 5% relative to the prior year. This can be compared to the historically high injection rates in 2019 of approximately 1,770 gpm (2.5 MGD) during injection capacity testing after relining of the Unit 1 GWRS Pipeline. As shown on Figure 7-5a, injection at MBI-1 was stable at or near the initial target rate of 1,215 gpm for the first three months of the year, then became reduced and variable (prior to backwash events) due to automated injection reductions beginning in April, declining to an annual low of 511 gpm (0.74 MGD) on November17. Despite the intermittently high injection levels within MBI-1 and subsequent automated injection rate reductions, the target injection rate was maintained at 1,215 gpm (1.75 MGD) throughout the year at MBI-1.

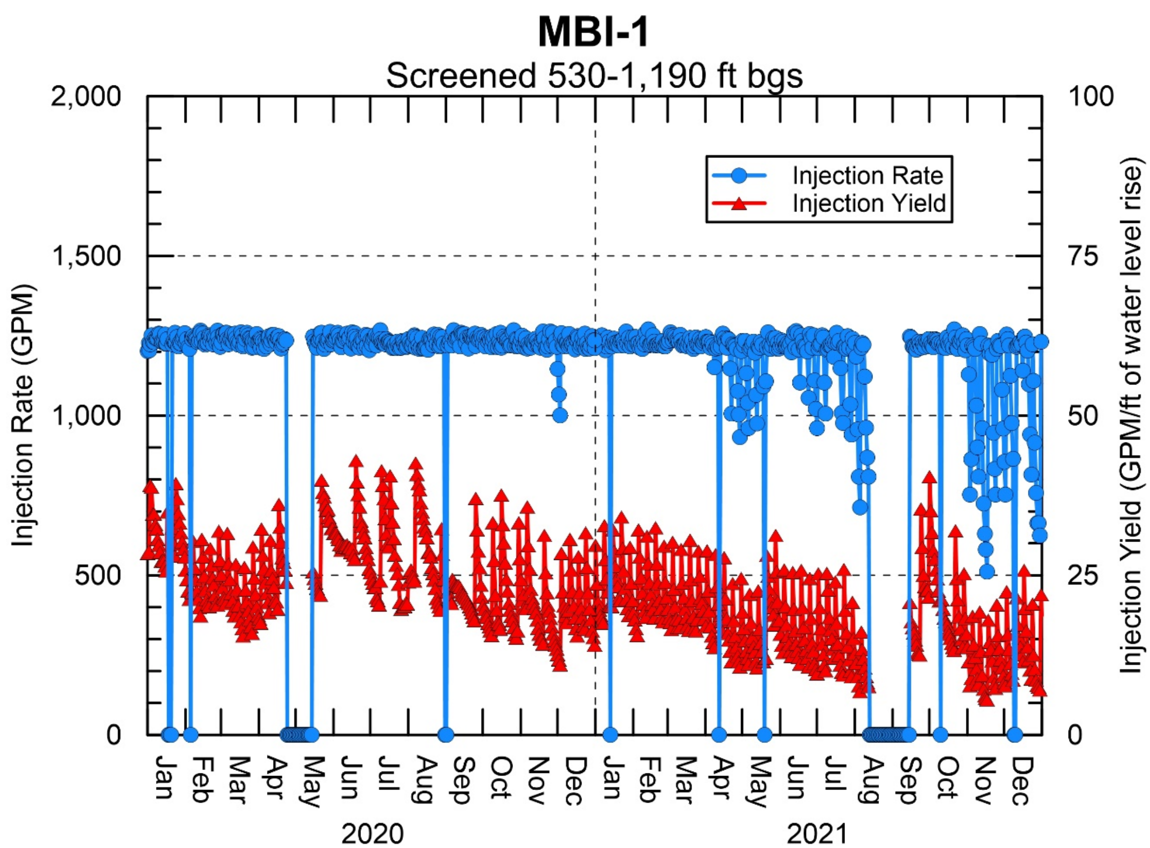


Figure 7-5a. 2020-2021 MBI-1 Injection Performance

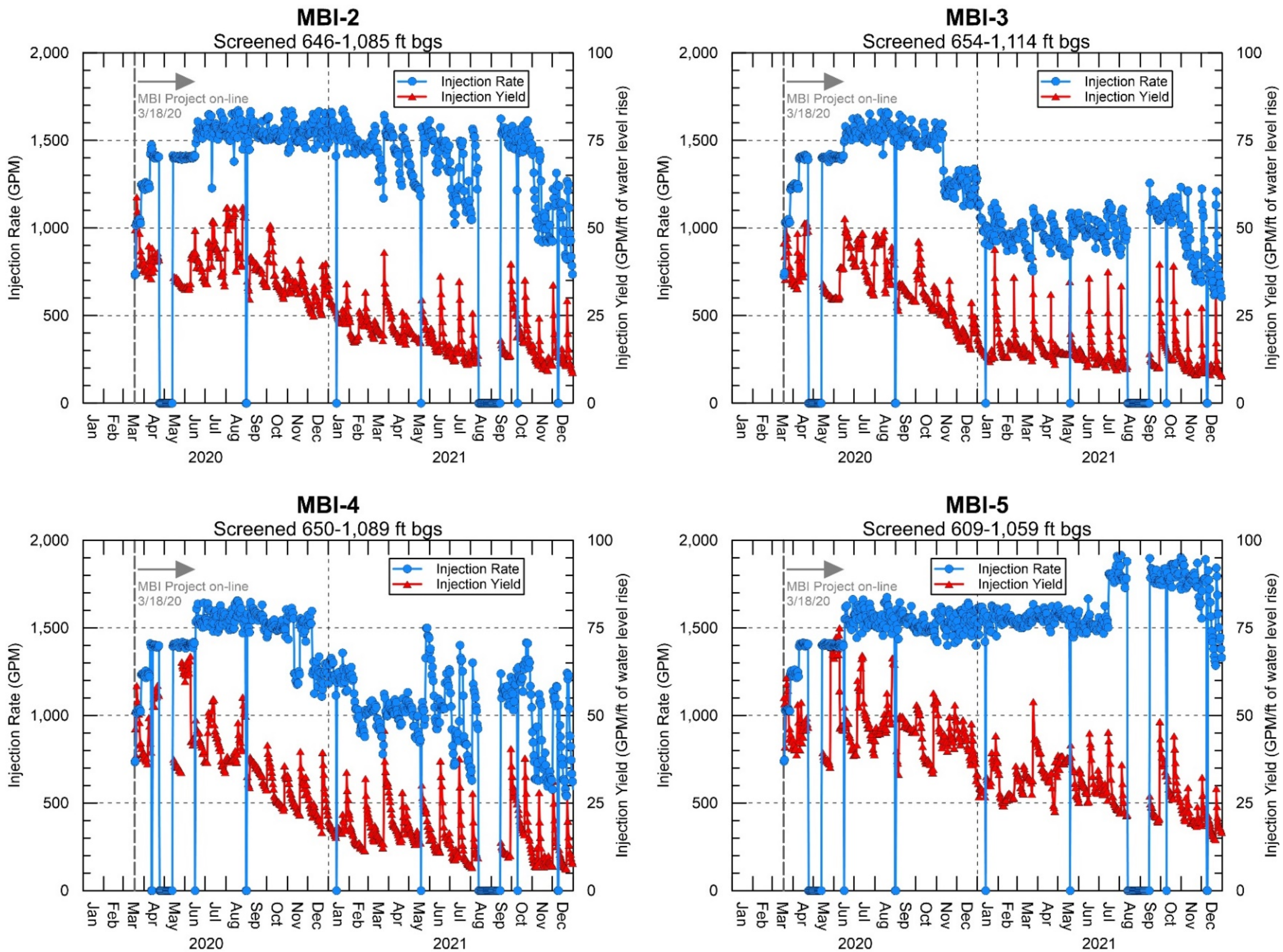


Figure 7-5b. 2020-2021 MBI Centennial Park Injection Performance

The average daily injection at MBI-2 during 2021 was 1,225 gpm (1.76 MGD), representing a decrease of 9% relative to the on-line portion (beginning March 18) of the prior year. If only days when MBI-2 was injecting are considered, the average daily injection at MBI-2 during 2021 was 1,343 gpm (1.93 MGD), representing a decrease of 8% relative to the prior year. As shown on Figure 7-5b, automated reduction of injection rates began in March and continued frequently prior to each backwash event into November, at which point the target injection rate was reduced to 1,215 gpm (1.75 MGD) for the last two months of the year. Even at the reduced target injection rate, the automated reduction of injection rates continued due to high injection levels at MBI-2 prior to backwashing. MBI-2 injection rates subsequently declined to an annual low of 625 gpm (0.90 MGD) on December 30.

The average daily injection at MBI-3 during 2021 was 861 gpm (1.24 MGD), representing a significant decrease of 33% relative to the on-line portion (beginning March 18) of the prior year. If only days when MBI-3 was injecting are considered, the average daily injection at MBI-3 during 2021 was 944 gpm (1.36 MGD), representing a decrease of 32% relative to the prior year. As shown on Figure 7-5b, the injection rates at MBI-3 were subject to only minor automated reductions from early January until early November. The relatively stable injection rates during that time were attributed to the lower target injection rate of 1,215 gpm (1.75 MGD) during 2021, as compared to the target rate of 1,565 gpm (2.25 MGD) during the prior year. Nonetheless, automated injection rate reductions at MBI-3 intensified from early November through the rest of the year and the injection rate reached an annual low of 606 gpm (0.87 MGD) on December 31.

The average daily injection at MBI-4 was 919 gpm (1.32 MGD), representing a significant decrease of 29% relative to the on-line portion (beginning March 18) of the prior year. If only days when MBI-4 was injecting are considered, the average daily injection at MBI-4 during 2021 was 1,008 gpm (1.45 MGD), representing a decrease of 28% relative to the prior year. As shown on Figure 7-5b, the injection rates at MBI-4 were subject to only minor automated reductions from mid-February through late May while the target injection rate was maintained at 1,215 gpm (1.75 MGD). In late May, the MBI-4 target injection rate was increased to 1,565 gpm (2.25 MGD) for the remainder of the year. Automated injection rate reductions increased significantly with the higher target injection rate, declining to an annual low of 540 gpm (0.78 MGD) on December 22.

The average daily injection at MBI-5 was 1,448 gpm (2.09 MGD), representing an increase of 8% relative to the on-line portion (beginning March 18) of the prior year. If only days when MBI-5 was injecting are considered, the average daily injection at MBI-5 during 2021 was 1,587 gpm (2.29 MGD), representing an increase of 10% relative to the prior year. Figure 7-5b shows that MBI-5 injection was relatively stable at the target rate of 1,565 gpm (2.25 MGD) from the beginning of the year until mid-July. In mid-July, the MBI-5 target injection rate was increased to a historical maximum of 1,910 gpm (2.75 MGD). Injection rates initially remained stable near this higher target then began automatically declining during the last two months of the year and declined to an annual low of 1,285 gpm (1.85 MGD) on December 22.

The average daily injection total of the five MBI wells during 2021 was 5,498 gpm (7.92 MGD), representing a 14% (1.3 MGD) decrease relative to the on-line portion (beginning January 1 for MBI-1 and March 18 for MBI-2, MBI-3, MBI-4, and MBI-5) of the prior year. A small portion of the decrease was due to ten additional days off-line during 2021 (33 days off-line compared to 23 days in 2020), but the main reason for the decrease in the average daily injection total was the automated flow control valve reduction of injection rates in response to elevated injection levels within each well casing frequently reaching the maximum threshold of 10 ft bgs, especially at MBI-3 and MBI-4. If only days when MBI wells were injecting are considered, the average daily injection total of the five MBI wells during 2021 was 5,876 gpm (8.45 MGD), representing a decrease of 15% relative to the prior year. Table 7-3 summarizes the average daily injection during both 2020 and 2021 for each of the five wells, showing that MBI-5 had the highest daily average injection in 2021, while MBI-3 had the lowest. During 2021, MBI-5 had higher average injection than the prior year, while MBI-3 had the largest decrease from the prior year. Both MBI-3 and MBI-5 were constructed with glass beads instead of the natural gravel pack used at MBI-2 and MBI-4. Therefore, it is difficult to discern any beneficial or detrimental effect of the glass beads on injection rates. Rather, the relative performance of the MBI wells appears to be more related to the grain size distribution of the aquifers screened at each well site.

Table 7-3. 2021 and 2020 MBI Project Average Daily Injection Rates

Average Daily Injection Rates	MBI-1		MBI-2		MBI-3		MBI-4		MBI-5	
	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days	All Days	On-line Days
2021 Average (gpm)	1,044	1,144	1,225	1,343	861	944	919	1,008	1,448	1,587
2020 Average (gpm)	1,123	1,198	1,353	1,454	1,291	1,388	1,299	1,407	1,341	1,446
2021-2020 Change (gpm)	-79	-54	-128	-111	-430	-444	-380	-399	107	141
2021-2020 Change (%)	-7	-5	-9	-8	-33	-32	-29	-28	8	10

Figures 7-5a and 7-5b also show the variation of injection yield at the MBI Project injection wells during 2021. The injection yield is defined as the injection flow rate in gpm per foot of groundwater level rise from static conditions within the injection well and is comparable to the specific capacity for a production well. The repeating cyclical trend in the injection yield at each well was due to the recurring backwash events. Injection at the MBI Project wells resumed 30 minutes after each backwash to first allow groundwater levels to recover back to near-static conditions so that the injection yield could be accurately calculated for the next cycle. The first injection yield value following a backwash event is typically recorded one day after injection is resumed, allowing the injection mound to stabilize.

As expected, the injection yield was always highest immediately following a backwash, then quickly declining thereafter. For a given water source with stable water quality, the rate of injection yield decline is typically proportional to the injection rate; the higher the injection rate, the more frequently backwashing is required. In 2021, the backwash frequency at the MBI wells was based on the cumulative volume of water injected between backwashes since this volume dictates the amount of particulate matter that entered the well over the interval.

Figures 7-5a and 7-5b show that the injection yields at all five MBI wells decreased from January until the AWPF shutdown August 13. After MBI operations resumed on September 14, injection yields temporarily increased, indicating once again that extended shutdowns do temporarily increase injection yields. However, this increase was short-lived; after the first two backwash cycles, the injection yields subsequently decreased for the remainder of 2021, reaching historical lows in November and December.

During 2021, the injection yields at MBI-1 ranged from 6 to 40 gpm/ft, with a daily average of 18 gpm/ft. The average injection yields were 19 gpm/ft at MBI-2, 15 gpm/ft at MBI-3, 16 gpm/ft at MBI-4, and 29 gpm/ft at MBI-5. Table 7-4 shows a comparison of MBI injection yields during 2021 and 2020. Injection yields at all five MBI wells have decreased significantly relative to the prior year, particularly at MBI-2, MBI-3, and MBI-4, where injection yields have decreased by over 50%.

Table 7-4. 2021 and 2020 MBI Project Average Injection Yields

Average Injection Yield	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
2021 Average (gpm/ft)	18	19	15	16	29
2020 Average (gpm/ft)	25	39	34	37	47
2021-2020 Change (gpm/ft)	-7	-20	-19	-21	-18
2021-2020 Change (%)	-28	-51	-56	-57	-38

7.4 MBI Project Backwash Pumping Rates and Yields

During 2021, MBI-1 was backwashed 45 times and MBI-2, MBI-3, MBI-4, and MBI-5 were each backwashed 13 times. The duration of each backwash event was determined by the rate of sand production, with pumping continuing until the sand content decreased to a target of approximately 1 PPM. The duration of backwash events at the MBI wells during 2021 ranged from 25 to 105 minutes and averaged approximately 40 minutes.

The pumping rate for each backwash event during 2021 is shown on Figure 7-6. Throughout the year, the backwash process was operated remotely with a target pumping rate set at 3,500 gpm at MBI-1, MBI-2, MBI-4, and MBI-5. At MBI-3, where greater backwash pumping rates have been found to produce large quantities of fine sand from the aquifer formation, the backwash target pumping rate was set at 1,500 gpm throughout the year. The lower target pumping rate at MBI-3 during 2021 was based on the results of a dynamic video survey performed in January 2021 for the purpose of determining the optimum backwash pumping rate with minimal sand production. Unfortunately, the dynamic video survey was unable to determine which zone or zones were contributing to the sand production at MBI-3. The average pumping rate of all backwash events during 2021 was very stable throughout the year, only showing minor decreases at MBI-3 and MBI-5 during the last two months of the year and in one case in January at MBI-3, when the well was backwashed at 2,500 gpm during the dynamic video survey. The stability of the pumping rate was due to the backwash process, and the very minor variations in magnitude were likely due to variations in regional groundwater levels.

Figure 7-6 also shows the backwash pumping yield or specific capacity for all MBI Project backwash events during 2021. The pumping levels used to determine the pumping yields were measured at the end of each backwash event. Figure 7-6 shows that the highest pumping yields of the year for all MBI wells were measured during the first two backwash events following the August 13 shutdown. During 2021, the pumping yield at MBI-1 decreased slightly throughout the year from a stable 45 gpm/ft in January and February and eventually down to 37 gpm/ft in December, averaging 42 gpm/ft for the year, which was only 1 gpm/ft less than the prior year. As shown on Figure 7-6, during 2021 the pumping yields of the other four MBI wells in Centennial Park were slightly lower in the winter months relative to the summer months but overall did not decrease throughout the year.

A comparison of the average backwash pumping yields of the MBI wells during 2020 and 2021 is shown in Table 7-5. Similar to the injection yields described in Section 7.3, the average MBI pumping yields during 2021 were substantially lower than the prior year with the most significant losses at MBI-2, MBI-3, and MBI-4, all of which decreased over 15%.

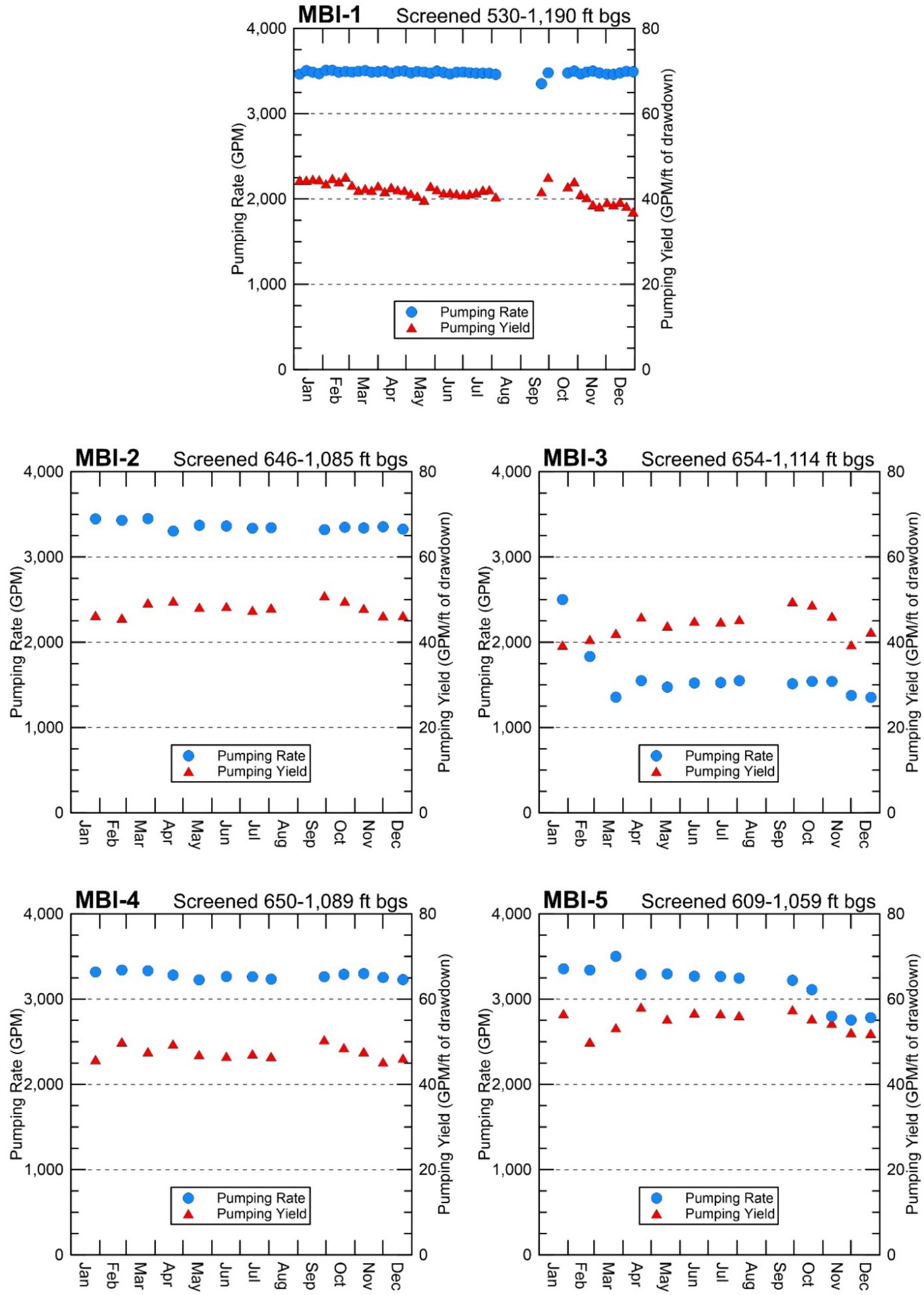


Figure 7-6. 2021 MBI Project Backwash Pumping Performance

Table 7-5. 2021 and 2020 MBI Project Average Backwash Pumping Yields

Average Pumping Yield	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
2021 Average (gpm/ft)	42	48	44	48	55
2020 Average (gpm/ft)	43	57	55	58	64
2021-2020 Change (gpm/ft)	-1	-9	-11	-10	-9
2021-2020 Change (%)	-2	-16	-20	-17	-14

The required backwash frequency provides a gauge of injection well performance. For a given injection rate, the longer the time required between backwashes, the better the injection performance (i.e., the slower the rate of clogging). Based on early operational data prior to relining of the Unit 1 GWRS Pipeline, backwash pumping at approximately three times per week was required for MBI-1 to achieve and maintain its design injection rate of 2 MGD (1,400 gpm). From 2016 to August 2018, slightly lower injection rates averaging 1.5 MGD (1,000 gpm) had resulted in a more acceptable weekly backwash frequency. Post-rehabilitation of the Unit 1 GWRS Pipeline, MBI-1 operational data in 2018 and 2019 indicated a higher sustainable injection rate of 1.7 to 2 MGD with a backwash frequency of one week, which is still more frequent than required by the modern injection wells at the Talbert Barrier (4-8 weeks). Potential reasons for the faster rate of injection yield decline and thus more frequent backwashes at MBI-1 include the following:

- Differences in local geology at the MBI-1 site versus the Talbert Barrier;
- Higher sustained injection rate; and
- Previously accumulated particulate matter from erosion of the GWRS Pipeline mortar lining prior to relining.

Inspection of MBI-1 geologic drill cuttings revealed an absence of coarse-grained sediments and rare medium-grained sediments, with fine-grained sediments making up the majority of those encountered. The predominance of finer sediments indicates a less permeable aquifer and reduced injection capacity. The fine-grained sediments also tend to physically clog faster than coarse-grained sediments if any particulates are present in the injection water.

The four MBI wells in Centennial Park have been backwashed monthly since they came on-line in mid-March 2020. Based on the decline in injection yields observed at each of the four wells during 2021, the frequency of backwash events may be increased during 2022. MBI-3 may be especially targeted for increased backwash frequency to mitigate the loss of injection capacity caused by the reduced backwash pumping rate at this well.

As was discussed in Section 3.4, the GWRS purified recycled water has been shown to cause some erosion (breakdown or shedding) of the inner lining of certain reaches of the Talbert Barrier pipeline as well as the interior cement mortar lining of the large 13-mile GWRS Pipeline to the Forebay, which also supplies the MBI wells. As such, Unit 1 of the GWRS Pipeline (from the AWPF product water pump station to the MBI-1 turnout) was rehabilitated during the summer of 2018 by epoxy coating the interior mortar lining to reduce the particulate loading to MBI-1 and eventually to the four MBI wells in Centennial Park which came on-line in March 2020.

8. GROUNDWATER MONITORING AT THE MBI PROJECT

OCWD has maintained a comprehensive groundwater monitoring program throughout the Basin for decades, testing ambient groundwater for various organic, inorganic, and microbiological constituents at OCWD monitoring wells and potable drinking water wells.

In the MBI Project area, OCWD began groundwater monitoring activities in 2012 to acquire background data prior to injecting GWRS purified recycled water at DMBI Project well MBI-1, which began on April 15, 2015.

Nested monitoring wells SAR-10 and SAR-11 were constructed during late 2011 and 2012 for the DMBI Project and are located approximately 80 and 650 feet, respectively, downgradient from injection well MBI-1 as shown in Figure 8-1. The DMBI Project site is located approximately 3 miles north of the Talbert Barrier, along the GWRS Pipeline at the Santa Ana River and Edinger Avenue in the city of Santa Ana.

Nested monitoring wells SAR-12 and SAR-13 were constructed during late 2017 approximately one-half mile southeast and downgradient of SAR-10 and SAR-11 (Figure 8-1) as part of the MBI Centennial Park Project. As discussed in Section 7, these two wells were strategically located downgradient of MBI-1 and the four newer MBI wells in Centennial Park, along the flow path towards the nearest drinking water wells IRWD-12 and IRWD-17. SAR-12 and SAR-13 serve as the two required downgradient monitoring wells (CCR, 2018; RWQCB, 2019) for the combined five injection well MBI Project which went on-line March 18, 2020. Data from all four monitoring wells (SAR-10, SAR-11, SAR-12, and SAR-13) are included in this section.

Commencement of GWRS purified recycled water injection at MBI-2, MBI-3, MBI-4, and MBI-5 on March 18, 2020, along with continued injection of GWRS water at MBI-1, marks the start of the full-scale intrinsic tracer test to comply with requirements (RWQCB, 2019) to track the injected GWRS water signal as it migrates to SAR-12 and SAR-13 and farther downgradient to drinking water production wells IRWD-12 and IRWD-17. For purposes of the intrinsic tracer test, all five MBI wells were placed fully on-line on the same day and were operated at relatively high and stable injection rates to the extent possible for the remainder of 2020, except for a three-week off-line period from April 24 to May 13 related to a planned AWPF shutdown for GWRSFE construction activities and GWRS Pipeline inspection.

This section presents the following for calendar year 2021:

- Aquifers in the MBI Project area;
- Overview of groundwater monitoring program;
- Groundwater elevations and directions of flow;

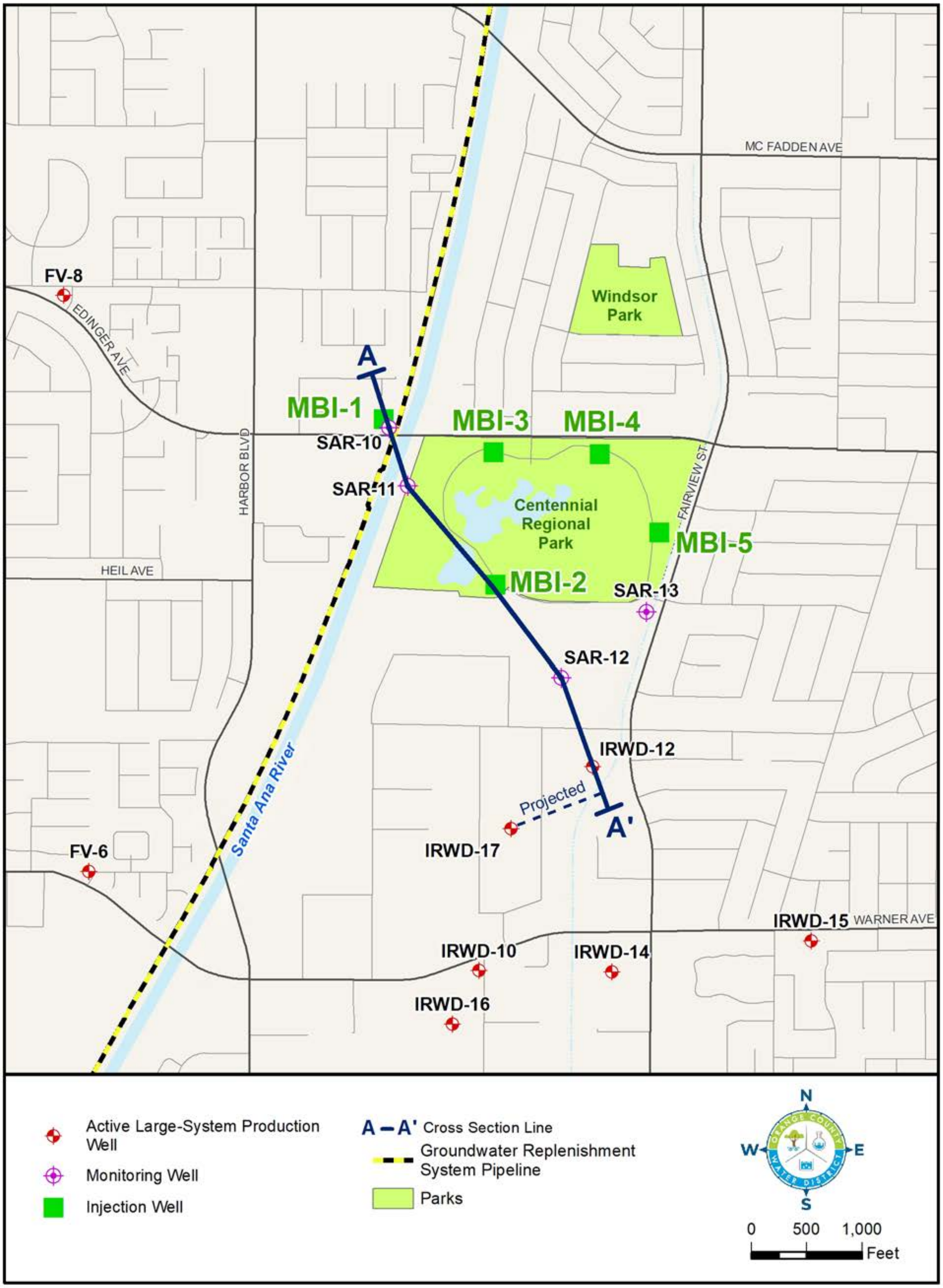


Figure 8-1. MBI Project Area and Well Location Map

- Groundwater quality; and
- Groundwater modeling for the MBI tracer test.

8.1 Aquifers in the MBI Project Area

Earlier studies (DWR, 1934; DWR, 1967) divided the Basin into the Forebay and Pressure areas. As was discussed in Section 6, the Forebay refers to the inland area of intake or recharge generally characterized by coarse-grained high permeability sediments (e.g., sands and gravels) and unconfined aquifer conditions, allowing for surface percolation of applied water for recharging the Basin. In contrast, the Pressure area refers to the coastal and central regions of the Basin where the presence of intervening fine-grained low-permeability clay and silt deposits creates confined or pressurized aquifer conditions at depth, thus making large-scale percolation of surface water for replenishing the Basin impractical in these areas. Therefore, the most feasible method of recharge in the Pressure area is by direct injection into targeted confined aquifers.

For the purposes of the OCWD Basin-wide Groundwater Flow Model (Phraner, 2001; OCWD, 2004b) and the Annual Groundwater Storage Change calculation (OCWD, 2007), the Basin has been vertically characterized into three distinct aquifer systems: (1) Shallow, (2) Principal, and (3) Deep. Over 90% of groundwater production in the Basin occurs from the Principal aquifer system. The approximate vertical intervals of the three aquifer systems in the vicinity of the MBI Project are presented in Table 8-1. The Principal and Deep aquifers are both approximately 1,000 feet thick in the MBI Project area and both rise and thin slightly to the southeast towards the IRWD Dyer Road Well Field (DRWF), conforming to the Basin's overall synclinal structure that plunges to the northwest towards the Buena Park area (Herndon and Bonsangue, 2006).

Table 8-1. Approximate Aquifer System Depths in the MBI Project Area

Shallow Aquifer (ft bgs)	Principal Aquifer (ft bgs)	Deep Aquifer (ft bgs)
0 – 250	250 -1,250	1,250 – 2,250

Figure 8-2 shows a schematic geological cross-section through the MBI Project area, extending to the southeast to IRWD-12. Since the cross-section in Figure 8-2 is a generalized schematic, it shows both IRWD-12 and IRWD-17, which are the two nearest municipal production wells directly downgradient from the MBI Project. Figure 8-1 shows the schematic cross-section alignment (A-A'), with IRWD-17 being perpendicularly projected onto that alignment.

Extrapolating the same aquifer naming scheme used in the Talbert Barrier area from earlier studies (DWR, 1966), Figure 8-2 shows that the Shallow aquifer system is comprised of only the Alpha aquifer in the MBI Project area since the Talbert aquifer is pinched out in this vicinity.

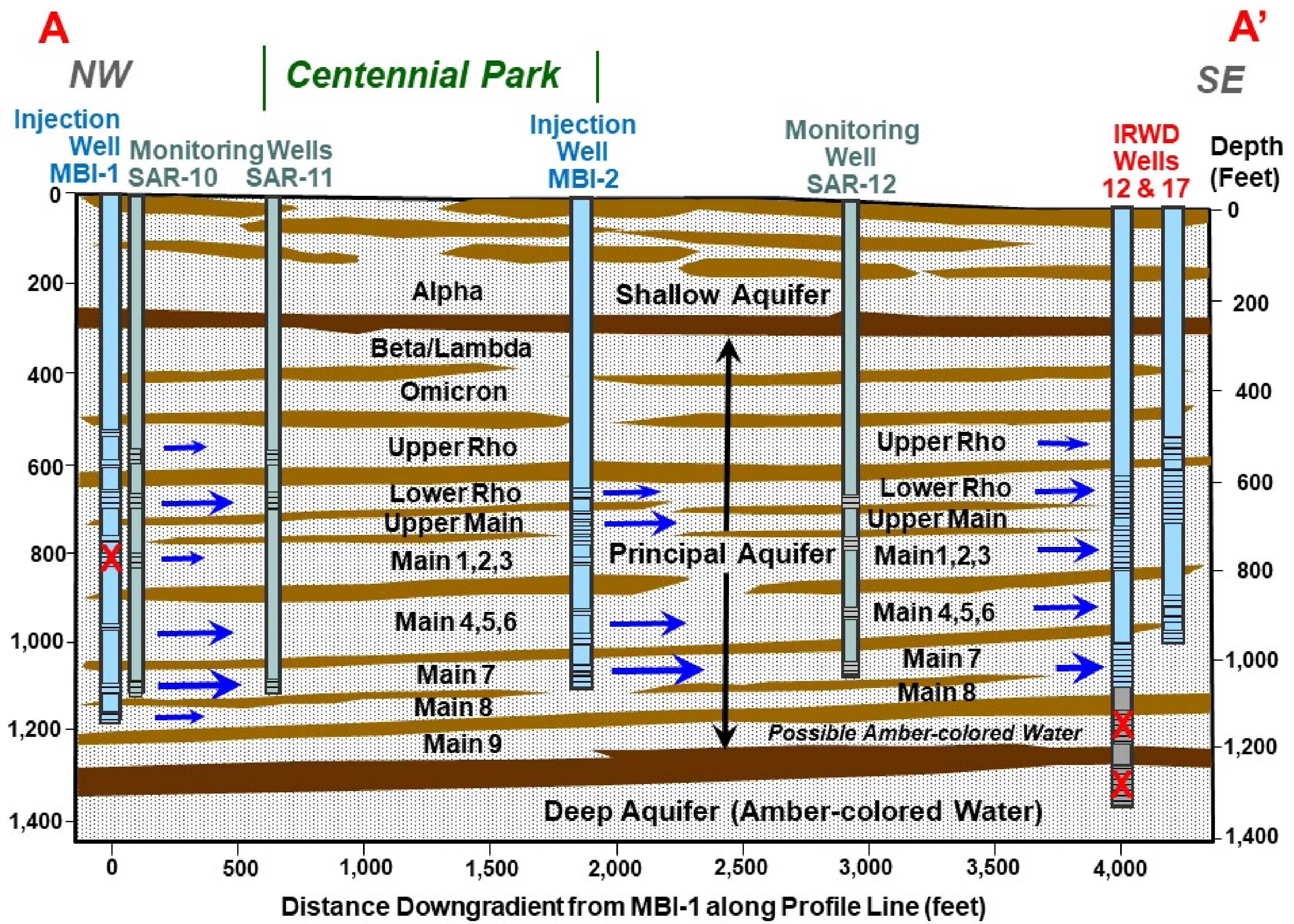


Figure 8-2. Schematic Geological Cross Section Through the MBI Project Area

The Principal aquifer, from shallowest to deepest, consists of the following aquifers:

- Beta and Lambda aquifers, often locally merged;
- Omicron aquifer;
- Upper Rho aquifer;
- Lower Rho aquifer; and
- Main aquifer.

The Main aquifer is the most prolific and thickest aquifer within the Principal aquifer system, typically segregated into multiple discrete aquifer zones separated by low-permeability aquitards that are not entirely laterally extensive (Figure 8-2). Although these Main aquifer subunits tend to be somewhat hydraulically connected to one another with only minor vertical head gradients between the subunits, they were individually correlated across the MBI Project area based on lithologic and geophysical logs from the MBI injection and monitoring wells. Based on the MBI well logs, these Main aquifer subunits have varying hydraulic conductivities and thicknesses that affect the rate of injected GWRS water transport. The individual Main aquifer subunits were numbered from 1 to 9 (from shallow to deep, respectively) with some of these subunits (*e.g.,* subunits 1, 2, and 3) being grouped together based on the interpreted stratigraphy, as shown in Figure 8-2.

Due to the synclinal structure of the Basin plunging to the northwest, the aquifers comprising the Principal aquifer system rise slightly to the southeast from MBI-1 to the nearest production wells, IRWD-12 and IRWD-17. The shallowest Principal aquifer zones (Beta and Lambda) were interpreted to be approximately 50 feet shallower at IRWD-12 and IRWD-17, while the deepest Principal aquifer zones (Main 8 and Main 9) were interpreted to be as much as 100 to 150 feet shallower at IRWD-12 and IRWD-17 than at the MBI-1 site (Figure 8-2). The correlated aquifer names and depths in the MBI Project area and the nearby production wells were based on OCWD staff's review of all hydrogeologic data for the MBI wells and nearby production wells, including geophysical logs, existing OCWD Basin-wide geologic cross-sections in the vicinity, and depth-specific groundwater level and quality data, especially for SAR-10, SAR-11, SAR-12, and SAR-13.

All five MBI wells were screened entirely within the Principal aquifer system and were constructed similarly to nearby production wells (Figure 8-2, Table 7-1).

The Principal aquifer system has significantly lower groundwater levels than the Shallow and Deep aquifer systems in the MBI Project area and throughout most of the Basin, due to the large volume of pumping from the Principal aquifer. Therefore, the greatest need for replenishing the Basin in the MBI Project area is within the Principal aquifer, especially due to the proximity to the IRWD DRWF, where pumping often drives groundwater levels to 100 feet below mean sea level in the summer months.

Downward vertical gradients typically exist between the individual aquifer units comprising the Principal aquifer system in the MBI Project area and throughout the larger Pressure area of the Basin, with groundwater levels generally becoming progressively lower with each successively deeper Principal aquifer unit; groundwater levels are typically highest in the shallowest Beta and Lambda aquifers, and lowest in the deepest Main aquifer subunit. These vertical gradients have consequences for injection well performance. For production or injection wells screened across these Principal aquifer units, groundwater level differences can cause wellbore flow under static or idle conditions, effectively producing water from screened intervals with higher head (pressure) and injecting this same water back out of the well into screened intervals with lower groundwater head. Under pumping and injection conditions, such groundwater level differences and each unit's transmissivity can significantly influence the amount of water pumped from or injected into each screened interval (OCWD, 2010).

Table 8-2 summarizes the results of downhole spinner log tests that were performed at MBI-1 and the four MBI wells in Centennial Park to determine the relative contribution of each individual screened interval during backwash pumping and injection conditions. At MBI-1, pumping and injection spinner log tests were conducted in August 2015, but then a new injection spinner log test was conducted at MBI-1 in July 2020 when injection spinner logs were also completed at the four MBI wells in Centennial Park. Table 8-2 shows that the percent contribution of pumping versus injection for each screened interval varies considerably at each MBI well and is likely due to different well hydraulics during pumping versus injection. Both the pumping and injection contribution within each Principal aquifer unit also varies considerably from one MBI well to another and is likely caused primarily by differences in aquifer thickness, screened interval length, and hydraulic conductivity at the different MBI locations. These local heterogeneities in the MBI Project area are confirmed and consistent with the lithologic and geophysical logs at the five MBI wells.

Table 8-2. MBI Spinner Log Test Results[1,2]

Principal Aquifer Unit	MBI-1				MBI-2			MBI-3			MBI-4			MBI-5		
	Screened Interval (ft bgs)	Pump Flow[3] (%)	Inject Flow[3] (%)	Inject Flow (%)	Screened Interval (ft bgs)	Pump Flow (%)	Inject Flow (%)	Screened Interval (ft bgs)	Pump Flow (%)	Inject Flow (%)	Screened Interval (ft bgs)	Pump Flow (%)	Inject Flow (%)	Screened Interval (ft bgs)	Pump Flow (%)	Inject Flow (%)
Upper Rho	530-540	20	11	18	----	----	----	----	----	----	----	----	----	----	----	----
	595-605	6	-4	7	----	----	----	----	----	----	----	----	----	----	----	----
Lower Rho	660-710	20	24	29	645-675	11	2	655-680	9	15	650-675[3]	3	5	610-620[5]	1	0
														630-665[5]	12	20
Upper Main	----	----	----	----	695-720	20	15	715-735	9	11	702-722	19	23	680-715[5]	32	43
Main 1	770-780	13	17	18	735-745	1	15	756-766	1	10	745-755	14	15	----	----	----
Main 2	800-830[4]	0	0	----	750-760	5	6	780-815	22	15	775-830	13	10	760-800[5]	10	14
					800-810	10	3									
Main 3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Main 4	970-980	7	18	3	920-930	7	10	945-965	15	19	930-940	4	13	915-935[5]	17	11
								975-985	13	13	955-975	30	26			
Main 5	990-1,000	9	14	16	980-995	5	8	1,005-1,015	9	9	----	----	----	----	----	----
Main 6	----	----	----	----	1,050-1,060	22	28	1,048-1,058	5	2	1,030-1,040	4	4	1,005-1,030[5]	11	6
Main 7	1,000-1,120	14	17	7	1,070-1,085	19	13	1,095-1,115	17	6	1,074-1,089	13	4	1,045-1,060[5]	17	6
Main 8	1,175-1,190	11	3	2	----	----	----	----	----	----	----	----	----	----	----	----

1. All pumping spinner logs shown (except MBI-1) were conducted when the wells were new.
2. Injection spinner logs for all 5 MBI wells conducted July 2020 unless otherwise noted.
3. MBI-1 post-liner spinner logs for both pumping and injection conducted on August 4, 2015.
4. MBI-1 screened interval 800-830 ft bgs was swaged off with a liner due to excessive sand into well.
5. Screened interval depths listed here are based on post-construction downhole video survery and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

8.2 Groundwater Monitoring Program

The MBI Project follows a groundwater monitoring program similar to those conducted within the other GWRS recharge areas (Talbert Barrier and K-M-M-L Basins). SAR-12 and SAR-13 serve as the two required downgradient monitoring wells (CCR, 2018; RWQCB, 2019 and 2020) for the combined five injection well MBI Project which went on-line March 18, 2020. Data from all four MBI monitoring wells (SAR-10, SAR-11, SAR-12, and SAR-13) are included in this section, and their screened interval depths and aquifer zones are summarized in Table 8-3.

Nested monitoring wells SAR-10 and SAR-11 were screened in Principal aquifer zones corresponding to individual screened intervals at MBI-1 for the purposes of monitoring the fate and transport of the injected GWRS purified recycled water from the DMBI Project. SAR-10 has four separate monitoring well casings each screened at different depths and nested together in one borehole, while SAR-11 has three nested monitoring well casings (Figure 8-2). Similarly, SAR-12 and SAR-13 were screened in Principal aquifer zones corresponding to individual screened intervals at the four MBI wells in Centennial Park (MBI-2 through MBI-5) for the purposes of monitoring the fate and transport of the injected GWRS water from the MBI Project. SAR-12 and SAR-13 both have four nested monitoring well casings and are screened in the same aquifer zones (Figure 8-2 and Table 8-3).

One of the main constituents monitored along the injection flow path is arsenic since mobilization of aquifer sediment-bound arsenic has been shown to occur at some locations in association with the recharge and injection of GWRS purified recycled water. Total arsenic, other metals, and general minerals such as chloride, sulfate, and TDS were sampled at least quarterly at SAR-10 and SAR-11 from 2012 through 2021 and from 2018 through 2021 at SAR-12 and SAR-13. Dissolved arsenic, dissolved vanadium and selected other constituents have been sampled at least quarterly as part of the metals mobilization monitoring program since April 2015 (when MBI-1 was placed on-line with GWRS water) at SAR-10 and SAR-11 and since 2018 at SAR-12 and SAR-13.

Groundwater levels at SAR-10, SAR-11, SAR-12, and SAR-13 were manually measured approximately monthly during 2021. In addition, all zones of all four wells were equipped with automated data loggers and pressure transducers for at least daily groundwater level monitoring prior to commencement of the MBI Project intrinsic tracer test in March 2020 to monitor the associated rise in groundwater levels. The monthly hand-measured water levels were used to verify that the pressure transducers were accurate and within acceptable calibration limits.

Groundwater level and quality results from all four monitoring wells have been instrumental in determining groundwater flow patterns and velocities emanating from the MBI Project area. Data from these four monitoring wells were also used to help refine and calibrate a groundwater flow and transport model of the MBI Project area as discussed in Section 8.5.

Table 8-3. Monitoring Wells at the MBI Project

OCWD Well Name	Date Completed	Nearest Injection Well [1]	Approximate Distance and Direction from MBI well	Nearest Drinking Water Well	Well Depth (ft bgs)	Aquifer Name
SAR-10/1[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	590-600	Upper Rho
SAR-10/2[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	690-710	Lower Rho
SAR-10/3[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	800-820	Main 2
SAR-10/4[2]	05/10/2012	MBI-1	80 ft SE	IRWD-12	1,100-1,115	Main 7
SAR-11/1[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	592-602	Upper Rho
SAR-11/2[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	675-690	Lower Rho
SAR-11/3[2]	11/10/2011	MBI-1	650 ft SE	IRWD-12	1,100-1,110	Main 7
SAR-12/1	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	605-625	Lower Rho
SAR-12/2	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	755-775	Main 2
SAR-12/3	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	915-930	Main 4
SAR-12/4	01/15/2018	MBI-2	1,000 ft SE	IRWD-12	1,045-1,055	Main 7
SAR-13/1	10/30/2017	MBI-5	500 ft S	IRWD-12	600-620	Lower Rho
SAR-13/2	10/30/2017	MBI-5	500 ft S	IRWD-12	750-770	Main 2
SAR-13/3	10/30/2017	MBI-5	500 ft S	IRWD-12	910-930	Main 4
SAR-13/4	10/30/2017	MBI-5	500 ft S	IRWD-12	1,045-1,055	Main 7

[1] The closest injection well is not necessarily the fastest source of injection water based on estimated arrival times and inferred groundwater flow directions.

[2] Monitoring well sites SAR-10 and SAR-11 are not compliance wells per the amended GWRS permit (RWQCB, 2019) and Revised Monitoring and Reporting Program (RWQCB, 2020).

8.3 Groundwater Elevations and Directions of Flow

This section discusses groundwater elevations and groundwater flow paths within the Principal aquifer in the MBI Project area.

8.3.1 Principal Aquifer

For the MBI Project, the Principal aquifer is of primary concern since all five MBI wells are screened in this aquifer zone, as are the nearest downgradient production wells (IRWD-12 and IRWD-17) that will receive injected GWRS water from the project. Principal aquifer groundwater elevations vary considerably due to seasonal fluctuations in the amount and location of Basin pumping, as well as year-to-year changes in Basin groundwater storage. However, regional groundwater flow directions have remained relatively stable in the greater MBI Project area over the last several years.

Figure 8-3 shows interpreted groundwater elevation contours and inferred groundwater flow directions for the Principal aquifer for June 30, 2021. Groundwater levels from SAR-10/4, SAR-11/3, SAR-12/4, and SAR-13/4 all screened in the Main 7 Principal aquifer zone (Table 8-3) were used to help construct and constrain these Basin-wide regional contours in the MBI Project area, and all five MBI wells were fully on-line at the time of the groundwater level measurements. Also, IRWD-12 and IRWD-17 were both on-line pumping during the time of the groundwater level measurements and therefore did not have a static water level measurement to help constrain the contours downgradient of the MBI Project. As shown on Figure 8-3, groundwater elevations in the Principal aquifer were approximately 53 feet below mean sea level in the northwest portion of the MBI Project area between SAR-10 and SAR-11, approximately 23 feet lower than in June 2020. In the southeast portion of the MBI Project area between SAR-12 and SAR-13, Principal aquifer groundwater elevations were approximately 65 feet below mean sea level, approximately 25 feet lower than in June 2020. The 25-foot decrease in groundwater elevations in the Principal aquifer in the MBI Project area is consistent with observations throughout the Basin in the same time period as the Principal aquifer lost 10,000 AF of storage relative to June 2020 due to Basin pumping being greater than Basin replenishment (both managed and incidental recharge) from June 2020 to June 2021. The uniformity of the decrease in Principal aquifer groundwater elevations throughout the greater MBI Project area was attributed to comparable pumping at the IRWD DRWF and comparable injection at the MBI Project wells from June 2020 to June 2021.

Based on the Principal aquifer groundwater elevation contours in Figure 8-3, the inferred groundwater flow direction in the MBI Project area is to the south towards the IRWD DRWF, as compared to southeasterly in years prior to MBI Project wells coming on-line.

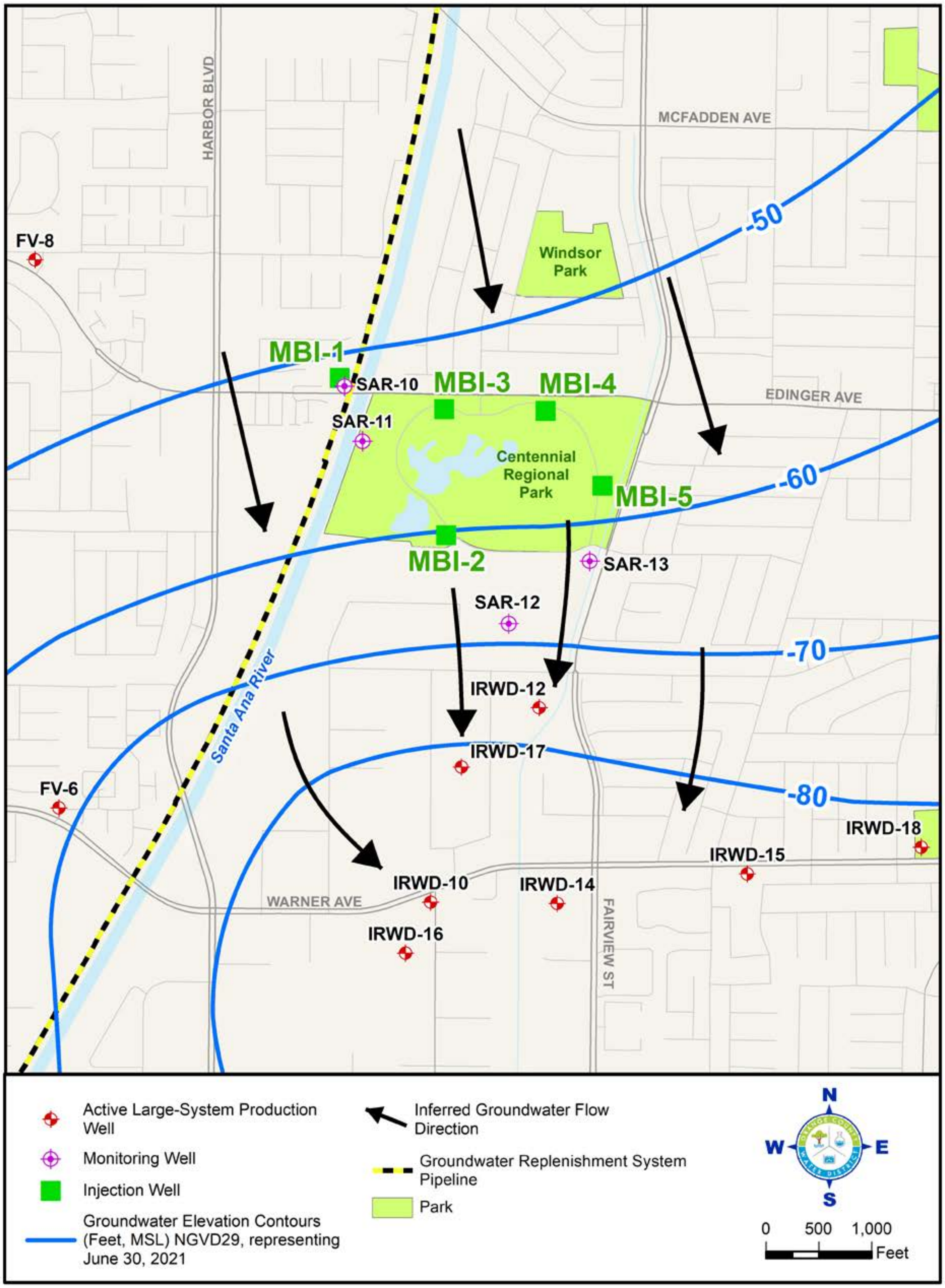


Figure 8-3. Principal Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the MBI Project Area During 2021

The closest downgradient production wells to the MBI Project are IRWD-12 and IRWD-17, both located approximately 2,200 feet downgradient from the nearest MBI wells, MBI-5 and MBI-2, respectively. As such, the inferred groundwater flow directions in Figure 8-3 indicate flow from MBI-5 towards IRWD-12 and from MBI-2 towards IRWD-17. Figure 8-3 shows that Principal aquifer groundwater elevations near IRWD-12 at the end of June 2021 were approximately 75 feet below mean sea level, approximately 24 feet lower than in June 2020 and consistent with the water level decreases observed throughout the Pressure area of the Basin and in the four monitoring wells. Due to continued MBI Project injection, the hydraulic gradient across the localized Centennial Park injection site in June 2021 was almost exactly as it was in June 2020, which is slightly flatter than in years prior to the MBI Project wells coming on-line. Also similar to June 2020, the gradient was much steeper south of Centennial Park towards the IRWD DRWF relative to years prior to the MBI Project wells coming on-line. However, in addition to the effects of MBI Project injection, the hydraulic gradient in this area can also be significantly influenced by variations in the timing and amount of pumping from nearby production wells, especially in the IRWD DRWF.

8.3.2 Monitoring Well Trends

Groundwater level hydrographs for MBI Project monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 are shown on the upper graph of Figure 8-4, Figure 8-5, Figure 8-6, and Figure 8-7, respectively. These figures also show chloride concentrations, which are discussed in Section 8.4.1 and NDMA concentrations, which are discussed in Section 8.4.2. Figure 8-4 and Figure 8-5 show groundwater level, chloride, and NDMA data from 2014 through 2021, which includes over one year of ambient background data before MBI-1 came on-line in April 2015. Figure 8-6 and Figure 8-7 show groundwater level, chloride, and NDMA data from 2018 through 2021, which includes two years of background data before the MBI Project came on-line in March 2020. All four MBI Project monitoring wells are screened in the Principal aquifer system, with separate screened casings in the Upper Rho, Lower Rho, and Main aquifers, corresponding to selected screened intervals at the MBI Project injection wells MBI-1 through MBI-5 and production wells IRWD-12 and IRWD-17. The screened interval depths and targeted aquifer names are shown in Table 8-3 and on Figure 8-4 through Figure 8-7 for the four depth-specific monitoring wells.

All zones at SAR-10 (Figure 8-4), SAR-11 (Figure 8-5), SAR-12 (Figure 8-6), and SAR-13 (Figure 8-7) were equipped with automated data loggers for frequent (at least daily) monitoring of groundwater levels throughout the periods shown on the four figures, except for pressure transducer malfunctions, in which case only monthly hand-measured water levels were available for those periods.

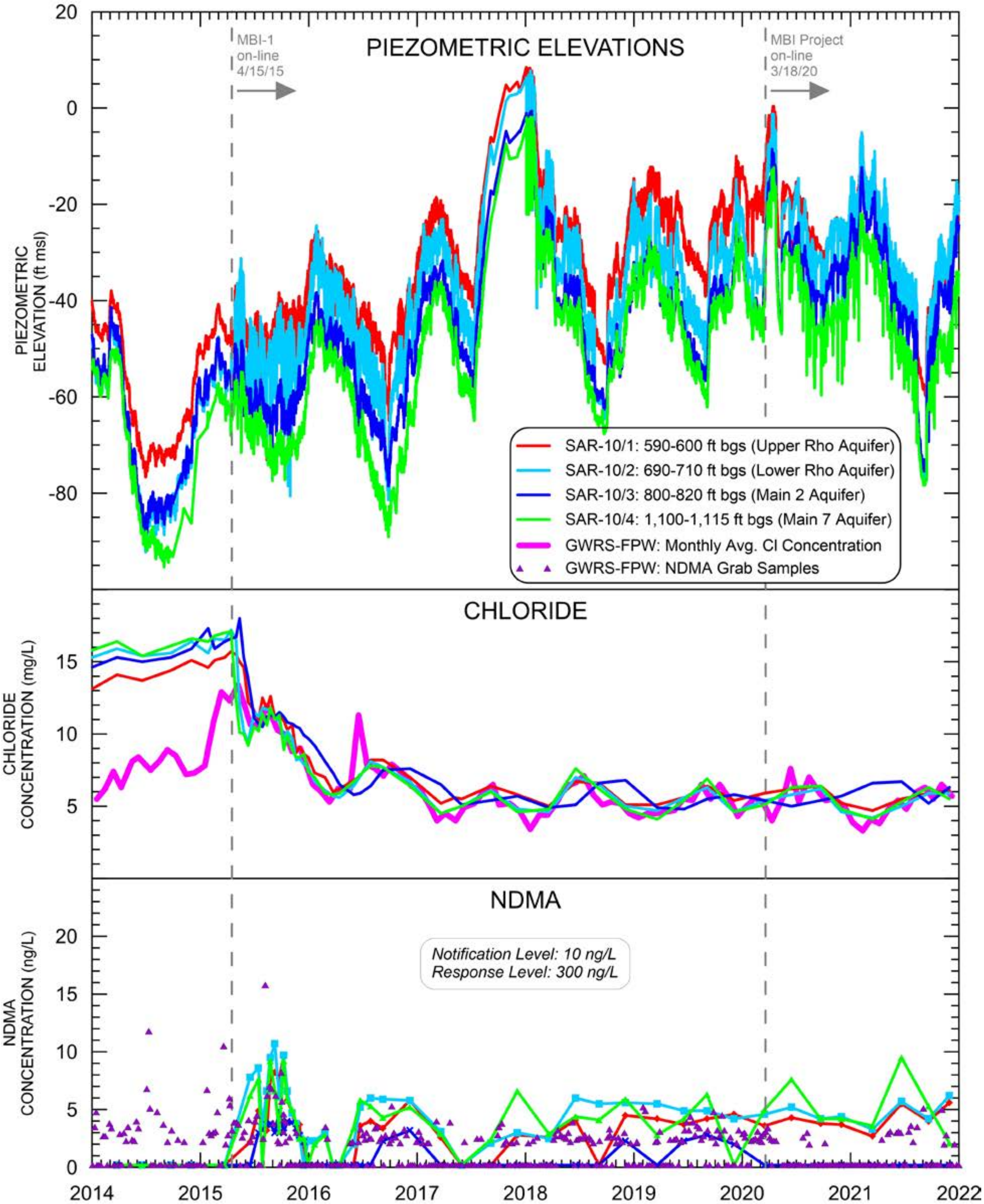


Figure 8-4. Monitoring Well SAR-10 Piezometric Elevations and Chloride Concentration

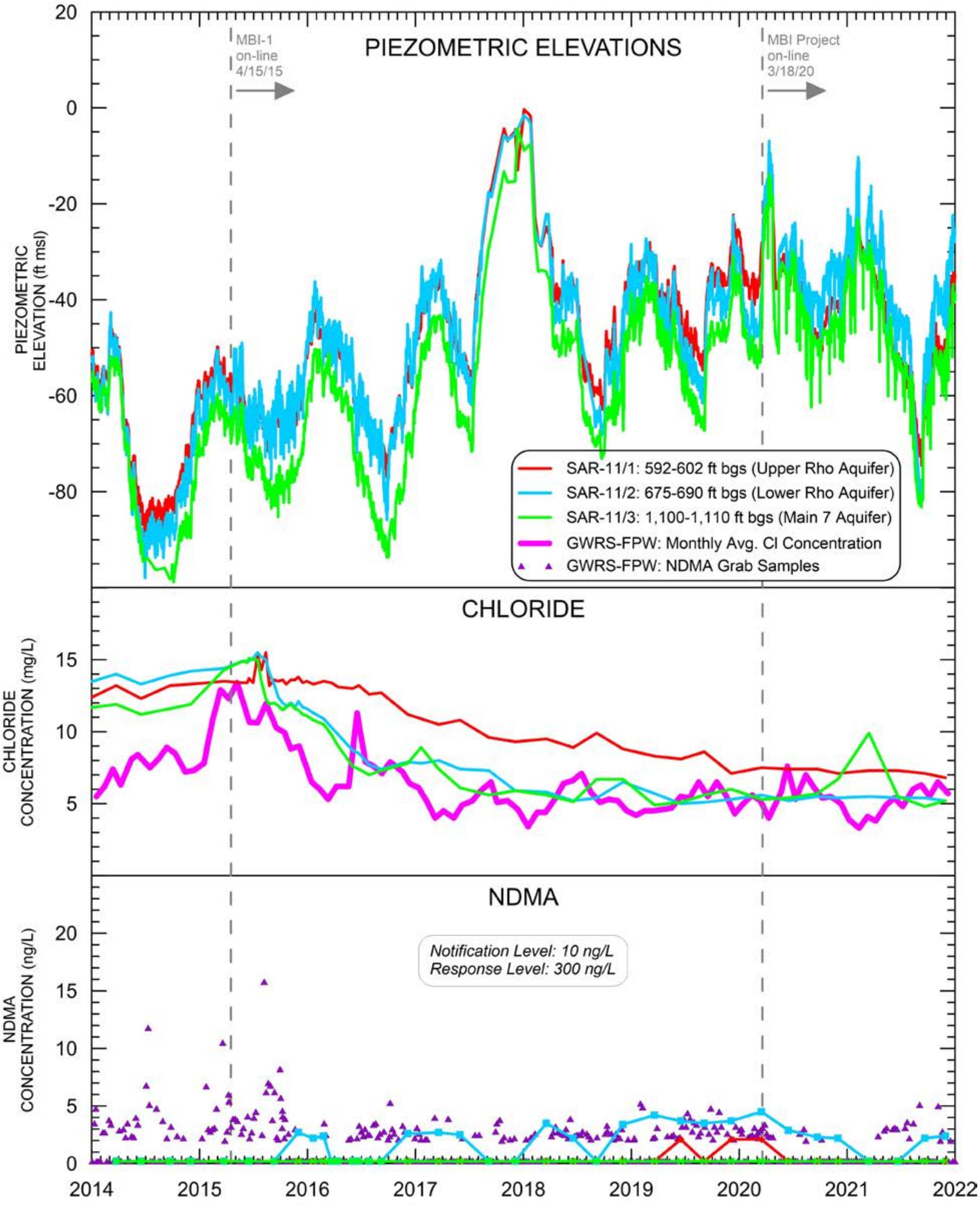


Figure 8-5. Monitoring Well SAR-11 Piezometric Elevations and Chloride Concentration

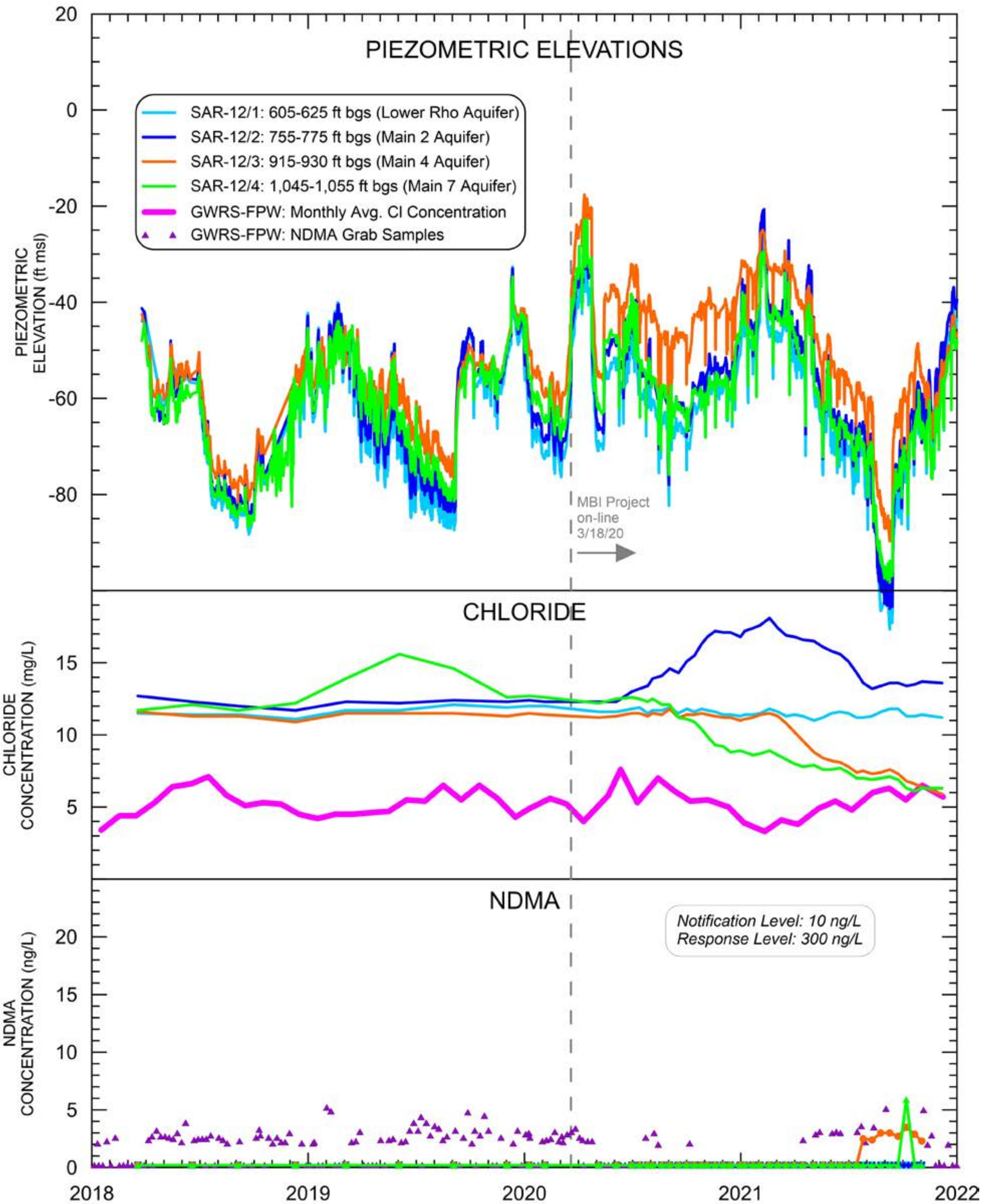


Figure 8-6. Monitoring Well SAR-12 Piezometric Elevations and Chloride Concentration

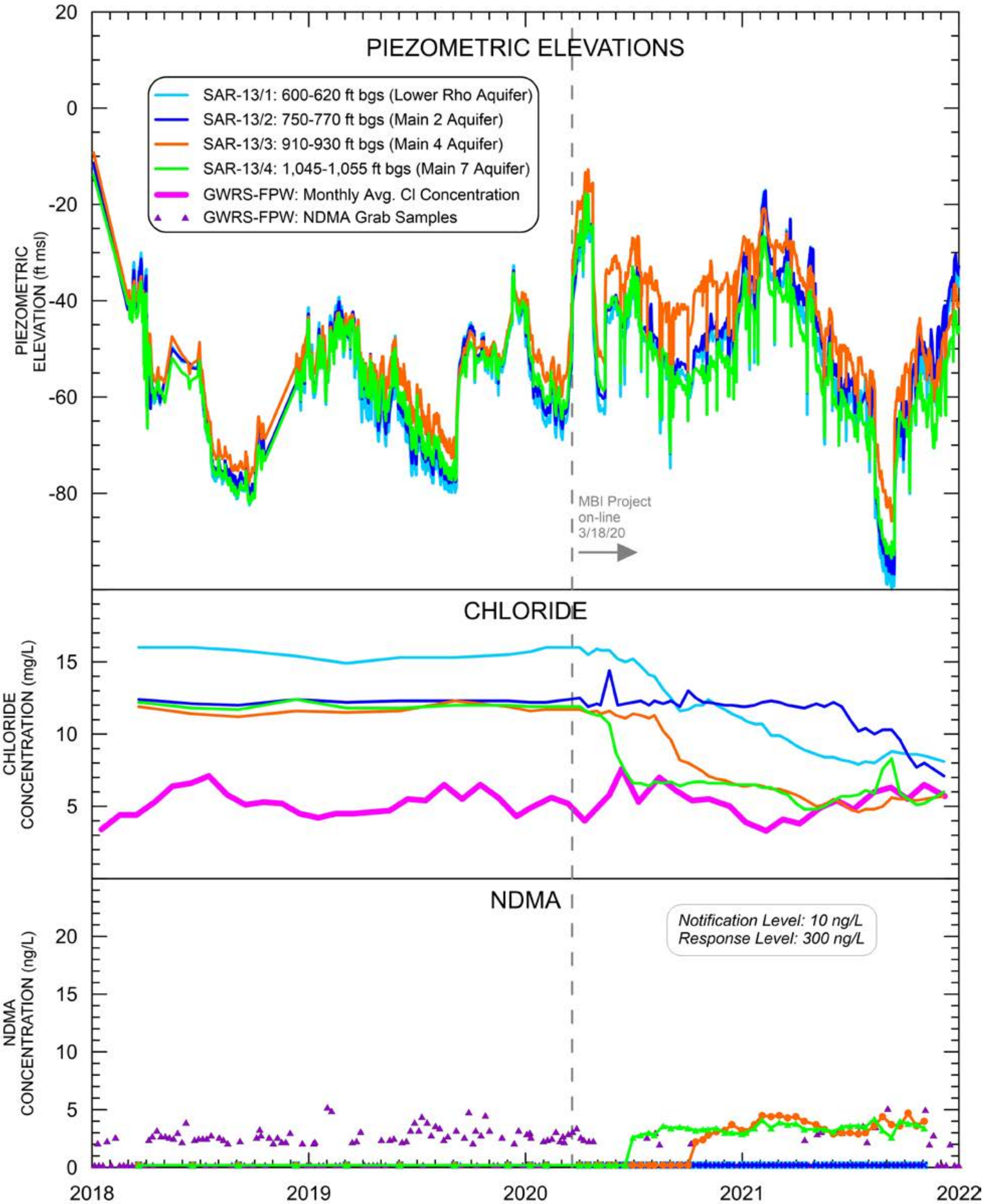


Figure 8-7. Monitoring Well SAR-13 Piezometric Elevations and Chloride Concentration

Groundwater level trends at the MBI Project monitoring wells typically follow a seasonal pattern: (1) rising and/or remaining high during the winter and early spring months, (2) declining in the late spring and summer months, and (3) recovering somewhat in the late fall months near the end of the year. In the MBI Project area, these seasonal trends largely result from seasonal water demands which lead to increased pumping during the summer and reduced pumping during the winter, and to a lesser degree from increased Forebay recharge (both natural and managed) from local rainfall and captured SAR storm flows during the winter months.

During 2021, Principal aquifer groundwater levels at the MBI Project monitoring wells peaked in February, then declined steadily until early August. Principal aquifer groundwater levels then fell sharply in early August when the MBI wells went off-line due to the planned AWPF shutdown, eventually declining to the lowest elevations since 2016 at SAR-10 and SAR-11 and to historically low levels at SAR-12 and SAR-13 in early September. These historical lows in September were lowest at SAR-12/1 and SAR-12/2 and were more than 100 feet below mean sea level as SAR-12 is the closest MBI Project monitoring well to the IRWD DRWF. Groundwater levels rebounded quickly once the MBI wells came back on-line in mid-September, and generally continued to increase for the rest of the year as Basin pumping decreased into the fall, except for a brief decline in November.

At all four MBI Project monitoring wells, Principal aquifer groundwater levels at the end of 2021 were on average approximately two feet lower than at the end of 2020.

During 2021, Principal aquifer groundwater levels at SAR-10 (Figure 8-4) and SAR-11 (Figure 8-5) were similar to one another and followed the typical seasonal pattern described above. The relatively large short-term fluctuations in groundwater levels of approximately 10 to 20 feet at both SAR-10 and SAR-11 were primarily due to MBI-1 injection and backwash pumping cycles. Principal aquifer groundwater levels at SAR-12 (Figure 8-6) and SAR-13 (Figure 8-7) followed the same longer-term seasonal pattern as SAR-10 and SAR-11 but were typically between 10 and 25 feet lower in elevation, as they are farther downgradient from the MBI Project wells and closer to the low pumping depression caused by the downgradient production wells (Figure 8-3). The large short-term fluctuations in groundwater levels at SAR-12 and SAR-13 were primarily due to production well operations at the nearby IRWD DRWF and to a lesser degree from injection and backwash pumping cycles at the four MBI Centennial Park wells.

As mentioned previously, downward vertical gradients typically exist between the individual aquifer units comprising the Principal aquifer system in the MBI Project area and throughout the larger Pressure area of the Basin, with groundwater levels generally becoming progressively lower with each successively deeper Principal aquifer unit. This downward vertical gradient is evident at SAR-10 (Figure 8-4) and SAR-11 (Figure 8-5), especially prior to the beginning of MBI-1 operations, with the highest groundwater elevations (heads) occurring in the shallowest Upper Rho aquifer zone and lowest heads in the lowermost Main 7 subunit of the Main aquifer.

However, the typical downward vertical gradient is not observed at SAR-12 (Figure 8-6) or SAR-13 (Figure 8-7) prior to or during MBI Centennial Park operations; this is likely due to their proximity to production wells IRWD-12 and IRWD-17, which both have their upper screened intervals within the same aquifer zones as the upper two zones at SAR-12 and SAR-13 (Figure 8-2). Based on the IRWD-17 spinner survey, the majority of pumping from these two production wells likely comes from these upper screened intervals, resulting in lower heads within the upper two zones at SAR-12 and SAR-13 as compared to the deeper two zones at these two monitoring wells. SAR-12 is located only 850 ft from IRWD-12, while SAR-13 is located 1,475 ft from IRWD-12, as compared to SAR-10 and SAR-11 which are both over 3,000 ft away from IRWD-12 (Figure 8-1) and thus have a much more dampened response to pumping from IRWD-12 and IRWD-17.

8.4 Groundwater Quality

Quarterly sampling continued at monitoring wells SAR-10 and SAR-11 during 2021 but has been voluntary since March 2020 as SAR-12 and SAR-13 became the official compliance wells for the MBI Project. SAR-10 and SAR-11 were voluntarily sampled more frequently in 2015 and 2016 around the startup of MBI-1 operations. Quarterly background sampling was conducted at monitoring wells SAR-12 and SAR-13 from March 2018 until February 2020 and then became compliance quarterly sampling in March 2020 with MBI Project startup. Beginning in mid-2020 and continuing through 2021, the sampling frequency at SAR-12 and SAR-13 was voluntarily increased to biweekly to track the injected GWRS water for the MBI intrinsic tracer test. Groundwater quality data for 2021 are presented in Appendix K. The four MBI Project monitoring wells were tested for: (1) an extensive list of inorganic, organic, and radiological parameters, (2) the majority of the U.S. Environmental Protection Agency (EPA) Priority Pollutants, and (3) 1,4-dioxane and NDMA. During 2021, groundwater quality at SAR-10, SAR-11, SAR-12, and SAR-13 complied with all Federal and State Primary Drinking Water Standards. Three instances of Secondary MCL exceedance (Aluminum and Iron) occurred at SAR-10/1 in 2021 and are discussed in Section 8.4.5.

This section describes groundwater quality at the four MBI Project monitoring wells for general constituents used as intrinsic tracers, 1,4-dioxane, NDMA, arsenic, vanadium, aluminum, and iron with comparison to their respective MCLs or other relevant water quality standards. Groundwater quality for production wells in the vicinity of the MBI Project is also summarized.

8.4.1 Monitoring Wells – Intrinsic Tracers Chloride and Sulfate

As discussed in Section 4 and Section 6 related to the Talbert Barrier and Anaheim Forebay recharge facilities, respectively, chloride has been effectively used as an intrinsic tracer of GWRS water in the subsurface arriving at nearby downgradient monitoring wells. Chloride is a conservative tracer and thus is expected to migrate at the same groundwater velocity as the injected water without any significant reactions with other constituents in the groundwater or the aquifer substrate. Fortunately for tracking purposes, GWRS-FPW has a very low and stable chloride concentration with an annual average ranging from 4-11 mg/L since 2008 and more recently ranging from 5-6 mg/L over the last five years. Monthly chloride concentrations of GWRS purified recycled water during 2021 ranged from approximately 3 to 7 mg/L, with an annual average of approximately 5 mg/L, slightly less than the 7 to 11 mg/L average in 2015-2016 and at the low end of recent annual averages due to replacement of RO membranes at the AWPF.

The middle graph of Figure 8-4 and Figure 8-5 show that ambient background chloride concentrations at all zones of SAR-10 and SAR-11 ranged from approximately 12-17 mg/L prior to the commencement of GWRS injection at MBI-1. Similarly, the middle graph of Figure 8-6 and Figure 8-7 show that the ambient background chloride concentrations at all zones of SAR-12 and SAR-13 ranged from approximately 11-16 mg/L prior to the commencement of GWRS injection at the MBI Centennial Park wells. The lack of chloride variability between these aquifer zones and the lack of seasonal chloride variation provided a reliable and stable antecedent chloride condition that was noticeably higher than GWRS water at all four monitoring wells. Also, as discussed in Section 8.4.7, chloride concentrations at the nearest downgradient production wells IRWD-12 and IRWD-17 were similarly stable within approximately the same range over a much longer historical period than the MBI Project monitoring wells.

At SAR-10, located approximately 80 feet downgradient of MBI-1, chloride concentrations declined rapidly after the commencement of MBI-1 injection on April 15, 2015 (Figure 8-4). After this initial decline, chloride concentrations in all four zones at SAR-10 have remained essentially the same as the GWRS injected water since the second half of 2015. The initial chloride concentration declines indicated breakthrough of GWRS water arriving in all four zones at slightly different times. The fastest arrival of GWRS water occurred in less than two weeks in the deepest injection zone at SAR-10/4 (Main 7 aquifer), while the slowest arrival occurred in approximately 6 to 8 weeks in the shallowest injection zone at SAR-10/1 (Upper Rho aquifer).

At SAR-11, located approximately 650 feet downgradient of MBI-1, the chloride concentration decline following commencement of MBI-1 injection operations was more delayed and dispersed than at the more proximal SAR-10 (Figure 8-5). In the shallowest injection zone at SAR-11/1 (Upper Rho aquifer), chloride concentrations gradually decreased for the first time during the second half of 2016 and likely indicated initial arrival of GWRS water. From the chloride data only, a precise initial arrival time was difficult to discern, possibly due to limited injection into this aquifer zone and the farther distance from MBI-1. Chloride concentrations at SAR-11/1 gradually declined after 2016, reaching a low of approximately 7 mg/L in December 2019, where they remained through 2021. For the other two deeper zones at SAR-11, the fastest arrival of GWRS water occurred in approximately 13 weeks following initial MBI-1 operations and was once again in the deepest injection zone at SAR-11/3 (Main 7 aquifer), while arrival was somewhat slower and occurred in approximately 17 weeks in SAR-11/2 (Lower Rho aquifer). During 2021, chloride concentrations at SAR-11/2 (Figure 8-5) remained at GWRS levels, indicating approximately 100%

GWRS water in this zone. At SAR-11/3 there was a small increase in chloride that began in September 2020 and increased to 10 mg/L in March 2021, just slightly less than ambient (pre-GWRS injection) concentrations. This small chloride increase was likely due to a change in gradient caused by the commencement of injection from the four MBI wells in Centennial Park in March 2020 temporarily displacing older GWRS injection from 2015-2016 at MBI-1 or ambient groundwater back to this well. In June 2021, the chloride concentrations at SAR-11/3 dropped back down to GWRS-FPW levels where they remained for the rest of the year.

At SAR-12, located approximately 1,025 feet downgradient of MBI-2, chloride concentration trends during 2021 were varied among the four well casings (Figure 8-6). At SAR-12/1 (Lower Rho aquifer), chloride concentrations remained stable at ambient levels throughout the year. At SAR-12/2 (Main 2 aquifer), chloride concentrations continued the increase that began in June 2020, reaching a peak of above 18 mg/L in February 2021, then decreased steadily thereafter to near ambient levels around 14 mg/L where they remained for the rest of the year. The peak at SAR-12/2 is similar to ambient chloride levels seen in the same Main 2 aquifer zone at SAR-10/3 prior to commencement of MBI-1 injection in 2015. This gradual increase in ambient chloride concentrations has also been observed in nearby production wells in the greater Santa Ana area and is likely due to the gradual arrival of modern recharge from the Forebay area of the Basin. At both SAR-12/3 (Main 4 aquifer) and SAR-12/4 (Main 7 aquifer), chloride concentrations declined during 2021. Chloride concentrations at SAR-12/3 began declining from ambient levels in March 2021 and dropped to GWRS-FPW levels in November, where they remained for the rest of the year, indicating sustained 100% GWRS arrival. During 2021, chloride concentrations at SAR-12/4 continued the decline that began in mid-September of 2020, reaching GWRS-FPW levels in November, where they remained for the rest of the year, indicating sustained 100% GWRS water in this well.

At SAR-13, located approximately 725 feet downgradient of MBI-5, chloride concentrations during 2021 decreased or remained below ambient levels at all four zones (Figure 8-7), signaling sustained GWRS arrival. At SAR-13/1 (Lower Rho aquifer), chloride concentrations continued the decreasing trend that began in mid-August 2020, declining steadily to approximately 8 mg/L but never reaching levels indicative of 100% GWRS water. At SAR-13/2 (Main 2 aquifer), chloride concentrations began decreasing in June 2021 and continued declining steadily through the end of the year, reaching approximately 7 mg/L in December, indicating a predominance of GWRS water at this well, though not quite 100%. At SAR-13/3, chloride concentrations were measured at GWRS-FPW levels throughout the year, indicating sustained 100% GWRS water at this well. At SAR-13/4 (Main 7 aquifer), chloride concentrations were low and stable at GWRS-FPW levels throughout 2021, except for a small increase to approximately 8 mg/L in late August and early September during the one-month MBI off-line period, likely indicating a small percentage of ambient groundwater temporarily arriving at this well due to the fast flow path within the Main 7 aquifer in the MBI Project area.

Sulfate was also used as an intrinsic tracer to estimate the arrival time of GWRS water at SAR-10, SAR-11, SAR-12, and SAR-13. Sulfate is typically considered less conservative than chloride in the subsurface but features a greater difference between the ambient background concentration at the MBI Project monitoring wells (32 to 44 mg/L) compared to the GWRS injection supply (approximately 1 mg/L). Over these relatively short travel distances from MBI-1 to SAR-10 and SAR-11 and from the MBI Centennial Park wells to SAR-12 and SAR-13, along with relatively constant injection, sulfate appeared to behave conservatively and yielded essentially the same GWRS arrival times as chloride but with more definitive breakthrough curves.

Figure 8-8 and Figure 8-9 show chloride and sulfate concentrations during 2015-2021 for all zones at SAR-10 and SAR-11, respectively, and Figure 8-10 and Figure 8-11 show chloride and sulfate concentrations during 2018-2021 for all zones at SAR-12 and SAR-13, respectively. In all cases, the concentration declines signaled the arrival of GWRS water to these wells, and the timing of the chloride and sulfate concentration declines were consistent with each other but were much more readily apparent with sulfate due to the larger range between ambient and GWRS sulfate concentrations.

Therefore, the estimated GWRS arrival times shown on each graph in Figure 8-8 through Figure 8-11 were based on the sulfate breakthrough curves but are the same as discussed above for chloride, except in the case of SAR-11/1 where breakthrough was only distinguishable for sulfate. As shown on Figure 8-9, breakthrough or arrival of GWRS water at SAR-11/1 was not apparent based on the relatively stable and low chloride concentrations at this well but finally became evident when sulfate concentrations began to decline in April 2016, approximately one year after injection operations began at MBI-1. At SAR-11/2 and SAR-11/3, the sulfate reduction breakthrough was much more obvious yet slightly more gradual than for these analogous zones at SAR-10 due to dispersion along the flow path farther downgradient from MBI-1. The breakthrough curves for those zones with GWRS arrival at SAR-12 and SAR-13 appear as gradual or even more gradual than those seen at SAR-11, due to the longer flow paths to these monitoring wells from the injection source.

Table 8-4 summarizes the GWRS water arrival time estimates for SAR-12 and SAR-13 during the MBI intrinsic tracer test in which all five MBI wells were fully on-line. The GWRS arrival time estimates for SAR-10 and SAR-11 from the DMBI operations in 2015-2016 were shown in Table 8-2 of the 2016 through 2019 Annual Reports. The GWRS arrival times for SAR-12 and SAR-13 in Table 8-4 were based on biweekly sulfate samples, with arrival defined as the date of the first sulfate sample whose concentration was 10-20 percent lower than the most recent ambient sulfate concentration. As mentioned previously, the fastest GWRS arrival occurred in the Main 7 aquifer zone at SAR-12/4 and SAR-13/4. This Main 7 aquifer zone also had the fastest GWRS arrival at SAR-10/4 and SAR-11/3 back in 2015.

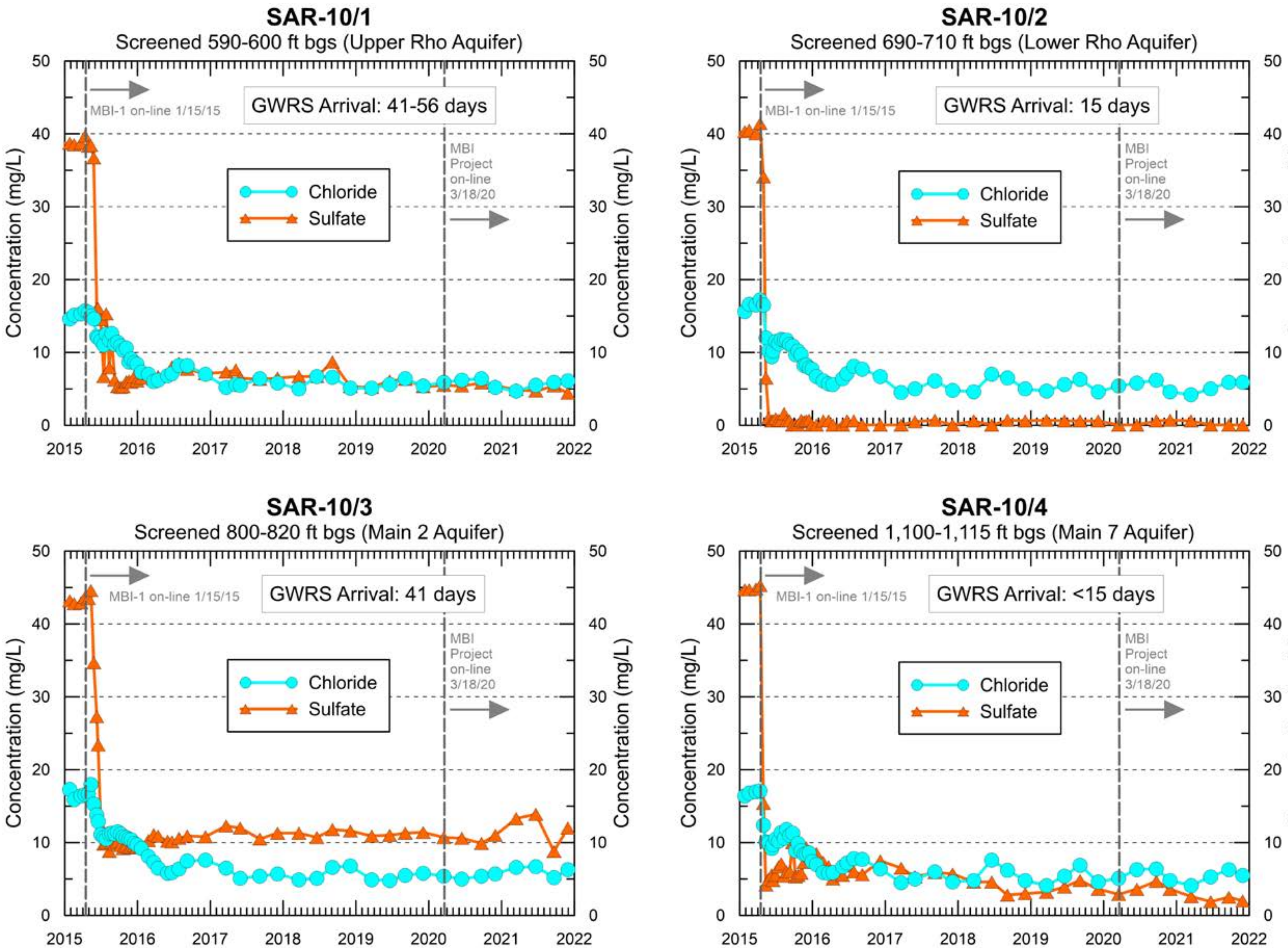


Figure 8-8. Monitoring Well SAR-10 Chloride and Sulfate Concentrations

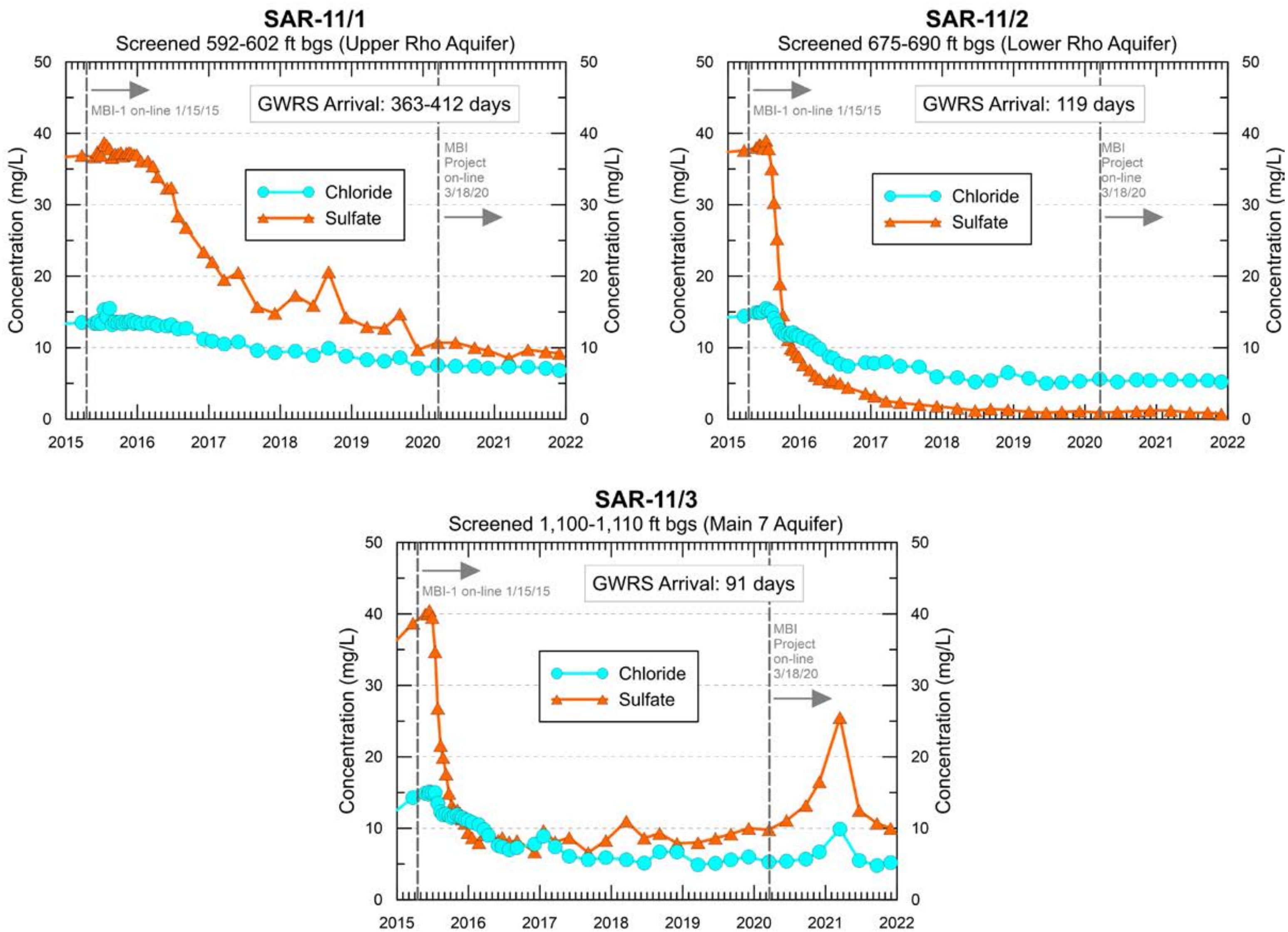


Figure 8-9. Monitoring Well SAR-11 Chloride and Sulfate Concentrations

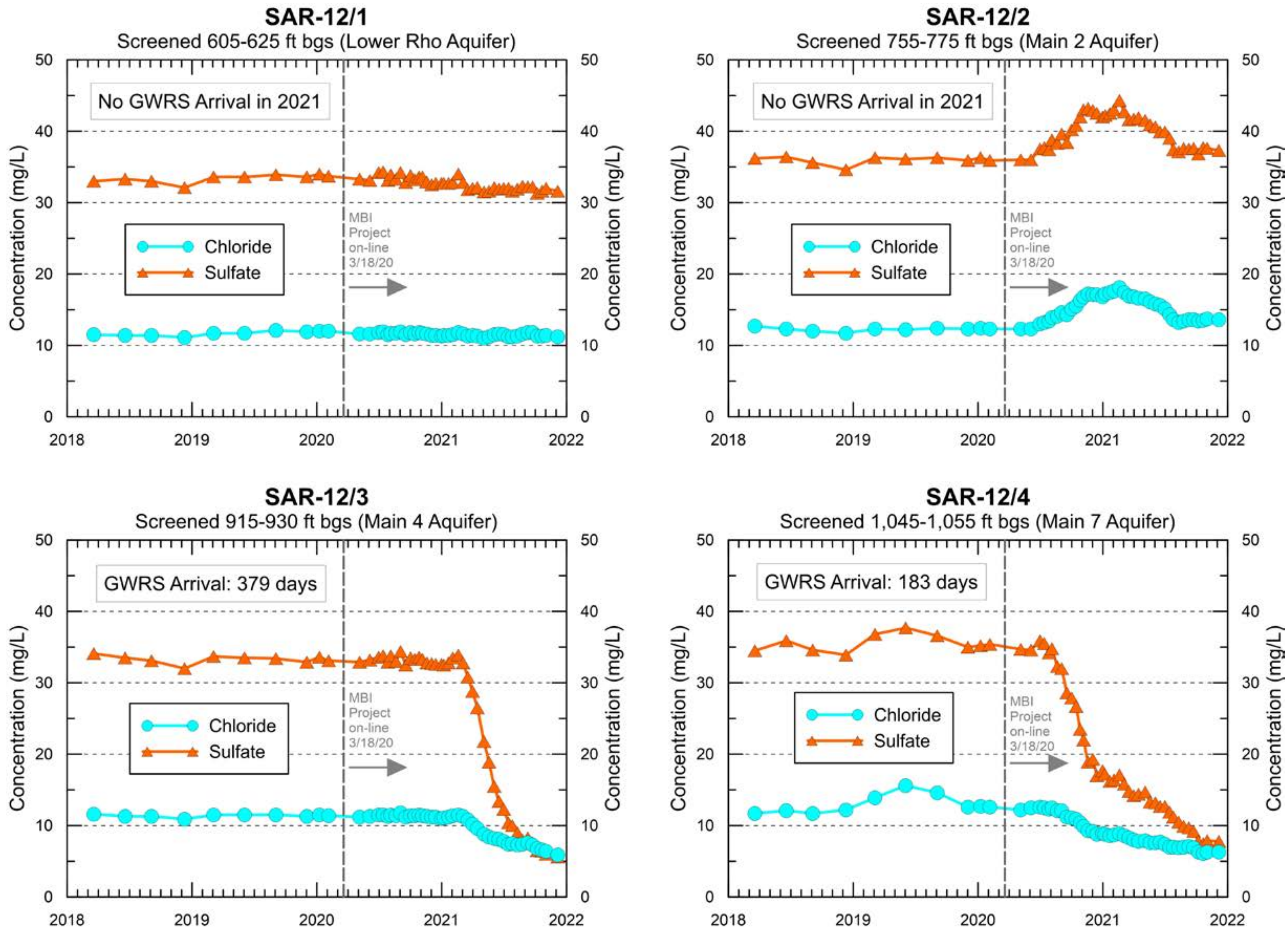


Figure 8-10. Monitoring Well SAR-12 Chloride and Sulfate Concentrations

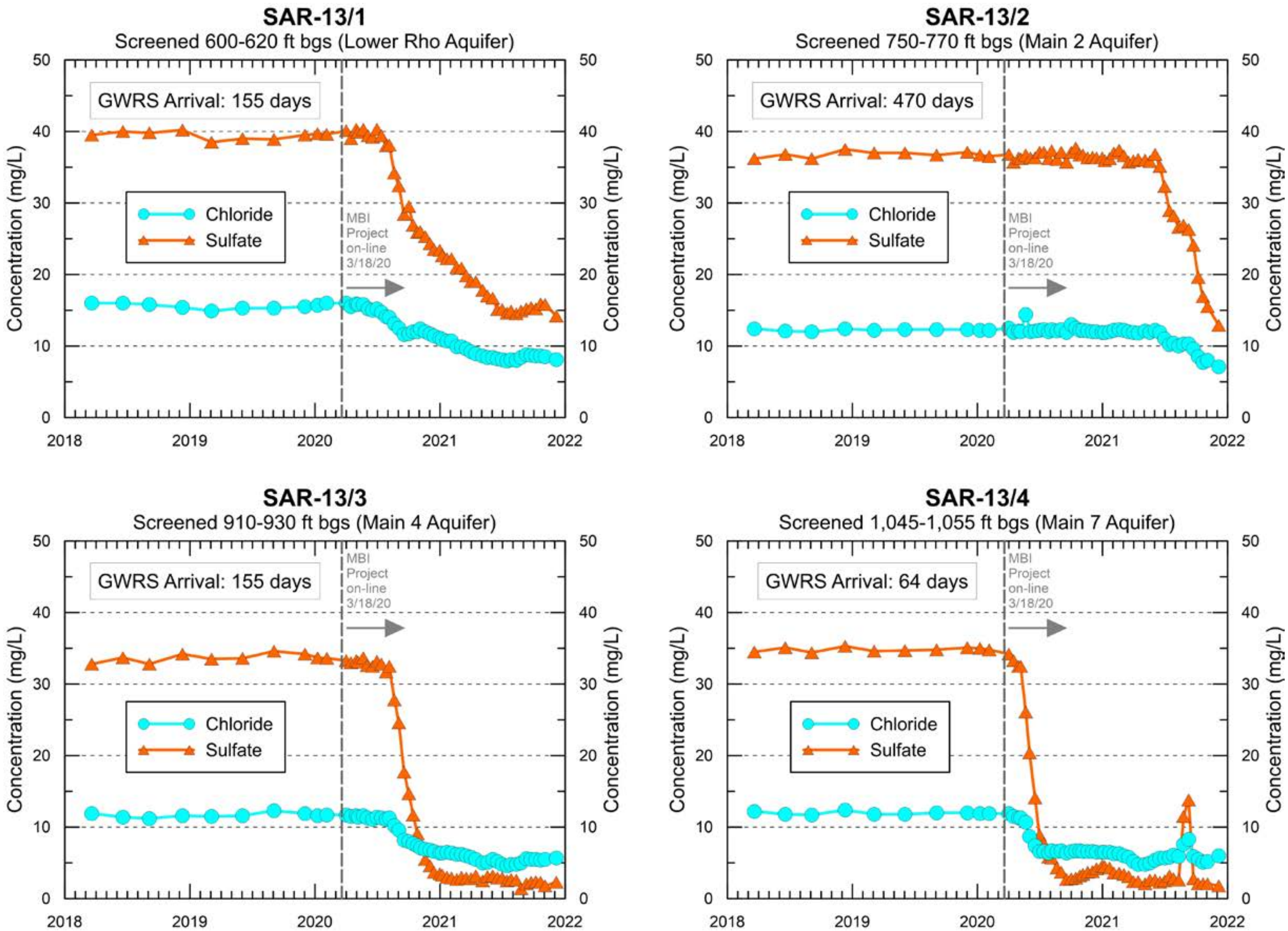


Figure 8-11. Monitoring Well SAR-13 Chloride and Sulfate Concentrations

Table 8-4. GWRS Water Arrival Time Estimates to SAR-12 and SAR-13

Monitoring Well	Screened Interval (ft bgs)	Aquifer Name	Distance from nearest MBI Well (ft)	Sulfate[1] Arrival Time (days)	Sulfate[1] Arrival Time (months)
SAR-12/1	605 - 625	Lower Rho	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/2	755 - 775	Main 2	1,025 (MBI-2)	No Arrival	No Arrival
SAR-12/3	915 - 930	Main 4	1,025 (MBI-2)	379	12.6
SAR-12/4	1,045 - 1,055	Main 7	1,025 (MBI-2)	183	6.1
SAR-13/1	600 - 620	Lower Rho	725 (MBI-5)	155	5.2
SAR-13/2	750 - 770	Main 2	725 (MBI-5)	470	15.7
SAR-13/3	910 - 930	Main 4	725 (MBI-5)	155	5.2
SAR-13/4	1,045 - 1,055	Main 7	725 (MBI-5)	64	2.1

[1] Sulfate biweekly sampling with arrival times based on 10 to 20% reduction from most recent ambient.

During 2021, only SAR-10/2 (Figure 8-8) and SAR-11/2 (Figure 8-9), both screened in the Lower Rho aquifer, showed sulfate concentrations as low as GWRS water. This indicates approximately 100% sustained GWRS water at these two wells likely due to their proximity to MBI-1 which had the largest proportion of injection in the Lower Rho aquifer. At all other MBI Project monitoring wells with sustained GWRS arrival (SAR-10/1, SAR-10/3, SAR-10/4, SAR-11/1, SAR-11/3, SAR-13/1, SAR-13/3, and SAR-13/4), sulfate concentrations have remained relatively low and somewhat stable since arrival of GWRS water but have never completely declined to GWRS levels like for chloride; this may be due to the oxidation of iron sulfide minerals found within the aquifer matrix generating sulfate in these aquifers zones. At MBI Project monitoring wells with more recent arrival (SAR-12/3, SAR-12/4, and SAR-13/2), sulfate concentrations have continued to decline, indicating a continued increase in the proportion of GWRS water in those zones.

8.4.2 Monitoring Wells – 1,4-Dioxane and NDMA

In mid-2020, the RDL for 1,4-dioxane was lowered from 1.0 to 0.5 µg/L for both AWPF and groundwater samples analyzed by the OCWD Laboratory. As mentioned in Section 4.4.3, the revised laboratory method for 1,4-dioxane was approved by the SWRCB's Division of Water Quality (SWRCB, 2021) to comply with the updated Recycled Water Quality AWPF CEC monitoring requirements at the AWPF, incorporated as part of the latest GWRS permit Monitoring and Reporting Program (RWQCB, 2020).

During 2021, all zones at the MBI Project monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 continued to be non-detect for 1,4-dioxane, as expected since historical ambient levels at all four monitoring wells and GWRS-FPW since 2015 were all non-detect.

As discussed in Section 4.4.3, OCWD has historically monitored for NDMA in the vicinity of the Talbert Barrier for GWRS permit compliance purposes and to track the release of NDMA within the aquifers receiving injection in the late 1990s and early 2000s from WF-21. Since then, through a combination of industrial source control, appropriate polymer selection and waste stream diversion at OC San, improved NDMA rejection by RO membranes, and UV treatment, the concentration of NDMA in GWRS-FPW has been significantly reduced and historically was consistently non-detect (OCWD, 2015c).

Any NDMA precursors that pass through the RO membranes and are not inactivated by the UV/AOP process, can subsequently form NDMA downstream due to the presence of residual combined chlorine and elevated pH created during the post-treatment lime addition process (See Section 2.2.4). From 2014 to late 2015, NDMA concentrations in GWRS-FPW were increased relative to more recent years, with an average of approximately 3 ng/L and three detections above the NL of 10 ng/L with the highest being 15.8 ng/L. In late 2015, a lower pH target of 8.5 was implemented in the post-treatment process and the replacement of RO membranes began. RO membrane replacement occurred continuously and is thought to be effective in further reducing the amount of precursor passing through to the downstream processes, thus helping to limit NDMA reformation (OCWD, 2015c). From late 2015 through 2021 the average NDMA concentration in GWRS-FPW was reduced to 1.2 ng/L, with only three detections exceeding 5 ng/L (5.1 ng/L, 5.2 ng/L and 5.3 ng/L, well below the NL of 10 ng/L) resulting from weekly monitoring.

NDMA concentrations at SAR-10 for 2014-2021 are shown in the lower graph of Figure 8-4, along with NDMA concentrations for GWRS-FPW for comparison. Prior to the onset of GWRS injection at MBI-1, all four zones were consistently non-detect under ambient background conditions. Shortly after the commencement of MBI-1 injection, NDMA concentrations in all four zones of SAR-10 have been detected and varied from approximately 2 to 11 ng/L, with a maximum peak value of 10.7 ng/L in September 2015 at SAR-10/2, just slightly above the NL of 10 ng/L but well below the RL of 300 ng/L set by DDW and consistent with the slightly higher NDMA concentrations in GWRS-FPW during that time.

During 2021, NDMA concentrations in all four zones at SAR-10 ranged from below the RDL to 9.5 ng/L (Figure 8-12). NDMA concentrations at SAR-10/1 and SAR-10/2 during 2021 were similar to those during 2020 and both followed a trend of increasing slightly throughout the year from a low of approximately 3 ng/L in March to a high of approximately 6 ng/L in November. The range in NDMA concentrations at SAR-10/1 and SAR-10/2 during both 2020 and 2021 was slightly higher than the contemporaneous NDMA concentrations in GWRS-FPW and was likely caused by older GWRS water injected at MBI-1 during the 2016-2019 period migrating back to this well again due to periodic shifts in the local hydraulic gradient from injection at the MBI Centennial Park wells. At SAR-10/3, NDMA concentrations were the lowest of all zones at SAR-10, measuring non-detect throughout 2021, likely due to the relatively low percentage of GWRS water in this zone which corresponds to the swaged off screened interval at MBI-1, as confirmed by elevated sulfate concentrations relative to the other zones at SAR-10 (Figure 8-8). Similar to previous years, NDMA concentrations at SAR-10/4 during 2021 were the highest and most variable of the SAR-10 zones, reaching a historical maximum of 9.5 ng/L in June 2021, slightly higher but comparable to the previous high of 9.2 ng/L in August and October of 2015. The June 2021 NDMA peak at SAR-10/4 was likely due to a localized gradient reversal caused by mounding from the four MBI wells in Centennial Park, thus allowing older GWRS water injected at MBI-1 during 2015 with similarly high NDMA concentrations to migrate back to this well.

NDMA concentrations at SAR-11 for 2014-2021 are shown in the lower graph of Figure 8-5 along with NDMA concentrations for GWRS-FPW for comparison. As with SAR-10, all three zones at SAR-11 were consistently non-detect prior to the onset of GWRS injection at MBI-1. From the onset of injection until mid-2019, SAR-11/1 had also consistently been non-detect for NDMA but was measured just above the RDL at 2.1 ng/L in June 2019, December 2019, and March 2020, then back below the RDL through 2021. At SAR-11/2, NDMA concentrations have been detected in the 2 to 5 ng/L range intermittently since GWRS arrival in mid-2015. During 2021, NDMA concentrations at SAR-11/2 ranged from non-detect in the first half of the year to just over 2 ng/L during the second half and were generally consistent with concurrent NDMA concentrations in GWRS-FPW. Since the start of MBI-1 injection, SAR-11/3 has consistently been non-detect. Overall, the NDMA concentrations were lower at SAR-11 as compared to SAR-10 due to mixing via dispersive transport for the longer travel distance to SAR-11 and possible biodegradation.

NDMA concentrations at SAR-12 for 2018-2021 are shown in the lower graph of Figure 8-6, along with NDMA concentrations for GWRS-FPW for comparison. SAR-12/1 and SAR-12/2 have been consistently non-detect for NDMA throughout the entire monitoring period of 2018-2021, as expected for zones without GWRS arrival. SAR 12/3 had been consistently non-detect for NDMA until late July 2021 approximately four months after initial GWRS arrival, when concentrations rose to 2.5 ng/L and then up to 3.5 ng/L in early October before declining slightly to 2.3 ng/L by early November. These low NDMA concentrations at SAR-12/3 were within the range of GWRS-FPW since injection began in March 2020 at the MBI wells and were likely indicative of an increasing percentage of GWRS water arriving at this well, as confirmed by the contemporaneously decreasing chloride concentrations (Figure 8-6). SAR-12/4 had also been consistently non-detect for NDMA in prior years, until October 2021 when a one-time spike of 5.9 ng/L occurred, then not detected again for the rest of the year. Because the one-time NDMA spike at SAR-12/4 was slightly above the range of NDMA concentrations measured in GWRS-FPW since MBI Project injection began, it likely resulted from older GWRS water injected at MBI-1 during 2015-2016 arriving at this well possibly due to a temporary shift in the gradient shortly after the MBI wells came back on-line following a one-month off-line period.

NDMA concentrations at SAR-13 for 2018-2021 are shown in the lower graph of Figure 8-7, along with NDMA concentrations for GWRS-FPW for comparison. SAR-13/1 and SAR-13/2 have been consistently non-detect for NDMA throughout the entire monitoring period of 2018-2021, which despite GWRS arrival at both zones, is not surprising since chloride concentrations have remained above GWRS-FPW levels through 2021 (Figure 8-7), indicating less than 100% GWRS water sustained at these zones. At SAR-13/3, NDMA concentrations were first measured above the RDL in October 2020 and have remained consistently within the contemporaneous GWRS-FPW range of 2 to 5 ng/L through 2021, indicating sustained near 100% GWRS water and confirmed by low chloride concentrations of approximately 5 mg/L similar to GWRS-FPW (Figure 8-7). Similarly at SAR-13/4, NDMA was first detected above the RDL in late June 2020 at 2.6 ng/L and remained relatively stable for the remainder of 2020. During 2021, NDMA concentrations at SAR-13/4 remained relatively stable and ranged from 3 ng/L to 4.2 ng/L, except for a one-time slight drop to 2.6 ng/L in early September near the end of the extended MBI off-line period, consistent with the contemporaneous chloride increase at this well (Figure 8-7). As previously discussed in Section 8.4.1, the chloride increase in late August and early September at SAR-13/4 was likely due to a small percentage of ambient groundwater temporarily arriving at this well during the off-line period due to the fast flow path within the Main 7 aquifer in the MBI Project area.

8.4.3 Monitoring Wells - Arsenic

As previously documented, the mobilization of arsenic from aquifer sediments has been observed at some locations downgradient of GWRS water injected at the Talbert Barrier and percolated in K-M-M-L Basins in the Anaheim Forebay area. Figure 8-12 and Figure 8-13 show dissolved arsenic and chloride concentrations during 2015-2021 for SAR-10 and SAR-11, respectively, and Figure 8-14 and Figure 8-15 show dissolved arsenic and chloride concentrations during 2018-2021 for SAR-12 and SAR-13, respectively. Dissolved arsenic is shown in these figures rather than total arsenic because total arsenic was only sampled quarterly for compliance whereas dissolved arsenic was sampled much more frequently along with chloride. At SAR-10 and SAR-11 dissolved arsenic was sampled at the following intervals: monthly prior to MBI-1 injection; biweekly thereafter for the remainder of 2015; monthly during the first three quarters of 2016; and then quarterly thereafter. At SAR-12 and SAR-13 dissolved arsenic was sampled at the following intervals: quarterly from March 2018 to November 2020; biweekly until early November 2021; and then quarterly beginning in December 2021. The dissolved arsenic concentrations were found to be consistent with and nearly equal to the quarterly total arsenic concentrations. Therefore, for the discussion that follows, dissolved arsenic will be referred to simply as arsenic.

At SAR-10, Figure 8-12 shows that the pre-injection ambient background arsenic concentration ranged from below the RDL of 1 µg/L to 2.5 µg/L for all four zones. With the arrival of GWRS water, arsenic concentrations increased along with the contemporaneous decline in chloride

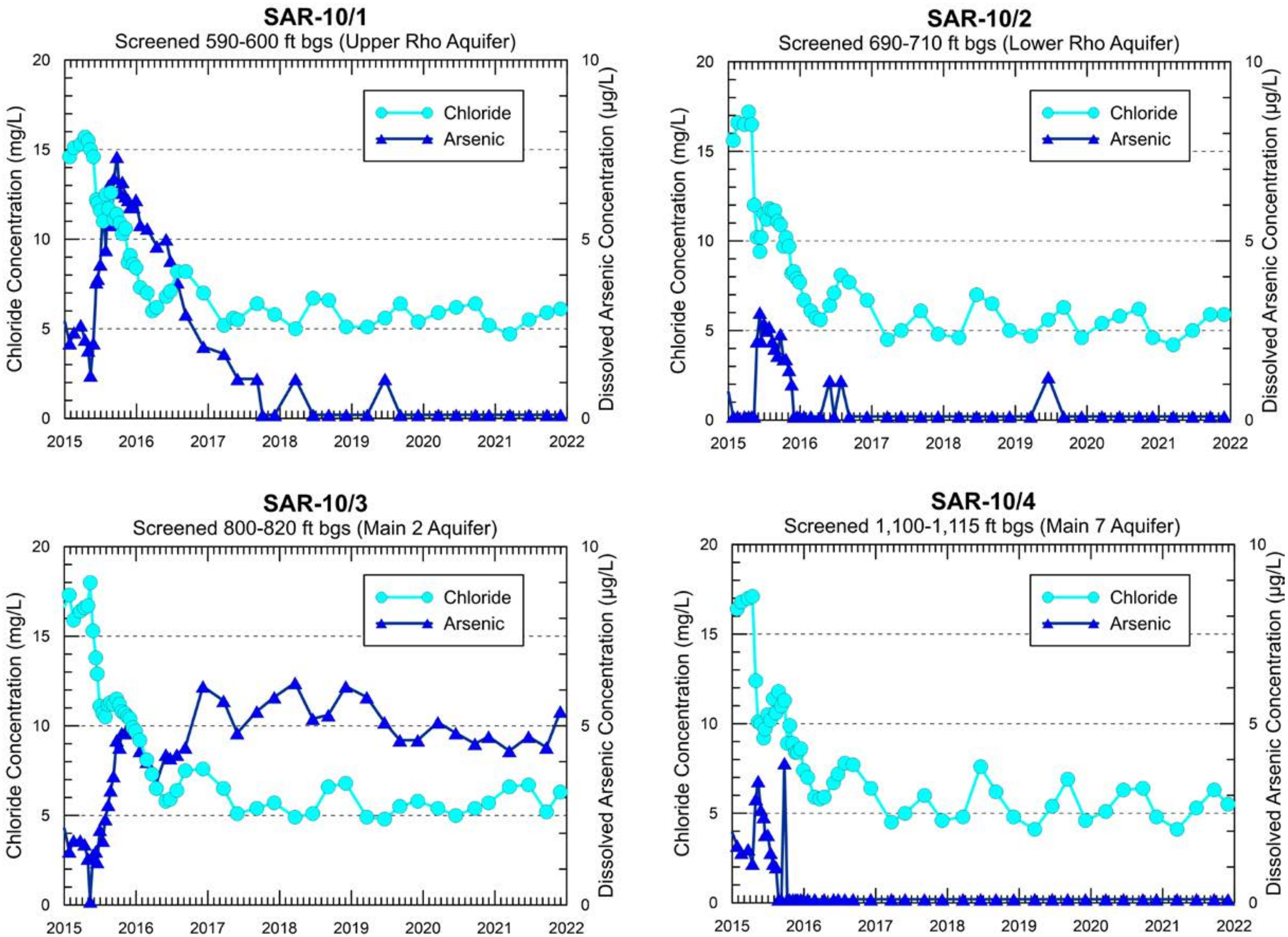
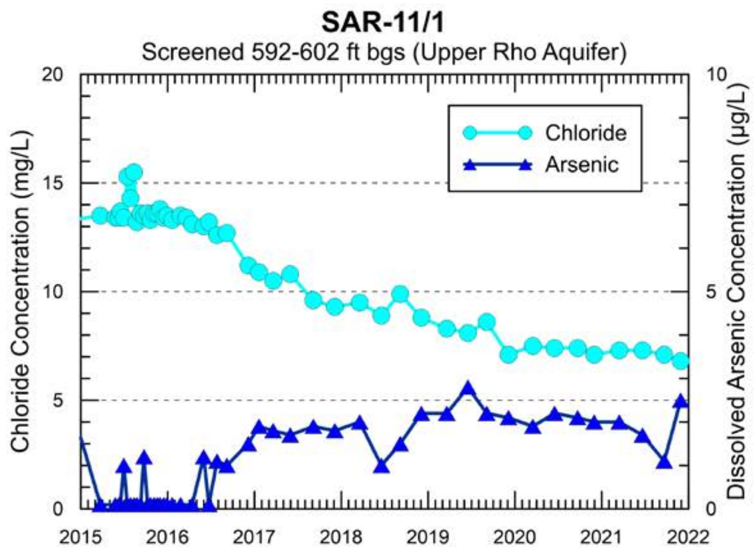
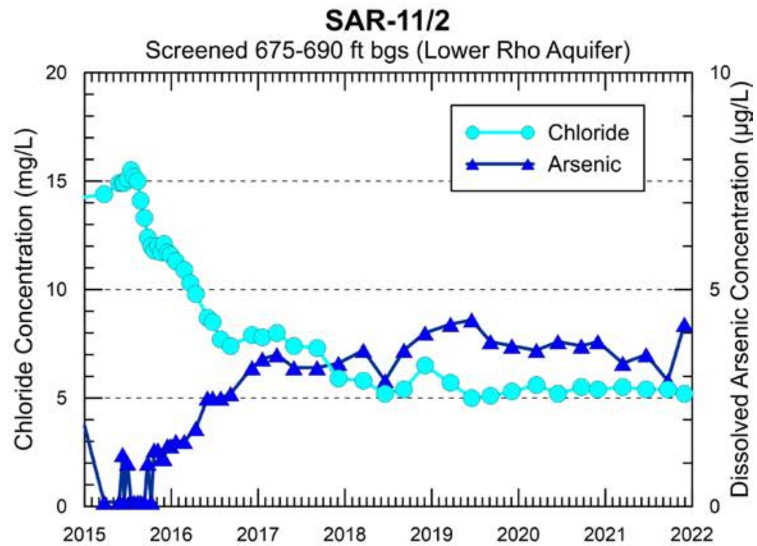


Figure 8-12. Monitoring Well SAR-10 Chloride and Dissolved Arsenic Concentrations





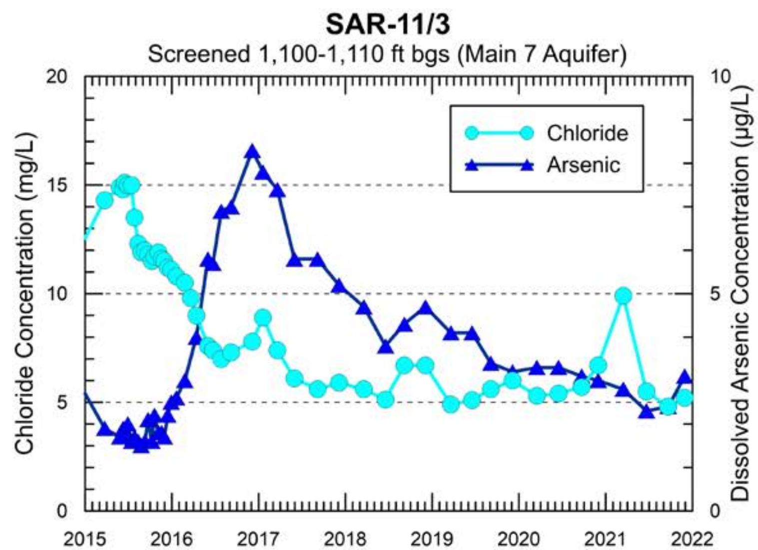


Figure 8-13. Monitoring Well SAR-11 Chloride and Dissolved Arsenic Concentrations

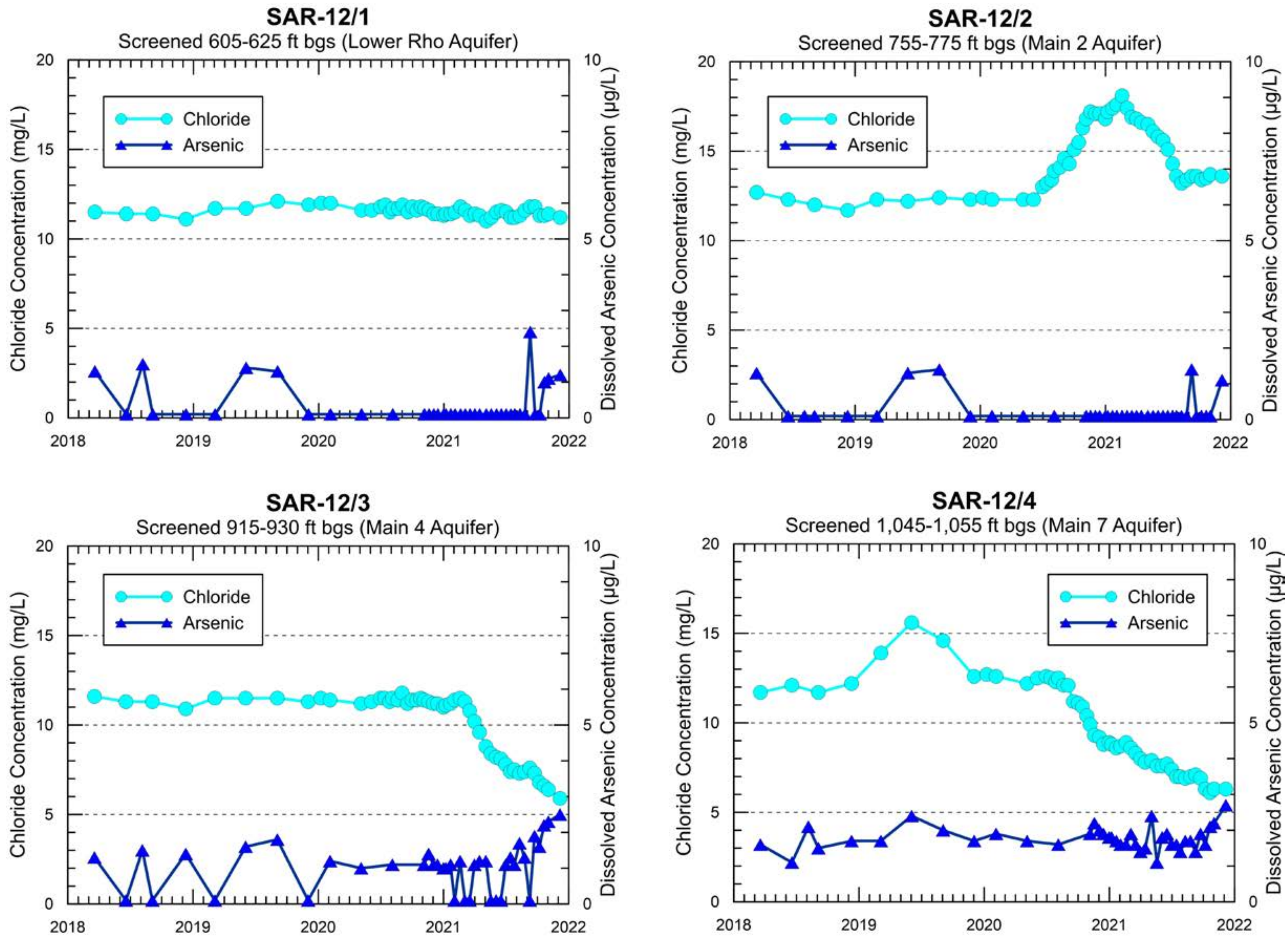


Figure 8-14. Monitoring Well SAR-12 Chloride and Dissolved Arsenic Concentrations

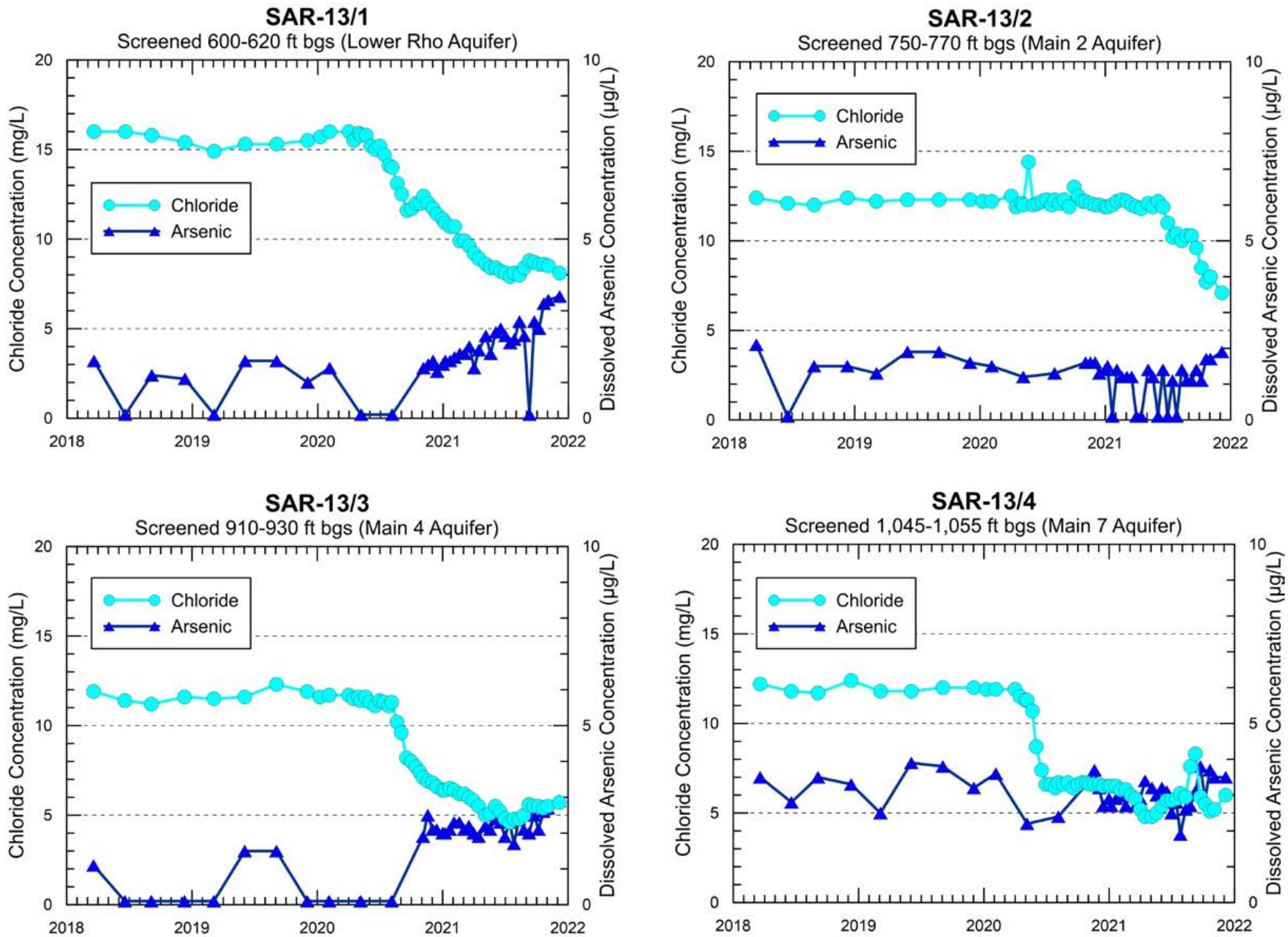


Figure 8-15. Monitoring Well SAR-13 Chloride and Dissolved Arsenic Concentrations

concentrations like what was observed in the Anaheim Forebay (Section 6.4.3). At SAR-10/1, SAR-10/2, and SAR-10/4, Figure 8-12 shows that arsenic concentrations peaked in late 2015 but remained below the MCL of 10 µg/L and have since gradually declined below pre-injection ambient levels due to arsenic mass removal from the sustained presence of 100% GWRS water. A more detailed discussion of arsenic trends from 2015-2019 at SAR-10 and SAR-11 can be found in Section 8.4.3 of the 2019 Annual Report. During 2020-2021, arsenic concentrations at SAR-10/1, SAR-10/2, and SAR-10/4 remained below the RDL of 1 µg/L (Figure 8-12). At SAR-10/3, arsenic concentrations increased after the first arrival of GWRS water in 2015 and remained elevated above pre-injection ambient background levels but well below the MCL of 10 µg/L through 2021 (Figure 8-12). As was previously discussed in Section 8.4.1 for SAR-10/3, although chloride concentrations were down at GWRS levels, sulfate concentrations of approximately 10 to 12 mg/L during 2016-2021 (Figure 8-8) were higher than those in GWRS-FPW and may indicate the oxidation of iron sulfide minerals; this may indicate a somewhat different geochemical environment for mobilization compared to other zones at SAR-10.

At SAR-11, Figure 8-13 shows that the pre-injection ambient background arsenic concentrations were consistent with those at SAR-10, ranging from below the RDL to 3.0 µg/L for all three zones. At SAR-11/1 and SAR-11/2, arsenic concentrations gradually increased from 2016 to mid-2019 to slightly above ambient levels but well below the MCL of 10 µg/L. Arsenic concentrations at SAR-11/1 and SAR-11/2 gradually decreased from mid-2019 to the third quarter of 2021 before experiencing a slight increase in the fourth quarter of 2021, possibly related to the one-month MBI shutdown from mid-August to mid-September. At SAR-11/3, arsenic concentrations peaked at approximately 8 µg/L in late 2016 and have since gradually declined, except for a subtle increase in the fourth quarter of 2021 similar to SAR-11/1 and SAR-11/2. During 2021, arsenic concentrations remained relatively low overall at slightly above ambient concentrations in all three zones at SAR-11, ranging from just above the RDL at 1.1 µg/L to 4.2 µg/L. (Figure 8-13).

At SAR-12, Figure 8-14 shows that the pre-injection ambient background arsenic concentrations were consistent with those at SAR-10 and SAR-11, ranging from below the RDL to 2.4 µg/L for all four zones. At SAR-12/1 and SAR-12/2, Figure 8-14 shows that arsenic concentrations remained at ambient background levels during 2020-2021 since no GWRS water has arrived at these zones. At SAR-12/3, where GWRS water arrived in early April 2021, arsenic concentrations increased steadily from August 2021 through the end of the year but remained within the ambient range until reaching just above ambient at 2.5 µg/L in December. At SAR-12/4, where GWRS water arrived in mid-September 2020, arsenic concentrations remained relatively stable at ambient background levels throughout the first three quarters of 2021 until gradually increasing in the fourth quarter to just above ambient levels at 2.7 µg/L in December. At both SAR-12/3 and SAR-12/4, the slight increase in arsenic concentrations during late 2021 were consistent with the contemporaneous decline in chloride concentrations at these two wells down to near GWRS levels (Figure 8-14), indicating an increasing proportion of GWRS water at these two wells nearing 100% for the first time.

Figure 8-15 shows that the pre-injection ambient background arsenic concentrations at SAR-13/1, SAR-13/2, and SAR-13/3 were consistent with those at all other MBI Project monitoring wells, while the pre-injection ambient background arsenic concentrations at SAR-13/4 were elevated relative to all others, ranging from 2.5 to 3.9 µg/L. Figure 8-15 shows that at SAR-13/1, where GWRS water arrived in mid-August 2020, arsenic concentrations began to gradually increase in early 2021, reached above background levels in March, and rose steadily throughout the rest of the year to a maximum of 3.4 µg/L in December. At SAR-13/2, where GWRS water arrived in early July 2021, arsenic concentrations began an apparent trend upward during the last three months of the year but remained within the range of background levels, once again consistent with the contemporaneous decline in chloride concentrations indicating an increasing percentage of GWRS water arriving at this well. At SAR-13/3, where GWRS water arrived in mid-August 2020, arsenic concentrations increased slightly in late 2020 from below the RDL to 2.6 µg/L in November 2020, then remaining relatively stable throughout most of 2021 before slightly increasing to 2.9 µg/L in December, consistent with the contemporaneous chloride decline in late 2020 that stabilized at low GWRS-FPW concentrations during the last three quarters of 2021 and indicating sustained arrival of approximately 100% GWRS water at this well. At SAR-13/4, where GWRS water arrived in mid-May 2020, arsenic concentrations remained relatively stable within background levels during 2021, ranging from below the RDL to 3.8 µg/L, despite contemporaneous chloride concentrations remaining low at or just slightly above GWRS-FPW levels.

The source of the arsenic release in the MBI Project area is likely the oxidation of iron sulfide minerals, such as pyrite, which was detected in some aquifer sediment samples collected from the DMBI Project well borings. Arsenic is known to associate with pyrite and can be released into the aqueous phase during oxidation by introducing oxidized GWRS water into a geochemically reduced aquifer, as measured by oxidation-reduction potential (ORP). Prior to the arrival of GWRS water, all MBI Project monitoring well zones showed negative ORP, while GWRS water has positive ORP. However, the oxidation of pyrite can also create hydroferrous oxide (HFO) coatings to the aquifer mineral surfaces. These HFOs can provide additional sorption sites for arsenic and other species that are controlled by pH and other geochemical factors, thereby limiting the extent of mobilization. This geochemistry may help limit arsenic mobilization and may also help to explain sulfate concentrations in some of the zones at MBI Project monitoring wells (SAR-10/1, SAR-10/3, SAR-10/4, SAR-11/1, SAR-11/3, SAR-13/3, and SAR-13/4) never declining as low as GWRS-FPW levels despite more conservative chloride concentrations indicative of 100% GWRS water.

8.4.4 Monitoring Wells - Vanadium

Vanadium is regulated as a NL and RL contaminant in drinking water by DDW, with a NL of 50 µg/L and a RL of 500 µg/L. There is no state or Federal MCL for vanadium. The basis for the DDW NL and RL is a memo in 2000 from the California Office of Environmental Health Hazard Assessment to DDW (then within the California Department of Health Services), which cites non-cancer endpoints related to developmental and reproductive effects in rats (DDW, 2015; OCWD, 2015c). Vanadium typically displays redox behavior similar to chromium, generally portioning strongly onto solids under reducing conditions and more weakly under oxidizing conditions.

Minor mobilization of vanadium has been previously observed with the arrival of GWRS water in the subsurface at a few monitoring wells near the Talbert Barrier and Anaheim Forebay, but all increases were temporary and remained well below the NL of 50 µg/L. Figure 8-16 and Figure 8-17 show dissolved vanadium and chloride concentrations during 2015-2021 for SAR-10 and SAR-11, respectively, and Figure 8-18 and Figure 8-19 show dissolved vanadium and chloride concentrations during 2018-2021 for SAR-12 and SAR-13, respectively. As with arsenic discussed above, dissolved vanadium was used in Figure 8-16, Figure 8-17, Figure 8-18, and Figure 8-19 rather than total vanadium because of the more frequent sampling for dissolved vanadium. At SAR-10 and SAR-11 sampling for dissolved vanadium was conducted monthly prior to MBI-1 injection, biweekly for the remainder of 2015, monthly during the first three quarters of 2016, and quarterly thereafter. At SAR-12 and SAR-13 sampling for dissolved vanadium was conducted quarterly from March 2018 to November 2020, biweekly from November 2020 until early November 2021, then quarterly beginning in December 2021. Dissolved vanadium concentrations were found to be consistent with and nearly equal to the quarterly total vanadium compliance samples. As such, for the discussion that follows, dissolved vanadium will be referred to simply as vanadium. In all zones at the MBI Project monitoring wells, pre-injection ambient background vanadium concentrations ranged from below the RDL of 1 µg/L to approximately 6 µg/L.

At SAR-10, Figure 8-16 shows that each of the four zones had different vanadium concentration responses with the arrival of GWRS water, likely resulting from variations in mineral composition of the sediments comprising each of the screened aquifers. During 2021, vanadium concentrations at all zones of SAR-10 were measured at or below ambient background concentrations throughout the year. A more detailed discussion of vanadium trends from 2015-2019 at SAR-10 and SAR-11 can found in Section 8.4.4 of the 2019 GWRS Annual Report.

At SAR-10/1, vanadium concentrations have gradually declined from their peak in mid-2016 and during 2021 ranged from 2.1 to 3.7 µg/L, slightly less than ambient concentrations of approximately 5 µg/L at this well. At SAR-10/2, vanadium concentrations peaked in mid-2015 and have since gradually declined and remained stable at just over 2 µg/L during 2021, also below ambient concentrations of approximately 4 µg/L. As was discussed previously for arsenic, mass

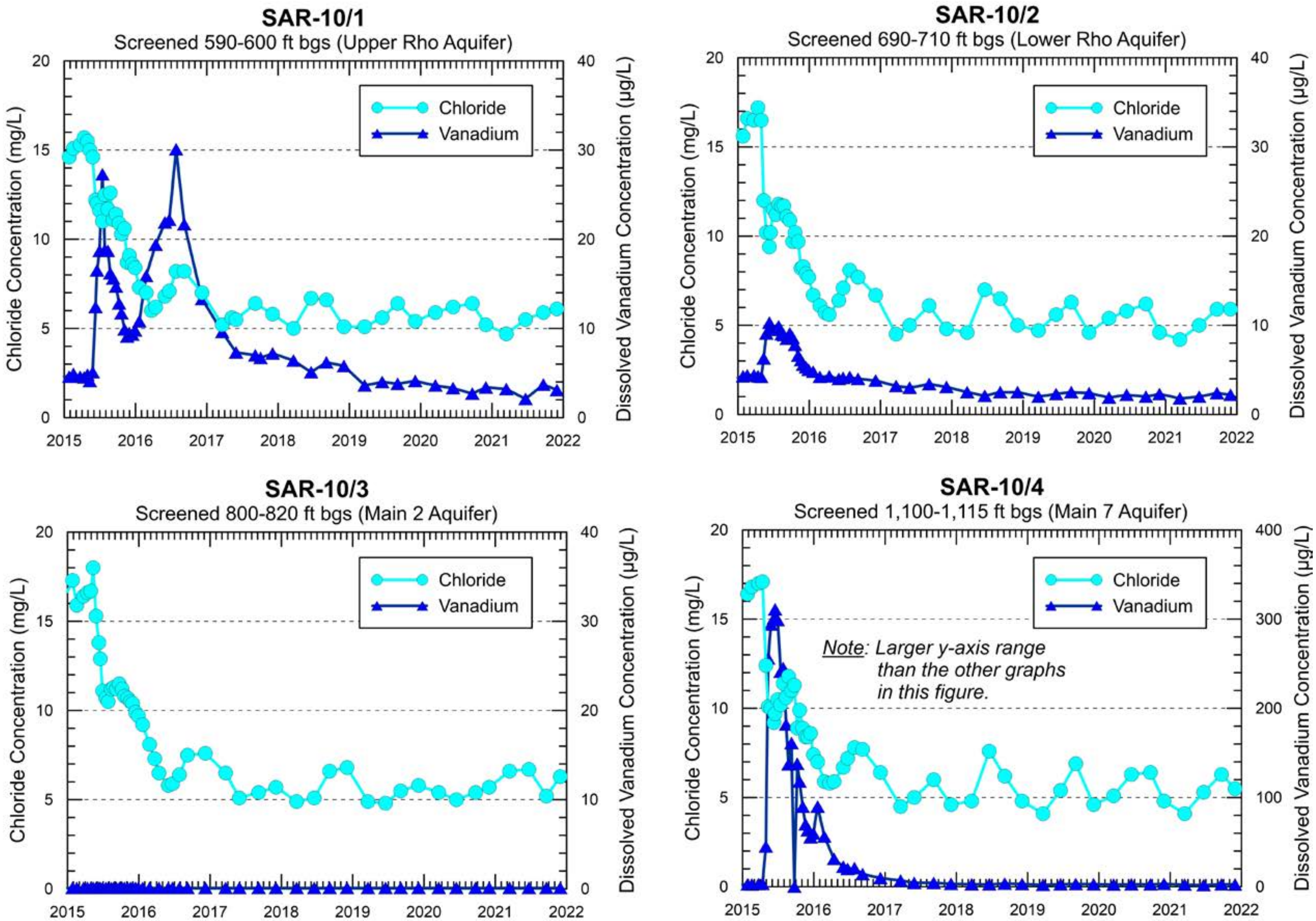


Figure 8-16. Monitoring Well SAR-10 Chloride and Dissolved Vanadium Concentrations

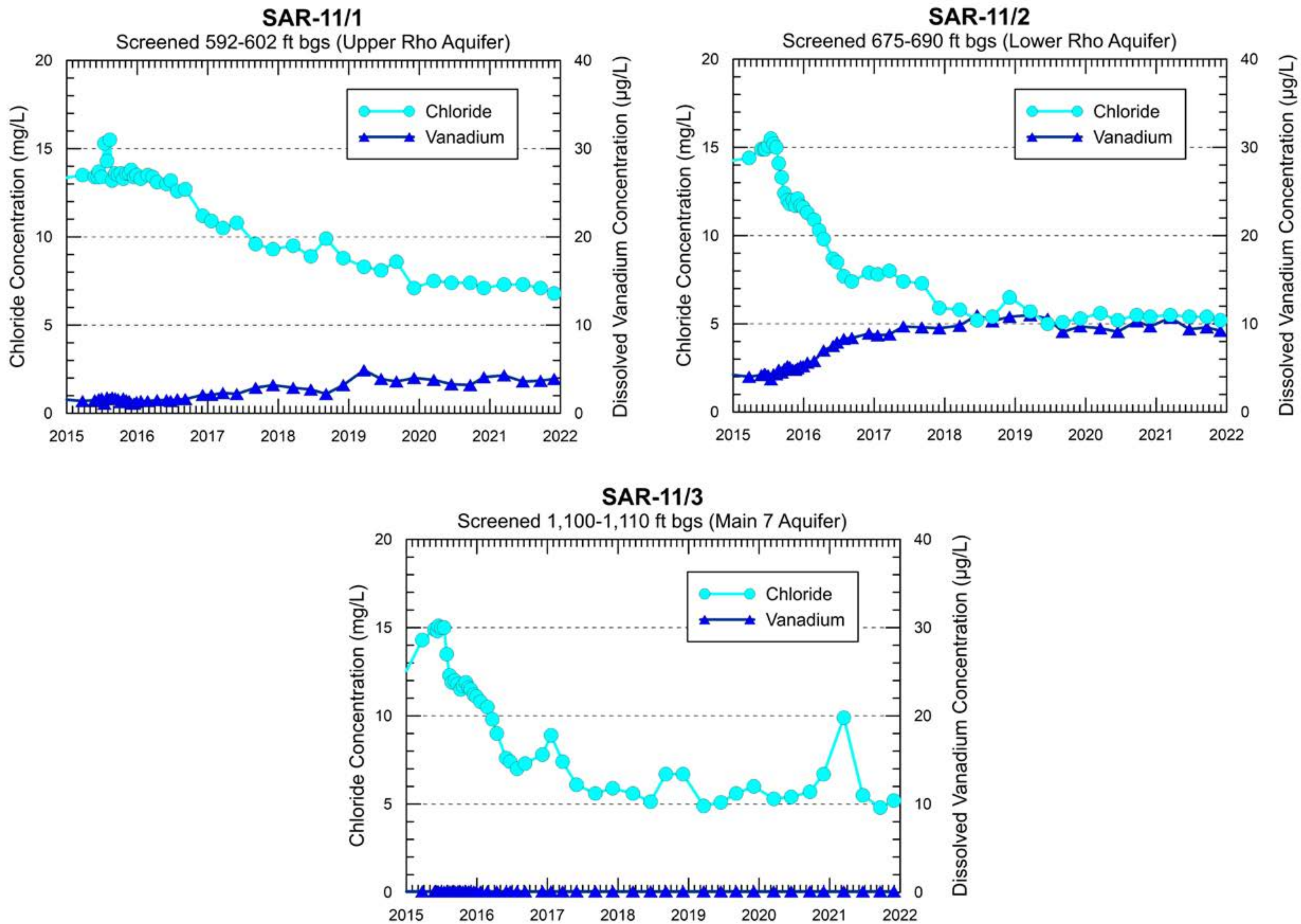


Figure 8-17. Monitoring Well SAR-11 Chloride and Dissolved Vanadium Concentrations

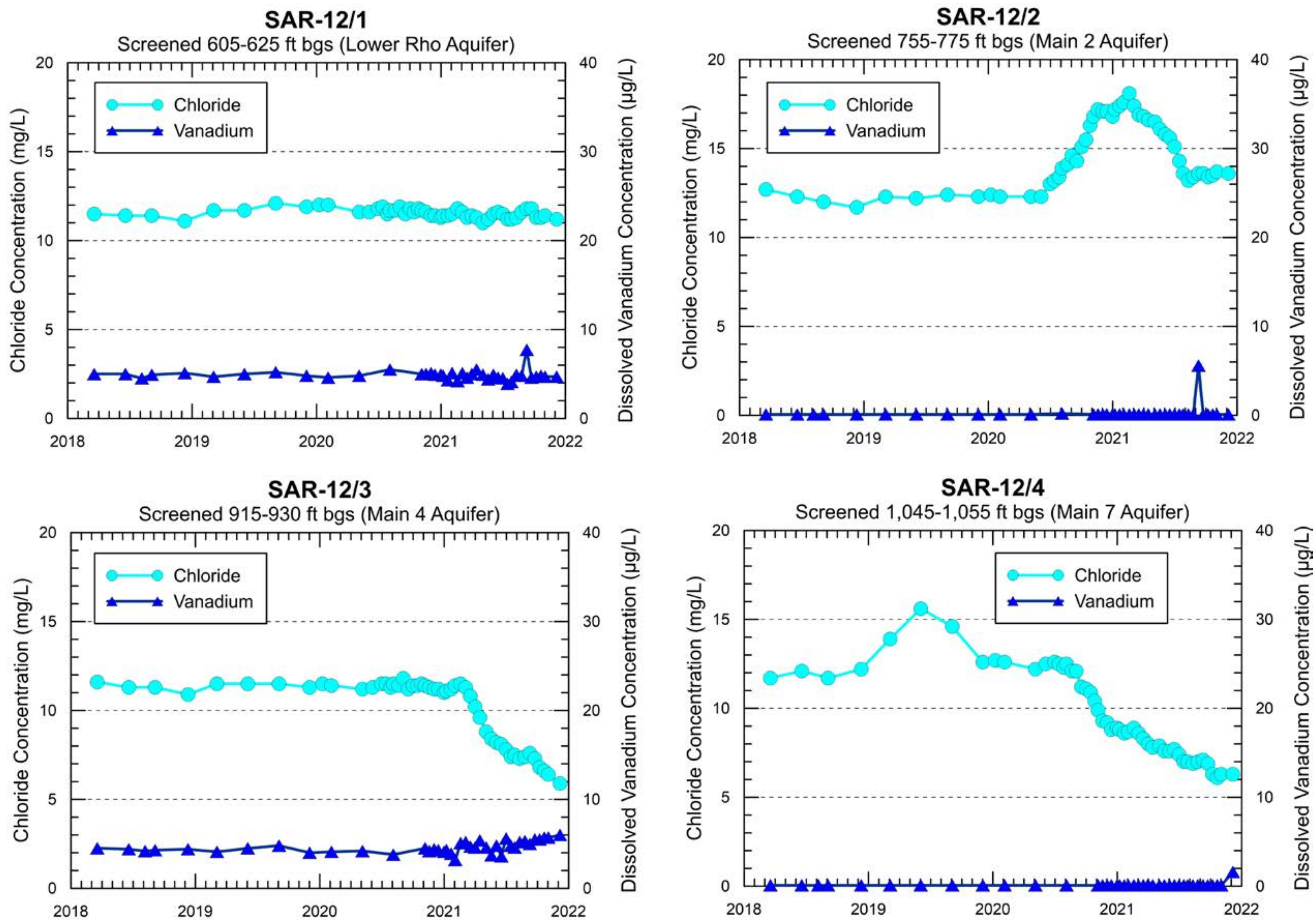


Figure 8-18. Monitoring Well SAR-12 Chloride and Dissolved Vanadium Concentrations

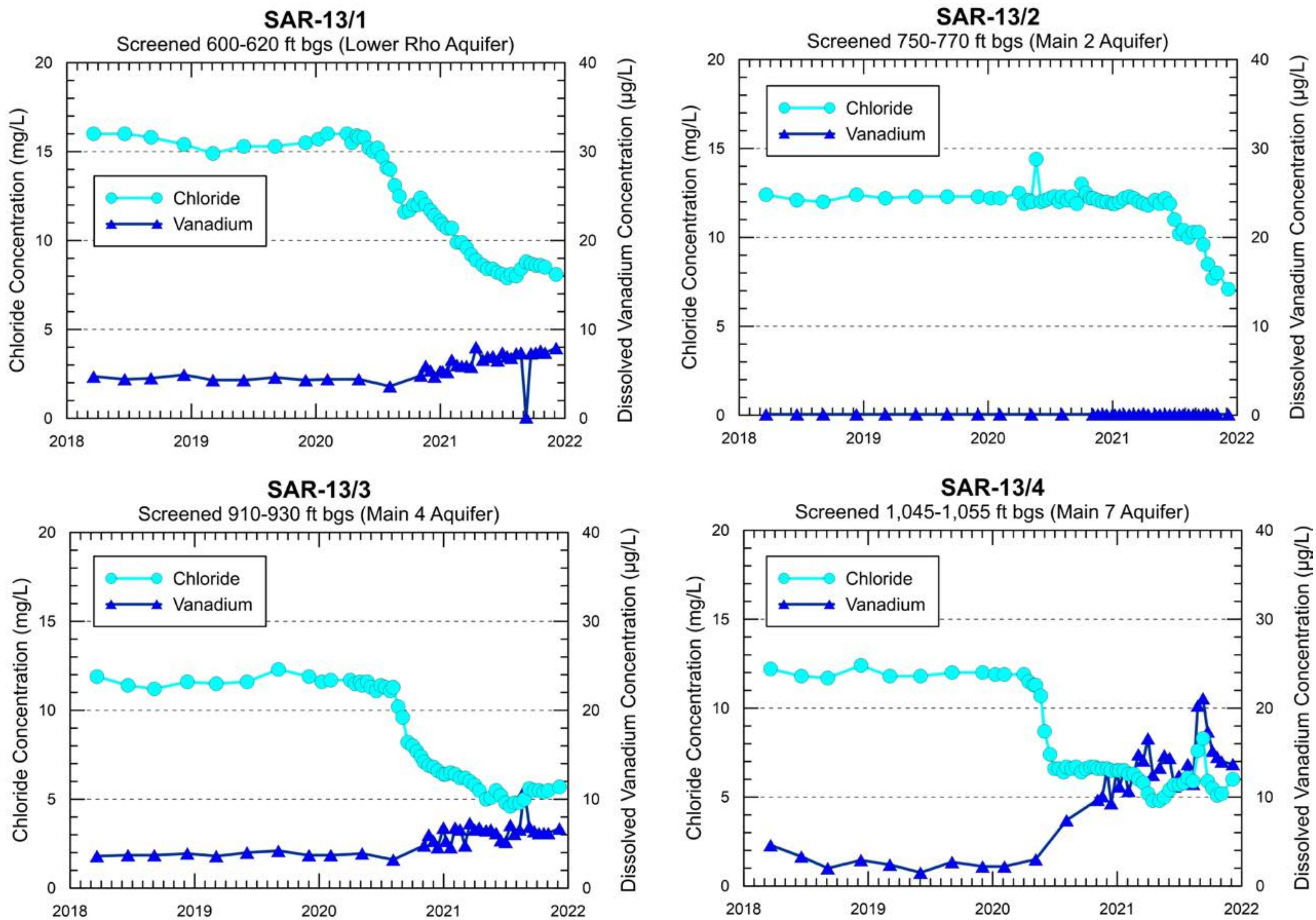


Figure 8-19. Monitoring Well SAR-13 Chloride and Dissolved Vanadium Concentrations

removal of vanadium due to the sustained arrival of 100% GWRS water likely caused vanadium concentrations to equilibrate to below ambient levels at this well. At SAR-10/3, vanadium concentrations have remained below the RDL of 1 µg/L both before and after the arrival of GWRS water and through 2021 (Figure 8-16). At SAR-10/4, vanadium concentrations displayed the most significant increase with the arrival of GWRS water, rising sharply from a pre-injection background of approximately 3 µg/L to a maximum of 311 µg/L (above the NL but below the RL) in June 2015 (Figure 8-16). Since that time, vanadium concentrations have asymptotically declined to pre-injection ambient levels, ranging from 1.8 to 2.8 µg/L during 2021. As was similarly discussed for arsenic, the declining vanadium trends during sustained GWRS arrival are primarily due to vanadium mass removal.

At SAR-11/1 (Figure 8-17), vanadium concentrations gradually rose from 2015 to a mild peak of 4.9 µg/L in early 2019 before decreasing slightly to approximately 4 µg/L for the remainder of the year and remaining stable through 2021. At SAR-11/2 (Figure 8-17), vanadium concentrations gradually rose from 2015 to a subtle peak of approximately 11 µg/L in early 2019, before decreasing slightly and remaining stable at approximately 9 to 11 µg/L during 2021 as 100% GWRS water was sustained at this well since early 2019 based on low stable chloride concentrations. At SAR-11/3 (Figure 8-17), vanadium concentrations have remained below the RDL of 1 µg/L both before and after the arrival of GWRS water and through 2021.

At SAR-12/1 (Figure 8-18), which has not shown GWRS arrival, vanadium concentrations have remained at background ambient levels ranging from below the RDL to approximately 6 µg/L from the beginning of the monitoring period in 2018 through 2021, except for a one-time small spike of 7.7 µg/L in September 2021. Similarly, SAR-12/2 has not shown GWRS arrival and vanadium concentrations have also consistently remained at ambient background concentrations below the RDL of 1 µg/L through 2021, also with the exception of a one-time small spike of 5.6 µg/L in September 2021. The two one-time small vanadium increases above background ambient levels recorded at SAR-12/1 and SAR-12/2 during September 2021 were not likely due to GWRS metals mobilization since no GWRS arrival has been observed at these wells based on chloride and sulfate concentrations (Figure 8-10) but may relate to a shift in the gradient related to the one-month MBI shutdown from mid-August to mid-September. At SAR-12/3 (Figure 8-18), where GWRS water arrived in early April 2021, vanadium concentrations increased slightly in August 2021, then continued to rise gradually throughout the year, reaching 6.0 µg/L in December, consistent with contemporaneously decreasing chloride concentrations approaching those of GWRS-FPW. At SAR-12/4 (Figure 8-18), where GWRS water arrived in mid-September 2020, vanadium concentrations remained at background ambient levels of below the RDL since 2018 until one detection of 1.6 µg/L in December 2021.

Figure 8-19 shows that at SAR-13/1 and SAR-13/3, where GWRS water arrived in mid-August 2020, vanadium concentrations began a steady increase above ambient background levels in November 2020 and reached maximums of 7.9 µg/L at SAR-13/1 in December 2021 and 11.0 µg/L at SAR-13/3 in August 2021, both likely attributable to the arrival of an increasing percentage of GWRS water based on contemporaneously declining chloride concentrations. At SAR-13/2 (Figure 8-19), where GWRS water arrived in early July 2021, vanadium concentrations have remained at ambient background concentrations of below the RDL of 1 µg/L from the beginning of the monitoring period in 2018 through 2021. At SAR-13/4 (Figure 8-19), vanadium concentrations began increasing shortly after GWRS arrival in May 2020, reached a maximum of 21.1 µg/L in September 2021, then declined throughout the rest of the year down to 13.7 µg/L in December. The increased vanadium concentrations at SAR-13/4 during 2020 and 2021 were attributed to the sustained near-100% GWRS arrival seen at this well based on chloride concentrations remaining at or just above GWRS-FPW levels (Figure 8-19). The brief peak and subsequent decline in vanadium concentrations at SAR-13/4 in late 2021 may be related to the one-month MBI shutdown from mid-August to mid-September which may have brought a small amount of ambient groundwater briefly to this well as evidenced by the contemporaneous chloride spike, which may have caused a brief adsorption and subsequent desorption of vanadium after MBI injection resumed. The subsequent decline in vanadium concentrations after the brief peak at the end of 2021 was likely due to mass removal with the return of sustained near-100% GWRS arrival.

Overall, vanadium concentrations at the MBI Project monitoring wells remained well below the NL during 2021 but indicated that some mobilization can occur to varying degrees due to mineral dissolution by GWRS water. However, the lack of a more significant increase in vanadium concentrations at those zones with GWRS arrival at SAR-11, SAR-12 and SAR-13 indicated that the greater mobilization observed at SAR-10/4 in 2015 was likely a localized one-time effect.

8.4.5 Aluminum

Aluminum is regulated via a California primary and secondary MCL of 1,000 µg/L and 200 µg/L, respectively, as well as a PHG of 600 µg/L. Prior to the onset of MBI-1 injection, total aluminum concentrations at SAR-10/1 ranged from 4.5 to 83.7 µg/L. With the arrival of GWRS water in June 2015, total aluminum concentrations at SAR-10/1 increased and were mostly above the Secondary MCL (Figure 8-20). During 2017, total aluminum at SAR-10/1 increased during the first quarter sampling event to a one-time peak value of 4,070 µg/L, before dropping back below the primary MCL for the remainder of the year, then below the secondary MCL and almost to ambient background levels in the first quarter of 2018. Total aluminum concentrations at SAR-10/1 remained at or just above ambient background concentrations from 2018 until another temporary increase above the secondary MCL in June and September of 2020, attributed to a three-week period during April and May 2020 when injection was suspended at MBI-1 due to a planned AWPF shutdown. The extended stop and then restart of GWRS injection at MBI-1 may have allowed native groundwater to move into and then back out of the SAR-10/1 zone, causing an adsorption and subsequent desorption of aluminum. After several months of sustained injection at MBI-1, total aluminum concentrations at SAR-10/1 dropped below the secondary MCL again to 90.0 µg/L in November 2020, then increased above the secondary MCL again to 829 µg/Lin mid-March 2021, consistent with a contemporaneously subtle chloride decrease to GWRS-FPW levels indicating the return of 100% GWRS arrival at this well.

At SAR-10/2 and SAR-10/3, Figure 8-20 shows no increase in total aluminum with the arrival of GWRS water and only a slight and gradual increase in dissolved aluminum at SAR-10/2 that has remained well below the Secondary MCL.

Figure 8-20 shows no increase in total or dissolved aluminum at any of the zones at SAR-11 with the arrival of GWRS water.

Figure 8-21 shows total and dissolved aluminum concentrations at monitoring wells SAR-12 and SAR-13 for 2018-2021. At SAR-12/1, SAR-12/3 and SAR-12/4, ambient background total aluminum concentrations were in the range of those at SAR-10 and SAR-11 where they remained after the onset of MBI Project injection and through 2021. At SAR-12/2, ambient background total aluminum concentrations in 2018 and 2019 were elevated and more varied relative to those of SAR-10 and SAR-11 but remained low and stable after the onset of MBI Project injection in 2020 and through 2021.

Figure 8-21 shows that ambient background total aluminum concentrations at all zones at SAR-13 were elevated and more varied relative to those of SAR-10 and SAR-11. At SAR-13/1 and SAR-13/3, total aluminum concentrations did not increase above background ambient levels at any time from when GWRS water arrived at both zones in mid-August 2020 through 2021. At SAR-13/4, a very slight increasing trend of total aluminum was observed beginning in August 2020 and rose to 11.8 µg/L in November 2020 but remained well below the 2018 ambient background levels through 2021. At SAR-13/2, total aluminum concentrations increased to a one-time spike of 68.2 µg/L in November 2020, but with no GWRS arrival observed at SAR-13/2 prior to July 2021, the elevated one-time spike was likely an ambient background concentration as it was only marginally higher than the ambient concentration of 50 µg/L in early 2018. During 2021, total aluminum concentrations at SAR-13/2 remained low at ambient background levels, ranging from 2.5 to 12.1 µg/L throughout the year.

As displayed on Figure 8-20 and Figure 8-21, no other MBI monitoring well zones at SAR-10, SAR-11, SAR-12, or SAR-13 have exhibited comparably significant increases in total aluminum as those observed at SAR-10/1, indicating a localized effect. In contrast to the SAR-10/1 results, the SAR-11/1 (equivalent aquifer interval at the downgradient monitoring well site) has displayed no increases in total aluminum with the arrival of GWRS water, with concentrations ranging from 2 to 16 µg/L, similar to pre-injection conditions. Furthermore, dissolved aluminum concentrations at SAR-10/1 have been much lower than those for total aluminum, ranging from 4.4 to 23.6 µg/L since GWRS water arrival in June 2015, featuring only a subtle increase from the pre-injection

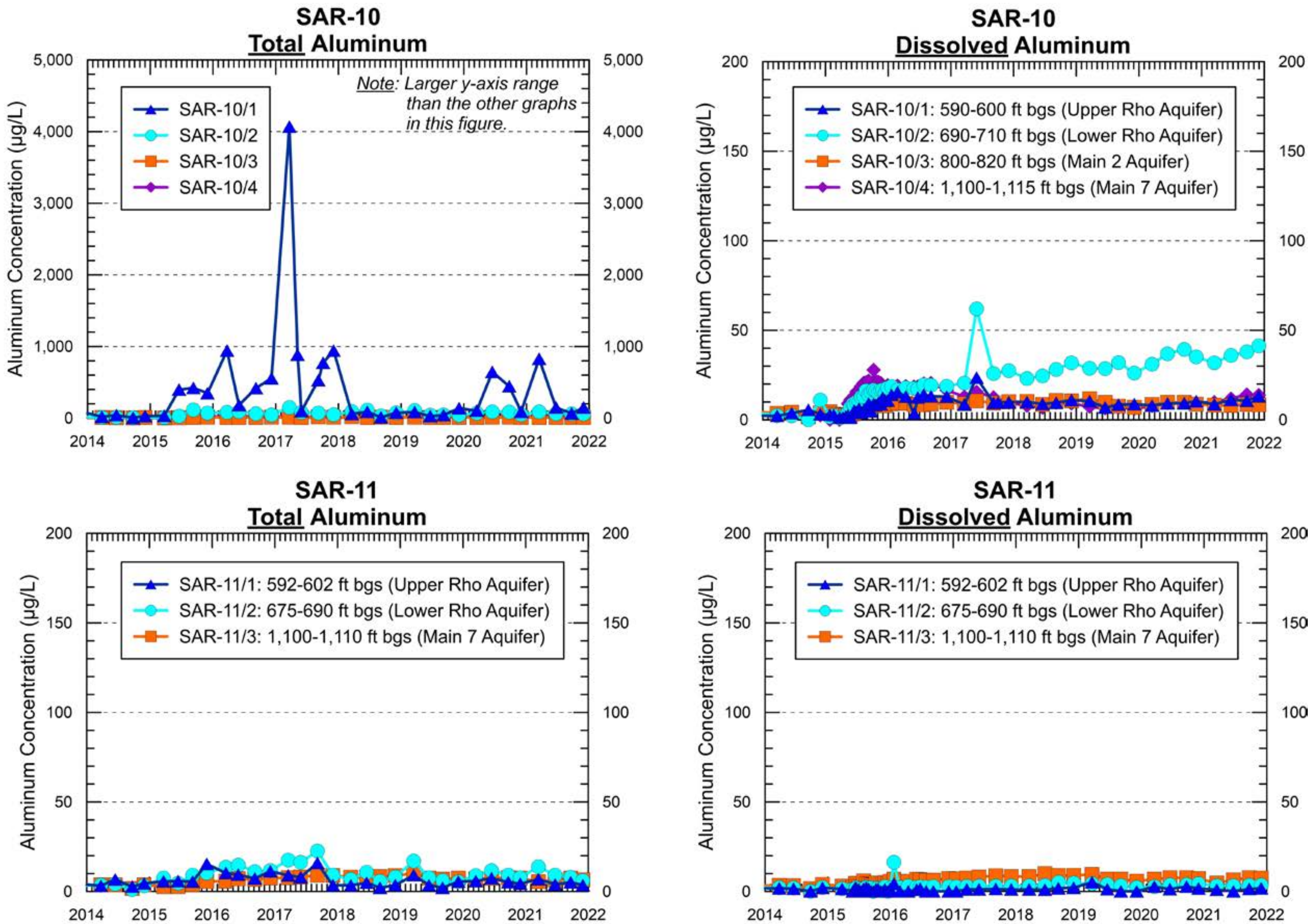
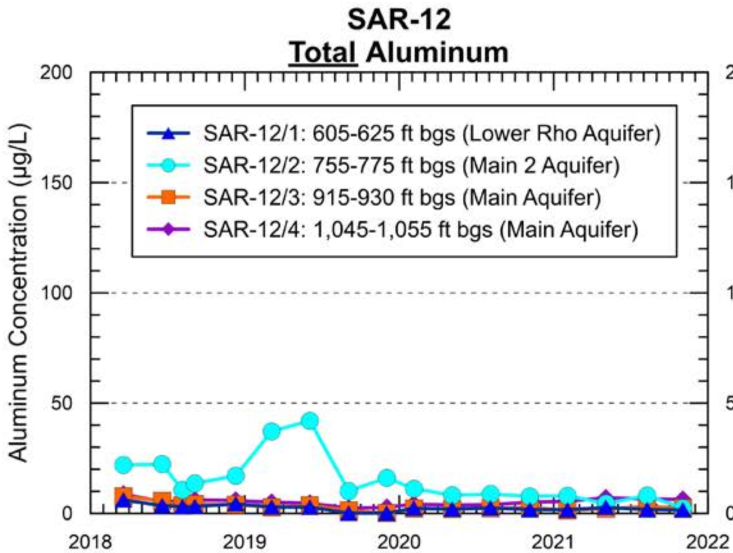
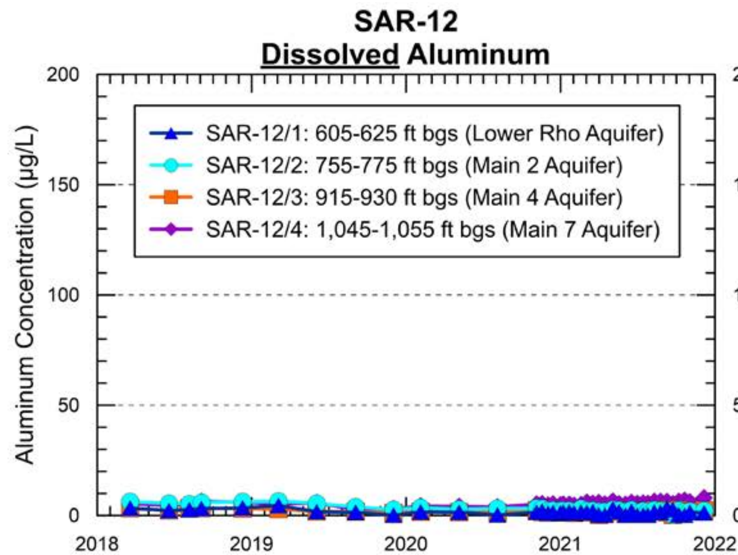
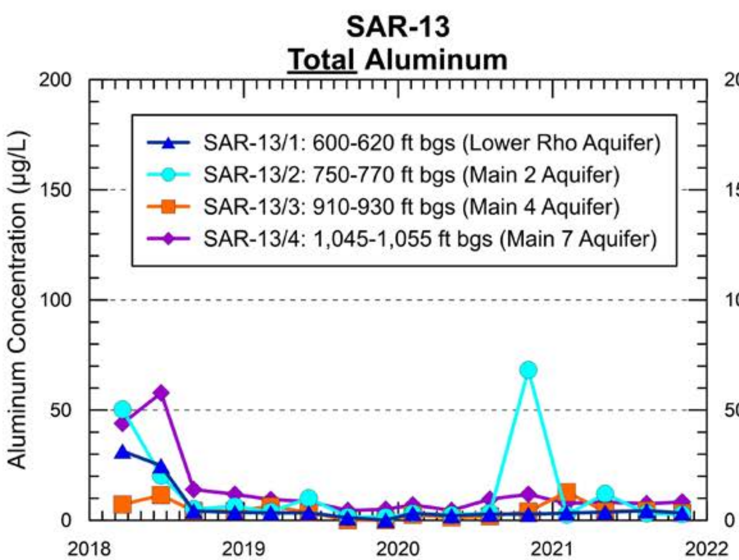


Figure 8-20. Monitoring Wells SAR-10 and SAR-11 Total and Dissolved Aluminum Concentrations







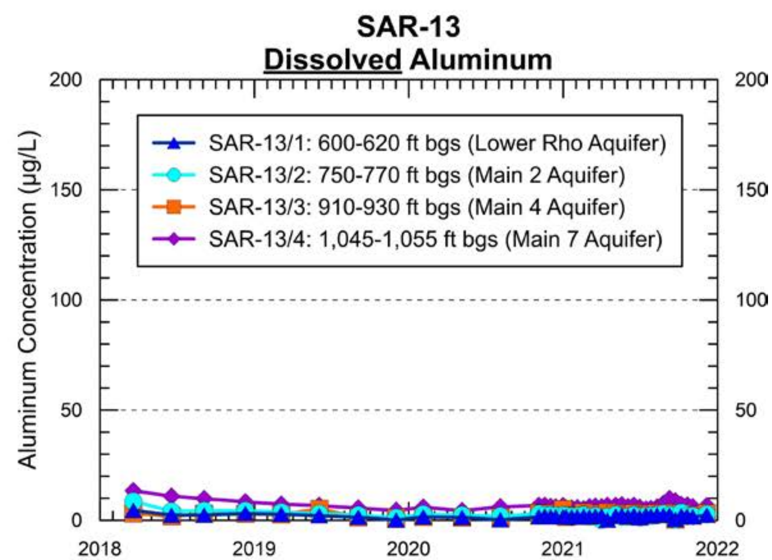


Figure 8-21. Monitoring Wells SAR-12 and SAR 13 Total and Dissolved Aluminum Concentrations

background conditions (Figure 8-20); the lower dissolved aluminum concentrations indicated that localized particle association was contributing to the elevated total aluminum concentrations, potentially due to pH-mediated aluminum hydroxide dissolution from the SAR-10/1 aquifer zone.

8.4.6 Iron

Iron is regulated via a California and Federal Secondary MCL, both set at 300 µg/L. Total iron concentrations at SAR-10/1 have followed a nearly identical trend as total aluminum since June 2015 and also peaked contemporaneously with aluminum in the first quarter of 2017 to 1,860 µg/L, well above the Secondary MCL. During 2021, total iron concentrations at SAR-10/1 twice exceeded the Secondary MCL, with a result of 380 µg/L in mid-March and 392 µg/L in late November, remaining well below the Primary MCL. Dissolved iron concentrations at SAR-10/1 were considerably lower than for total iron, but also followed the general temporal trends, albeit at much lower concentrations. Similar to aluminum discussed above, the elevated total iron concentrations at SAR-10/1 were likely related to the arrival of GWRS purified recycled water in June 2015. The iron has likely been released by the oxidation of pyrite and other iron sulfide minerals known to occur in the Principal aquifer system. The oxidized iron can then potentially be resorbed to the aquifer mineral surfaces. No other MBI Project monitoring well zones at SAR-10, SAR-11, SAR-12, or SAR-13 have exhibited comparably significant increases in total iron as those observed at SAR-10/1, indicating a localized effect similar to what was observed for total aluminum.

8.4.7 Production Wells

Data for water samples collected from potable production wells in the vicinity of the MBI Project are summarized in Table 8-5. Municipal production wells IRWD-12 and IRWD-17 are the two nearest downgradient drinking water wells from the MBI Project, with IRWD-12 located 2,200 feet downgradient from the nearest injection well MBI-5 and IRWD-17 located 2,200 feet downgradient from the nearest injection well MBI-2 (Figure 8-3). Municipal production well FV-8 is located upgradient to the northwest of the MBI Project and FV-6 is located to the southwest and somewhat cross-gradient of the MBI Project based on the June 2021 Principal aquifer groundwater elevation contours in Figure 8-3. The production wells listed in Table 8-5 and shown on Figure 8-3 are located less than one mile from the nearest MBI well.

As discussed in Section 8.4.1, chloride and sulfate have both been successfully used as intrinsic tracers to track the GWRS water injected to the downgradient MBI Project monitoring wells. As such, chloride and sulfate were also used to track the GWRS water signal at the nearest downgradient production wells IRWD-12 and IRWD-17, with the understanding that the GWRS signal could be more dampened due to dispersive transport farther downgradient and vertical blending from the pumped samples of these long-screened interval wells.

Table 8-5. 2021 Water Quality for Potable Wells Within the Influence of the MBI Project

OCWD Well Name	Well Depth (ft bgs)[1]	Perforation Interval (ft bgs)[1]	Distance from Injection Site (ft)[2]	Concentration [3,4]								
				Arsenic (As), ug/L	Chloride (Cl) mg/L	Sulfate (SO4) mg/L	Total Dissolved Solids (TDS) mg/L	Nitrate Nitrogen (NO3-N) mg/L	Nitrite Nitrogen (NO2-N) mg/L	Total Organic Carbon (Unfiltered) (TOC) mg/L	n-Nitrosodi-methylamine (NDMA) ng/L	1,4-Dioxane (14DIOX) ug/L
Large System Municipal Wells												
FV-8[5]	864	312 - 844	3,097	ND	29.5 (27.6 - 30.9)	62.1 (59.8 - 64.1)	342 (328 - 353)	1.36 (1.11 - 1.66)	0.001 (ND - 0.003)	0.09 (0.07 - 0.1)	ND	ND
IRWD-12	1,335	580 - 1,040	3,655	0.7 (ND - 1.5)	9.7 (7.5 - 11.8)	20.2 (14.0 - 27.2)	182 (108 - 234)	0.47 (0.37 - 0.56)	0.002 (ND - 0.003)	0.07 (ND - 0.17)	ND	ND
IRWD-17	980	504 - 960	3,864	0.4 (ND - 1.3)	17.8 (15.6 - 19.5)	36.4 (31.7 - 39.9)	238 (170 - 290)	0.51 (0.41 - 0.61)	0.002 (ND - 0.003)	0.07 (ND - 0.22)	ND	0.6 (0.5 - 0.8)
FV-6	1,120	370 - 1,110	4,867	ND	34.0 (32.8 - 35.5)	63.4 (61.8 - 65.4)	328 (312 - 336)	0.83 (0.73 - 0.91)	0.001 (ND - 0.003)	0.14 (0.14 - 0.16)	ND	1.5 (1.3 - 1.7)

[1] Feet below ground surface

[2] Straight line shortest distance to the nearest DMBI injection well, estimated to the nearest 100 feet

[3] Concentrations are annual averages with annual ranges in parenthesis for the given year

[4] ND: Not detected or less than the detection limit

[5] Upgradient from injection site

Figure 8-22 shows chloride and sulfate concentrations at IRWD-12 and IRWD-17 for the ten-year period 2012-2021. The relatively stable chloride and sulfate concentrations prior to 2020 confirmed that similar ambient concentrations as observed at SAR-10 and SAR-11 prior to MBI-1 injection were representative of longer-term regional conditions in this area. As shown on Figure 8-22, both chloride and sulfate concentrations were slightly higher at IRWD-17 than at IRWD-12, likely due to IRWD-17 being screened slightly shallower than IRWD-12. Mineral content and overall TDS tend to decrease with depth within the Principal aquifer system as these lower aquifer zones are more vertically removed from surficial recharge operations in the Forebay area of the Basin. As was shown in the schematic cross-section in Figure 8-2, IRWD-17 is screened in the same aquifers as MBI-1 (Upper Rho, Lower Rho, and Main), albeit with a slightly shallower bottommost screen, while IRWD-12 is only screened in the Lower Rho and Main aquifers. As discussed in Section 8.1, these Principal aquifer zones are interpreted to be approximately 50 to 150 feet shallower at IRWD-12 and IRWD-17 than at MBI-1 due to the synclinal structure of the Basin dipping to the northwest.

Figure 8-22 shows that during 2021 chloride and sulfate concentrations at IRWD-12 continued to steadily decline, supporting the preliminary interpretation described in last year's Annual Report that the first notable percentage of GWRS water arrived at this well in 2020. Based on the considerable magnitude of the sulfate reduction, the 2020 GWRS arrival at IRWD-12 was likely from the 2020 MBI Project tracer test rather than from older GWRS injection at MBI-1. The same GWRS arrival criteria used for the MBI monitoring wells in Section 8.4.1 was used for IRWD-12, i.e., a chloride and sulfate decrease between 10 and 20 percent from the most recent ambient concentrations. At IRWD-12, a chloride and sulfate reduction of at least 10% was first observed on the 9/17/20 sample, yielding a GWRS arrival time of 182 days or approximately 6 months from the startup of the MBI Project tracer test on 3/18/20. This GWRS arrival time estimate at IRWD-12 yielded a consistent groundwater velocity as the 64-day GWRS arrival at SAR-13/4 along the most likely flow path from MBI-5, which lends confidence that the GWRS arrival at IRWD-12 is from the MBI Project tracer test rather than from older MBI-1 injection.

Figure 8-22 shows that during 2021 chloride and sulfate concentrations at IRWD-17 also continued the steady decline that began in 2020. The declining trends in chloride and sulfate at IRWD-17 during 2021 continued to be much more gradual than at IRWD-12. At IRWD-17, a chloride and sulfate reduction of at least 10% was first observed on the 4/13/21 sample, yielding a GWRS arrival time of 393 days or approximately 13 months from the startup of the MBI Project tracer test on 3/18/20.

Based on the travel distance of 2,200 feet and an estimated travel time of 182 days to IRWD-12, a groundwater velocity of approximately 12 feet per day was estimated, likely occurring via the Main 7 aquifer zone (Figure 8-2) which had the fastest GWRS arrival at all four MBI monitoring wells (SAR-10/4, SAR-11/3, SAR-12/4, and SAR-13/4). In fact, the 64-day GWRS arrival at SAR-

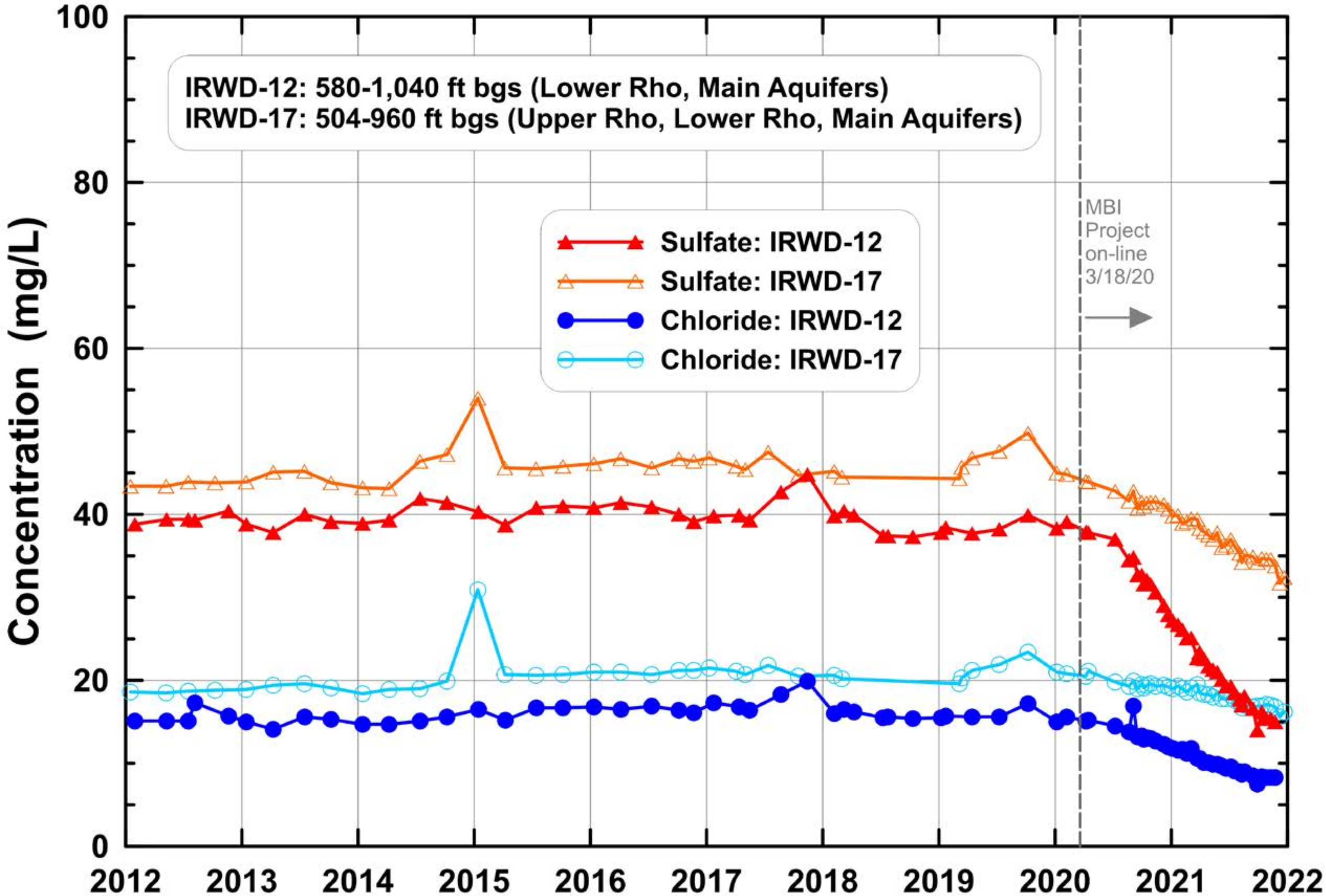


Figure 8-22. Wells IRWD-12 and IRWD-17 Chloride and Sulfate Concentrations

13/4, if originating from MBI-5 (Figure 8-3), yields an equivalent groundwater velocity of approximately 12 feet per day. Based on the travel distance of 2,200 feet and an estimated travel time of 393 days to IRWD-17, GWRS arrival based on the dampened sulfate decrease would yield a slower groundwater velocity of approximately 6 feet per day from MBI-2 to this well, likely in the same Main 7 fast flow path zone. IRWD-17 is only partially screened in the Main 7 aquifer zone (Figure 8-2), likely explaining the more dampened response as compared to IRWD-12.

Currently the Title 22 regulations for direct injection of recycled water require a minimum of two months of response retention time for projects employing GWRS type treatment prior to withdrawal from a production well, with potentially additional retention required for pathogenic microorganism control depending on the credits granted for the pre-injection above ground treatment (CCR, 2018); under these regulations, GWRS is currently permitted for a minimum retention time of four months in the Anaheim Forebay area. The model-determined buffer areas currently permitted in the MBI area assume a primary boundary of eight months and a secondary boundary of ten months and will be subject to revision based on analysis of the tracer test (see Section 8.5).

IRWD-12 and IRWD-17 have shown minor detections of arsenic and vanadium over the last several years. Historically, arsenic concentrations at IRWD-12 have ranged from below the RDL of 1 µg/L to occasional detections up to 2 µg/L, thus remaining well below the MCL of 10 µg/L. During 2021, IRWD-12 had three minor arsenic detections of 1 µg/L, 1.2 µg/L and 1.5 µg/L, based on quarterly sampling. At IRWD-17, arsenic concentrations ranged historically from below the RDL to 2.4 µg/L. During 2021, IRWD-17 had two minor arsenic detections of 1.1 µg/L and 1.4 µg/L, based on quarterly samples. During 2021, vanadium concentrations at both IRWD-12 and IRWD-17 remained within the historical range of 2.9 to 5.2 µg/L, well below the NL of 50 µg/L.

IRWD-12 and IRWD-17 historically have had no detections of NDMA or 1,4-dioxane and through 2021 this trend has continued for both constituents at IRWD-12 and for NDMA at IRWD-17. However, IRWD-17 had a minor detection of 1,4-dioxane at a concentration of 1.1 µg/L just above the RDL for the first time in July 2019 and confirmed with a resample at the same concentration in August 2019. During 2021, IRWD-17 continued to have minor detections of 1,4-dioxane, ranging from 0.5 µg/L to 0.8 µg/L, just at or slightly above the new lower RDL of 0.5 µg/L implemented by the OCWD Laboratory in mid-2020. These minor detections of 1,4-dioxane at IRWD-17 during the last three years likely indicate a small percentage of historical (pre-GWRS) injection water finally arriving at IRWD-17 from the Talbert Barrier approximately 2 miles away.

Production wells FV-6, IRWD-14, and IRWD-16 have also had low concentrations of 1,4-dioxane over recent years as well as during 2021 (Table 8-5), historically remaining less than 3 µg/L at FV-6 and IRWD-14 and less than 6 µg/L at IRWD-16. Similar to IRWD-17, the low 1,4-dioxane concentrations at these three wells likely indicated some percentage of pre-GWRS injection water from the Talbert Barrier.

8.5 Groundwater Modeling for MBI Tracer Test

A tracer test was required for MBI Project compliance to establish primary and secondary boundaries representing zones of controlled drinking water well construction as described in MBI Project Title 22 Engineering Report Supplement (OCWD, 2018) and the subsequent Regional Water Quality Board Amending Order R8-2019-0007 (RWQCB, 2019). Concurrent with the tracer experiment, the NWRI GWRS IAP recommended using MT3D mass transport (Zheng and Wang, 1999) modeling along with MODFLOW (Harbaugh and McDonald, 1996) and MODPATH (Pollock, 1994) to assist in the analysis and interpretation of observed downgradient tracer breakthrough.

Concurrent with the MBI tracer test which began March 18, 2020 with full-scale operations of all five MBI wells through the end of the year, OCWD modeling staff refined the existing OCWD Talbert Model specifically in the MBI Project area and calibrated the flow model to observed groundwater levels at SAR-10, SAR-11, SAR-12, and SAR-13. The transport model was preliminarily calibrated to observed GWRS arrival time results at SAR-10 and SAR-11 from prior DMBI injection at MBI-1 (Table 8-6). GWRS arrival had not yet been observed at SAR-12 and SAR-13 from the 2020 tracer test at the time of the modeling work.

Table 8-6. Simulated and Observed GWRS Water Arrival Times at SAR-10 and SAR-11

Monitoring Well	Screened Interval (ft bgs)	Aquifer Name	Model Layer	Intrinsic Tracer Arrival Time (days) [1]	MT3DMS Modeled Arrival Time (days) [2]
SAR-10/2	690-710	Lower Rho	11	15.2	13
SAR-10/3	800-820	Main 1,2,3	13	39.3	30
SAR-10/4	1,100-1,115	Main 7	17	2.5	7
SAR-11/2	675-690	Lower Rho	11	134.3	134
SAR-11/3	1,100-1,110	Main 7	17	98.5	92

[1] Observed arrival based on 10% of peak sulfate concentration.
[2] Simulated arrival based on 10% GWRS water (concentration of 0.1).

The first phase of Talbert Model refinements in the MBI Project area during 2020 included temporally extending the model calibration period through December 2019 based on the most recent data available at that time. Spatial refinements were also made in the MBI Project area by refining both the lateral grid cell dimensions and the vertical layering based on lithology logs and geophysical logs from the MBI Project injection and monitoring wells leading to the aquifer stratigraphy schematically shown in Figure 8-2. Table 8-7 shows that the vertical model layering was refined from 13 to 21 layers to accurately calibrate to observed GWRS arrival times from specific aquifer zones screened at the MBI Project monitoring wells. The original model layer 11 for the Lower Rho and Main aquifers was subdivided into 8 model layers. For the updated 21-

layer model, layers 5-19 comprise the Principal aquifer system. The aquifer names in Table 8-7 are consistent with the schematic cross-section in Figure 8-2.

Table 8-7. Talbert Model Layers and Aquifer Names

Original 13-Layer Model		Updated 21-Layer Model	
Model Layer [1]	Aquifer Names	Model Layer [1]	Aquifer Names
1	Talbert (and Bolsa)	1	Talbert (and Bolsa)
3	Alpha	3	Alpha
5	Beta	5	Beta
7	Lambda	7	Lambda
9	Omicron/Upper Rho	9	Omicron/Upper Rho
11	Lower Rho/Main	11	Lower Rho/Upper Main
		13	Main 1,2,3
		15	Main 4,5,6
		17	Main 7
		19	Main 8 and below
13	Lower Main (Deep Aquifer)	21	Lower Main (Deep Aquifer)

[1] The even numbered model layers (not shown) represent the intervening low-permeability aquitards.

As discussed in Section 8.4.1, the fastest observed arrival of GWRS water during the 2020 MBI tracer test was in the Main 7 aquifer zone at SAR-13/4 and SAR-12/4 (OCWD, 2021). This fast flow path Main 7 aquifer zone corresponds to the bottommost screened interval at the four Centennial Park MBI wells (MBI-2 through MBI-5) and nearest production well IRWD-12 (Figure 8-2). These observations are consistent with the fastest arrivals recorded at SAR-10/4 and SAR-11/3 in this same Main 7 aquifer zone during the earlier DMBI Project injection from MBI-1. Since this Main 7 aquifer zone had the fastest observed arrival times at all four MBI Project monitoring well sites, this relatively narrow but highly permeable zone was represented as a separate model layer in the updated 21-layer model (Table 8-7 and Figure 8-2) to increase the accuracy of simulated transport velocities in this worst-case arrival zone.

During 2021, the Talbert Model was further extended through May 2021 to calibrate the flow and transport model to the MBI full-scale tracer test that began in March 2020 by including all monthly production and injection volumes from the Talbert Barrier and MBI wells and observed water level data from monitoring wells. Despite these modifications however, the model was not yet able to achieve the breakthrough curves observed in model Layers 15 and 17 (e.g., SAR-12/3, SAR-13/3, and SAR 13/4) and additional refinements were deemed necessary to further improve both the flow and transport calibrations (OCWD, 2021b). The refinements to the Talbert Model in the MBI Project area planned for 2022 include: (1) further adjustment of storativity, (2) further evaluation and adjustment of vertical distribution of flow at the production and injection wells, and (3) inclusion of tracer arrival observations at production wells IRWD-12 and IRWD-17. Based on results to date, the most rapid transport of GWRS water has still been observed in the Main 7 aquifer, represented by Layer 17. As such, this model layer will be prioritized for calibration efforts.

Ultimately, the goal is to accurately simulate the on-going intrinsic tracer test that began with startup of the new injection wells in March 2020, and then determine the required buffer zones with the model as a means of extending and extrapolating results from the downgradient monitoring wells. Additional future efforts may focus on modelling simultaneous injection at all MBI wells. Consistent with reality, the current simulation assumed injection at MBI-1 began five years prior to injection at the four MBI Centennial Park wells. Once the model has been adequately calibrated, the model-based buffer areas can be determined for the condition of all five MBI wells operating at full scale simultaneously.

ACRONYMS LIST

1,2,3-TCP	1,2,3-trichloropropane
ABF	ammonium bifluoride (antiscalant)
AF	acre-foot, acre-feet
AFY	acre-feet per year
AI	Aggressive Index or Aggressivity Index
AL	action level
AOP	advanced oxidation process
ARTIC	Anaheim Regional Transportation Intermodal Center
AS	activated sludge
AS1	OC San Plant No. 1 P1-82 Activated Sludge Plant
AS2	OC San Plant No. 2 P1-102 Activated Sludge Plant
ASTM	American Society for Testing and Materials (ASTM International)
AVG	average
AWC	American Water Chemicals
AWPF	advanced water purification facility
AWT	advanced water treatment
Basin	Orange County Groundwater Basin
Basin Model	OCWD Basin-wide Groundwater Flow Model
bgs	below ground surface
BP	Basin Plan (Water Quality Control Plan for the Santa Ana River Basin)
BPL	UV reactor ballast power level
BPP	basin production percentage
BPS	barrier pump station

BWW	backwash waste
CA UCMR	California Unregulated Chemical Monitoring Regulations
CBOD	carbonaceous biochemical oxygen demand
CCPP	calcium carbonate precipitation potential
CDPH	California Department of Public Health (formerly DHS; now DDW)
CEC	chemicals of emerging concern or constituents of emerging concern
cfm	cubic feet per minute
CFS	cubic feet per second
CIP	clean-in-place
Cl^-	chloride
CPP	(Anaheim) Canyon Power Plant
CPTP	Coastal Pumping Transfer Program
CUP	Conjunctive Use Program
DBP	disinfection by-product
DDW	Division of Drinking Water, State Water Resources Control Board (formerly DHS, then CDPH)
DHS	California Department of Health Services (later CDPH, now DDW)
DMBI	Demonstration Mid-Basin Injection
DOC	dissolved organic carbon
DPW	decarbonated product water
DRWF	Dyer Road Well Field
DWEL	drinking water equivalent level
DWR	California Department of Water Resources
EC	electrical conductivity
EED	electrical energy dose

EPA	U. S. Environmental Protection Agency
FPW	finished product water or final product water (purified recycled water)
FPWB	finished product water bypass structure
ft	foot, feet
FV	Fountain Valley, City of Fountain Valley
GAC	granular activated carbon
GAP	Green Acres Project
gpm, GPM	gallons per minute
GSWC	Golden State Water Company (formerly Southern California Water Company)
GWRS	Groundwater Replenishment System
GWRSFE	Groundwater Replenishment System Final Expansion
HFO	hydroferrous oxide
hr	hour(s)
I	injection well numbering designation
IRWD	Irvine Ranch Water District
IWF-21	Interim Water Factory 21
kgal	thousand gallons
K-M-M-L	Kraemer-Miller-Miraloma-La Palma (Basins)
kW	kilowatt
kWh	kilowatt-hours
LP	UV reactor lamp output
LRV	log reduction value (for pathogenic microorganisms)
LSI	Langelier Saturation Index
M	monitoring well numbering designation

m^3	cubic meter
m^3/day	cubic meters per day
MBI	Mid-Basin Injection
MCL	maximum contaminant level
MCWD	Mesa Water District (formerly Mesa Consolidated Water District)
Mesa Water	Mesa Water District
MF	membrane filtration
MFE	membrane filtration effluent (filtrate)
MFF	membrane filtration feed
MFL	million fibers greater than 10 microns in length per liter
MG	million gallons
mil gal	million gallons
mJ/cm^2	millijoules per square centimeter
MGD	million gallons per day
mg/L	milligrams per liter
micron	micrometer
mL	milliliters
MPN	most probable number
msl	mean sea level
MWD	Metropolitan Water District of Southern California
na	not analyzed
N/A	not applicable
ND	non-detect, not detected (numerically designated as 10% of the reportable detection limit for purposes of calculating the average)
NDMA	N-nitrosodimethylamine

NdN	nitrification/denitrification
ng/L	nanograms per liter
NL	California Notification Level
nm	nanometers
nr	not reported
NR	Not Required
NS	not sampled
NTU	nephelometric turbidity unit
NWRI	National Water Research Institute
OC-44	MWD Turnout designation in Huntington Beach
OCHCA	Orange County Health Care Agency
OC San	Orange County Sanitation District (aka OCSD)
OCWD	Orange County Water District
OMMP	Operation, Maintenance, and Monitoring Plan
OOP	Operation Optimization Plan
ORP	oxidation reduction potential
%	percent
Panel	Independent Advisory Panel
PCS	process control system
PDT	pressure decay test
PEPS	Primary Effluent Pump Station
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PISB	Primary Influent Splitter Box
PMCL	Primary Maximum Contaminant Level

PPM	parts per million
psi	pounds per square inch
PVDF	polyvinylidene difluoride
PWPS	product water pump station
Q	flow rate
Q1	secondary effluent from OC San Plant No. 1 (same as Q-1)
R	number of reactors in service in a UV train
RAS	return activated sludge
RDL	reportable detection limit
RfD	Reference Dose
RL	California Response Level
RO	reverse osmosis
ROF	reverse osmosis feed
ROP	reverse osmosis product
%RW	percentage recycled water (instantaneous; not averaged over 60 months)
RWC	recycled water contribution (monthly; averaged over 60 months)
RWQCB	Regional Water Quality Control Board, Santa Ana Region
SALS	Steve Anderson Lift Station (at OC San Plant No. 1)
SAR	Santa Ana River
SARI	Santa Ana Regional Interceptor
SARWQH	Santa Ana River Water Quality and Health (Study)
SCADA	supervisory control and data acquisition (see also PCS)
SCE	Southern California Edison
SCWC	Southern California Water Company, now Golden State Water Company
SEB	Southeast Barrier Pipeline

SMCL	secondary maximum contaminant level
SOC	synthetic organic compound
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TF	trickling filter(s)
TIC	tentatively identified compound
TMP	transmembrane pressure
TOC	total organic carbon
TR	trace
ug/L, µg/L	micrograms per liter
µmhos/cm, µm/cm, um/cm	micromhos per centimeter
UPS	uninterruptible power supply
UR	unregulated chemicals requiring monitoring
µS	microsiemens (same as micromhos)
USEPA	United States Environmental Protection Agency
UV	ultraviolet (light exposure or irradiation)
UV/AOP	ultraviolet/advanced oxidation process
UVF	ultraviolet/advanced oxidation process feed
UVP	ultraviolet/advanced oxidation process product
UV%T, %UVT	percent UV Transmissivity
VFD	variable frequency drive
VOC	volatile organic compound
WF-21	Water Factory 21
WRMS	Water Resources Management System

REFERENCES

Bowell, R.J. 1994. *"Sorption of Arsenic by Iron Oxides and Oxyhydrides in Soils: Applied Geochemistry"*, Volume 9, Pages 279-286.

California Code of Regulations (CCR). 2018. *"Title 22, Division 4, Chapter 3, Water Recycling Criteria".* October 1, 2018.

California Department of Public Health (CDPH). 2009. *"System No. 3090001 – Orange County Water District, Groundwater Replenishment System: Approval of 100 Percent Recycled Water Contribution at the Talbert Barrier"*. Letter to OCWD dated November 25, 2009.

California Department of Public Health (CDPH). 2010a. "*System No. 3090001 – Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion and Kraemer/Miller Basins – Water Recycling Requirements Revised Monitoring Frequency – Selected Analytes".* Letter to OCWD dated September 20, 2010.

California Department of Public Health (CDPH). 2010b. "*System No. 3090001-Orange County Water District's Demonstration Mid-Basin Injection Project Plan".* Letter to OCWD dated February 8, 2010.

California Department of Public Health (CDPH). 2010c. "Letter from CDPH to Donald Calkins, City of Anaheim, System No. 3090012, Anaheim Canyon Power Plant, New Recycled Water User to Orange County Water District's Groundwater Replenishment System", December 27, 2010.

California Department of Public Health (CDPH). 2012. *"System No. 3090001-Groundwater Replenishment System (GWRS) Title 22 Engineering Report Update".* Letter to OCWD dated May 11, 2012.

California Department of Public Health (CDPH), 2014. *"System No. 3090001 – Groundwater Replenishment System (GWRS) Title 22 Engineering Report Supplement."* Letter to OCWD dated June 30, 2014.

California Department of Water Resources (DWR). 1934. *"South Coastal Basin Investigation, Geology and Groundwater Storage Capacity of Valley Fill."* Bulletin No. 45.

California Department of Water Resources (DWR). 1966. *"Bulletin No. 147-1, Ground Water Basin Protection Projects, Santa Ana Gap Salinity Barrier, Orange County"*, December 1966.

California Department of Water Resources (DWR). 1967. *"Progress Report on the Groundwater Geology of the Coastal Plain of Orange County"*, July 1967.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2004. *Order No. R8-2004-0002, "Producer/User Water Recycling Requirements and Monitoring and Reporting Program for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Basins"*. March 12, 2004.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2008. *Order No. R8-2008-0058, Amending Order No. R8-2004-0002, "Producer/User Water Recycling Requirements for the Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins"*. July 18, 2008.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2009a. *"100% RWC at Talbert Barrier"*. Email correspondence to OCWD dated December 9, 2009.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2009b. "*GWRS water to Anaheim CPP and future users*". Email correspondence to OCWD dated December 24, 2009

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2010. *"Demonstration Mid-Basin Injection Project – Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's Groundwater Replenishment System, Fountain Valley, California".* Letter to OCWD dated February 23, 2010.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2011. *"Approval of Groundwater Monitoring Frequency Reduction Request for Selected Analytes – Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's Groundwater Replenishment System, Fountain Valley, California."* Letter to OCWD dated March 14, 2011.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2012. *"Approval of Miraloma Basin for Recharge Operations – Producer/User Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's Groundwater Replenishment System, Fountain Valley, California"*. Letter to OCWD dated May 31, 2012.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2014a. *Order No. R8-2014-0054, "Amending Order No. R8-2004-0002, as amended by Order No. R8-2008-0058, Producer/User Water Recycling Requirements for Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins, Orange County"*. December 12, 2014.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2016. *Order No. R8-2016-0051, "Amending Order No. R8-2004-0002, as amended by Order No. R8-2008-0058 and Order No. R8-2014-0054, Producer/User Water Recycling Requirements for Orange County Water District Interim Water Factory 21 and Groundwater Replenishment System Groundwater Recharge and Reuse at Talbert Gap Seawater Intrusion Barrier and Kraemer/Miller Recharge Basins, Orange County"*. July 29, 2016.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2018. *"Letter from RWQCB to Jason Dadakis, OCWD, Approval of Groundwater Monitoring Program Modification for Selected Analytes – Water Recycling Requirements Order No. R8-2004-0002 for Orange County Water District's (OCWD) Groundwater Replenishment System, Fountain Valley, California".* February 27, 2018.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2019. *Order No. R8-2019-0007, "Amending Order No. R8-2004-0002, Producer/User Water Recycling Requirements for the Orange County Water District Groundwater Replenishment System, Orange County"*. March 22, 2019.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2020a. *"Monitoring and Reporting Program No. R8-2004-0002".* November 2, 2020.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB. 2020b. *Order No. R8-2020-0006 NPDES No. CAG998001, "General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimis) Threat to Water Quality".* June 19, 2020.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2021. *Order No. R8-2021-0003, "Waste Discharge Requirements and Master Recycling Permit for Orange County Water District Advanced Water Purification Facility, Orange County".* March 12, 2021.

California Regional Water Quality Control Board, Santa Ana Region (RWQCB). 2022. *Order No. R8-2022-0002, NPDES No. CA8000408 "Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the Orange County Water District Groundwater Replenishment System Advanced Water Purification Facility Emergency Discharge to Reach 1 of Santa Ana River"*. March 18, 2022.

California State Water Resources Control Board Division of Drinking Water (DDW). 2017. *"Orange County Water District, Groundwater Replenishment System (GWRS), System No. 3090001, Project No. 745, Comments on Section 60320.200 Groundwater Recharge Report",* Letter dated January 27, 2017.

California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). 2018a. *"Letter to Milasol Gaslan, California Regional Water Quality Control Board, DDW Evaluation of Orange County Water District Groundwater Replenishment System's Groundwater Monitoring – Monitoring Reduction Request (3090001-704)".* January 16, 2018.

California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). 2018b. *"Letter to Milasol Gaslan, California Regional Water Quality Control Board, Conditional Approval Letter for the Orange County Water District's Groundwater Replenishment System Mid-Basin Injection Project (3090001-704)".* September 18, 2018.

California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). 2018c. *"Letter to Hope Smythe, California Regional Water Quality Control Board, Division of Drinking Water's Request to Update Monitoring and Reporting Program of Select Groundwater Replenishment Reuse Projects with Perfluorooctanoic Acid, Perfluorooctane Sulfonic Acid and 1,2,3-Trichloropropane".* December 20, 2018.

California State Water Resources Control Board Division of Drinking Water (DDW). 2020. *"Drinking Water Notification Levels and Response Levels: An Overview"*, Updated February 6, 2020.

Clark, Jordan F. 2009. *"The 2008 Kraemer Basin Tracer Experiment Final Report"*, August 7, 2009.

DDB Engineering, Inc. 2009a. *"Ramp-Up Demonstration Report, Groundwater Replenishment System, Recycled Water Contribution Increase to 100% at Talbert Barrier"*. July 2009.

DDB Engineering, Inc. 2009b. "*Demonstration Mid-Basin Injection Project Plan".* December 22, 2009.

DDB Engineering, Inc. 2015. *"Groundwater Replenishment System 2014 Annual Report". June 2015.*

DDB Engineering, Inc. 2017. *“Groundwater Replenishment System 2016 Annual Report”.* June 2017.

DDB Engineering, Inc. 2020. “Groundwater Replenishment System 2019 Annual Report”. June 2020.

Fakhreddine, et al. 2015. *“Geochemical Triggers of Arsenic Mobilization during Managed Aquifer Recharge”.* Environmental Science & Technology, 2015, 49 (13), 7802-7809. June 9, 2015.

Freeze, R. Allan and John A. Cherry. 1979. *“Groundwater”*. Prentice-Hall, Inc., 604 pp.

Ghyben, W.B. 1888. Nota in verband met de voorgenomen putboring nabij Amsterdam. *Tijdschrift van Let Koninklijk Inst. Van Ing.*

Harbaugh, A.W. and McDonald, M.G. 1996. *“User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model.”* U.S. Geological Survey Open-File Report. 96-485.

Herndon, Roy L. and John D. Bonsangue. 2006. *“Hydrogeology of the Orange County Groundwater Basin – An Updated Overview”*, Geology of the Orange County Region, Southern California, 2006, Annual Field Trip Guide No. 33, South Coast Geological Society, Inc.

Herzberg, A. 1901. Die Wasserversorgung einiger Nordseebader. *J. Gasbeleucht. Wasserversorg., 44, pp. 815-819.*

Lawrence Livermore National Laboratory. 2004. *"Final Report on Isotope Tracer Investigations in the Forebay of the Orange County Groundwater Basin"*. UCRL-TR-201735, January 2004.

Li, Quinlin, Mason Tomson, and Philip Bedient. 2006. *“Leaching of Metals from Aquifer Soils during Infiltration of Low-Ionic Strength Reclaimed Water, Determination of Kinetics and Potential Mitigation Strategies”*, WateReuse Foundation Project Number WRF-06-005.

National Water Research Institute (NWRI). 2004. *"Report of the Scientific Advisory Panel, Orange County Water District's Santa Ana River Water Quality and Health Study”*, August 2004.

National Water Research Institute (NWRI). 2021. *“Meeting 17 Panel Report, Review of the Orange County Water District Groundwater Replenishment System, based on an Independent Advisory Panel Meeting, October 29-30, 2020, Prepared by NWRI Independent Advisory Panel to Review the Groundwater Replenishment System”,* January 6, 2021.

Orange County Water District. 2004a. *"Santa Ana River Water Quality and Health Study, Final Report"*, October 2004.

Orange County Water District. 2004b. *"Groundwater Management Plan"*, March 2004.

Orange County Water District. 2005. "*Board of Directors Resolution No. 05-4-40. (Establishing a GWR System Buffer Area around the GWR System Injection Operation at the Talbert Gap Seawater Intrusion Barrier…)",* April 20, 2005.

Orange County Water District. 2007. *"Report on Evaluation of Orange County Groundwater Basin Storage and Operational Strategy"*, February 2007.

Orange County Water District. 2008. *"Board of Directors Resolution No. 08-11-140"*, November 5, 2008.

Orange County Water District. 2010. *"Demonstration Mid-Basin Injection well design and the potential for cross-aquifer wellbore flow and effects on injection and pumping operations, Technical Memorandum Prepared by Jason Dadakis"*. April 9, 2010.

Orange County Water District, 2012. *"Board of Directors Resolution No. 12-7-83",* July 18, 2012.

Orange County Water District, 2013. *"Q1/MFF/MFE Microbial Water Quality Study".* December 18, 2013.

Orange County Water District. 2015a. "*Monthly Report, Orange County Water District, Groundwater Replenishment System, Advanced Water Purification Facility and Green Acres".* March 2015.

Orange County Water District. 2015b. *"Injection Well MBI-1 Spinner Survey Results, Technical Memorandum Prepared by Tim Sovich",* October 12, 2015.

Orange County Water District. 2015c. "*Demonstration Mid-Basin Injection Project: Initial Operations and Water Quality, Technical Memorandum Prepared by Jason Dadakis, John Bonsangue, and Justin McKeever"*, Technical Memorandum from OCWD to GWRS Independent Advisory Panel, October 14, 2015.

Orange County Water District, 2016. *"Board of Directors Resolution No. 16-7-98",* July 20, 2016.

Orange County Water District, 2017. *"Letter to Julio Lara, Santa Ana Regional Water Quality Control Board",* February 6, 2017.

Orange County Water District, 2018. *"Updated GWRS Operation Optimization Plan"*, April 17, 2018.

Orange County Water District (OCWD). 2020. *"Water Resources Summary"*, March and April, 2020.

Orange County Water District (OCWD). 2021a. *"Recycled Water Retention Time Buffer Area Analysis for GWRSFE – Proposed GWRS Recharge at Burris & Santiago Areas"*. March 10, 2021.

Orange County Water District (OCWD). 2021b. *"Mid-Basin Injection Project: Groundwater Flow and Transport Modeling Update, Technical Memorandum Prepared by Li Li and Jason Dadakis"*, Technical Memorandum from OCWD to GWRS Independent Advisory Panel, September 2, 2021.

Orange County Water District and DDB Engineering, Inc. 2011. *"Title 22 Engineering Report Update for the Groundwater Replenishment System",* May 2011.

Orange County Water District and DDB Engineering, Inc. 2014. *"Title 22 Engineering Report Update Supplement for the Groundwater Replenishment System",* March 2014.

Orange County Water District and DDB Engineering, Inc. 2015. *"Groundwater Replenishment System Operation Optimization Plan"*. June 2015.

Orange County Water District and DDB Engineering, Inc. 2018. *"Title 22 Engineering Report Mid-Basin Injection Supplement for the Groundwater Replenishment System".* July 2018.

Orange County Water District and DDB Engineering, Inc. 2021. *"Title 22 Engineering Report for the Groundwater Replenishment System",* April 2021.

Phraner, R.W., B. Harley, E.G. Reichard, and B. Stollar. 2001. "*Findings of Model Advisory Panel - Transient Calibration of Multi-layer Basin Flow Model*". Letter from Basin Model Advisory Panel to OCWD.

Pollock, D.W. 1994. "*User's Guide for MODPATH/MODPATH-PLOT. Version 3: A Particle Tracking Post-Processing Package for MODFLOW, the US Geological Survey Finite-Difference Ground-Water Flow Model.*" U.S. Geological Survey Open-File Report. 94-464.

Santa Ana River Watermaster. 2016. (Santa Ana River Watermaster for Orange County Water District v. City of Chino, et al., Case No. 117628 – County of Orange.) *"Forty-Fifth Annual Report of the Santa Ana River Watermaster for Water Year October 1, 2014 – September 30, 2015"*, April 30, 2016.

State Water Resources Control Board (SWRCB). 2013. *"Recycled Water Policy, as modified by SWRCB Resolution 2013-0003",* January 22, 2013.

State Water Resources Control Board (SWRCB). 2018. *"Water Quality Control Policy for Recycled Water",* December 11, 2018.

State Water Resources Control Board (SWRCB). 2021a. *"Notice for conditional approval of OCWD Quality Assurance Project Plan",* Letter to OCWD dated June 7, 2021.

State Water Resources Control Board (SWRCB). 2021b. *"Approval for use of an in-house method for the 'Determination of 1,4-Dioxane and Other Targets in Water by Purge and Trap and Capillary Gas Chromatography/Mass Spectrometry' for monitoring 1,4-dioxane pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated April 5, 2021.

State Water Resources Control Board (SWRCB). 2021c. *"Approval for use of an in-house method for the 'Chemical of Emerging Concern (CECs) for monitoring sucralose and sulfamethoxazole pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated May 10, 2021.

State Water Resources Control Board (SWRCB). 2021d. *"Approval for use of an in-house method for the 'N-Nitrosodimethylamine (NDMA) Low Level" for monitoring NDMA and N-nitrosomorpholine (NMOR) pursuant to the Water Quality Control Policy for Recycled Water (Recycled Water Policy)",* Letter to OCWD dated May 10, 2021.

U.S. Environmental Protection Agency (USEPA). 2003. *"Integrated Risk Information System (IRIS)"*, July 2003.

U.S. Environmental Protection Agency (USEPA). 2005. *"Membrane Filtration Guidance Manual"*, November 2005.

Welch, Alan H. and Kenneth G. Stollenwerk. 2003. *"Arsenic in Ground Water"*, Chapter 3, Pages 77-82.

Zheng, Chunmiao and Wang, Pu. 1999. *"MT3DMS: A Modular Three-Dimensional Multispecies Transport Model for Simulation of Advection, Dispersion, and Chemical Reactions of Contaminants in Groundwater Systems; Documentation and User's Guide."*

APPENDICES

Appendix	Title
A	Water Quality Requirements for Groundwater Replenishment System and Final Product Water Quality Data, January 1 through December 31, 2021
B	Laboratory Methods of Analysis
C	Water Quality Constituents with Laboratory Methods
D	Operator Certifications, Operations and Maintenance Summary and Calibration Records
E	Critical Control Points
F	Pathogen Log Reduction Value (LRV) Reports
G	Groundwater Quality Data at the Talbert Barrier
H	Talbert Barrier Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents
I	Groundwater Quality Data at the Anaheim Forebay
J	Anaheim Forebay Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents
K	Groundwater Quality Data at the Mid-Basin Injection Project Area
L	Mid-Basin Injection Project Area Monitoring Well Groundwater Quality Data, 1,4-Dioxane, NDMA and Selected Constituents

Appendix A

Water Quality Requirements for

Groundwater Replenishment System

and

Final Product Water Quality Data

January 1 through December 31, 2021

Advanced Water Purification Facility

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Total Purified Recycled Water Flow	Plant Monitoring	N/A	MGD	88.64	89.47	70.05	89.30				≤ 100
REQUIRED REVERSE OSMOSIS PRODUCT MONITORING[5]											
Ultraviolet Transmittance (UV%/T) at 254	Plant Monitoring	0.10%	%	97.7%	97.9%	97.3%	97.4%				>90%
Turbidity	Plant Monitoring	N/A	NTU	0.03	0.02	0.02	0.014		5		<0.2/0.5[6]
BIOLOGICAL											
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1	MPN	ND	ND	ND	ND				N/A
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	BIOASCEC	0.5	ng/L	NS	NS	ND	ND				3.5
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	9223B	1	MPN	ND	ND	ND	ND				2.2
INORGANIC											
Aggressive Index (AI)	Plant Monitoring		A.I.	11.72	11.81	11.75	11.51				>11.0
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	ND	ND	ND	0.22				N/A
Aluminum (Al)	X200.8	1	ug/L	ND	1.4	1.7	4.4	1,000	200		200[7]
Ammonia Nitrogen (NH3-N)	350.1	0.1	mg/L	0.11	0.20	0.27	0.28				N/A
Antimony (Sb)	X200.8	1	ug/L	ND	ND	ND	ND	6			6
Apparent Color (unfiltered) (APCOLR)	2120B	3	UNITS	ND	ND	ND	ND		15		15
Arsenic (As)	X200.8	1	ug/L	ND	ND	ND	ND	10			10
Asbestos (ASBESTOS)	100.2	0.2	MFL	ND	ND	ND	ND	7			7
Barium (Ba)	X200.8	1	ug/L	ND	ND	ND	ND	1,000			1,000
Beryllium (Be)	X200.8	1	ug/L	ND	ND	ND	ND	4			4
Bicarbonate (as CaCO3) (HCO3Ca)	2320B	1	mg/L	37.68	40.22	38.68	38.85				N/A
Bicarbonate (as HCO3) (HCO3)	UNKWQAN	1.2	mg/L	45.92	49.04	47.16	47.37				N/A
Biochemical Oxygen Demand (BOD)	5210B	1.3 - 2.5	mg/L	NS	1.33	0.93	0.56				20/Mo; 30/wk
Boron (B)	X200.7	0.1	mg/L	0.2	0.23	0.25	0.24			1	N/A
Bromate (BrO3)	300.1B	5	ug/L	ND	ND	ND	ND	10			10
Bromide (Br)	300.1B / X1-300.0	0.01 - 0.1	mg/L	0.011	0.012	0.01	0.015				N/A
Cadmium (Cd)	X200.8	1	ug/L	ND	ND	ND	ND	5			5
Calcium (Ca)	X200.7	0.5	mg/L	13.815	13.992	13.336	13.754				N/A
Calcium Hardness (CaHRD)	X200.7	0.25	mg/L	34.531	34.923	33.264	34.346				N/A
Carbonate (as CaCO3) (CO3Ca)	2320B	1	mg/L	ND	ND	ND	0.354				N/A
Cation-Anion meq balance (CATANI)	UNKWQAN		RATIO	-2.927	1.125	-4.43	-2.703				N/A
Chlorate (CLO3)	300.1B	10	ug/L	ND	ND	ND	11.9			800	N/A
Chloride (Cl)	X1-300.0	0.5	mg/L	3.767	4.7	5.7	5.9		250		55[8]
Chlorite (CLO2)	300.1B	10	ug/L	ND	ND	ND	ND	1,000			1,000
Chromium (Cr)	X200.8	1	ug/L	ND	ND	ND	ND	50			50
Cobalt (Co)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Copper (Cu)	X200.8	1	ug/L	ND	ND	ND	ND		1,000	1,300	1,000[9]
Corrosivity (CORROS)	2330B	-100	S.I.	-1.832	-1.22	-0.591	-0.505				N/A
Cyanide (CN)	X1-335.4	5	ug/L	ND	ND	ND	ND	150			150
Electrical Conductivity (EC)	2510B	1	uS/cm	90.267	95.75	101.733	100.806		900		900
Fluoride (F)	X1-300.0	0.1	mg/L	ND	ND	ND	ND	2			2

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
INORGANIC (Continued)											
Free Chlorine (FRCL2)	4500CLF	0.1	mg/L	ND	ND	ND	ND				N/A
Gadolinium (Gd)	X200.8	10	ng/L	ND	ND	ND	ND				N/A
Hexavalent Chromium (CrVI)	X1-218.7	0.2	ug/L	ND	ND	ND	ND				10
Hydrogen Peroxide (H2O2)	H2O2	0.1	mg/L	2.369	2.315	2.5	2.331				N/A
Hydroxide (as CaCO3) (OHCa)	2320B	1	mg/L	ND	ND	ND	ND				N/A
Iron (Fe)	X200.7	5	ug/L	ND	ND	ND	9.6		300		300
Lead (Pb)	X200.8	1	ug/L	ND	ND	ND	ND			15	15[10]
Magnesium (Mg)	X200.7	0.5	mg/L	ND	ND	ND	ND				N/A
Manganese (Mn)	X200.8	1	ug/L	ND	ND	ND	ND		50	500	50[11]
Manganese (dissolved) (Mn-DIS)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Mercury (Hg)	X200.8	1	ug/L	ND	ND	ND	ND	2			2
Nickel (Ni)	X200.8	1	ug/L	ND	ND	ND	ND	100			100
Nitrate (NO3)	4500NO3F / UNKWQAN	0.4	mg/L	2.233	2.534	3.2	3.248	45			45
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1	mg/L	0.538	0.617	0.77	0.792	10			10[12]
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1	mg/L	0.504	0.572	0.72	0.733	10			3[12]
Nitrite (NO2)	UNKWQAN	0.007	mg/L	0.112	0.146	0.163	0.198				N/A
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002	mg/L	0.034	0.045	0.05	0.06	1			1
Organic Nitrogen (ORG-N)	X1-351.2	0.1	mg/L	0.033	0.056	0.017	0.047				N/A
Perchlorate (CLO4)	332.0	2	ug/L	ND	ND	ND	ND	6			6
pH (pH)	4500H+B	1	UNITS	6.885	7.492	8.173	8.192				6 - 9
Phosphate Phosphorus (orthophosphate) (PO4-P)	365.1	0.01	mg/L	ND	ND	ND	ND				N/A
Potassium (K)	X200.7	0.5	mg/L	ND	0.2	0.417	0.383				N/A
Selenium (Se)	X200.8	1	ug/L	ND	ND	ND	ND	50			50
Silica (SIO2)	4500SIOC	1	mg/L	ND	1	1.4	1.3				N/A
Silver (Ag)	X200.8	1	ug/L	ND	ND	ND	ND		100		100
Sodium (Na)	X200.7	0.5	mg/L	4.633	5.767	6.767	6.7				45[13]
Strontium (Sr)	X200.8	1	ug/L	2.6	2.8	2.4	2.5				N/A
Sulfate (SO4)	X1-300.0	0.5	mg/L	0.233	0.233	0.55	ND		250		100[14]
Surfactants (MBAS)	5540C	0.02	mg/L	ND	ND	ND	ND		0.5		0.5
Suspended Solids (SUSSOL)	2540D	2.5	mg/L	NS	ND	ND	ND				20/Mo; 30/wk
Temperature (Laboratory) (TEMP)	4500H+B	1	C	21.377	21.277	30.282	22.685				N/A
Thallium (Tl)	X200.8	1	ug/L	ND	ND	ND	ND	2			2
Threshold Odor Number (Median) (ODOR)	2150B	0	TON	ND	ND	ND	ND		3		3
Title 22 Cation-Anion Balance (T22CAB)	UNKWQAN		meq/L	-2.713	1.351	-4.224	-2.594				N/A
Title 22 Total Anions (T22ANI)	UNKWQAN		meq/L	0.934	0.882	0.967	0.898				N/A
Title 22 Total Cations (T22CAT)	UNKWQAN		meq/L	0.897	0.942	0.982	0.985				N/A
Total Alkalinity (as CaCO3) (TOTALK)	2320B	5	mg/L	37.677	40.223	38.8	39.115				N/A
Total Anions (TOTANI)	UNKWQAN		meq/L	0.936	0.884	0.969	0.9				N/A
Total Cations (TOTCAT)	UNKWQAN		meq/L	0.909	0.894	0.927	0.876				N/A
Total Chlorine (TOTCL2)	4500CLF	0.1	mg/L	0.5	0.5	1.4	0.5				N/A
Total Dissolved Solids (TDS)	2540C	2.5	mg/L	45.015	53.846	56.091	45.308		500		500[15]

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
INORGANIC (Continued)											
Total Hardness (as CaCO3) (TOTHRD)	X200.7	1	mg/L	35.3	34.9	34.333	34.367				240[16]
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2	mg/L	0.119	0.175	0.209	0.241				N/A
Total Nitrogen (TOT-N)	X1-351.2	0.3	mg/L	0.7	0.831	0.98	1.048				5
Total Organic Carbon (Unfiltered) (TOC)	5310C	0.05	mg/L	0.079	0.083	0.088	0.085				0.5[17]
Trivalent Chromium (CrIII)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
Ultraviolet (absorbance) (UVAB)	5910B	0.005	1/cm	0.007	0.006	0.006	0.007				N/A
Uranium (U) (U)	X200.8	1	ug/L	ND	ND	ND	ND				N/A
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	0.099	0.065	0.093	0.088				N/A
Vanadium (V)	X200.8	1	ug/L	ND	ND	ND	ND			50	N/A
Zinc (Zn)	X200.8	1	ug/L	ND	1.6	ND	ND		5,000		5,000
ORGANIC											
1,1,1,2-Tetrachloroethane (1112PC)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,1,1-Trichloro-2-propanone (TCPONE)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
1,1,1-Trichloroethane (111TCA)	524.2	0.5	ug/L	ND	ND	ND	ND	200			200
1,1,2,2-Tetrachloroethane (1122PC)	524.2	0.5	ug/L	ND	ND	ND	ND	1			1
1,1,2-Trichloroethane (112TCA)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,1-Dichloro-2-propanone (11DC2P)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
1,1-Dichloroethane (11DCA)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,1-Dichloroethene (11DCE)[18]	524.2	0.5	ug/L	ND	ND	ND	ND	6			6
1,1-Dichloropropene (11DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,2,3-Trichlorobenzene (123TCB)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,2,3-Trichloropropane (123TCP)	14DIOX / 504.1 / 524.2 / 524M-TCP	0.005 - 0.5	ug/L	ND	ND	ND	ND	0.005			N/A
1,2,4-Trichlorobenzene (124TCB)	524.2 / 625.1 / 8270C	0.5 - 10	ug/L	ND	ND	ND	ND	5			5
1,2,4-Trimethylbenzene (124TMB)	524.2	0.5	ug/L	ND	ND	ND	ND			330	N/A
1,2-Dibromo-3-chloropropane (DBCP)[19]	14DIOX / 504.1 / 524.2 / 524M-TCP	0.01 - 0.5	ug/L	ND	ND	ND	ND	0.2			0.2
1,2-Dibromoethane (EDB)[20]	14DIOX / 504.1 / 524.2 / 524M-TCP	0.005 - 0.5	ug/L	ND	ND	ND	ND	0.05			0.05
1,2-Dichlorobenzene (12DCB)	524.2 / 625.1 / 8270C	0.5 - 10	ug/L	ND	ND	ND	ND	600			600
1,2-Dichloroethane (12DCA)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5
1,2-Dichloropropane (12DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
1,2-Diphenylhydrazine (12DPH)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
1,3,5-Trimethylbenzene (135TMB)	524.2	0.5	ug/L	ND	ND	ND	ND			330	N/A
1,3-Dichlorobenzene (13DCB)	524.2 / 625.1 / 8270C	0.5 - 10	ug/L	ND	ND	ND	ND			600	N/A
1,3-Dichloropropane (13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
1,4-Dichlorobenzene (14DCB)	524.2 / 625.1 / 8270C	0.5 - 10	ug/L	ND	ND	ND	ND	5			5
1,4-Dioxane (14DIOX)	14DIOX	0.5	ug/L	ND	ND	ND	ND			1	1
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	537.1	2	ng/L	ND	ND	ND	ND				N/A
17a-Estradiol (aESTRA)	CEC	1	ng/L	ND	ND	ND	ND				N/A
17a-Ethynylestradiol (aETEST)[21]	CEC	2	ng/L	ND	ND	ND	ND				N/A
17b-Estradiol (bESTRA)	CEC	2	ng/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
ORGANIC (Continued)											
2,2-Dichloropropane (22DCP)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1613B	4.8 - 5	pg/L	ND	ND	ND	ND	30			30
2,4,5-Trichlorophenol (245TCP)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
2,4,6-Trichlorophenol (246TCP)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
2,4-Dichlorophenol (24DCPH)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
2,4-Dimethylphenol (24DMP)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND			100	N/A
2,4-Dinitrophenol (24DNP)	625.1 / 8270C	10 - 48	ug/L	ND	ND	ND	ND				N/A
2,4-Dinitrotoluene (24DNT)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
2,6-Dinitrotoluene (26DNT)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
2-Chloroethylvinyl ether (2ClEVE)	14DIOX	1	ug/L	ND	ND	ND	ND				N/A
2-Chloronapthalene (2ClNAP)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
2-Chlorophenol (2ClPNL)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
2-Chlorotoluene (2CLTOL)	524.2	0.5	ug/L	ND	ND	ND	ND			140	N/A
2-Methyl naphthalene (2MNAP)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1 / 8270C	5 - 48	ug/L	ND	ND	ND	ND				N/A
2-Methylphenol (oCRESL)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
2-Nitroaniline (oNTANL)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
2-Nitrophenol (2NPNL)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
3- & 4-Methylphenol (mpCRESL)	8270C	1	ug/L	NS	ND	ND	ND				N/A
3,3'-Dichlorobenzidine (DCBZDE)	625.1 / 8270C	5 - 24	ug/L	ND	ND	ND	ND				N/A
3-Nitroaniline (mNTANL)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
4:2 Fluorotelomer sulfonate (4:2FTS)	533	2	ng/L	NS	NS	ND	ND				N/A
4-Androstene-3,17-dione (ANDROS)	CEC	2	ng/L	ND	ND	ND	ND				N/A
4-Bromophenyl phenyl ether (4BrPPE)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
4-Chloro-3-methylphenol (43CMP)[22]	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
4-Chloroaniline (pClANL)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
4-Chlorophenyl phenyl ether (4ClPPE)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
4-Chlorotoluene (4CLTOL)	524.2	0.5	ug/L	ND	ND	ND	ND			140	N/A
4-Isopropyltoluene (4IPTOL)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
4-Methylphenol (pCRESL)	625.1	9.9 - 10	ug/L	ND	ND	NR	NR				N/A
4-Nitroaniline (pNTANL)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
4-Nitrophenol (4NPNL)	625.1 / 8270C	5 - 20	ug/L	ND	ND	ND	ND				N/A
4-n-Octylphenol (4nOCPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
4-tert-Octylphenol (4tOCPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
6:2 Fluorotelomer sulfonate (6:2FTS)	533	2	ng/L	NS	NS	ND	ND				N/A
8:2 Fluorotelomer sulfonate (8:2FTS)	533	2	ng/L	NS	NS	ND	ND				N/A
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Acetaldehyde (ACEALD)	556	2	ug/L	ND	ND	ND	ND				N/A
Acetone (ACETNE)	524.2	10	ug/L	ND	ND	1.95	ND				N/A
Acrolein (ACROLN)	524.2 / 624.1	5	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
ORGANIC (Continued)											
Acrylonitrile (ACRYLO)	524.2 / 624.1	2	ug/L	ND	ND	ND	ND				N/A
Aniline (ANLN)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
Aspartame (ASPATM)	CEC	100	ng/L	ND	ND	ND	ND				N/A
Atenolol (ATENOL)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Benzaldehyde (BENALD)	556	2	ug/L	ND	ND	ND	ND				N/A
Benzene (BENZ)	524.2	0.5	ug/L	ND	ND	ND	ND	1			1
Benzidine (BNZDE)	625.1 / 8270C	10 - 48	ug/L	ND	ND	ND	ND				N/A
Benzoic Acid (BNZACD)	625.1 / 8270C	20 - 100	ug/L	ND	ND	ND	ND				N/A
Benzyl Alcohol (BNZALC)	625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethoxy) methane (B2CEM)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethyl) ether (B2CLEE)	524.2 / 625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroisopropyl) ether (B2CIPE)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
Bisphenol A (BisPHA)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Bromobenzene (BRBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromochloroacetic Acid (BCAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Bromochloroacetonitrile (BCAN)	551.1	0.5	ug/L	ND	ND	ND	1.3				N/A
Bromochloromethane (CH2BrC)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromodichloroacetic Acid (BDCAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Bromodichloromethane (CHBrCl)[23]	524.2	0.5	ug/L	0.593	0.739	0.987	0.873				N/A
Bromoform (CHBr3)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Bromomethane (CH3Br)[24]	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Carbazole (CARBZL)	8270C	1	ug/L	NS	ND	ND	ND				N/A
Carbon Disulfide (CS2)	524.2	0.5	ug/L	ND	ND	ND	ND			160	N/A
Carbon tetrachloride (CCl4)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5 ug/L
Chlorobenzene (CLBENZ)[25]	524.2	0.5	ug/L	ND	ND	ND	ND	70			70 ug/L
Chlorodibromoacetic Acid (CDBAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Chlorodifluoromethane (FREN22)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloroethane (ClETHA)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloroform (CHCl3)	524.2	0.5	ug/L	1.35	1.679	2.242	2.093				N/A
Chloromethane (CH3Cl)[26]	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Chloropicrin (ClPICR)	551.1	0.5	ug/L	ND	ND	ND	ND			50	N/A
cis-1,2-Dichloroethene (c12DCE)[27]	524.2	0.5	ug/L	ND	ND	ND	ND	6			6
cis-1,3-Dichloropropene (c13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.50			0.5
Crotonaldehyde (CRTALD)	556	2	ug/L	ND	ND	ND	ND				N/A
Cyclohexanone (CYCHXN)	556	2	ug/L	ND	ND	ND	ND				N/A
Decanal (DECNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Dibenzofuran (DBFUR)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
Dibromoacetic Acid (DBAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Dibromoacetonitrile (DBAN)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
Dibromochloromethane (CHBr2C)[29]	524.2	0.5	ug/L	ND	ND	0.067	0.077				N/A
Dibromomethane (CH2Br2)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
ORGANIC (Continued)											
Dichloroacetic Acid (DCAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Dichloroacetonitrile (DCAN)	551.1	0.5	ug/L	0.63	0.57	0.73	1.5				N/A
Dichlorodifluoromethane (CCl2F2)	524.2	0.5	ug/L	ND	ND	ND	ND			1,000	N/A
Diclofenac (DICLFN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Diethylstilbestrol (DESTBL)	CEC	2	ng/L	ND	ND	ND	ND				N/A
Diisopropyl ether (DIPE)	524.2	1	ug/L	ND	ND	ND	ND				N/A
Dilantin (DILANT)	CEC	10	ng/L	ND	ND	ND	ND				N/A
Dissolved Organic Carbon (DOC)	5310C	0.05	mg/L	0.2	0.14	0.12	0.08				N/A
Endosulfan II (ENDOII)[30]	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
Epitestosterone (cis-Testosterone) (EPITES)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Equilin (EQUILN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Estriol (ESTRIO)	CEC	2	ng/L	ND	ND	ND	ND				N/A
Estrone (ESTRON)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Ethyl tert-butyl ether (ETBE)	524.2	1	ug/L	ND	ND	ND	ND				N/A
Ethylbenzene (EtBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND	300			300
Fluoxetine (FLUXET)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Formaldehyde (FORALD)	556	2	ug/L	11	11	10	16			100	N/A
Freon 123a (FR123A)	524.2	0.5 - 2	ug/L	ND	ND	ND	ND				N/A
Glyoxal (GLYOXL)	556	2	ug/L	ND	ND	ND	ND				N/A
HCH-alpha (Alpha-BHC) (BHCa)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND			0.015	N/A
HCH-beta (Beta-BHC) (BHCb)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND			0.025	N/A
HCH-delta (Delta-BHC) (BHCd)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
Heptanal (HEPNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Hexachlorobutadiene (HClBut)	524.2 / 625.1 / 8270C	0.5 - 10	ug/L	ND	ND	ND	ND				N/A
Hexachloroethane (HCE)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Hexanal (HEXNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Iohexol (IOHEXL)	CEC	20	ng/L	ND	ND	ND	ND				N/A
Iopromide (IOPRMD)	CEC	10	ng/L	ND	ND	ND	ND				N/A
Isophorone (IPHOR)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Isopropylbenzene (ISPBNZ)	524.2	0.5	ug/L	ND	ND	ND	ND			770	N/A
Linuron (LINURN)	CEC	0.005	ug/L	ND	ND	ND	ND				N/A
m,p-Xylene (mp-XYL)[35]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[35]
Meprobamate (MEPROB)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Methyl Ethyl Ketone (MEK) (MEK)	524.2	2.5 - 5	ug/L	ND	ND	ND	ND				N/A
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	2.5 - 5	ug/L	ND	ND	ND	ND			120	N/A
Methyl tert-butyl ether (MTBE)[31]	524.2	0.2	ug/L	ND	ND	ND	ND	13	5		5[31]
Methylene Chloride (CH2Cl2)[32]	524.2	0.5	ug/L	ND	0.207	0.154	0.077	5			5
Methylglyoxal (MGLYOX)	556	2	ug/L	ND	ND	ND	ND				N/A
Methylisothiocyanate (MITC)	14DIOX	0.05 - 0.1	ug/L	ND	ND	ND	ND			190	N/A
Metolachlor (METOCL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
ORGANIC (Continued)											
Monobromoacetic Acid (MBAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Monochloroacetic Acid (MCAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Naphthalene (NAP)	524.2/525.2/625.1/8270C	0.1 - 10	ug/L	ND	ND	ND	ND			17	N/A
Naproxen (NAPRXN)	CEC	5	ng/L	ND	ND	ND	ND				N/A
n-Butylbenzene (nBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Neotame (NEOTAM)	CEC	10	ng/L	ND	ND	ND	ND				N/A
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Nitrobenzene (NBENZ)	625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodimethylamine (NDMA)[36]	NDMA-LOW / 8270C	2 / 1,000	ng/L	ND[36]	1.364[36]	1.575[36]	0.933[36]			10	10
n-Nitroso-di-n-propylamine (NDPA)	625.1 / 8270C / NDMA-LOW	2 - 10,000	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodiphenylamine (NDPhA)	625.1 / 8270C	1,000 - 10,000	ng/L	ND	ND	ND	ND				N/A
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2	ng/L	ND	ND	ND	ND				12
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	533	2	ng/L	NS	NS	ND	ND				N/A
Nonanal (NONNAL)	556	2	ug/L	ND	ND	ND	ND				N/A
Nonylphenol (NONYPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
o-Xylene (o-XYL)[35]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[35]
para-Chlorobenzene sulfonic acid (pCBSA)	CEC	200	ng/L	ND	ND	ND	ND				N/A
PCB-1016 (PCB16)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1221 (PCB21)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1232 (PCB32)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1242 (PCB42)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1248 (PCB48)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1254 (PCB54)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1260 (PCB60)[33]	508	0.1 - 0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCBs, Total (TOTPCB)[33]	508	0.5	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
Perfluoro butane sulfonic acid (PFBS)	537.1	2	ng/L	ND	ND	ND	ND			500	N/A
Perfluoro heptanoic acid (PFHpA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro hexane sulfonic acid (PFHxS)	537.1	2	ng/L	ND	ND	ND	ND			2	N/A
Perfluoro nonanoic acid (PFNA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoro octane sulfonic acid (PFOS)	537.1	2	ng/L	ND	ND	ND	ND			6.5	13
Perfluoro octanoic acid (PFOA)	537.1	2	ng/L	ND	ND	ND	ND			5.1	14
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluoro-3-methoxypropanoic acid (PFMPA)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluoro-4-methoxybutanoic acid (PFMBA)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluorobutanoic acid (PFBA)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluorodecanoic acid (PFDA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluorododecanoic acid (PFDoA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoroheptanesulfonic Acid (PFHpS)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluorohexanoic acid (PFHxA)	537.1	2	ng/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
ORGANIC (Continued)											
Perfluoropentanesulfonic acid (PFPeS)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluoropentanoic acid (PFPeA)	533	2	ng/L	NS	NS	ND	ND				N/A
Perfluorotetradecanoic acid (PFTA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluorotridecanoic acid (PFTrDA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
Perfluoroundecanoic acid (PFUnA)	537.1	2	ng/L	ND	ND	ND	ND				N/A
PFOA + PFOS (PFOAOS)	UNKWQAN	2	ng/L	ND	ND	ND	ND				N/A
Phenol (PHENOL)	625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND			4,200	N/A
PhenylPhenol (PHNYPH)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Progesterone (PRGSTR)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Propylbenzene (PRPBNZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Pyridine (PYRDN)	8270c	5	ug/L	NS	ND	ND	ND				N/A
sec-Butylbenzene (sBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Styrene (STYR)	524.2	0.5	ug/L	ND	ND	ND	ND	100			100
Sucralose (SUCRAL)	CEC	100	ng/L	ND	ND	ND	ND				N/A
Sum of five Haloacetic Acids (HAA5)	UNKWQAN	1	ug/L	ND	ND	ND	ND	60			60
Sum of nine Haloacetic Acids (HAA9)	UNKWQAN	1	ug/L	ND	ND	ND	ND				N/A
Sum of Six Brominated Haloacetic Acids (HAA6Br)	UNKWQAN	1	ug/L	ND	ND	ND	ND				N/A
Terbufos Sulfone (TERSUL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Tert-amyl methyl ether (TAME)	524.2	1	ug/L	ND	ND	ND	ND				N/A
tert-butyl alcohol (TBA)	524.2	2	ug/L	ND	ND	ND	ND			12	N/A
tert-Butylbenzene (tBBENZ)	524.2	0.5	ug/L	ND	ND	ND	ND			260	N/A
Testosterone (trans-Testosterone) (TESTOR)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Tetrabromobisphenol A (TBBISA)	CEC	0.2	ug/L	ND	ND	ND	ND				N/A
Tetrachloroethene (PCE)[34]	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
Toluene (TOLU)	524.2	0.5	ug/L	ND	ND	ND	ND	150			150
Total 1,3-Dichloropropene (x13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5
Total Trihalomethanes (TTHMs)	524.2	0.5	ug/L	1.871	2.407	3.167	2.88	80			80
Total Xylenes (m,p,&o) (TOTALX)[35]	524.2	0.5	ug/L	ND	ND	ND	ND	1,750			1750[35]
trans-1,2 Dichloroethene (t12DCE)[37]	524.2	0.5	ug/L	ND	ND	ND	ND	10			10
trans-1,3-Dichloropropene (t13DCP)	524.2	0.5	ug/L	ND	ND	ND	ND	0.50			0.5
Tribromoacetic Acid (TBAA)	552.2	1	ug/L	ND	ND	ND	ND				N/A
Trichloroacetic Acid (TCAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Trichloroacetonitrile (TCAN)	551.1	0.5	ug/L	ND	ND	ND	ND				N/A
Trichloroethene (TCE)[38]	524.2	0.5	ug/L	ND	ND	ND	ND	5			5
Trichlorofluoromethane (Freon 11) (CCl3F)	524.2	0.5	ug/L	ND	ND	ND	ND	150			150
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)[39]	524.2	0.5	ug/L	ND	ND	ND	ND	1,200			1,200
Trimethoprim (TRIMTP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Tris-2-chloroethyl phosphate (TCEP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Vinyl chloride (VNYLCL)	524.2	0.5	ug/L	ND	ND	ND	ND	0.5			0.5

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
RADIOLOGICALS											
Gross Alpha Excluding Uranium (TOTa-U)	UNKWQAN	DLR[40] 3, 1.11-1.28	pCi/L	1.09	1.64	2.09	2.53	15			15
Natural Uranium (NTUr)	X200.8	DLR[40] 1, 0.27-0.67	pCi/L	3.08	ND	ND	ND	20			20
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	DLR[40] 1, 0.4-0.624	pCi/L	0.324	0.302	0.295	0.803	5			5
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.4 - 0.624	pCi/L	0.244	0.771	0.163	1.09				N/A
Total Alpha (TOTa)	7110C	1.11 - 1.28	pCi/L	4.17	1.64	2.09	2.53				N/A
Total Alpha Counting Error (TOTaCE)	7110C	1.11 - 1.28	pCi/L	1.76	1.29	1.35	1.39				N/A
Total Beta (TOTb)	900.0	DLR[40] 4, 1.02-1.64	pCi/L	2.84	2.54	4.09	4.34	50			50
Total Beta Counting Error (TOTbCE)	900.0	1.02 - 1.64	pCi/L	0.82	1.06	0.953	1.31				N/A
Total Radium 226 (TRa226)	903.0	0.362 - 0.41	pCi/L	0.324	0.301	0.295	0.339	5			N/A
Total Radium 226 Counting Error (TRa6CE)	903.0	0.362 - 0.41	pCi/L	0.244	0.196	0.163	0.266				N/A
Total Radium 228 (TRa228)	RA-05	0.4 - 0.624	pCi/L	ND	0.001	ND	0.464	5			N/A
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.4 - 0.624	pCi/L	ND	0.575	ND	0.824				N/A
Total Strontium-90 (TS90)	905.0	DLR[40] 2, 0.353-1.5	pCi/L	0.043	0.074	0.27	-0.248	8			8
Total Strontium-90 Counting Error (TS90CE)	905.0	0.353 - 1.5	pCi/L	0.148	0.326	0.643	0.193				N/A
Total Tritium (TTr)	906.0	DLR[40] 1000, 434	pCi/L	345.5	358.5	294.5	249.25	20,000			20,000
Total Tritium Counting Error (TTrCE)	906.0	434	pCi/L	275	276	275.25	274				N/A
SEMI-ORGANIC											
1-Naphthol (NPTHOL)	531 / 531.2	5	ug/L	ND	ND	ND	ND				N/A
2,4,5-T (245T)	515.4	0.2	ug/L	ND	ND	ND	ND				N/A
2,4,5-TP (Silvex) (245TP)	515.4	0.2	ug/L	ND	ND	ND	ND	50			50
2,4,6-Trinitrotoluene (246TNT)	8330A	0.11	ug/L	ND	ND	ND	ND			1	N/A
2,4-DB (24DB)	515.4	2	ug/L	ND	ND	ND	ND				N/A
2,4-Dichlorophenoxyacetic Acid (24D)	515.4	0.4	ug/L	ND	ND	ND	ND	70			70
3,5-Dichlorobenzoic Acid (35DBA)	515.4	1	ug/L	ND	ND	ND	ND				N/A
3-Hydroxycarbofuran (HYDCFR)	531 / 531.2	2	ug/L	ND	ND	ND	ND				N/A
4,4'-DDD (DDD)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDE (DDE)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDT (DDT)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
Acenaphthene (ACNAPE)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Acenaphthylene (ACENAP)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Acetaminophen (ACTMNP)	CEC	5	ng/L	ND	ND	ND	ND				N/A
Acetochlor (ACETOC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Acifluorfen (ACIFEN)	515.4	0.4	ug/L	ND	ND	ND	ND				N/A
Alachlor (ALACHL)	525.2	0.1	ug/L	ND	ND	ND	ND	2			2
Aldicarb (ALDI)	531 / 531.2	1	ug/L	ND	ND	ND	ND			7	N/A
Aldicarb sulfone (ALDISN)	531 / 531.2	2	ug/L	ND	ND	ND	ND				N/A
Aldicarb sulfoxide (ALDISX)	531 / 531.2	2	ug/L	ND	ND	ND	ND				N/A
Aldrin (ALDRIN)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND			0.002	N/A
Ametryn (AMERYN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Anthracene (ANTHRA)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
SEMI-ORGANIC (Continued)											
Atrazine (ATRAZ)	525.2 / CEC	0.001 - 0.1	ug/L	ND	ND	ND	ND	1			1
Azithromycin (AZTMCN)	CEC	10 - 50	ng/L	ND	ND	ND	NR				N/A
Baygon (BAYGON)	531 / 531.2	1	ug/L	ND	ND	ND	ND			30	N/A
Bentazon (BENTAZ)	515.4	2	ug/L	ND	ND	ND	ND	18			18
Benzo(a)anthracene (BaANTH)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Benzo(a)pyrene (BaPYRE)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND	0.2			0.2
Benzo(b)fluoranthene (BbFLUR)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Benzo(g,h,i)perylene (BghiPR)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Benzo[k]fluoranthene (BkFLUR)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
bis (2-ethylhexyl) adipate (DEHA)[41]	525.2	2	ug/L	ND	ND	ND	ND	400			400
bis (2-ethylhexyl) phthalate (DEHP)[42]	525.2 / 625.1 / 8270C	2 - 20	ug/L	ND	ND	ND	ND	4			4
Bromacil (BROMAC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butachlor (BUTACL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butanal (BUTAN)	556	2	ug/L	ND	ND	ND	ND				N/A
Butylate (BTYATE)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Butylbenzyl phthalate (BBP)	525.2 / 625.1 / 8270C	1 - 20	ug/L	ND	ND	ND	ND				N/A
Caffeine (CAFFEI)	525.2 / CEC	3 - 100	ng/L	ND	ND	ND	ND				N/A
Captan (CAPTAN)	525.2	0.1	ug/L	ND	ND	ND	ND			15	N/A
Carbamazepine (CBMAZP)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Carbaryl (CARBAR)	531 / 531.2	2	ug/L	ND	ND	ND	ND			700	N/A
Carbofuran (CARBOF)	531 / 531.2	1	ug/L	ND	ND	ND	ND	18			18
Chlordane (ClDANE)	508 / 8081A	0.019 - 0.1	ug/L	ND	ND	ND	ND	0.1			0.1
Chlordane-alpha (CLDA)	525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlordane-gamma (CLDG)	525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlorobenzilate (CLBZLA)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chloroneb (CLNEB)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chlorothalonil (CLTNIL)	508 / 525.2	0.05 - 0.1	ug/L	ND	ND	ND	ND				N/A
Chlorpropham (CPRPHM)	525.2	0.1	ug/L	ND	ND	ND	ND			1,200	N/A
Chlorpyrifos (ClPYRI)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chrysene (CHRYS)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Dalapon (DALAPN)	515.4 / 552.2	0.4 - 1	ug/L	ND	ND	ND	ND	200			200
DCPA-Dacthal (DCPA)	515.4 / 525.2	0.1	ug/L	ND	ND	ND	ND			1.2	N/A
Diazinon (DIAZI)	525.2	0.1	ug/L	ND	ND	ND	ND			1.2	N/A
Dibenzo(a,h)anthracene (DBahAN)	525.2 / 625.1 / 8270C	0.1 - 20	ug/L	ND	ND	ND	ND				N/A
Dicamba (DICAMB)	515.4	0.6	ug/L	ND	ND	ND	ND				N/A
Dichlorprop (24DP)	515.4	0.3	ug/L	ND	ND	ND	ND				N/A
Dichlorvos (DCLVOS)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Dieldrin (DIELDR)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND			0.002	N/A
Diethyl phthalate (DEP)	525.2 / 625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A
Dimethoate (DMTH)	525.2	1	ug/L	ND	ND	ND	ND			1	N/A
Dimethyl phthalate (DMP)	525.2 / 625.1 / 8270C	1 - 10	ug/L	ND	ND	ND	ND				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
SEMI-ORGANIC (Continued)											
Di-n-butylphthalate (DnBP)	525.2 / 625.1 / 8270C	1 - 20	ug/L	ND	ND	1.6	ND				N/A
Di-n-octyl phthalate (DnOP)	525.2 / 625.1 / 8270C	1 - 24	ug/L	ND	ND	ND	ND				N/A
Dinoseb (DINOSB)	515.4	0.4	ug/L	ND	ND	ND	ND	7			7
Diphenamid (DPHNMD)	525.2	0.1	ug/L	ND	ND	ND	ND			200	N/A
Diquat (DIQUAT)	549.2	4	ug/L	ND	ND	ND	ND	20			20
Diuron (DIURON)	CEC	0.005	ug/L	ND	ND	ND	ND				N/A
Endosulfan I (ENDOI)[43]	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endosulfan sulfate (ENDOSL)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endothall (ENDOTL)	548.1	45	ug/L	ND	ND	ND	ND	100			100
Endrin (ENDRIN)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND	2			2
Endrin Aldehyde (ENDR-A)	508 / 525.2 / 8081A	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endrin Ketone (ENDR-K)	8081A	0.0097 - 0.01	ug/L	NS	ND	ND	ND				N/A
EPTC (EPTC)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Erythromycin (ERYTHN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Ethion (ETHION)	525.2	0.1	ug/L	ND	ND	ND	ND			4	N/A
Ethoprop (ETHPRP)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Ethylene Glycol (GLYCOL)	8015D	10,000	ug/L	ND	ND	ND	ND			14,000	N/A
Etridiazole (ETRDZL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Fluoranthene (FLANTH)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Fluorene (FLUOR)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Gemfibrozil (GMFIBZ)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Glyphosate (GLYPHO)	547	25	ug/L	ND	ND	ND	ND	700			700
HCH-gamma (Lindane) (LINDNE)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND	0.2			0.2
Heptachlor (HEPTA)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01
Heptachlor epoxide (HEPEPX)	508 / 525.2 / 8081A	0.0039 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01
Hexachlorobenzene (HEXCLB)	508 / 525.2 / 625.1 / 8270C	0.05 - 10	ug/L	ND	ND	ND	ND	1			1
Hexachlorocyclopentadiene (HClCPD)	508 / 525.2 / 625.1 / 8270C	0.05 - 24	ug/L	ND	ND	ND	ND	50			50
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.21 - 0.22	ug/L	ND	ND	ND	ND			0.3	N/A
Hexazinone (HEXZON)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Ibuprofen (IBPRFN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2 / 625.1 / 8270C	0.1 - 20	ug/L	ND	ND	ND	ND			160	N/A
Malathion (MALATH)	525.2	2	ug/L	ND	ND	ND	ND				N/A
Methiocarb (MTHCRB)	531 / 531.2	4	ug/L	ND	ND	ND	ND				N/A
Methomyl (MTHOMY)	531 / 531.2	1	ug/L	ND	ND	ND	ND				N/A
Methoxychlor (METHOX)	508 / 525.2 / 8081A	0.0097 - 0.1	ug/L	ND	ND	ND	ND	30			30
methyl-Parathion (MPARA)	525.2	0.5	ug/L	ND	ND	ND	ND			2	N/A
Metribuzin (MTRBZN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Molinate (MOLINT)	525.2	0.1	ug/L	ND	ND	ND	ND	20			20
N,N-diethyl-m-toluamide (DEET)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Norflurazon (NORFLR)	525.2	1	ug/L	ND	ND	ND	ND				N/A
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.21 - 0.22	ug/L	ND	ND	ND	ND			350	N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1]) AVERAGES FOR ALL AVAILABLE DATA FOR 2021[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2021 Quarter 1	2021 Quarter 2	2021 Quarter 3	2021 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
SEMI-ORGANIC (Continued)											
Oxamyl (OXAMYL)	531 / 531.2	2	ug/L	ND	ND	ND	ND	50			50
Paraquat (PARAQT)	549.2	4	ug/L	ND	ND	ND	ND				N/A
Parathion (PARA)	525.2	0.5	ug/L	ND	ND	ND	ND			40	N/A
Pentachlorophenol (PCP)	515.4/525.2/625.1/8270C/CEC	0.2 - 24	ug/L	ND	ND	ND	ND	1			1
Pentanal (PENTNL)	556	2	ug/L	ND	ND	ND	ND				N/A
Permethrin-(total of cis/trans) (PMTHRN)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Phenanthrene (PHENAN)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Picloram (PICLOR)	515.4	0.6	ug/L	ND	ND	ND	ND	500			500
Primidone (PRIMDN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Prometryn (PROMET)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Pronamide (PROAMD)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Propachlor (PROPCL)	508 / 525.2	0.05 - 0.1	ug/L	ND	ND	ND	ND			90	N/A
Propanal (PROPNL)	556	2	ug/L	ND	ND	ND	ND				N/A
Propazine (PROPAZ)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Pyrene (PYRENE)	525.2 / 625.1 / 8270C	0.1 - 10	ug/L	ND	ND	ND	ND				N/A
Simazine (SIMAZ)	525.2 / CEC	0.005 - 0.1	ug/L	ND	ND	ND	ND	4			4
Sulfamethoxazole (SULTHZ)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Tebuthiuron (TBTURN)	525.2	2	ug/L	ND	ND	ND	ND				N/A
Terbacil (TRBACL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Thiobencarb (THIO)[44]	525.2	0.1	ug/L	ND	ND	ND	ND	70	1		1[44]
Toxaphene Mixture (TOXA)	508 / 8081A	0.058 - 1	ug/L	ND	ND	ND	ND	3			3
Triclosan (TRICLN)	CEC	1	ng/L	ND	ND	ND	ND				N/A
Trifluralin (TRFLRN)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Trithion (TRTION)	525.2	0.1	ug/L	ND	ND	ND	ND			7	N/A

APPENDIX A
Orange County Water District
GWRS WATER QUALITY REQUIREMENTS

Purified Recycled Water Monitoring

Footnotes:

[1] Purified Recycled Water (also called Finished Product Water (FPW) or Final Product Water) is the final recycled water flow stream.

[2] For purposes of calculating quarterly averages, 10% of corresponding Reportable Detection Limits (RDL) was used for all non-detect (ND) values. If all data for the quarter were ND, then the average is shown as ND.

[3] Permit and monitoring and reporting requirements per RWQCB Order Nos. R8-2004-0002 amended by R8-2008-0058, R8-2014-0054, R8-2016-0051 and R8-2021-0003.

[4] California Drinking Water Standards are shown as applicable. Abbreviations are: Action Level = AL; Primary MCL = 1MCL; Secondary MCL = 2MCL(recommended value (more stringent value) is considered); Notification Level = NL (includes notification levels and archived advisory levels); Unregulated Chemicals Requiring Monitoring = UR; California Unregulated Chemical Monitoring Regulation = CA UCMR; N/A = not applicable. While not drinking water standards, the RWQCB Basin Plan requirements for the permit are noted as BP in this column with Talbert Barrier area water quality objectives shown.

[5] ROP is the RO Permeate or RO Product flow stream. Permit requirements for UV%T and turbidity are applicable to the ROP flow stream.

[6] ROP turbidity shall not exceed: 0.2 Nephelometric Turbidity Units (NTU) more than 5 percent of the time in any 24-hour period; and 0.5 NTU at any time.

[7] Aluminum has a Primary MCL of 1 mg/L and a Secondary MCL of 0.2 mg/L. The permit limit is the lower of these two values.

[8] Chloride has a Secondary MCL of 250 mg/L and a RWQCB Basin Plan Water Quality Objective of 55 mg/L.

[9] Copper has a Secondary MCL of 1 mg/L and an Action Level of 1.3 mg/L.

[10] Lead has an Action Level of 0.015 mg/L.

[11] Manganese has a Secondary MCL of 50 ug/L and a Notification Level of 500 ug/L.

[12] Nitrate-nitrogen has a Primary MCL of 10 mg/L (as nitrogen) and a RWQCB Basin Plan Water Quality Objective of 3 mg/L. The sum of nitrate-nitrogen plus nitrite-nitrogen has a primary MCL of 10 mg/L (as nitrogen).

[13] Sodium has a RWQCB Basin Plan Water Quality Objective of 45 mg/L.

[14] Sulfate has a Secondary MCL of 250 mg/L and a RWQCB Basin Plan Water Quality Objective of 100 mg/L.

[15] Total Dissolved Solids has a Secondary MCL of 500 mg/L and a RWQCB Basin Plan Water Quality Objective of 500 mg/L.

[16] Total Hardness (as CaCO3) has a RWQCB Basin Plan Water Quality Objective of 240 mg/L.

[17] TOC limit of 0.5 mg/L is based on the maximum allowable Recycled Water Contribution (RWC) of 100% at Talbert Barrier. The TOC limit is calculated by dividing 0.5 mg/L by the approved maximum RWC specified by CDPH for each recharge site. On November 25, 2009, CDPH approved the 100% RWC at Talbert Barrier, making the TOC requirement calculated by dividing 0.5 mg/L by 100%, or equal to 0.5 mg/L thereafter, at that site. The TOC permit requirement for Kraemer-Miller Basins remains 0.7 mg/L based on the approved RWC of 75% at that location. However, because the same FPW is supplied to both sites, the maximum TOC concentration is effectively 0.5 mg/L.

[18] Alternate name for 1,1-Dichloroethene is 1,1-Dichloroethylene.

[19] Alternate name for 1,2-Dibromo-3-chloropropane is Dibromochloropropane (DBCP).

[20] Alternate name for Dibromoethane is Ethylene Dibromide (EDB).

[21] Alternate name for 17a-Ethynyl Estradiol is Ethinyl Estradiol.

[22] Alternate name for 4-Chloro-3-methylphenol is 3-Methyl-4-Chlorophenol.

[23] Alternate name for Bromodichloromethane is Dichlorobromomethane.

[24] Alternate name for Bromomethane is Methyl Bromide.

[25] Alternate name for Chlorobenzene is Monochlorobenzene .

[26] Alternate name for Chloromethane is Methyl Chloride.

[27] Alternate name for cis-1,2-Dichloroethene is cis-1,2-Dichloroethylene.

[28] Total Haloacetic acids (five) (HAA5) are listed separately as Monochloroacetic Acid, Dichloroacetic Acid, Trichloroacetic Acid, Monobromoacetic Acid, and Dibromoacetic Acid.

[29] Alternate name for Dibromochloromethane is Chlorodibromomethane.

[30] Alternate name for Endosulfan II is Beta Endosulfan.

[31] MTBE has a Primary MCL of 13 ug/L and a Secondary MCL of 5 ug/L. The permit limit is the lower of these two values.

[32] Alternate name for Methylene chloride is Dichloromethane.

[33] Polychlorinated Biphenyls are listed separately as PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260; however the PMCL is for the total mixture of PCB congeners (TOTPCB) and not individual PCB's.

[34] Alternate name for Tetrachloroethene is Tetrachloroethylene.

[35] Primary MCL for Total Xylenes and not isomers (o-, m-, p-xylene).

[36] Averages shown for In-house Method NDMA-LOW using RDL=2 ng/L. All results for Method 8270C using RDL=1,000 ng/L were ND.

[37] Alternate name for trans-1,2-Dichloroethene is trans-1,2-Dichloroethylene.

[38] Alternate name for Trichloroethene is Trichloroethylene.

[39] Alternate name for Trichlorotrifluoroethane (Freon 113) is 1,1,2-Trichloro-1,2,2-Trifluoroethane.

[40] California Detection Level for purposes of Reporting (DLR).

[41] Alternate name for bis (2-ethylhexyl) adipate is Di(2-ethylhexyl)adipate.

[42] Alternate name for bis (2-ethylhexyl) phthalate is Di(2-ethylhexyl)phthalate (DEHP).

[43] Alternate name for Endosulfan I is Alpha Endosulfan.

[44] Thiobencarb has a Primary MCL of 70 ug/L and a Secondary MCL of 1 ug/L. The permit limit is the lower of these two values.

GWRS 2021 Quarterly Sampling Dates
OCWD Water Quality Department
GWRS FINAL PRODUCT WATER (FPW)

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
GWRS-FPW	01/06/2021	04/07/2021	07/07/2021	10/06/2021

Notes for Appendix A Tables:

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Appendices B and C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► Analysis for priority pollutants is performed by multiple inorganic and organic methods

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NS: Not sampled

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	Permit Limit	GWRS-FPW Qtr 1	GWRS-FPW Qtr 2	GWRS-FPW Qtr 3	GWRS-FPW Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	200	ND	1.4	1.7	4.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	ND	ND
Asbestos (ASBESTOS), MFL	Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	ND	ND	ND	ND
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	ND	ND	ND	ND
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	3	0.46 - 0.56	0.48 - 0.68	0.59 - 0.86	0.61 - 0.84
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	0.024 - 0.074	0.03 - 0.063	ND - 0.089	0.025 - 0.105
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EuroTSac/EutalKnx	30	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	1.09	1.64	2.09	2.53
Other Radionuclides	FGL / PaceGrns	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	0.9 - 2.9	1.3 - 3.1	1.2 - 6.1	0.8 - 7.7
Primary Drinking Water Standards - Biological						
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	2.2	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	N/A	80 - 109	84 - 108	91 - 116	92 - 115
Iron (Fe), ug/L	OCWD	300	ND	ND	ND	9.6
Manganese (Mn), ug/L	OCWD	50	ND	ND	ND	ND
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	10.2 - 52	48.5 - 61	47.5 - 63.5	37.5 - 54.5
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1000	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.2	0.23	0.25	0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND	ND	ND	ND
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD/EurfC/Weck	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD/EurfC/Weck	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD/EurfC/Weck	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalr/CLLC	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* MCL based on total (not dissolved); ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	GWRS-FPW Qtr 1	GWRS-FPW Qtr 2	GWRS-FPW Qtr 3	GWRS-FPW Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508	Chlorinated Pesticides	Weck	ND	ND	ND	ND
515.4	Chlorinated Acids	Weck	ND	ND	ND	ND
522	1,4-Dioxane	OCWD / Eurofins	ND	ND	NS	NS
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531 / 531.2	Carbamates	OCWD	ND	ND	ND	ND
533	PFAS Compounds	OCWD	NS	NS	ND	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	ND
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	Weck	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	Weck	ND - Detections	ND - Detections	ND - Detections	ND - Detections
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
556	Determination of Carbonyl Compounds	Weck	ND < NL	ND < NL	ND < NL	ND < NL
624.1	Acrolein and Acrylonitrile	Weck	ND	ND	ND	NS
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	Eurf CalR/CLLC	ND	ND	ND < NL	ND
8015D	Nonhalogenated Organics	EurofBuf	ND	ND	ND	ND
8081A	Chlorine Containing Pesticides	EurfCLLC	NS	ND	ND	ND
8270C	Semivolatile Organics	Weck	NS	ND	ND	ND
8330A	Nitroaromatics and Nitramines	EurDenvr	ND	ND	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	ND	ND	ND	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND < NL	ND < NL	ND < NL

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	*Time*	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
1/1/2021	8:25	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
1/1/2021	8:25	Chloroform (CHCl3)	1.5	ug/L	0.5
1/1/2021	8:25	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
1/6/2021	10:20	Bromodichloromethane (CHBrCl)	1.0	ug/L	0.5
1/6/2021	10:20	Chloroform (CHCl3)	1.9	ug/L	0.5
1/6/2021	10:20	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
1/8/2021	8:45	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/8/2021	8:45	Chloroform (CHCl3)	1.6	ug/L	0.5
1/8/2021	8:45	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
1/15/2021	8:20	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/15/2021	8:20	Chloroform (CHCl3)	1.4	ug/L	0.5
1/15/2021	8:20	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
1/22/2021	8:30	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
1/22/2021	8:30	Chloroform (CHCl3)	1.1	ug/L	0.5
1/22/2021	8:30	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
1/29/2021	8:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
1/29/2021	8:10	Chloroform (CHCl3)	1.2	ug/L	0.5
1/29/2021	8:10	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
2/5/2021	8:25	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
2/5/2021	8:25	Chloroform (CHCl3)	1.6	ug/L	0.5
2/5/2021	8:25	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5
2/12/2021	8:55	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/12/2021	8:55	Chloroform (CHCl3)	1.2	ug/L	0.5
2/12/2021	8:55	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5
2/19/2021	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
2/19/2021	8:20	Chloroform (CHCl3)	0.9	ug/L	0.5
2/19/2021	8:20	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5
2/26/2021	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
2/26/2021	8:20	Chloroform (CHCl3)	1.1	ug/L	0.5
2/26/2021	8:20	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5
3/5/2021	7:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/5/2021	7:40	Chloroform (CHCl3)	1.1	ug/L	0.5
3/5/2021	7:40	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5
3/12/2021	7:50	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
3/12/2021	7:50	Chloroform (CHCl3)	1.2	ug/L	0.5
3/12/2021	7:50	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5
3/19/2021	8:54	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/19/2021	8:54	Chloroform (CHCl3)	1.5	ug/L	0.5
3/19/2021	8:54	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/26/2021	8:59	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
3/26/2021	8:59	Chloroform (CHCl3)	1.6	ug/L	0.5
3/26/2021	8:59	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/6/2021	10:20	Dichloroacetonitrile (DCAN)	0.63	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/6/2021	10:20	Formaldehyde (FORALD)	11	ug/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/2/2021	8:30	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
4/2/2021	8:30	Chloroform (CHCl3)	1.9	ug/L	0.5
4/2/2021	8:30	Total Trihalomethanes (TTHMs)	2.8	ug/L	0.5
4/7/2021	9:35	Bromodichloromethane (CHBrCl)	1.2	ug/L	0.5
4/7/2021	9:35	Chloroform (CHCl3)	1.9	ug/L	0.5
4/7/2021	9:35	Total Trihalomethanes (TTHMs)	3.1	ug/L	0.5
4/9/2021	7:30	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
4/9/2021	7:30	Chloroform (CHCl3)	1.6	ug/L	0.5
4/9/2021	7:30	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
4/16/2021	8:50	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
4/16/2021	8:50	Chloroform (CHCl3)	1.6	ug/L	0.5
4/16/2021	8:50	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5
4/23/2021	8:22	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
4/23/2021	8:22	Chloroform (CHCl3)	1.3	ug/L	0.5
4/23/2021	8:22	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
4/30/2021	8:20	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
4/30/2021	8:20	Chloroform (CHCl3)	1.6	ug/L	0.5
4/30/2021	8:20	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
5/7/2021	8:25	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/7/2021	8:25	Chloroform (CHCl3)	1.6	ug/L	0.5
5/7/2021	8:25	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
5/14/2021	8:15	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
5/14/2021	8:15	Chloroform (CHCl3)	1.7	ug/L	0.5
5/14/2021	8:15	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5
5/21/2021	8:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
5/21/2021	8:10	Chloroform (CHCl3)	1.9	ug/L	0.5
5/21/2021	8:10	Methylene Chloride (CH2Cl2)	0.8	ug/L	0.5
5/21/2021	8:10	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5
5/28/2021	8:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
5/28/2021	8:10	Chloroform (CHCl3)	1.5	ug/L	0.5
5/28/2021	8:10	Methylene Chloride (CH2Cl2)	1.3	ug/L	0.5
5/28/2021	8:10	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
6/4/2021	8:00	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
6/4/2021	8:00	Chloroform (CHCl3)	1.4	ug/L	0.5
6/4/2021	8:00	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
6/11/2021	8:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/11/2021	8:10	Chloroform (CHCl3)	1.8	ug/L	0.5
6/11/2021	8:10	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
6/11/2021	8:10	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
6/18/2021	8:00	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
6/18/2021	8:00	Chloroform (CHCl3)	1.7	ug/L	0.5
6/18/2021	8:00	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
6/25/2021	8:10	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
6/25/2021	8:10	Chloroform (CHCl3)	2	ug/L	0.5
6/25/2021	8:10	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/7/2021	9:35	Dichloroacetonitrile (DCAN)	0.57	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/7/2021	9:35	Formaldehyde (FORALD)	11	ug/L	2

GWRS-FPW

Organic Detections by Method

Year 2021, Quarter 2

METHOD: ***NDMA-LOW***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/16/2021	8:50	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
5/7/2021	8:25	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
5/14/2021	8:15	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
6/4/2021	8:00	n-Nitrosodimethylamine (NDMA)	3	ng/L	2
6/11/2021	8:10	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
6/18/2021	8:00	n-Nitrosodimethylamine (NDMA)	3	ng/L	2

Year 2021, Quarter 3

METHOD: ***524.2***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/2/2021	8:00	Bromodichloromethane (CHBrCl)	1	ug/L	0.5
7/2/2021	8:00	Chloroform (CHCl3)	2.1	ug/L	0.5
7/2/2021	8:00	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
7/2/2021	8:00	Total Trihalomethanes (TTHMs)	3.1	ug/L	0.5
7/7/2021	9:45	Acetone (ACETNE)	12.4	ug/L	10
7/7/2021	9:45	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
7/7/2021	9:45	Chloroform (CHCl3)	2.1	ug/L	0.5
7/7/2021	9:45	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5
7/9/2021	8:20	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
7/9/2021	8:20	Chloroform (CHCl3)	2.4	ug/L	0.5
7/9/2021	8:20	Total Trihalomethanes (TTHMs)	3.7	ug/L	0.5
7/16/2021	8:40	Bromodichloromethane (CHBrCl)	1.6	ug/L	0.5
7/16/2021	8:40	Chloroform (CHCl3)	2.6	ug/L	0.5
7/16/2021	8:40	Total Trihalomethanes (TTHMs)	4.2	ug/L	0.5
7/23/2021	8:30	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
7/23/2021	8:30	Chloroform (CHCl3)	2.3	ug/L	0.5
7/23/2021	8:30	Total Trihalomethanes (TTHMs)	3.4	ug/L	0.5
7/30/2021	8:55	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/30/2021	8:55	Chloroform (CHCl3)	1.4	ug/L	0.5
7/30/2021	8:55	Methylene Chloride (CH2Cl2)	0.9	ug/L	0.5
7/30/2021	8:55	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
8/6/2021	8:55	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/6/2021	8:55	Chloroform (CHCl3)	1.9	ug/L	0.5
8/6/2021	8:55	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5
8/13/2021	8:25	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
8/13/2021	8:25	Chloroform (CHCl3)	2	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/13/2021	8:25	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
8/13/2021	8:25	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
9/3/2021	8:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/3/2021	8:20	Chloroform (CHCl3)	1.2	ug/L	0.5
9/3/2021	8:20	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5
9/10/2021	0:00	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
9/10/2021	0:00	Chloroform (CHCl3)	1.9	ug/L	0.5
9/10/2021	0:00	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
9/17/2021	8:32	Bromodichloromethane (CHBrCl)	1.6	ug/L	0.5
9/17/2021	8:32	Chloroform (CHCl3)	3.1	ug/L	0.5
9/17/2021	8:32	Total Trihalomethanes (TTHMs)	4.7	ug/L	0.5
9/24/2021	8:20	Bromodichloromethane (CHBrCl)	2.2	ug/L	0.5
9/24/2021	8:20	Chloroform (CHCl3)	3.9	ug/L	0.5
9/24/2021	8:20	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/24/2021	8:20	Total Trihalomethanes (TTHMs)	6.1	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/7/2021	9:45	Dichloroacetonitrile (DCAN)	0.73	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/7/2021	9:45	Formaldehyde (FORALD)	10	ug/L	2

METHOD: 625.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/7/2021	9:45	Di-n-butylphthalate (DnBP)	4.5	ug/L	9.7

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/16/2021	8:40	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
7/23/2021	8:30	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
7/30/2021	8:55	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2
8/13/2021	8:25	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 3

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
9/3/2021	8:20	n-Nitrosodimethylamine (NDMA)	5.1	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/1/2021	8:40	Bromodichloromethane (CHBrCl)	2.7	ug/L	0.5
10/1/2021	8:40	Chloroform (CHCl3)	4.9	ug/L	0.5
10/1/2021	8:40	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
10/1/2021	8:40	Total Trihalomethanes (TTHMs)	7.6	ug/L	0.5
10/6/2021	10:00	Bromodichloromethane (CHBrCl)	2.9	ug/L	0.5
10/6/2021	10:00	Chloroform (CHCl3)	4.8	ug/L	0.5
10/6/2021	10:00	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
10/6/2021	10:00	Total Trihalomethanes (TTHMs)	7.7	ug/L	0.5
10/8/2021	8:20	Bromodichloromethane (CHBrCl)	1.8	ug/L	0.5
10/8/2021	8:20	Chloroform (CHCl3)	3.7	ug/L	0.5
10/8/2021	8:20	Total Trihalomethanes (TTHMs)	5.4	ug/L	0.5
10/15/2021	8:20	Bromodichloromethane (CHBrCl)	1.6	ug/L	0.5
10/15/2021	8:20	Chloroform (CHCl3)	2.9	ug/L	0.5
10/15/2021	8:20	Total Trihalomethanes (TTHMs)	4.4	ug/L	0.5
10/22/2021	8:10	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
10/22/2021	8:10	Chloroform (CHCl3)	2.1	ug/L	0.5
10/22/2021	8:10	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
10/29/2021	8:35	Chloroform (CHCl3)	1.1	ug/L	0.5
10/29/2021	8:35	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
10/29/2021	8:35	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5
11/5/2021	8:20	Chloroform (CHCl3)	0.8	ug/L	0.5
11/5/2021	8:20	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5
11/12/2021	8:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/12/2021	8:15	Chloroform (CHCl3)	1.3	ug/L	0.5
11/12/2021	8:15	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
11/19/2021	8:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
11/19/2021	8:10	Chloroform (CHCl3)	1.5	ug/L	0.5
11/19/2021	8:10	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5
11/26/2021	8:05	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
11/26/2021	8:05	Chloroform (CHCl3)	1.5	ug/L	0.5
11/26/2021	8:05	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
12/3/2021	9:28	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
12/3/2021	9:28	Chloroform (CHCl3)	1.7	ug/L	0.5
12/3/2021	9:28	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
12/3/2021	9:28	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
12/10/2021	8:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/10/2021	8:30	Chloroform (CHCl3)	1.4	ug/L	0.5
12/10/2021	8:30	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5
12/17/2021	8:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
12/17/2021	8:10	Chloroform (CHCl3)	1.3	ug/L	0.5
12/17/2021	8:10	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5
12/24/2021	9:13	Chloroform (CHCl3)	1	ug/L	0.5
12/24/2021	9:13	Total Trihalomethanes (TTHMs)	1	ug/L	0.5
12/31/2021	8:30	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
12/31/2021	8:30	Chloroform (CHCl3)	1.4	ug/L	0.5
12/31/2021	8:30	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/6/2021	10:00	Bromochloroacetonitrile (BCAN)	1.3	ug/L	0.5
10/6/2021	10:00	Dichloroacetonitrile (DCAN)	1.5	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/6/2021	10:00	Formaldehyde (FORALD)	16	ug/L	2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/5/2021	8:20	n-Nitrosodimethylamine (NDMA)	5	ng/L	2
11/12/2021	8:15	n-Nitrosodimethylamine (NDMA)	2	ng/L	2
11/19/2021	8:10	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2
12/17/2021	8:10	n-Nitrosodimethylamine (NDMA)	2	ng/L	2

Appendix B

Laboratory Methods of Analysis

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

Laboratory Method: 100.2

Laboratory: EUROFINS CEI, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Asbestos (ASBESTOS)	0.18	MFL

Laboratory: EUROFINS EATON ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Asbestos (ASBESTOS)	0.2	MFL

Laboratory Method: 14DIOX

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,3-Trichloropropane (123TCP)	0.005	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.005	ug/L
1,4-Dioxane (14DIOX)	0.5	ug/L
2-Chloroethylvinyl ether (2ClEVE)	1	ug/L
Methylisothiocyanate (MITC)	0.05 - 0.10	ug/L

Laboratory Method: 1600

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Enterococcus(Membrane Filtration-CFU/100ml) (ENTRCC)	1	CFU/100

Laboratory Method: 1601

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bacteriophage, Male Specific (BACTMLSP)	0 - 1	P/A PERL
Bacteriophage, Somatic (BACTSOMT)	0 - 1	P/A PERL

Laboratory Method: 1602

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Male Specific Phage (MALSPHAG)	1	pfu/100

Laboratory Method: 1613B

Laboratory: EUROFINS SACRAMENTO

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	4.8 - 5.0	pg/L

Laboratory Method: 1623

Laboratory: EUROFINS EATON SOUTH BEND

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cryptosporidium (CRYPTO)	0.074 - 0.121	oocyst/L
Giardia (GIARDIA)	0.074 - 0.121	cysts/L

Laboratory Method: 1694MESI

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N,N-diethyl-m-toluamide (DEET)	4	ng/L
Oxybenzone (BP3)	4	ng/L

Laboratory Method: 2120B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Apparent Color (unfiltered) (APCOLR)	3 - 15	UNITS
True Color (filtered) (TRCOLR)	3 - 15	UNITS

Laboratory Method: 2130B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Turbidity (TURB)	0.1	NTU

Laboratory Method: 2150B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Threshold Odor Number (Median) (ODOR)	0	TON

Laboratory Method: 2320B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Alkalinity-Phenolphthalein (ALKPHE)	1	mg/L
Bicarbonate (as CaCO3) (HCO3Ca)	1	mg/L
Bicarbonate (as HCO3) (HCO3)	1.2	mg/L
Carbonate (as CaCO3) (CO3Ca)	1	mg/L
Carbonate (as CO3) (CO3)	0.6	mg/L
Hydroxide (as CaCO3) (OHCa)	1	mg/L
Hydroxide (as OH) (OH)	0.3	mg/L
Total Alkalinity (as CaCO3) (TOTALK)	5	mg/L

Laboratory Method: 2330B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Corrosivity (CORROS)	-100	S.I.

Laboratory Method: 2510B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Electrical Conductivity (EC)	1	uS/cm

Laboratory Method: 2540C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Dissolved Solids (TDS)	2.5	mg/L

Laboratory Method: 2540D

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Suspended Solids (SUSSOL)	2.5	mg/L

Laboratory Method: 300.1B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromate (BrO3)	5	ug/L
Bromide (Br)	0.01	mg/L
Chlorate (CLO3)	10	ug/L
Chlorite (CLO2)	10	ug/L

Laboratory Method: 332.0

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Perchlorate (CLO4)	2	ug/L

Laboratory Method: 350.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Ammonia Nitrogen (NH3-N)	0.1 - 1.0	mg/L

Laboratory Method: 365.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Phosphate Phosphorus (orthophosphate) (PO4-P)	0.01	mg/L

Laboratory Method: 4500CLF

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Free Chlorine (FRCL2)	0.1	mg/L
Total Chlorine (TOTCL2)	0.1	mg/L

Laboratory Method: 4500H+B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
pH (pH)	1	UNITS
Temperature (Laboratory) (TEMP)	1	C

Laboratory Method: 4500NO3F

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Nitrate (NO3)	0.4	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1 - 0.3	mg/L

Laboratory Method: 4500NO3F

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Nitrate Nitrogen (NO3-N)	0.1 - 0.3	mg/L
Nitrite Nitrogen (NO2-N)	0.002 - 0.018	mg/L

Laboratory Method: 4500SIOC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Silica (SIO2)	1	mg/L

Laboratory Method: 504.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,3-Trichloropropane (123TCP)	0.05	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.01	ug/L

Laboratory Method: 508

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4,4'-DDD (DDD)	0.01	ug/L
4,4'-DDE (DDE)	0.01	ug/L
4,4'-DDT (DDT)	0.01	ug/L
Aldrin (ALDRIN)	0.01	ug/L
Chlordane (ClDANE)	0.1	ug/L
Chlorothalonil (CLTNIL)	0.05	ug/L
Dieldrin (DIELDR)	0.01	ug/L
Endosulfan I (ENDOI)	0.01	ug/L

Laboratory Method: 508

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Endosulfan II (ENDOII)	0.01	ug/L
Endosulfan sulfate (ENDOSL)	0.01	ug/L
Endrin (ENDRIN)	0.01	ug/L
Endrin Aldehyde (ENDR-A)	0.01	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.01	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.01	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.01	ug/L
HCH-gamma (Lindane) (LINDNE)	0.01	ug/L
Heptachlor (HEPTA)	0.01	ug/L
Heptachlor epoxide (HEPEPX)	0.01	ug/L
Hexachlorobenzene (HEXCLB)	0.05	ug/L
Hexachlorocyclopentadiene (HClCPD)	0.05	ug/L
Methoxychlor (METHOX)	0.01	ug/L
PCB-1016 (PCB16)	0.1 - 0.5	ug/L
PCB-1221 (PCB21)	0.1 - 0.5	ug/L
PCB-1232 (PCB32)	0.1 - 0.5	ug/L
PCB-1242 (PCB42)	0.1 - 0.5	ug/L
PCB-1248 (PCB48)	0.1 - 0.5	ug/L
PCB-1254 (PCB54)	0.1 - 0.5	ug/L
PCB-1260 (PCB60)	0.1 - 0.5	ug/L
PCBs, Total (TOTPCB)	0.5	ug/L
Propachlor (PROPCL)	0.05	ug/L
Toxaphene Mixture (TOXA)	1	ug/L
Trifluralin (TRFLRN)	0.01	ug/L

Laboratory Method: 508.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
4,4'-DDD (DDD)	0.01	ug/L
4,4'-DDE (DDE)	0.01	ug/L
4,4'-DDT (DDT)	0.01	ug/L

Laboratory Method: 508.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Aldrin (ALDRIN)	0.01	ug/L
Chlordane (ClDANE)	0.1	ug/L
Chlorothalonil (CLTNIL)	0.05	ug/L
Dieldrin (DIELDR)	0.01	ug/L
Endosulfan I (ENDOI)	0.01	ug/L
Endosulfan II (ENDOII)	0.01	ug/L
Endosulfan sulfate (ENDOSL)	0.01	ug/L
Endrin (ENDRIN)	0.01	ug/L
Endrin Aldehyde (ENDR-A)	0.01	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.01	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.01	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.01	ug/L
HCH-gamma (Lindane) (LINDNE)	0.01	ug/L
Heptachlor (HEPTA)	0.01	ug/L
Heptachlor epoxide (HEPEPX)	0.01	ug/L
Hexachlorobenzene (HEXCLB)	0.05	ug/L
Hexachlorocyclopentadiene (HClCPD)	0.05	ug/L
Methoxychlor (METHOX)	0.01	ug/L
PCB-1016 (PCB16)	0.1	ug/L
PCB-1221 (PCB21)	0.1	ug/L
PCB-1232 (PCB32)	0.1	ug/L
PCB-1242 (PCB42)	0.1	ug/L
PCB-1248 (PCB48)	0.1	ug/L
PCB-1254 (PCB54)	0.1	ug/L
PCB-1260 (PCB60)	0.1	ug/L
PCBs, Total (TOTPCB)	0.5	ug/L
Propachlor (PROPCL)	0.05	ug/L
Toxaphene Mixture (TOXA)	1	ug/L
Trifluralin (TRFLRN)	0.01	ug/L

Laboratory Method: 515.4

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,5-T (245T)	0.2	ug/L
2,4,5-TP (Silvex) (245TP)	0.2	ug/L
2,4-DB (24DB)	2	ug/L
2,4-Dichlorophenoxyacetic Acid (24D)	0.4	ug/L
3,5-Dichlorobenzoic Acid (35DBA)	1	ug/L
Acifluorfen (ACIFEN)	0.4	ug/L
Bentazon (BENTAZ)	2	ug/L
Dalapon (DALAPN)	0.4	ug/L
DCPA-Dacthal (DCPA)	0.1	ug/L
Dicamba (DICAMB)	0.6	ug/L
Dichlorprop (24DP)	0.3	ug/L
Dinoseb (DINOSB)	0.4	ug/L
Pentachlorophenol (PCP) (PCP)	0.2	ug/L
Picloram (PICLOR)	0.6	ug/L

Laboratory Method: 5210B

Laboratory: EUROFINS CALSCIENCE IRVINE

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Biochemical Oxygen Demand (BOD)	2 - 6	mg/L

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Biochemical Oxygen Demand (BOD)	1.3 - 2.5	mg/L

Laboratory Method: 522

Laboratory: EUROFINS EATON ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,4-Dioxane (14DIOX)	0.5	ug/L

Laboratory Method: 522

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,4-Dioxane (14DIOX)	0.07	ug/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1,1,2-Tetrachloroethane (1112PC)	0.5	ug/L
1,1,1-Trichloroethane (111TCA)	0.5	ug/L
1,1,2,2-Tetrachloroethane (1122PC)	0.5	ug/L
1,1,2-Trichloroethane (112TCA)	0.5	ug/L
1,1-Dichloroethane (11DCA)	0.5	ug/L
1,1-Dichloroethene (11DCE)	0.5	ug/L
1,1-Dichloropropene (11DCP)	0.5	ug/L
1,2,3-Trichlorobenzene (123TCB)	0.5	ug/L
1,2,3-Trichloropropane (123TCP)	0.5	ug/L
1,2,4-Trichlorobenzene (124TCB)	0.5	ug/L
1,2,4-Trimethylbenzene (124TMB)	0.5	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.5	ug/L
1,2-Dibromoethane (EDB)	0.5	ug/L
1,2-Dichlorobenzene (12DCB)	0.5	ug/L
1,2-Dichloroethane (12DCA)	0.5	ug/L
1,2-Dichloropropane (12DCP)	0.5	ug/L
1,3,5-Trimethylbenzene (135TMB)	0.5	ug/L
1,3-Dichlorobenzene (13DCB)	0.5	ug/L
1,3-Dichloropropane (13DCP)	0.5	ug/L
1,4-Dichlorobenzene (14DCB)	0.5	ug/L
2,2-Dichloropropane (22DCP)	0.5	ug/L
2-Chlorotoluene (2CLTOL)	0.5	ug/L
4-Chlorotoluene (4CLTOL)	0.5	ug/L
4-Isopropyltoluene (4IPTOL)	0.5	ug/L
Acetone (ACETNE)	10 - 100	ug/L
Acrolein (ACROLN)	5	ug/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Acrylonitrile (ACRYLO)	2	ug/L
Benzene (BENZ)	0.5	ug/L
bis (2-chloroethyl) ether (B2CLEE)	2.5 - 5.0	ug/L
Bromobenzene (BRBENZ)	0.5	ug/L
Bromochloromethane (CH2BrC)	0.5	ug/L
Bromodichloromethane (CHBrCl)	0.5	ug/L
Bromoform (CHBr3)	0.5	ug/L
Bromomethane (CH3Br)	0.5	ug/L
Carbon Disulfide (CS2)	0.5	ug/L
Carbon tetrachloride (CCl4)	0.5	ug/L
Chlorobenzene (CLBENZ)	0.5	ug/L
Chlorodifluoromethane (FREN22)	0.5	ug/L
Chloroethane (ClETHA)	0.5 - 5.0	ug/L
Chloroform (CHCl3)	0.5	ug/L
Chloromethane (CH3Cl)	0.5	ug/L
cis-1,2-Dichloroethene (c12DCE)	0.5	ug/L
cis-1,3-Dichloropropene (c13DCP)	0.5	ug/L
Dibromochloromethane (CHBr2C)	0.5	ug/L
Dibromomethane (CH2Br2)	0.5	ug/L
Dichlorodifluoromethane (CCl2F2)	0.5	ug/L
Diisopropyl ether (DIPE)	1	ug/L
Ethyl tert-butyl ether (ETBE)	1	ug/L
Ethylbenzene (EtBENZ)	0.5	ug/L
Freon 123a (FR123A)	0.5 - 2.0	ug/L
Hexachlorobutadiene (HClBut)	0.5	ug/L
Isopropylbenzene (ISPBNZ)	0.5	ug/L
m,p-Xylene (mp-XYL)	0.5	ug/L
Methyl Ethyl Ketone (MEK) (MEK)	2.5 - 5.0	ug/L
Methyl Isobutyl Ketone (MIBK) (MIBK)	2.5 - 5.0	ug/L
Methyl tert-butyl ether (MTBE)	0.2	ug/L
Methylene Chloride (CH2Cl2)	0.5	ug/L
Naphthalene (NAP)	0.5	ug/L
n-Butylbenzene (nBBENZ)	0.5	ug/L
o-Xylene (o-XYL)	0.5	ug/L

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Propylbenzene (PRPBNZ)	0.5	ug/L
sec-Butylbenzene (sBBENZ)	0.5	ug/L
Styrene (STYR)	0.5	ug/L
Tert-amyl methyl ether (TAME)	1	ug/L
tert-butyl alcohol (TBA)	2	ug/L
tert-Butylbenzene (tBBENZ)	0.5	ug/L
Tetrachloroethene (PCE)	0.5	ug/L
Toluene (TOLU)	0.5	ug/L
Total 1,3-Dichloropropene (x13DCP)	0.5	ug/L
Total Trihalomethanes (TTHMs)	0.5	ug/L
Total Xylenes (m,p,&o) (TOTALX)	0.5	ug/L
trans-1,2 Dichloroethene (t12DCE)	0.5	ug/L
trans-1,3-Dichloropropene (t13DCP)	0.5	ug/L
Trichloroethene (TCE)	0.5	ug/L
Trichlorofluoromethane (Freon 11) (CCl3F)	0.5	ug/L
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)	0.5	ug/L
Vinyl chloride (VNYLCL)	0.5	ug/L

Laboratory Method: 524M-TCP

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
1,2,3-Trichloropropane (123TCP)	0.005	ug/L
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.005	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
2,4-Dinitrotoluene (24DNT)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
2,6-Dinitrotoluene (26DNT)	0.1	ug/L
4,4'-DDD (DDD)	0.1	ug/L
4,4'-DDE (DDE)	0.1	ug/L
4,4'-DDT (DDT)	0.1	ug/L
Acenaphthene (ACNAPE)	0.1	ug/L
Acenaphthylene (ACENAP)	0.1	ug/L
Acetochlor (ACETOC)	0.1	ug/L
Alachlor (ALACHL)	0.1	ug/L
Aldrin (ALDRIN)	0.1	ug/L
Ametryn (AMERYN)	0.1	ug/L
Anthracene (ANTHRA)	0.1	ug/L
Atrazine (ATRAZ)	0.1	ug/L
Benzo(a)anthracene (BaANTH)	0.1	ug/L
Benzo(a)pyrene (BaPYRE)	0.1	ug/L
Benzo(b)fluoranthene (BbFLUR)	0.1	ug/L
Benzo(g,h,i)perylene (BghiPR)	0.1	ug/L
Benzo[k]fluoranthene (BkFLUR)	0.1	ug/L
bis (2-ethylhexyl) adipate (DEHA)	2	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	2	ug/L
Bromacil (BROMAC)	0.1	ug/L
Butachlor (BUTACL)	0.1	ug/L
Butylate (BTYATE)	0.1	ug/L
Butylbenzyl phthalate (BBP)	2	ug/L
Caffeine (CAFFEI)	100	ng/L
Captan (CAPTAN)	0.1	ug/L
Chlordane-alpha (CLDA)	0.1	ug/L
Chlordane-gamma (CLDG)	0.1	ug/L
Chlorobenzilate (CLBZLA)	0.1	ug/L
Chloroneb (CLNEB)	0.1	ug/L
Chlorothalonil (CLTNIL)	0.1	ug/L
Chlorpropham (CPRPHM)	0.1	ug/L
Chlorpyrifos (ClPYRI)	0.1	ug/L
Chrysene (CHRYS)	0.1	ug/L
DCPA-Dacthal (DCPA)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Diazinon (DIAZI)	0.1	ug/L
Dibenzo(a,h)anthracene (DBahAN)	0.1	ug/L
Dichlorvos (DCLVOS)	0.1	ug/L
Dieldrin (DIELDR)	0.1	ug/L
Diethyl phthalate (DEP)	2	ug/L
Dimethoate (DMTH)	1	ug/L
Dimethyl phthalate (DMP)	2	ug/L
Di-n-butylphthalate (DnBP)	2	ug/L
Di-n-octyl phthalate (DnOP)	2	ug/L
Diphenamid (DPHNMD)	0.1	ug/L
Endosulfan I (ENDOI)	0.1	ug/L
Endosulfan II (ENDOII)	0.1	ug/L
Endosulfan sulfate (ENDOSL)	0.1	ug/L
Endrin (ENDRIN)	0.1	ug/L
Endrin Aldehyde (ENDR-A)	0.1	ug/L
EPTC (EPTC)	0.1	ug/L
Ethion (ETHION)	0.1	ug/L
Ethoprop (ETHPRP)	0.1	ug/L
Etridiazole (ETRDZL)	0.1	ug/L
Fluoranthene (FLANTH)	0.1	ug/L
Fluorene (FLUOR)	0.1	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.1	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.1	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.1	ug/L
HCH-gamma (Lindane) (LINDNE)	0.1	ug/L
Heptachlor (HEPTA)	0.1	ug/L
Heptachlor epoxide (HEPEPX)	0.1	ug/L
Hexachlorobenzene (HEXCLB)	0.1	ug/L
Hexachlorocyclopentadiene (HClCPD)	0.1	ug/L
Hexazinone (HEXZON)	0.1	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	0.1	ug/L
Isophorone (IPHOR)	0.1	ug/L
Malathion (MALATH)	2	ug/L
Methoxychlor (METHOX)	0.1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
methyl-Parathion (MPARA)	0.5	ug/L
Metolachlor (METOCL)	0.1	ug/L
Metribuzin (MTRBZN)	0.1	ug/L
Molinate (MOLINT)	0.1	ug/L
Naphthalene (NAP)	0.1	ug/L
Norflurazon (NORFLR)	0.1 - 1.0	ug/L
Parathion (PARA)	0.5	ug/L
Pentachlorophenol (PCP) (PCP)	1	ug/L
Permethrin-(total of cis/trans) (PMTHRN)	0.1	ug/L
Phenanthrene (PHENAN)	0.1	ug/L
Prometryn (PROMET)	0.1	ug/L
Pronamide (PROAMD)	0.1	ug/L
Propachlor (PROPCL)	0.1	ug/L
Propazine (PROPAZ)	0.1	ug/L
Pyrene (PYRENE)	0.1	ug/L
Simazine (SIMAZ)	0.1	ug/L
Tebuthiuron (TBTURN)	2	ug/L
Terbacil (TRBACL)	0.1	ug/L
Terbufos Sulfone (TERSUL)	0.1	ug/L
Thiobencarb (THIO)	0.1	ug/L
Trifluralin (TRFLRN)	0.1	ug/L
Trithion (TRTION)	0.1	ug/L

Laboratory Method: 531

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1-Naphthol (NPTHOL)	5	ug/L
3-Hydroxycarbofuran (HYDCFR)	2	ug/L
Aldicarb (ALDI)	1	ug/L
Aldicarb sulfone (ALDISN)	2	ug/L
Aldicarb sulfoxide (ALDISX)	2	ug/L

Laboratory Method: 531

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Baygon (BAYGON)	1	ug/L
Carbaryl (CARBAR)	2	ug/L
Carbofuran (CARBOF)	1	ug/L
Methiocarb (MTHCRB)	4	ug/L
Methomyl (MTHOMY)	1	ug/L
Oxamyl (OXAMYL)	2	ug/L

Laboratory Method: 531.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1-Naphthol (NPTHOL)	5	ug/L
3-Hydroxycarbofuran (HYDCFR)	2	ug/L
Aldicarb (ALDI)	1	ug/L
Aldicarb sulfone (ALDISN)	2	ug/L
Aldicarb sulfoxide (ALDISX)	2	ug/L
Baygon (BAYGON)	1	ug/L
Carbaryl (CARBAR)	2	ug/L
Carbofuran (CARBOF)	1	ug/L
Methiocarb (MTHCRB)	4	ug/L
Methomyl (MTHOMY)	1	ug/L
Oxamyl (OXAMYL)	2	ug/L

Laboratory Method: 5310C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Dissolved Organic Carbon (DOC)	0.05	mg/L
Total Organic Carbon (Unfiltered) (TOC)	0.05	mg/L

Laboratory Method: 533

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
4:2 Fluorotelomer sulfonate (4:2FTS)	2	ng/L
6:2 Fluorotelomer sulfonate (6:2FTS)	2 - 10	ng/L
8:2 Fluorotelomer sulfonate (8:2FTS)	2	ng/L
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	2	ng/L
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	2	ng/L
Perfluoro-3-methoxypropanoic acid (PFMPA)	2	ng/L
Perfluoro-4-methoxybutanoic acid (PFMBA)	2	ng/L
Perfluorobutanoic acid (PFBA)	2	ng/L
Perfluoroheptanesulfonic Acid (PFHpS)	2	ng/L
Perfluoropentanesulfonic acid (PFPeS)	2	ng/L
Perfluoropentanoic acid (PFPeA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	2	ng/L
11-chloroeicosafluoro3oxaundecane1sulfonicacid-DUP (D-11CLPF)	2	ng/L
11-chloroeicosafluoro3oxaundecane1sulfonicacid-FRB (B-11CLPF)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (DUP) (D-ADONA)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (FRB) (B-ADONA)	2	ng/L
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	2	ng/L
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-DUP (D-9CLPF3)	2	ng/L
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-FRB (B-9CLPF3)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (DUP) (D-HFPODA)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (FRB) (B-HFPODA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid(DUP) (D-EtFOSA)	2	ng/L
N-ethyl perfluorooctanesulfonamidoacetic acid(FRB) (B-EtFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N-methyl perfluorooctanesulfonamidoacetic acid-DUP (D-MeFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid-FRB (B-MeFOSA)	2	ng/L
Perfluoro butane sulfonic acid (PFBS)	2	ng/L
Perfluoro butane sulfonic acid (DUP) (D-PFBS)	2	ng/L
Perfluoro butane sulfonic acid (FRB) (B-PFBS)	2	ng/L
Perfluoro heptanoic acid (PFHpA)	2	ng/L
Perfluoro heptanoic acid (DUP) (D-PFHpA)	2	ng/L
Perfluoro heptanoic acid (FRB) (B-PFHpA)	2	ng/L
Perfluoro hexane sulfonic acid (PFHxS)	2	ng/L
Perfluoro hexane sulfonic acid (DUP) (D-PFHxS)	2	ng/L
Perfluoro hexane sulfonic acid (FRB) (B-PFHxS)	2	ng/L
Perfluoro nonanoic acid (PFNA)	2	ng/L
Perfluoro nonanoic acid (DUP) (D-PFNA)	2	ng/L
Perfluoro nonanoic acid (FRB) (B-PFNA)	2	ng/L
Perfluoro octane sulfonic acid (PFOS)	2	ng/L
Perfluoro octane sulfonic acid (DUP) (D-PFOS)	2	ng/L
Perfluoro octane sulfonic acid (FRB) (B-PFOS)	2	ng/L
Perfluoro octanoic acid (PFOA)	2	ng/L
Perfluoro octanoic acid (DUP) (D-PFOA)	2	ng/L
Perfluoro octanoic acid (FRB) (B-PFOA)	2	ng/L
Perfluorodecanoic acid (PFDA)	2	ng/L
Perfluorodecanoic acid (DUP) (D-PFDA)	2	ng/L
Perfluorodecanoic acid (FRB) (B-PFDA)	2	ng/L
Perfluorododecanoic acid (PFDoA)	2	ng/L
Perfluorododecanoic acid (DUP) (D-PFDoA)	2	ng/L
Perfluorododecanoic acid (FRB) (B-PFDoA)	2	ng/L
Perfluorohexanoic acid (PFHxA)	2	ng/L
Perfluorohexanoic acid (DUP) (D-PFHxA)	2	ng/L
Perfluorohexanoic acid (FRB) (B-PFHxA)	2	ng/L
Perfluorotetradecanoic acid (PFTA)	2	ng/L
Perfluorotetradecanoic acid (DUP) (D-PFTA)	2	ng/L
Perfluorotetradecanoic acid (FRB) (B-PFTA)	2	ng/L
Perfluorotridecanoic acid (PFTrDA)	2	ng/L
Perfluorotridecanoic acid (DUP) (D-PFTrDA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Perfluorotridecanoic acid (FRB) (B-PFTrDA)	2	ng/L
Perfluoroundecanoic acid (PFUnA)	2	ng/L
Perfluoroundecanoic acid (DUP) (D-PFUnA)	2	ng/L
Perfluoroundecanoic acid (FRB) (B-PFUnA)	2	ng/L

Laboratory Method: 547

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Glyphosate (GLYPHO)	25	ug/L

Laboratory Method: 548.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Endothall (ENDOTL)	45	ug/L

Laboratory Method: 549.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Diquat (DIQUAT)	4	ug/L
Paraquat (PARAQT)	4	ug/L

Laboratory Method: 551.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,1,1-Trichloro-2-propanone (TCPONE)	0.5	ug/L
1,1-Dichloro-2-propanone (11DC2P)	0.5	ug/L
Bromochloroacetonitrile (BCAN)	0.5	ug/L
Chloropicrin (ClPICR)	0.5	ug/L
Dibromoacetonitrile (DBAN)	0.5	ug/L
Dichloroacetonitrile (DCAN)	0.5	ug/L
Trichloroacetonitrile (TCAN)	0.5	ug/L

Laboratory Method: 552.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromochloroacetic Acid (BCAA)	1	ug/L
Bromodichloroacetic Acid (BDCAA)	1	ug/L
Chlorodibromoacetic Acid (CDBAA)	1	ug/L
Dalapon (DALAPN)	1	ug/L
Dibromoacetic Acid (DBAA)	1	ug/L
Dichloroacetic Acid (DCAA)	1	ug/L
Monobromoacetic Acid (MBAA)	1	ug/L
Monochloroacetic Acid (MCAA)	1	ug/L
Tribromoacetic Acid (TBAA)	1	ug/L
Trichloroacetic Acid (TCAA)	1	ug/L

Laboratory Method: 5540C

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Surfactants (MBAS)	0.02 - 0.04	mg/L

Laboratory Method: 556

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Acetaldehyde (ACEALD)	2	ug/L
Benzaldehyde (BENALD)	2	ug/L
Butanal (BUTAN)	2	ug/L
Crotonaldehyde (CRTALD)	2	ug/L
Cyclohexanone (CYCHXN)	2	ug/L
Decanal (DECNAL)	2	ug/L
Formaldehyde (FORALD)	2	ug/L
Glyoxal (GLYOXL)	2	ug/L
Heptanal (HEPNAL)	2	ug/L
Hexanal (HEXNAL)	2	ug/L
Methylglyoxal (MGLYOX)	2	ug/L
Nonanal (NONNAL)	2	ug/L
Pentanal (PENTNL)	2	ug/L
Propanal (PROPNL)	2	ug/L

Laboratory Method: 5910B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Ultraviolet (absorbance) (UVAB)	0.005	1/cm
Ultraviolet percent transmittance @254nm (UV%T-254)	0.1	%
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	0.0001	L/mg-cm

Laboratory Method: 624.1

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Acrolein (ACROLN)	5	ug/L
Acrylonitrile (ACRYLO)	2	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE IRVINE

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
1,2,4-Trichlorobenzene (124TCB)	9.5 - 10.0	ug/L
1,2-Dichlorobenzene (12DCB)	9.5 - 10.0	ug/L
1,2-Diphenylhydrazine (12DPH)	19 - 20	ug/L
1,3-Dichlorobenzene (13DCB)	9.5 - 10.0	ug/L
1,4-Dichlorobenzene (14DCB)	9.5 - 10.0	ug/L
2,4,5-Trichlorophenol (245TCP)	19 - 20	ug/L
2,4,6-Trichlorophenol (246TCP)	19 - 20	ug/L
2,4-Dichlorophenol (24DCPH)	9.5 - 10.0	ug/L
2,4-Dimethylphenol (24DMP)	19 - 20	ug/L
2,4-Dinitrophenol (24DNP)	38 - 40	ug/L
2,4-Dinitrotoluene (24DNT)	9.5 - 10.0	ug/L
2,6-Dinitrotoluene (26DNT)	9.5 - 10.0	ug/L
2-Chloronaphthalene (2ClNAP)	9.5 - 10.0	ug/L
2-Chlorophenol (2ClPNL)	9.5 - 10.0	ug/L
2-Methyl naphthalene (2MNAP)	9.5 - 10.0	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	19 - 20	ug/L
2-Methylphenol (oCRESL)	9.5 - 10.0	ug/L
2-Nitroaniline (oNTANL)	19 - 20	ug/L
2-Nitrophenol (2NPNL)	9.5 - 10.0	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	19 - 20	ug/L
3-Nitroaniline (mNTANL)	19 - 20	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	9.5 - 10.0	ug/L
4-Chloro-3-methylphenol (43CMP)	19 - 20	ug/L
4-Chloroaniline (pClANL)	9.5 - 10.0	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	9.5 - 10.0	ug/L
4-Methylphenol (pCRESL)	9.5 - 10.0	ug/L
4-Nitroaniline (pNTANL)	19 - 20	ug/L
4-Nitrophenol (4NPNL)	19 - 20	ug/L
Acenaphthene (ACNAPE)	9.5 - 10.0	ug/L
Acenaphthylene (ACENAP)	9.5 - 10.0	ug/L
Aniline (ANLN)	9.5 - 10.0	ug/L
Anthracene (ANTHRA)	9.5 - 10.0	ug/L
Benzidine (BNZDE)	38 - 40	ug/L
Benzo(a)anthracene (BaANTH)	9.5 - 10.0	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE IRVINE

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Benzo(a)pyrene (BaPYRE)	9.5 - 10.0	ug/L
Benzo(b)fluoranthene (BbFLUR)	9.5 - 10.0	ug/L
Benzo(g,h,i)perylene (BghiPR)	9.5 - 10.0	ug/L
Benzo[k]fluoranthene (BkFLUR)	9.5 - 10.0	ug/L
Benzoic Acid (BNZACD)	19 - 20	ug/L
Benzyl Alcohol (BNZALC)	19 - 20	ug/L
bis (2-chloroethoxy) methane (B2CEM)	9.5 - 10.0	ug/L
bis (2-chloroethyl) ether (B2CLEE)	9.5 - 10.0	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	9.5 - 10.0	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	19 - 20	ug/L
Butylbenzyl phthalate (BBP)	19 - 20	ug/L
Chrysene (CHRYS)	9.5 - 10.0	ug/L
Dibenzo(a,h)anthracene (DBahAN)	19 - 20	ug/L
Dibenzofuran (DBFUR)	9.5 - 10.0	ug/L
Diethyl phthalate (DEP)	9.5 - 10.0	ug/L
Dimethyl phthalate (DMP)	9.5 - 10.0	ug/L
Di-n-butylphthalate (DnBP)	19 - 20	ug/L
Di-n-octyl phthalate (DnOP)	19 - 20	ug/L
Fluoranthene (FLANTH)	9.5 - 10.0	ug/L
Fluorene (FLUOR)	9.5 - 10.0	ug/L
Hexachlorobenzene (HEXCLB)	9.5 - 10.0	ug/L
Hexachlorobutadiene (HClBut)	9.5 - 10.0	ug/L
Hexachlorocyclopentadiene (HClCPD)	19 - 20	ug/L
Hexachloroethane (HCE)	9.5 - 10.0	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	19 - 20	ug/L
Isophorone (IPHOR)	9.5 - 10.0	ug/L
Naphthalene (NAP)	9.5 - 10.0	ug/L
Nitrobenzene (NBENZ)	19 - 20	ug/L
n-Nitroso-di-n-propylamine (NDPA)	9,500 - 10,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	9,500 - 10,000	ng/L
Pentachlorophenol (PCP) (PCP)	19 - 20	ug/L
Phenanthrene (PHENAN)	9.5 - 10.0	ug/L
Phenol (PHENOL)	9.5 - 10.0	ug/L
Pyrene (PYRENE)	9.5 - 10.0	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,4-Trichlorobenzene (124TCB)	9.6 - 10	ug/L
1,2-Dichlorobenzene (12DCB)	9.6 - 10	ug/L
1,2-Diphenylhydrazine (12DPH)	9.6 - 10	ug/L
1,3-Dichlorobenzene (13DCB)	9.6 - 10	ug/L
1,4-Dichlorobenzene (14DCB)	9.6 - 10	ug/L
2,4,5-Trichlorophenol (245TCP)	9.6 - 10	ug/L
2,4,6-Trichlorophenol (246TCP)	9.6 - 10	ug/L
2,4-Dichlorophenol (24DCPH)	9.6 - 10	ug/L
2,4-Dimethylphenol (24DMP)	9.6 - 10	ug/L
2,4-Dinitrophenol (24DNP)	48 - 51	ug/L
2,4-Dinitrotoluene (24DNT)	9.6 - 10	ug/L
2,6-Dinitrotoluene (26DNT)	9.6 - 10	ug/L
2-Chloronaphthalene (2ClNAP)	9.6 - 10	ug/L
2-Chlorophenol (2ClPNL)	9.6 - 10	ug/L
2-Methyl naphthalene (2MNAP)	9.6 - 10	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	48 - 51	ug/L
2-Methylphenol (oCRESL)	9.6 - 10	ug/L
2-Nitroaniline (oNTANL)	9.6 - 10	ug/L
2-Nitrophenol (2NPNL)	9.6 - 10	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	24 - 26	ug/L
3-Nitroaniline (mNTANL)	9.6 - 10	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	9.6 - 10	ug/L
4-Chloro-3-methylphenol (43CMP)	9.6 - 10	ug/L
4-Chloroaniline (pClANL)	9.6 - 10	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	9.6 - 10	ug/L
4-Nitroaniline (pNTANL)	9.6 - 10	ug/L
4-Nitrophenol (4NPNL)	9.6 - 10	ug/L
Acenaphthene (ACNAPE)	9.6 - 10	ug/L
Acenaphthylene (ACENAP)	9.6 - 10	ug/L
Aniline (ANLN)	9.6 - 10	ug/L
Anthracene (ANTHRA)	9.6 - 10	ug/L
Benzidine (BNZDE)	48 - 51	ug/L
Benzo(a)anthracene (BaANTH)	9.6 - 10	ug/L
Benzo(a)pyrene (BaPYRE)	9.6 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Benzo(b)fluoranthene (BbFLUR)	9.6 - 10	ug/L
Benzo(g,h,i)perylene (BghiPR)	9.6 - 10	ug/L
Benzo[k]fluoranthene (BkFLUR)	9.6 - 10	ug/L
Benzoic Acid (BNZACD)	48 - 51	ug/L
Benzyl Alcohol (BNZALC)	9.6 - 10	ug/L
bis (2-chloroethoxy) methane (B2CEM)	9.6 - 10	ug/L
bis (2-chloroethyl) ether (B2CLEE)	24 - 26	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	9.6 - 10	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	9.6 - 10	ug/L
Butylbenzyl phthalate (BBP)	9.6 - 10	ug/L
Chrysene (CHRYS)	9.6 - 10	ug/L
Dibenzo(a,h)anthracene (DBahAN)	9.6 - 10	ug/L
Dibenzofuran (DBFUR)	9.6 - 10	ug/L
Diethyl phthalate (DEP)	9.6 - 10	ug/L
Dimethyl phthalate (DMP)	9.6 - 10	ug/L
Di-n-butylphthalate (DnBP)	9.6 - 10	ug/L
Di-n-octyl phthalate (DnOP)	24 - 26	ug/L
Fluoranthene (FLANTH)	9.6 - 10	ug/L
Fluorene (FLUOR)	9.6 - 10	ug/L
Hexachlorobenzene (HEXCLB)	9.6 - 10	ug/L
Hexachlorobutadiene (HClBut)	9.6 - 10	ug/L
Hexachlorocyclopentadiene (HClCPD)	24 - 26	ug/L
Hexachloroethane (HCE)	9.6 - 10	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	9.6 - 10	ug/L
Isophorone (IPHOR)	9.6 - 10	ug/L
Naphthalene (NAP)	9.6 - 10	ug/L
Nitrobenzene (NBENZ)	24 - 26	ug/L
n-Nitroso-di-n-propylamine (NDPA)	9,600 - 10,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	9,600 - 10,000	ng/L
Pentachlorophenol (PCP) (PCP)	24 - 26	ug/L
Phenanthrene (PHENAN)	9.6 - 10	ug/L
Phenol (PHENOL)	9.6 - 10	ug/L
Pyrene (PYRENE)	9.6 - 10	ug/L

Laboratory Method: 7110C

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Total Alpha (TOTa)	1.1 - 1.28	pCi/L
Total Alpha Counting Error (TOTaCE)	1.1 - 1.28	pCi/L

Laboratory Method: 8015D

Laboratory: EUROFINS BUFFALO

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Ethylene Glycol (GLYCOL)	10,000	ug/L

Laboratory Method: 8081A

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
4,4'-DDD (DDD)	0.0097 - 0.01	ug/L
4,4'-DDE (DDE)	0.0039 - 0.004	ug/L
4,4'-DDT (DDT)	0.0097 - 0.01	ug/L
Aldrin (ALDRIN)	0.0097 - 0.01	ug/L
Chlordane (ClDANE)	0.019 - 0.02	ug/L
Chlordane-alpha (CLDA)	0.0039 - 0.004	ug/L
Chlordane-gamma (CLDG)	0.0097 - 0.01	ug/L
Dieldrin (DIELDR)	0.0097 - 0.01	ug/L
Endosulfan I (ENDOI)	0.0097 - 0.01	ug/L
Endosulfan II (ENDOII)	0.0097 - 0.01	ug/L
Endosulfan sulfate (ENDOSL)	0.0097 - 0.01	ug/L
Endrin (ENDRIN)	0.0039 - 0.004	ug/L
Endrin Aldehyde (ENDR-A)	0.019 - 0.02	ug/L
Endrin Ketone (ENDR-K)	0.0097 - 0.01	ug/L
HCH-alpha (Alpha-BHC) (BHCa)	0.0039 - 0.004	ug/L
HCH-beta (Beta-BHC) (BHCb)	0.0039 - 0.004	ug/L
HCH-delta (Delta-BHC) (BHCd)	0.0039 - 0.004	ug/L
HCH-gamma (Lindane) (LINDNE)	0.0039 - 0.004	ug/L

Laboratory Method: 8081A

Laboratory: EUROFINS CALSCIENCE LINCOLN

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Heptachlor (HEPTA)	0.0039 - 0.004	ug/L
Heptachlor epoxide (HEPEPX)	0.0039 - 0.004	ug/L
Methoxychlor (METHOX)	0.0097 - 0.01	ug/L
Toxaphene Mixture (TOXA)	0.058 - 0.06	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2,4-Trichlorobenzene (124TCB)	1	ug/L
1,2-Dichlorobenzene (12DCB)	1	ug/L
1,2-Diphenylhydrazine (12DPH)	1	ug/L
1,3-Dichlorobenzene (13DCB)	1	ug/L
1,4-Dichlorobenzene (14DCB)	1	ug/L
2,4,5-Trichlorophenol (245TCP)	1	ug/L
2,4,6-Trichlorophenol (246TCP)	1	ug/L
2,4-Dichlorophenol (24DCPH)	1	ug/L
2,4-Dimethylphenol (24DMP)	1	ug/L
2,4-Dinitrophenol (24DNP)	10	ug/L
2,4-Dinitrotoluene (24DNT)	1	ug/L
2,6-Dinitrotoluene (26DNT)	1	ug/L
2-Chloronaphthalene (2ClNAP)	1	ug/L
2-Chlorophenol (2ClPNL)	1	ug/L
2-Methyl naphthalene (2MNAP)	1	ug/L
2-Methyl-4,6-Dinitrophenol (2MDNP)	5	ug/L
2-Methylphenol (oCRESL)	1	ug/L
2-Nitroaniline (oNTANL)	1	ug/L
2-Nitrophenol (2NPNL)	1	ug/L
3- & 4-Methylphenol (mpCRESL)	1	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	5	ug/L
3-Nitroaniline (mNTANL)	1	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	1	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
4-Chloro-3-methylphenol (43CMP)	1	ug/L
4-Chloroaniline (pClANL)	1	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	1	ug/L
4-Nitroaniline (pNTANL)	1	ug/L
4-Nitrophenol (4NPNL)	5	ug/L
Acenaphthene (ACNAPE)	1	ug/L
Acenaphthylene (ACENAP)	1	ug/L
Aniline (ANLN)	1	ug/L
Anthracene (ANTHRA)	1	ug/L
Benzidine (BNZDE)	10	ug/L
Benzo(a)anthracene (BaANTH)	1	ug/L
Benzo(a)pyrene (BaPYRE)	1	ug/L
Benzo(b)fluoranthene (BbFLUR)	1	ug/L
Benzo(g,h,i)perylene (BghiPR)	2	ug/L
Benzo[k]fluoranthene (BkFLUR)	1	ug/L
Benzoic Acid (BNZACD)	100	ug/L
Benzyl Alcohol (BNZALC)	1	ug/L
bis (2-chloroethoxy) methane (B2CEM)	1	ug/L
bis (2-chloroethyl) ether (B2CLEE)	1	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	1	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	5	ug/L
Butylbenzyl phthalate (BBP)	1	ug/L
Carbazole (CARBZL)	1	ug/L
Chrysene (CHRYS)	1	ug/L
Dibenzo(a,h)anthracene (DBahAN)	2	ug/L
Dibenzofuran (DBFUR)	1	ug/L
Diethyl phthalate (DEP)	1	ug/L
Dimethyl phthalate (DMP)	1	ug/L
Di-n-butylphthalate (DnBP)	1	ug/L
Di-n-octyl phthalate (DnOP)	1	ug/L
Fluoranthene (FLANTH)	1	ug/L
Fluorene (FLUOR)	1	ug/L
Hexachlorobenzene (HEXCLB)	1	ug/L
Hexachlorobutadiene (HClBut)	1	ug/L

Laboratory Method: 8270C

Laboratory: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hexachlorocyclopentadiene (HClCPD)	5	ug/L
Hexachloroethane (HCE)	1	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	2	ug/L
Isophorone (IPHOR)	1	ug/L
Naphthalene (NAP)	1	ug/L
Nitrobenzene (NBENZ)	1	ug/L
n-Nitrosodimethylamine (NDMA)	1,000	ng/L
n-Nitroso-di-n-propylamine (NDPA)	1,000	ng/L
n-Nitrosodiphenylamine (NDPhA)	1,000	ng/L
Pentachlorophenol (PCP) (PCP)	1	ug/L
Phenanthrene (PHENAN)	1	ug/L
Phenol (PHENOL)	1	ug/L
Pyrene (PYRENE)	1	ug/L
Pyridine (PYRDN)	5	ug/L

Laboratory Method: 8330A

Laboratory: EUROFINS TESTAMERICA, DENVER

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,6-Trinitrotoluene (246TNT)	0.11	ug/L
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.21 - 0.22	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.21 - 0.22	ug/L

Laboratory Method: 900.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Beta (TOTb)	0.651 - 1.66	pCi/L
Total Beta Counting Error (TOTbCE)	0.651 - 1.66	pCi/L

Laboratory Method: 903.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Radium 226 (TRa226)	0.362 - 0.41	pCi/L
Total Radium 226 Counting Error (TRa6CE)	0.362 - 0.41	pCi/L

Laboratory Method: 905.0

Laboratory: DAVI LABORATORY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.29 - 1.04	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.29 - 1.04	pCi/L

Laboratory: PACE ANALYTICAL SERVICES - GREENSBURG

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.353 - 1.50	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.353 - 1.50	pCi/L

Laboratory Method: 906.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Tritium (TTr)	434	pCi/L
Total Tritium Counting Error (TTrCE)	434	pCi/L

Laboratory Method: 9221B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Coliform (Mult. Tube Fermentation) (TCOLIM)	1.1	MPN

Laboratory Method: 9221E

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Fecal Coliform (Mult. Tube Fermentation) (FCOLIM)	1.1	MPN

Laboratory Method: 9222B

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Coliform (Membrane Filtration-CFU/100ml) (TCOLIF)	1	CFU/100

Laboratory Method: 9222D

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Fecal Coliform (Membrane Filtration-CFU/100ml) (FCOLIF)	1	CFU/100

Laboratory Method: 9223B

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	1 - 3,400	MPN
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	1 - 3,400	MPN

Laboratory Method: BIOASCEC

Laboratory: TRUSSELL TECHNOLOGIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	0.5	ng/L

Laboratory Method: CEC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
17a-Estradiol (aESTRA)	1	ng/L
17a-Ethynylestradiol (aETEST)	2	ng/L
17b-Estradiol (bESTRA)	2	ng/L
4-Androstene-3,17-dione (ANDROS)	2	ng/L
4-n-Octylphenol (4nOCPH)	0.2	ug/L
4-tert-Octylphenol (4tOCPH)	0.2	ug/L
Acetaminophen (ACTMNP)	5	ng/L
Aspartame (ASPATM)	100	ng/L
Atenolol (ATENOL)	5	ng/L
Atrazine (ATRAZ)	0.001	ug/L
Azithromycin (AZTMCN)	10 - 100	ng/L
Bisphenol A (BisPHA)	0.2	ug/L
Caffeine (CAFFEI)	3 - 30	ng/L
Carbamazepine (CBMAZP)	1	ng/L
Diclofenac (DICLFN)	5	ng/L
Diethylstilbestrol (DESTBL)	2	ng/L
Dilantin (DILANT)	10	ng/L
Diuron (DIURON)	0.005	ug/L
Epitestosterone (cis-Testosterone) (EPITES)	1	ng/L
Equilin (EQUILN)	5	ng/L
Erythromycin (ERYTHN)	1	ng/L
Estriol (ESTRIO)	2	ng/L
Estrone (ESTRON)	1	ng/L
Fluoxetine (FLUXET)	5	ng/L
Gemfibrozil (GMFIBZ)	1	ng/L
Ibuprofen (IBPRFN)	1	ng/L
Iohexol (IOHEXL)	20 - 2000	ng/L
Iopromide (IOPRMD)	10	ng/L
Linuron (LINURN)	0.005	ug/L
Meprobamate (MEPROB)	5	ng/L
N,N-diethyl-m-toluamide (DEET)	1 - 10	ng/L
Naproxen (NAPRXN)	5 - 50	ng/L
Neotame (NEOTAM)	10	ng/L
Nonylphenol (NONYPH)	0.2	ug/L

Laboratory Method: CEC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
para-Chlorobenzene sulfonic acid (pCBSA)	200	ng/L
Pentachlorophenol (PCP) (PCP)	0.2	ug/L
PhenylPhenol (PHNYPH)	0.2	ug/L
Primidone (PRIMDN)	1	ng/L
Progesterone (PRGSTR)	1	ng/L
Simazine (SIMAZ)	0.005	ug/L
Sucralose (SUCRAL)	100 - 1,000	ng/L
Sulfamethoxazole (SULTHZ)	1 - 10	ng/L
Testosterone (trans-Testosterone) (TESTOR)	1	ng/L
Tetrabromobisphenol A (TBBISA)	0.2	ug/L
Triclosan (TRICLN)	1	ng/L
Trimethoprim (TRIMTP)	5	ng/L
Tris-2-chloroethyl phosphate (TCEP)	5	ng/L

Laboratory Method: H2O2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hydrogen Peroxide (H2O2)	0.1	mg/L

Laboratory Method: LC-MS-MS

Laboratory: EUROFINS EATON ANALYTICAL

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N,N-diethyl-m-toluamide (DEET)	10	ng/L
Oxybenzone (BP3)	30 - 300	ng/L

Laboratory Method: M-TEC

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
E. Coli (Membrane Filtration - CFU/100ml) (ECOLI)	1	CFU/100

Laboratory Method: NDMA-LOW

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
N-Nitrosodiethylamine (NDEA)	2 - 10	ng/L
n-Nitrosodimethylamine (NDMA)	2 - 10	ng/L
n-Nitroso-di-n-propylamine (NDPA)	2 - 10	ng/L
N-Nitrosomorpholine (NMOR)	2 - 10	ng/L

Laboratory Method: RA-05

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Radium 228 (TRa228)	0.4 - 0.643	pCi/L
Total Radium 228 Counting Error (TRa8CE)	0.4 - 0.643	pCi/L

Laboratory Method: UNKWQAN

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Gross Alpha Excluding Uranium (TOTa-U)	1.1 - 1.28	pCi/L
Radium 226 + Radium 228 (Ra6Ra8)	0.4 - 0.643	pCi/L
Radium 226 + Radium 228 Counting Error (Ra68CE)	0.4 - 0.643	pCi/L

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Aggressive Index (AI)		A.I.

Laboratory Method: UNKWQAN

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bicarbonate (as HCO3) (HCO3)	1.2	mg/L
Cation-Anion meq balance (CATANI)		RATIO
Hydroxide (as CaCO3) (OHCa)	5	mg/L
Nitrate (NO3)	0.4 - 1.3	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1 - 0.2	mg/L
Nitrite (NO2)	0.007 - 0.059	mg/L
PFOA + PFOS (PFOAOS)	2	ng/L
PFOA + PFOS (DUP) (D-PFOAOS)	2	ng/L
PFOA + PFOS (FRB) (B-PFOAOS)	2	ng/L
Sum of five Haloacetic Acids (HAA5)	1	ug/L
Sum of nine Haloacetic Acids (HAA9)	1	ug/L
Sum of Six Brominated Haloacetic Acids (HAA6Br)	1	ug/L
Title 22 Cation-Anion Balance (T22CAB)		meq/L
Title 22 Total Anions (T22ANI)		meq/L
Title 22 Total Cations (T22CAT)		meq/L
Total Anions (TOTANI)		meq/L
Total Cations (TOTCAT)		meq/L
Total Nitrogen (TOT-N)	0.2 - 1	mg/L

Laboratory Method: X1-218.6

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hexavalent Chromium (CrVI)	0.2	ug/L

Laboratory Method: X1-218.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Hexavalent Chromium (CrVI)	0.2	ug/L

Laboratory Method: X1-300.0

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromide (Br)	0.1 - 0.3	mg/L
Chloride (Cl)	0.5 - 2.5	mg/L
Fluoride (F)	0.1 - 0.4	mg/L
Nitrate Nitrogen (NO3-N)	0.1 - 0.2	mg/L
Sulfate (SO4)	0.5 - 2.5	mg/L

Laboratory Method: X1-335.4

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cyanide (CN)	5	ug/L

Laboratory Method: X1-351.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Organic Nitrogen (ORG-N)	0.1 - 0.2	mg/L
Total Kjeldahl Nitrogen (TKN)	0.2 - 1	mg/L
Total Nitrogen (TOT-N)	0.3	mg/L

Laboratory Method: X200.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Boron (B)	0.1	mg/L
Boron (dissolved) (B-DIS)	0.1	mg/L
Calcium (Ca)	0.5	mg/L
Calcium (dissolved) (Ca-DIS)	0.5	mg/L
Calcium Hardness (CaHRD)	0.25	mg/L

Laboratory Method: X200.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Iron (Fe)	5 - 20	ug/L
Iron (dissolved) (Fe-DIS)	1 - 5	ug/L
Magnesium (Mg)	0.5	mg/L
Magnesium (dissolved) (Mg-DIS)	0.5	mg/L
Potassium (K)	0.5	mg/L
Potassium (dissolved) (K-DIS)	0.5	mg/L
Sodium (Na)	0.5	mg/L
Sodium (dissolved) (Na-DIS)	0.5	mg/L
Total Hardness (as CaCO3) (TOTHRD)	1	mg/L
Total Hardness (as CaCO3) (dissolved) (TOTHRD-D)	1	mg/L

Laboratory Method: X200.8

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Natural Uranium (NTUr)	0.13 - 0.67	pCi/L

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Aluminum (Al)	1 - 20	ug/L
Aluminum (dissolved) (Al-DIS)	1 - 3	ug/L
Antimony (Sb)	1	ug/L
Antimony (dissolved) (Sb-DIS)	1	ug/L
Arsenic (As)	1	ug/L
Arsenic (dissolved) (As-DIS)	1	ug/L
Barium (Ba)	1 - 5	ug/L
Barium (dissolved) (Ba-DIS)	1 - 2	ug/L
Beryllium (Be)	1	ug/L
Beryllium (dissolved) (Be-DIS)	1	ug/L
Cadmium (Cd)	1	ug/L
Cadmium (dissolved) (Cd-DIS)	1	ug/L

Laboratory Method: X200.8

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Chromium (Cr)	1 - 2	ug/L
Chromium (dissolved) (Cr-DIS)	1 - 3	ug/L
Cobalt (Co)	1 - 2	ug/L
Cobalt (dissolved) (Co-DIS)	1 - 3	ug/L
Copper (Cu)	1 - 2	ug/L
Copper (dissolved) (Cu-DIS)	1 - 3	ug/L
Gadolinium (Gd)	10	ng/L
Gadolinium (dissolved) (Gd-DIS)	10	ng/L
Lead (Pb)	1	ug/L
Lead (dissolved) (Pb-DIS)	1	ug/L
Manganese (Mn)	1 - 3	ug/L
Manganese (dissolved) (Mn-DIS)	1 - 3	ug/L
Mercury (Hg)	1	ug/L
Mercury (dissolved) (Hg-DIS)	1	ug/L
Nickel (Ni)	1 - 2	ug/L
Nickel (dissolved) (Ni-DIS)	1 - 3	ug/L
Selenium (Se)	1	ug/L
Selenium (dissolved) (Se-DIS)	1	ug/L
Silver (Ag)	1	ug/L
Silver (dissolved) (Ag-DIS)	1	ug/L
Strontium (Sr)	1 - 50	ug/L
Thallium (Tl)	1	ug/L
Thallium (dissolved) (Tl-DIS)	1	ug/L
Trivalent Chromium (CrIII)	1	ug/L
Uranium (dissolved) (U-DIS)	1	ug/L
Uranium (U) (U)	1	ug/L
Vanadium (V)	1 - 2	ug/L
Vanadium (dissolved) (V-DIS)	1 - 2	ug/L
Zinc (Zn)	1 - 2	ug/L
Zinc (dissolved) (Zn-DIS)	1	ug/L

Appendix C

Water Quality Constituents
With Laboratory Methods

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: BIOLOGICAL

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Bacteriophage, Male Specific (BACTMLSP)	1601	0 - 1	P/A PERL	OCHCA
Bacteriophage, Somatic (BACTSOMT)	1601	0 - 1	P/A PERL	OCHCA
Cryptosporidium (CRYPTO)	1623	0.074 - 0.121	oocyst/L	EUROSBIN
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1 - 3,400	MPN	OCWD
E. Coli (Membrane Filtration - CFU/100ml) (ECOLI)	M-TEC	1	CFU/100	OCHCA
Enterococcus(Membrane Filtration-CFU/100ml) (ENTRCC)	1600	1	CFU/100	OCHCA
Estrogen Receptor alpha as 17-beta Estradiol (ERa17bES)	BIOASCEC	0.5	ng/L	TRUSSELL
Fecal Coliform (Membrane Filtration-CFU/100ml) (FCOLIF)	9222D	1	CFU/100	OCHCA
Fecal Coliform (Mult. Tube Fermentation) (FCOLIM)	9221E	1.1	MPN	OCWD
Giardia (GIARDIA)	1623	0.074 - 0.121	cysts/L	EUROSBIN
Male Specific Phage (MALSPHAG)	1602	1	pfu/100	OCHCA
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	9223B	1 - 3,400	MPN	OCWD
Total Coliform (Membrane Filtration-CFU/100ml) (TCOLIF)	9222B	1	CFU/100	OCHCA
Total Coliform (Mult. Tube Fermentation) (TCOLIM)	9221B	1.1	MPN	OCWD

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Aggressive Index (AI)	UNKWQAN		A.I.	OCWD
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	OCWD
Aluminum (Al)	X200.8	1 - 20	ug/L	OCWD
Aluminum (dissolved) (Al-DIS)	X200.8	1 - 3	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Ammonia Nitrogen (NH3-N)	350.1	0.1 - 1.0	mg/L	OCWD
Antimony (Sb)	X200.8	1	ug/L	OCWD
Antimony (dissolved) (Sb-DIS)	X200.8	1	ug/L	OCWD
Apparent Color (unfiltered) (APCOLR)	2120B	3 - 15	UNITS	OCWD
Arsenic (As)	X200.8	1	ug/L	OCWD
Arsenic (dissolved) (As-DIS)	X200.8	1	ug/L	OCWD
Asbestos (ASBESTOS)	100.2	0.18	MFL	EUROFCEI
Asbestos (ASBESTOS)	100.2	0.2	MFL	EUROFINS
Barium (Ba)	X200.8	1 - 5	ug/L	OCWD
Barium (dissolved) (Ba-DIS)	X200.8	1 - 2	ug/L	OCWD
Beryllium (Be)	X200.8	1	ug/L	OCWD
Beryllium (dissolved) (Be-DIS)	X200.8	1	ug/L	OCWD
Bicarbonate (as CaCO3) (HCO3Ca)	2320B	1	mg/L	OCWD
Bicarbonate (as HCO3) (HCO3)	2320B	1.2	mg/L	OCWD
Bicarbonate (as HCO3) (HCO3)	UNKWQAN	1.2	mg/L	OCWD
Biochemical Oxygen Demand (BOD)	5210B	2 - 6	mg/L	EURFCAIR
Biochemical Oxygen Demand (BOD)	5210B	1.3 - 2.5	mg/L	EURFCLLC
Boron (B)	X200.7	0.1	mg/L	OCWD
Boron (dissolved) (B-DIS)	X200.7	0.1	mg/L	OCWD
Bromate (BrO3)	300.1B	5	ug/L	OCWD
Bromide (Br)	300.1B	0.01	mg/L	OCWD
Bromide (Br)	X1-300.0	0.1 - 0.3	mg/L	OCWD
Cadmium (Cd)	X200.8	1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Cadmium (dissolved) (Cd-DIS)	X200.8	1	ug/L	OCWD
Calcium (Ca)	X200.7	0.5	mg/L	OCWD
Calcium (dissolved) (Ca-DIS)	X200.7	0.5	mg/L	OCWD
Calcium Hardness (CaHRD)	X200.7	0.25	mg/L	OCWD
Carbonate (as CaCO3) (CO3Ca)	2320B	1	mg/L	OCWD
Carbonate (as CO3) (CO3)	2320B	0.6	mg/L	OCWD
Cation-Anion meq balance (CATANI)	UNKWQAN		RATIO	OCWD
Chlorate (CLO3)	300.1B	10	ug/L	OCWD
Chloride (Cl)	X1-300.0	0.5 - 2.5	mg/L	OCWD
Chlorite (CLO2)	300.1B	10	ug/L	OCWD
Chromium (Cr)	X200.8	1 - 2	ug/L	OCWD
Chromium (dissolved) (Cr-DIS)	X200.8	1 - 3	ug/L	OCWD
Cobalt (Co)	X200.8	1 - 2	ug/L	OCWD
Cobalt (dissolved) (Co-DIS)	X200.8	1 - 3	ug/L	OCWD
Copper (Cu)	X200.8	1 - 2	ug/L	OCWD
Copper (dissolved) (Cu-DIS)	X200.8	1 - 3	ug/L	OCWD
Corrosivity (CORROS)	2330B	-100	S.I.	OCWD
Cyanide (CN)	X1-335.4	5	ug/L	OCWD
Electrical Conductivity (EC)	2510B	1	uS/cm	OCWD
Fluoride (F)	X1-300.0	0.1 - 0.4	mg/L	OCWD
Free Chlorine (FRCL2)	4500CLF	0.1	mg/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Gadolinium (Gd)	X200.8	10	ng/L	OCWD
Gadolinium (dissolved) (Gd-DIS)	X200.8	10	ng/L	OCWD
Hexavalent Chromium (CrVI)	X1-218.6	0.2	ug/L	OCWD
Hexavalent Chromium (CrVI)	X1-218.7	0.2	ug/L	OCWD
Hydrogen Peroxide (H2O2)	H2O2	0.1	mg/L	OCWD
Hydroxide (as CaCO3) (OHCa)	2320B	1	mg/L	OCWD
Hydroxide (as CaCO3) (OHCa)	UNKWQAN	5	mg/L	OCWD
Hydroxide (as OH) (OH)	2320B	0.3	mg/L	OCWD
Iron (Fe)	X200.7	5 - 20	ug/L	OCWD
Iron (dissolved) (Fe-DIS)	X200.7	1 - 5	ug/L	OCWD
Lead (Pb)	X200.8	1	ug/L	OCWD
Lead (dissolved) (Pb-DIS)	X200.8	1	ug/L	OCWD
Magnesium (Mg)	X200.7	0.5	mg/L	OCWD
Magnesium (dissolved) (Mg-DIS)	X200.7	0.5	mg/L	OCWD
Manganese (Mn)	X200.8	1 - 3	ug/L	OCWD
Manganese (dissolved) (Mn-DIS)	X200.8	1 - 3	ug/L	OCWD
Mercury (Hg)	X200.8	1	ug/L	OCWD
Mercury (dissolved) (Hg-DIS)	X200.8	1	ug/L	OCWD
Nickel (Ni)	X200.8	1 - 2	ug/L	OCWD
Nickel (dissolved) (Ni-DIS)	X200.8	1 - 3	ug/L	OCWD
Nitrate (NO3)	4500NO3F	0.4	mg/L	OCWD
Nitrate (NO3)	UNKWQAN	0.4 - 1.3	mg/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1 - 0.3	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	UNKWQAN	0.1 - 0.2	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1 - 0.3	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	X1-300.0	0.1 - 0.2	mg/L	OCWD
Nitrite (NO2)	UNKWQAN	0.007 - 0.059	mg/L	OCWD
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002 - 0.018	mg/L	OCWD
Organic Nitrogen (ORG-N)	X1-351.2	0.1 - 0.2	mg/L	OCWD
Perchlorate (CLO4)	332.0	2	ug/L	OCWD
pH (pH)	4500H+B	1	UNITS	OCWD
Phosphate Phosphorus (orthophosphate) (PO4-P)	365.1	0.01	mg/L	OCWD
Potassium (K)	X200.7	0.5	mg/L	OCWD
Potassium (dissolved) (K-DIS)	X200.7	0.5	mg/L	OCWD
Selenium (Se)	X200.8	1	ug/L	OCWD
Selenium (dissolved) (Se-DIS)	X200.8	1	ug/L	OCWD
Silica (SIO2)	4500SIOC	1	mg/L	OCWD
Silver (Ag)	X200.8	1	ug/L	OCWD
Silver (dissolved) (Ag-DIS)	X200.8	1	ug/L	OCWD
Sodium (Na)	X200.7	0.5	mg/L	OCWD
Sodium (dissolved) (Na-DIS)	X200.7	0.5	mg/L	OCWD
Strontium (Sr)	X200.8	1 - 50	ug/L	OCWD
Sulfate (SO4)	X1-300.0	0.5 - 2.5	mg/L	OCWD
Surfactants (MBAS)	5540C	0.02 - 0.04	mg/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Suspended Solids (SUSSOL)	2540D	2.5	mg/L	OCWD
Temperature (Laboratory) (TEMP)	4500H+B	1	C	OCWD
Thallium (Tl)	X200.8	1	ug/L	OCWD
Thallium (dissolved) (Tl-DIS)	X200.8	1	ug/L	OCWD
Threshold Odor Number (Median) (ODOR)	2150B	0	TON	OCWD
Title 22 Cation-Anion Balance (T22CAB)	UNKWQAN		meq/L	OCWD
Title 22 Total Anions (T22ANI)	UNKWQAN		meq/L	OCWD
Title 22 Total Cations (T22CAT)	UNKWQAN		meq/L	OCWD
Total Alkalinity (as CaCO3) (TOTALK)	2320B	5	mg/L	OCWD
Total Anions (TOTANI)	UNKWQAN		meq/L	OCWD
Total Cations (TOTCAT)	UNKWQAN		meq/L	OCWD
Total Chlorine (TOTCL2)	4500CLF	0.1	mg/L	OCWD
Total Dissolved Solids (TDS)	2540C	2.5	mg/L	OCWD
Total Hardness (as CaCO3) (TOTHRD)	X200.7	1	mg/L	OCWD
Total Hardness (as CaCO3) (dissolved) (TOTHRD-D)	X200.7	1	mg/L	OCWD
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2 - 1	mg/L	OCWD
Total Nitrogen (TOT-N)	UNKWQAN	0.2 - 1	mg/L	OCWD
Total Nitrogen (TOT-N)	X1-351.2	0.3	mg/L	OCWD
Total Organic Carbon (Unfiltered) (TOC)	5310C	0.05	mg/L	OCWD
Trivalent Chromium (CrIII)	X200.8	1	ug/L	OCWD
True Color (filtered) (TRCOLR)	2120B	3 - 15	UNITS	OCWD
Turbidity (TURB)	2130B	0.1	NTU	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Ultraviolet (absorbance) (UVAB)	5910B	0.005	1/cm	OCWD
Ultraviolet percent transmittance @254nm (UV%T-254)	5910B	0.1	%	OCWD
Uranium (dissolved) (U-DIS)	X200.8	1	ug/L	OCWD
Uranium (U) (U)	X200.8	1	ug/L	OCWD
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	OCWD
Vanadium (V)	X200.8	1 - 2	ug/L	OCWD
Vanadium (dissolved) (V-DIS)	X200.8	1 - 2	ug/L	OCWD
Zinc (Zn)	X200.8	1 - 2	ug/L	OCWD
Zinc (dissolved) (Zn-DIS)	X200.8	1	ug/L	OCWD

Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1,1,1,2-Tetrachloroethane (1112PC)	524.2	0.5	ug/L	OCWD
1,1,1-Trichloro-2-propanone (TCPONE)	551.1	0.5	ug/L	WECKLAB
1,1,1-Trichloroethane (111TCA)	524.2	0.5	ug/L	OCWD
1,1,2,2-Tetrachloroethane (1122PC)	524.2	0.5	ug/L	OCWD
1,1,2-Trichloroethane (112TCA)	524.2	0.5	ug/L	OCWD
1,1-Dichloro-2-propanone (11DC2P)	551.1	0.5	ug/L	WECKLAB
1,1-Dichloroethane (11DCA)	524.2	0.5	ug/L	OCWD
1,1-Dichloroethene (11DCE)	524.2	0.5	ug/L	OCWD
1,1-Dichloropropene (11DCP)	524.2	0.5	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
1,2,3-Trichlorobenzene (123TCB)	524.2	0.5	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	14DIOX	0.005	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	504.1	0.05	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	524.2	0.5	ug/L	OCWD
1,2,3-Trichloropropane (123TCP)	524M-TCP	0.005	ug/L	OCWD
1,2,4-Trichlorobenzene (124TCB)	524.2	0.5	ug/L	OCWD
1,2,4-Trichlorobenzene (124TCB)	625.1	9.5 - 10.0	ug/L	EURFCAIR
1,2,4-Trichlorobenzene (124TCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2,4-Trichlorobenzene (124TCB)	8270C	1	ug/L	WECKLAB
1,2,4-Trimethylbenzene (124TMB)	524.2	0.5	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	14DIOX	0.01	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	504.1	0.01	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	524.2	0.5	ug/L	OCWD
1,2-Dibromo-3-chloropropane (DBCP)	524M-TCP	0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	14DIOX	0.005	ug/L	OCWD
1,2-Dibromoethane (EDB)	504.1	0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	524.2	0.5	ug/L	OCWD
1,2-Dibromoethane (EDB)	524M-TCP	0.005	ug/L	OCWD
1,2-Dichlorobenzene (12DCB)	524.2	0.5	ug/L	OCWD
1,2-Dichlorobenzene (12DCB)	625.1	9.5 - 10.0	ug/L	EURFCAIR
1,2-Dichlorobenzene (12DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2-Dichlorobenzene (12DCB)	8270C	1	ug/L	WECKLAB
1,2-Dichloroethane (12DCA)	524.2	0.5	ug/L	OCWD
1,2-Dichloropropane (12DCP)	524.2	0.5	ug/L	OCWD
1,2-Diphenylhydrazine (12DPH)	625.1	9.6 - 10	ug/L	EURFCLLC
1,2-Diphenylhydrazine (12DPH)	625.1	19 - 20	ug/L	EURFCAIR

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1,2-Diphenylhydrazine (12DPH)	8270C	1	ug/L	WECKLAB
1,3,5-Trimethylbenzene (135TMB)	524.2	0.5	ug/L	OCWD
1,3-Dichlorobenzene (13DCB)	524.2	0.5	ug/L	OCWD
1,3-Dichlorobenzene (13DCB)	625.1	9.5 - 10.0	ug/L	EURFCAIR
1,3-Dichlorobenzene (13DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,3-Dichlorobenzene (13DCB)	8270C	1	ug/L	WECKLAB
1,3-Dichloropropane (13DCP)	524.2	0.5	ug/L	OCWD
1,4-Dichlorobenzene (14DCB)	524.2	0.5	ug/L	OCWD
1,4-Dichlorobenzene (14DCB)	625.1	9.6 - 10	ug/L	EURFCLLC
1,4-Dichlorobenzene (14DCB)	625.1	9.5 - 10.0	ug/L	EURFCAIR
1,4-Dichlorobenzene (14DCB)	8270C	1	ug/L	WECKLAB
1,4-Dioxane (14DIOX)	14DIOX	0.5	ug/L	OCWD
1,4-Dioxane (14DIOX)	522	0.07	ug/L	OCWD
1,4-Dioxane (14DIOX)	522	0.5	ug/L	EUROFINS
11-chloroeicosafluoro-3-oxaundecane-1sulfonic acid (11CLPF)	537.1	2	ng/L	OCWD
17a-Estradiol (aESTRA)	CEC	1	ng/L	OCWD
17a-Ethynylestradiol (aETEST)	CEC	2	ng/L	OCWD
17b-Estradiol (bESTRA)	CEC	2	ng/L	OCWD
2,2-Dichloropropane (22DCP)	524.2	0.5	ug/L	OCWD
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1613B	4.8 - 5.0	pg/L	EUROTSAC
2,4,5-Trichlorophenol (245TCP)	625.1	19 - 20	ug/L	EURFCAIR
2,4,5-Trichlorophenol (245TCP)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4,5-Trichlorophenol (245TCP)	8270C	1	ug/L	WECKLAB
2,4,6-Trichlorophenol (246TCP)	625.1	19 - 20	ug/L	EURFCAIR
2,4,6-Trichlorophenol (246TCP)	625.1	9.6 - 10	ug/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
2,4,6-Trichlorophenol (246TCP)	8270C	1	ug/L	WECKLAB
2,4-Dichlorophenol (24DCPH)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2,4-Dichlorophenol (24DCPH)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dichlorophenol (24DCPH)	8270C	1	ug/L	WECKLAB
2,4-Dimethylphenol (24DMP)	625.1	19 - 20	ug/L	EURFCAIR
2,4-Dimethylphenol (24DMP)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dimethylphenol (24DMP)	8270C	1	ug/L	WECKLAB
2,4-Dinitrophenol (24DNP)	625.1	38 - 40	ug/L	EURFCAIR
2,4-Dinitrophenol (24DNP)	625.1	48 - 51	ug/L	EURFCLLC
2,4-Dinitrophenol (24DNP)	8270C	10	ug/L	WECKLAB
2,4-Dinitrotoluene (24DNT)	525.2	0.1	ug/L	OCWD
2,4-Dinitrotoluene (24DNT)	625.1	9.6 - 10	ug/L	EURFCLLC
2,4-Dinitrotoluene (24DNT)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2,4-Dinitrotoluene (24DNT)	8270C	1	ug/L	WECKLAB
2,6-Dinitrotoluene (26DNT)	525.2	0.1	ug/L	OCWD
2,6-Dinitrotoluene (26DNT)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2,6-Dinitrotoluene (26DNT)	625.1	9.6 - 10	ug/L	EURFCLLC
2,6-Dinitrotoluene (26DNT)	8270C	1	ug/L	WECKLAB
2-Chloroethylvinyl ether (2ClEVE)	14DIOX	1	ug/L	OCWD
2-Chloronaphthalene (2ClNAP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2-Chloronaphthalene (2ClNAP)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Chloronaphthalene (2ClNAP)	8270C	1	ug/L	WECKLAB
2-Chlorophenol (2ClPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Chlorophenol (2ClPNL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2-Chlorophenol (2ClPNL)	8270C	1	ug/L	WECKLAB
2-Chlorotoluene (2CLTOL)	524.2	0.5	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
2-Methyl naphthalene (2MNAP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2-Methyl naphthalene (2MNAP)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Methyl naphthalene (2MNAP)	8270C	1	ug/L	WECKLAB
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	19 - 20	ug/L	EURFCAIR
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	48 - 51	ug/L	EURFCLLC
2-Methyl-4,6-Dinitrophenol (2MDNP)	8270C	5	ug/L	WECKLAB
2-Methylphenol (oCRESL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2-Methylphenol (oCRESL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Methylphenol (oCRESL)	8270C	1	ug/L	WECKLAB
2-Nitroaniline (oNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Nitroaniline (oNTANL)	625.1	19 - 20	ug/L	EURFCAIR
2-Nitroaniline (oNTANL)	8270C	1	ug/L	WECKLAB
2-Nitrophenol (2NPNL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
2-Nitrophenol (2NPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
2-Nitrophenol (2NPNL)	8270C	1	ug/L	WECKLAB
3- & 4-Methylphenol (mpCRESL)	8270C	1	ug/L	WECKLAB
3,3'-Dichlorobenzidine (DCBZDE)	625.1	19 - 20	ug/L	EURFCAIR
3,3'-Dichlorobenzidine (DCBZDE)	625.1	24 - 26	ug/L	EURFCLLC
3,3'-Dichlorobenzidine (DCBZDE)	8270C	5	ug/L	WECKLAB
3-Nitroaniline (mNTANL)	625.1	19 - 20	ug/L	EURFCAIR
3-Nitroaniline (mNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
3-Nitroaniline (mNTANL)	8270C	1	ug/L	WECKLAB
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	537.1	2	ng/L	OCWD
4:2 Fluorotelomer sulfonate (4:2FTS)	533	2	ng/L	OCWD
4-Androstene-3,17-dione (ANDROS)	CEC	2	ng/L	OCWD
4-Bromophenyl phenyl ether (4BrPPE)	625.1	9.6 - 10	ug/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
4-Bromophenyl phenyl ether (4BrPPE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
4-Bromophenyl phenyl ether (4BrPPE)	8270C	1	ug/L	WECKLAB
4-Chloro-3-methylphenol (43CMP)	625.1	19 - 20	ug/L	EURFCAIR
4-Chloro-3-methylphenol (43CMP)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chloro-3-methylphenol (43CMP)	8270C	1	ug/L	WECKLAB
4-Chloroaniline (pClANL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
4-Chloroaniline (pClANL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chloroaniline (pClANL)	8270C	1	ug/L	WECKLAB
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Chlorophenyl phenyl ether (4ClPPE)	8270C	1	ug/L	WECKLAB
4-Chlorotoluene (4CLTOL)	524.2	0.5	ug/L	OCWD
4-Isopropyltoluene (4IPTOL)	524.2	0.5	ug/L	OCWD
4-Methylphenol (pCRESL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
4-Nitroaniline (pNTANL)	625.1	19 - 20	ug/L	EURFCAIR
4-Nitroaniline (pNTANL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Nitroaniline (pNTANL)	8270C	1	ug/L	WECKLAB
4-Nitrophenol (4NPNL)	625.1	19 - 20	ug/L	EURFCAIR
4-Nitrophenol (4NPNL)	625.1	9.6 - 10	ug/L	EURFCLLC
4-Nitrophenol (4NPNL)	8270C	5	ug/L	WECKLAB
4-n-Octylphenol (4nOCPH)	CEC	0.2	ug/L	OCWD
4-tert-Octylphenol (4tOCPH)	CEC	0.2	ug/L	OCWD
6:2 Fluorotelomer sulfonate (6:2FTS)	533	2 - 10	ng/L	OCWD
8:2 Fluorotelomer sulfonate (8:2FTS)	533	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	537.1	2	ng/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Acetaldehyde (ACEALD)	556	2	ug/L	WECKLAB
Acetone (ACETNE)	524.2	10 - 100	ug/L	OCWD
Acrolein (ACROLN)	524.2	5	ug/L	OCWD
Acrolein (ACROLN)	624.1	5	ug/L	WECKLAB
Acrylonitrile (ACRYLO)	524.2	2	ug/L	OCWD
Acrylonitrile (ACRYLO)	624.1	2	ug/L	WECKLAB
Aniline (ANLN)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Aniline (ANLN)	625.1	9.6 - 10	ug/L	EURFCLLC
Aniline (ANLN)	8270C	1	ug/L	WECKLAB
Aspartame (ASPATM)	CEC	100	ng/L	OCWD
Atenolol (ATENOL)	CEC	5	ng/L	OCWD
Benzaldehyde (BENALD)	556	2	ug/L	WECKLAB
Benzene (BENZ)	524.2	0.5	ug/L	OCWD
Benzidine (BNZDE)	625.1	38 - 40	ug/L	EURFCAIR
Benzidine (BNZDE)	625.1	48 - 51	ug/L	EURFCLLC
Benzidine (BNZDE)	8270C	10	ug/L	WECKLAB
Benzoic Acid (BNZACD)	625.1	19 - 20	ug/L	EURFCAIR
Benzoic Acid (BNZACD)	625.1	48 - 51	ug/L	EURFCLLC
Benzoic Acid (BNZACD)	8270C	100	ug/L	WECKLAB
Benzyl Alcohol (BNZALC)	625.1	19 - 20	ug/L	EURFCAIR
Benzyl Alcohol (BNZALC)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzyl Alcohol (BNZALC)	8270C	1	ug/L	WECKLAB
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.5 - 10.0	ug/L	EURFCAIR
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-chloroethoxy) methane (B2CEM)	8270C	1	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
bis (2-chloroethyl) ether (B2CLEE)	524.2	2.5 - 5.0	ug/L	OCWD
bis (2-chloroethyl) ether (B2CLEE)	625.1	24 - 26	ug/L	EURFCLLC
bis (2-chloroethyl) ether (B2CLEE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
bis (2-chloroethyl) ether (B2CLEE)	8270C	1	ug/L	WECKLAB
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-chloroisopropyl) ether (B2CIPE)	8270C	1	ug/L	WECKLAB
Bisphenol A (BisPHA)	CEC	0.2	ug/L	OCWD
Bromobenzene (BRBENZ)	524.2	0.5	ug/L	OCWD
Bromochloroacetic Acid (BCAA)	552.2	1	ug/L	OCWD
Bromochloroacetonitrile (BCAN)	551.1	0.5	ug/L	WECKLAB
Bromochloromethane (CH2BrC)	524.2	0.5	ug/L	OCWD
Bromodichloroacetic Acid (BDCAA)	552.2	1	ug/L	OCWD
Bromodichloromethane (CHBrCl)	524.2	0.5	ug/L	OCWD
Bromoform (CHBr3)	524.2	0.5	ug/L	OCWD
Bromomethane (CH3Br)	524.2	0.5	ug/L	OCWD
Carbazole (CARBZL)	8270C	1	ug/L	WECKLAB
Carbon Disulfide (CS2)	524.2	0.5	ug/L	OCWD
Carbon tetrachloride (CCl4)	524.2	0.5	ug/L	OCWD
Chlorobenzene (CLBENZ)	524.2	0.5	ug/L	OCWD
Chlorodibromoacetic Acid (CDBAA)	552.2	1	ug/L	OCWD
Chlorodifluoromethane (FREN22)	524.2	0.5	ug/L	OCWD
Chloroethane (ClETHA)	524.2	0.5 - 5.0	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Chloroform (CHCl3)	524.2	0.5	ug/L	OCWD
Chloromethane (CH3Cl)	524.2	0.5	ug/L	OCWD
Chloropicrin (ClPICR)	551.1	0.5	ug/L	WECKLAB
cis-1,2-Dichloroethene (c12DCE)	524.2	0.5	ug/L	OCWD
cis-1,3-Dichloropropene (c13DCP)	524.2	0.5	ug/L	OCWD
Crotonaldehyde (CRTALD)	556	2	ug/L	WECKLAB
Cyclohexanone (CYCHXN)	556	2	ug/L	WECKLAB
Decanal (DECNAL)	556	2	ug/L	WECKLAB
Dibenzofuran (DBFUR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Dibenzofuran (DBFUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Dibenzofuran (DBFUR)	8270C	1	ug/L	WECKLAB
Dibromoacetic Acid (DBAA)	552.2	1	ug/L	OCWD
Dibromoacetonitrile (DBAN)	551.1	0.5	ug/L	WECKLAB
Dibromochloromethane (CHBr2C)	524.2	0.5	ug/L	OCWD
Dibromomethane (CH2Br2)	524.2	0.5	ug/L	OCWD
Dichloroacetic Acid (DCAA)	552.2	1	ug/L	OCWD
Dichloroacetonitrile (DCAN)	551.1	0.5	ug/L	WECKLAB
Dichlorodifluoromethane (CCl2F2)	524.2	0.5	ug/L	OCWD
Diclofenac (DICLFN)	CEC	5	ng/L	OCWD
Diethylstilbestrol (DESTBL)	CEC	2	ng/L	OCWD
Diisopropyl ether (DIPE)	524.2	1	ug/L	OCWD
Dilantin (DILANT)	CEC	10	ng/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Dissolved Organic Carbon (DOC)	5310C	0.05	mg/L	OCWD
Endosulfan II (ENDOII)	508	0.01	ug/L	WECKLAB
Endosulfan II (ENDOII)	508.1	0.01	ug/L	WECKLAB
Endosulfan II (ENDOII)	525.2	0.1	ug/L	OCWD
Endosulfan II (ENDOII)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Epitestosterone (cis-Testosterone) (EPITES)	CEC	1	ng/L	OCWD
Equilin (EQUILN)	CEC	5	ng/L	OCWD
Estriol (ESTRIO)	CEC	2	ng/L	OCWD
Estrone (ESTRON)	CEC	1	ng/L	OCWD
Ethyl tert-butyl ether (ETBE)	524.2	1	ug/L	OCWD
Ethylbenzene (EtBENZ)	524.2	0.5	ug/L	OCWD
Fluoxetine (FLUXET)	CEC	5	ng/L	OCWD
Formaldehyde (FORALD)	556	2	ug/L	WECKLAB
Freon 123a (FR123A)	524.2	0.5 - 2.0	ug/L	OCWD
Glyoxal (GLYOXL)	556	2	ug/L	WECKLAB
HCH-alpha (Alpha-BHC) (BHCa)	508	0.01	ug/L	WECKLAB
HCH-alpha (Alpha-BHC) (BHCa)	508.1	0.01	ug/L	WECKLAB
HCH-alpha (Alpha-BHC) (BHCa)	525.2	0.1	ug/L	OCWD
HCH-alpha (Alpha-BHC) (BHCa)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
HCH-beta (Beta-BHC) (BHCb)	508	0.01	ug/L	WECKLAB
HCH-beta (Beta-BHC) (BHCb)	508.1	0.01	ug/L	WECKLAB
HCH-beta (Beta-BHC) (BHCb)	525.2	0.1	ug/L	OCWD
HCH-beta (Beta-BHC) (BHCb)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
HCH-delta (Delta-BHC) (BHCd)	508	0.01	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
HCH-delta (Delta-BHC) (BHCd)	508.1	0.01	ug/L	WECKLAB
HCH-delta (Delta-BHC) (BHCd)	525.2	0.1	ug/L	OCWD
HCH-delta (Delta-BHC) (BHCd)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Heptanal (HEPNAL)	556	2	ug/L	WECKLAB
Hexachlorobutadiene (HClBut)	524.2	0.5	ug/L	OCWD
Hexachlorobutadiene (HClBut)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Hexachlorobutadiene (HClBut)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachlorobutadiene (HClBut)	8270C	1	ug/L	WECKLAB
Hexachloroethane (HCE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Hexachloroethane (HCE)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachloroethane (HCE)	8270C	1	ug/L	WECKLAB
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	537.1	2	ng/L	OCWD
Hexanal (HEXNAL)	556	2	ug/L	WECKLAB
Iohexol (IOHEXL)	CEC	20 - 2000	ng/L	OCWD
Iopromide (IOPRMD)	CEC	10	ng/L	OCWD
Isophorone (IPHOR)	525.2	0.1	ug/L	OCWD
Isophorone (IPHOR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Isophorone (IPHOR)	625.1	9.6 - 10	ug/L	EURFCLLC
Isophorone (IPHOR)	8270C	1	ug/L	WECKLAB
Isopropylbenzene (ISPBNZ)	524.2	0.5	ug/L	OCWD
Linuron (LINURN)	CEC	0.005	ug/L	OCWD
m,p-Xylene (mp-XYL)	524.2	0.5	ug/L	OCWD
Meprobamate (MEPROB)	CEC	5	ng/L	OCWD
Methyl Ethyl Ketone (MEK) (MEK)	524.2	2.5 - 5.0	ug/L	OCWD
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	2.5 - 5.0	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Methyl tert-butyl ether (MTBE)	524.2	0.2	ug/L	OCWD
Methylene Chloride (CH2Cl2)	524.2	0.5	ug/L	OCWD
Methylglyoxal (MGLYOX)	556	2	ug/L	WECKLAB
Methylisothiocyanate (MITC)	14DIOX	0.05 - 0.10	ug/L	OCWD
Metolachlor (METOCL)	525.2	0.1	ug/L	OCWD
Monobromoacetic Acid (MBAA)	552.2	1	ug/L	OCWD
Monochloroacetic Acid (MCAA)	552.2	1	ug/L	OCWD
Naphthalene (NAP)	524.2	0.5	ug/L	OCWD
Naphthalene (NAP)	525.2	0.1	ug/L	OCWD
Naphthalene (NAP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Naphthalene (NAP)	625.1	9.6 - 10	ug/L	EURFCLLC
Naphthalene (NAP)	8270C	1	ug/L	WECKLAB
Naproxen (NAPRXN)	CEC	5 - 50	ng/L	OCWD
n-Butylbenzene (nBBENZ)	524.2	0.5	ug/L	OCWD
Neotame (NEOTAM)	CEC	10	ng/L	OCWD
N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSA)	537.1	2	ng/L	OCWD
Nitrobenzene (NBENZ)	625.1	19 - 20	ug/L	EURFCAIR
Nitrobenzene (NBENZ)	625.1	24 - 26	ug/L	EURFCLLC
Nitrobenzene (NBENZ)	8270C	1	ug/L	WECKLAB
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	OCWD
N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodimethylamine (NDMA)	8270C	1,000	ng/L	WECKLAB
n-Nitrosodimethylamine (NDMA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitroso-di-n-propylamine (NDPA)	625.1	9,600 - 10,000	ng/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
n-Nitroso-di-n-propylamine (NDPA)	625.1	9,500 - 10,000	ng/L	EURFCAIR
n-Nitroso-di-n-propylamine (NDPA)	8270C	1,000	ng/L	WECKLAB
n-Nitroso-di-n-propylamine (NDPA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodiphenylamine (NDPhA)	625.1	9,500 - 10,000	ng/L	EURFCAIR
n-Nitrosodiphenylamine (NDPhA)	625.1	9,600 - 10,000	ng/L	EURFCLLC
n-Nitrosodiphenylamine (NDPhA)	8270C	1,000	ng/L	WECKLAB
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2 - 10	ng/L	OCWD
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	533	2	ng/L	OCWD
Nonanal (NONNAL)	556	2	ug/L	WECKLAB
Nonylphenol (NONYPH)	CEC	0.2	ug/L	OCWD
o-Xylene (o-XYL)	524.2	0.5	ug/L	OCWD
para-Chlorobenzene sulfonic acid (pCBSA)	CEC	200	ng/L	OCWD
PCB-1016 (PCB16)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1016 (PCB16)	508.1	0.1	ug/L	WECKLAB
PCB-1221 (PCB21)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1221 (PCB21)	508.1	0.1	ug/L	WECKLAB
PCB-1232 (PCB32)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1232 (PCB32)	508.1	0.1	ug/L	WECKLAB
PCB-1242 (PCB42)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1242 (PCB42)	508.1	0.1	ug/L	WECKLAB
PCB-1248 (PCB48)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1248 (PCB48)	508.1	0.1	ug/L	WECKLAB
PCB-1254 (PCB54)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1254 (PCB54)	508.1	0.1	ug/L	WECKLAB
PCB-1260 (PCB60)	508	0.1 - 0.5	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
PCB-1260 (PCB60)	508.1	0.1	ug/L	WECKLAB
PCBs, Total (TOTPCB)	508	0.5	ug/L	WECKLAB
PCBs, Total (TOTPCB)	508.1	0.5	ug/L	WECKLAB
Perfluoro butane sulfonic acid (PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (PFOA)	537.1	2	ng/L	OCWD
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	533	2	ng/L	OCWD
Perfluoro-3-methoxypropanoic acid (PFMPA)	533	2	ng/L	OCWD
Perfluoro-4-methoxybutanoic acid (PFMBA)	533	2	ng/L	OCWD
Perfluorobutanoic acid (PFBA)	533	2	ng/L	OCWD
Perfluorodecanoic acid (PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (PFDoA)	537.1	2	ng/L	OCWD
Perfluoroheptanesulfonic Acid (PFHpS)	533	2	ng/L	OCWD
Perfluorohexanoic acid (PFHxA)	537.1	2	ng/L	OCWD
Perfluoropentanesulfonic acid (PFPeS)	533	2	ng/L	OCWD
Perfluoropentanoic acid (PFPeA)	533	2	ng/L	OCWD
Perfluorotetradecanoic acid (PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (PFUnA)	537.1	2	ng/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
PFOA + PFOS (PFOAOS)	UNKWQAN	2	ng/L	OCWD
Phenol (PHENOL)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Phenol (PHENOL)	625.1	9.6 - 10	ug/L	EURFCLLC
Phenol (PHENOL)	8270C	1	ug/L	WECKLAB
PhenylPhenol (PHNYPH)	CEC	0.2	ug/L	OCWD
Progesterone (PRGSTR)	CEC	1	ng/L	OCWD
Propylbenzene (PRPBNZ)	524.2	0.5	ug/L	OCWD
Pyridine (PYRDN)	8270C	5	ug/L	WECKLAB
sec-Butylbenzene (sBBENZ)	524.2	0.5	ug/L	OCWD
Styrene (STYR)	524.2	0.5	ug/L	OCWD
Sucralose (SUCRAL)	CEC	100 - 1,000	ng/L	OCWD
Sum of five Haloacetic Acids (HAA5)	UNKWQAN	1	ug/L	OCWD
Sum of nine Haloacetic Acids (HAA9)	UNKWQAN	1	ug/L	OCWD
Sum of Six Brominated Haloacetic Acids (HAA6Br)	UNKWQAN	1	ug/L	OCWD
Terbufos Sulfone (TERSUL)	525.2	0.1	ug/L	OCWD
Tert-amyl methyl ether (TAME)	524.2	1	ug/L	OCWD
tert-butyl alcohol (TBA)	524.2	2	ug/L	OCWD
tert-Butylbenzene (tBBENZ)	524.2	0.5	ug/L	OCWD
Testosterone (trans-Testosterone) (TESTOR)	CEC	1	ng/L	OCWD
Tetrabromobisphenol A (TBBISA)	CEC	0.2	ug/L	OCWD
Tetrachloroethene (PCE)	524.2	0.5	ug/L	OCWD
Toluene (TOLU)	524.2	0.5	ug/L	OCWD

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Total 1,3-Dichloropropene (x13DCP)	524.2	0.5	ug/L	OCWD
Total Trihalomethanes (TTHMs)	524.2	0.5	ug/L	OCWD
Total Xylenes (m,p,&o) (TOTALX)	524.2	0.5	ug/L	OCWD
trans-1,2 Dichloroethene (t12DCE)	524.2	0.5	ug/L	OCWD
trans-1,3-Dichloropropene (t13DCP)	524.2	0.5	ug/L	OCWD
Tribromoacetic Acid (TBAA)	552.2	1	ug/L	OCWD
Trichloroacetic Acid (TCAA)	552.2	1	ug/L	OCWD
Trichloroacetonitrile (TCAN)	551.1	0.5	ug/L	WECKLAB
Trichloroethene (TCE)	524.2	0.5	ug/L	OCWD
Trichlorofluoromethane (Freon 11) (CCl3F)	524.2	0.5	ug/L	OCWD
Trichlorotrifluoroethane (Freon 113) (Cl3F3E)	524.2	0.5	ug/L	OCWD
Trimethoprim (TRIMTP)	CEC	5	ng/L	OCWD
Tris-2-chloroethyl phosphate (TCEP)	CEC	5	ng/L	OCWD
Vinyl chloride (VNYLCL)	524.2	0.5	ug/L	OCWD

Constituent Type: ORGANIC DUPLICATE

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
11-chloroeicosafluoro3oxaundecane1sulfonicacid-DUP (D-11CLPF)	537.1	2	ng/L	OCWD
4,8-dioxa-3H-perfluorononanoic acid (DUP) (D-ADONA)	537.1	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-DUP (D-9CLPF3)	537.1	2	ng/L	OCWD
Hexafluoropropylene oxide dimer acid (GenX) (DUP) (D-HFPODA)	537.1	2	ng/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: ORGANIC DUPLICATE

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
N-ethyl perfluorooctanesulfonamidoacetic acid(DUP) (D-EtFOSA)	537.1	2	ng/L	OCWD
N-methyl perfluorooctanesulfonamidoacetic acid-DUP (D-MeFOSA)	537.1	2	ng/L	OCWD
Perfluoro butane sulfonic acid (DUP) (D-PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (DUP) (D-PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (DUP) (D-PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (DUP) (D-PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (DUP) (D-PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (DUP) (D-PFOA)	537.1	2	ng/L	OCWD
Perfluorodecanoic acid (DUP) (D-PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (DUP) (D-PFDoA)	537.1	2	ng/L	OCWD
Perfluorohexanoic acid (DUP) (D-PFHxA)	537.1	2	ng/L	OCWD
Perfluorotetradecanoic acid (DUP) (D-PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (DUP) (D-PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (DUP) (D-PFUnA)	537.1	2	ng/L	OCWD
PFOA + PFOS (DUP) (D-PFOAOS)	UNKWQAN	2	ng/L	OCWD

Constituent Type: ORGANIC FRB

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
11-chloroeicosafluoro3oxaundecane1sulfonicacid-FRB (B-11CLPF)	537.1	2	ng/L	OCWD
4,8-dioxa-3H-perfluorononanoic acid (FRB) (B-ADONA)	537.1	2	ng/L	OCWD
9-chlorohexadecafluoro-3-oxanone1sulfonic acid-FRB (B-9CLPF3)	537.1	2	ng/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC FRB

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Hexafluoropropylene oxide dimer acid (GenX) (FRB) (B-HFPODA)	537.1	2	ng/L	OCWD
N-ethyl perfluorooctanesulfonamidoacetic acid(FRB) (B-EtFOSA)	537.1	2	ng/L	OCWD
N-methyl perfluorooctanesulfonamidoacetic acid-FRB (B-MeFOSA)	537.1	2	ng/L	OCWD
Perfluoro butane sulfonic acid (FRB) (B-PFBS)	537.1	2	ng/L	OCWD
Perfluoro heptanoic acid (FRB) (B-PFHpA)	537.1	2	ng/L	OCWD
Perfluoro hexane sulfonic acid (FRB) (B-PFHxS)	537.1	2	ng/L	OCWD
Perfluoro nonanoic acid (FRB) (B-PFNA)	537.1	2	ng/L	OCWD
Perfluoro octane sulfonic acid (FRB) (B-PFOS)	537.1	2	ng/L	OCWD
Perfluoro octanoic acid (FRB) (B-PFOA)	537.1	2	ng/L	OCWD
Perfluorodecanoic acid (FRB) (B-PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (FRB) (B-PFDoA)	537.1	2	ng/L	OCWD
Perfluorohexanoic acid (FRB) (B-PFHxA)	537.1	2	ng/L	OCWD
Perfluorotetradecanoic acid (FRB) (B-PFTA)	537.1	2	ng/L	OCWD
Perfluorotridecanoic acid (FRB) (B-PFTrDA)	537.1	2	ng/L	OCWD
Perfluoroundecanoic acid (FRB) (B-PFUnA)	537.1	2	ng/L	OCWD
PFOA + PFOS (FRB) (B-PFOAOS)	UNKWQAN	2	ng/L	OCWD

Constituent Type: RADIOLOGICALS

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Gross Alpha Excluding Uranium (TOTa-U)	UNKWQAN	1.1 - 1.28	pCi/L	FGL
Natural Uranium (NTUr)	X200.8	0.13 - 0.67	pCi/L	FGL

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: RADIOLOGICALS

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	0.4 - 0.643	pCi/L	FGL
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.4 - 0.643	pCi/L	FGL
Total Alpha (TOTa)	7110C	1.1 - 1.28	pCi/L	FGL
Total Alpha Counting Error (TOTaCE)	7110C	1.1 - 1.28	pCi/L	FGL
Total Beta (TOTb)	900.0	0.651 - 1.66	pCi/L	FGL
Total Beta Counting Error (TOTbCE)	900.0	0.651 - 1.66	pCi/L	FGL
Total Radium 226 (TRa226)	903.0	0.362 - 0.41	pCi/L	FGL
Total Radium 226 Counting Error (TRa6CE)	903.0	0.362 - 0.41	pCi/L	FGL
Total Radium 228 (TRa228)	RA-05	0.4 - 0.643	pCi/L	FGL
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.4 - 0.643	pCi/L	FGL
Total Strontium-90 (TS90)	905.0	0.29 - 1.04	pCi/L	DAVI
Total Strontium-90 (TS90)	905.0	0.353 - 1.50	pCi/L	PACEGRNS
Total Strontium-90 Counting Error (TS90CE)	905.0	0.29 - 1.04	pCi/L	DAVI
Total Strontium-90 Counting Error (TS90CE)	905.0	0.353 - 1.50	pCi/L	PACEGRNS
Total Tritium (TTr)	906.0	434	pCi/L	FGL
Total Tritium Counting Error (TTrCE)	906.0	434	pCi/L	FGL

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
1-Naphthol (NPTHOL)	531	5	ug/L	OCWD
1-Naphthol (NPTHOL)	531.2	5	ug/L	OCWD
2,4,5-T (245T)	515.4	0.2	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
2,4,5-TP (Silvex) (245TP)	515.4	0.2	ug/L	WECKLAB
2,4,6-Trinitrotoluene (246TNT)	8330A	0.11	ug/L	EURDENVR
2,4-DB (24DB)	515.4	2	ug/L	WECKLAB
2,4-Dichlorophenoxyacetic Acid (24D)	515.4	0.4	ug/L	WECKLAB
3,5-Dichlorobenzoic Acid (35DBA)	515.4	1	ug/L	WECKLAB
3-Hydroxycarbofuran (HYDCFR)	531	2	ug/L	OCWD
3-Hydroxycarbofuran (HYDCFR)	531.2	2	ug/L	OCWD
4,4'-DDD (DDD)	508	0.01	ug/L	WECKLAB
4,4'-DDD (DDD)	508.1	0.01	ug/L	WECKLAB
4,4'-DDD (DDD)	525.2	0.1	ug/L	OCWD
4,4'-DDD (DDD)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
4,4'-DDE (DDE)	508	0.01	ug/L	WECKLAB
4,4'-DDE (DDE)	508.1	0.01	ug/L	WECKLAB
4,4'-DDE (DDE)	525.2	0.1	ug/L	OCWD
4,4'-DDE (DDE)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
4,4'-DDT (DDT)	508	0.01	ug/L	WECKLAB
4,4'-DDT (DDT)	508.1	0.01	ug/L	WECKLAB
4,4'-DDT (DDT)	525.2	0.1	ug/L	OCWD
4,4'-DDT (DDT)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Acenaphthene (ACNAPE)	525.2	0.1	ug/L	OCWD
Acenaphthene (ACNAPE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Acenaphthene (ACNAPE)	625.1	9.6 - 10	ug/L	EURFCLLC
Acenaphthene (ACNAPE)	8270C	1	ug/L	WECKLAB
Acenaphthylene (ACENAP)	525.2	0.1	ug/L	OCWD
Acenaphthylene (ACENAP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Acenaphthylene (ACENAP)	625.1	9.6 - 10	ug/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Acenaphthylene (ACENAP)	8270C	1	ug/L	WECKLAB
Acetaminophen (ACTMNP)	CEC	5	ng/L	OCWD
Acetochlor (ACETOC)	525.2	0.1	ug/L	OCWD
Acifluorfen (ACIFEN)	515.4	0.4	ug/L	WECKLAB
Alachlor (ALACHL)	525.2	0.1	ug/L	OCWD
Aldicarb (ALDI)	531	1	ug/L	OCWD
Aldicarb (ALDI)	531.2	1	ug/L	OCWD
Aldicarb sulfone (ALDISN)	531	2	ug/L	OCWD
Aldicarb sulfone (ALDISN)	531.2	2	ug/L	OCWD
Aldicarb sulfoxide (ALDISX)	531	2	ug/L	OCWD
Aldicarb sulfoxide (ALDISX)	531.2	2	ug/L	OCWD
Aldrin (ALDRIN)	508	0.01	ug/L	WECKLAB
Aldrin (ALDRIN)	508.1	0.01	ug/L	WECKLAB
Aldrin (ALDRIN)	525.2	0.1	ug/L	OCWD
Aldrin (ALDRIN)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Ametryn (AMERYN)	525.2	0.1	ug/L	OCWD
Anthracene (ANTHRA)	525.2	0.1	ug/L	OCWD
Anthracene (ANTHRA)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Anthracene (ANTHRA)	625.1	9.6 - 10	ug/L	EURFCLLC
Anthracene (ANTHRA)	8270C	1	ug/L	WECKLAB
Atrazine (ATRAZ)	525.2	0.1	ug/L	OCWD
Atrazine (ATRAZ)	CEC	0.001	ug/L	OCWD
Azithromycin (AZTMCN)	CEC	10 - 100	ng/L	OCWD
Baygon (BAYGON)	531	1	ug/L	OCWD
Baygon (BAYGON)	531.2	1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Bentazon (BENTAZ)	515.4	2	ug/L	WECKLAB
Benzo(a)anthracene (BaANTH)	525.2	0.1	ug/L	OCWD
Benzo(a)anthracene (BaANTH)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Benzo(a)anthracene (BaANTH)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(a)anthracene (BaANTH)	8270C	1	ug/L	WECKLAB
Benzo(a)pyrene (BaPYRE)	525.2	0.1	ug/L	OCWD
Benzo(a)pyrene (BaPYRE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Benzo(a)pyrene (BaPYRE)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(a)pyrene (BaPYRE)	8270C	1	ug/L	WECKLAB
Benzo(b)fluoranthene (BbFLUR)	525.2	0.1	ug/L	OCWD
Benzo(b)fluoranthene (BbFLUR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Benzo(b)fluoranthene (BbFLUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(b)fluoranthene (BbFLUR)	8270C	1	ug/L	WECKLAB
Benzo(g,h,i)perylene (BghiPR)	525.2	0.1	ug/L	OCWD
Benzo(g,h,i)perylene (BghiPR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Benzo(g,h,i)perylene (BghiPR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo(g,h,i)perylene (BghiPR)	8270C	2	ug/L	WECKLAB
Benzo[k]fluoranthene (BkFLUR)	525.2	0.1	ug/L	OCWD
Benzo[k]fluoranthene (BkFLUR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Benzo[k]fluoranthene (BkFLUR)	625.1	9.6 - 10	ug/L	EURFCLLC
Benzo[k]fluoranthene (BkFLUR)	8270C	1	ug/L	WECKLAB
bis (2-ethylhexyl) adipate (DEHA)	525.2	2	ug/L	OCWD
bis (2-ethylhexyl) phthalate (DEHP)	525.2	2	ug/L	OCWD
bis (2-ethylhexyl) phthalate (DEHP)	625.1	19 - 20	ug/L	EURFCAIR
bis (2-ethylhexyl) phthalate (DEHP)	625.1	9.6 - 10	ug/L	EURFCLLC
bis (2-ethylhexyl) phthalate (DEHP)	8270C	5	ug/L	WECKLAB
Bromacil (BROMAC)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Butachlor (BUTACL)	525.2	0.1	ug/L	OCWD
Butanal (BUTAN)	556	2	ug/L	WECKLAB
Butylate (BTYATE)	525.2	0.1	ug/L	OCWD
Butylbenzyl phthalate (BBP)	525.2	2	ug/L	OCWD
Butylbenzyl phthalate (BBP)	625.1	19 - 20	ug/L	EURFCAIR
Butylbenzyl phthalate (BBP)	625.1	9.6 - 10	ug/L	EURFCLLC
Butylbenzyl phthalate (BBP)	8270C	1	ug/L	WECKLAB
Caffeine (CAFFEI)	525.2	100	ng/L	OCWD
Caffeine (CAFFEI)	CEC	3 - 30	ng/L	OCWD
Captan (CAPTAN)	525.2	0.1	ug/L	OCWD
Carbamazepine (CBMAZP)	CEC	1	ng/L	OCWD
Carbaryl (CARBAR)	531	2	ug/L	OCWD
Carbaryl (CARBAR)	531.2	2	ug/L	OCWD
Carbofuran (CARBOF)	531	1	ug/L	OCWD
Carbofuran (CARBOF)	531.2	1	ug/L	OCWD
Chlordane (ClDANE)	508	0.1	ug/L	WECKLAB
Chlordane (ClDANE)	508.1	0.1	ug/L	WECKLAB
Chlordane (ClDANE)	8081A	0.019 - 0.02	ug/L	EURFCLLC
Chlordane-alpha (CLDA)	525.2	0.1	ug/L	OCWD
Chlordane-alpha (CLDA)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Chlordane-gamma (CLDG)	525.2	0.1	ug/L	OCWD
Chlordane-gamma (CLDG)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Chlorobenzilate (CLBZLA)	525.2	0.1	ug/L	OCWD
Chloroneb (CLNEB)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Chlorothalonil (CLTNIL)	508	0.05	ug/L	WECKLAB
Chlorothalonil (CLTNIL)	508.1	0.05	ug/L	WECKLAB
Chlorothalonil (CLTNIL)	525.2	0.1	ug/L	OCWD
Chlorpropham (CPRPHM)	525.2	0.1	ug/L	OCWD
Chlorpyrifos (ClPYRI)	525.2	0.1	ug/L	OCWD
Chrysene (CHRYS)	525.2	0.1	ug/L	OCWD
Chrysene (CHRYS)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Chrysene (CHRYS)	625.1	9.6 - 10	ug/L	EURFCLLC
Chrysene (CHRYS)	8270C	1	ug/L	WECKLAB
Dalapon (DALAPN)	515.4	0.4	ug/L	WECKLAB
Dalapon (DALAPN)	552.2	1	ug/L	OCWD
DCPA-Dacthal (DCPA)	515.4	0.1	ug/L	WECKLAB
DCPA-Dacthal (DCPA)	525.2	0.1	ug/L	OCWD
Diazinon (DIAZI)	525.2	0.1	ug/L	OCWD
Dibenzo(a,h)anthracene (DBahAN)	525.2	0.1	ug/L	OCWD
Dibenzo(a,h)anthracene (DBahAN)	625.1	19 - 20	ug/L	EURFCAIR
Dibenzo(a,h)anthracene (DBahAN)	625.1	9.6 - 10	ug/L	EURFCLLC
Dibenzo(a,h)anthracene (DBahAN)	8270C	2	ug/L	WECKLAB
Dicamba (DICAMB)	515.4	0.6	ug/L	WECKLAB
Dichlorprop (24DP)	515.4	0.3	ug/L	WECKLAB
Dichlorvos (DCLVOS)	525.2	0.1	ug/L	OCWD
Dieldrin (DIELDR)	508	0.01	ug/L	WECKLAB
Dieldrin (DIELDR)	508.1	0.01	ug/L	WECKLAB
Dieldrin (DIELDR)	525.2	0.1	ug/L	OCWD
Dieldrin (DIELDR)	8081A	0.0097 - 0.01	ug/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Diethyl phthalate (DEP)	525.2	2	ug/L	OCWD
Diethyl phthalate (DEP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Diethyl phthalate (DEP)	625.1	9.6 - 10	ug/L	EURFCLLC
Diethyl phthalate (DEP)	8270C	1	ug/L	WECKLAB
Dimethoate (DMTH)	525.2	1	ug/L	OCWD
Dimethyl phthalate (DMP)	525.2	2	ug/L	OCWD
Dimethyl phthalate (DMP)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Dimethyl phthalate (DMP)	625.1	9.6 - 10	ug/L	EURFCLLC
Dimethyl phthalate (DMP)	8270C	1	ug/L	WECKLAB
Di-n-butylphthalate (DnBP)	525.2	2	ug/L	OCWD
Di-n-butylphthalate (DnBP)	625.1	19 - 20	ug/L	EURFCAIR
Di-n-butylphthalate (DnBP)	625.1	9.6 - 10	ug/L	EURFCLLC
Di-n-butylphthalate (DnBP)	8270C	1	ug/L	WECKLAB
Di-n-octyl phthalate (DnOP)	525.2	2	ug/L	OCWD
Di-n-octyl phthalate (DnOP)	625.1	19 - 20	ug/L	EURFCAIR
Di-n-octyl phthalate (DnOP)	625.1	24 - 26	ug/L	EURFCLLC
Di-n-octyl phthalate (DnOP)	8270C	1	ug/L	WECKLAB
Dinoseb (DINOSB)	515.4	0.4	ug/L	WECKLAB
Diphenamid (DPHNMD)	525.2	0.1	ug/L	OCWD
Diquat (DIQUAT)	549.2	4	ug/L	OCWD
Diuron (DIURON)	CEC	0.005	ug/L	OCWD
Endosulfan I (ENDOI)	508	0.01	ug/L	WECKLAB
Endosulfan I (ENDOI)	508.1	0.01	ug/L	WECKLAB
Endosulfan I (ENDOI)	525.2	0.1	ug/L	OCWD
Endosulfan I (ENDOI)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Endosulfan sulfate (ENDOSL)	508	0.01	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Endosulfan sulfate (ENDOSL)	508.1	0.01	ug/L	WECKLAB
Endosulfan sulfate (ENDOSL)	525.2	0.1	ug/L	OCWD
Endosulfan sulfate (ENDOSL)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
Endothall (ENDOTL)	548.1	45	ug/L	WECKLAB
Endrin (ENDRIN)	508	0.01	ug/L	WECKLAB
Endrin (ENDRIN)	508.1	0.01	ug/L	WECKLAB
Endrin (ENDRIN)	525.2	0.1	ug/L	OCWD
Endrin (ENDRIN)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Endrin Aldehyde (ENDR-A)	508	0.01	ug/L	WECKLAB
Endrin Aldehyde (ENDR-A)	508.1	0.01	ug/L	WECKLAB
Endrin Aldehyde (ENDR-A)	525.2	0.1	ug/L	OCWD
Endrin Aldehyde (ENDR-A)	8081A	0.019 - 0.02	ug/L	EURFCLLC
Endrin Ketone (ENDR-K)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
EPTC (EPTC)	525.2	0.1	ug/L	OCWD
Erythromycin (ERYTHN)	CEC	1	ng/L	OCWD
Ethion (ETHION)	525.2	0.1	ug/L	OCWD
Ethoprop (ETHPRP)	525.2	0.1	ug/L	OCWD
Ethylene Glycol (GLYCOL)	8015D	10,000	ug/L	EUROFBUF
Etridiazole (ETRDZL)	525.2	0.1	ug/L	OCWD
Fluoranthene (FLANTH)	525.2	0.1	ug/L	OCWD
Fluoranthene (FLANTH)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Fluoranthene (FLANTH)	625.1	9.6 - 10	ug/L	EURFCLLC
Fluoranthene (FLANTH)	8270C	1	ug/L	WECKLAB
Fluorene (FLUOR)	525.2	0.1	ug/L	OCWD
Fluorene (FLUOR)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Fluorene (FLUOR)	625.1	9.6 - 10	ug/L	EURFCLLC

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Fluorene (FLUOR)	8270C	1	ug/L	WECKLAB
Gemfibrozil (GMFIBZ)	CEC	1	ng/L	OCWD
Glyphosate (GLYPHO)	547	25	ug/L	OCWD
HCH-gamma (Lindane) (LINDNE)	508	0.01	ug/L	WECKLAB
HCH-gamma (Lindane) (LINDNE)	508.1	0.01	ug/L	WECKLAB
HCH-gamma (Lindane) (LINDNE)	525.2	0.1	ug/L	OCWD
HCH-gamma (Lindane) (LINDNE)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Heptachlor (HEPTA)	508	0.01	ug/L	WECKLAB
Heptachlor (HEPTA)	508.1	0.01	ug/L	WECKLAB
Heptachlor (HEPTA)	525.2	0.1	ug/L	OCWD
Heptachlor (HEPTA)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Heptachlor epoxide (HEPEPX)	508	0.01	ug/L	WECKLAB
Heptachlor epoxide (HEPEPX)	508.1	0.01	ug/L	WECKLAB
Heptachlor epoxide (HEPEPX)	525.2	0.1	ug/L	OCWD
Heptachlor epoxide (HEPEPX)	8081A	0.0039 - 0.004	ug/L	EURFCLLC
Hexachlorobenzene (HEXCLB)	508	0.05	ug/L	WECKLAB
Hexachlorobenzene (HEXCLB)	508.1	0.05	ug/L	WECKLAB
Hexachlorobenzene (HEXCLB)	525.2	0.1	ug/L	OCWD
Hexachlorobenzene (HEXCLB)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Hexachlorobenzene (HEXCLB)	625.1	9.6 - 10	ug/L	EURFCLLC
Hexachlorobenzene (HEXCLB)	8270C	1	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	508	0.05	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	508.1	0.05	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	525.2	0.1	ug/L	OCWD
Hexachlorocyclopentadiene (HClCPD)	625.1	19 - 20	ug/L	EURFCAIR
Hexachlorocyclopentadiene (HClCPD)	625.1	24 - 26	ug/L	EURFCLLC
Hexachlorocyclopentadiene (HClCPD)	8270C	5	ug/L	WECKLAB

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.21 - 0.22	ug/L	EURDENVR
Hexazinone (HEXZON)	525.2	0.1	ug/L	OCWD
Ibuprofen (IBPRFN)	CEC	1	ng/L	OCWD
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2	0.1	ug/L	OCWD
Indeno(1,2,3-cd)pyrene (INDPYR)	625.1	9.6 - 10	ug/L	EURFCLLC
Indeno(1,2,3-cd)pyrene (INDPYR)	625.1	19 - 20	ug/L	EURFCAIR
Indeno(1,2,3-cd)pyrene (INDPYR)	8270C	2	ug/L	WECKLAB
Malathion (MALATH)	525.2	2	ug/L	OCWD
Methiocarb (MTHCRB)	531	4	ug/L	OCWD
Methiocarb (MTHCRB)	531.2	4	ug/L	OCWD
Methomyl (MTHOMY)	531	1	ug/L	OCWD
Methomyl (MTHOMY)	531.2	1	ug/L	OCWD
Methoxychlor (METHOX)	508	0.01	ug/L	WECKLAB
Methoxychlor (METHOX)	508.1	0.01	ug/L	WECKLAB
Methoxychlor (METHOX)	525.2	0.1	ug/L	OCWD
Methoxychlor (METHOX)	8081A	0.0097 - 0.01	ug/L	EURFCLLC
methyl-Parathion (MPARA)	525.2	0.5	ug/L	OCWD
Metribuzin (MTRBZN)	525.2	0.1	ug/L	OCWD
Molinate (MOLINT)	525.2	0.1	ug/L	OCWD
N,N-diethyl-m-toluamide (DEET)	1694MESI	4	ng/L	WECKLAB
N,N-diethyl-m-toluamide (DEET)	CEC	1 - 10	ng/L	OCWD
N,N-diethyl-m-toluamide (DEET)	LC-MS-MS	10	ng/L	EUROFINS
Norflurazon (NORFLR)	525.2	0.1 - 1.0	ug/L	OCWD
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.21 - 0.22	ug/L	EURDENVR

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Oxamyl (OXAMYL)	531	2	ug/L	OCWD
Oxamyl (OXAMYL)	531.2	2	ug/L	OCWD
Oxybenzone (BP3)	1694MESI	4	ng/L	WECKLAB
Oxybenzone (BP3)	LC-MS-MS	30 - 300	ng/L	EUROFINS
Paraquat (PARAQT)	549.2	4	ug/L	OCWD
Parathion (PARA)	525.2	0.5	ug/L	OCWD
Pentachlorophenol (PCP) (PCP)	515.4	0.2	ug/L	WECKLAB
Pentachlorophenol (PCP) (PCP)	525.2	1	ug/L	OCWD
Pentachlorophenol (PCP) (PCP)	625.1	19 - 20	ug/L	EURFCAIR
Pentachlorophenol (PCP) (PCP)	625.1	24 - 26	ug/L	EURFCLLC
Pentachlorophenol (PCP) (PCP)	8270C	1	ug/L	WECKLAB
Pentachlorophenol (PCP) (PCP)	CEC	0.2	ug/L	OCWD
Pentanal (PENTNL)	556	2	ug/L	WECKLAB
Permethrin-(total of cis/trans) (PMTHRN)	525.2	0.1	ug/L	OCWD
Phenanthrene (PHENAN)	525.2	0.1	ug/L	OCWD
Phenanthrene (PHENAN)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Phenanthrene (PHENAN)	625.1	9.6 - 10	ug/L	EURFCLLC
Phenanthrene (PHENAN)	8270C	1	ug/L	WECKLAB
Picloram (PICLOR)	515.4	0.6	ug/L	WECKLAB
Primidone (PRIMDN)	CEC	1	ng/L	OCWD
Prometryn (PROMET)	525.2	0.1	ug/L	OCWD
Pronamide (PROAMD)	525.2	0.1	ug/L	OCWD
Propachlor (PROPCL)	508	0.05	ug/L	WECKLAB
Propachlor (PROPCL)	508.1	0.05	ug/L	WECKLAB
Propachlor (PROPCL)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Propanal (PROPNL)	556	2	ug/L	WECKLAB
Propazine (PROPAZ)	525.2	0.1	ug/L	OCWD
Pyrene (PYRENE)	525.2	0.1	ug/L	OCWD
Pyrene (PYRENE)	625.1	9.5 - 10.0	ug/L	EURFCAIR
Pyrene (PYRENE)	625.1	9.6 - 10	ug/L	EURFCLLC
Pyrene (PYRENE)	8270C	1	ug/L	WECKLAB
Simazine (SIMAZ)	525.2	0.1	ug/L	OCWD
Simazine (SIMAZ)	CEC	0.005	ug/L	OCWD
Sulfamethoxazole (SULTHZ)	CEC	1 - 10	ng/L	OCWD
Tebuthiuron (TBTURN)	525.2	2	ug/L	OCWD
Terbacil (TRBACL)	525.2	0.1	ug/L	OCWD
Thiobencarb (THIO)	525.2	0.1	ug/L	OCWD
Toxaphene Mixture (TOXA)	508	1	ug/L	WECKLAB
Toxaphene Mixture (TOXA)	508.1	1	ug/L	WECKLAB
Toxaphene Mixture (TOXA)	8081A	0.058 - 0.06	ug/L	EURFCLLC
Triclosan (TRICLN)	CEC	1	ng/L	OCWD
Trifluralin (TRFLRN)	508	0.01	ug/L	WECKLAB
Trifluralin (TRFLRN)	508.1	0.01	ug/L	WECKLAB
Trifluralin (TRFLRN)	525.2	0.1	ug/L	OCWD
Trithion (TRTION)	525.2	0.1	ug/L	OCWD

Laboratory Abbreviation Descriptions:

DAVI: Davi Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EURFCLLC: Eurofins Calsciene Lincoln; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; TRUSSELL: Trussell Technologies, Inc.; WECKLAB: Weck Laboratories, Inc.

Appendix D

Operator Certifications, Operations and Maintenance Summary and Calibration Records

Orange County Water District Groundwater Replenishment System 2021 Annual Report

Orange County Water District
Groundwater Replenishment System
Advanced Water Purification Facility

Operations Certification Levels
(As of December 2021)

Listed according to level of Operator Certification level, high-to-low

Operator	OCWD Job Title	WWTP Certification Level & No.		DWT Certification Level & No.		AWTO Certification Level & No.	
Tyson Neely	Operations Manager	V	V-27698	T-3	26138		
Derrick Mansell	Chief Plant Operator	V	V-28340				
Steve Clark	Shift Supervisor	V	V-8430				
Russell Sutton	Shift Supervisor	V	V-5143				
Mario Manriquez	Lead Plant Operator	V	V-10397				
John Souza	Shift Supervisor	IV	IV-3998				
Anthony Carreira	Shift Supervisor	IV	IV-27787				
Mike Ewing	Lead Plant Operator	III	III-10199				
Luis Torres	Lead Plant Operator	III	III-28285	T-2	27383		
Craig Liebzeit Jr.	Lead Plant Operator	III	III-43546	T-2	34896		
Heinz Roehler	Sr. Plant Operator III	III	III-3534	T-3	9202		
Thomas Nicholson	Sr. Plant Operator III	III	III-9446				
Curtis Sanders	Sr. Plant Operator III	III	III-28461				
Chris Vu	Sr. Plant Operator III	III	III-10630				
Philip Jacobs	Plant Operator II	III	II-42110				
Jacob Bermudez	Plant Operator II	III	III-43637				
Charles Spade	Plant Operator II	II	II-7966				
Eric Gautier	Plant Operator II	II	II-10135				
Bryan Bushay	Plant Operator II	II	II-43759	T-3	35438		
Jonathan Mok	Plant Operator I	II	II-43357	T-2	41147		
Christopher Owens	Plant Operator II			T-4	29560		
Anthony Lockhart	Plant Operator II			T-3	38600		

Plant Shutdown Summary for Advanced Water Purification Facility
2021 Groundwater Replenishment System Annual Report

	Cause of AWPF Shutdown	Hours Offline per Month												Annual Total
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Planned shutdown for GWRSFE construction - UV commissioning	30.00												30.00
2	Unplanned shutdown due to RO transfer pump pressure controller issue	1.20												1.20
3	Unplanned shutdown due to influent screens blinding			2.70										2.70
4	Planned shutdown for annual PM inspections (high voltage) & GWRSFE construction tie-ins					14.00								14.00
5	Unplanned SCE power interruption										8.90			8.90
6	Planned shutdown for GWRSFE construction & GWRS Pipeline inspection								395.25	32.25				427.50
7	Planned shutdown for GWRSFE construction work												11.25	11.25
Total Hours Offline		**31.20**	**0.00**	**2.70**	**0.00**	**14.00**	**0.00**	**0.00**	**395.25**	**32.25**	**8.90**	**0.00**	**11.25**	**495.55**
Total Days Offline		**1.30**	**0.00**	**0.11**	**0.00**	**0.58**	**0.00**	**0.00**	**16.47**	**1.34**	**0.37**	**0.00**	**0.47**	**20.65**

Appendix D
Plant Shutdown Summary

D.1 January 2021

January 1 - 31: Total Downtime 31.2 hours (4.2%)

The AWPF / GWRS experienced one scheduled and one unexpected shutdowns, lasting a total of 31.2 hours during the month of January.

January 12 – 13: On January 12, at 0800 hours, the GWRS performed a scheduled shutdown to begin commissioning exercises on the three new GWRSFE UV trains N, O, and P. The GWRS was brought back online to resume normal operation on January 13 at 1400 hours.

During the new UV trains commissioning period the GWRS was offline and/or operated in bypass mode for a total of 30.0 hours. During this period 0.12 MG of OC-44 water, and 0.43 MG of City of Fountain Valley potable water was used to keep the Talbert Seawater Barrier Injection well field pressurized.

January 21: The GWRS experienced an unexpected 1.2 hour shutdown (1220 – 1330 hours) due to a brief RO transfer pump pressure controller communications interruption that caused the RO system to fail due to a false low pressure signal. A total of 0.18 MG of City of Fountain Valley potable water was used during the shutdown period to keep the Talbert Seawater Intrusion Barrier injection well field pressurized until the plant could be restarted and resume normal FPW injection.

D.2 February 2021

February 1 — 28: Total Downtime 0.0 hours (0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of February.

D.3 March 2021

March 1 - 31: Total Downtime 2.7 hours (0.4%)

The AWPF / GWRS experienced one unexpected shutdown during March.

On March 24, a 2.7-hours long GWRS shutdown occurred between 1920 – 2200 hours. The GWRS shutdown when the plant became starved of feedwater flow from OC San Plant 1. The event quickly occurred after multiple OC San Plant 1 operators began washing secondary clarifier effluent weirs and launders simultaneously which blinded the GWRS influent screens and caused them to fail due to overload conditions. During the shutdown staff used 0.25 MG of OC-44 potable water to keep the Talbert Seawater Intrusion Barrier injection system pressurized until the GWRS could be restarted to resume normal injection.

D.4 April 2021

April 1 — 30: Total Downtime 0.0 hours (0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of April.

D.5 May 2021

May 1 — 31: Total Downtime 14.0 hours (1.9%)

The AWPF / GWRS experienced one scheduled shutdown during the month of May, lasting a total of 14.0 hours.

May 19: The GWRS experienced a 14-hour scheduled shutdown (0500 – 1900 hours) for annual high voltage systems preventive maintenance inspections. The shutdown also provided the GWRSFE construction contractor the opportunity to complete tie-ins for a new MF backwash waste pump as well as RO concentrate pipe tie-ins for new RO trains H and I. During the shutdown staff used 0.30 MG of OC-44 potable water to keep the Talbert Seawater Barrier injection system pressurized until the AWPF could be restarted to resume normal injection.

D.6 June 2021

June 1 — 30: Total Downtime 0.0 hours (0.0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of June.

D.7 July 2021

July 1 —31: Total Downtime 0.0 hours (0.0%)

The AWPF / GWRS experienced no shutdowns during the month of July.

During the July operating period, the GWRS responded to one Enel X Demand Response electrical load reduction event. Details follow.

July 9: The GWRS performed a 3.0-hour (1800 – 2100 hours) Demand Response power load reduction event. During the event, the AWPF production rate was dropped from 95 MGD to 15 MGD. During the flow reduction period all production was sent to the Talbert Seawater Barrier injection system while delivery of recycled water to the Mid-Basin Injection wells and the spreading basins located in Anaheim stopped.

D.8 August 2021

August 1 — 31: Total Downtime 395.25 hours (53.1%)

The GWRS experienced extended shutdown during August. On August 15, the GWRS began the extended shutdown that was estimated to last for 2 weeks while the GWRSFE Phase III constriction contractor made various tie-ins for new equipment. The OCWD Engineering Department also utilized the downtime to perform internal inspections and epoxy paint repairs inside Segments 1 and 2 of the GWRS Pipeline. The GWRS did not resume production until September 2. The following bullet points provide brief details of the work that was completed during the extended GWRS shutdown.

GWRSFE construction

- Installation of tie-in piping / valves for new MF backwash blower B04.
- Installation of tie-in piping / valves for new MF backwash supply pumps A04 and B04.
- Installation of tie-in piping / valves for new MF vacuum pump F01 and F02.
- Installation of tie-in piping / valves for new MF West Air Compressor B03.

- Tie-in MF backwash supply piping, Control Air piping, Air Scour (blower) supply piping, Vacuum Supply piping, to new UF cells E05 - E08, and new UF train F (F01 - F08).
- MF BWW vault intermediate waste sump wall coring to common the MF East & West BWW sump vaults.
- A420 tie-ins of piping / valves for new sulfuric acid bulk storage tanks A05 and A06.
- Installation of tie-in piping / valves for new sulfuric acid dosing pump A04.
- Installation of tie-in piping / valves for new A450 CF vessels A-15 & A-16.
- A470 84" static mixer replacement.
- Installation of tie-in piping / valves for new RO flush pump A05 and DPW pump A04.
- Installation of tie-in piping / valves for new Decarbonator Tower A05 and modifications on the decarbonation system's RO Bypass piping.
- Installation of tie-in piping / valves for new DPW booster pump in A730 for polymer dilution.
- Installation of tie-in piping / valves for new PWP A05.

OCWD activities

- SEFE tank(s) cleaning & inspections and repairs to SEFE tank A01's solar bee mixer.
- FPWC entry for PM inspections, lime scale cPM in #1 channel and its LIT floats.
- Replacement of A840 FPWBS 78" PWPS bypass valve FV-3410's gearbox and actuator.
- GWRS Santa Ana River pipeline internal inspections and point repairs (epoxy).

D.9 September 2021

September 1 —30: Total Downtime 32.25 hours (4.5%)

The GWRS began the month of September in a shutdown state with continuation of scheduled shutdown for GWRSFE construction work that began on August 15.

The GWRS resumed normal production and distribution on September 2 at 0815 hours.

No other GWRS shutdowns or process interruptions occurred in September.

D.10 October 2021

October 1 – 31: Total Downtime 8.9 hours (1.2%)

October 9-10: The AWPF experienced an 8.9-hour shutdown due to the unexpected Southern California Edison power interruption (10/10, 1615 hours – 10/11, 0110 hours). As a result of the power interruption, multiple power and equipment issues occurred throughout the plant, and required extensive assistance from I&E on-call staff to help ready the plant to be brought online again. During the shutdown staff used 1.08 MG of OC-44 potable water to keep the Talbert Seawater Barrier injection system pressurized until the AWPF could be restarted to resume normal injection.

D.11 November 2021

November 1 — 30: Total Downtime 0.0 hours (0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of November.

D.12 December 2021

December 1 - 31: Total Downtime 11.25 hours (1.5%)

The GWRS experienced scheduled shutdown during December for GWRSFE construction work. The 11.25-hour shutdown occurred on December 9 (0600-1715 hours). During the shutdown, the GWRSFE contractors performed PCS (DeltaV) downloads for new decarbonated product water (DPW) pump A04, and for two new MF backwash supply pumps, A04 and B04. The contractor also utilized the shutdown period to pull and make new wiring tie-ins for the two new MF backwash supply pumps as well as wiring connections to the electrical transformers for the six new RO high pressure pumps, H01, H02, H03, I01, I02, and I03. Testing also occurred on the new electrical breakers that were installed.

The shutdown was also coordinated with OC San Plan 2 so they could receive 50 - 70 MGD of extra influent flow, which with the GWRS offline OC San Plant 1 was able to bypass to Plant 2 without affecting GWRS operations. Plant 2 needed the extra flow to test and commission a new Ocean Outfall Booster Pump.

During the shutdown, staff used 0.41 MG of OC-44 potable water to keep the Talbert Seawater Barrier injection system pressurized until the AWPF could be restarted to resume normal injection.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/17/21	17.0	13.10	5.30	3.49
February	2/1/21	(See Note 1)			
	2/3/21	13.7	14.00	5.00	4.44
	2/22/21	15.0	12.00	5.32	4.83
March	3/12/21	15.0	13.19	6.18	4.99
	3/31/21	15.2	12.06	5.63	4.90
April	4/19/21	15.0	11.92	5.57	4.87
May	5/7/21	15.0	11.70	6.02	5.86
	5/26/21	15.0	13.22	5.30	4.66
June	6/14/21	15.2	10.88	5.21	4.70
July	7/1/21	(See Note 2)			
	7/6/21	17.1	13.00	4.70	4.50
	7/27/21	17.0	12.10	5.36	4.44
August	8/11/21	11.5	7.67	4.37	4.25
September	9/22/21	17.0	11.00	4.83	4.24
October	10/14/21	17.0	10.30	4.71	4.22
November	11/1/21	(See Note 3)			
	11/2/21	15.0	12.70	5.37	5.02
	11/21/21	15.0	13.10	5.64	4.89
December	12/10/21	14.9	12.60	6.38	5.00
	12/29/21	15.3	13.10	6.01	5.21

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/15/21	17.0	13.03	4.21	3.54
February	2/1/21	(See Note 1)			
	2/2/21	15.0	13.90	4.43	4.97
	2/20/21	14.5	13.07	4.40	4.22
March	3/11/21	15.1	13.10	4.60	3.95
	3/30/21	15.1	14.14	4.53	3.98
April	4/18/21	15.0	12.84	4.73	4.00
May	5/7/21	15.0	12.37	4.03	4.17
	5/26/21	15.0	12.02	3.80	3.73
June	6/14/21	15.0	11.30	4.13	3.59
July	7/1/21	(See Note 2)			
	7/5/21	17.0	12.20	4.20	3.31
	7/27/21	17.0	12.20	4.18	3.32
August	8/10/21	11.3	8.56	3.65	3.12
September	9/23/21	17.2	10.50	3.76	3.56
October	10/15/21	17.0	10.90	3.60	3.16
November	11/1/21	(See Note 3)			
	11/3/21	15.6	12.10	4.05	3.63
	11/21/21	14.9	12.70	4.60	3.91
December	12/11/21	15.1	12.50	4.91	4.03
	12/29/21	15.1	12.80	5.03	4.26

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.1	12.90	5.01	4.03
	1/28/21	11.0	12.85	5.81	4.86
February	2/1/21	(See Note 1)			
	2/16/21	15.0	13.68	13.68	4.63
March	3/4/21	13.5	13.10	4.60	4.46
	3/23/21	15.0	13.41	4.88	4.57
April	4/11/21	12.6	12.70	5.06	3.94
	4/30/21	15.0	13.75	4.92	4.60
May	5/20/21	15.4	12.16	4.14	4.10
June	6/8/21	15.0	13.53	4.10	3.70
	6/27/21	15.0	12.20	4.32	3.82
July	7/1/21	(See Note 2)			
	7/16/21	14.7	10.07	4.69	3.50
August	8/9/21	15.8	12.30	4.55	3.90
September	9/17/21	13.4	11.88	4.36	3.63
October	10/9/21	17.0	12.60	4.30	3.73
	10/30/21	16.2	12.70	4.12	(See Note 3)
November	11/1/21	(See Note 4)			
	11/19/21	14.1	12.60	5.65	4.09
December	12/3/21	8.7	9.40	3.28	4.25
	12/27/21	15.0	12.88	3.78	6.30

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Post citric data not collected.

4 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/4/21	13.3	12.90	4.65	5.51
	1/16/21	8.8	13.18	4.83	4.40
	1/28/21	8.9	13.63	4.58	4.40
February	2/1/21	(See Note 1)			
	2/11/21	11.9	13.60	4.90	4.73
	2/24/21	10.3	15.27	5.14	5.11
March	3/10/21	10.5	13.24	5.03	4.56
April	4/2/21	15.0	13.48	5.00	4.94
	4/16/21	11.9	13.21	5.39	4.47
May	5/5/21	15.0	14.77	6.30	4.50
	5/24/21	15.0	14.88	5.39	4.41
June	6/12/21	15.0	12.12	4.99	4.29
	6/30/21	14.4	11.60	3.08	4.19
July	7/1/21	(See Note 2)			
	7/22/21	17.0	12.20	4.11	4.48
August	8/9/21	15.0	14.65	5.01	4.22
September	9/19/21	14.6	12.13	4.84	4.16
October	10/11/21	17.0	12.78	5.21	4.47
	10/29/21	14.8	13.80	5.00	4.04
November	11/1/21	(See Note 3)			
	11/13/21	11.5	11.80	4.64	4.48
	11/28/21	10.3	10.70	3.69	4.49
December	12/6/21	6.2	13.10	4.54	4.38
	12/17/21	7.7	9.50	5.54	5.20
	12/28/21	5.3	7.40	4.02	3.63

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/10/21	17.1	12.40	5.88	4.63
	1/29/21	14.5	13.52	5.89	5.48
February	2/1/21	(See Note 1)			
	2/16/21	15.2	12.17	6.73	5.19
March	3/6/21	15.0	12.70	6.05	4.82
	3/25/21	15.0	11.50	5.34	4.83
April	4/11/21	15.0	12.12	5.56	5.06
May	5/1/21	15.0	10.80	7.76	5.04
	5/20/21	15.3	12.29	5.22	4.95
June	6/8/21	15.0	10.33	5.20	4.86
	6/26/21	15.0	10.58	5.17	4.57
July	7/1/21	(See Note 2)			
	7/18/21	17.0	12.30	5.15	4.60
August	8/8/21	17.0	11.26	5.50	4.14
September	9/15/21	11.8	7.65	4.38	3.94
October	10/7/21	17.0	9.80	4.16	4.23
	10/28/21	17.0	12.50	5.16	5.14
November	11/1/21	(See Note 3)			
	11/15/21	15.0	13.04	6.07	4.82
December	12/2/21	13.2	10.40	5.45	4.73
	12/18/21	12.3	8.50	4.21	4.60
	12/27/21	6.1	5.23	5.04	3.52

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/20/21	17.2	11.44	5.42	4.76
February	2/1/21	(See Note 1)			
	2/8/21	15.0	11.40	4.82	4.55
	2/26/21	15.0	14.22	5.17	4.95
March	3/17/21	15.0	12.50	4.87	5.00
April	4/5/21	15.1	10.87	4.61	4.24
	4/23/21	15.0	11.35	5.19	4.42
May	5/12/21	15.0	9.97	4.46	3.87
	5/31/21	15.0	10.11	5.34	4.38
June	6/19/21	15.0	8.81	4.48	4.21
July	7/1/21	(See Note 2)			
	7/10/21	17.0	11.30	4.63	4.41
August	8/3/21	17.0	10.70	4.75	4.08
	8/12/21	7.4	6.22	4.07	3.73
September	9/24/21	17.1	11.30	4.19	3.78
October	10/15/21	17.0	10.50	4.97	3.75
November	11/1/21	(See Note 3)			
	11/1/21	13.5	12.20	4.69	4.15
	11/16/21	11.9	9.80	3.41	3.20
December	12/3/21	13.5	10.20	3.86	4.38
	12/21/21	14.6	10.22	5.88	5.38

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/18/21	17.0	12.14	5.23	5.28
February	2/1/21	(See Note 1)			
	2/5/21	15.0	13.00	4.75	4.89
	2/24/21	15.0	11.96	5.30	6.53
March	3/15/21	15.0	12.70	5.21	4.96
April	4/2/21	15.0	10.84	5.14	4.71
	4/21/21	15.0	11.02	5.23	4.87
May	5/9/21	15.0	10.20	4.67	4.76
	5/28/21	15.0	11.36	4.92	4.46
June	6/16/21	15.0	9.38	4.74	4.74
July	7/1/21	(See Note 2)			
	7/7/21	17.0	11.00	4.95	4.57
	7/28/21	17.0	10.45	4.88	4.42
August	8/11/21	11.8	6.95	4.18	4.41
September	9/17/21	12.8	7.96	4.35	4.10
October	10/8/21	17.0	9.10	4.20	4.00
	10/29/21	17.0	12.50	5.19	5.22
November	11/1/21	(See Note 3)	0.00	0.00	0.00
	11/16/21	15.0	13.20	5.64	5.03
December	12/5/21	15.0	13.00	6.03	5.08
	12/24/21	15.0	11.80	5.77	4.89

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit A08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/4/21	MW (See Note 1)			
	1/15/21	MW (See Note 1)			
	1/24/21	21.1	9.4	4.50	5.11
February	2/2/21	MW (See Note 1)			
	2/11/21	MW (See Note 1)			
	2/20/21	21.1	11.6	5.20	4.60
March	3/1/21	MW (See Note 1)			
	3/10/21	MW (See Note 1)			
	3/20/21	21.2	11.8	5.25	4.90
	3/28/21	MW (See Note 1)			
April	4/6/21	MW (See Note 1)			
	4/15/21	21.0	11.2	4.90	5.10
	4/24/21	MW (See Note 1)			
May	5/3/21	MW (See Note 1)			
	5/12/21	21.0	10.0	4.20	4.10
	5/21/21	MW (See Note 1)			
	5/30/21	MW (See Note 1)			
June	6/8/21	21.0	10.0	4.75	4.68
	6/17/21	MW (See Note 1)			
	6/26/21	MW (See Note 1)			
July	7/5/21	21.0	9.8	4.10	4.25
	7/14/21	MW (See Note 1)			
	7/23/21	21.0	9.2	4.60	4.60
August	8/1/21	MW (See Note 1)			
	8/12/21	15.8	8.5	4.36	3.85
September	9/12/21	MW (See Note 1)			
	9/21/21	MW (See Note 1)			
	9/30/21	21.0	8.7	4.29	4.75
October	10/9/21	MW (See Note 1)			
	10/18/21	MW (See Note 1)			
	10/27/21	21.0	10.4	4.78	4.17
November	11/5/21	MW (See Note 1)			
	11/14/21	MW (See Note 1)			
	11/23/21	20.8	11.9	3.82	3.70
December	12/2/21	MW (See Note 1)			
	12/11/21	MW (See Note 1)			
	12/20/21	21.0	12.7	5.74	5.96
	12/29/21	MW (See Note 1)			

[1] Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/2/21	17.0	12.50	4.86	4.17
	1/21/21	15.4	13.54	5.17	5.17
February	2/1/21	(See Note 1)			
	2/9/21	15.0	14.54	5.16	4.69
	2/28/21	16.7	12.36	5.30	4.84
March	3/17/21	13.9	13.34	5.35	4.70
April	4/5/21	15.0	13.86	6.21	5.59
	4/24/21	15.1	12.67	5.73	4.20
May	5/13/21	15.0	13.34	4.74	4.25
June	6/1/21	15.0	12.55	4.80	4.41
	6/20/21	15.0	12.40	4.43	4.37
July	7/1/21	(See Note 2)			
	7/11/21	17.0	12.31	5.07	4.10
August	8/1/21	17.0	11.36	5.23	4.14
	8/13/21	9.0	6.74	4.02	3.89
September	9/14/21	10.7	8.27	4.30	4.07
October	10/6/21	17.0	11.40	3.90	3.78
	10/25/21	(See Note 3)			
November	11/24/21	21.0	7.90	3.43	2.62
December	12/21/21	21.0	10.30	3.75	2.80

[1] Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

[2] Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

[3] Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/2/21	17.1	12.20	6.47	4.77
	1/24/21	17.0	13.50	5.08	4.66
February	2/1/21	(See Note 1)			
	2/12/21	15.0	14.07	5.39	4.41
March	3/3/21	14.8	12.36	5.45	4.38
	3/22/21	15.0	12.30	4.76	4.25
April	4/10/21	15.0	13.17	4.93	4.18
	4/29/21	15.2	12.97	5.26	4.52
May	5/18/21	15.0	12.50	5.15	4.46
June	6/6/21	15.2	12.10	5.22	4.11
	6/24/21	15.0	13.45	4.90	4.26
July	7/1/21	(See Note 2)			
	7/16/21	17.1	12.35	4.60	4.67
August	8/6/21	17.0	13.20	4.72	4.54
	8/14/21	6.7	5.95	3.60	3.29
September	9/23/21	17.2	12.90	4.04	4.02
October	10/11/21	(See Note 3)			
November	11/10/21	21.0	5.40	2.63	2.22
December	12/6/21	21.0	9.20	3.65	2.67

[1] Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

[2] Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

[3] Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/10/21	17.0	13.20	4.83	4.02
	1/28/21	14.1	13.50	(See Note 1)	
February	2/1/21	(See Note 2)			
	2/3/21	4.9	8.46	4.31	3.86
	2/22/21	15.1	14.88	5.58	5.99
March	3/13/21	15.0	11.50	4.92	4.47
April	4/1/21	15.0	11.05	4.57	4.60
	4/19/21	15.0	13.88	5.35	4.28
May	5/8/21	15.0	10.90	4.17	3.98
	5/27/21	15.0	10.74	4.40	4.26
June	6/14/21	15.1	9.61	4.50	3.80
July	7/1/21	(See Note 3)			
	7/6/21	17.1	11.10	4.03	3.60
	7/27/21	17.0	10.60	4.44	3.44
August	8/11/21	11.4	6.97	3.84	3.36
September	9/18/21	14.1	7.58	3.57	3.64
	9/27/21	(See Note 4)			
October	10/22/21	17.0	4.40	2.80	2.58
November	11/18/21	21.1	7.10	3.51	3.00
December	12/15/21	21.0	4.90	2.93	2.98

1 No Citric CIP performed due to a valve leak.
2 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.
3 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.
4 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.0	11.21	4.07	2.49
	1/29/21	15.0	14.20	2.90	4.11
February	2/1/21	(See Note 1)			
	2/16/21	15.0	14.47	5.44	4.28
March	3/7/21	15.7	12.20	4.58	4.36
	3/26/21	15.0	12.98	4.51	4.28
April	4/12/21	15.0	13.14	5.54	4.15
May	5/2/21	15.0	12.80	4.24	4.11
	5/21/21	15.0	10.18	4.26	4.17
June	6/8/21	15.0	11.92	4.83	3.94
	6/27/21	15.0	9.92	4.43	3.45
July	7/1/21	(See Note 2)			
	7/18/21	17.0	11.50	4.31	3.86
August	8/8/21	17.1	10.75	4.65	3.79
September	9/13/21	(See Note 3)			
October	10/14/21	21.5	4.80	2.92	2.84
November	11/9/21	21.0	7.50	3.30	3.36
December	12/9/21	21.0	7.40	3.57	3.11

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.
2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.
3 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/1/21	17.0	14.80	5.45	4.60
	1/22/21	17.3	14.26	5.78	5.15
February	2/1/21	(See Note 1)			
	2/10/21	15.0	12.59	4.82	4.79
	2/25/21	12.4	13.10	5.58	5.04
March	3/16/21	15.0	13.04	5.30	5.50
April	4/4/21	15.0	13.67	4.83	4.69
	4/23/21	15.0	14.10	6.11	5.09
May	5/11/21	15.0	12.63	5.36	4.81
June	6/2/21	15.0	11.08	4.58	4.50
	6/20/21	15.0	11.29	4.70	4.54
July	7/1/21	(See Note 2)			
	7/11/21	17.0	12.30	5.07	4.72
August	8/2/21	17.0	13.86	5.22	4.24
	8/13/21	9.1	7.21	4.13	3.74
September	9/22/21	16.7	11.77	4.82	4.35
October	10/14/21	17.2	12.60	5.31	4.55
November	11/1/21	(See Note 3)			
	11/1/21	14.6	12.50	5.22	4.85
	11/15/21	11.5	11.40	4.24	4.90
December	12/1/21	11.6	9.00	3.85	4.93
	12/22/21	15.0	11.70	5.53	5.26

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.2	12.30	5.30	4.45
	1/28/21	11.3	13.20	5.12	4.73
February	2/1/21	(See Note 1)			
	2/12/21	11.2	12.00	4.22	4.09
March	3/2/21	14.9	14.85	5.61	5.37
	3/21/21	15.1	13.22	4.96	5.20
April	4/10/21	15.2	12.10	4.22	5.04
	4/29/21	15.0	13.35	4.80	4.47
May	5/18/21	15.2	13.00	5.17	4.71
June	6/7/21	15.4	11.30	4.19	3.87
	6/25/21	15.0	11.28	4.51	3.76
July	7/1/21	(See Note 2)			
	7/15/21	15.5	13.00	3.94	3.40
August	8/7/21	17.0	12.60	4.86	3.98
	8/15/21	5.8	5.50	3.45	2.81
September	9/21/21	15.1	10.70	4.30	3.90
October	10/13/21	17.6	12.00	4.21	3.84
November	11/1/21	(See Note 3)			
	11/1/21	15.4	13.70	5.97	4.24
	11/17/21	11.9	12.10	3.66	4.02
December	12/4/21	13.6	11.90	4.08	4.01
	12/21/21	13.2	11.40	3.51	4.76

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/11/21	16.9	12.28	5.65	5.14
February	2/1/21	(See Note 1)			
	2/1/21	15.0	13.53	6.06	5.88
	2/22/21	15.0	12.45	5.42	4.67
March	3/14/21	15.0	12.00	5.28	5.19
April	4/4/21	14.9	11.43	5.08	4.85
	4/26/21	15.0	12.00	4.85	5.05
May	5/16/21	15.0	10.96	5.45	4.63
June	6/7/21	15.4	11.93	5.21	4.39
	6/27/21	15.2	11.39	5.09	5.02
July	7/1/21	(See Note 2)			
	7/19/21	17.0	12.60	5.42	4.58
August	8/9/21	16.2	12.34	4.75	4.13
September	9/24/21	17.1	11.40	4.69	4.09
October	10/17/21	17.0	10.60	4.56	4.10
November	11/1/21	(See Note 3)			
	11/22/21	10.5	13.70	6.31	4.62
December	12/12/21	13.1	12.50	6.36	5.21

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit B08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/20/21	17.0	12.99	5.44	4.88
February	2/1/21	(See Note 1)			
	2/8/21	15.0	11.10	5.35	4.84
	2/27/21	15.0	13.10	5.20	5.28
March	3/18/21	14.6	13.20	5.13	4.53
April	4/6/21	15.1	14.15	6.40	5.26
	4/25/21	15.0	12.50	5.30	4.59
May	5/15/21	15.0	13.14	5.28	4.39
June	6/4/21	15.0	9.82	5.27	5.03
	6/23/21	15.1	12.59	5.17	4.54
July	7/1/21	(See Note 2)			
	7/15/21	17.0	12.70	5.05	4.37
August	8/5/21	17.0	10.99	5.24	4.29
	8/13/21	6.5	6.25	4.07	3.77
September	9/20/21	15.4	10.82	5.03	4.40
October	10/12/21	17.1	10.58	5.20	4.55
	10/31/21	14.8	11.90	3.67	4.28
November	11/1/21	(See Note 3)			
	11/9/21	6.8	9.60	4.89	4.53
	11/29/21	11.2	9.60	3.90	4.85
December	12/13/21	(See Note 4)			

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, switched to full caustic-only---no citric acid on 10-day / 240 run hour intervals with every 3rd 10-day runtime CIP concluding with normal full caustic and citric CIPs.

3 Unit taken offline for filter replacements.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/18/21	(See Note 1)			
February	2/1/21	(See Note 2)			
	2/10/21	15.1	6.86	3.28	3.31
March	3/1/21	15.0	8.16	3.19	3.21
	3/20/21	15.0	7.30	3.30	3.11
April	4/8/21	15.0	5.88	3.06	3.25
	4/26/21	15.0	6.75	3.44	2.92
May	5/1/21	(See Note 3)			
	5/24/21	21.0	8.15	3.38	2.91
June	6/19/21	21.0	8.39	3.51	2.95
July	7/16/21	21.1	8.00	3.24	2.89
August	8/9/21	19.9	8.00	3.71	2.89
October	10/5/21	21.0	6.43	3.44	3.21
	10/31/21	21.0	7.78	8.90	3.47
November	11/27/21	21.0	12.10	4.57	3.56
December	12/24/21	21.0	12.80	5.18	3.74

1 Unit taken offline for filter replacements.

2 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

3 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/2/21	17.3	5.60	2.84	2.72
	1/25/21	10.6	7.12	3.17	2.80
February	2/1/21	(See Note 1)			
	2/13/21	5.3	7.02	3.13	3.36
March	3/3/21	8.7	6.75	3.36	3.05
	3/23/21	9.6	8.08	3.68	3.08
April	4/11/21	7.3	6.62	3.27	2.85
	4/30/21	6.1	6.46	3.44	2.92
May	5/1/21	(See Note 2)			
	5/27/21	4.8	10.00	3.67	2.66
June	6/22/21	8.1	8.97	3.74	3.23
July	7/19/21	3.6	8.30	3.81	3.04
August	8/10/21	4.6	6.70	3.67	3.00
September	9/17/21	4.2	4.26	2.74	2.54
October	10/14/21	12.6	6.40	3.39	2.79
November	11/10/21	21.0	13.20	4.43	3.35
December	12/6/21	21.1	12.50	5.51	3.57

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/22/21	17.0	6.32	3.04	2.91
February	2/1/21	(See Note 1)			
	2/10/21	15.3	7.88	3.26	3.41
March	3/2/21	15.1	8.17	3.44	3.28
	3/21/21	15.0	6.97	3.43	2.99
April	4/9/21	15.0	5.99	3.47	2.77
	4/29/21	15.1	6.41	3.08	3.18
May	5/1/21	(See Note 2)			
	5/27/21	21.2	9.31	4.06	3.01
June	6/23/21	21.0	7.40	3.79	2.90
July	7/20/21	21.0	8.00	3.35	3.08
August	8/11/21	17.5	6.92	3.53	2.94
September	9/23/21	17.0	5.08	3.04	2.83
October	10/20/21	21.0	6.75	3.23	3.00
November	11/16/21	21.0	12.54	4.50	3.43
December	12/12/21	20.4	12.20	4.67	3.62

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/7/21	17.0	6.40	3.18	3.10
	1/29/21	17.0	7.33	3.56	3.12
February	2/1/21	(See Note 1)			
	2/17/21	15.1	6.52	3.13	2.98
March	3/8/21	15.1	6.76	3.39	3.40
	3/27/21	15.0	7.78	3.65	3.15
April	4/15/21	15.0	6.17	3.21	3.27
May	5/1/21	(See Note 2)			
	5/11/21	21.0	8.26	3.50	2.90
June	6/7/21	21.3	9.12	3.90	3.93
July	7/3/21	21.0	8.50	3.57	2.62
	7/30/21	21.0	8.00	3.43	2.67
August	8/14/21	12.0	4.54	2.75	2.63
September	9/19/21	13.4	5.20	3.22	2.84
October	10/16/21	21.0	7.00	3.40	2.90
November	11/11/21	21.0	12.00	4.26	3.22
December	12/7/21	21.1	12.70	4.00	4.04

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/20/21	16.9	15.52	6.17	4.11
February	2/1/21	(See Note 1)			
	2/8/21	14.6	13.21	6.75	5.56
	2/23/21	11.5	13.43	5.69	4.20
March	3/8/21	(See Note 2)			
	3/31/21	15.0	4.94	2.88	2.60
April	4/20/21	15.2	5.96	3.03	2.77
May	5/1/21	(See Note 3			
	5/17/21	21.2	5.81	2.49	2.60
June	6/13/21	21.0	5.94	2.93	2.68
July	7/10/21	21.0	7.00	3.01	2.54
August	8/5/21	21.2	6.24	3.39	2.60
	8/15/21	7.3	3.05	2.11	0.00
September	9/29/21	21.0	5.90	3.00	2.62
October	10/26/21	21.0	6.90	3.12	2.74
November	11/22/21	21.0	12.90	4.29	2.79
December	12/18/21	21.0	12.60	4.59	3.20

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.
2 Unit taken offline for filter replacements.
3 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/16/21	14.1	13.50	4.94	4.01
February	2/1/21	(See Note 1)			
	2/3/21	14.3	16.48	6.06	6.03
	2/17/21	11.6	15.12	5.01	3.97
	2/22/21	(See Note 2)			
March	3/17/21	15.0	6.27	3.11	2.70
April	4/5/21	15.1	5.52	2.49	2.57
	4/23/21	15.0	4.89	2.83	2.42
May	5/1/21	(See Note 3)			
	5/20/21	21.5	6.43	3.39	3.39
June	6/15/21	21.0	6.67	3.22	2.90
July	7/11/21	21.1	6.50	3.11	2.71
August	8/6/21	21.0	6.68	3.00	2.66
	8/15/21	(See Note 4)			
September	9/14/21	15.8	4.17	2.78	2.58
October	10/10/21	21.0	6.10	2.93	3.04
November	11/5/21	21.0	9.40	3.81	3.73
December	12/1/21	21.1	13.60	5.15	3.74
	12/27/21	21.0	13.50	5.62	4.12

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.
2 Unit taken offline for filter replacements.
3 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.
4 No Citric CIP in order to speed up planned 2-week shutdown.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/8/21	12.6	14.80	5.69	4.05
	1/30/21	17.0	14.71	5.46	4.59
February	2/1/21	(See Note 1)			
	2/8/21	(See Note 2)			
March	3/3/21	15.1	5.40	3.41	3.03
	3/22/21	15.4	5.12	3.19	2.80
April	4/10/21	15.0	5.09	2.83	2.78
	4/28/21	15.0	5.48	2.90	2.69
May	5/1/21	(See Note 3)			
	5/25/21	21.0	7.45	3.35	3.18
June	6/21/21	21.2	6.42	3.21	2.69
July	7/17/21	21.0	7.00	5.76	3.10
August	8/10/21	19.5	6.45	3.24	2.60
September	9/29/21	21.0	6.80	3.10	2.84
October	10/25/21	21.0	7.50	3.87	3.30
November	11/20/21	21.0	12.60	4.44	3.63
December	12/16/21	21.0	13.20	4.82	3.86

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Unit taken offline for filter replacements.

3 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit C08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/21/21	17.2	14.75	5.70	4.78
	1/25/21	(See Note 1)			
February	2/17/21	15.0	6.05	3.07	2.53
March	3/8/21	15.3	5.79	3.42	2.60
	3/26/21	15.0	5.75	3.60	3.18
April	4/14/21	15.1	5.28	3.14	2.94
May	5/1/21	(See Note 2)			
	5/10/21	21.0	5.72	3.27	2.76
June	6/6/21	21.0	6.73	3.29	3.29
July	7/1/21	21.0	7.30	6.39	3.24
	7/28/21	21.0	6.30	3.06	2.88
August	8/13/21	12.5	4.20	2.48	2.23
September	9/16/21	11.6	4.17	2.34	2.49
October	10/13/21	21.0	5.80	2.74	2.65
November	11/8/21	21.0	10.30	3.67	3.51
December	12/4/21	21.0	11.70	4.71	3.31
	12/30/21	21.0	11.30	4.56	3.90

1 Unit taken offline for filter replacements.

2 Starting 5/1/2021, returned to standard 21-day runtime interval CIPs.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/13/21	17.0	11.12	5.40	4.60
	1/30/21	13.7	12.70	5.20	4.85
February	2/1/21	(See Note 1)			
	2/18/21	15.3	14.20	5.41	4.81
March	3/9/21	15.0	12.00	5.53	4.86
	3/28/21	15.0	12.90	5.03	4.43
April	4/16/21	15.0	13.10	5.44	4.37
May	5/4/21	15.0	12.03	5.63	4.34
	5/24/21	15.2	11.87	5.04	4.67
June	6/12/21	15.0	10.16	4.69	4.18
July	7/1/21	(See Note 2)			
	7/3/21	17.0	12.00	5.20	4.05
	7/24/21	17.0	11.80	5.31	3.84
August	8/11/21	13.5	9.52	4.93	3.89
September	9/23/21	17.3	12.00	5.20	3.88
October	10/15/21	17.0	10.70	4.70	4.10
November	11/1/21	(See Note 3)			
	11/3/21	15.3	13.60	6.13	4.51
	11/17/21	11.1	11.40	4.25	4.14
December	12/4/21	13.4	11.30	5.29	4.15
	12/24/21	15.0	11.03	6.38	5.77

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.0	11.60	4.88	3.81
	1/29/21	11.8	13.50	4.80	4.55
February	2/1/21	(See Note 1)			
	2/16/21	15.1	14.62	5.71	6.47
March	3/7/21	15.0	12.00	5.82	4.78
	3/26/21	15.0	13.80	4.91	4.91
April	4/14/21	15.0	11.04	5.19	4.96
May	5/3/21	15.0	10.50	5.64	4.61
	5/23/21	15.0	11.62	5.50	4.35
June	6/10/21	15.0	12.65	4.88	4.25
	6/29/21	15.0	12.10	5.66	4.72
July	7/1/21	(See Note 2)			
	7/23/21	17.0	12.21	5.30	4.69
August	8/9/21	13.9	13.00	5.01	4.08
September	9/20/21	15.2	12.52	4.93	4.58
October	10/12/21	17.0	11.40	4.84	4.45
November	11/1/21	(See Note 3)			
	11/1/21	16.1	12.98	5.31	4.86
	11/16/21	12.4	9.80	4.35	4.76
December	12/1/21	12.0	11.10	4.50	4.81
	12/17/21	11.5	12.10	6.10	4.78

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/19/21	17.0	11.81	5.28	4.59
February	2/1/21	(See Note 1)			
	2/6/21	15.0	12.90	4.72	4.47
	2/25/21	15.0	12.14	5.36	4.88
March	3/16/21	15.0	13.02	5.93	4.86
April	4/3/21	15.0	9.91	5.09	5.99
	4/21/21	15.0	12.97	5.10	5.06
May	5/10/21	15.0	11.18	4.95	4.95
	5/30/21	15.1	12.01	5.00	4.47
June	6/17/21	15.0	10.69	5.22	4.72
July	7/1/21	(See Note 2)			
	7/8/21	17.0	12.90	5.02	4.30
	7/29/21	17.0	9.89	5.09	4.43
August	8/12/21	10.9	7.71	4.05	3.80
September	9/16/21	12.4	8.69	4.62	4.05
October	10/7/21	17.0	10.30	4.14	3.86
	10/28/21	16.5	12.68	4.71	4.89
November	11/1/21	(See Note 3)			
	11/13/21	12.6	11.60	5.68	4.40
	11/28/21	11.7	10.00	5.00	4.98
December	12/15/21	13.1	11.00	3.54	4.59

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.1	11.10	4.80	4.25
February	2/1/21	(See Note 1)			
	2/2/21	15.0	13.60	6.53	4.57
	2/21/21	15.0	14.03	5.09	4.67
March	3/11/21	15.0	12.35	4.95	4.58
	3/30/21	15.0	12.29	4.97	4.59
April	4/18/21	15.0	13.13	4.93	4.21
May	5/6/21	15.0	11.90	4.79	3.93
	5/26/21	15.0	11.76	4.62	4.36
June	6/13/21	15.0	10.15	4.40	4.01
July	7/1/21	(See Note 2)			
	7/4/21	16.8	11.80	4.59	3.92
	7/26/21	17.0	12.80	4.61	4.30
August	8/11/21	13.5	9.82	4.30	3.45
September	9/21/21	16.0	10.44	4.45	4.10
October	10/13/21	17.0	11.00	4.69	3.94
	10/31/21	14.5	12.70	5.39	4.32
November	11/1/21	(See Note 3)			
	11/17/21	11.9	11.30	5.10	4.91
December	12/5/21	14.0	13.28	5.62	4.53
	12/19/21	10.7	9.80	4.74	4.53

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D05

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/1/21	17.0	10.77	4.66	4.15
	1/21/21	14.6	13.60	4.98	4.56
February	2/1/21	(See Note 1)			
	2/9/21	15.0	12.70	5.44	4.58
	2/28/21	15.3	13.01	5.19	4.49
March	3/22/21	15.0	13.00	4.68	5.08
April	4/9/21	15.0	10.12	5.71	5.71
	4/28/21	15.0	12.01	5.22	4.51
May	5/17/21	15.0	11.40	5.66	4.36
June	6/7/21	15.0	10.20	5.16	4.18
	6/27/21	15.5	10.50	4.84	4.45
July	7/1/21	(See Note 2)			
	7/18/21	17.1	11.00	4.70	3.78
August	8/8/21	16.5	11.88	5.33	4.63
September	9/23/21	17.4	11.90	4.49	3.84
October	10/15/21	17.0	10.50	4.34	3.78
November	11/1/21	(See Note 3)			
	11/1/21	14.0	12.21	5.49	4.39
	11/20/21	15.1	12.60	5.22	4.76
December	12/10/21	15.0	12.40	5.99	4.98
	12/29/21	15.0	12.80	5.73	4.85

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D06

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/21/21	17.2	11.50	4.77	4.34
February	2/1/21	(See Note 1)			
	2/10/21	15.0	12.26	4.96	4.39
	2/25/21	12.2	9.46	4.35	4.70
March	3/17/21	15.0	12.10	4.64	3.94
April	4/5/21	15.0	11.25	5.33	5.11
	4/25/21	15.1	11.90	4.42	4.94
May	5/16/21	15.0	9.96	5.09	3.94
June	6/5/21	15.0	10.22	4.55	4.46
	6/24/21	15.0	9.02	3.96	4.03
July	7/1/21	(See Note 2)			
	7/15/21	17.0	11.30	4.29	3.69
August	8/5/21	17.0	10.67	4.40	3.64
	8/13/21	6.2	4.89	3.29	2.98
September	9/14/21	11.5	6.55	3.49	3.59
October	10/5/21	17.0	8.30	3.95	3.64
	10/27/21	17.0	12.80	4.42	3.85
November	11/1/21	(See Note 3)			
	11/14/21	15.0	12.70	4.53	3.84
December	12/3/21	15.0	11.90	5.39	4.42
	12/22/21	15.0	12.60	5.22	4.37

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D07

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/20/21	17.0	14.45	4.91	4.64
February	2/1/21	(See Note 1)			
	2/8/21	15.0	14.17	5.01	5.56
	2/27/21	15.0	12.80	5.46	4.80
March	3/18/21	15.0	12.50	5.26	5.40
April	4/6/21	15.1	13.42	5.03	4.61
	4/25/21	14.9	12.10	4.48	4.60
May	5/14/21	15.0	11.01	4.38	5.36
June	6/3/21	15.0	11.33	4.04	3.97
	6/21/21	15.0	10.10	4.62	4.22
July	7/1/21	(See Note 2)			
	7/13/21	17.0	12.20	4.84	3.96
August	8/3/21	16.9	12.42	4.70	3.79
	8/14/21	8.2	5.82	3.68	3.43
September	9/16/21	12.6	7.64	3.40	4.33
October	10/8/21	17.0	10.20	3.79	3.39
	10/31/21	17.0	12.60	4.10	3.55
November	11/1/21	(See Note 3)			
	11/18/21	15.0	12.20	4.77	4.27
December	12/7/21	15.0	14.00	5.87	4.41
	12/26/21	15.0	12.50	5.14	4.52

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit D08

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/10/21	17.0	12.64	5.44	4.57
	1/27/21	13.8	12.88	4.51	4.27
February	2/1/21	(See Note 1)			
	2/15/21	15.1	13.56	4.87	5.88
March	3/6/21	15.0	13.50	4.56	4.22
	3/24/21	15.0	12.40	4.72	4.55
April	4/12/21	15.0	12.75	5.10	5.43
	4/30/21	15.0	12.31	5.20	4.15
May	5/20/21	15.9	12.63	4.65	3.98
June	6/8/21	15.0	12.99	4.63	3.90
	6/26/21	15.0	12.20	4.39	3.60
July	7/1/21	(See Note 2)			
	7/17/21	17.0	10.00	4.30	3.64
August	8/8/21	17.0	12.23	4.95	4.00
	8/14/21	4.8	5.48	3.25	3.67
September	9/18/21	14.1	10.10	3.71	3.79
October	10/9/21	17.0	10.70	4.13	3.79
	10/29/21	16.2	13.00	4.46	3.72
November	11/1/21	(See Note 3)			
	11/15/21	13.7	12.68	5.12	4.76
December	12/1/21	12.9	11.50	3.51	4.36
	12/20/21	14.7	11.40	9.42	4.60

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E01

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/2/21	MW (See Note 1)			
	1/6/21	17.0	17.02	5.50	5.10
	1/19/21	MW (See Note 1)			
	1/24/21	MW (See Note 1)			
February	2/2/21	21.0	21.00	6.00	5.80
	2/11/21	MW (See Note 1)			
	2/19/21	MW (See Note 1)			
	2/28/21	21.0	21.04	5.40	5.80
March	3/9/21	MW (See Note 1)			
	3/18/21	MW (See Note 1)			
	3/27/21	21.1	21.10	5.50	5.98
April	4/4/21	MW (See Note 1)			
	4/13/21	MW (See Note 1)			
	4/22/21	21.2	21.20	5.90	5.31
May	5/1/21	MW (See Note 1)			
	5/10/21	MW (See Note 1)			
	5/20/21	21.6	21.58	5.50	5.70
	5/31/21	MW (See Note 1)			
June	6/10/21	MW (See Note 1)			
	6/17/21	21.1	21.08	5.40	5.63
	6/26/21	MW (See Note 1)			
July	7/5/21	MW (See Note 1)			
	7/14/21	21.0	21.04	5.96	4.94
	7/23/21	MW (See Note 1)			
August	8/1/21	MW (See Note 1)			
	8/9/21	21.0	20.96	5.27	5.11
September	9/11/21	MW (See Note 1)			
	9/20/21	MW (See Note 1)			
	9/29/21	21.0	21.00	5.75	5.54
October	10/7/21	MW (See Note 1)			
	10/16/21	MW (See Note 1)			
	10/25/21	21.0	21.00	6.04	5.50
November	11/3/21	MW (See Note 1)			
	11/12/21	MW (See Note 1)			
	11/20/21	21.0	20.99	6.91	5.88
	11/29/21	MW (See Note 1)			
December	12/8/21	MW (See Note 1)			
	12/17/21	20.8	20.83	7.10	6.26
	12/25/21	MW (See Note 1)			

1 Maintenance Wash using dilute caustic and no citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E02

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/14/21	17.1	12.30	5.72	4.69
	1/30/21	12.9	13.00	5.23	4.63
February	2/1/21	(See Note 1)			
	2/18/21	15.0	12.60	5.57	5.76
March	3/8/21	15.0	12.15	6.66	5.86
	3/27/21	15.2	12.33	4.96	5.20
April	4/15/21	15.0	13.00	5.40	4.75
May	5/4/21	15.0	12.86	5.92	5.26
	5/23/21	14.7	11.20	4.74	5.26
June	6/14/21	15.0	12.01	4.80	4.27
July	7/1/21	(See Note 2)			
	7/5/21	17.1	12.40	6.02	4.52
	7/27/21	17.2	10.20	5.16	4.36
August	8/13/21	13.4	9.74	4.69	4.15
September	9/15/21	12.4	7.97	3.99	4.72
October	10/7/21	17.9	12.20	4.32	4.13
	10/29/21	17.0	13.40	5.29	4.22
November	11/1/21	(See Note 3)			
	11/14/21	12.8	12.30	4.63	4.36
	11/28/21	10.9	11.29	4.99	4.64
December	12/15/21	12.4	11.70	4.35	4.73

1 Starting 2/1/2021, reduced targeted runtime intervals between CIPs from 17-days to 15-days due to wintertime fouling rates.

2 Starting 7/1/2021, increased targeted runtime intervals between CIPs from 15-days to 17-days.

3 Starting 11/1/2021, increased targeted runtime intervals between CIPs from 17-days to 15-days.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/1/21	MW (See Note 1)			
	1/4/21	MW (See Note 1)			
	1/7/21	23.0	12.3	4.51	3.60
	1/10/21	MW (See Note 1)			
	1/13/21	MW (See Note 1)			
	1/16/21	MW (See Note 1)			
	1/19/21	MW (See Note 1)			
	1/22/21	MW (See Note 1)			
	1/25/21	MW (See Note 1)			
	1/26/21	14.7	12.3	4.73	3.70
	1/26/21	MW (See Note 1)			
	1/29/21	MW (See Note 1)			
February	2/1/21	MW (See Note 1)			
	2/4/21	MW (See Note 1)			
	2/7/21	MW (See Note 1)			
	2/10/21	MW (See Note 1)			
	2/13/21	MW (See Note 1)			
	2/16/21	MW (See Note 1)			
	2/19/21	MW (See Note 1)			
	2/22/21	MW (See Note 1)			
	2/25/21	22.9	13.4	4.92	4.10
	2/28/21	MW (See Note 1)			
March	3/3/21	MW (See Note 1)			
	3/6/21	MW (See Note 1)			
	3/9/21	MW (See Note 1)			
	3/12/21	MW (See Note 1)			
	3/15/21	MW (See Note 1)			
	3/18/21	MW (See Note 1)			
	3/21/21	MW (See Note 1)			
	3/24/21	MW (See Note 1)			
	3/27/21	23.1	12.6	4.59	4.20
	3/30/21	MW (See Note 1)			
April	4/2/21	MW (See Note 1)			
	4/5/21	MW (See Note 1)			
	4/8/21	MW (See Note 1)			
	4/11/21	MW (See Note 1)			
	4/14/21	MW (See Note 1)			
	4/17/21	MW (See Note 1)			
	4/20/21	MW (See Note 1)			
	4/23/21	MW (See Note 1)			
	4/26/21	MW (See Note 1)			
	4/27/21	22.9	12.0	3.98	3.50
	4/30/21	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
May	5/3/21	MW (See Note 1)			
	5/6/21	MW (See Note 1)			
	5/9/21	MW (See Note 1)			
	5/12/21	MW (See Note 1)			
	5/15/21	MW (See Note 1)			
	5/18/21	MW (See Note 1)			
	5/21/21	MW (See Note 1)			
	5/24/21	MW (See Note 1)			
	5/29/21	23.3	11.7	5.70	3.40
June	6/1/21	MW (See Note 1)			
	6/4/21	MW (See Note 1)			
	6/7/21	MW (See Note 1)			
	6/10/21	MW (See Note 1)			
	6/13/21	MW (See Note 1)			
	6/16/21	MW (See Note 1)			
	6/19/21	MW (See Note 1)			
	6/22/21	MW (See Note 1)			
	6/25/21	MW (See Note 1)			
	6/29/21	22.2	10.0	4.40	3.80
July	7/3/21	MW (See Note 1)			
	7/6/21	MW (See Note 1)			
	7/10/21	MW (See Note 1)			
	7/12/21	MW (See Note 1)			
	7/15/21	MW (See Note 1)			
	7/18/21	MW (See Note 1)			
	7/21/21	MW (See Note 1)			
	7/24/21	MW (See Note 1)			
	7/27/21	MW (See Note 1)			
	7/30/21	22.8	8.5	3.36	3.00
August	8/2/21	MW (See Note 1)			
	8/5/21	MW (See Note 1)			
	8/8/21	MW (See Note 1)			
	8/11/21	MW (See Note 1)			
	8/13/21	11.1	5.8	3.00	2.52
September	9/6/21	MW (See Note 1)			
	9/9/21	MW (See Note 1)			
	9/12/21	MW (See Note 1)			
	9/15/21	MW (See Note 1)			
	9/18/21	MW (See Note 1)			
	9/21/21	MW (See Note 1)			
	9/24/21	MW (See Note 1)			
	9/27/21	MW (See Note 1)			
	9/30/21	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
October	10/3/21	23.7	7.7	3.45	2.97
	10/6/21	MW (See Note 1)			
	10/9/21	MW (See Note 1)			
	10/12/21	MW (See Note 1)			
	10/15/21	MW (See Note 1)			
	10/18/21	MW (See Note 1)			
	10/21/21	MW (See Note 1)			
	10/24/21	MW (See Note 1)			
	10/27/21	MW (See Note 1)			
	10/30/21	MW (See Note 1)			
November	11/2/21	22.8	12.4	5.76	4.50
	11/5/21	MW (See Note 1)			
	11/7/21	MW (See Note 1)			
	11/11/21	MW (See Note 1)			
	11/14/21	MW (See Note 1)			
	11/17/21	MW (See Note 1)			
	11/20/21	MW (See Note 1)			
	11/22/21	MW (See Note 1)			
	11/25/21	MW (See Note 1)			
	11/29/21	MW (See Note 1)			
December	12/2/21	22.7	12.7	6.65	4.20
	12/5/21	MW (See Note 1)			
	12/8/21	MW (See Note 1)			
	12/11/21	MW (See Note 1)			
	12/14/21	MW (See Note 1)			
	12/19/21	MW (See Note 1)			
	12/22/21	MW (See Note 1)			
	12/25/21	MW (See Note 1)			

[1] Maintenance Wash using sodium hypochlorite and citric.

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
January	1/1/21	MW (See Note 1)			
	1/4/21	MW (See Note 1)			
	1/7/21	22.3	12.20	3.93	3.50
	1/10/21	MW (See Note 1)			
	1/13/21	MW (See Note 1)			
	1/16/21	MW (See Note 1)			
	1/19/21	MW (See Note 1)			
	1/22/21	MW (See Note 1)			
	1/25/21	MW (See Note 1)			
	1/28/29	MW (See Note 1)			
	1/31/21	MW (See Note 1)			
	1/31/21	MW (See Note 1)			
February	2/2/21	MW (See Note 1)			
	2/6/21	21.6	14.60	3.02	2.60
	2/9/21	MW (See Note 1)			
	2/12/21	MW (See Note 1)			
	2/15/21	MW (See Note 1)			
	2/18/21	MW (See Note 1)			
	2/21/21	MW (See Note 1)			
	2/24/21	MW (See Note 1)			
	2/27/21	MW (See Note 1)			
March	3/2/21	MW (See Note 1)			
	3/5/21	MW (See Note 1)			
	3/8/21	22.9	13.50	4.05	3.00
	3/11/21	MW (See Note 1)			
	3/14/21	MW (See Note 1)			
	3/17/21	MW (See Note 1)			
	3/20/21	MW (See Note 1)			
	3/23/21	MW (See Note 1)			
	3/26/21	MW (See Note 1)			
	3/29/21	MW (See Note 1)			
April	4/1/21	MW (See Note 1)			
	4/4/21	MW (See Note 1)			
	4/7/21	22.1	10.00	3.42	3.00
	4/10/21	MW (See Note 1)			
	4/13/21	MW (See Note 1)			
	4/16/21	MW (See Note 1)			
	4/19/21	MW (See Note 1)			
	4/22/21	MW (See Note 1)			
	4/25/21	MW (See Note 1)			
	4/28/21	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
May	5/1/21	MW (See Note 1)			
	5/4/21	MW (See Note 1)			
	5/7/21	22.2	9.00	2.98	2.80
	5/10/21	MW (See Note 1)			
	5/13/21	MW (See Note 1)			
	5/16/21	MW (See Note 1)			
	5/19/21	MW (See Note 1)			
	5/22/21	MW (See Note 1)			
	5/28/21	MW (See Note 1)			
	5/31/21	MW (See Note 1)			
June	6/3/21	MW (See Note 1)			
	6/6/21	MW (See Note 1)			
	6/9/21	22.1	8.30	3.21	2.40
	6/12/21	MW (See Note 1)			
	6/15/21	MW (See Note 1)			
	6/20/21	MW (See Note 1)			
	6/23/21	MW (See Note 1)			
	6/26/21	MW (See Note 1)			
	6/29/21	MW (See Note 1)			
July	7/3/21	MW (See Note 1)			
	7/6/21	MW (See Note 1)			
	7/9/21	MW (See Note 1)			
	7/12/21	22.3	7.80	2.90	2.80
	7/15/21	MW (See Note 1)			
	7/18/21	MW (See Note 1)			
	7/21/21	MW (See Note 1)			
	7/24/21	MW (See Note 1)			
	7/27/21	MW (See Note 1)			
	7/30/21	MW (See Note 1)			
August	8/2/21	MW (See Note 1)			
	8/5/21	MW (See Note 1)			
	8/8/21	MW (See Note 1)			
	8/10/21	22.3	7.00	3.13	3.25
September	9/6/21	MW (See Note 1)			
	9/9/21	MW (See Note 1)			
	9/16/21	MW (See Note 1)			
	9/19/21	MW (See Note 1)			
	9/22/21	MW (See Note 1)			
	9/25/21	MW (See Note 1)			
	9/28/21	MW (See Note 1)			
October	10/1/21	MW (See Note 1)			
	10/4/21	MW (See Note 1)			
	10/7/21	23.1	8.40	2.96	3.12
	10/10/21	MW (See Note 1)			
	10/13/21	MW (See Note 1)			
	10/16/21	MW (See Note 1)			
	10/19/21	MW (See Note 1)			
	10/22/21	MW (See Note 1)			
	10/25/21	MW (See Note 1)			
	10/28/21	MW (See Note 1)			
	10/31/21	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E04

Month	Date of CIP	Runtime Between CIP (Days)	TMP Before CIP (psi)	TMP After Caustic CIP (psi)	TMP After Citric CIP (psi)
November	11/3/21	MW (See Note 1)			
	11/6/21	22.4	11.80	3.51	3.41
	11/9/21	MW (See Note 1)			
	11/12/21	MW (See Note 1)			
	11/15/21	MW (See Note 1)			
	11/18/21	MW (See Note 1)			
	11/21/21	MW (See Note 1)			
	11/24/21	MW (See Note 1)			
	11/27/21	MW (See Note 1)			
	11/30/21	MW (See Note 1)			
December	12/3/21	MW (See Note 1)			
	12/6/21	22.8	12.00	4.26	3.23
	12/9/21	MW (See Note 1)			
	12/12/21	MW (See Note 1)			
	12/15/21	MW (See Note 1)			
	12/18/21	MW (See Note 1)			
	12/21/21	MW (See Note 1)			
	12/24/21	MW (See Note 1)			
	12/27/21	MW (See Note 1)			
	12/30/21	MW (See Note 1)			

[1] Maintenance Wash using caustic, sodium hypochlorite and citric.

Reverse Osmosis Plant Cleaning Summary

Unit A01

Date of Cleaning	Treatment Performed
1/22-24/2021	Full unit CIP using 2% AWC C-227, followed by full unit acid wash (2% citric acid) One batch of 2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 132 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2-2.3 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
11/20-25/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 85.0 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1-2.2 pH and ambient temperature (77-78^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit A02

Date of Cleaning	Treatment Performed
3/12-14/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 85 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.0-2.1 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min followed by another 60 minute permeate flush after completing the acid washes (4" PCR open for entire flush period).
11/26-28/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 88.0 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1-2.2 pH and ambient temperature (74-75^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit A03

Date of Cleaning	Treatment Performed
2/22-3/11/2021	Full unit CIP using 2.2% AWC C-227, followed for full unit citric acid wash A03's scheduled full unit CIP was started on February 22 beginning with simultaneous CIPs on sub-stages 1A & 1B. One and a half hour before completing the 11-12 hour CIP a train A CIP pipe look break occurred at TO unit A02's 1st stage in CIP valve and RO A03's 1A/1B high pH CIP had to be ended due to the resulting loss of cleaning solution. RO A03 received its normal 60-minute post CIP flush and was then kept offline soaking in RO permeate flush water for the remainder of February while the train A CIP loop repair remained pending. The repairs were completed in March and RO A03's full unit CIP was completed March 10-11. One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B (Feb. 22), and a new batch of solution was used to complete 2nd and 3rd stages March 10). Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 78 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.4-2.5 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min followed by another 60 minute permeate flush after completing the acid washes (4" PCR open for entire flush period).
11/29-12/1/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 104.75 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acit wash using a 2.0% citric acid solution at 2.2 pH and ambient temperature (73^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallongs of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit B01

Date of Cleaning	Treatment Performed
5/14-16/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperature up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 79 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% cirri acid solution at 2.0-2.1 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).
12/4-6/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 101.0 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1-2.2 pH and ambient temperature (73°F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit B02

Date of Cleaning	Treatment Performed
1/1-12/31/2021	None

Reverse Osmosis Plant Cleaning Summary

Unit B03

Date of Cleaning	Treatment Performed
12/7-9/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 118.0 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1-2.2 pH and ambient temperature (70^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit C01

Date of Cleaning	Treatment Performed
5/11-13/2021	Full unit CIP using 2.2 AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring th solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 71 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush periods). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2-2.3 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit C02

Date of Cleaning	Treatment Performed
5/8-10/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 116 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2-2.3 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CBs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

<u>Unit C03</u>

Date of Cleaning	Treatment Performed
1/19-21/2021	<u>Full unit CIP using 2% AWC C-227, followed by full unit acid wash (2% citric acid)</u> One batch of 2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 104 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
4/25-5/7/2021	<u>Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash</u> One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 72 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0 % citric acid solution at 2.2 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 min permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush period).
12/10-12/2021	<u>Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash</u> One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 97.0 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0 % citric acid solution at 2.1-2.2 pH and ambient temperature (72^{o}F)). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 min permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush period).

Reverse Osmosis Plant Cleaning Summary

Unit D01

Date of Cleaning	Treatment Performed
5/3-5/2021	Full Unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with not heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 66 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3 pH and ambient temperatre (no heat). Each sub-stage received 1 hour of contact time using the sam acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not used CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

<u>Unit D02</u>

Date of Cleaning	Treatment Performed
7/13-15/2021	<u>Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash</u> One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 99 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit D03

Date of Cleaning	Treatment Performed
2/12-14/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit citric acid wash C-227 high pH cleaning solution concentrations were increased for the first time for RO D03's full unit CIP, from 2% to 2.2%. One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 107 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3-2.4 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min followed by another 60 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit E01

Date of Cleaning	Treatment Performed
4/19-21/2021	E01 Full unit CIP using 2.2% AWC C-227, followed by full unit citric acid wash First time C-227 high pH CIP contact times were increased from 11 - 12 hours to 13 - 14 hours. One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13 - 14 hours of membrane contact time. Both CIPs performed at pH 11.0 with 2nd and 3rd stages. Each CIP targeted 13 - 14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 91 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1-micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4"" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4"" PCR open for entire flush periods).
12/23-25/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 10.9 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 123 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.4 pH and ambient temperature (68-69oF). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit E02

Date of Cleaning	Treatment Performed
7/8-11/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total 67 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCF open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total 400 gallons of 50% citric acid was used. Did not use CBs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).
12/26-28/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact. Both CIPs performed at pH 10.8 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 116 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.4 pH and ambient temperature (68-69^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

<u>Unit E03</u>

Date of Cleaning	Treatment Performed
2/9-11/2021	<u>E03 Full unit CIP using AWC C-227, followed by full unit citric acid wash</u> One batch of 2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 126 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3-2.4 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 90 min followed by another 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
4/22-24/2021	<u>E03 Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash</u> One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and castic soda was added to bring the solution's pH up to 12.0. A total of 72 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1-micron CFs. Performed 60 mine permeate flushes after completing eah CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.3-2.4 pH and ambient temperature (no heat). Each sub-stage received 1 hour of contact times uing the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

12/29-31/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 10.9 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 172 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using 2.0% citric acid solution at 2.5 pH and ambient temperature (71oF). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit F01

Date of Cleaning	Treatment Performed
1/14-15/2021	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2% citric acid) F01's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 25.0 gallons of 50% caustic soda was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2% citric acid solution at 2.1 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 300 gallons of 50% citric acid was used for the 3rd stage acid wash. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
10/28-30/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 10.9 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 114 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1 pH and ambient temperature (73-74oF). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit F02

Date of Cleaning	Treatment Performed
6/21-22/2021	3rd state-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2% citric acid) FO2's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 30 gallons of 50% caustic soda was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4"PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2% citric acid solution at 2.1-2.2 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 300 gallons of 50% citric acid was used for the 3rd stage acid wash. Did not use CFs during the full unit acid wash. Performed a normal an initial full unit 45 min permeate flush after completing the acid washes, then drained the unit, then performed an additional 30 min full unit permeate flush (4" PCR open for both flush periods). The final "double flush" prevents combined ROP TOC spikes when RO units are started up after CIPs.
10/31-11/2/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 10.7-10.8 with no heat during the first hour. After one-hour the CIP tank heaters were started to bring the solution temperatures up to 35 C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 190.5 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2-2.3 pH and ambient temperature (75-76^{o}F). Each substage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45-minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit F03

Date of Cleaning	Treatment Performed
2/15-17/2021	3rd stage-only CIP using AWC C-227, followed by AWC's C-219 silicate remover & citric acid wash F03's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 26.0 gallons of 50% caustic soda was needed for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a special 3rd stage-only 2% AWC C-219 & 4.8% citric acid solution at 2.5 pH and ambient temperature (no heat) for 6-hours of contact time. A total of 700 gallons of 50% citric acid was used for the 3rd stage C-219 acid wash. Did not use CFs during the full unit acid wash. Performed an extended full unit 90 min followed by another 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period). After this CIP was completed two 3rd stage tail-end / #7 membranes were removed and sent to AWC for autopsy and cleaning trials. Both Dow XFLRE membranes were replaced with new ones of the same type from the OCWD's inventory of spare new membranes.
11/3-5/2021	Full unit CIP using 2.2% Avista P-111, followed by full unit 2% citric acid wash One batch of 2.2% Avista P-111 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 10.7-10.8 with no heat during the first hour. After one-hour the CIP tank heaters were started to bring the solution temperatures up to 35 C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 99 gallons of 50% caustic soda was used during the full unit CIP. All Avista P-111 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1 pH and ambient temperature (76^{o}F). Each substage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45-minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit G01

Date of Cleaning	Treatment Performed
1/16-17/2021	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2% citric acid) G01's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 25.0 gallons of 50% caustic soda was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2% citric acid solution at 2.1 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 300 gallons of 50% citric acid was used for the 3rd stage acid wash. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
10/18-20/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/5F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 54 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period. Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.1-2.2 pH and ambient temperature (75^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit G02

Date of Cleaning	Treatment Performed
6/22-23/2021	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2% citric acid) G02's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 20.0 gallons of 50% caustic soda was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2% citric acid solution at 2.1-2.2 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 300 gallons of 50% citric acid was used for the 3rd stage acid wash. Did not use CFs during the full unit acid wash. Performed a normal an initial full unit 45 min permeate flush after completing the acid washes, then drained the unit, then performed an additional 30 min full unit permeate flush (4" PCR open for both flush period). The final "double flush" prevents combined ROP TOC spikes when RO units are started up after CIPs.
10/21-23/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 101.3 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 min full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using 2.0% citric acid solution at 2.6-2.7 pH and ambient temperature (72^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 978 gallons of 50% citric acid was used due to incomplete 2nd/3rd stage post high CIP permeate flush (op error). Did not use CFs during the full unit acid wash. Performed a normal full unit 60 min permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

Reverse Osmosis Plant Cleaning Summary

Unit G03

Date of Cleaning	Treatment Performed
2/16-18/2021	3rd stage-only CIP using 2% AWC C-227, followed by AWC's C-219 silicate remover & citric acid wash G03's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 21.0 gallons of 50% caustic soda were added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a special 3rd stage-only 2% AWC C-219 & 2.8% citric acid solution at 2.5 pH and ambient temperature (no heat) for 6-hours of contact. A total of 400 gallons of 50% citric acid was used for the 3rd stage C-219 acid wash. Did not use CFs during the full unit acid wash. Performed an extended full unit 90 min followed by another 60 minute permeate flush after completing the acid washes (4" PCR open for entire flush period). After this CIP was completed two 3rd stage tail-end #7 membranes were removed and sent to AWC for autopsy and cleaning trials. Both Dow XFLRE membranes were replaced with new ones of the same type from the OCWD's inventory of spare new membranes.
10/24-26/2021	Full unit CIP using 2.2% AWC C-227, followed by full unit 2% citric acid wash One batch of 2.2% AWC C-227 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stages. Each CIP targeted 13-14 hours of membrane contact time. Both CIPs performed at pH 11.0 with no heat during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F, and caustic soda was added to bring the solution's pH up to 12.0. A total of 152.25 gallons of 50% caustic soda was used during the full unit CIP. All AWC C-227 high pH recirculation flows through 1 micron CFs. Performed 60 minute full unit permeate flushes after completing each CIP (4" PCR open for entire flush period). Followed high pH CIPs with a full unit acid wash using a 2.0% citric acid solution at 2.2 pH and ambient temperature (74-75^{o}F). Each sub-stage received 1 hour of contact time using the same acid solution for each. A total of 400 gallons of 50% citric acid was used. Did not use CFs during the full unit acid wash. Performed a normal full unit 60 minute permeate flush followed by another 45 minute permeate flush after completing the acid washes (4" PCR open for entire flush periods).

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7343	3 Mo. Rosemount Chlorine Analyzer Maintenance 450-AE-2164	Element Analyzer Total Chlorine - RO Feed	450-CPF-0001	25-Jan-22	3	MONTHS	21-Apr-22
7344	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0312	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	13-Jan-22	3	MONTHS	14-Apr-22
7345	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0314	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	13-Jan-22	3	MONTHS	14-Apr-22
7346	3 Mo. Rosemount Chlorine Analyzer Maintenance 710-AE-3425	Element Analyzer Chlorine - Finished Product Water to PWPS	710-CPF-0009	27-Jan-22	3	MONTHS	28-Apr-22
9284	540-SWGR-125VDC Inspect Batteries & Monitor	540 RO Electric 12KV Switchgear 125 VDC Battery Syst	540-SWG12000	04-Jun-21	1	YEARS	04-Jun-22
9283	815-SWGR-125VDC Inspect Batteries & Monitor	815 12KV Switchgear 125 VDC Battery System	815-SWG-8001B	04-Jun-21	1	YEARS	03-Jun-22
3055	AVFM Enclosure PM 100-FIT-5020-East MF CIP Tank E01	Transmitter Flow Indicating - East MF CIP Tank E01	100-PIP-SW	16-Sep-21	6	MONTHS	14-Mar-22
3056	AVFM Enclosure PM on 100-FIT-5500-160 Bldg South Wall	Transmitter Flow Indicating - south side of 160 building	100-PIP-SD-SITE-MAIN	16-Sep-21	6	MONTHS	16-Mar-22
3053	AVFM Enclosure PM on 100-FIT-5530-910 Bldg. North Wall	Transmitter Flow Indicating - north side 910 building	100-PIP-SD-SITE-MAIN	16-Sep-21	6	MONTHS	15-Mar-22
3253	Ammonia Sensor Replacement 1 YR 450-AE-2185	Element Analyzer Ammonia	450-CPF-0001	25-Jun-21	9	MONTHS	01-Apr-22
3204	Area 450 Ammonia Analyzer Weekly	Transmitter Analyzer Indicating Ammonia	450-CPF-0001	08-Feb-22	1	WEEKS	15-Feb-22
2290	Block, Bleed and Check Zero - A01-DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	11-Jan-22	6	MONTHS	07-Jul-22
2291	Block, Bleed and Check Zero -A02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	03-Aug-21	1	YEARS	07-Jul-22
2292	Block, Bleed and Check Zero -A03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	03-Aug-21	1	YEARS	07-Jul-22
2293	Block, Bleed and Check Zero -A04- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	03-Aug-21	1	YEARS	07-Jul-22
2294	Block, Bleed and Check Zero -A05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	28-Jul-21	1	YEARS	21-Jul-22
2295	Block, Bleed and Check Zero -A06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	28-Jul-21	1	YEARS	21-Jul-22
2296	Block, Bleed and Check Zero -A07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	28-Jul-21	1	YEARS	21-Jul-22
2297	Block, Bleed and Check Zero -A08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	28-Jul-21	1	YEARS	21-Jul-22
2298	Block, Bleed and Check Zero -B01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	09-Aug-21	1	YEARS	03-Aug-22
2299	Block, Bleed and Check Zero -B02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	09-Aug-21	1	YEARS	03-Aug-22
2300	Block, Bleed and Check Zero -B03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	09-Aug-21	1	YEARS	03-Aug-22
2301	Block, Bleed and Check Zero -B04- DPIT-0405 Every 6 MO	Valve Ball 1/2"	216-PIP-PA-MEMDE	09-Aug-21	1	YEARS	03-Aug-22
2302	Block, Bleed and Check Zero -B05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	18-Aug-21	1	YEARS	17-Aug-22
2303	Block, Bleed and Check Zero -B06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	18-Aug-21	1	YEARS	17-Aug-22
2304	Block, Bleed and Check Zero -B07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	18-Aug-21	1	YEARS	17-Aug-22
2305	Block, Bleed and Check Zero -B08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	18-Aug-21	1	YEARS	17-Aug-22
2306	Block, Bleed and Check Zero -D01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	26-Aug-21	1	YEARS	03-Aug-22
2307	Block, Bleed and Check Zero -D02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	26-Aug-21	1	YEARS	03-Aug-22
2308	Block, Bleed and Check Zero -D03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	26-Aug-21	1	YEARS	03-Aug-22
2309	Block, Bleed and Check Zero -D04- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	26-Aug-21	1	YEARS	03-Aug-22
2310	Block, Bleed and Check Zero -D05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	18-Aug-21	1	YEARS	17-Aug-22
2311	Block, Bleed and Check Zero -D06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	24-Aug-21	1	YEARS	17-Aug-22
2312	Block, Bleed and Check Zero -D07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	24-Aug-21	1	YEARS	17-Aug-22
2313	Block, Bleed and Check Zero -D08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	24-Aug-21	1	YEARS	17-Aug-22
2314	Block, Bleed and Check Zero -E01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	24-Aug-21	1	YEARS	17-Aug-22
2315	Block, Bleed and Check Zero -E02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	24-Aug-21	1	YEARS	17-Aug-22
3507	Block, Bleed, and Check Zero - C01-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	02-Sep-21	1	YEARS	01-Sep-22
3508	Block, Bleed, and Check Zero - C02-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	02-Sep-21	1	YEARS	01-Sep-22
3510	Block, Bleed, and Check Zero - C04-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	02-Sep-21	1	YEARS	01-Sep-22
3511	Block, Bleed, and Check Zero - C05-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	01-Sep-21	1	YEARS	01-Sep-22
3512	Block, Bleed, and Check Zero - C06-PDIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	01-Sep-21	1	YEARS	01-Sep-22
3509	Block, Bleed, and Check Zero C03-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	02-Sep-21	1	YEARS	01-Sep-22
3513	Block, Bleed, and Check Zero C07-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	01-Sep-21	1	YEARS	01-Sep-22
3514	Block, Bleed, and Check Zero C08-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	01-Sep-21	1	YEARS	01-Sep-22
2866	Calibration of O2 Analyzer 750- AE-4040	Element Analyzer Oxygen - North Building	750-CPF-0030	20-Aug-21	6	MONTHS	22-Feb-22
2867	Calibration of O2 Analyzer 750- AE-4045	Element Analyzer Oxygen - South Building	750-CPF-0030	20-Aug-21	6	MONTHS	22-Feb-22
2868	Calibration of O2 Analyzer 750- AE-4050	Element Analyzer Oxygen - North Trench	750-CPF-0030	24-Aug-21	6	MONTHS	22-Feb-22
2869	Calibration of O2 Analyzer 750- AE-4055	Element Analyzer Oxygen - South Trench	750-CPF-0030	24-Aug-21	6	MONTHS	22-Feb-22
3519	Check Calibration of TIT-0420 MF Filtrate Train C Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMC5	24-Aug-21	6	MONTHS	10-Aug-22
3561	Check Calibration of BFV-0460 MF Filtrate Train C Cell 2	Actuator	210-PIP-MFE-MEMC2	14-Jun-21	1	YEARS	01-Jun-22
3562	Check Calibration of BFV-0460 MF Filtrate Train C Cell 3	Actuator	210-PIP-MFE-MEMC3	14-Jun-21	1	YEARS	01-Jun-22
3563	Check Calibration of BFV-0460 MF Filtrate Train C Cell 4	Actuator	210-PIP-MFE-MEMC4	14-Jun-21	1	YEARS	01-Jun-22
3564	Check Calibration of BFV-0460 MF Filtrate Train C Cell 5	Actuator	210-PIP-MFE-MEMC5	14-Jun-21	1	YEARS	01-Jun-22
3565	Check Calibration of BFV-0460 MF Filtrate Train C Cell 6	Actuator	210-PIP-MFE-MEMC6	14-Jun-21	1	YEARS	01-Jun-22
3566	Check Calibration of BFV-0460 MF Filtrate Train C Cell 7	Valve Butterfly 12"	210-PIP-MFE-MEMC7	14-Jun-21	1	YEARS	01-Jun-22
3567	Check Calibration of BFV-0460 MF Filtrate Train C Cell 8	Valve Butterfly 12"	210-PIP-MFE-MEMC8	14-Jun-21	1	YEARS	01-Jun-22
3560	Check Calibration of BFV-0460 MF Filtrate Train C Cell1	Actuator	210-PIP-MFE-MEMC1	15-Jun-21	1	YEARS	01-Jun-22
3642	Check Calibration of BFV-0460 MF Filtrate Train E Cell 3	Actuator	210-PIP-MFE-MEME3	01-Jul-21	1	YEARS	04-Jul-22
3643	Check Calibration of BFV-0460 MF Filtrate Train E Cell 4	Actuator	210-PIP-MFE-MEME4	01-Jul-21	1	YEARS	04-Jul-22
7560	Check Calibration of BFV-0460, MF Filtrate Train A Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA1	14-Oct-21	1	YEARS	17-Oct-22

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7561	Check Calibration of BFV-0460, MF Filtrate Train A Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA2	14-Oct-21	1	YEARS	17-Oct-22
7562	Check Calibration of BFV-0460, MF Filtrate Train A Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA3	14-Oct-21	1	YEARS	17-Oct-22
7563	Check Calibration of BFV-0460, MF Filtrate Train A Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA4	14-Oct-21	1	YEARS	17-Oct-22
7564	Check Calibration of BFV-0460, MF Filtrate Train A Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA5	21-Oct-21	1	YEARS	23-Oct-22
7565	Check Calibration of BFV-0460, MF Filtrate Train A Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA6	21-Oct-21	1	YEARS	23-Oct-22
7566	Check Calibration of BFV-0460, MF Filtrate Train A Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA7	21-Oct-21	1	YEARS	23-Oct-22
7567	Check Calibration of BFV-0460, MF Filtrate Train A Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA8	21-Oct-21	1	YEARS	23-Oct-22
7568	Check Calibration of BFV-0460, MF Filtrate Train B Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB1	15-Nov-21	1	YEARS	03-Nov-22
7569	Check Calibration of BFV-0460, MF Filtrate Train B Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB2	15-Nov-21	1	YEARS	03-Nov-22
7570	Check Calibration of BFV-0460, MF Filtrate Train B Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB3	15-Nov-21	1	YEARS	03-Nov-22
7571	Check Calibration of BFV-0460, MF Filtrate Train B Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB4	15-Nov-21	1	YEARS	03-Nov-22
7572	Check Calibration of BFV-0460, MF Filtrate Train B Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB5	24-Nov-21	1	YEARS	19-Nov-22
7573	Check Calibration of BFV-0460, MF Filtrate Train B Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB6	30-Nov-21	1	YEARS	19-Nov-22
7574	Check Calibration of BFV-0460, MF Filtrate Train B Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB7	30-Nov-21	1	YEARS	19-Nov-22
7575	Check Calibration of BFV-0460, MF Filtrate Train B Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB8	30-Nov-21	1	YEARS	19-Nov-22
7576	Check Calibration of BFV-0460, MF Filtrate Train D Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD1	01-Dec-21	1	YEARS	26-Nov-22
7577	Check Calibration of BFV-0460, MF Filtrate Train D Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD2	01-Dec-21	1	YEARS	26-Nov-22
7578	Check Calibration of BFV-0460, MF Filtrate Train D Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD3	01-Dec-21	1	YEARS	26-Nov-22
7579	Check Calibration of BFV-0460, MF Filtrate Train D Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD4	01-Dec-21	1	YEARS	26-Nov-22
7580	Check Calibration of BFV-0460, MF Filtrate Train D Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD5	17-Dec-21	1	YEARS	09-Dec-22
7581	Check Calibration of BFV-0460, MF Filtrate Train D Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD6	17-Dec-21	1	YEARS	09-Dec-22
7582	Check Calibration of BFV-0460, MF Filtrate Train D Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD7	17-Dec-21	1	YEARS	09-Dec-22
7583	Check Calibration of BFV-0460, MF Filtrate Train D Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD8	17-Dec-21	1	YEARS	09-Dec-22
7584	Check Calibration of BFV-0460, MF Filtrate Train E Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME1	20-Dec-21	1	YEARS	17-Dec-22
7585	Check Calibration of BFV-0460, MF Filtrate Train E Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME2	20-Dec-21	1	YEARS	17-Dec-22
3537	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 1 MFE	Transmitter Level Indicating	210-C01-TNK-0340	12-Mar-21	1	YEARS	14-Mar-22
3538	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 2 MFE	Transmitter Level Indicating	210-C02-TNK-0340	12-Mar-21	1	YEARS	14-Mar-22
3539	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 3 MFE	Transmitter Level Indicating	210-C03-TNK-0340	12-Mar-21	1	YEARS	14-Mar-22
3540	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 4 MFE	Transmitter Level Indicating	210-C04-TNK-0340	12-Mar-21	1	YEARS	14-Mar-22
3541	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 5 MFE	Transmitter Level Indicating	210-C05-TNK-0340	31-Mar-21	1	YEARS	14-Mar-22
3544	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 8 MFE	Transmitter Level Indicating	210-C08-TNK-0340	31-Mar-21	1	YEARS	14-Mar-22
3542	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell6 MFE	Transmitter Level Indicating	210-C06-TNK-0340	31-Mar-21	1	YEARS	14-Mar-22
3648	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 3	Transmitter Level Indicating	210-E03-TNK-0340	29-Jun-21	1	YEARS	06-Jun-22
3649	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 4	Transmitter Level Indicating	210-E04-TNK-0340	29-Jun-21	1	YEARS	06-Jun-22
3543	Check Calibration of Cell Level transmitter LIT-0345 Train C Cell 7 MFE	Transmitter Level Indicating	210-C07-TNK-0340	31-Mar-21	1	YEARS	14-Mar-22
3569	Check Calibration of DPIT-0405 Train C Cell 1	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	04-May-21	1	YEARS	02-May-22
3570	Check Calibration of DPIT-0405 Train C Cell 2	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	04-May-21	1	YEARS	02-May-22
3571	Check Calibration of DPIT-0405 Train C Cell 3	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	04-May-21	1	YEARS	02-May-22
3572	Check Calibration of DPIT-0405 Train C Cell 4	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	04-May-21	1	YEARS	02-May-22
3573	Check Calibration of DPIT-0405 Train C Cell 5	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	29-Apr-21	1	YEARS	02-May-22
3574	Check Calibration of DPIT-0405 Train C Cell 6	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	29-Apr-21	1	YEARS	02-May-22
3575	Check Calibration of DPIT-0405 Train C Cell 7	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	29-Apr-21	1	YEARS	02-May-22
3576	Check Calibration of DPIT-0405 Train C Cell 8	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	29-Apr-21	1	YEARS	02-May-22
3652	Check Calibration of DPIT-0405 Train E Cell 3	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME3	29-Jun-21	1	YEARS	01-Jun-22
3653	Check Calibration of DPIT-0405 Train E Cell 4	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME4	17-Jun-21	1	YEARS	01-Jun-22
7713	Check Calibration of LIT-1207, MF CIP Tank A01	Transmitter Level Indicating 0 - 12 FT	220-A01-TNK-1200	09-Jul-21	1	YEARS	09-Jul-22
7714	Check Calibration of LIT-1207, MF CIP Tank B01	Transmitter Level Indicating 0 - 12 FT	220-B01-TNK-1200	09-Jul-21	1	YEARS	09-Jul-22
7715	Check Calibration of LIT-1207, MF CIP Tank D01	Transmitter Level Indicating 0 - 12 FT	220-D01-TNK-1200	09-Jul-21	1	YEARS	09-Jul-22
7716	Check Calibration of LIT-1207, MF CIP Tank E01	Transmitter Level Indicating 0 - 12 FT	220-E01-TNK-1200	09-Jul-21	1	YEARS	09-Jul-22
3568	Check Calibration of PIT-0454 MF Effluent Train C Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	24-Aug-21	2	YEARS	05-Aug-23
3644	Check Calibration of PIT-0454 MF Effluent Train E Cell 3	Transmitter Pressure Indication	210-PIP-MFE-MEME3	29-Jun-21	2	YEARS	05-Jun-23
3645	Check Calibration of PIT-0454 MF Effluent Train E Cell 4	Transmitter Pressure Indication	210-PIP-MFE-MEME4	29-Jun-21	2	YEARS	05-Jun-23
7515	Check Calibration of PIT-0454, MF Effluent Train A Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMA1	10-Nov-21	2	YEARS	04-Nov-23
7516	Check Calibration of PIT-0454, MF Effluent Train A Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMA2	10-Nov-21	2	YEARS	04-Nov-23
7517	Check Calibration of PIT-0454, MF Effluent Train A Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMA3	10-Nov-21	2	YEARS	04-Nov-23
7518	Check Calibration of PIT-0454, MF Effluent Train A Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMA4	10-Nov-21	2	YEARS	04-Nov-23
7519	Check Calibration of PIT-0454, MF Effluent Train A Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMA5	12-Nov-21	2	YEARS	11-Nov-23
7520	Check Calibration of PIT-0454, MF Effluent Train A Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMA6	12-Nov-21	2	YEARS	11-Nov-23
7521	Check Calibration of PIT-0454, MF Effluent Train A Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMA7	12-Nov-21	2	YEARS	11-Nov-23
7522	Check Calibration of PIT-0454, MF Effluent Train A Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMA8	12-Nov-21	2	YEARS	11-Nov-23
7523	Check Calibration of PIT-0454, MF Effluent Train B Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMB1	18-Nov-21	2	YEARS	18-Nov-23

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7524	Check Calibration of PIT-0454, MF Effluent Train B Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMB2	18-Nov-21	2	YEARS	18-Nov-23
7525	Check Calibration of PIT-0454, MF Effluent Train B Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMB3	18-Nov-21	2	YEARS	18-Nov-23
7526	Check Calibration of PIT-0454, MF Effluent Train B Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMB4	18-Nov-21	2	YEARS	18-Nov-23
7527	Check Calibration of PIT-0454, MF Effluent Train B Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMB5	30-Nov-21	2	YEARS	25-Nov-23
7528	Check Calibration of PIT-0454, MF Effluent Train B Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMB6	30-Nov-21	2	YEARS	25-Nov-23
7529	Check Calibration of PIT-0454, MF Effluent Train B Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMB7	30-Nov-21	2	YEARS	25-Nov-23
7538	Check Calibration of PIT-0454, MF Effluent Train B Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMB8	30-Nov-21	2	YEARS	25-Nov-23
3552	Check Calibration of PIT-0454, MF Effluent Train C Cell 1	Transmitter Pressure Indication	210-PIP-MFE-MEMC1	30-Jul-21	2	YEARS	01-Aug-23
3553	Check Calibration of PIT-0454, MF Effluent Train C Cell 2	Transmitter Pressure Indication	210-PIP-MFE-MEMC2	30-Jul-21	2	YEARS	01-Aug-23
3555	Check Calibration of PIT-0454, MF Effluent Train C Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMC4	30-Jul-21	2	YEARS	01-Aug-23
3556	Check Calibration of PIT-0454, MF Effluent Train C Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMC5	30-Jul-21	2	YEARS	01-Aug-23
3557	Check Calibration of PIT-0454, MF Effluent Train C Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMC6	30-Jul-21	2	YEARS	01-Aug-23
3558	Check Calibration of PIT-0454, MF Effluent Train C Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMC7	29-Jul-21	2	YEARS	01-Aug-23
3559	Check Calibration of PIT-0454, MF Effluent Train C Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMC8	29-Jul-21	2	YEARS	01-Aug-23
7530	Check Calibration of PIT-0454, MF Effluent Train D Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMD1	30-Nov-21	2	YEARS	02-Dec-23
7531	Check Calibration of PIT-0454, MF Effluent Train D Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMD2	30-Nov-21	2	YEARS	02-Dec-23
7532	Check Calibration of PIT-0454, MF Effluent Train D Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMD3	30-Nov-21	2	YEARS	02-Dec-23
7533	Check Calibration of PIT-0454, MF Effluent Train D Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMD4	30-Nov-21	2	YEARS	02-Dec-23
7534	Check Calibration of PIT-0454, MF Effluent Train D Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMD5	15-Dec-21	2	YEARS	09-Dec-23
7535	Check Calibration of PIT-0454, MF Effluent Train D Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMD6	15-Dec-21	2	YEARS	09-Dec-23
7536	Check Calibration of PIT-0454, MF Effluent Train D Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMD7	15-Dec-21	2	YEARS	09-Dec-23
7537	Check Calibration of PIT-0454, MF Effluent Train D Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMD8	15-Dec-21	2	YEARS	09-Dec-23
7539	Check Calibration of PIT-0454, MF Effluent Train E Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEME1	20-Dec-21	2	YEARS	16-Dec-23
7540	Check Calibration of PIT-0454, MF Effluent Train E Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEME2	20-Dec-21	2	YEARS	16-Dec-23
7550	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	01-Dec-21	2	YEARS	27-Nov-23
7551	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	01-Dec-21	2	YEARS	27-Nov-23
7552	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	01-Dec-21	2	YEARS	27-Nov-23
7553	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	01-Dec-21	2	YEARS	27-Nov-23
7554	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	09-Dec-21	2	YEARS	27-Nov-23
7556	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	09-Dec-21	2	YEARS	27-Nov-23
7557	Check Calibration of PIT-0471, MF Filtrate Header Train E Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEME	09-Dec-21	2	YEARS	27-Nov-23
7712	Check Calibration of PIT-0750, MF backwash - Do during plant shutdown	Transmitter Pressure Indicating 0 - 60 psi	255-PIP-BW	09-Dec-21	1	YEARS	24-Nov-22
3515	Check Calibration of TIT-0420 MF Filtrate Train C Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMC1	10-Aug-21	6	MONTHS	10-Aug-22
3516	Check Calibration of TIT-0420 MF Filtrate Train C Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMC2	10-Aug-21	6	MONTHS	10-Aug-22
3517	Check Calibration of TIT-0420 MF Filtrate Train C Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMC3	10-Aug-21	6	MONTHS	10-Aug-22
3518	Check Calibration of TIT-0420 MF Filtrate Train C Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMC4	10-Aug-21	6	MONTHS	10-Aug-22
3520	Check Calibration of TIT-0420 MF Filtrate Train C Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMC6	24-Aug-21	6	MONTHS	10-Aug-22
3521	Check Calibration of TIT-0420 MF Filtrate Train C Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMC7	24-Aug-21	6	MONTHS	10-Aug-22
3522	Check Calibration of TIT-0420 MF Filtrate Train C Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMC8	24-Aug-21	6	MONTHS	10-Aug-22
3640	Check Calibration of TIT-0420 MF Filtrate Train E Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEME3	30-Nov-21	6	MONTHS	23-May-22
3641	Check Calibration of TIT-0420 MF Flitrate Train E Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEME4	30-Nov-21	6	MONTHS	23-May-22
7595	Check Calibration of TIT-0420, MF Filtrate Train A Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMA1	13-Jan-22	6	MONTHS	07-Jul-22
7596	Check Calibration of TIT-0420, MF Filtrate Train A Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMA2	08-Sep-21	6	MONTHS	09-Mar-22
7597	Check Calibration of TIT-0420, MF Filtrate Train A Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMA3	08-Sep-21	6	MONTHS	09-Mar-22
7598	Check Calibration of TIT-0420, MF Filtrate Train A Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMA4	08-Sep-21	6	MONTHS	09-Mar-22
7599	Check Calibration of TIT-0420, MF Filtrate Train A Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMA5	23-Sep-21	6	MONTHS	16-Mar-22
7600	Check Calibration of TIT-0420, MF Filtrate Train A Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMA6	23-Sep-21	6	MONTHS	16-Mar-22
7601	Check Calibration of TIT-0420, MF Filtrate Train A Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMA7	23-Sep-21	6	MONTHS	16-Mar-22
7602	Check Calibration of TIT-0420, MF Filtrate Train A Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMA8	23-Sep-21	6	MONTHS	16-Mar-22
7603	Check Calibration of TIT-0420, MF Filtrate Train B Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMB1	24-Sep-21	6	MONTHS	23-Mar-22
7604	Check Calibration of TIT-0420, MF Filtrate Train B Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMB2	24-Sep-21	6	MONTHS	23-Mar-22
7605	Check Calibration of TIT-0420, MF Filtrate Train B Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMB3	24-Sep-21	6	MONTHS	23-Mar-22
7606	Check Calibration of TIT-0420, MF Filtrate Train B Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMB4	24-Sep-21	6	MONTHS	23-Mar-22
7607	Check Calibration of TIT-0420, MF Filtrate Train B Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMB5	29-Sep-21	6	MONTHS	30-Mar-22
7608	Check Calibration of TIT-0420, MF Filtrate Train B Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMB6	29-Sep-21	6	MONTHS	30-Mar-22
7609	Check Calibration of TIT-0420, MF Filtrate Train B Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMB7	29-Sep-21	6	MONTHS	30-Mar-22
7610	Check Calibration of TIT-0420, MF Filtrate Train B Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMB8	13-Jan-22	6	MONTHS	07-Jul-22
7611	Check Calibration of TIT-0420, MF Filtrate Train D Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMD1	14-Oct-21	6	MONTHS	07-Apr-22
7612	Check Calibration of TIT-0420, MF Filtrate Train D Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMD2	14-Oct-21	6	MONTHS	07-Apr-22
7613	Check Calibration of TIT-0420, MF Filtrate Train D Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMD3	14-Oct-21	6	MONTHS	07-Apr-22
7614	Check Calibration of TIT-0420, MF Filtrate Train D Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMD4	14-Oct-21	6	MONTHS	07-Apr-22

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7615	Check Calibration of TIT-0420, MF Filtrate Train D Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMD5	21-Oct-21	6	MONTHS	14-Apr-22
7616	Check Calibration of TIT-0420, MF Filtrate Train D Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMD6	21-Oct-21	6	MONTHS	14-Apr-22
7617	Check Calibration of TIT-0420, MF Filtrate Train D Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMD7	21-Oct-21	6	MONTHS	14-Apr-22
7618	Check Calibration of TIT-0420, MF Filtrate Train D Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMD8	21-Oct-21	6	MONTHS	14-Apr-22
7619	Check Calibration of TIT-0420, MF Filtrate Train E Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEME1	26-Oct-21	6	MONTHS	21-Apr-22
7620	Check Calibration of TIT-0420, MF Filtrate Train E Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEME2	26-Oct-21	6	MONTHS	21-Apr-22
7510	Check Calibration of Train Feed Valve A02-BFV-0320 MFE	Valve Butterfly 60"	210-PIP-MFF-MEM	18-Aug-21	12	MONTHS	11-Jun-22
7511	Check Calibration of Train Feed Valve B02-BFV-0320 MFE	Valve Butterfly 60"	210-PIP-MFF-MEM	18-Aug-21	12	MONTHS	11-Jun-22
3577	Check Calibration of Train Feed Valve C02-BFV-0320	Actuator	210-PIP-MFF-MEM	18-Aug-21	1	YEARS	01-Jun-22
7512	Check Calibration of Train Feed Valve D02-BFV-0320 MFW	Valve Butterfly 60"	210-PIP-MFF-MEM	18-Aug-21	12	MONTHS	11-Jun-22
7513	Check Calibration of Train Feed Valve E01-E02-BFV-0320 MFW	Valve Butterfly 36"	210-PIP-MFF-MEM	18-Aug-21	12	MONTHS	11-Jun-22
7470	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 1 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA1	15-Mar-21	12	MONTHS	09-Mar-22
7471	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 2 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA2	15-Mar-21	12	MONTHS	09-Mar-22
7472	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 3 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA3	15-Mar-21	12	MONTHS	09-Mar-22
7473	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 4 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA4	15-Mar-21	12	MONTHS	09-Mar-22
7474	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 5 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA5	07-Apr-21	12	MONTHS	16-Mar-22
7475	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 6 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA6	07-Apr-21	12	MONTHS	16-Mar-22
7476	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 7 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA7	07-Apr-21	12	MONTHS	16-Mar-22
7477	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 8 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA8	07-Apr-21	12	MONTHS	16-Mar-22
7478	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 1 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB1	25-Mar-21	12	MONTHS	23-Mar-22
7479	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 2 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB2	25-Mar-21	12	MONTHS	23-Mar-22
7480	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 3 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB3	25-Mar-21	12	MONTHS	23-Mar-22
7481	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 4 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB4	25-Mar-21	12	MONTHS	23-Mar-22
7482	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 5 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB5	21-Apr-21	12	MONTHS	30-Mar-22
7483	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 6 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB6	21-Apr-21	12	MONTHS	30-Mar-22
7484	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 7 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB7	21-Apr-21	12	MONTHS	30-Mar-22
7485	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 8 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB8	21-Apr-21	12	MONTHS	30-Mar-22
3579	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 1	Actuator	210-PIP-MFF-MEMC1	21-Jul-21	1	YEARS	01-Jul-22
3580	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 2	Actuator	210-PIP-MFF-MEMC2	21-Jul-21	1	YEARS	01-Jul-22
3581	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 3	Actuator	210-PIP-MFF-MEMC3	21-Jul-21	1	YEARS	01-Jul-22
3584	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 6	Actuator	210-PIP-MFF-MEMC6	21-Jul-21	1	YEARS	01-Jul-22
3585	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 7	Actuator	210-PIP-MFF-MEMC7	21-Jul-21	1	YEARS	01-Jul-22
3586	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 8	Actuator	210-PIP-MFF-MEMC8	21-Jul-21	1	YEARS	01-Jul-22
3583	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell5	Actuator	210-PIP-MFF-MEMC5	21-Jul-21	1	YEARS	01-Jul-22
7486	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 1 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD1	28-Apr-21	12	MONTHS	07-Apr-22
7487	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 2 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD2	28-Apr-21	12	MONTHS	07-Apr-22
7488	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 3 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD3	28-Apr-21	12	MONTHS	07-Apr-22
7489	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 4 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD4	28-Apr-21	12	MONTHS	07-Apr-22
7490	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 5 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD5	29-Apr-21	12	MONTHS	14-Apr-22
7491	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 6 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD6	30-Apr-21	12	MONTHS	14-Apr-22
7492	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 7 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD7	29-Apr-21	12	MONTHS	14-Apr-22
7493	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 8 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD8	29-Apr-21	12	MONTHS	14-Apr-22
7494	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 1 MFW	Valve Butterfly 24"	210-PIP-MFF-MEME1	20-Apr-21	12	MONTHS	21-Apr-22
7495	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 2 MFW	Valve Butterfly 24"	210-PIP-MFF-MEME2	20-Apr-21	12	MONTHS	21-Apr-22
3646	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 3	Actuator	210-PIP-MFF-MEME3	01-Jul-21	1	YEARS	06-Jun-22
3647	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 4	Actuator	210-PIP-MFF-MEME4	01-Jul-21	1	YEARS	06-Jun-22
7390	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 1 MFE	Transmitter Level Indicating	210-A01-TNK-0340	11-Mar-21	1	YEARS	09-Mar-22
7391	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 2 MFE	Transmitter Level Indicating	210-A02-TNK-0340	11-Mar-21	1	YEARS	09-Mar-22
7392	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 3 MFE	Transmitter Level Indicating	210-A03-TNK-0340	18-Mar-21	1	YEARS	09-Mar-22
7393	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 4 MFE	Transmitter Level Indicating	210-A04-TNK-0340	18-Mar-21	1	YEARS	09-Mar-22
7394	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 5 MFE	Transmitter Level Indicating	210-A05-TNK-0340	19-Mar-21	1	YEARS	16-Mar-22
7395	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 6 MFE	Transmitter Level Indicating	210-A06-TNK-0340	07-Apr-21	1	YEARS	16-Mar-22
7396	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 7 MFE	Transmitter Level Indicating	210-A07-TNK-0340	07-Apr-21	1	YEARS	16-Mar-22
7397	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 8 MFE	Transmitter Level Indicating	210-A08-TNK-0340	07-Apr-21	1	YEARS	16-Mar-22
7398	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 1 MFE	Transmitter Level Indicating	210-B01-TNK-0340	21-Apr-21	1	YEARS	23-Mar-22
7399	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 2 MFE	Transmitter Level Indicating	210-B02-TNK-0340	21-Apr-21	1	YEARS	23-Mar-22
7400	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 3 MFE	Transmitter Level Indicating	210-B03-TNK-0340	21-Apr-21	1	YEARS	23-Mar-22
7401	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 4 MFE	Transmitter Level Indicating	210-B04-TNK-0340	21-Apr-21	1	YEARS	23-Mar-22
7402	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 5 MFE	Transmitter Level Indicating	210-B05-TNK-0340	15-Apr-21	1	YEARS	30-Mar-22
7403	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 6 MFE	Transmitter Level Indicating	210-B06-TNK-0340	15-Apr-21	1	YEARS	30-Mar-22
7404	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 7 MFE	Transmitter Level Indicating	210-B07-TNK-0340	15-Apr-21	1	YEARS	30-Mar-22

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7405	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 8 MFE	Transmitter Level Indicating	210-B08-TNK-0340	15-Apr-21	1	YEARS	30-Mar-22
7406	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-D01-TNK-0340	15-Apr-21	1	YEARS	07-Apr-22
7407	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 2 MFW	Transmitter Level Indicating	210-D02-TNK-0340	15-Apr-21	1	YEARS	07-Apr-22
7408	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 3 MFW	Transmitter Level Indicating	210-D03-TNK-0340	15-Apr-21	1	YEARS	07-Apr-22
7409	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 4 MFW	Transmitter Level Indicating	210-D04-TNK-0340	15-Apr-21	1	YEARS	07-Apr-22
7410	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 5 MFW	Transmitter Level Indicating	210-D05-TNK-0340	21-Apr-21	1	YEARS	14-Apr-22
7411	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 6 MFW	Transmitter Level Indicating	210-D06-TNK-0340	21-Apr-21	1	YEARS	14-Apr-22
7412	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 7 MFW	Transmitter Level Indicating	210-D07-TNK-0340	21-Apr-21	1	YEARS	14-Apr-22
7413	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 8 MFW	Transmitter Level Indicating	210-D08-TNK-0340	21-Apr-21	1	YEARS	14-Apr-22
7414	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 1 MFW	Transmitter Level Indicating	210-E01-TNK-0340	28-Apr-21	1	YEARS	21-Apr-22
7415	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 2 MFW	Transmitter Level Indicating	210-E02-TNK-0340	28-Apr-21	1	YEARS	21-Apr-22
7350	Check calibration of DPIT-0405, Train A Cell 1 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	13-Jan-22	1	YEARS	07-Dec-22
7351	Check calibration of DPIT-0405, Train A Cell 2 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	13-Jan-22	1	YEARS	07-Dec-22
7352	Check calibration of DPIT-0405, Train A Cell 3 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	13-Jan-22	1	YEARS	07-Dec-22
7353	Check calibration of DPIT-0405, Train A Cell 4 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	13-Jan-22	1	YEARS	07-Dec-22
7354	Check calibration of DPIT-0405, Train A Cell 5 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	05-Jan-22	1	YEARS	04-Jan-23
7355	Check calibration of DPIT-0405, Train A Cell 6 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	05-Jan-22	1	YEARS	04-Jan-23
7356	Check calibration of DPIT-0405, Train A Cell 7 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	05-Jan-22	1	YEARS	04-Jan-23
7357	Check calibration of DPIT-0405, Train A Cell 8 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	05-Jan-22	1	YEARS	04-Jan-23
7358	Check calibration of DPIT-0405, Train B Cell 1 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	19-Jan-22	1	YEARS	18-Jan-23
7359	Check calibration of DPIT-0405, Train B Cell 2 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	19-Jan-22	1	YEARS	18-Jan-23
7360	Check calibration of DPIT-0405, Train B Cell 3 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	19-Jan-22	1	YEARS	18-Jan-23
7361	Check calibration of DPIT-0405, Train B Cell 4 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB4	19-Jan-22	1	YEARS	18-Jan-23
7362	Check calibration of DPIT-0405, Train B Cell 5 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	08-Feb-22	1	YEARS	08-Feb-23
7363	Check calibration of DPIT-0405, Train B Cell 6 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	08-Feb-22	1	YEARS	08-Feb-23
7364	Check calibration of DPIT-0405, Train B Cell 7 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	08-Feb-22	1	YEARS	08-Feb-23
7365	Check calibration of DPIT-0405, Train B Cell 8 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	08-Feb-22	1	YEARS	08-Feb-23
7366	Check calibration of DPIT-0405, Train D Cell 1 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	05-Mar-21	1	YEARS	22-Feb-22
7367	Check calibration of DPIT-0405, Train D Cell 2 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	12-Mar-21	1	YEARS	22-Feb-22
7368	Check calibration of DPIT-0405, Train D Cell 3 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	12-Mar-21	1	YEARS	22-Feb-22
7369	Check calibration of DPIT-0405, Train D Cell 4 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	12-Mar-21	1	YEARS	22-Feb-22
7370	Check calibration of DPIT-0405, Train D Cell 5 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	12-Mar-21	1	YEARS	08-Mar-22
7371	Check calibration of DPIT-0405, Train D Cell 6 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	30-Mar-21	1	YEARS	08-Mar-22
7372	Check calibration of DPIT-0405, Train D Cell 7 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	30-Mar-21	1	YEARS	08-Mar-22
7373	Check calibration of DPIT-0405, Train D Cell 8 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	30-Mar-21	1	YEARS	08-Mar-22
7374	Check calibration of DPIT-0405, Train E Cell 1 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	30-Mar-21	1	YEARS	08-Mar-22
7375	Check calibration of DPIT-0405, Train E Cell 2 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	30-Mar-21	1	YEARS	08-Mar-22
3554	Ckeck Calibration of PIT-0454, MF Effluent Train C Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	30-Jul-21	2	YEARS	01-Aug-23
9680	Clean & Calibrate MFE 250-AIT-0475 CL2 Analyzer	MF Effluent Total Chlorine	250-PIP-MFE	08-Feb-22	1	WEEKS	17-Feb-22
2055	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	510-A01-CPF-5101	27-Dec-21	3	MONTHS	27-Mar-22
2057	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2059	Element Analyzer Conductivity - RO Concentrate Train A Unit 3	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2061	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	510-B01-CPF-5101	27-Dec-21	3	MONTHS	27-Mar-22
2063	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	510-B02-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2065	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	510-B03-CPF-5101	18-Nov-21	3	MONTHS	18-Feb-22
2067	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	510-C01-CPF-5101	13-Jan-22	3	MONTHS	13-Apr-22
2069	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	510-C02-CPF-5101	27-Dec-21	3	MONTHS	27-Mar-22
2071	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	510-C03-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2073	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	510-D01-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2075	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	510-D02-CPF-5101	27-Dec-21	3	MONTHS	27-Mar-22
2077	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	510-D03-CPF-5101	23-Nov-21	3	MONTHS	23-Feb-22
2079	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	510-E01-CPF-5101	24-Nov-21	3	MONTHS	24-Feb-22
2081	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	510-E02-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
2083	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	510-E03-CPF-5101	10-Nov-21	3	MONTHS	14-Feb-22
3471	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	510-F01-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
3472	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	510-F02-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
3474	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	510-F03-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
3479	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	510-G01-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
3480	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	510-G02-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
3481	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	510-G03-CPF-5101	13-Jan-22	3	MONTHS	16-Apr-22
2320	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 5 MFE	Transmitter Level Indicating	210-A05-TNK-0340	25-Jan-22	1	YEARS	25-Jan-23

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
2321	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 6 MFE	Transmitter Level Indicating	210-A06-TNK-0340	25-Jan-22	1	YEARS	25-Jan-23
2322	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 7 MFE	Transmitter Level Indicating	210-A07-TNK-0340	25-Jan-22	1	YEARS	25-Jan-23
2339	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 5 MFW	Transmitter Level Indicating	210-D05-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2340	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 6 MFW	Transmitter Level Indicating	210-D06-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2341	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 7 MFW	Transmitter Level Indicating	210-D07-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2342	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 8 MFW	Transmitter Level Indicating	210-D08-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2326	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 1 MFE	Transmitter Level Indicating	210-B01-TNK-0340	01-Feb-22	1	YEARS	01-Feb-23
2327	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 2 MFE	Transmitter Level Indicating	210-B02-TNK-0340	01-Feb-22	1	YEARS	01-Feb-23
2328	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 3 MFE	Transmitter Level Indicating	210-B03-TNK-0340	01-Feb-22	1	YEARS	01-Feb-23
2329	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 4 MFE	Transmitter Level Indicating	210-B04-TNK-0340	01-Feb-22	1	YEARS	01-Feb-23
2330	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 5 MFE	Transmitter Level Indicating	210-B05-TNK-0340	22-Feb-21	1	YEARS	15-Feb-22
2331	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 6 MFE	Transmitter Level Indicating	210-B06-TNK-0340	22-Feb-21	1	YEARS	15-Feb-22
2332	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 7 MFE	Transmitter Level Indicating	210-B07-TNK-0340	22-Feb-21	1	YEARS	15-Feb-22
2336	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 2 MFW	Transmitter Level Indicating	210-D02-TNK-0340	04-Mar-21	1	YEARS	22-Feb-22
2337	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 3 MFW	Transmitter Level Indicating	210-D03-TNK-0340	04-Mar-21	1	YEARS	22-Feb-22
2338	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 4 MFW	Transmitter Level Indicating	210-D04-TNK-0340	04-Mar-21	1	YEARS	22-Feb-22
2343	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 1 MFW	Transmitter Level Indicating	210-E01-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2344	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 2 MFW	Transmitter Level Indicating	210-E02-TNK-0340	03-Mar-21	1	YEARS	01-Mar-22
2319	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 4 MFE	Transmitter Level Indicating	210-A04-TNK-0340	18-Jan-22	1	YEARS	18-Jan-23
2324	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 8 MFE	Transmitter Level Indicating	210-A08-TNK-0340	25-Jan-22	1	YEARS	25-Jan-23
2333	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 8 MFE	Transmitter Level Indicating	210-B08-TNK-0340	22-Feb-21	1	YEARS	15-Feb-22
2334	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-D01-TNK-0340	22-Feb-21	1	YEARS	15-Feb-22
2335	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-B08-TNK-0340	04-Mar-21	1	YEARS	22-Feb-22
2316	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 1 MFE	Transmitter Level Indicating	210-A01-TNK-0340	18-Jan-22	1	YEARS	18-Jan-23
2317	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 2 MFE	Transmitter Level Indicating	210-A02-TNK-0340	18-Jan-22	1	YEARS	18-Jan-23
2318	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 3 MFE	Transmitter Level Indicating	210-A03-TNK-0340	18-Jan-22	1	YEARS	18-Jan-23
3587	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 1	Transmitter Level Indicating	210-C01-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3588	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 2	Transmitter Level Indicating	210-C02-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3589	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 3	Transmitter Level Indicating	210-C03-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3590	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 4	Transmitter Level Indicating	210-C04-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3591	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 5	Transmitter Level Indicating	210-C05-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3592	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 6	Transmitter Level Indicating	210-C06-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3593	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 7	Transmitter Level Indicating	210-C07-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3594	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 8	Transmitter Level Indicating	210-C08-TNK-0340	07-Jun-21	1	YEARS	01-Jun-22
3650	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 3	Transmitter Level Indicating	210-E03-TNK-0340	15-Jun-21	1	YEARS	06-Jun-22
3651	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 4	Transmitter Level Indicating	210-E04-TNK-0340	15-Jun-21	1	YEARS	06-Jun-22
9307	Inspect and Clean SEFE Tank A01-LSH-130 Warrick	Switch Level High	142-A01-TNK-0130	13-Jan-22	1	YEARS	14-Jan-23
9308	Inspect and Clean SEFE Tank A02-LSH-130 Warrick	Switch Level High	142-A02-TNK-0130	13-Jan-22	1	YEARS	14-Jan-23
9681	M9 Portable TOC No. 1 Replace Consumables 3 MO.	Portable M9 TOC Analyzer No.1 RO Feed	510-B02-RO-2200	28-Dec-21	3	MONTHS	23-Mar-22
9682	M9 Portable TOC No. 2 Replace Consumables 3 MO.	M9 Portable TOC Analyzer No. 2 Permeate	510-PIP-ROP-ROB2	28-Dec-21	3	MONTHS	23-Mar-22
9242	MF Effluent Trubidity Wet Calibration HACH FT 660SC	MF Process Effluent Turbidity	250-PIP-MFE	13-Jan-22	3	MONTHS	16-Apr-22
9179	Planner Order Trojan UV 100% T Standard Solution	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	04-Jun-21	1	YEARS	04-Jun-22
2982	Polymer Blend Controller 730-A01-FDR-7200 6 mo. PM	Polymer Blend and Feed System Train A	730-A01-FDR-7200	27-Aug-21	6	MONTHS	23-Feb-22
2981	Polymer Blend Controller 730-B01-FDR-7200 6 mo. PM	Polymer Blend and Feed System Train B	730-B01-FDR-7200	16-Sep-21	6	MONTHS	13-Mar-22
2980	Polymer Blend Controller 730-C01-FDR-7200 - 6 mo. PM	Polymer Blend and Feed System Train C	730-C01-FDR-7200	19-Oct-21	6	MONTHS	19-Apr-22
3633	Polymer Blend Controller 730-D01-FDR-7200 6 MO. PM	Polymer Blend and Feed System Train D	730-D01-FDR-7200	09-Aug-21	6	MONTHS	08-Aug-22
3466	Prominent H2O2 Sensor Calibration Method 1 YR	Transmitter UV Product PROMINENT Peroxide Analyzer	805-CPD-0002	20-May-21	1	YEARS	16-May-22
3467	Prominent H2O2 Sensor Calibration Method 1 YR	Transmitter UV Feed PROMINENT Peroxide Analyzer	510-CPF-0010	20-May-21	1	YEARS	16-May-22
3463	Prominent H2O2 Sensor Standardization Method	Transmitter UV Feed PROMINENT Peroxide Analyzer	510-CPF-0010	31-Jan-22	2	WEEKS	23-Feb-22
3465	Prominent H2O2 Sensor Standardization Method	Transmitter UV Product PROMINENT Peroxide Analyzer	805-CPD-0002	31-Jan-22	2	WEEKS	23-Feb-22
3135	ROP / UVP CL2 Analyzer Weekly Calibration	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	01-Feb-22	1	WEEKS	15-Feb-22
9044	ROP/UVP CL2 ANALYZER 1 YR	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	02-Apr-21	1	YEARS	04-Apr-22
9149	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	Analyzer Total Organic Compound	450-CPF-0001	05-Jan-22	3	MONTHS	09-Apr-22
9239	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	RO Feed TOC Analyzer	450-PIP-ROF	05-Jan-22	3	MONTHS	09-Apr-22
9150	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	Analyzer Total Organic Compound	510-CPF-0010	05-Jan-22	3	MONTHS	09-Apr-22
9240	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	RO Permate TOC Analyzer	510-CPF-0010	17-Nov-21	3	MONTHS	15-Feb-22
7003	Replace pH probe of I&E handheld	pH meter, handheld (s/n 003366)	TOOLS	23-Sep-21	1	YEARS	22-Sep-22
7004	Replace pH probe of I&E handheld	pH meter, handheld (s/n C03416)	TOOLS	29-Sep-21	1	YEARS	22-Sep-22
7342	Rosemount Free Chlorine Maintenance 450-AE-2162	Element Analyzer Free Chlorine and pH- RO Feed	450-CPF-0001	14-Jan-22	3	MONTHS	11-Apr-22
2231	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2120	Transmitter Analyzer Indicating pH	450-CPF-0001	25-Aug-21	9	MONTHS	12-May-22
2234	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2140	Transmitter Analyzer Indicating pH	450-CPF-0001	25-Aug-21	9	MONTHS	10-May-22

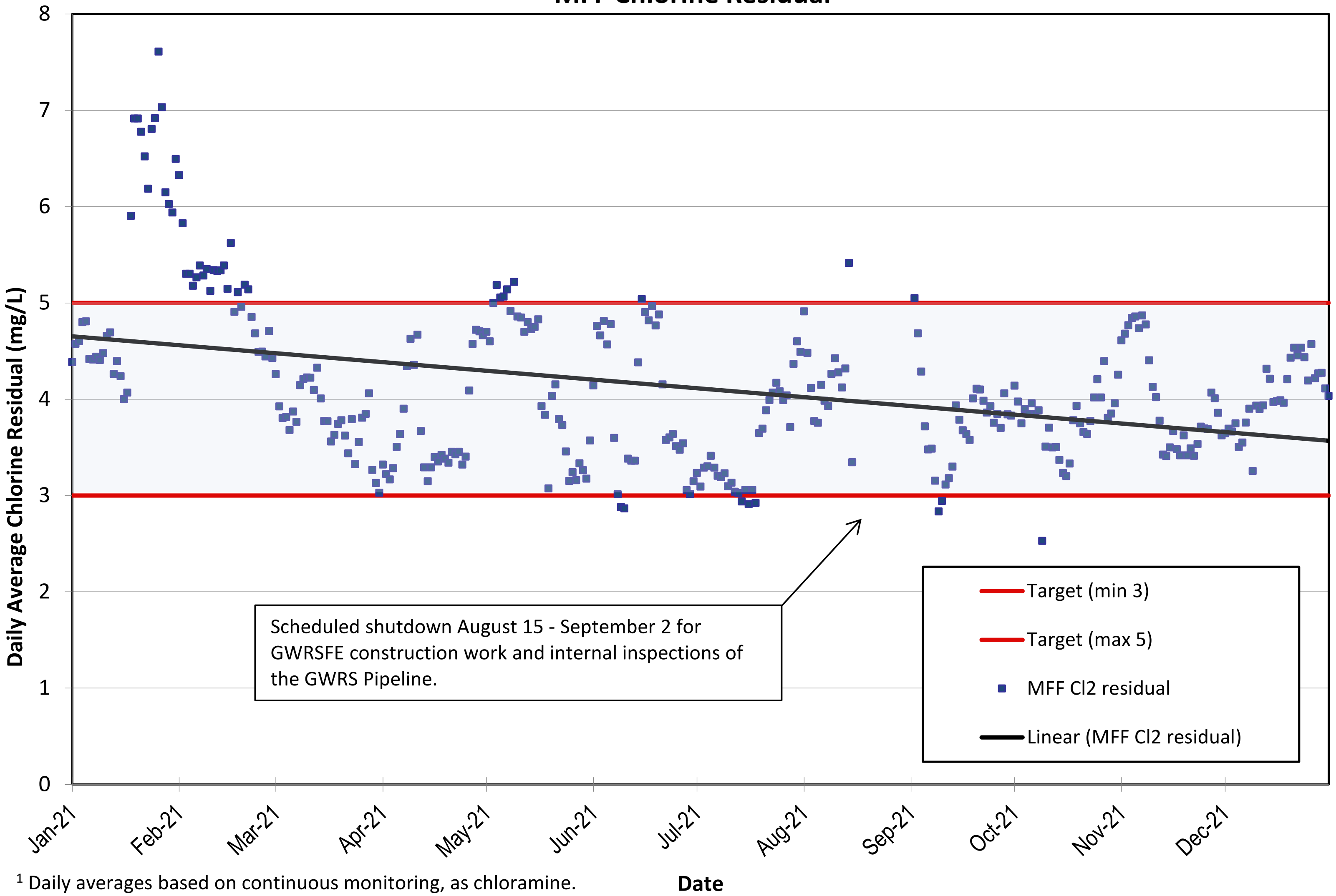
PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
3595	Rosemount pH Analyzer Annual Element Analyzer pH MF Train C CIP-C01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400C	23-Jun-21	1	YEARS	06-Jun-22
3596	Rosemount pH analyzer Annual Element Analyzer pH MF Train C02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400C	23-Jun-21	1	YEARS	01-Jun-22
2238	Rosemount pH analyzer annual- MF Feedwater-B B01-AIT-0305	Transmitter Analyzer Indicating pH - MF Feedwater B	255-PIP-MFF-WQAS	01-Sep-21	1	YEARS	26-Aug-22
2237	Rosemount pH analyzer annual-DPW 710-AIT-3310	Transmitter Analyzer Indicating pH	710-CPF-0008	20-Aug-21	1	YEARS	19-Aug-22
2243	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400A	08-Nov-21	1	YEARS	03-Nov-22
2244	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400A	29-Dec-21	1	YEARS	29-Dec-22
2245	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400B	08-Nov-21	1	YEARS	04-Nov-22
2246	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400B	13-Jan-22	1	YEARS	12-Jan-23
2247	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400D	08-Feb-22	1	YEARS	26-Jan-23
2248	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400D	03-Mar-21	1	YEARS	09-Feb-23
2249	Rosemount pH analyzer annual-Element Analyzer pH - MF Train E CIP-E01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400E	03-Mar-21	1	YEARS	23-Feb-22
2232	Rosemount pH analyzer annual-FPW: 710-AIT-3410	Transmitter Analyzer Indicating pH	710-CPF-0009	05-Aug-21	1	YEARS	05-Aug-22
2235	Rosemount pH analyzer annual-RO PW: 510-AIT-2241	Transmitter Analyzer Indicating pH	510-CPF-0010	20-Aug-21	1	YEARS	12-Aug-22
2236	Rosemount pH analyzer annual-SAR Bypass: 805-AIT-3580	Transmitter Analyzer Indicating pH	805-CPD-0002	27-Apr-21	1	YEARS	28-Apr-22
9302	SEFE Tank A01 Flush & Clean LIT-0130A Transmitter	Transmitter Level Indicating	142-A01-TNK-0130	30-Nov-21	1	YEARS	05-Nov-22
9303	SEFE Tank A01 Flush & Clean LIT-0130B Transmitter	Transmitter Level Indicating	142-A01-TNK-0130	30-Nov-21	1	YEARS	05-Nov-22
9304	SEFE Tank A02 Flush & Clean LIT-0130A Transmitter	Transmitter Level Indicating	142-A02-TNK-0130	30-Nov-21	1	YEARS	05-Nov-22
3017	Surge tank level control functional check - 830-A01-TNK-3410	Tank steel 30430 gal	830-A01-TNK-3410	29-Apr-21	1	YEARS	29-Apr-22
2960	Surge tank level control functional check - 830-A02-TNK-3410	Tank steel 30430 gal	830-A02-TNK-3410	29-Apr-21	1	YEARS	29-Apr-22
2961	Surge tank level control functional check - 830-A03-TNK-3410	Tank steel 30430 gal	830-A03-TNK-3410	29-Apr-21	1	YEARS	29-Apr-22
2962	Surge tank level control functional check - 830-A04-TNK-3410	Tank steel 30430 gal	830-A04-TNK-3410	29-Apr-21	1	YEARS	29-Apr-22
2963	Surge tank level control functional check - 830-B01-TNK-3410	Tank steel 5984 gal	830-B01-TNK-3410	29-Apr-21	1	YEARS	29-Apr-22
7721	Test Overtemperature Thermocouple, TIT-1226 Train A01	Transmitter Temperature Indicating	220-A01-TNK-1200	12-Jul-21	1	YEARS	09-Jul-22
7722	Test Overtemperature Thermocouple, TIT-1226 Train B01	Transmitter Temperature Indicating	220-B01-TNK-1200	12-Jul-21	1	YEARS	09-Jul-22
7723	Test Overtemperature Thermocouple, TIT-1226 Train D01	Transmitter Temperature Indicating	220-D01-TNK-1200	12-Jul-21	1	YEARS	09-Jul-22
7724	Test Overtemperature Thermocouple, TIT-1226 Train E01	Transmitter Temperature Indicating	220-E01-TNK-1200	12-Jul-21	1	YEARS	09-Jul-22
2116	Transmitter Analyzer Indicating Chlorine	Element Analyzer Chlorine - SAR Bypass	805-CPD-0002	02-Feb-22	1	WEEKS	10-Feb-22
7339	UV Transmittance Calibration Check 1 Yr. 610-AE-2220	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	12-May-21	1	YEARS	15-May-22
9241	UV Transmittance Calibration Check 1 Yr. 610-AE-2240	UV Transmittance Analyzer	510-CPF-0010	22-Apr-21	1	YEARS	22-Apr-22
9296	UVT 2240 Optiview Cleaning & Transmittance Monthly	UV Transmittance Analyzer	510-CPF-0010	01-Feb-22	1	MONTHS	01-Mar-22

Appendix E

Critical Control Points

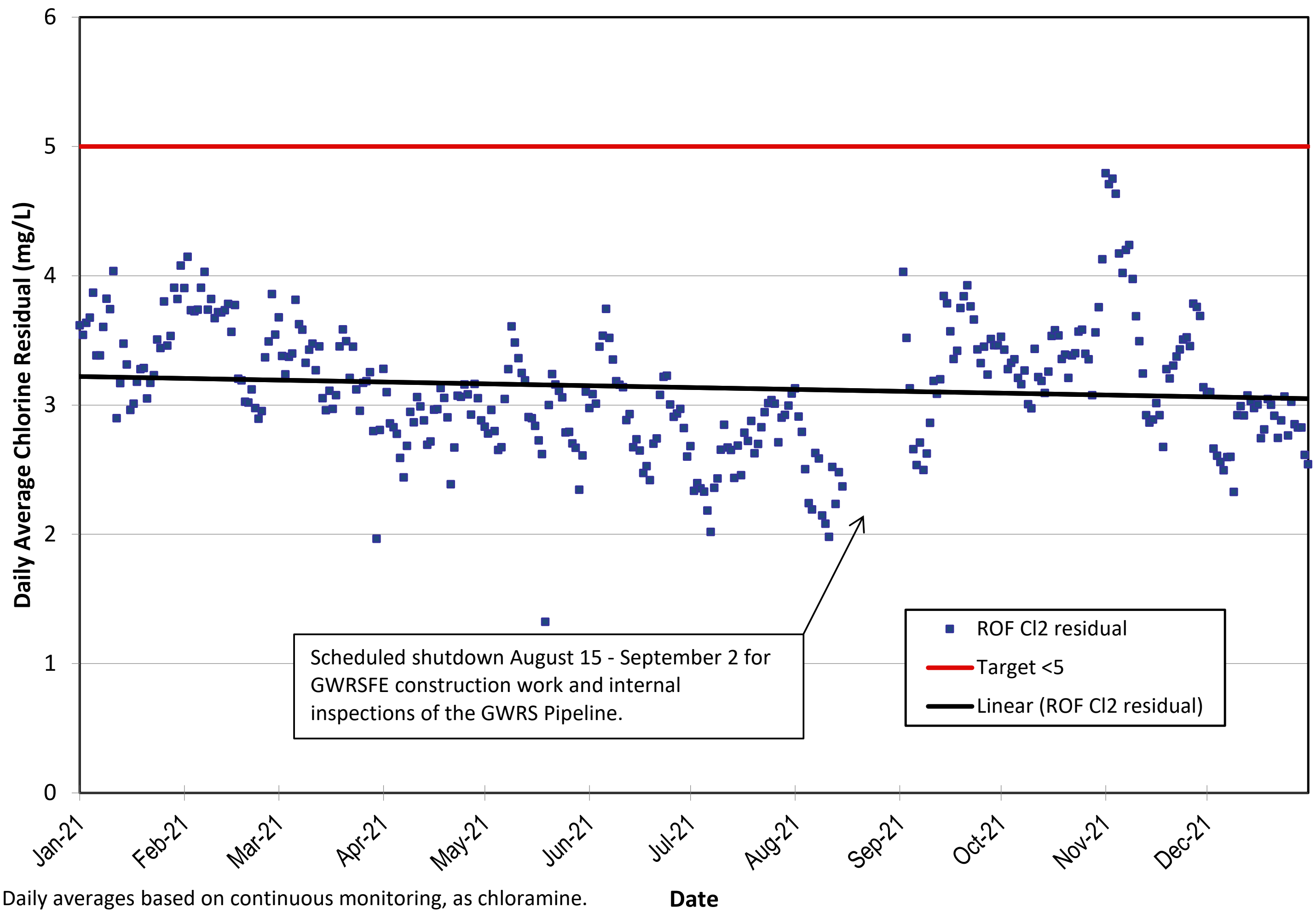
Orange County Water District
Groundwater Replenishment System
2021 Annual Report

Figure E-1
MFF Chlorine Residual[1]



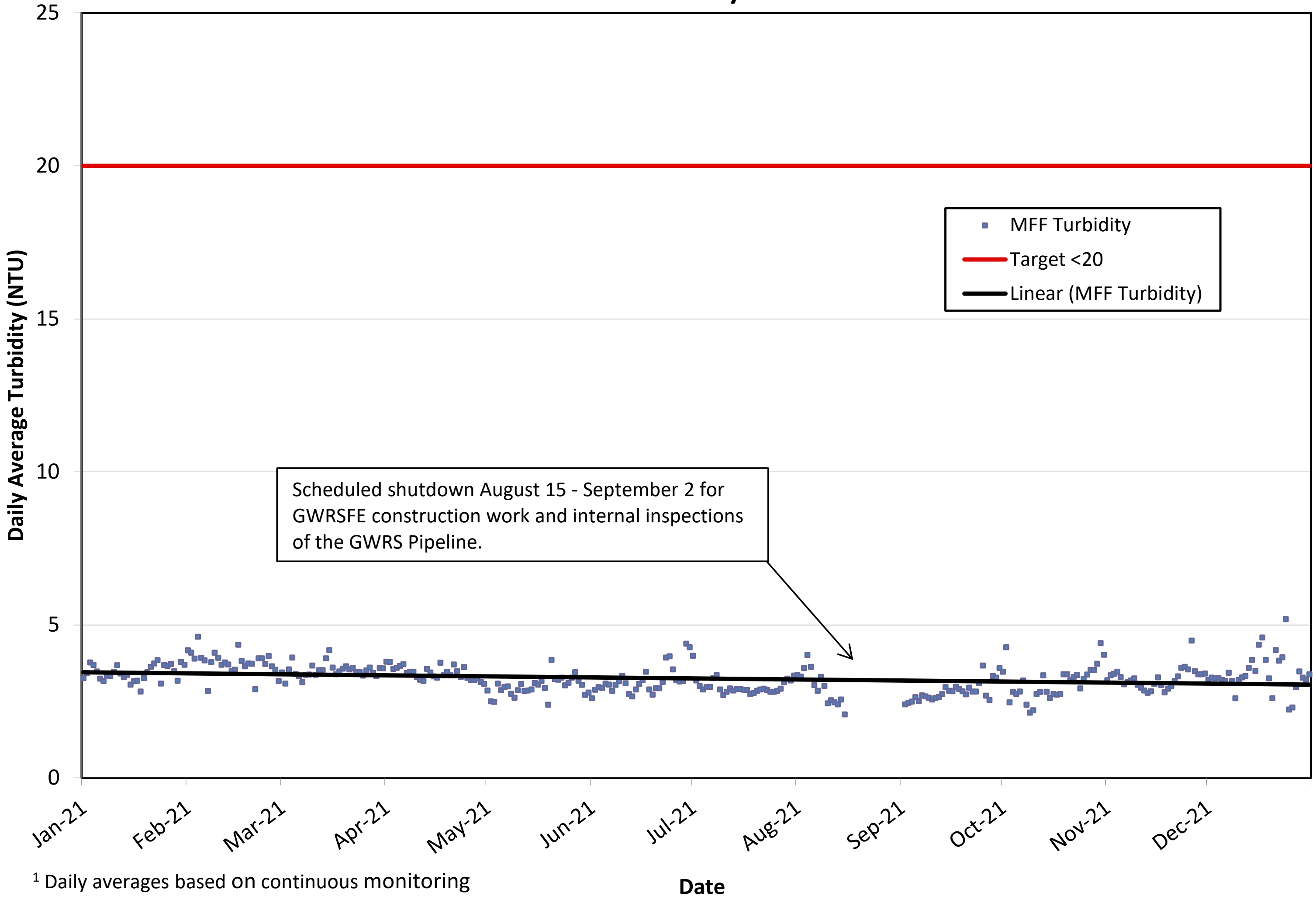
[1] Daily averages based on continuous monitoring, as chloramine.

Figure E-2
ROF Chlorine Residual[1]



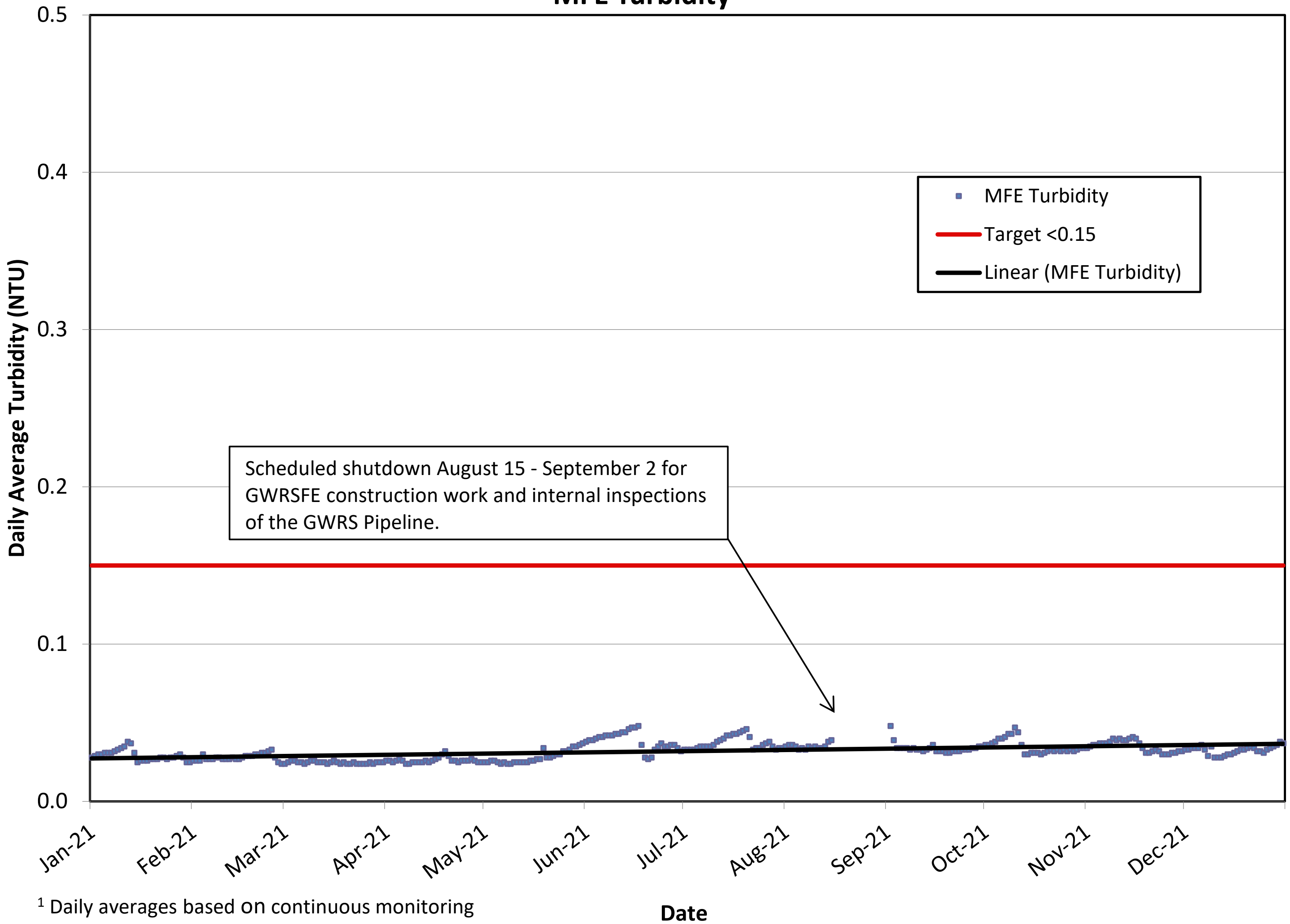
[1] Daily averages based on continuous monitoring, as chloramine.

Figure E-3
MFF Turbidity[1]



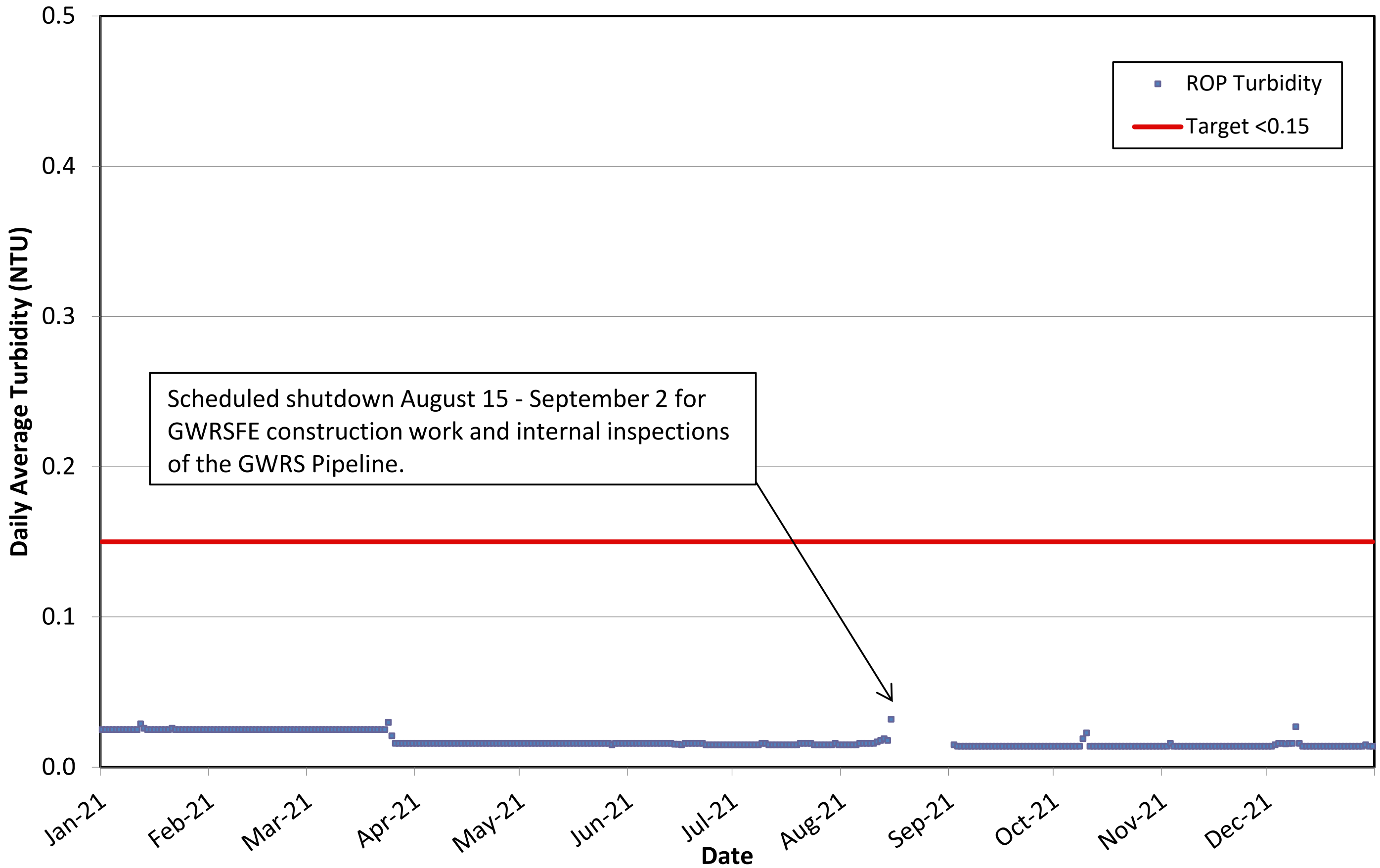
[1] Daily averages based on continuous monitoring

Figure E-4
MFE Turbidity[1]



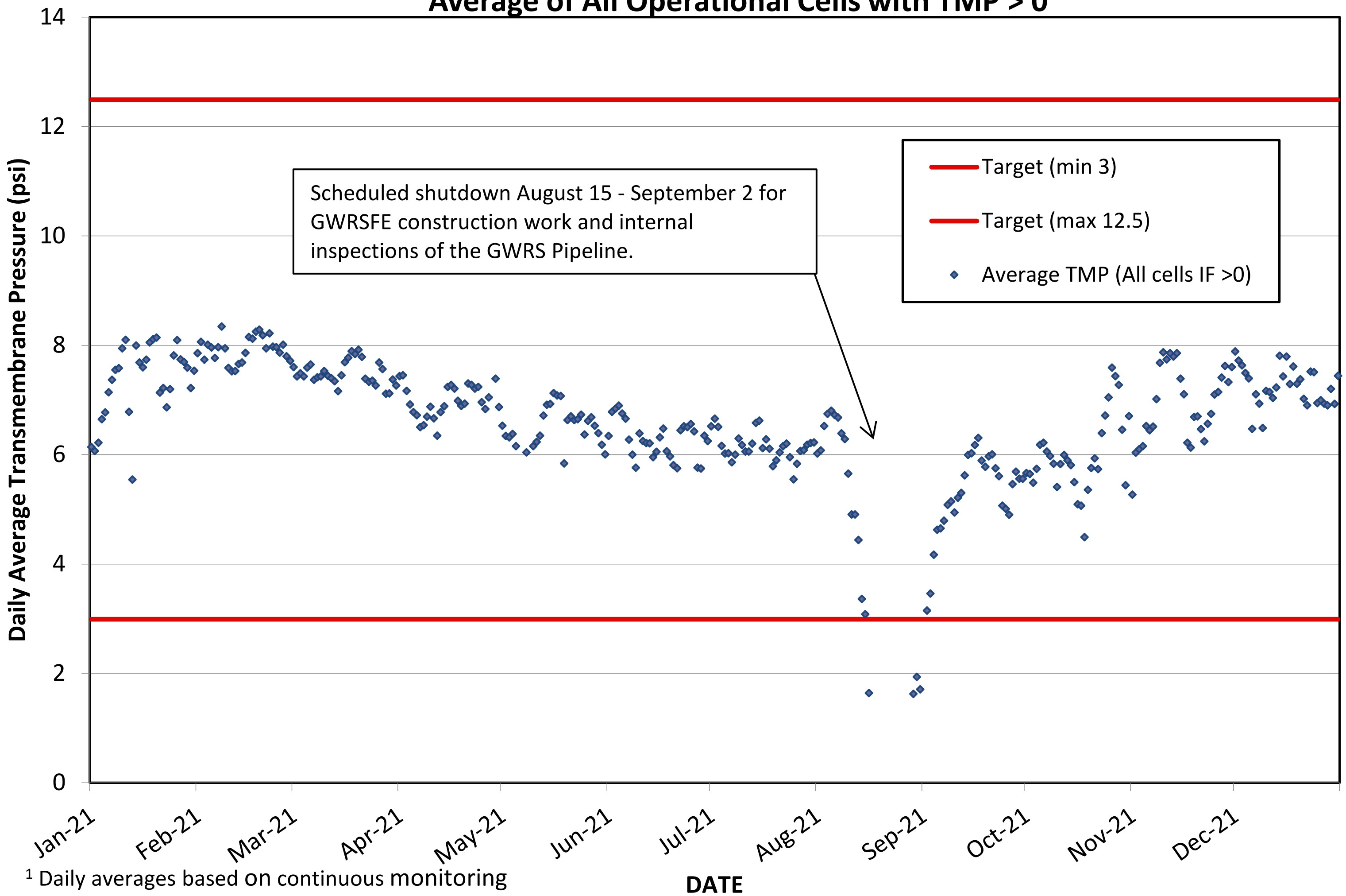
[1] Daily averages based on continuous monitoring

Figure E-5
ROP Turbidity[1]



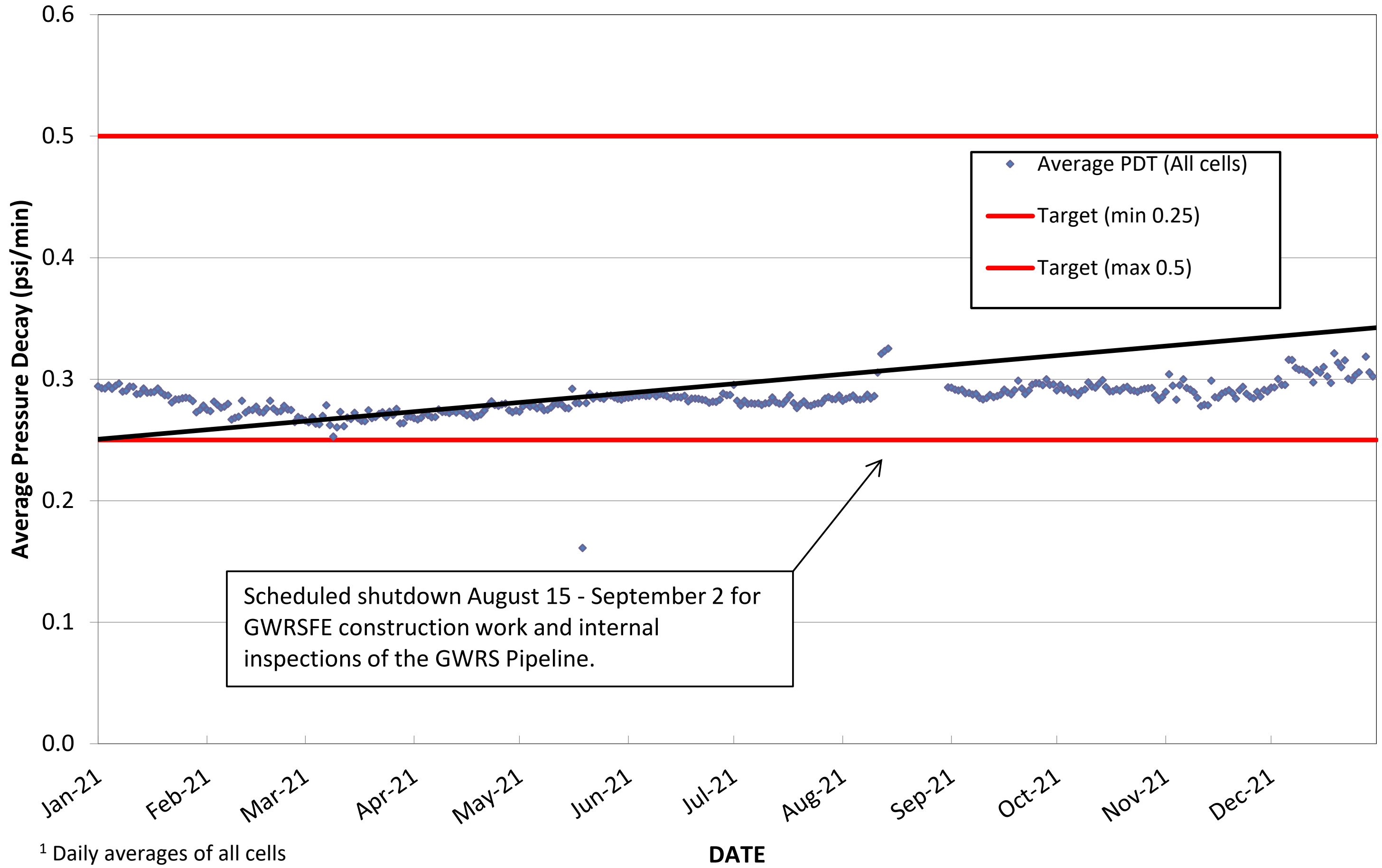
[1] Turbidity shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-6
MF Transmembrane Pressure (TMP)[1]
All Operating Cells A01-E04
Average of All Operational Cells with TMP > 0



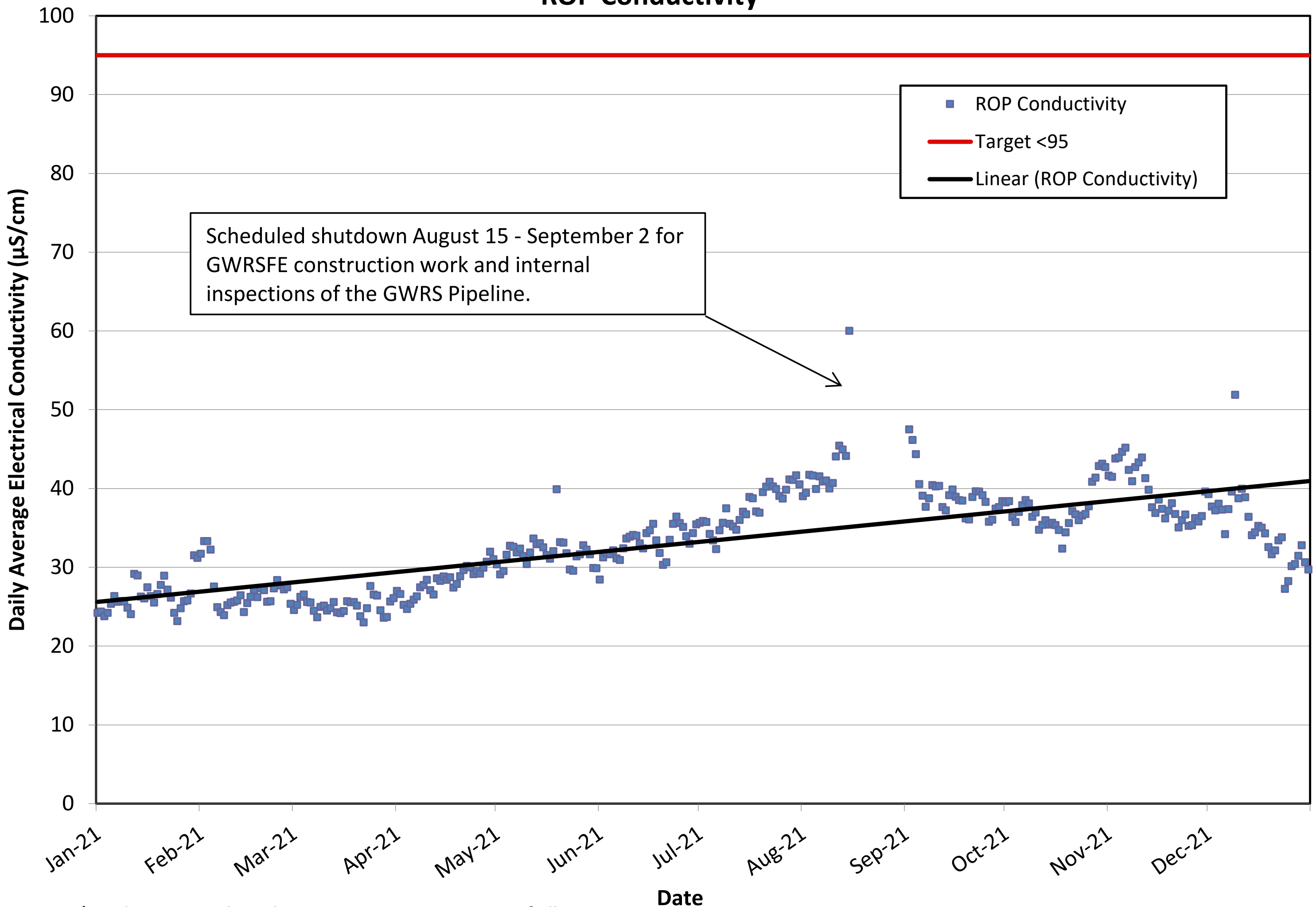
[1] Daily averages based on continuous monitoring

Figure E-7
MF Pressure Decay Test (PDT)
All Cells A01-E04[1]



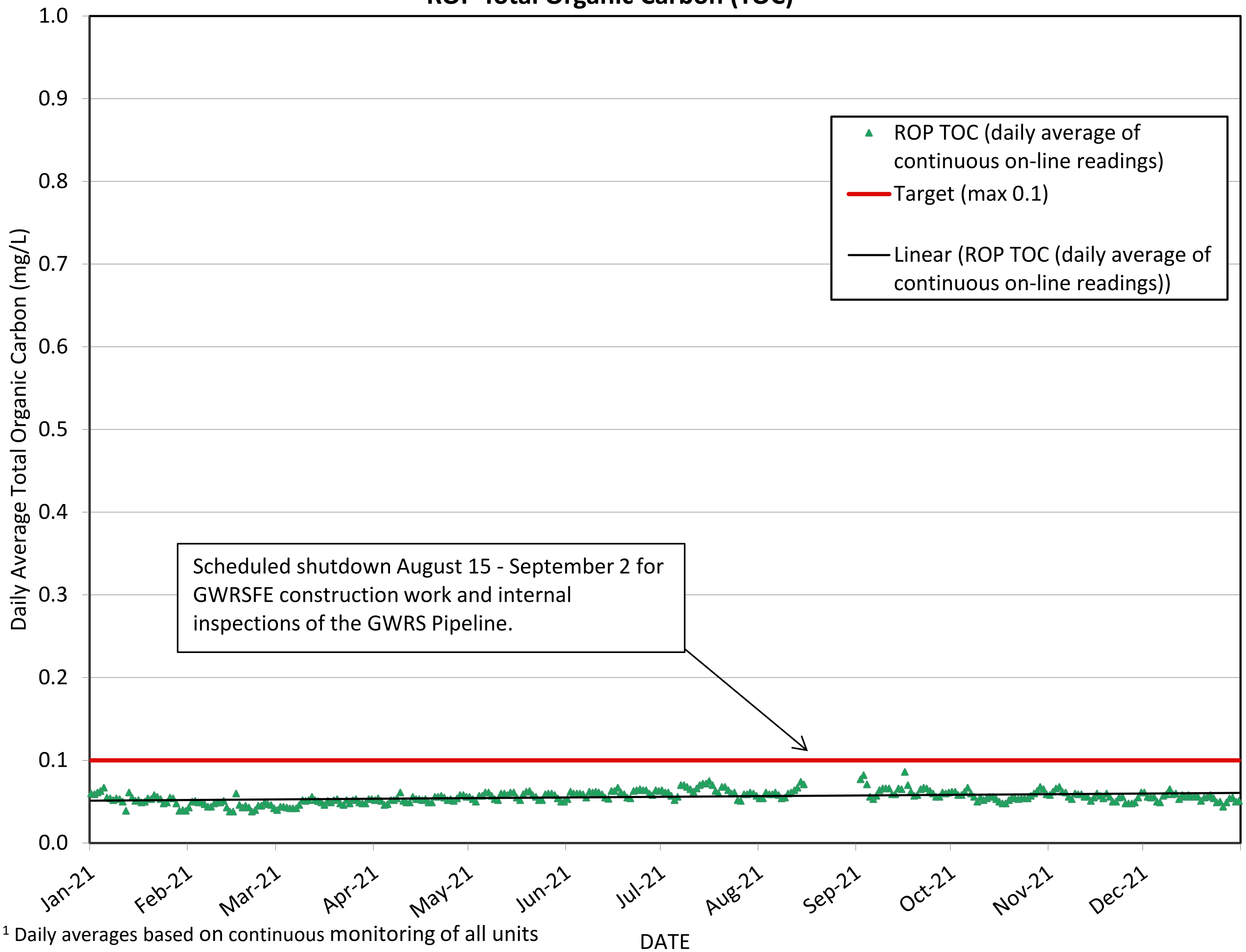
[1] Daily averages of all cells

Figure E-8
ROP Conductivity[1]



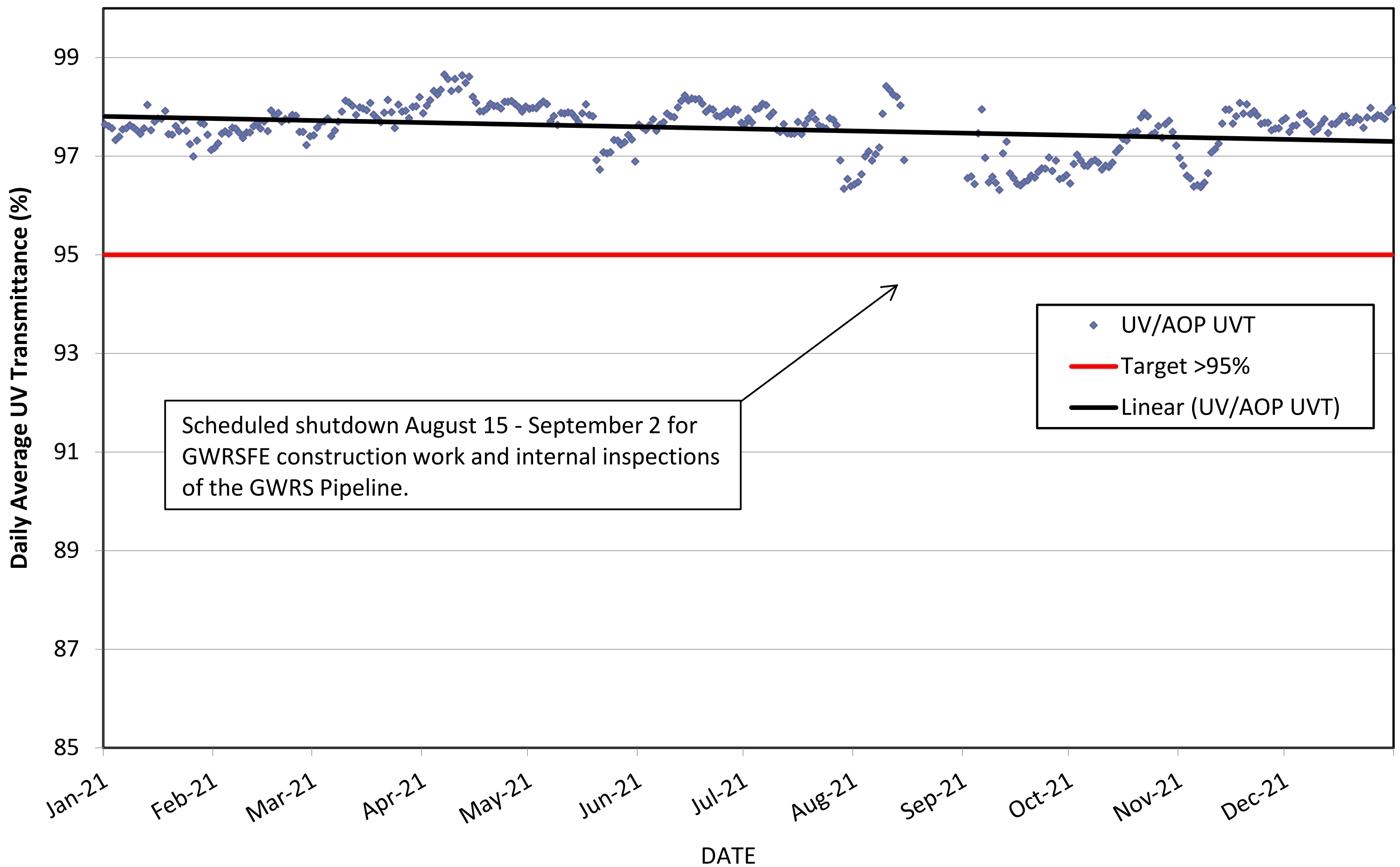
[1] Daily averages based on continuous monitoring of all units.
Electrical conductivity data for ROP are not normalized

Figure E-9
ROP Total Organic Carbon (TOC)[1]



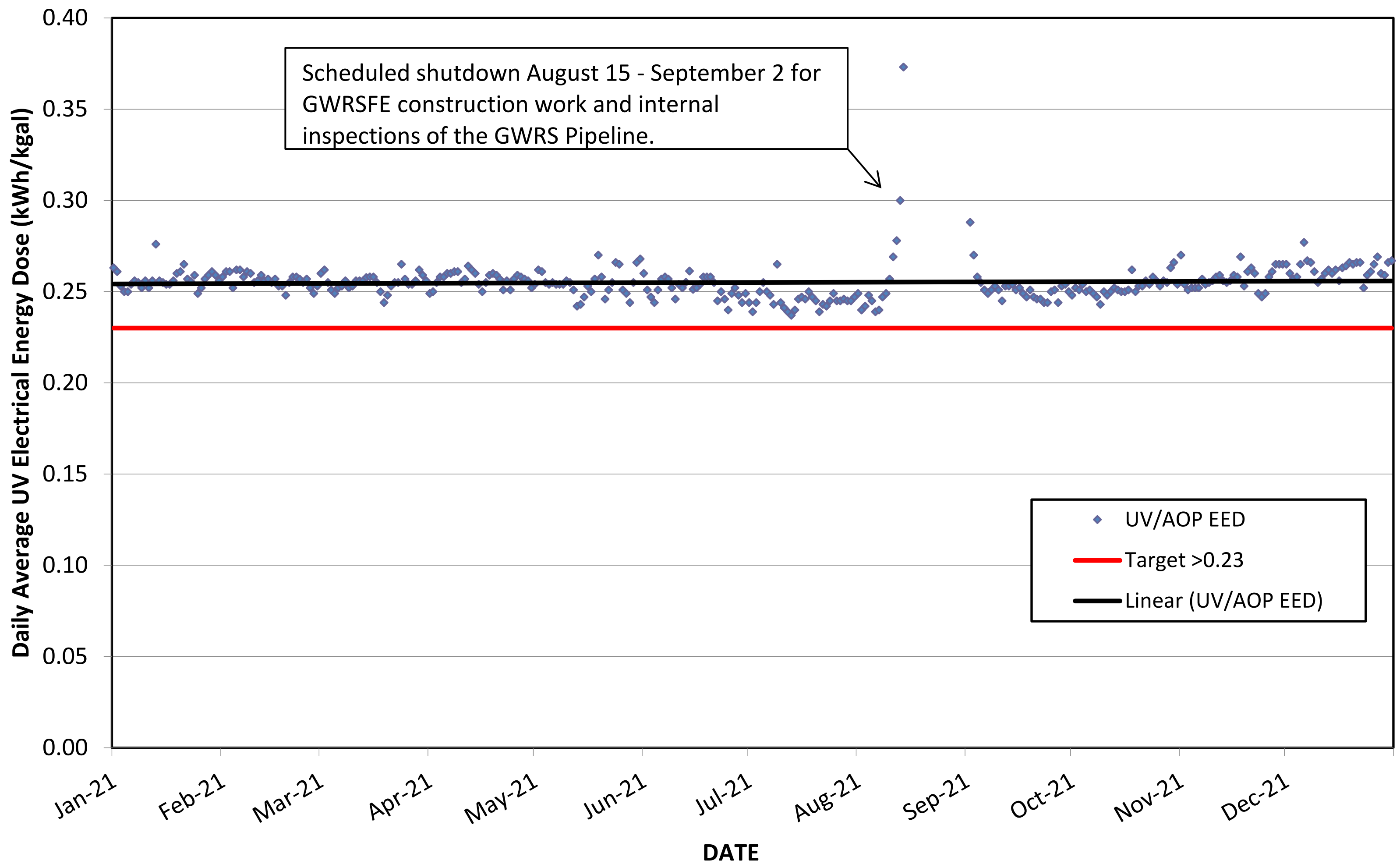
[1] Daily averages based on continuous monitoring of all units

Figure E-10
UV/AOP UV Transmittance [1]



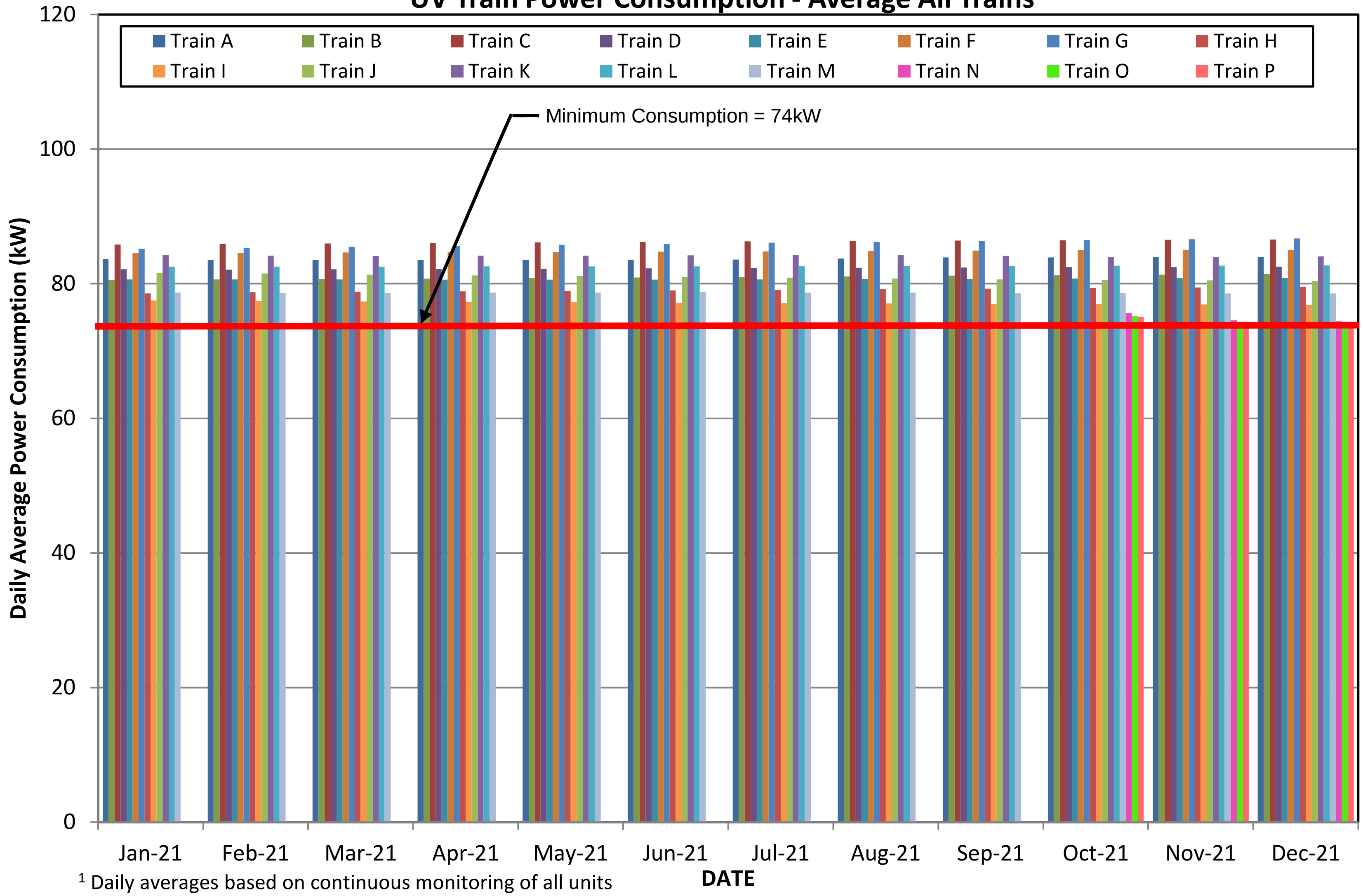
[1] UV Transmittance shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-11
UV/AOP Electrical Energy Dose (EED)[1]



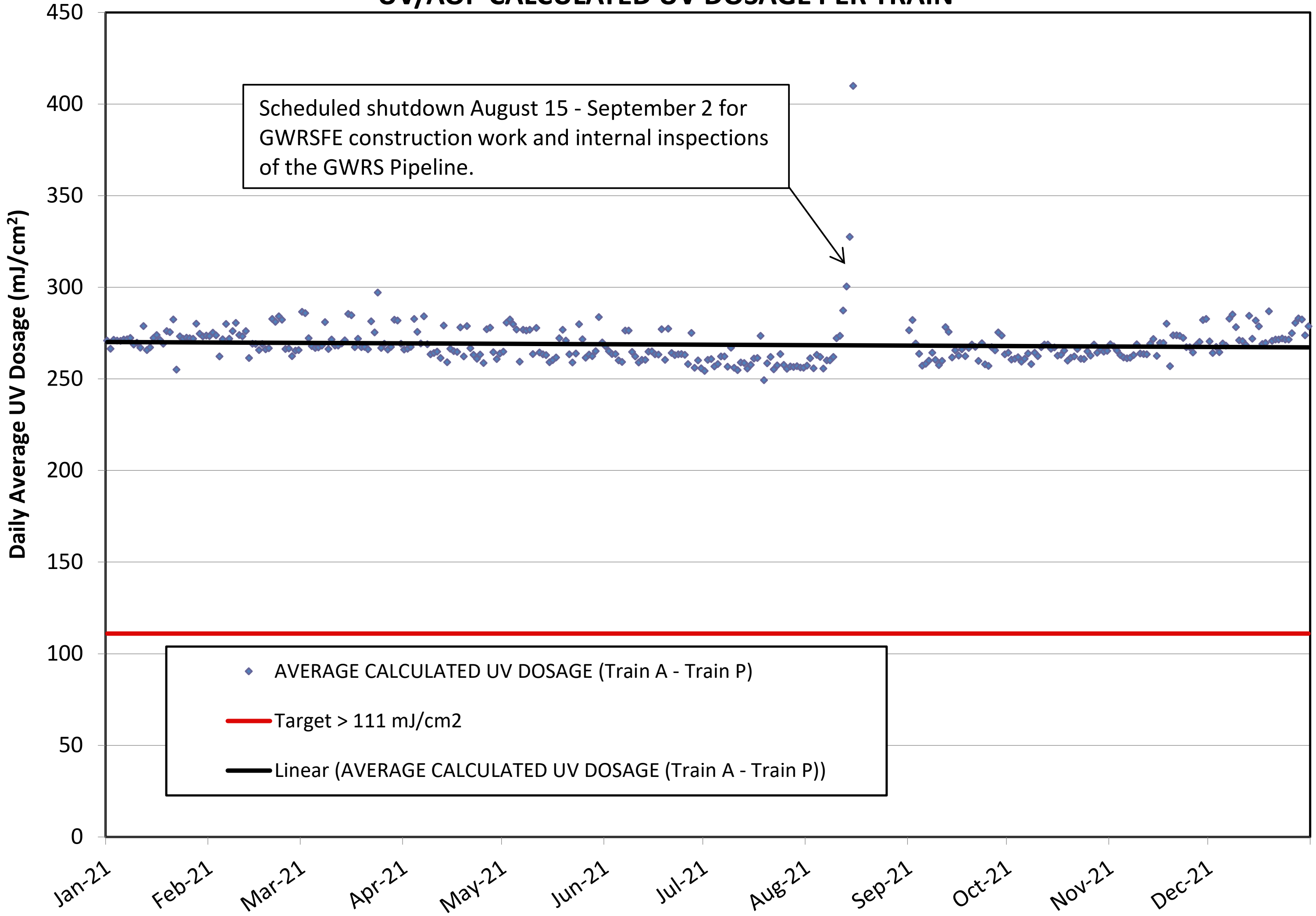
[1] Daily averages based on continuous monitoring of all units

Figure E-12
UV Train Power Consumption - Average All Trains[1]



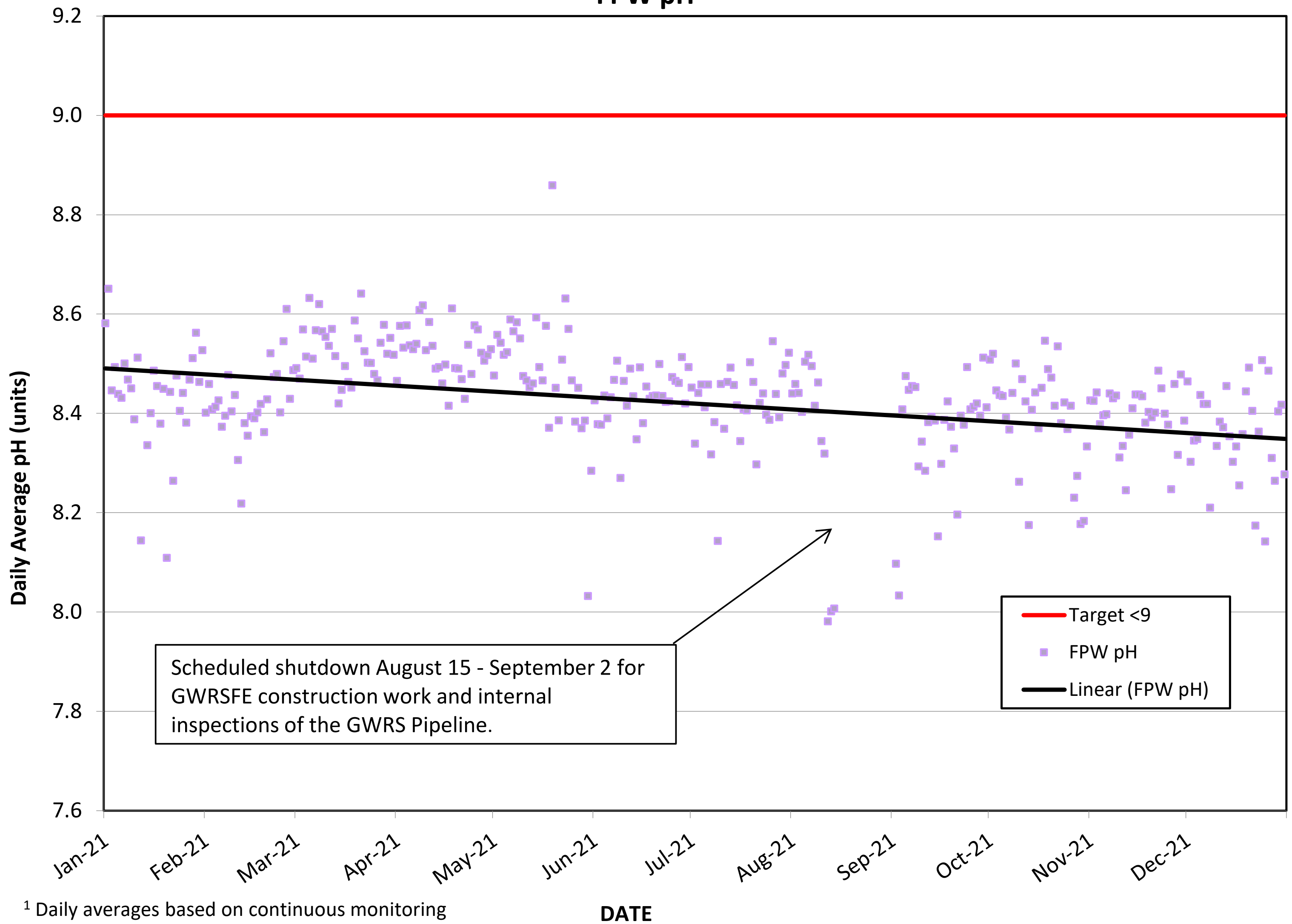
[1] Daily averages based on continuous monitoring of all units

Figure E-13
UV/AOP CALCULATED UV DOSAGE PER TRAIN[1]



[1] Daily averages based on continuous monitoring of all units

Figure E-14
FPW pH[1]



[1] Daily averages based on continuous monitoring

Appendix F

Pathogenic Microorganism Reduction Reports

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
01/01/21	12.35	12.35	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/02/21	12.37	12.37	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/03/21	12.31	12.31	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/04/21	12.32	12.32	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/05/21	12.29	12.29	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/06/21	12.36	12.36	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/07/21	12.33	12.33	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/08/21	12.33	12.33	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/09/21	12.37	12.37	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/10/21	12.35	12.35	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/11/21	12.32	12.32	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/12/21	12.23	12.23	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/13/21	12.27	12.27	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/14/21	12.31	12.31	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/15/21	12.31	12.31	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/16/21	12.29	12.29	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/17/21	12.31	12.31	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/18/21	12.29	12.29	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/19/21	12.26	12.26	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/20/21	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/21/21	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/22/21	12.37	12.37	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/23/21	12.34	12.34	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/24/21	12.35	12.35	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/25/21	12.39	12.39	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/26/21	12.34	12.34	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/27/21	12.33	12.33	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/28/21	12.35	12.35	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/29/21	12.43	12.43	12.35	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/30/21	12.40	12.40	12.34	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/31/21	12.45	12.45	12.37	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/21	0.00	4.21	2.14	6.00	0.00	12.35
01/02/21	0.00	4.23	2.15	6.00	0.00	12.37
01/03/21	0.00	4.15	2.16	6.00	0.00	12.31
01/04/21	0.00	4.16	2.15	6.00	0.00	12.32
01/05/21	0.00	4.15	2.14	6.00	0.00	12.29
01/06/21	0.00	4.15	2.21	6.00	0.00	12.36
01/07/21	0.00	4.12	2.21	6.00	0.00	12.33
01/08/21	0.00	4.11	2.22	6.00	0.00	12.33
01/09/21	0.00	4.16	2.21	6.00	0.00	12.37
01/10/21	0.00	4.13	2.22	6.00	0.00	12.35
01/11/21	0.00	4.09	2.23	6.00	0.00	12.32
01/12/21	0.00	4.08	2.15	6.00	0.00	12.23
01/13/21	0.00	4.12	2.16	6.00	0.00	12.27
01/14/21	0.00	4.10	2.21	6.00	0.00	12.31
01/15/21	0.00	4.09	2.22	6.00	0.00	12.31
01/16/21	0.00	4.06	2.23	6.00	0.00	12.29
01/17/21	0.00	4.06	2.25	6.00	0.00	12.31
01/18/21	0.00	4.03	2.26	6.00	0.00	12.29
01/19/21	0.00	4.03	2.23	6.00	0.00	12.26
01/20/21	0.00	4.01	2.22	6.00	0.00	12.23
01/21/21	0.00	4.02	2.19	6.00	0.00	12.21
01/22/21	0.00	4.18	2.19	6.00	0.00	12.37
01/23/21	0.00	4.12	2.21	6.00	0.00	12.34
01/24/21	0.00	4.10	2.26	6.00	0.00	12.35
01/25/21	0.00	4.13	2.26	6.00	0.00	12.39
01/26/21	0.00	4.13	2.21	6.00	0.00	12.34
01/27/21	0.00	4.12	2.21	6.00	0.00	12.33
01/28/21	0.00	4.08	2.27	6.00	0.00	12.35
01/29/21	0.00	4.08	2.35	6.00	0.00	12.43
01/30/21	0.00	4.06	2.34	6.00	0.00	12.40
01/31/21	0.00	4.09	2.37	6.00	0.00	12.45

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/21	0.00	0.00	2.14	6.00	4.00	12.14
01/02/21	0.00	0.00	2.15	6.00	4.00	12.15
01/03/21	0.00	0.00	2.16	6.00	4.00	12.16
01/04/21	0.00	0.00	2.15	6.00	4.00	12.15
01/05/21	0.00	0.00	2.14	6.00	4.00	12.14
01/06/21	0.00	0.00	2.21	6.00	4.00	12.21
01/07/21	0.00	0.00	2.21	6.00	4.00	12.21
01/08/21	0.00	0.00	2.22	6.00	4.00	12.22
01/09/21	0.00	0.00	2.21	6.00	4.00	12.21
01/10/21	0.00	0.00	2.22	6.00	4.00	12.22
01/11/21	0.00	0.00	2.23	6.00	4.00	12.23
01/12/21	0.00	0.00	2.15	6.00	4.00	12.15
01/13/21	0.00	0.00	2.16	6.00	4.00	12.16
01/14/21	0.00	0.00	2.21	6.00	4.00	12.21
01/15/21	0.00	0.00	2.22	6.00	4.00	12.22
01/16/21	0.00	0.00	2.23	6.00	4.00	12.23
01/17/21	0.00	0.00	2.25	6.00	4.00	12.25
01/18/21	0.00	0.00	2.26	6.00	4.00	12.26
01/19/21	0.00	0.00	2.23	6.00	4.00	12.23
01/20/21	0.00	0.00	2.22	6.00	4.00	12.22
01/21/21	0.00	0.00	2.19	6.00	4.00	12.19
01/22/21	0.00	0.00	2.19	6.00	4.00	12.19
01/23/21	0.00	0.00	2.21	6.00	4.00	12.21
01/24/21	0.00	0.00	2.26	6.00	4.00	12.26
01/25/21	0.00	0.00	2.26	6.00	4.00	12.26
01/26/21	0.00	0.00	2.21	6.00	4.00	12.21
01/27/21	0.00	0.00	2.21	6.00	4.00	12.21
01/28/21	0.00	0.00	2.27	6.00	4.00	12.27
01/29/21	0.00	0.00	2.35	6.00	4.00	12.35
01/30/21	0.00	0.00	2.34	6.00	4.00	12.34
01/31/21	0.00	0.00	2.37	6.00	4.00	12.37

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
01/01/21	4.60	4.59	4.58	4.21	4.38	4.43	4.61	4.27	4.29	4.26	4.53	4.68	4.61	4.30	4.31	4.37
01/02/21	4.56	4.65	4.58	4.24	4.38	4.42	4.57	4.23	4.26	4.30	4.49	4.65	4.61	4.29	4.30	4.37
01/03/21	4.55	4.60	4.46	4.15	4.31	4.40	4.61	4.22	4.45	4.50	4.50	4.65	4.57	4.26	4.29	4.39
01/04/21	4.60	4.67	4.50	4.21	4.32	4.42	4.56	4.23	4.56	4.55	4.49	4.65	4.49	4.27	4.29	4.39
01/05/21	4.58	4.66	4.48	4.18	4.29	4.43	4.52	4.30	4.47	4.55	4.50	4.64	4.48	4.27	4.27	4.39
01/06/21	4.55	4.62	4.45	4.34	4.28	4.43	4.50	4.29	4.50	4.54	4.46	4.62	4.51	4.22	4.25	4.39
01/07/21	4.44	4.59	4.45	4.39	4.28	4.41	4.51	4.27	4.49	4.50	4.44	4.57	4.49	4.20	4.21	4.35
01/08/21	4.42	4.55	4.42	4.34	4.25	4.37	4.52	4.29	4.45	4.49	4.43	4.60	4.46	4.18	4.20	4.32
01/09/21	4.50	4.54	4.40	4.33	4.24	4.39	4.52	4.30	4.47	4.46	4.42	4.57	4.43	4.16	4.20	4.31
01/10/21	4.38	4.46	4.28	4.36	4.20	4.30	4.47	4.27	4.45	4.42	4.37	4.49	4.45	4.13	4.15	4.30
01/11/21	4.42	4.46	4.30	4.31	4.45	4.30	4.46	4.29	4.44	4.42	4.58	4.47	4.42	4.09	4.12	4.28
01/12/21	4.29	4.46	4.28	4.16	4.47	4.27	4.44	4.22	4.37	4.39	4.66	4.47	4.41	4.08	4.32	4.27
01/13/21	4.42	4.49	4.33	4.27	4.48	4.36	4.50	4.30	4.44	4.44	4.68	4.48	4.44	4.14	4.43	4.29
01/14/21	4.41	4.40	4.33	4.25	4.40	4.31	4.44	4.34	4.35	4.36	4.61	4.76	4.38	4.10	4.37	4.25
01/15/21	4.36	4.34	4.34	4.17	4.42	4.27	4.42	4.39	4.38	4.37	4.61	4.76	4.34	4.28	4.34	4.21
01/16/21	4.33	4.65	4.52	4.16	4.45	4.18	4.39	4.49	4.33	4.36	4.57	4.69	4.31	4.36	4.35	4.16
01/17/21	4.31	4.70	4.53	4.28	4.43	4.22	4.37	4.47	4.32	4.35	4.58	4.70	4.31	4.31	4.34	4.15
01/18/21	4.59	4.72	4.50	4.34	4.41	4.16	4.33	4.40	4.30	4.34	4.59	4.66	4.31	4.30	4.34	4.14
01/19/21	4.60	4.67	4.46	4.33	4.40	4.20	4.54	4.42	4.26	4.29	4.55	4.63	4.30	4.27	4.31	4.12
01/20/21	4.56	4.62	4.50	4.28	4.38	4.18	4.58	4.38	4.22	4.25	4.49	4.59	4.26	4.22	4.29	4.28
01/21/21	4.48	4.62	4.48	4.27	4.37	4.46	4.55	4.41	4.19	4.31	4.52	4.56	4.26	4.24	4.28	4.44
01/22/21	4.47	4.60	4.41	4.20	4.31	4.45	4.51	4.40	4.44	4.33	4.52	4.56	4.25	4.21	4.25	4.38
01/23/21	4.44	4.52	4.45	4.12	4.35	4.42	4.52	4.35	4.49	4.28	4.49	4.56	4.50	4.19	4.25	4.34
01/24/21	4.44	4.52	4.43	4.10	4.34	4.40	4.54	4.33	4.51	4.28	4.45	4.55	4.55	4.18	4.26	4.38
01/25/21	4.52	4.57	4.41	4.21	4.34	4.40	4.54	4.46	4.43	4.58	4.44	4.56	4.52	4.14	4.23	4.36
01/26/21	4.43	4.55	4.34	4.16	4.30	4.41	4.44	4.42	4.42	4.52	4.39	4.50	4.52	4.13	4.16	4.32
01/27/21	4.38	4.47	4.37	4.13	4.25	4.34	4.51	4.39	4.46	4.55	4.35	4.51	4.48	4.12	4.18	4.34
01/28/21	4.49	4.46	4.38	4.08	4.19	4.37	4.52	4.33	4.46	4.55	4.31	4.50	4.42	4.11	4.16	4.30
01/29/21	4.47	4.39	4.39	4.24	4.54	4.36	4.48	4.30	4.44	4.54	4.56	4.81	4.43	4.30	4.15	4.24
01/30/21	4.45	4.46	4.49	4.22	4.46	4.36	4.45	4.36	4.41	4.52	4.58	4.75	4.39	4.31	4.16	4.26
01/31/21	4.40	4.46	4.49	4.25	4.45	4.32	4.44	4.37	4.40	4.44	4.57	4.64	4.42	4.22	4.13	4.27

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
01/01/21	4.30	5.24	5.36	4.83	4.42	4.37	4.23	4.36	4.43	4.38	4.48	4.34	4.34	4.33	4.36	4.37
01/02/21	4.42	5.24	5.38	4.87	4.40	4.42	4.23	4.39	4.43	4.35	4.49	4.33	4.50	4.34	4.38	4.38
01/03/21	4.41	5.37	5.46	4.88	4.39	4.40	4.19	4.39	4.41	4.32	4.46	4.30	4.66	4.29	4.36	4.33
01/04/21	4.40	5.40	5.39	4.84	4.35	4.34	4.16	4.33	4.36	4.31	4.47	4.29	4.70	4.32	4.32	4.31
01/05/21	4.37	5.37	5.36	4.82	4.34	4.29	4.15	4.31	4.34	4.32	4.45	4.28	4.67	4.28	4.35	4.28
01/06/21	4.33	5.35	5.35	4.85	4.32	4.26	4.15	4.30	4.34	4.29	4.41	4.25	4.61	4.28	4.37	4.28
01/07/21	4.33	5.29	5.31	4.84	4.25	4.23	4.12	4.26	4.33	4.23	4.41	4.26	4.61	4.29	4.34	4.25
01/08/21	4.33	5.29	5.32	4.86	4.24	4.24	4.11	4.26	4.34	4.24	4.43	4.25	4.57	4.24	4.30	4.25
01/09/21	4.34	5.32	5.34	4.88	4.25	4.26	4.38	4.25	4.30	4.26	4.40	4.22	4.57	4.25	4.26	4.22
01/10/21	4.30	5.31	5.30	4.91	4.22	4.24	4.47	4.21	4.28	4.18	4.38	4.19	4.53	4.24	4.27	4.33
01/11/21	4.21	5.28	5.31	4.91	4.21	4.19	4.40	4.17	4.23	4.15	4.34	4.17	4.49	4.21	4.21	4.47
01/12/21	4.25	5.37	5.36	4.89	4.20	4.19	4.40	4.13	4.17	4.27	4.31	4.10	4.53	4.24	4.26	4.49
01/13/21	4.31	5.35	5.37	4.88	4.22	4.26	4.48	4.19	4.25	4.28	4.37	4.12	4.62	4.27	4.33	4.60
01/14/21	4.24	5.27	5.32	4.89	4.19	4.18	4.43	4.15	4.39	4.34	4.28	4.14	4.55	4.20	4.36	4.56
01/15/21	4.17	5.20	5.23	4.92	4.12	4.09	4.31	4.11	4.49	4.42	4.24	4.26	4.48	4.17	4.21	4.48
01/16/21	4.11	5.19	5.21	4.88	4.11	4.06	4.27	4.10	4.43	4.40	4.26	4.43	4.46	4.13	4.23	4.43
01/17/21	4.11	5.20	5.19	4.88	4.10	4.23	4.25	4.06	4.41	4.37	4.22	4.38	4.42	4.18	4.13	4.35
01/18/21	4.14	5.15	5.18	4.91	4.08	4.37	4.24	4.03	4.44	4.38	4.19	4.33	4.34	4.15	4.12	4.36
01/19/21	n/a *	5.12	5.11	4.88	4.06	4.32	4.24	4.03	4.43	4.36	4.34	4.35	4.42	4.08	4.11	4.34
01/20/21	n/a *	5.08	5.09	4.83	4.05	4.25	4.22	4.01	4.38	4.33	4.54	4.35	4.45	4.03	4.09	4.33
01/21/21	n/a *	5.10	5.12	4.84	4.23	4.25	4.20	4.13	4.40	4.34	4.48	4.35	4.68	4.02	4.23	4.33
01/22/21	5.02	5.14	5.24	4.85	4.34	4.21	4.18	4.37	4.40	4.35	4.48	4.30	4.79	4.26	4.42	4.33
01/23/21	5.43	5.13	5.40	4.84	4.30	4.17	4.18	4.33	4.37	4.30	4.44	4.26	4.74	4.35	4.33	4.32
01/24/21	5.33	5.07	5.40	4.80	4.28	4.18	4.16	4.33	4.32	4.29	4.43	4.29	4.84	4.29	4.35	4.31
01/25/21	5.37	5.14	5.35	4.74	4.25	4.13	4.14	4.37	4.30	4.20	4.42	4.25	4.66	4.28	4.29	4.25
01/26/21	5.35	5.29	5.29	4.71	4.26	4.13	4.13	n/a *	4.28	4.16	4.40	4.18	4.55	4.32	4.29	4.15
01/27/21	5.27	5.28	5.32	4.75	4.21	4.15	4.13	n/a *	4.24	4.17	4.38	4.17	4.70	4.28	4.27	4.19
01/28/21	5.25	5.26	5.32	4.85	4.17	4.14	4.12	n/a *	4.25	4.10	4.37	4.21	4.67	4.25	4.29	4.28
01/29/21	5.26	5.22	5.28	4.89	4.08	4.09	4.10	5.15	4.24	4.20	4.33	4.21	4.60	4.29	4.23	4.46
01/30/21	5.26	5.24	5.29	4.98	4.15	4.06	4.41	5.42	4.21	4.33	4.35	4.18	4.62	4.25	4.30	4.41
01/31/21	5.24	5.25	5.23	5.10	4.15	4.09	4.42	5.38	4.38	4.33	4.34	4.14	4.60	4.20	4.29	4.39

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for membrane changeout.

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
01/01/21	4.34	4.37	4.39	4.64
01/02/21	4.35	4.34	4.41	4.76
01/03/21	4.35	4.37	4.41	4.73
01/04/21	4.38	4.33	4.27	4.68
01/05/21	4.41	4.27	4.39	4.80
01/06/21	4.40	4.31	4.39	4.67
01/07/21	4.47	4.25	4.30	4.63
01/08/21	4.38	4.24	4.31	4.84
01/09/21	4.39	4.20	4.28	4.58
01/10/21	4.39	4.19	4.30	4.62
01/11/21	4.38	4.12	4.29	4.64
01/12/21	4.37	4.12	4.30	4.59
01/13/21	4.41	4.16	4.29	4.72
01/14/21	4.42	4.29	4.33	4.88
01/15/21	4.30	4.53	4.24	4.57
01/16/21	4.31	4.39	4.18	4.66
01/17/21	4.28	4.41	4.30	4.81
01/18/21	4.23	4.38	4.32	4.68
01/19/21	4.23	4.32	4.45	4.44
01/20/21	4.33	4.31	4.54	4.58
01/21/21	4.34	4.34	4.25	4.55
01/22/21	4.35	4.34	4.37	4.60
01/23/21	4.28	4.33	4.44	4.72
01/24/21	4.33	4.30	4.32	4.67
01/25/21	4.34	4.27	4.36	4.55
01/26/21	4.37	4.21	4.56	4.57
01/27/21	4.29	4.20	4.53	4.62
01/28/21	4.20	4.09	4.38	4.61
01/29/21	4.24	4.14	4.38	4.68
01/30/21	4.32	4.16	4.46	4.53
01/31/21	4.30	4.21	4.35	4.51

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
Date	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
01/01/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.06	0.05	0.06	0.02	0.03	0.02	0.03	0.04	0.04	0.03
01/02/21	0.02	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.02	0.03	0.05	0.08	0.03	0.03	0.02	0.03	0.04	0.05	0.03
01/03/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.06	0.03	0.03	0.02	0.02	0.05	0.05	0.03
01/04/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.05	0.06	0.03
01/05/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.05	0.06	0.03	0.03	0.02	0.02	0.06	0.06	0.03
01/06/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.05	0.07	0.03	0.05	0.02	0.03	0.06	0.07	0.03
01/07/21	0.02	0.03	0.02	0.02	0.02	0.05	0.03	0.03	0.02	0.03	0.05	0.05	0.03	0.04	0.02	0.02	0.07	0.07	0.03
01/08/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.05	0.07	0.03	0.03	0.02	0.02	0.07	0.08	0.03
01/09/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.05	0.06	0.03	0.05	0.02	0.03	0.08	0.09	0.03
01/10/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.05	0.05	0.03	0.03	0.02	0.03	0.09	0.09	0.03
01/11/21	0.03	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.02	0.03	0.05	0.06	0.03	0.03	0.02	0.03	0.10	0.10	0.04
01/12/21	0.03	0.03	0.02	0.05	0.02	0.06	0.03	0.05	0.03	0.13	0.05	0.07	0.03	0.06	0.02	0.04	0.11	0.13	0.04
01/13/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.06	0.05	0.06	0.03	0.03	0.02	0.03	0.11	0.12	0.04
01/14/21	0.03	0.03	0.02	0.02	0.02	0.04	0.03	0.04	0.02	0.03	0.05	0.06	0.03	0.04	0.02	0.03	0.07	0.12	0.03
01/15/21	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.02	0.03	0.02	0.03	0.03
01/16/21	0.03	0.04	0.02	0.03	0.02	0.02	0.03	0.05	0.02	0.03	0.04	0.04	0.03	0.03	0.02	0.03	0.03	0.05	0.03
01/17/21	0.03	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.05	0.04	0.04	0.03	0.05	0.02	0.03	0.03	0.03	0.03
01/18/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.02	0.03	0.03	0.03	0.03
01/19/21	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.02	0.03	0.03	0.04	0.03
01/20/21	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.10	0.02	0.04	0.04	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03
01/21/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.16	0.02	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.03	0.04	0.03
01/22/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.07	0.04	0.05	0.03	0.03	0.02	0.03	0.03	0.04	0.03
01/23/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.02	0.03	0.04	0.06	0.03
01/24/21	0.02	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.04	0.06	0.03
01/25/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.02	0.03	0.04	0.05	0.03
01/26/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.06	0.03	0.03	0.02	0.02	0.05	0.05	0.03
01/27/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.05	0.04	0.04	0.03	0.03	0.02	0.03	0.05	0.05	0.03
01/28/21	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.05	0.02	0.03	0.05	0.06	0.03
01/29/21	0.02	0.03	0.02	0.04	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.07	0.03	0.04	0.02	0.02	0.04	0.06	0.03
01/30/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.03
01/31/21	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																		
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
01/01/21	0.025	0.025	8.276	7.419	9.724	0.060	0.055	0.079	1,612	1,539	1,680	24	22	27	99.27	2.14	98.50	1.82
01/02/21	0.025	0.025	8.322	7.315	9.914	0.059	0.050	0.079	1,555	1,483	1,624	24	21	32	99.29	2.15	98.43	1.80
01/03/21	0.025	0.025	8.783	7.713	10.082	0.061	0.055	0.081	1,557	1,473	1,676	24	21	27	99.30	2.16	98.47	1.82
01/04/21	0.025	0.025	9.045	7.918	10.382	0.063	0.051	0.081	1,608	1,516	1,723	24	21	28	99.30	2.15	98.50	1.82
01/05/21	0.025	0.025	9.156	7.726	10.579	0.067	0.054	0.080	1,683	1,583	1,849	25	22	30	99.27	2.14	98.50	1.82
01/06/21	0.025	0.025	8.921	7.885	10.280	0.055	0.052	0.069	1,733	1,657	1,803	26	24	31	99.38	2.21	98.48	1.82
01/07/21	0.025	0.025	8.775	7.878	10.082	0.054	0.047	0.060	1,726	1,657	1,834	26	23	30	99.38	2.21	98.52	1.83
01/08/21	0.025	0.025	8.794	7.883	10.177	0.053	0.048	0.064	1,709	1,632	1,807	26	23	31	99.40	2.22	98.49	1.82
01/09/21	0.025	0.025	8.766	7.637	10.280	0.054	0.049	0.082	1,692	1,637	1,763	26	23	29	99.38	2.21	98.48	1.82
01/10/21	0.025	0.025	8.956	7.576	10.280	0.054	0.044	0.080	1,627	1,559	1,703	25	22	28	99.40	2.22	98.47	1.82
01/11/21	0.025	0.025	8.398	6.870	10.177	0.050	0.044	0.064	1,592	1,511	1,702	24	22	27	99.40	2.23	98.49	1.82
01/12/21	0.029	0.031	8.428	7.210	9.503	0.060	0.049	0.074	1,702	1,595	1,835	28	23	45	99.29	2.15	98.34	1.78
01/13/21	0.026	0.028	8.699	7.807	9.700	0.061	0.047	0.097	1,716	1,640	1,809	28	25	46	99.30	2.16	98.37	1.79
01/14/21	0.025	0.025	8.900	7.823	9.834	0.055	0.051	0.062	1,737	1,666	1,831	26	24	30	99.38	2.21	98.49	1.82
01/15/21	0.025	0.025	8.598	7.507	9.983	0.051	0.047	0.062	1,732	1,644	1,830	26	23	31	99.40	2.22	98.50	1.82
01/16/21	0.025	0.025	8.735	7.697	9.963	0.052	0.044	0.062	1,749	1,692	1,842	27	25	32	99.40	2.23	98.43	1.80
01/17/21	0.025	0.025	8.756	7.578	9.950	0.049	0.047	0.054	1,662	1,582	1,731	26	24	29	99.44	2.25	98.42	1.80
01/18/21	0.025	0.025	8.982	7.699	10.381	0.050	0.045	0.056	1,616	1,534	1,697	25	23	30	99.44	2.26	98.42	1.80
01/19/21	0.025	0.025	9.193	8.093	10.381	0.054	0.047	0.058	1,670	1,577	1,805	27	24	30	99.42	2.23	98.41	1.80
01/20/21	0.025	0.025	8.798	7.888	10.080	0.053	0.049	0.067	1,758	1,677	1,870	28	23	33	99.40	2.22	98.42	1.80
01/21/21	0.026	0.033	8.928	7.907	10.080	0.058	0.046	0.079	1,724	1,647	1,808	30	25	83	99.35	2.19	98.29	1.77
01/22/21	0.025	0.026	8.805	7.682	9.915	0.056	0.052	0.064	1,725	1,668	1,797	27	25	30	99.36	2.19	98.43	1.80
01/23/21	0.025	0.025	8.756	7.516	9.943	0.054	0.049	0.064	1,706	1,652	1,783	26	24	28	99.39	2.21	98.47	1.81
01/24/21	0.025	0.025	8.612	7.407	10.081	0.048	0.040	0.054	1,622	1,550	1,689	24	22	27	99.44	2.26	98.51	1.83
01/25/21	0.025	0.025	8.911	7.789	9.857	0.049	0.038	0.055	1,587	1,500	1,684	23	21	26	99.45	2.26	98.54	1.84
01/26/21	0.025	0.025	8.885	7.633	9.964	0.054	0.047	0.065	1,683	1,585	1,830	25	22	29	99.39	2.21	98.53	1.83
01/27/21	0.025	0.025	8.880	7.503	10.176	0.055	0.051	0.064	1,723	1,626	1,833	26	23	30	99.38	2.21	98.51	1.83
01/28/21	0.025	0.025	8.982	7.645	10.082	0.049	0.037	0.062	1,720	1,628	1,834	26	23	32	99.46	2.27	98.50	1.82
01/29/21	0.025	0.030	8.689	7.906	9.753	0.039	0.026	0.047	1,630	1,539	1,753	27	21	32	99.55	2.35	98.37	1.79
01/30/21	0.025	0.025	8.858	7.511	10.177	0.040	0.034	0.046	1,663	1,598	1,765	31	28	37	99.54	2.34	98.11	1.72
01/31/21	0.025	0.025	9.039	7.960	10.382	0.039	0.033	0.046	1,629	1,561	1,690	31	28	38	99.57	2.37	98.08	1.72

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
01/01/21	97.64	87.095	24,047.3	0.26	3.0	6
01/02/21	97.62	87.206	22,808.3	0.26	3.0	6
01/03/21	97.56	91.322	22,723.3	0.26	3.0	6
01/04/21	97.32	93.948	23,014.0	0.25	3.0	6
01/05/21	97.39	94.159	23,468.5	0.25	3.0	6
01/06/21	97.54	93.258	23,472.5	0.25	3.0	6
01/07/21	97.56	94.003	23,809.6	0.25	3.0	6
01/08/21	97.62	93.733	23,874.1	0.26	3.0	6
01/09/21	97.58	91.632	23,392.7	0.25	3.0	6
01/10/21	97.52	91.043	23,209.4	0.25	3.0	6
01/11/21	97.45	93.747	23,469.6	0.25	3.0	6
01/12/21	97.80	54.366	20,572.3	0.26	3.0	6
01/13/21	98.10	65.225	13,998.8	0.28	3.0	6
01/14/21	97.53	91.142	17,172.4	0.27	3.0	6
01/15/21	97.71	92.575	23,414.2	0.26	3.0	6
01/16/21	97.76	91.549	23,409.8	0.25	3.0	6
01/17/21	97.76	92.483	23,342.8	0.25	3.0	6
01/18/21	97.91	91.548	23,267.9	0.25	3.0	6
01/19/21	97.44	90.449	23,310.4	0.26	3.0	6
01/20/21	97.44	90.169	23,516.9	0.26	3.0	6
01/21/21	97.69	79.657	23,526.2	0.26	3.0	6
01/22/21	97.51	91.720	21,649.0	0.26	3.0	6
01/23/21	97.73	90.986	23,538.3	0.25	3.0	6
01/24/21	97.51	90.834	23,217.9	0.26	3.0	6
01/25/21	97.24	94.804	23,421.1	0.26	3.0	6
01/26/21	96.99	93.916	23,607.8	0.25	3.0	6
01/27/21	97.31	92.569	23,950.1	0.25	3.0	6
01/28/21	97.65	87.272	23,754.3	0.26	3.0	6
01/29/21	97.67	89.983	22,652.4	0.26	3.0	6
01/30/21	97.43	91.698	23,350.5	0.26	3.0	6
01/31/21	97.13	92.809	23,700.8	0.26	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
02/01/21	12.39	12.39	12.33	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/02/21	12.30	12.30	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/03/21	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/04/21	12.33	12.33	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/05/21	12.30	12.30	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/06/21	12.31	12.31	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/07/21	12.32	12.32	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/08/21	12.33	12.33	12.31	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/09/21	12.34	12.34	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/10/21	12.37	12.37	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/11/21	12.34	12.34	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/12/21	12.31	12.31	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/13/21	12.37	12.37	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/14/21	12.41	12.41	12.34	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/15/21	12.40	12.40	12.35	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/16/21	12.22	12.22	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/17/21	12.32	12.32	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/18/21	12.37	12.37	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/19/21	12.35	12.35	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/20/21	12.37	12.37	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/21/21	12.41	12.41	12.35	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/22/21	12.40	12.40	12.35	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/23/21	12.33	12.33	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/24/21	12.35	12.35	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/25/21	12.29	12.29	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/26/21	12.30	12.30	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/27/21	12.33	12.33	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/28/21	12.37	12.37	12.31	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/21	0.00	4.06	2.33	6.00	0.00	12.39
02/02/21	0.00	4.03	2.27	6.00	0.00	12.30
02/03/21	0.00	4.01	2.25	6.00	0.00	12.26
02/04/21	0.00	4.07	2.26	6.00	0.00	12.33
02/05/21	0.00	4.04	2.26	6.00	0.00	12.30
02/06/21	0.00	4.04	2.27	6.00	0.00	12.31
02/07/21	0.00	4.02	2.30	6.00	0.00	12.32
02/08/21	0.00	4.02	2.31	6.00	0.00	12.33
02/09/21	0.00	4.05	2.28	6.00	0.00	12.34
02/10/21	0.00	4.10	2.26	6.00	0.00	12.37
02/11/21	0.00	4.09	2.25	6.00	0.00	12.34
02/12/21	0.00	4.08	2.23	6.00	0.00	12.31
02/13/21	0.00	4.08	2.29	6.00	0.00	12.37
02/14/21	0.00	4.07	2.34	6.00	0.00	12.41
02/15/21	0.00	4.06	2.35	6.00	0.00	12.40
02/16/21	0.00	4.05	2.17	6.00	0.00	12.22
02/17/21	0.00	4.06	2.27	6.00	0.00	12.32
02/18/21	0.00	4.08	2.29	6.00	0.00	12.37
02/19/21	0.00	4.08	2.28	6.00	0.00	12.35
02/20/21	0.00	4.07	2.29	6.00	0.00	12.37
02/21/21	0.00	4.06	2.35	6.00	0.00	12.41
02/22/21	0.00	4.05	2.35	6.00	0.00	12.40
02/23/21	0.00	4.04	2.29	6.00	0.00	12.33
02/24/21	0.00	4.06	2.29	6.00	0.00	12.35
02/25/21	0.00	4.03	2.27	6.00	0.00	12.29
02/26/21	0.00	4.03	2.27	6.00	0.00	12.30
02/27/21	0.00	4.06	2.27	6.00	0.00	12.33
02/28/21	0.00	4.06	2.31	6.00	0.00	12.37

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/21	0.00	0.00	2.33	6.00	4.00	12.33
02/02/21	0.00	0.00	2.27	6.00	4.00	12.27
02/03/21	0.00	0.00	2.25	6.00	4.00	12.25
02/04/21	0.00	0.00	2.26	6.00	4.00	12.26
02/05/21	0.00	0.00	2.26	6.00	4.00	12.26
02/06/21	0.00	0.00	2.27	6.00	4.00	12.27
02/07/21	0.00	0.00	2.30	6.00	4.00	12.30
02/08/21	0.00	0.00	2.31	6.00	4.00	12.31
02/09/21	0.00	0.00	2.28	6.00	4.00	12.28
02/10/21	0.00	0.00	2.26	6.00	4.00	12.26
02/11/21	0.00	0.00	2.25	6.00	4.00	12.25
02/12/21	0.00	0.00	2.23	6.00	4.00	12.23
02/13/21	0.00	0.00	2.29	6.00	4.00	12.29
02/14/21	0.00	0.00	2.34	6.00	4.00	12.34
02/15/21	0.00	0.00	2.35	6.00	4.00	12.35
02/16/21	0.00	0.00	2.17	6.00	4.00	12.17
02/17/21	0.00	0.00	2.27	6.00	4.00	12.27
02/18/21	0.00	0.00	2.29	6.00	4.00	12.29
02/19/21	0.00	0.00	2.28	6.00	4.00	12.28
02/20/21	0.00	0.00	2.29	6.00	4.00	12.29
02/21/21	0.00	0.00	2.35	6.00	4.00	12.35
02/22/21	0.00	0.00	2.35	6.00	4.00	12.35
02/23/21	0.00	0.00	2.29	6.00	4.00	12.29
02/24/21	0.00	0.00	2.29	6.00	4.00	12.29
02/25/21	0.00	0.00	2.27	6.00	4.00	12.27
02/26/21	0.00	0.00	2.27	6.00	4.00	12.27
02/27/21	0.00	0.00	2.27	6.00	4.00	12.27
02/28/21	0.00	0.00	2.31	6.00	4.00	12.31

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	**A02**	**A03**	**A04**	**A05**	**A06**	**A07**	**A08**	**B01**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
02/01/21	4.40	4.44	4.49	4.25	4.42	4.32	4.44	4.39	4.38	4.46	4.55	4.67	4.42	4.21	4.13	4.22
02/02/21	4.39	4.42	4.51	4.24	4.42	4.30	4.42	4.38	4.29	4.49	4.53	4.66	4.41	4.18	4.29	4.21
02/03/21	4.34	4.67	4.49	4.20	4.38	4.30	4.42	4.38	4.26	4.49	4.53	4.65	4.40	4.15	4.36	4.22
02/04/21	4.61	4.68	4.41	4.07	4.37	4.23	4.32	4.42	4.31	4.31	4.63	4.57	4.33	4.19	4.28	4.14
02/05/21	4.55	4.62	4.39	4.07	4.30	4.24	4.26	4.40	4.31	4.39	4.64	4.51	4.33	4.16	4.27	4.11
02/06/21	4.56	4.64	4.40	4.05	4.29	4.25	4.67	4.39	4.23	4.38	4.60	4.53	4.33	4.18	4.31	4.13
02/07/21	4.54	4.66	4.36	4.14	4.30	4.24	4.70	4.39	4.20	4.37	4.58	4.54	4.32	4.19	4.31	4.14
02/08/21	4.52	4.50	4.31	4.14	4.35	4.22	4.53	4.36	4.20	4.38	4.49	4.48	4.28	4.16	4.25	4.23
02/09/21	4.52	4.45	4.39	4.12	4.32	4.49	4.53	4.35	4.21	4.33	4.49	4.47	4.29	4.12	4.19	4.28
02/10/21	4.44	4.56	4.38	4.10	4.33	4.43	4.54	4.36	4.45	4.34	4.52	4.47	4.52	4.11	4.18	4.33
02/11/21	4.36	4.52	4.37	4.09	4.25	4.42	4.54	4.36	4.52	4.34	4.53	4.47	4.63	4.11	4.20	4.37
02/12/21	4.45	4.52	4.30	4.18	4.29	4.37	4.44	4.39	4.47	4.27	4.41	4.46	4.43	4.28	4.22	4.32
02/13/21	4.46	4.50	4.29	4.22	4.30	4.39	4.48	4.43	4.46	4.46	4.42	4.46	4.38	4.24	4.21	4.28
02/14/21	4.28	4.37	4.27	4.09	4.20	4.38	4.42	4.41	4.40	4.49	4.37	4.42	4.38	4.22	4.19	4.23
02/15/21	4.42	4.47	4.32	4.22	4.26	4.38	4.40	4.41	4.39	4.48	4.36	4.41	4.38	4.24	4.17	4.17
02/16/21	4.25	4.42	4.29	4.20	4.24	4.25	4.41	4.43	4.30	4.42	4.34	4.37	4.34	4.23	4.15	4.24
02/17/21	4.38	4.40	4.49	4.12	4.33	4.23	4.41	4.42	4.24	4.48	4.33	4.62	4.34	4.18	4.13	4.25
02/18/21	4.33	4.36	4.51	4.08	4.35	4.17	4.38	4.38	4.26	4.38	4.27	4.58	4.35	4.11	4.12	4.18
02/19/21	4.33	4.35	4.42	4.10	4.33	4.14	4.37	4.38	4.27	4.35	4.25	4.54	4.35	4.15	4.12	4.14
02/20/21	4.31	4.32	4.43	4.11	4.32	4.27	4.30	4.33	4.28	4.32	4.24	4.54	4.27	4.15	4.10	4.15
02/21/21	4.31	4.80	4.39	4.11	4.41	4.23	4.36	4.44	4.28	4.36	4.23	4.55	4.25	4.14	4.10	4.15
02/22/21	4.21	4.70	4.36	4.11	4.41	4.16	4.34	4.43	4.27	4.31	4.25	4.59	4.23	4.13	4.30	4.14
02/23/21	4.47	4.67	4.34	4.06	4.40	4.15	4.33	4.43	4.27	4.29	4.26	4.61	4.23	4.13	4.33	4.16
02/24/21	4.55	4.66	4.44	4.06	4.38	4.20	4.35	4.36	4.24	4.28	4.59	4.47	4.18	4.08	4.29	4.12
02/25/21	4.50	4.52	4.37	4.06	4.34	4.17	4.51	4.36	4.17	4.32	4.56	4.48	4.14	4.07	4.28	4.11
02/26/21	4.52	4.56	4.28	4.13	4.31	4.15	4.55	4.34	4.15	4.31	4.49	4.49	4.36	4.03	4.24	4.09
02/27/21	4.52	4.48	4.26	4.17	4.29	4.14	4.55	4.34	4.14	4.30	4.47	4.50	4.46	4.06	4.24	4.26
02/28/21	4.46	4.43	4.34	4.12	4.25	4.44	4.48	4.25	4.16	4.19	4.44	4.48	4.41	4.06	4.24	4.30

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
02/01/21	5.21	5.22	5.21	5.06	4.09	4.06	4.32	5.32	4.46	4.36	4.30	4.07	4.57	4.23	4.18	4.43
02/02/21	5.24	5.21	5.19	4.98	4.09	4.03	4.28	5.23	4.42	4.34	4.27	4.18	4.52	4.18	4.14	4.42
02/03/21	5.25	5.19	5.17	4.95	4.13	4.01	4.29	5.20	4.41	4.28	4.27	4.38	4.41	4.12	4.12	4.39
02/04/21	5.13	5.17	5.19	5.03	4.09	4.28	4.19	5.29	4.36	4.27	4.22	4.30	4.35	4.14	4.08	4.30
02/05/21	5.10	5.16	5.15	4.95	4.04	4.22	4.17	5.28	4.35	4.27	4.20	4.36	4.40	4.09	4.06	4.28
02/06/21	5.15	5.18	5.18	4.98	4.04	4.21	4.23	5.29	4.40	4.22	4.20	4.35	4.40	4.08	4.09	4.25
02/07/21	5.17	5.19	5.21	5.01	4.08	4.21	4.26	5.30	4.41	4.27	4.13	4.34	4.37	4.12	4.02	4.32
02/08/21	5.15	5.09	5.12	4.98	4.02	4.22	4.22	5.22	4.35	4.26	4.45	4.29	4.40	4.08	4.18	4.25
02/09/21	5.13	5.08	5.11	4.95	4.22	4.21	n/a *	5.16	4.25	4.16	4.38	4.30	4.40	4.05	4.41	4.27
02/10/21	5.13	5.11	5.12	4.94	4.29	4.10	n/a *	5.18	4.27	4.13	4.34	4.28	4.61	4.13	4.35	4.22
02/11/21	5.13	5.11	5.13	4.95	4.30	4.13	n/a *	5.20	4.30	4.20	4.40	4.25	4.54	4.28	4.33	4.26
02/12/21	5.30	5.06	5.31	4.94	4.23	4.08	4.87	5.15	4.20	4.09	4.29	4.25	4.52	4.22	4.32	4.15
02/13/21	5.25	5.35	5.31	4.93	4.18	4.08	5.37	5.15	4.20	4.11	4.34	4.21	4.47	4.19	4.33	4.18
02/14/21	5.21	5.37	5.27	4.90	4.17	4.07	5.24	5.18	4.23	4.11	4.38	4.20	4.45	4.21	4.28	4.16
02/15/21	5.20	5.28	5.25	4.89	4.19	4.06	5.38	5.19	4.23	4.11	4.35	4.18	4.69	4.28	4.24	4.15
02/16/21	5.27	5.29	5.32	4.92	4.14	4.09	5.36	5.11	4.20	4.05	4.33	4.13	4.70	4.20	4.21	4.53
02/17/21	5.24	5.26	5.32	4.88	4.13	4.06	5.28	5.30	4.12	4.18	4.28	4.14	4.47	4.19	4.21	4.39
02/18/21	5.17	5.21	5.26	5.00	4.12	4.21	5.22	5.31	4.12	4.36	4.19	4.08	4.37	4.19	4.15	4.41
02/19/21	5.13	5.15	5.24	5.09	4.11	4.33	5.26	5.26	4.08	4.32	4.15	4.10	4.44	4.16	4.08	4.36
02/20/21	5.08	5.12	5.21	5.07	4.08	4.22	5.23	5.27	4.37	4.28	4.16	4.07	4.53	4.16	4.14	4.30
02/21/21	5.13	5.18	5.19	5.08	4.06	4.21	5.23	5.36	4.36	4.26	4.17	4.22	4.47	4.12	4.06	4.34
02/22/21	5.14	5.20	5.19	5.06	4.05	4.20	5.26	5.26	4.38	4.23	4.15	4.39	4.43	4.09	4.08	4.35
02/23/21	5.12	5.15	5.21	5.05	4.04	n/a *	5.27	5.18	4.32	4.26	4.18	4.43	4.44	4.09	4.14	4.26
02/24/21	5.09	5.15	5.13	5.01	4.35	n/a *	5.23	5.18	4.37	4.21	4.09	4.26	4.33	4.06	4.07	4.29
02/25/21	5.02	5.13	5.05	4.96	4.20	n/a *	5.19	5.20	4.37	4.18	4.23	4.23	4.35	4.03	4.06	4.26
02/26/21	5.06	5.08	5.03	4.99	4.10	5.40	5.19	5.18	4.32	4.14	4.47	4.24	4.27	4.30	4.06	4.26
02/27/21	5.11	5.06	5.03	5.01	4.13	5.62	5.24	5.18	4.26	4.11	4.38	4.32	4.29	4.26	4.21	4.24
02/28/21	5.03	5.05	5.01	4.96	4.13	5.33	5.16	5.19	4.33	4.13	4.38	4.23	4.27	4.27	4.37	4.25

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for membrane changeout.

	MicroFiltration Process online monitoring results Log Removal Value															
	E01	**E02**	**E03**	**E04**												
Date	LRV	LRV	LRV	LRV												
02/01/21	4.25	4.33	4.25	4.65												
02/02/21	4.30	4.34	4.32	4.29												
02/03/21	4.44	4.36	4.25	4.44												
02/04/21	4.27	4.31	4.24	4.48												
02/05/21	4.27	4.25	4.19	4.38												
02/06/21	4.37	4.31	4.24	4.57												
02/07/21	4.38	4.31	4.25	4.79												
02/08/21	4.29	4.20	4.38	4.47												
02/09/21	4.21	4.17	5.08	4.56												
02/10/21	4.31	4.19	4.92	4.68												
02/11/21	4.30	4.19	4.71	4.61												
02/12/21	4.34	4.13	4.24	4.48												
02/13/21	4.33	4.16	4.21	4.63												
02/14/21	4.29	4.14	4.17	4.53												
02/15/21	4.34	4.10	4.16	4.47												
02/16/21	4.30	4.09	4.23	4.67												
02/17/21	4.29	4.08	4.37	4.48												
02/18/21	4.24	4.16	4.28	4.47												
02/19/21	4.18	4.36	4.21	4.75												
02/20/21	4.23	4.33	4.25	4.39												
02/21/21	4.38	4.35	4.23	4.49												
02/22/21	4.35	4.33	4.16	4.55												
02/23/21	4.30	4.28	4.18	4.48												
02/24/21	4.28	4.30	4.28	4.53												
02/25/21	4.24	4.23	4.20	4.51												
02/26/21	4.19	4.15	4.44	4.37												
02/27/21	4.19	4.23	4.63	4.40												
02/28/21	4.32	4.17	4.26	4.59												

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
02/01/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.03	0.03	0.03
02/02/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.05	0.04	0.04	0.03	0.04	0.02	0.07	0.03	0.04	0.03
02/03/21	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.07	0.04	0.04	0.03	0.03	0.02	0.02	0.03	0.03	0.03
02/04/21	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.02	0.02	0.03	0.03
02/05/21	0.02	0.03	0.02	0.02	0.02	0.04	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.02	0.02	0.03
02/06/21	0.02	0.03	0.02	0.03	0.02	0.02	0.04	0.04	0.03	0.08	0.04	0.04	0.03	0.03	0.02	0.03	0.02	0.02	0.03
02/07/21	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.03	0.05	0.04	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.03
02/08/21	0.02	0.03	0.02	0.04	0.02	0.02	0.04	0.04	0.03	0.05	0.05	0.11	0.03	0.03	0.02	0.03	0.02	0.02	0.03
02/09/21	0.02	0.03	0.02	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.04	0.03	0.10	0.03
02/10/21	0.02	0.03	0.02	0.03	0.02	0.04	0.04	0.05	0.03	0.06	0.04	0.05	0.03	0.03	0.02	0.03	0.02	0.04	0.03
02/11/21	0.03	0.04	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.03	0.02	0.03	0.03
02/12/21	0.03	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.07	0.03	0.03	0.02	0.03	0.02	0.02	0.03
02/13/21	0.03	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.03	0.07	0.04	0.05	0.03	0.03	0.02	0.03	0.02	0.02	0.03
02/14/21	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.02	0.03	0.02	0.03	0.03
02/15/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.02	0.03	0.03
02/16/21	0.03	0.03	0.02	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.05	0.02	0.03	0.03	0.04	0.03
02/17/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.02	0.03	0.03	0.03	0.03
02/18/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.03	0.04	0.03
02/19/21	0.03	0.03	0.02	0.03	0.02	0.02	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.02	0.03	0.03	0.04	0.03
02/20/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.05	0.04	0.05	0.03	0.03	0.02	0.03	0.04	0.05	0.03
02/21/21	0.03	0.03	0.02	0.03	0.02	0.02	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.02	0.02	0.04	0.05	0.03
02/22/21	0.03	0.04	0.02	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.05	0.06	0.03	0.03	0.02	0.03	0.04	0.04	0.03
02/23/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.03	0.11	0.05	0.05	0.03	0.03	0.02	0.03	0.04	0.05	0.03
02/24/21	0.03	0.05	0.02	0.03	0.02	0.03	0.04	0.05	0.03	0.04	0.05	0.06	0.03	0.04	0.02	0.03	0.05	0.05	0.03
02/25/21	0.03	0.03	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.03	0.05	0.05	0.03	0.03	0.02	0.03	0.05	0.05	0.03
02/26/21	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.12	0.05	0.15	0.03	0.03	0.02	0.04	0.03	0.06	0.03
02/27/21	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.02	0.08	0.04	0.10	0.02	0.03	0.02	0.03	0.02	0.02	0.02
02/28/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.07	0.02	0.03	0.02	0.02	0.02	0.03	0.02

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
Date	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
02/01/21	0.025	0.025	9.221	7.930	10.731	0.043	0.036	0.059	1,615	1,534	1,740	32	28	37	99.53	2.33	98.04	1.71
02/02/21	0.025	0.025	9.351	8.111	10.578	0.050	0.047	0.059	1,706	1,594	1,859	33	28	40	99.46	2.27	98.05	1.71
02/03/21	0.025	0.025	9.184	8.252	10.175	0.051	0.049	0.053	1,743	1,661	1,854	33	30	38	99.44	2.25	98.09	1.72
02/04/21	0.025	0.025	9.000	8.001	10.019	0.049	0.046	0.056	1,731	1,647	1,820	32	28	37	99.45	2.26	98.14	1.73
02/05/21	0.025	0.025	8.905	7.929	10.154	0.049	0.044	0.056	1,719	1,667	1,787	28	22	34	99.45	2.26	98.39	1.79
02/06/21	0.025	0.025	8.769	7.701	9.643	0.047	0.043	0.052	1,726	1,673	1,812	25	23	28	99.46	2.27	98.55	1.84
02/07/21	0.025	0.025	8.836	7.756	9.782	0.044	0.036	0.050	1,659	1,615	1,710	24	22	27	99.50	2.30	98.54	1.84
02/08/21	0.025	0.025	8.992	7.777	10.154	0.044	0.041	0.052	1,609	1,522	1,707	24	22	28	99.51	2.31	98.51	1.83
02/09/21	0.025	0.025	9.308	8.542	10.176	0.048	0.043	0.053	1,705	1,579	1,859	25	22	30	99.48	2.28	98.52	1.83
02/10/21	0.025	0.025	8.981	7.999	9.830	0.049	0.046	0.056	1,726	1,662	1,806	26	22	29	99.45	2.26	98.52	1.83
02/11/21	0.025	0.025	8.713	7.855	9.642	0.049	0.044	0.072	1,706	1,645	1,792	26	23	29	99.44	2.25	98.50	1.82
02/12/21	0.025	0.025	8.482	7.516	9.502	0.050	0.041	0.059	1,694	1,607	1,799	26	22	31	99.41	2.23	98.48	1.82
02/13/21	0.025	0.025	8.387	7.396	9.198	0.043	0.038	0.056	1,674	1,615	1,757	26	24	29	99.49	2.29	98.42	1.80
02/14/21	0.025	0.025	8.262	7.345	9.198	0.038	0.027	0.045	1,604	1,533	1,661	24	21	27	99.54	2.34	98.48	1.82
02/15/21	0.025	0.025	8.332	7.280	9.767	0.038	0.033	0.047	1,567	1,492	1,650	25	23	29	99.55	2.35	98.38	1.79
02/16/21	0.025	0.025	8.869	7.799	9.753	0.060	0.028	0.153*	1,620	1,536	1,746	26	23	30	99.33	2.17	98.38	1.79
02/17/21	0.025	0.025	8.669	7.848	9.460	0.047	0.041	0.071	1,698	1,623	1,798	27	24	31	99.46	2.27	98.40	1.80
02/18/21	0.025	0.025	8.491	7.617	9.464	0.043	0.034	0.055	1,681	1,597	1,767	26	24	30	99.49	2.29	98.44	1.81
02/19/21	0.025	0.025	8.479	7.595	9.464	0.045	0.036	0.056	1,687	1,600	1,784	27	25	31	99.47	2.28	98.38	1.79
02/20/21	0.025	0.025	8.518	7.572	9.466	0.044	0.038	0.057	1,686	1,628	1,765	27	25	30	99.49	2.29	98.39	1.79
02/21/21	0.025	0.025	8.533	7.602	9.473	0.038	0.034	0.042	1,609	1,523	1,677	26	23	28	99.56	2.35	98.41	1.80
02/22/21	0.025	0.025	8.796	7.735	9.877	0.040	0.033	0.055	1,583	1,492	1,681	26	22	30	99.55	2.35	98.38	1.79
02/23/21	0.025	0.025	8.855	8.012	9.908	0.045	0.036	0.057	1,674	1,575	1,840	27	24	32	99.49	2.29	98.37	1.79
02/24/21	0.025	0.025	8.823	7.889	9.757	0.045	0.038	0.053	1,725	1,615	1,865	28	25	34	99.49	2.29	98.36	1.78
02/25/21	0.025	0.025	9.057	8.296	9.801	0.049	0.043	0.060	1,713	1,652	1,785	28	25	32	99.46	2.27	98.38	1.79
02/26/21	0.025	0.025	8.747	7.962	9.759	0.047	0.036	0.056	1,696	1,628	1,788	27	23	32	99.46	2.27	98.40	1.80
02/27/21	0.025	0.025	8.575	7.567	9.422	0.046	0.041	0.067	1,666	1,597	1,736	27	25	30	99.47	2.27	98.35	1.78
02/28/21	0.025	0.025	8.531	7.834	9.422	0.042	0.036	0.047	1,582	1,501	1,651	25	23	28	99.51	2.31	98.40	1.79

Notes:

* TOC above internal critical control point (0.1 mg/L) observed from 18:45 to 22:34. OC San reported both contemporaneous primary clarifier upset due to PLC error and scheduled caustic treatment.

OCWD sampling during spike event revealed acetone above baseline concentrations, but well below USEPA IRIS RfD or taste & odor thresholds.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
	UVT %	FLOW	POWER	EED	Peroxide Dose	Log
Date	avg	MG	kW	kWh/kgal	mg/l	Removal
02/01/21	97.16	92.454	23,842.9	0.26	3.0	6
02/02/21	97.23	90.798	23,814.6	0.26	3.0	6
02/03/21	97.48	90.974	23,663.6	0.26	3.0	6
02/04/21	97.51	94.091	23,680.1	0.26	3.0	6
02/05/21	97.46	90.741	23,784.8	0.25	3.0	6
02/06/21	97.58	89.147	23,756.6	0.26	3.0	6
02/07/21	97.55	91.810	23,381.9	0.26	3.0	6
02/08/21	97.48	88.466	23,714.4	0.26	3.0	6
02/09/21	97.37	86.385	22,374.4	0.26	3.0	6
02/10/21	97.48	86.637	21,596.3	0.26	3.0	6
02/11/21	97.48	87.495	22,054.3	0.26	3.0	6
02/12/21	97.60	88.830	22,391.7	0.26	3.0	6
02/13/21	97.67	90.678	23,036.6	0.26	3.0	6
02/14/21	97.56	89.963	23,231.3	0.26	3.0	6
02/15/21	97.70	90.034	23,111.3	0.26	3.0	6
02/16/21	97.50	90.346	22,903.0	0.26	3.0	6
02/17/21	97.92	90.949	23,180.7	0.26	3.0	6
02/18/21	97.83	90.759	23,050.0	0.25	3.0	6
02/19/21	97.88	92.799	22,927.7	0.25	3.0	6
02/20/21	97.70	89.997	22,936.4	0.25	3.0	6
02/21/21	97.76	89.163	22,978.1	0.26	3.0	6
02/22/21	97.75	89.674	23,345.8	0.26	3.0	6
02/23/21	97.83	89.835	22,730.8	0.26	3.0	6
02/24/21	97.82	90.356	22,869.1	0.26	3.0	6
02/25/21	97.49	85.480	23,052.6	0.26	3.0	6
02/26/21	97.50	90.517	22,023.3	0.26	3.0	6
02/27/21	97.23	91.332	22,851.0	0.25	3.0	6
02/28/21	97.39	89.921	22,737.9	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
Date	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
03/01/21	12.39	12.39	12.33	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/02/21	12.34	12.34	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/03/21	12.37	12.37	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/04/21	12.32	12.32	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/05/21	12.39	12.39	12.31	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/06/21	12.36	12.36	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/07/21	12.37	12.37	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/08/21	12.33	12.33	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/09/21	12.30	12.30	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/10/21	12.28	12.28	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/11/21	12.27	12.27	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/12/21	12.27	12.27	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/13/21	12.28	12.28	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/14/21	12.32	12.32	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/15/21	12.30	12.30	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/16/21	12.34	12.34	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/17/21	12.29	12.29	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/18/21	12.28	12.28	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/19/21	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/20/21	12.28	12.28	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/21/21	12.31	12.31	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/22/21	12.35	12.35	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/23/21	12.28	12.28	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/24/21	12.27	12.27	12.24	Y	Y	Y	0.0	0.0	0.3	0.0	0.0
03/25/21	12.25	12.25	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/26/21	12.31	12.31	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/27/21	12.29	12.29	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/28/21	12.33	12.33	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/29/21	12.37	12.37	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/30/21	12.30	12.30	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/31/21	12.30	12.30	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/21	0.00	4.06	2.33	6.00	0.00	12.39
03/02/21	0.00	4.04	2.30	6.00	0.00	12.34
03/03/21	0.00	4.07	2.30	6.00	0.00	12.37
03/04/21	0.00	4.02	2.30	6.00	0.00	12.32
03/05/21	0.00	4.08	2.31	6.00	0.00	12.39
03/06/21	0.00	4.06	2.30	6.00	0.00	12.36
03/07/21	0.00	4.07	2.30	6.00	0.00	12.37
03/08/21	0.00	4.06	2.28	6.00	0.00	12.33
03/09/21	0.00	4.06	2.24	6.00	0.00	12.30
03/10/21	0.00	4.04	2.23	6.00	0.00	12.28
03/11/21	0.00	4.05	2.22	6.00	0.00	12.27
03/12/21	0.00	4.08	2.19	6.00	0.00	12.27
03/13/21	0.00	4.06	2.21	6.00	0.00	12.28
03/14/21	0.00	4.10	2.22	6.00	0.00	12.32
03/15/21	0.00	4.05	2.25	6.00	0.00	12.30
03/16/21	0.00	4.07	2.27	6.00	0.00	12.34
03/17/21	0.00	4.07	2.21	6.00	0.00	12.29
03/18/21	0.00	4.05	2.23	6.00	0.00	12.28
03/19/21	0.00	4.04	2.22	6.00	0.00	12.26
03/20/21	0.00	4.05	2.23	6.00	0.00	12.28
03/21/21	0.00	4.03	2.28	6.00	0.00	12.31
03/22/21	0.00	4.06	2.29	6.00	0.00	12.35
03/23/21	0.00	4.03	2.25	6.00	0.00	12.28
03/24/21	0.00	4.04	2.24	6.00	0.00	12.27
03/25/21	0.00	4.02	2.23	6.00	0.00	12.25
03/26/21	0.00	4.10	2.22	6.00	0.00	12.31
03/27/21	0.00	4.04	2.25	6.00	0.00	12.29
03/28/21	0.00	4.07	2.26	6.00	0.00	12.33
03/29/21	0.00	4.10	2.27	6.00	0.00	12.37
03/30/21	0.00	4.07	2.23	6.00	0.00	12.30
03/31/21	0.00	4.08	2.21	6.00	0.00	12.30

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/21	0.00	0.00	2.33	6.00	4.00	12.33
03/02/21	0.00	0.00	2.30	6.00	4.00	12.30
03/03/21	0.00	0.00	2.30	6.00	4.00	12.30
03/04/21	0.00	0.00	2.30	6.00	4.00	12.30
03/05/21	0.00	0.00	2.31	6.00	4.00	12.31
03/06/21	0.00	0.00	2.30	6.00	4.00	12.30
03/07/21	0.00	0.00	2.30	6.00	4.00	12.30
03/08/21	0.00	0.00	2.28	6.00	4.00	12.28
03/09/21	0.00	0.00	2.24	6.00	4.00	12.24
03/10/21	0.00	0.00	2.23	6.00	4.00	12.23
03/11/21	0.00	0.00	2.22	6.00	4.00	12.22
03/12/21	0.00	0.00	2.19	6.00	4.00	12.19
03/13/21	0.00	0.00	2.21	6.00	4.00	12.21
03/14/21	0.00	0.00	2.22	6.00	4.00	12.22
03/15/21	0.00	0.00	2.25	6.00	4.00	12.25
03/16/21	0.00	0.00	2.27	6.00	4.00	12.27
03/17/21	0.00	0.00	2.21	6.00	4.00	12.21
03/18/21	0.00	0.00	2.23	6.00	4.00	12.23
03/19/21	0.00	0.00	2.22	6.00	4.00	12.22
03/20/21	0.00	0.00	2.23	6.00	4.00	12.23
03/21/21	0.00	0.00	2.28	6.00	4.00	12.28
03/22/21	0.00	0.00	2.29	6.00	4.00	12.29
03/23/21	0.00	0.00	2.25	6.00	4.00	12.25
03/24/21	0.00	0.00	2.24	6.00	4.00	12.24
03/25/21	0.00	0.00	2.23	6.00	4.00	12.23
03/26/21	0.00	0.00	2.22	6.00	4.00	12.22
03/27/21	0.00	0.00	2.25	6.00	4.00	12.25
03/28/21	0.00	0.00	2.26	6.00	4.00	12.26
03/29/21	0.00	0.00	2.27	6.00	4.00	12.27
03/30/21	0.00	0.00	2.23	6.00	4.00	12.23
03/31/21	0.00	0.00	2.21	6.00	4.00	12.21

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
03/01/21	4.44	4.44	4.33	4.11	4.24	4.42	4.49	4.46	4.43	4.26	4.47	4.44	4.40	4.06	4.20	4.28
03/02/21	4.48	4.51	4.33	4.14	4.28	4.33	4.52	4.44	4.46	4.27	4.46	4.44	4.40	4.04	4.25	4.27
03/03/21	4.38	4.41	4.31	4.07	4.23	4.30	4.52	4.43	4.45	4.26	4.45	4.44	4.40	4.20	4.25	4.27
03/04/21	4.41	4.48	4.27	4.02	4.23	4.39	4.44	4.38	4.44	4.48	4.36	4.44	4.39	4.30	4.22	4.27
03/05/21	4.41	4.38	4.30	4.10	4.23	4.30	4.47	4.37	4.43	4.47	4.41	4.44	4.36	4.27	4.22	4.25
03/06/21	4.34	4.37	4.43	4.09	4.17	4.29	4.43	4.34	4.40	4.52	4.37	4.38	4.32	4.23	4.18	4.22
03/07/21	4.37	4.42	4.41	4.10	4.50	4.29	4.42	4.33	4.39	4.53	4.35	4.36	4.31	4.26	4.16	4.18
03/08/21	4.41	4.39	4.40	4.08	4.44	4.35	4.45	4.38	4.35	4.45	4.35	4.65	4.35	4.21	4.17	4.25
03/09/21	4.39	4.43	4.47	4.06	4.41	4.33	4.46	4.35	4.28	4.43	4.33	4.71	4.35	4.14	4.16	4.21
03/10/21	4.30	4.35	4.34	4.04	4.34	4.24	4.42	4.31	4.26	4.39	4.26	4.66	4.33	4.18	4.12	4.18
03/11/21	4.35	4.43	4.37	4.17	4.36	4.23	4.41	4.29	4.25	4.38	4.24	4.65	4.32	4.16	4.05	4.18
03/12/21	4.34	4.64	4.30	4.12	4.35	4.27	4.38	4.34	4.32	4.42	4.25	4.59	4.26	4.16	4.09	4.15
03/13/21	4.59	4.61	4.30	4.14	4.35	4.28	4.38	4.31	4.30	4.42	4.21	4.58	4.24	4.12	4.06	4.15
03/14/21	4.55	4.63	4.29	4.11	4.34	4.27	4.39	4.35	4.19	4.38	4.47	4.57	4.25	4.12	4.10	4.16
03/15/21	4.46	4.49	4.31	4.10	4.27	4.26	4.39	4.35	4.17	4.37	4.53	4.56	4.26	4.09	4.23	4.12
03/16/21	4.46	4.45	4.30	* N/A	4.29	4.13	4.48	4.31	4.14	4.31	4.43	4.47	4.44	4.07	4.28	4.13
03/17/21	4.51	4.45	4.28	4.09	4.35	4.18	4.46	4.23	4.15	4.24	4.38	4.49	4.44	4.08	4.23	4.07
03/18/21	4.46	4.40	4.24	4.09	4.23	4.42	4.47	4.30	4.36	4.28	4.39	4.44	4.39	4.05	4.19	4.31
03/19/21	4.47	4.49	4.35	4.06	4.32	4.44	4.47	4.32	4.40	4.30	4.40	4.41	4.39	4.04	4.20	4.24
03/20/21	4.44	4.43	4.30	4.08	4.28	4.29	4.45	4.50	4.28	4.33	4.42	4.39	4.37	4.05	4.21	4.24
03/21/21	4.41	4.47	4.26	4.05	4.23	4.36	4.43	4.40	4.36	4.28	4.41	4.41	4.38	4.03	4.21	4.22
03/22/21	4.40	4.47	4.25	4.06	4.19	4.37	4.40	4.40	4.38	4.29	4.36	4.44	4.35	4.20	4.16	4.24
03/23/21	4.40	4.36	4.29	4.03	4.20	4.37	4.39	4.40	4.37	4.30	4.35	4.44	4.33	4.29	4.15	4.20
03/24/21	4.35	4.32	4.32	4.04	4.19	4.26	4.45	4.32	4.30	4.49	4.31	4.35	4.32	4.27	4.18	4.21
03/25/21	4.35	4.33	4.54	4.02	4.19	4.29	4.42	4.42	4.29	4.52	4.33	4.33	4.27	4.23	4.19	4.16
03/26/21	4.34	4.39	4.46	4.10	4.33	4.31	4.43	4.39	4.25	4.52	4.30	4.61	4.22	4.18	4.13	4.14
03/27/21	4.33	4.37	4.35	4.18	4.42	4.31	4.43	4.38	4.24	4.51	4.29	4.73	4.21	4.22	4.15	4.18
03/28/21	4.26	4.37	4.45	4.11	4.39	4.29	4.41	4.29	4.26	4.45	4.32	4.60	4.45	4.17	4.11	4.13
03/29/21	4.22	4.32	4.32	4.10	4.41	4.20	4.40	4.28	4.24	4.41	4.32	4.64	4.33	4.17	4.11	4.14
03/30/21	4.27	4.30	4.37	4.07	4.39	4.25	4.34	4.35	4.16	4.40	4.34	4.59	4.16	4.12	4.12	4.14
03/31/21	4.27	4.61	4.39	4.08	4.37	4.26	4.31	4.37	4.14	4.41	4.37	4.55	4.23	4.11	4.12	4.13

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* MF Cell A04 out of service for maintenance

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
03/01/21	5.13	5.05	5.00	4.97	4.13	5.28	5.16	5.18	4.32	4.16	4.37	4.23	4.30	4.25	4.25	4.23
03/02/21	5.23	5.04	5.27	4.93	4.14	5.16	5.12	5.14	4.25	4.16	4.37	4.19	4.49	4.25	4.31	4.24
03/03/21	5.21	5.05	5.49	4.92	4.16	5.12	5.11	5.13	4.20	4.08	4.34	4.19	4.57	4.23	4.28	4.17
03/04/21	5.26	5.22	5.29	4.94	4.08	5.17	5.32	5.13	4.26	4.10	4.37	4.29	4.60	4.23	4.29	4.18
03/05/21	5.20	5.30	5.26	4.89	4.11	5.17	5.28	5.13	4.24	4.08	4.35	4.25	4.59	4.21	4.31	4.18
03/06/21	5.15	5.30	5.27	4.91	4.09	5.18	5.24	5.09	4.24	4.06	4.32	4.21	4.37	4.22	4.28	4.29
03/07/21	5.16	5.32	5.29	4.93	4.07	5.19	5.21	5.10	4.22	4.08	4.32	4.18	4.29	4.24	4.26	4.48
03/08/21	5.18	5.24	5.25	5.04	4.06	5.23	5.23	5.28	4.15	4.32	4.22	4.23	4.51	4.15	4.17	4.38
03/09/21	5.15	5.21	5.26	5.07	* N/A	5.21	5.13	5.32	4.27	4.31	4.23	4.27	4.76	4.11	4.15	4.34
03/10/21	5.13	5.20	5.22	5.08	* N/A	5.19	5.13	5.30	4.43	4.35	4.21	4.20	4.74	4.09	4.21	4.36
03/11/21	5.11	5.22	5.21	5.08	* N/A	5.21	5.15	5.31	4.35	4.36	4.17	4.12	4.75	4.18	4.19	4.29
03/12/21	5.08	5.13	5.19	5.07	4.79	5.19	5.14	5.23	4.40	4.28	4.20	4.26	4.39	4.11	4.08	4.34
03/13/21	5.06	5.17	5.21	5.08	5.37	5.22	5.20	5.21	4.37	4.28	4.19	4.45	4.38	4.08	4.16	4.29
03/14/21	5.07	5.18	5.16	5.01	5.25	5.20	5.25	5.24	4.40	4.31	4.23	4.45	4.41	4.10	4.18	4.30
03/15/21	5.11	5.15	5.14	4.97	5.20	5.17	5.28	5.26	4.43	4.33	4.23	4.38	4.46	4.07	4.19	4.32
03/16/21	5.05	5.11	5.12	4.96	5.12	5.15	5.14	5.20	4.34	4.27	4.25	4.33	4.36	4.08	4.10	4.25
03/17/21	5.00	5.07	5.08	4.90	5.14	5.31	5.14	5.20	4.34	4.30	4.34	4.49	4.32	4.15	4.16	4.30
03/18/21	4.98	5.03	5.06	4.89	5.16	5.36	5.11	5.13	4.26	4.32	4.32	4.42	4.20	4.23	4.18	4.22
03/19/21	4.95	5.01	5.06	4.89	5.08	5.34	5.09	5.05	4.18	4.25	4.32	4.28	4.20	4.16	4.27	4.14
03/20/21	5.32	5.05	5.06	4.89	4.99	5.32	5.10	5.13	4.27	4.19	4.35	4.35	4.30	4.22	4.34	4.24
03/21/21	5.37	5.05	5.00	4.89	5.07	5.31	5.06	5.16	4.25	4.18	4.35	4.33	4.42	4.21	4.33	4.14
03/22/21	5.20	4.94	5.16	4.90	5.09	5.29	5.25	5.14	4.21	4.11	4.25	4.32	4.57	4.16	4.23	4.17
03/23/21	5.18	4.91	5.34	4.90	5.06	5.29	5.37	5.11	4.16	4.06	4.20	4.32	4.50	4.19	4.20	4.15
03/24/21	5.15	5.28	5.28	4.85	5.02	5.23	5.31	5.12	4.21	4.07	4.24	4.22	4.50	4.18	4.25	4.15
03/25/21	5.15	5.24	5.25	4.87	5.03	5.18	5.23	5.08	4.17	4.05	4.27	4.14	4.43	4.17	4.22	4.46
03/26/21	5.13	5.15	5.20	4.81	5.07	5.21	5.21	5.02	4.17	4.15	4.29	4.20	4.44	4.13	4.15	4.38
03/27/21	5.10	5.09	5.17	4.80	5.07	5.23	5.19	5.02	4.20	4.31	4.28	4.25	4.46	4.10	4.12	4.40
03/28/21	5.10	5.16	5.17	5.08	5.10	5.27	5.24	5.32	4.31	4.29	4.19	4.14	4.42	4.07	4.13	4.36
03/29/21	5.12	5.18	5.16	5.07	5.09	5.27	5.21	5.24	4.44	4.29	4.17	4.14	4.42	4.13	4.18	4.33
03/30/21	5.09	5.15	5.13	5.06	5.10	5.25	5.21	5.23	4.41	4.27	4.11	4.25	4.41	4.12	4.15	4.36
03/31/21	5.06	5.11	5.15	5.05	5.05	5.25	5.20	5.23	4.40	4.26	4.12	4.29	4.41	4.08	4.11	4.35

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* MF Cell C05 out of service for installation of new membranes

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
03/01/21	4.46	4.15	4.46	4.48
03/02/21	4.39	4.20	4.71	4.46
03/03/21	4.38	4.20	4.74	4.58
03/04/21	4.33	4.18	4.53	4.47
03/05/21	4.30	4.15	4.65	4.41
03/06/21	4.26	4.09	4.47	4.48
03/07/21	4.30	4.14	4.59	4.40
03/08/21	4.23	4.06	4.65	4.42
03/09/21	4.31	4.15	4.65	4.71
03/10/21	4.41	4.37	5.09	4.44
03/11/21	4.35	4.35	4.44	4.36
03/12/21	4.27	4.34	4.20	4.49
03/13/21	4.27	4.34	4.18	4.33
03/14/21	4.25	4.29	4.11	4.33
03/15/21	4.33	4.23	4.05	4.48
03/16/21	4.21	4.19	4.17	4.35
03/17/21	4.21	4.23	4.13	4.23
03/18/21	4.23	4.24	4.08	4.52
03/19/21	4.37	4.21	4.09	4.32
03/20/21	4.32	4.20	4.13	4.30
03/21/21	4.27	4.18	4.14	4.42
03/22/21	4.18	4.12	4.28	4.34
03/23/21	4.17	4.04	4.08	4.31
03/24/21	4.17	4.07	4.05	4.42
03/25/21	4.27	4.08	4.15	4.28
03/26/21	4.27	4.10	4.10	4.30
03/27/21	4.23	4.04	4.06	4.17
03/28/21	4.39	4.15	4.52	4.48
03/29/21	4.39	4.30	4.13	4.25
03/30/21	4.30	4.29	4.15	4.44
03/31/21	4.27	4.26	4.27	4.29

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04 avg	A01-A04 max	A05-A08 avg	A05-A08 max	B01-B04 avg	B01-B04 max	B05-B08 avg	B05-B08 max	C01-C04 avg	C01-C04 max	C05-C08 avg	C05-C08 max	D01-D04 avg	D01-D04 max	D05-D08 avg	D05-D08 max	E01-E04 avg	E01-E04 max	MFE avg
03/01/21	0.02	0.03	0.02	0.05	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.03	0.02	0.02	0.02
03/02/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.06	0.02	0.03	0.02	0.03	0.02	0.02	0.03
03/03/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.03
03/04/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.08	0.03	0.03	0.02	0.02	0.02	0.06	0.03
03/05/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.03
03/06/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.02
03/07/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.02
03/08/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.04	0.04	0.06	0.02	0.03	0.02	0.02	0.02	0.03	0.03
03/09/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.03
03/10/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.02	0.04	0.03
03/11/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.05	0.02	0.03	0.03	0.04	0.02	0.04	0.02	0.03	0.02	0.02	0.02
03/12/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.04	0.10	0.03	0.03	0.02	0.03	0.02	0.03	0.02
03/13/21	0.02	0.05	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02
03/14/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.04	0.08	0.02	0.03	0.02	0.03	0.02	0.02	0.02
03/15/21	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.02	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02
03/16/21	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.08	0.04	0.04	0.03	0.04	0.02	0.03	0.02	0.02	0.03
03/17/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.06	0.03	0.03	0.02	0.03	0.02	0.02	0.03
03/18/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.02
03/19/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.05	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.02
03/20/21	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.05	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.02
03/21/21	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.04	0.11	0.02	0.03	0.02	0.02	0.02	0.02	0.02
03/22/21	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.02
03/23/21	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.02	0.02
03/24/21	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.02
03/25/21	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.05	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.02
03/26/21	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.03	0.04	0.08	0.02	0.04	0.02	0.02	0.02	0.02	0.02
03/27/21	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.04	0.04	0.05	0.02	0.03	0.02	0.03	0.02	0.03	0.02
03/28/21	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.02
03/29/21	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.06	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.02
03/30/21	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.04	0.05	0.02	0.04	0.02	0.03	0.02	0.03	0.02
03/31/21	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.02	0.03	0.02

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
03/01/21	0.025	0.025	8.666	7.788	9.634	0.040	0.036	0.051	1,544	1,450	1,645	25	22	29	99.53	2.33	98.41	1.80
03/02/21	0.025	0.025	8.873	7.940	9.682	0.044	0.038	0.055	1,621	1,518	1,788	25	22	30	99.50	2.30	98.45	1.81
03/03/21	0.025	0.025	8.817	8.121	9.503	0.044	0.038	0.057	1,692	1,621	1,755	26	23	30	99.50	2.30	98.45	1.81
03/04/21	0.025	0.025	8.643	7.751	9.422	0.043	0.031	0.050	1,645	1,555	1,743	27	23	31	99.50	2.30	98.39	1.79
03/05/21	0.025	0.025	8.529	7.738	9.422	0.042	0.038	0.051	1,628	1,546	1,717	26	23	29	99.51	2.31	98.43	1.80
03/06/21	0.025	0.025	8.483	7.661	9.407	0.042	0.033	0.051	1,625	1,570	1,718	26	22	29	99.50	2.30	98.43	1.80
03/07/21	0.025	0.025	8.423	7.579	9.421	0.042	0.036	0.046	1,558	1,492	1,638	25	22	28	99.50	2.30	98.43	1.80
03/08/21	0.025	0.025	8.631	7.759	9.818	0.046	0.041	0.060	1,511	1,444	1,622	24	21	27	99.47	2.28	98.44	1.81
03/09/21	0.025	0.025	8.911	8.138	9.525	0.052	0.048	0.060	1,604	1,518	1,730	25	22	29	99.42	2.24	98.45	1.81
03/10/21	0.025	0.025	8.776	8.023	9.421	0.051	0.047	0.060	1,636	1,582	1,698	25	23	28	99.42	2.23	98.46	1.81
03/11/21	0.025	0.025	8.557	7.925	9.274	0.052	0.045	0.063	1,593	1,516	1,663	24	22	28	99.40	2.22	98.47	1.81
03/12/21	0.025	0.025	8.568	7.805	9.570	0.056	0.048	0.068	1,629	1,551	1,734	25	21	29	99.35	2.19	98.48	1.82
03/13/21	0.025	0.025	8.554	7.739	9.921	0.052	0.046	0.060	1,631	1,575	1,717	26	23	29	99.39	2.21	98.44	1.81
03/14/21	0.025	0.025	8.457	7.582	9.570	0.051	0.045	0.059	1,584	1,520	1,653	24	21	28	99.40	2.22	98.47	1.81
03/15/21	0.025	0.025	8.702	7.921	9.579	0.049	0.043	0.064	1,550	1,468	1,658	24	22	27	99.44	2.25	98.44	1.81
03/16/21	0.025	0.025	8.620	7.837	9.321	0.046	0.043	0.051	1,616	1,528	1,743	24	22	28	99.46	2.27	98.49	1.82
03/17/21	0.025	0.025	8.361	7.763	9.052	0.051	0.045	0.062	1,680	1,597	1,773	26	22	33	99.39	2.21	98.47	1.82
03/18/21	0.025	0.025	8.289	7.543	8.913	0.049	0.047	0.058	1,668	1,608	1,762	26	23	29	99.41	2.23	98.47	1.81
03/19/21	0.025	0.025	8.621	7.642	9.641	0.052	0.044	0.060	1,645	1,563	1,741	26	23	29	99.40	2.22	98.44	1.81
03/20/21	0.025	0.025	9.024	8.192	10.278	0.053	0.044	0.060	1,622	1,554	1,715	25	23	28	99.42	2.23	98.45	1.81
03/21/21	0.025	0.025	9.098	8.311	10.082	0.048	0.037	0.056	1,550	1,476	1,618	24	21	26	99.48	2.28	98.46	1.81
03/22/21	0.025	0.025	9.000	8.176	9.887	0.046	0.042	0.055	1,522	1,428	1,647	23	20	27	99.49	2.29	98.49	1.82
03/23/21	0.025	0.025	9.180	8.363	10.074	0.052	0.049	0.058	1,619	1,536	1,722	25	21	29	99.43	2.25	98.47	1.82
03/24/21	0.029	0.370*	8.927	8.283	9.704	0.051	0.045	0.062	1,663	1,587	1,804	26	23	46	99.42	2.24	98.45	1.81
03/25/21	0.022	0.059	8.851	8.257	9.529	0.052	0.048	0.060	1,678	1,606	1,765	27	24	30	99.41	2.23	98.42	1.80
03/26/21	0.016	0.020	8.770	7.975	9.436	0.053	0.045	0.059	1,681	1,609	1,766	26	24	31	99.40	2.22	98.43	1.80
03/27/21	0.016	0.016	8.762	7.991	9.584	0.050	0.047	0.057	1,650	1,600	1,709	25	22	28	99.43	2.25	98.51	1.83
03/28/21	0.016	0.016	8.632	7.638	9.669	0.048	0.045	0.051	1,596	1,531	1,672	24	21	27	99.45	2.26	98.52	1.83
03/29/21	0.016	0.016	8.925	7.975	9.685	0.048	0.042	0.057	1,599	1,504	1,738	24	21	28	99.47	2.27	98.52	1.83
03/30/21	0.016	0.016	9.064	8.408	10.080	0.053	0.050	0.059	1,673	1,591	1,781	26	22	30	99.41	2.23	98.47	1.82
03/31/21	0.016	0.016	8.671	8.014	9.531	0.053	0.047	0.058	1,687	1,612	1,789	26	23	30	99.39	2.21	98.45	1.81

Notes:

* Higher than normal ROP turbidity occurred briefly (approximately 5 minutes) while restarting the plant after an unexpected shutdown.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
03/01/21	97.42	89.736	22,669.4	0.25	3.0	6
03/02/21	97.56	89.595	23,198.4	0.26	3.0	6
03/03/21	97.69	90.766	23,571.5	0.26	3.0	6
03/04/21	97.71	91.663	23,152.3	0.25	3.0	6
03/05/21	97.76	93.661	23,618.1	0.25	3.0	6
03/06/21	97.41	91.751	23,314.9	0.25	3.0	6
03/07/21	97.51	90.110	22,880.3	0.25	3.0	6
03/08/21	97.69	89.734	22,974.2	0.25	3.0	6
03/09/21	97.91	91.084	22,986.6	0.26	3.0	6
03/10/21	98.13	91.008	22,914.5	0.25	3.0	6
03/11/21	98.09	88.425	23,029.5	0.25	3.0	6
03/12/21	98.03	90.634	22,957.5	0.26	3.0	6
03/13/21	97.85	90.927	23,137.7	0.26	3.0	6
03/14/21	97.99	85.869	22,988.5	0.25	3.0	6
03/15/21	97.97	89.627	22,328.6	0.26	3.0	6
03/16/21	97.93	89.566	23,057.3	0.26	3.0	6
03/17/21	98.09	89.499	22,797.5	0.26	3.0	6
03/18/21	97.84	92.628	22,769.1	0.25	3.0	6
03/19/21	97.78	94.799	22,924.7	0.25	3.0	6
03/20/21	97.68	92.773	23,061.1	0.24	3.0	6
03/21/21	97.89	90.285	22,896.4	0.25	3.0	6
03/22/21	98.14	89.939	22,522.7	0.25	3.0	6
03/23/21	97.89	89.893	22,880.9	0.25	3.0	6
03/24/21	98.01	75.917	22,207.2	0.26	3.0	6
03/25/21	98.06	87.459	20,054.8	0.26	3.0	6
03/26/21	97.91	91.613	22,334.8	0.25	3.0	6
03/27/21	97.92	92.046	23,203.9	0.25	3.0	6
03/28/21	97.77	90.710	23,301.8	0.25	3.0	6
03/29/21	98.00	89.656	23,250.6	0.26	3.0	6
03/30/21	98.02	89.714	23,458.2	0.26	3.0	6
03/31/21	98.20	90.583	23,283.2	0.26	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		ROP TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
04/01/21	12.28	12.28	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/02/21	12.26	12.26	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/03/21	12.29	12.29	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/04/21	12.31	12.31	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/05/21	12.33	12.33	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/06/21	12.31	12.31	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/07/21	12.32	12.32	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/08/21	12.28	12.28	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/09/21	12.22	12.22	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/10/21	12.31	12.31	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/11/21	12.30	12.30	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/12/21	12.29	12.29	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/13/21	12.28	12.28	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/14/21	12.32	12.32	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/15/21	12.31	12.31	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/16/21	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/17/21	12.25	12.25	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/18/21	12.36	12.36	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/19/21	12.36	12.36	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/20/21	12.28	12.28	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/21/21	12.26	12.26	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/22/21	12.21	12.21	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/23/21	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/24/21	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/25/21	12.25	12.25	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/26/21	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/27/21	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/28/21	12.22	12.22	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/29/21	12.22	12.22	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/30/21	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/21	0.00	4.06	2.22	6.00	0.00	12.28
04/02/21	0.00	4.05	2.21	6.00	0.00	12.26
04/03/21	0.00	4.06	2.22	6.00	0.00	12.29
04/04/21	0.00	4.04	2.26	6.00	0.00	12.31
04/05/21	0.00	4.05	2.28	6.00	0.00	12.33
04/06/21	0.00	4.06	2.25	6.00	0.00	12.31
04/07/21	0.00	4.09	2.23	6.00	0.00	12.32
04/08/21	0.00	4.07	2.22	6.00	0.00	12.28
04/09/21	0.00	4.05	2.16	6.00	0.00	12.22
04/10/21	0.00	4.07	2.24	6.00	0.00	12.31
04/11/21	0.00	4.03	2.27	6.00	0.00	12.30
04/12/21	0.00	4.02	2.28	6.00	0.00	12.29
04/13/21	0.00	4.06	2.22	6.00	0.00	12.28
04/14/21	0.00	4.08	2.23	6.00	0.00	12.32
04/15/21	0.00	4.08	2.24	6.00	0.00	12.31
04/16/21	0.00	4.01	2.22	6.00	0.00	12.23
04/17/21	0.00	4.04	2.21	6.00	0.00	12.25
04/18/21	0.00	4.12	2.24	6.00	0.00	12.36
04/19/21	0.00	4.11	2.25	6.00	0.00	12.36
04/20/21	0.00	4.09	2.20	6.00	0.00	12.28
04/21/21	0.00	4.06	2.20	6.00	0.00	12.26
04/22/21	0.00	4.03	2.18	6.00	0.00	12.21
04/23/21	0.00	4.01	2.20	6.00	0.00	12.21
04/24/21	0.00	4.04	2.22	6.00	0.00	12.26
04/25/21	0.00	4.03	2.22	6.00	0.00	12.25
04/26/21	0.00	4.02	2.25	6.00	0.00	12.26
04/27/21	0.00	4.01	2.22	6.00	0.00	12.24
04/28/21	0.00	4.05	2.18	6.00	0.00	12.22
04/29/21	0.00	4.05	2.17	6.00	0.00	12.22
04/30/21	0.00	4.06	2.18	6.00	0.00	12.24

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/21	0.00	0.00	2.22	6.00	4.00	12.22
04/02/21	0.00	0.00	2.21	6.00	4.00	12.21
04/03/21	0.00	0.00	2.22	6.00	4.00	12.22
04/04/21	0.00	0.00	2.26	6.00	4.00	12.26
04/05/21	0.00	0.00	2.28	6.00	4.00	12.28
04/06/21	0.00	0.00	2.25	6.00	4.00	12.25
04/07/21	0.00	0.00	2.23	6.00	4.00	12.23
04/08/21	0.00	0.00	2.22	6.00	4.00	12.22
04/09/21	0.00	0.00	2.16	6.00	4.00	12.16
04/10/21	0.00	0.00	2.24	6.00	4.00	12.24
04/11/21	0.00	0.00	2.27	6.00	4.00	12.27
04/12/21	0.00	0.00	2.28	6.00	4.00	12.28
04/13/21	0.00	0.00	2.22	6.00	4.00	12.22
04/14/21	0.00	0.00	2.23	6.00	4.00	12.23
04/15/21	0.00	0.00	2.24	6.00	4.00	12.24
04/16/21	0.00	0.00	2.22	6.00	4.00	12.22
04/17/21	0.00	0.00	2.21	6.00	4.00	12.21
04/18/21	0.00	0.00	2.24	6.00	4.00	12.24
04/19/21	0.00	0.00	2.25	6.00	4.00	12.25
04/20/21	0.00	0.00	2.20	6.00	4.00	12.20
04/21/21	0.00	0.00	2.20	6.00	4.00	12.20
04/22/21	0.00	0.00	2.18	6.00	4.00	12.18
04/23/21	0.00	0.00	2.20	6.00	4.00	12.20
04/24/21	0.00	0.00	2.22	6.00	4.00	12.22
04/25/21	0.00	0.00	2.22	6.00	4.00	12.22
04/26/21	0.00	0.00	2.25	6.00	4.00	12.25
04/27/21	0.00	0.00	2.22	6.00	4.00	12.22
04/28/21	0.00	0.00	2.18	6.00	4.00	12.18
04/29/21	0.00	0.00	2.17	6.00	4.00	12.17
04/30/21	0.00	0.00	2.18	6.00	4.00	12.18

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
04/01/21	4.51	4.63	4.34	4.18	4.31	4.20	4.36	4.36	4.18	4.37	4.34	4.53	4.32	4.12	4.11	4.11
04/02/21	4.46	4.60	4.24	4.16	4.35	4.14	4.34	4.32	4.20	4.35	4.55	4.54	4.31	4.15	4.09	4.08
04/03/21	4.45	4.62	4.31	4.25	4.35	4.21	4.59	4.32	4.12	4.32	4.59	4.52	4.36	4.15	4.08	4.06
04/04/21	4.46	4.56	4.32	4.35	4.32	4.23	4.62	4.33	4.10	4.31	4.58	4.51	4.12	4.14	4.11	4.04
04/05/21	4.46	4.56	4.33	4.35	4.33	4.20	4.52	4.30	4.17	4.33	4.57	4.49	4.22	4.12	4.33	4.07
04/06/21	4.44	4.56	4.31	4.31	4.30	4.43	4.47	4.30	4.45	4.34	4.54	4.49	4.42	4.12	4.29	4.06
04/07/21	4.45	4.51	4.29	4.30	4.28	4.44	4.46	4.46	4.41	4.27	4.51	4.46	4.38	4.09	4.36	4.18
04/08/21	4.40	4.53	4.23	4.29	4.29	4.44	4.47	4.48	4.38	4.25	4.50	4.46	4.39	4.07	4.41	4.26
04/09/21	4.41	4.50	4.26	4.24	4.27	4.39	4.45	4.39	4.37	4.30	4.51	4.45	4.37	4.05	4.38	4.28
04/10/21	4.32	4.48	4.18	4.28	4.24	4.40	4.43	4.39	4.34	4.28	4.51	4.44	4.36	4.21	4.33	4.25
04/11/21	4.32	4.47	4.19	4.19	4.22	4.26	4.43	4.37	4.32	4.58	4.48	4.36	4.34	4.30	4.30	4.27
04/12/21	4.35	4.46	4.36	4.17	4.23	4.26	4.42	4.36	4.32	4.62	4.47	4.33	4.33	4.28	4.31	4.26
04/13/21	4.33	4.46	4.44	4.14	4.48	4.36	4.40	4.35	4.29	4.51	4.41	4.36	4.35	4.27	4.41	4.26
04/14/21	4.32	4.44	4.48	4.13	4.45	4.33	4.40	4.35	4.28	4.53	4.38	4.56	4.32	4.29	4.44	4.23
04/15/21	4.28	4.39	4.44	4.17	4.40	4.30	4.37	4.32	4.29	4.49	4.33	4.71	4.33	4.23	4.41	4.17
04/16/21	4.24	4.34	4.31	4.08	4.36	4.25	4.34	4.31	4.22	4.41	4.35	4.60	4.22	4.16	4.43	4.16
04/17/21	4.23	4.34	4.31	4.19	4.37	4.24	4.32	4.31	4.21	4.40	4.34	4.55	4.22	4.12	4.38	4.15
04/18/21	4.19	4.32	4.31	4.27	4.40	4.23	4.32	4.32	4.21	4.40	4.29	4.55	4.21	4.12	4.36	4.12
04/19/21	4.19	4.68	4.33	4.28	4.40	4.23	4.32	4.32	4.21	4.40	4.27	4.55	4.19	4.14	4.36	4.11
04/20/21	4.47	4.60	4.35	4.25	4.36	4.20	4.29	4.30	4.20	4.33	4.54	4.56	4.11	4.12	4.36	4.10
04/21/21	4.48	4.58	4.31	4.32	4.33	4.19	4.31	4.28	4.12	4.28	4.61	4.49	4.12	4.11	4.36	4.06
04/22/21	4.46	4.54	4.27	4.27	4.32	4.15	4.49	4.24	4.13	4.27	4.59	4.48	4.03	4.06	4.34	4.03
04/23/21	4.40	4.58	4.21	4.26	4.31	4.14	4.52	4.23	4.13	4.27	4.59	4.48	4.15	4.07	4.34	4.01
04/24/21	4.35	4.55	4.29	4.21	4.29	4.55	4.52	4.27	4.11	4.22	4.51	4.46	4.44	4.09	4.31	4.05
04/25/21	4.45	4.53	4.29	4.19	4.31	4.40	4.51	4.33	4.37	4.25	4.49	4.43	4.29	4.07	4.31	4.03
04/26/21	4.44	4.54	4.28	4.16	4.31	4.38	4.52	4.36	4.40	4.28	4.50	4.47	4.34	4.05	4.52	4.21
04/27/21	4.31	4.55	4.27	4.16	4.21	4.40	4.49	4.32	4.38	4.22	4.46	4.42	4.31	4.05	4.53	4.24
04/28/21	4.41	4.55	4.23	4.16	4.24	4.37	4.49	4.32	4.38	4.24	4.49	4.41	4.48	4.05	4.50	4.25
04/29/21	4.40	4.47	4.21	4.16	4.21	4.33	4.46	4.28	4.37	4.20	4.42	4.35	4.37	4.05	4.43	4.21
04/30/21	4.35	4.40	4.18	4.13	4.23	4.26	4.45	4.25	4.37	4.45	4.42	4.35	4.27	4.29	4.41	4.17

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
04/01/21	5.10	5.10	5.17	5.07	5.13	5.20	5.18	5.25	4.33	4.25	4.11	4.29	4.38	4.06	4.13	4.30
04/02/21	5.07	5.09	5.20	5.02	5.23	5.19	5.16	5.22	4.32	4.21	4.09	4.26	4.38	4.05	4.08	4.29
04/03/21	5.06	5.11	5.13	4.99	5.22	5.17	5.15	5.26	4.39	4.19	4.22	4.30	4.38	4.08	4.11	4.27
04/04/21	5.06	5.13	5.09	4.98	5.24	5.14	5.12	5.31	4.42	4.18	4.44	4.29	4.38	4.04	4.05	4.19
04/05/21	5.06	5.08	5.14	4.98	5.25	5.35	5.13	5.24	4.41	4.17	4.36	4.26	4.40	4.06	4.05	4.25
04/06/21	5.10	5.05	5.13	4.96	5.27	5.38	5.14	5.24	4.37	4.15	4.32	4.25	4.34	4.15	4.14	4.24
04/07/21	5.07	5.08	5.11	4.95	5.24	5.33	5.17	5.20	4.31	4.16	4.35	4.25	4.25	4.28	4.37	4.23
04/08/21	5.04	5.09	5.08	4.95	5.23	5.33	5.19	5.17	4.32	4.12	4.36	4.23	4.26	4.27	4.38	4.21
04/09/21	5.32	5.08	5.04	4.93	5.22	5.40	5.21	5.20	4.33	4.10	4.33	4.21	4.39	4.23	4.33	4.21
04/10/21	5.27	5.08	5.24	4.93	5.22	5.37	5.29	5.22	4.30	4.07	4.32	4.23	4.54	4.22	4.27	4.15
04/11/21	5.27	5.29	5.33	4.90	5.25	5.31	5.26	5.19	4.22	4.03	4.27	4.22	4.47	4.18	4.20	4.13
04/12/21	5.26	5.42	5.32	4.90	5.26	5.28	5.20	5.17	4.17	4.02	4.24	4.19	4.46	4.19	4.27	4.18
04/13/21	5.22	5.29	5.26	4.93	5.18	5.35	5.27	5.15	4.18	4.06	4.30	4.15	4.49	4.22	4.25	4.47
04/14/21	5.16	5.24	5.23	4.90	5.18	5.30	5.24	5.10	4.10	4.12	4.28	4.13	4.49	4.18	4.19	4.45
04/15/21	5.17	5.23	5.26	5.03	5.12	5.29	5.23	5.13	4.12	4.29	4.25	4.08	4.45	4.22	4.25	4.42
04/16/21	5.16	5.20	5.25	5.10	5.15	5.24	5.19	5.24	4.26	4.23	4.19	4.01	4.42	4.19	4.20	4.38
04/17/21	5.14	5.19	5.18	5.06	5.11	5.22	5.19	5.30	4.37	4.27	4.19	4.04	4.40	4.20	4.18	4.35
04/18/21	5.13	5.18	5.15	5.04	5.07	5.19	5.20	5.31	4.39	4.28	4.19	4.21	4.38	4.13	4.22	4.35
04/19/21	5.13	5.15	5.16	5.04	5.08	5.15	5.15	5.31	4.43	4.25	4.16	4.34	4.35	4.14	4.19	4.38
04/20/21	5.14	5.18	5.16	4.99	5.26	5.19	5.22	5.29	4.40	4.22	4.15	4.32	4.39	4.13	4.12	4.35
04/21/21	5.12	5.17	4.98	4.97	5.33	5.15	5.19	5.21	4.32	4.16	4.10	4.31	4.37	4.12	4.09	4.30
04/22/21	5.08	5.17	4.98	5.00	5.29	5.16	5.16	5.18	4.33	4.09	4.16	4.25	4.34	4.10	4.08	4.28
04/23/21	5.08	5.18	5.04	5.02	5.29	5.17	5.17	5.22	4.37	4.05	4.32	4.21	4.33	4.11	4.10	4.23
04/24/21	5.02	5.11	4.88	4.99	5.23	5.39	5.13	5.24	4.30	4.06	4.31	4.27	4.31	4.07	4.04	4.20
04/25/21	5.04	5.08	4.85	4.96	5.27	5.39	5.16	5.19	4.29	4.04	4.30	4.26	4.26	4.08	4.13	4.18
04/26/21	5.05	5.12	4.86	4.95	5.26	5.39	5.15	5.19	4.30	4.02	4.25	4.26	4.26	4.16	4.30	4.16
04/27/21	5.23	5.10	4.82	4.94	5.25	5.35	5.12	5.17	4.28	4.01	4.26	4.24	4.18	4.29	4.28	4.15
04/28/21	5.26	5.13	4.84	4.91	5.28	5.30	5.11	5.18	4.30	4.10	4.32	4.19	4.20	4.25	4.27	4.17
04/29/21	5.19	5.07	5.14	4.90	5.22	5.30	5.39	5.17	4.26	4.20	4.26	4.22	4.29	4.31	4.29	4.14
04/30/21	5.18	5.13	5.18	4.87	5.25	5.25	5.50	5.15	4.19	4.12	4.26	4.12	4.49	4.38	4.25	4.30

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Date	MicroFiltration Process online monitoring results Log Removal Value															
	E01 LRV	**E02** LRV	**E03** LRV	**E04** LRV												
04/01/21	4.30	4.34	4.14	4.38												
04/02/21	4.32	4.26	4.10	4.43												
04/03/21	4.31	4.25	4.30	4.39												
04/04/21	4.28	4.30	4.27	4.31												
04/05/21	4.32	4.22	4.21	4.48												
04/06/21	4.37	4.22	4.33	4.35												
04/07/21	4.31	4.17	4.23	4.36												
04/08/21	4.35	4.18	4.21	4.56												
04/09/21	4.28	4.14	4.20	4.46												
04/10/21	4.31	4.21	4.23	4.43												
04/11/21	4.28	4.18	4.18	4.48												
04/12/21	4.24	4.13	4.26	4.36												
04/13/21	4.26	4.11	4.15	4.43												
04/14/21	4.32	4.08	4.23	4.39												
04/15/21	4.31	4.10	4.23	4.31												
04/16/21	4.31	4.15	4.18	4.31												
04/17/21	4.30	4.30	4.17	4.46												
04/18/21	4.23	4.34	4.28	4.36												
04/19/21	4.19	4.31	4.20	4.33												
04/20/21	4.15	4.28	4.09	4.49												
04/21/21	4.18	4.27	4.22	4.31												
04/22/21	4.20	4.30	4.06	4.34												
04/23/21	4.14	4.29	4.03	4.51												
04/24/21	4.44	4.23	4.19	4.27												
04/25/21	4.39	4.21	4.06	4.41												
04/26/21	4.35	4.17	4.23	4.48												
04/27/21	4.30	4.22	4.25	4.33												
04/28/21	4.24	4.14	4.20	4.37												
04/29/21	4.24	4.07	4.13	4.48												
04/30/21	4.25	4.06	4.23	4.37												

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
Date	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
04/01/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.03	0.03	0.03
04/02/21	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.05	0.04	0.05	0.02	0.03	0.02	0.02	0.03	0.04	0.03
04/03/21	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.04	0.04	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.03
04/04/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.03
04/05/21	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.05	0.05	0.02	0.03	0.02	0.03	0.03	0.03	0.03
04/06/21	0.02	0.03	0.02	0.03	0.02	0.04	0.03	0.04	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.03	0.03	0.03
04/07/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.04	0.04	0.04	0.02	0.02	0.02	0.03	0.02	0.03	0.02
04/08/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.04	0.04	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.02
04/09/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.06	0.02	0.03	0.02	0.03	0.02	0.03	0.02
04/10/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.03
04/11/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.07	0.02	0.03	0.02	0.03	0.02	0.03	0.02
04/12/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.04	0.02	0.03	0.03
04/13/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.02	0.03	0.03
04/14/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.03	0.11	0.03
04/15/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.02	0.04	0.03	0.03	0.03
04/16/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.02	0.03	0.02	0.03	0.03	0.03	0.03
04/17/21	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.05	0.05	0.06	0.03	0.03	0.02	0.03	0.03	0.03	0.03
04/18/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.06	0.08	0.02	0.03	0.02	0.03	0.03	0.04	0.03
04/19/21	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.03	0.03	0.03	0.08	0.11	0.02	0.03	0.02	0.03	0.03	0.04	0.03
04/20/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.06	0.09	0.03	0.04	0.02	0.03	0.03	0.04	0.03
04/21/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.03	0.03	0.03
04/22/21	0.02	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.04	0.03
04/23/21	0.02	0.04	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03
04/24/21	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03
04/25/21	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03
04/26/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.03
04/27/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.03
04/28/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.04	0.03
04/29/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.02	0.04	0.03	0.04	0.02	0.03	0.03	0.03	0.03
04/30/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.04	0.02	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Reverse Osmosis Process online monitoring results																		
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
Date	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
04/01/21	0.016	0.016	8.687	7.865	9.477	0.053	0.049	0.077	1,699	1,621	1,795	27	24	31	99.40	2.22	98.41	1.80
04/02/21	0.016	0.020	8.708	7.916	9.441	0.054	0.049	0.064	1,707	1,632	1,793	27	23	35	99.38	2.21	98.44	1.81
04/03/21	0.016	0.016	8.568	7.835	9.619	0.051	0.043	0.056	1,667	1,596	1,747	25	23	29	99.40	2.22	98.49	1.82
04/04/21	0.016	0.016	8.457	7.742	9.289	0.046	0.043	0.049	1,613	1,541	1,684	25	23	28	99.46	2.26	98.47	1.81
04/05/21	0.016	0.016	8.810	7.670	10.214	0.047	0.043	0.057	1,608	1,512	1,747	25	22	30	99.47	2.28	98.43	1.80
04/06/21	0.016	0.016	9.289	8.515	10.380	0.052	0.049	0.057	1,689	1,597	1,809	26	22	31	99.44	2.25	98.47	1.81
04/07/21	0.016	0.016	8.926	8.196	9.956	0.052	0.046	0.056	1,698	1,620	1,789	26	23	30	99.42	2.23	98.45	1.81
04/08/21	0.016	0.016	8.890	8.062	9.553	0.054	0.052	0.062	1,722	1,659	1,816	27	24	32	99.39	2.22	98.41	1.80
04/09/21	0.016	0.020	8.951	8.105	9.849	0.061	0.049	0.089	1,735	1,658	1,845	28	23	35	99.32	2.16	98.40	1.80
04/10/21	0.016	0.016	8.987	8.151	9.751	0.051	0.047	0.081	1,725	1,666	1,803	28	25	32	99.43	2.24	98.35	1.78
04/11/21	0.016	0.016	9.010	8.224	9.896	0.049	0.045	0.052	1,670	1,618	1,733	27	25	31	99.46	2.27	98.38	1.79
04/12/21	0.016	0.016	9.138	8.225	10.315	0.048	0.045	0.062	1,644	1,539	1,786	26	23	32	99.47	2.28	98.39	1.79
04/13/21	0.016	0.016	9.374	8.578	10.315	0.056	0.045	0.063	1,740	1,666	1,846	29	26	33	99.40	2.22	98.36	1.78
04/14/21	0.016	0.016	9.127	8.339	9.949	0.053	0.049	0.061	1,749	1,667	1,848	28	25	34	99.42	2.23	98.38	1.79
04/15/21	0.016	0.016	9.120	8.185	9.901	0.053	0.000	0.061	1,773	1,707	1,866	29	26	33	99.42	2.24	98.38	1.79
04/16/21	0.016	0.020	8.754	8.111	9.927	0.052	0.047	0.060	1,749	1,666	1,847	28	25	34	99.40	2.22	98.38	1.79
04/17/21	0.016	0.016	8.610	7.740	9.426	0.053	0.046	0.060	1,734	1,668	1,802	29	26	32	99.39	2.21	98.34	1.78
04/18/21	0.016	0.016	8.565	7.726	9.301	0.049	0.046	0.057	1,674	1,602	1,748	27	24	31	99.42	2.24	98.36	1.79
04/19/21	0.016	0.016	8.603	7.707	9.618	0.049	0.043	0.060	1,661	1,565	1,781	28	24	32	99.43	2.25	98.32	1.78
04/20/21	0.016	0.016	8.848	7.995	9.670	0.056	0.049	0.060	1,732	1,643	1,861	29	25	33	99.37	2.20	98.34	1.78
04/21/21	0.016	0.016	8.937	8.039	9.567	0.056	0.049	0.068	1,774	1,699	1,861	30	27	34	99.37	2.20	98.33	1.78
04/22/21	0.016	0.016	8.625	7.737	9.737	0.057	0.050	0.073	1,773	1,684	1,898	30	26	36	99.34	2.18	98.30	1.77
04/23/21	0.016	0.020	8.718	7.717	9.639	0.055	0.048	0.073	1,760	1,688	1,837	30	25	37	99.37	2.20	98.30	1.77
04/24/21	0.016	0.016	8.700	7.792	9.639	0.052	0.049	0.058	1,728	1,662	1,799	29	27	32	99.40	2.22	98.31	1.77
04/25/21	0.016	0.016	8.779	7.609	9.853	0.053	0.042	0.060	1,672	1,606	1,750	30	26	35	99.40	2.22	98.24	1.75
04/26/21	0.016	0.016	8.972	7.979	10.279	0.051	0.045	0.064	1,649	1,554	1,776	29	25	34	99.43	2.25	98.23	1.75
04/27/21	0.016	0.016	9.106	8.131	10.279	0.054	0.046	0.067	1,726	1,634	1,838	30	26	35	99.40	2.22	98.27	1.76
04/28/21	0.016	0.016	8.642	7.735	9.844	0.058	0.052	0.067	1,726	1,629	1,840	31	27	35	99.33	2.18	98.22	1.75
04/29/21	0.016	0.016	8.537	7.598	9.545	0.058	0.052	0.062	1,734	1,641	1,840	32	28	37	99.32	2.17	98.16	1.73
04/30/21	0.016	0.020	8.523	7.609	9.541	0.056	0.050	0.062	1,732	1,638	1,824	31	25	37	99.34	2.18	98.21	1.75

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
04/01/21	97.87	92.364	23,151.9	0.25	3.0	6
04/02/21	98.03	92.079	22,965.4	0.25	3.0	6
04/03/21	98.13	90.387	23,011.1	0.25	3.0	6
04/04/21	98.33	88.978	23,015.4	0.25	3.0	6
04/05/21	98.25	89.353	22,952.6	0.26	3.0	6
04/06/21	98.33	89.597	23,010.0	0.26	3.0	6
04/07/21	98.66	89.541	23,227.8	0.26	3.0	6
04/08/21	98.58	89.312	23,586.9	0.26	3.0	6
04/09/21	98.33	88.996	23,157.7	0.26	3.0	6
04/10/21	98.57	91.231	22,881.3	0.26	3.0	6
04/11/21	98.36	90.729	22,900.7	0.25	3.0	6
04/12/21	98.64	89.105	22,499.5	0.26	3.0	6
04/13/21	98.48	89.788	23,533.8	0.26	3.0	6
04/14/21	98.62	87.609	23,511.4	0.26	3.0	6
04/15/21	98.22	91.232	22,792.2	0.26	3.0	6
04/16/21	98.09	93.460	23,392.0	0.25	3.0	6
04/17/21	97.90	91.327	24,330.5	0.25	3.0	6
04/18/21	97.91	89.811	24,124.3	0.26	3.0	6
04/19/21	97.96	89.802	23,918.6	0.26	3.0	6
04/20/21	98.06	89.803	23,600.7	0.26	3.0	6
04/21/21	98.01	90.534	23,269.2	0.26	3.0	6
04/22/21	98.01	92.251	23,247.3	0.26	3.0	6
04/23/21	97.96	90.917	23,198.1	0.26	3.0	6
04/24/21	98.10	92.471	23,265.9	0.25	3.0	6
04/25/21	98.09	90.207	23,140.8	0.25	3.0	6
04/26/21	98.11	89.461	23,150.1	0.26	3.0	6
04/27/21	98.06	89.649	23,124.9	0.26	3.0	6
04/28/21	97.99	89.818	23,127.3	0.26	3.0	6
04/29/21	97.91	89.318	23,130.8	0.26	3.0	6
04/30/21	98.01	91.710	22,929.1	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
05/01/21	12.30	12.30	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/02/21	12.33	12.33	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/03/21	12.32	12.32	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/04/21	12.25	12.25	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/05/21	12.25	12.25	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/06/21	12.24	12.24	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/07/21	12.25	12.25	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/08/21	12.30	12.30	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/09/21	12.30	12.30	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/10/21	12.30	12.30	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/11/21	12.23	12.23	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/12/21	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/13/21	12.21	12.21	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/14/21	12.18	12.18	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/15/21	12.20	12.20	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/16/21	12.23	12.23	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/17/21	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/18/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/19/21	12.17	12.17	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/20/21	12.18	12.18	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/21/21	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/22/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/23/21	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/24/21	12.24	12.24	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/25/21	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/26/21	12.30	12.30	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/27/21	12.26	12.26	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/28/21	12.21	12.21	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/29/21	12.28	12.28	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/30/21	12.28	12.28	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/31/21	12.28	12.28	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/21	0.00	4.11	2.19	6.00	0.00	12.30
05/02/21	0.00	4.11	2.22	6.00	0.00	12.33
05/03/21	0.00	4.08	2.23	6.00	0.00	12.32
05/04/21	0.00	4.06	2.19	6.00	0.00	12.25
05/05/21	0.00	4.07	2.18	6.00	0.00	12.25
05/06/21	0.00	4.10	2.15	6.00	0.00	12.24
05/07/21	0.00	4.10	2.14	6.00	0.00	12.25
05/08/21	0.00	4.13	2.17	6.00	0.00	12.30
05/09/21	0.00	4.11	2.19	6.00	0.00	12.30
05/10/21	0.00	4.10	2.20	6.00	0.00	12.30
05/11/21	0.00	4.07	2.15	6.00	0.00	12.23
05/12/21	0.00	4.05	2.15	6.00	0.00	12.19
05/13/21	0.00	4.05	2.16	6.00	0.00	12.21
05/14/21	0.00	4.05	2.13	6.00	0.00	12.18
05/15/21	0.00	4.06	2.14	6.00	0.00	12.20
05/16/21	0.00	4.06	2.18	6.00	0.00	12.23
05/17/21	0.00	4.02	2.21	6.00	0.00	12.23
05/18/21	0.00	4.04	2.16	6.00	0.00	12.20
05/19/21	0.00	4.05	2.12	6.00	0.00	12.17
05/20/21	0.00	4.06	2.13	6.00	0.00	12.18
05/21/21	0.00	4.02	2.15	6.00	0.00	12.17
05/22/21	0.00	4.04	2.16	6.00	0.00	12.20
05/23/21	0.00	4.06	2.18	6.00	0.00	12.24
05/24/21	0.00	4.04	2.20	6.00	0.00	12.24
05/25/21	0.00	4.02	2.16	6.00	0.00	12.18
05/26/21	0.00	4.15	2.15	6.00	0.00	12.30
05/27/21	0.00	4.12	2.14	6.00	0.00	12.26
05/28/21	0.00	4.06	2.15	6.00	0.00	12.21
05/29/21	0.00	4.10	2.18	6.00	0.00	12.28
05/30/21	0.00	4.08	2.20	6.00	0.00	12.28
05/31/21	0.00	4.08	2.20	6.00	0.00	12.28

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/21	0.00	0.00	2.19	6.00	4.00	12.19
05/02/21	0.00	0.00	2.22	6.00	4.00	12.22
05/03/21	0.00	0.00	2.23	6.00	4.00	12.23
05/04/21	0.00	0.00	2.19	6.00	4.00	12.19
05/05/21	0.00	0.00	2.18	6.00	4.00	12.18
05/06/21	0.00	0.00	2.15	6.00	4.00	12.15
05/07/21	0.00	0.00	2.14	6.00	4.00	12.14
05/08/21	0.00	0.00	2.17	6.00	4.00	12.17
05/09/21	0.00	0.00	2.19	6.00	4.00	12.19
05/10/21	0.00	0.00	2.20	6.00	4.00	12.20
05/11/21	0.00	0.00	2.15	6.00	4.00	12.15
05/12/21	0.00	0.00	2.15	6.00	4.00	12.15
05/13/21	0.00	0.00	2.16	6.00	4.00	12.16
05/14/21	0.00	0.00	2.13	6.00	4.00	12.13
05/15/21	0.00	0.00	2.14	6.00	4.00	12.14
05/16/21	0.00	0.00	2.18	6.00	4.00	12.18
05/17/21	0.00	0.00	2.21	6.00	4.00	12.21
05/18/21	0.00	0.00	2.16	6.00	4.00	12.16
05/19/21	0.00	0.00	2.12	6.00	4.00	12.12
05/20/21	0.00	0.00	2.13	6.00	4.00	12.13
05/21/21	0.00	0.00	2.15	6.00	4.00	12.15
05/22/21	0.00	0.00	2.16	6.00	4.00	12.16
05/23/21	0.00	0.00	2.18	6.00	4.00	12.18
05/24/21	0.00	0.00	2.20	6.00	4.00	12.20
05/25/21	0.00	0.00	2.16	6.00	4.00	12.16
05/26/21	0.00	0.00	2.15	6.00	4.00	12.15
05/27/21	0.00	0.00	2.14	6.00	4.00	12.14
05/28/21	0.00	0.00	2.15	6.00	4.00	12.15
05/29/21	0.00	0.00	2.18	6.00	4.00	12.18
05/30/21	0.00	0.00	2.20	6.00	4.00	12.20
05/31/21	0.00	0.00	2.20	6.00	4.00	12.20

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
05/01/21	4.34	4.42	4.24	4.13	4.18	4.27	4.45	4.26	4.33	4.48	4.40	4.35	4.35	4.26	4.43	4.22
05/02/21	4.32	4.38	4.43	4.15	4.35	4.29	4.42	4.25	4.31	4.48	4.40	4.62	4.30	4.21	4.43	4.23
05/03/21	4.33	4.40	4.52	4.14	4.40	4.32	4.44	4.45	4.33	4.45	4.41	4.63	4.27	4.24	4.41	4.22
05/04/21	4.28	4.36	4.43	4.06	4.40	4.28	4.40	4.41	4.31	4.44	4.37	4.62	4.33	4.22	4.40	4.20
05/05/21	4.31	4.37	4.45	4.10	4.42	4.28	4.40	4.41	4.31	4.47	4.39	4.64	4.33	4.23	4.42	4.17
05/06/21	4.27	4.36	4.47	4.22	4.38	4.29	4.43	4.39	4.30	4.43	4.37	4.65	4.28	4.22	4.42	4.15
05/07/21	4.30	4.74	4.41	4.33	4.40	4.25	4.37	4.41	4.27	4.40	4.36	4.59	4.28	4.21	4.40	4.15
05/08/21	4.51	4.68	4.41	4.33	4.41	4.25	4.40	4.35	4.21	4.39	4.53	4.62	4.15	4.18	4.35	4.15
05/09/21	4.54	4.66	4.43	4.34	4.37	4.25	4.42	4.35	4.23	4.41	4.63	4.61	4.28	4.17	4.38	4.14
05/10/21	4.46	4.65	4.41	4.33	4.38	4.26	4.54	4.36	4.24	4.41	4.60	4.56	4.25	4.17	4.37	4.11
05/11/21	4.47	4.56	4.31	4.32	4.30	4.19	4.51	4.37	4.15	4.33	4.54	4.59	4.07	4.15	4.33	4.09
05/12/21	4.50	4.60	4.34	4.24	4.31	4.20	4.53	4.47	4.16	4.29	4.53	4.54	4.41	4.16	4.31	4.05
05/13/21	4.49	4.59	4.33	4.25	4.32	4.32	4.54	4.41	4.44	4.30	4.51	4.53	4.30	4.07	4.26	4.05
05/14/21	4.46	4.54	4.26	4.22	4.31	4.34	4.51	4.37	4.41	4.28	4.52	4.51	4.41	4.05	4.24	4.05
05/15/21	4.43	4.54	4.22	4.14	4.23	4.31	4.49	4.32	4.39	4.22	4.53	4.46	4.23	4.06	4.25	4.25
05/16/21	4.43	4.55	4.23	4.16	4.25	4.32	4.49	4.34	4.40	4.23	4.51	4.46	* N/A	4.06	4.27	4.28
05/17/21	4.38	4.54	4.21	4.17	4.22	4.30	4.48	4.31	4.37	4.21	4.48	4.45	4.51	4.02	4.42	4.23
05/18/21	4.36	4.36	4.19	4.16	4.18	4.29	4.47	4.29	4.38	4.21	4.46	4.41	4.40	4.04	4.44	4.22
05/19/21	4.37	4.44	4.12	4.13	4.18	4.33	4.41	4.29	4.36	4.34	4.42	4.40	4.45	4.25	4.47	4.24
05/20/21	4.40	4.51	4.30	4.13	4.18	4.35	4.42	4.26	4.30	4.48	4.45	4.42	4.44	4.33	4.46	4.26
05/21/21	4.33	4.47	4.23	4.10	4.45	4.31	4.42	4.22	4.29	4.48	4.47	4.38	4.45	4.31	4.45	4.27
05/22/21	4.31	4.43	4.42	4.07	4.37	4.29	4.42	4.35	4.27	4.44	4.41	4.58	4.42	4.25	4.42	4.24
05/23/21	4.31	4.33	4.35	4.06	4.36	4.27	4.41	4.29	4.30	4.45	4.38	4.62	4.39	4.25	4.42	4.21
05/24/21	4.32	4.31	4.48	4.04	4.33	4.26	4.39	4.26	4.24	4.41	4.37	4.61	4.34	4.23	4.43	4.17
05/25/21	4.25	4.28	4.42	4.14	4.35	4.22	4.36	4.34	4.22	4.41	4.35	4.61	4.31	4.24	4.39	4.18
05/26/21	4.26	4.26	4.42	4.20	4.39	4.19	4.36	4.26	4.22	4.35	4.34	4.57	4.32	4.23	4.39	4.25
05/27/21	4.56	4.59	4.35	4.31	4.37	4.15	4.34	4.34	4.17	4.35	4.31	4.57	4.30	4.19	4.35	4.32
05/28/21	4.51	4.58	4.32	4.31	4.33	4.13	4.30	4.27	4.12	4.27	4.53	4.57	4.26	4.13	4.34	4.32
05/29/21	4.50	4.55	4.24	4.23	4.29	4.10	4.60	4.28	4.17	4.32	4.54	4.56	4.21	4.14	4.34	4.29
05/30/21	4.46	4.64	4.33	4.20	4.35	4.11	4.57	4.20	4.14	4.32	4.58	4.54	4.24	4.12	4.33	4.27
05/31/21	4.46	4.55	4.26	4.25	4.28	4.12	4.49	4.34	4.14	4.33	4.54	4.52	4.22	4.12	4.29	4.23

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell Out of service for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
05/01/21	5.17	5.25	5.04	4.87	5.25	5.19	5.24	5.10	4.15	4.13	4.29	4.11	4.52	4.35	4.25	4.49
05/02/21	5.13	5.24	5.01	4.88	5.32	5.18	5.24	5.07	4.18	4.16	4.26	4.15	4.54	4.31	4.24	4.45
05/03/21	5.17	5.25	4.94	4.87	5.31	5.20	5.23	5.08	4.15	4.10	4.26	4.13	4.51	4.29	4.24	4.35
05/04/21	5.13	5.24	4.89	4.85	5.29	5.20	5.24	5.10	4.13	4.20	4.22	4.13	4.48	4.31	4.21	4.41
05/05/21	5.17	5.26	4.90	4.85	5.31	5.22	5.21	5.12	4.35	4.30	4.22	4.07	4.43	4.30	4.22	4.40
05/06/21	5.22	5.25	4.96	4.82	5.26	5.18	5.22	5.07	4.38	4.29	4.20	4.10	4.43	4.34	4.24	4.43
05/07/21	5.16	5.24	4.97	4.80	5.23	5.15	5.25	5.04	4.43	4.26	4.22	4.25	4.41	4.40	4.17	4.36
05/08/21	5.13	5.24	4.99	4.81	5.20	5.14	5.23	5.04	4.43	4.29	4.19	4.31	4.45	4.36	4.18	4.36
05/09/21	5.18	5.22	4.96	4.81	5.16	5.17	5.23	5.15	4.41	4.24	4.13	4.31	4.43	4.33	4.21	4.35
05/10/21	5.16	5.21	4.89	4.79	5.16	5.11	5.19	5.34	4.35	4.27	4.14	4.31	4.41	4.33	4.17	4.33
05/11/21	5.09	5.18	4.87	5.07	5.14	5.12	5.17	5.29	4.34	4.27	4.34	4.34	4.37	4.31	4.12	4.31
05/12/21	5.12	5.19	4.85	5.08	5.15	5.13	5.22	5.29	4.38	4.24	4.33	4.29	4.39	4.35	4.10	4.32
05/13/21	5.10	5.16	4.85	5.06	5.11	5.11	5.17	5.29	4.36	4.21	4.31	4.29	4.33	4.42	4.14	4.28
05/14/21	5.07	5.13	4.90	5.04	5.14	5.10	5.16	5.30	4.30	4.12	4.34	4.25	4.31	4.45	4.15	4.26
05/15/21	5.07	5.11	4.91	5.02	5.08	5.05	5.16	5.30	4.30	4.14	4.29	4.24	4.29	4.39	4.37	4.17
05/16/21	5.02	5.11	4.89	5.03	5.04	5.03	5.13	5.23	4.31	4.07	4.28	4.24	4.26	4.36	4.40	4.19
05/17/21	4.98	5.11	4.82	4.99	5.40	5.02	5.10	5.17	4.26	4.12	4.27	4.21	4.26	4.32	4.28	4.21
05/18/21	4.97	5.11	4.81	4.94	5.37	4.99	5.15	5.18	4.23	4.11	4.28	4.20	4.47	4.50	4.31	4.11
05/19/21	5.07	5.15	4.83	4.99	5.39	5.12	5.18	5.22	4.20	4.07	4.28	4.18	4.52	4.56	4.35	4.20
05/20/21	5.03	5.13	4.77	4.98	5.37	5.06	5.14	5.21	4.19	4.06	4.30	4.13	4.57	4.60	4.37	4.31
05/21/21	4.98	5.10	4.76	5.00	5.34	5.12	5.08	5.16	4.15	4.02	4.19	4.12	4.55	4.50	4.27	4.51
05/22/21	4.93	5.07	4.72	4.97	5.31	5.27	5.03	5.19	4.17	4.04	4.21	4.09	4.53	4.49	4.21	4.43
05/23/21	4.92	5.03	4.67	4.92	5.30	5.26	5.03	5.20	4.14	4.12	4.22	4.08	4.50	4.51	4.22	4.43
05/24/21	5.10	5.00	4.71	4.91	5.29	5.23	5.03	5.17	4.33	4.31	4.22	4.08	4.49	4.51	4.24	4.38
05/25/21	5.26	4.95	4.73	4.92	5.30	5.23	5.00	5.15	4.40	4.29	4.14	4.02	4.51	4.46	4.24	4.35
05/26/21	5.23	4.95	4.72	4.89	5.28	5.22	5.10	5.15	4.37	4.27	4.15	4.20	4.47	4.48	4.21	4.37
05/27/21	5.16	4.91	4.60	4.86	5.25	5.15	5.20	5.12	4.37	4.17	4.12	4.35	4.42	4.49	4.16	4.37
05/28/21	5.14	5.07	4.83	4.80	5.25	5.14	5.20	5.09	4.37	4.14	4.06	4.34	4.41	4.39	4.14	4.30
05/29/21	5.15	5.28	4.89	4.82	5.22	5.17	5.24	5.08	4.37	4.18	4.10	4.31	4.43	4.42	4.14	4.31
05/30/21	5.12	5.25	4.91	4.85	5.25	5.17	5.23	5.09	4.35	4.22	4.22	4.29	4.39	4.41	4.08	4.34
05/31/21	5.13	5.25	4.88	4.83	5.32	5.19	5.25	5.13	4.40	4.21	4.34	4.30	4.40	4.40	4.09	4.33

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
05/01/21	4.21	4.11	4.20	4.40
05/02/21	4.29	4.11	4.13	4.44
05/03/21	4.40	4.08	4.17	4.34
05/04/21	4.40	4.11	4.21	4.40
05/05/21	4.37	4.16	4.16	4.50
05/06/21	4.33	4.34	4.14	4.42
05/07/21	4.30	4.29	4.10	4.42
05/08/21	4.31	4.27	4.13	4.58
05/09/21	4.31	4.30	4.11	4.47
05/10/21	4.34	4.34	4.10	4.47
05/11/21	4.39	4.34	4.09	4.51
05/12/21	4.36	4.32	4.18	4.39
05/13/21	4.34	4.28	4.30	4.37
05/14/21	4.31	4.25	4.23	4.38
05/15/21	4.30	4.24	4.16	4.31
05/16/21	4.25	4.20	4.25	4.40
05/17/21	4.21	4.16	4.20	4.43
05/18/21	4.23	4.14	4.12	4.31
05/19/21	4.20	4.05	4.22	4.10
05/20/21	4.23	4.14	4.30	4.35
05/21/21	4.38	4.06	4.21	4.40
05/22/21	4.40	4.08	4.53	4.24
05/23/21	4.36	4.11	4.21	4.35
05/24/21	4.32	4.08	4.09	4.36
05/25/21	* N/A	* N/A	* N/A	* N/A
05/26/21	4.36	4.44	4.37	4.44
05/27/21	4.33	4.30	4.35	4.38
05/28/21	4.32	4.27	4.17	4.35
05/29/21	4.24	4.29	4.22	4.36
05/30/21	4.22	4.33	4.49	4.39
05/31/21	4.28	4.28	4.08	4.25

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell out of service.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
05/01/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.06	0.03
05/02/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03
05/03/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03
05/04/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.04	0.03	0.04	0.02	0.03	0.04	0.04	0.03
05/05/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.03
05/06/21	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02
05/07/21	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.04	0.03	0.04	0.02	0.03	0.02	0.02	0.02
05/08/21	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02
05/09/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.05	0.03	0.03	0.02	0.03	0.02	0.03	0.02
05/10/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.03	0.02
05/11/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.02	0.03	0.02	0.04	0.02
05/12/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.03
05/13/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02
05/14/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.03
05/15/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
05/16/21	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.06	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
05/17/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.03
05/18/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
05/19/21	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.09	0.03	0.12	0.03	0.04	0.03	0.03	0.04	0.04	0.03
05/20/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.02	0.03	0.04	0.04	0.03
05/21/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.04	0.04	0.03
05/22/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.17	0.03	0.03	0.04	0.04	0.02	0.03	0.04	0.05	0.03
05/23/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.06	0.04	0.04	0.02	0.03	0.05	0.05	0.03
05/24/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.03	0.05	0.05	0.03
05/25/21	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	* N/A	* N/A	0.03
05/26/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.04	0.04	0.02	0.03	0.05	0.06	0.03
05/27/21	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.05	0.05	0.04	0.04	0.02	0.03	0.06	0.06	0.03
05/28/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.05	0.06	0.04	0.04	0.02	0.03	0.06	0.06	0.03
05/29/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.06	0.06	0.04	0.04	0.02	0.03	0.06	0.06	0.04
05/30/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.06	0.08	0.04	0.04	0.02	0.03	0.06	0.07	0.04
05/31/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.06	0.07	0.04	0.04	0.02	0.03	0.07	0.07	0.04

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Cell out of service

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
05/01/21	0.016	0.016	8.714	7.839	9.566	0.056	0.054	0.062	1,651	1,580	1,725	29	26	33	99.35	2.19	98.24	1.75
05/02/21	0.016	0.016	8.733	7.850	9.553	0.053	0.044	0.058	1,616	1,524	1,725	29	26	35	99.40	2.22	98.18	1.74
05/03/21	0.016	0.016	8.600	7.668	9.699	0.050	0.045	0.061	1,696	1,617	1,800	32	27	37	99.42	2.23	98.14	1.73
05/04/21	0.016	0.016	8.809	7.888	9.699	0.057	0.052	0.064	1,736	1,661	1,862	33	29	38	99.35	2.19	98.12	1.73
05/05/21	0.016	0.016	8.594	7.794	9.530	0.057	0.053	0.062	1,745	1,677	1,834	33	28	37	99.34	2.18	98.13	1.73
05/06/21	0.016	0.016	8.570	7.752	9.340	0.061	0.054	0.072	1,750	1,676	1,854	32	28	38	99.29	2.15	98.18	1.74
05/07/21	0.016	0.016	8.472	7.719	9.281	0.061	0.055	0.071	1,730	1,670	1,799	32	29	37	99.28	2.14	98.13	1.73
05/08/21	0.016	0.016	8.366	7.629	9.244	0.057	0.054	0.062	1,661	1,595	1,719	31	29	35	99.32	2.17	98.11	1.72
05/09/21	0.016	0.016	8.202	7.495	8.936	0.053	0.047	0.057	1,613	1,531	1,709	30	28	34	99.36	2.19	98.12	1.73
05/10/21	0.016	0.016	8.182	7.385	9.588	0.052	0.047	0.062	1,693	1,601	1,808	32	27	38	99.37	2.20	98.12	1.73
05/11/21	0.016	0.016	8.538	7.779	9.588	0.060	0.052	0.068	1,740	1,671	1,824	34	30	38	99.30	2.15	98.07	1.71
05/12/21	0.016	0.016	8.447	7.716	9.281	0.060	0.057	0.067	1,736	1,663	1,840	33	29	38	99.28	2.15	98.10	1.72
05/13/21	0.016	0.019	8.365	7.712	9.161	0.058	0.052	0.068	1,745	1,676	1,822	33	29	37	99.30	2.16	98.11	1.72
05/14/21	0.016	0.016	8.251	7.596	9.161	0.061	0.058	0.069	1,716	1,654	1,794	33	29	36	99.26	2.13	98.10	1.72
05/15/21	0.016	0.016	8.294	7.500	11.454	0.061	0.055	0.068	1,646	1,587	1,709	32	29	35	99.27	2.14	98.08	1.72
05/16/21	0.016	0.016	8.302	7.549	9.238	0.055	0.051	0.062	1,613	1,511	1,752	31	27	36	99.34	2.18	98.08	1.72
05/17/21	0.016	0.016	8.372	7.726	9.350	0.052	0.048	0.064	1,695	1,599	1,844	32	27	39	99.38	2.21	98.11	1.72
05/18/21	0.016	0.016	8.509	7.858	9.510	0.059	0.052	0.066	1,750	1,694	1,801	34	26	40	99.31	2.16	98.05	1.71
05/19/21	0.016	0.016	8.751	8.230	9.224	0.067	0.061	0.089	1,730	1,646	1,848	33	29	40	99.23	2.12	98.08	1.72
05/20/21	0.016	0.020	8.437	7.981	9.066	0.063	0.059	0.075	1,728	1,648	1,811	33	30	38	99.25	2.13	98.08	1.72
05/21/21	0.016	0.016	8.157	7.559	8.776	0.058	0.052	0.066	1,708	1,653	1,787	32	29	37	99.29	2.15	98.14	1.73
05/22/21	0.016	0.016	8.133	7.620	9.098	0.056	0.054	0.061	1,638	1,574	1,697	30	27	34	99.31	2.16	98.19	1.74
05/23/21	0.016	0.016	7.994	7.420	8.965	0.052	0.045	0.057	1,611	1,525	1,736	30	26	35	99.34	2.18	98.17	1.74
05/24/21	0.016	0.016	8.342	7.666	9.426	0.052	0.049	0.062	1,699	1,591	1,819	31	26	37	99.37	2.20	98.16	1.73
05/25/21	0.016	0.016	8.495	7.884	9.214	0.059	0.052	0.065	1,714	1,627	1,810	32	27	37	99.31	2.16	98.16	1.73
05/26/21	0.015	0.016	8.407	7.872	9.317	0.060	0.054	0.066	1,716	1,635	1,817	33	28	37	99.29	2.15	98.09	1.72
05/27/21	0.016	0.020	8.367	7.815	9.231	0.060	0.055	0.070	1,718	1,644	1,792	32	29	36	99.28	2.14	98.12	1.73
05/28/21	0.016	0.016	8.251	7.658	9.501	0.058	0.050	0.067	1,688	1,627	1,761	32	29	35	99.29	2.15	98.12	1.73
05/29/21	0.016	0.016	8.262	7.606	9.018	0.055	0.052	0.062	1,617	1,552	1,677	30	27	34	99.34	2.18	98.15	1.73
05/30/21	0.016	0.016	7.934	7.518	8.688	0.050	0.048	0.056	1,581	1,521	1,633	30	27	33	99.36	2.20	98.10	1.72
05/31/21	0.016	0.016	7.947	7.276	9.069	0.050	0.049	0.056	1,549	1,458	1,691	28	25	33	99.36	2.20	98.17	1.74

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
Date	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
05/01/21	97.96	91.101	23,112.1	0.25	3.0	6
05/02/21	97.98	89.720	24,121.1	0.26	3.0	6
05/03/21	97.97	89.742	23,832.2	0.26	3.0	6
05/04/21	98.05	89.771	22,898.6	0.26	3.0	6
05/05/21	98.10	89.725	22,746.4	0.25	3.0	6
05/06/21	98.06	88.081	22,605.2	0.26	3.0	6
05/07/21	97.71	89.652	22,800.7	0.25	3.0	6
05/08/21	97.82	89.786	22,800.5	0.25	3.0	6
05/09/21	97.63	89.857	22,817.2	0.25	3.0	6
05/10/21	97.85	89.441	22,873.2	0.26	3.0	6
05/11/21	97.87	87.774	22,850.3	0.25	3.0	6
05/12/21	97.89	91.047	22,829.3	0.25	3.0	6
05/13/21	97.86	94.235	22,811.1	0.24	3.0	6
05/14/21	97.77	93.619	22,715.2	0.25	3.0	6
05/15/21	97.69	91.258	22,531.2	0.25	3.0	6
05/16/21	97.86	91.103	22,979.9	0.25	3.0	6
05/17/21	98.04	91.914	22,927.3	0.25	3.0	6
05/18/21	97.83	89.227	22,885.3	0.26	3.0	6
05/19/21	98.01	26.403	8,671.8	0.28	3.0	6
05/20/21	96.93	90.514	23,396.8	0.26	3.0	6
05/21/21	96.73	93.258	23,129.5	0.25	3.0	6
05/22/21	97.08	91.971	23,067.0	0.25	3.0	6
05/23/21	97.05	90.787	23,107.3	0.26	3.0	6
05/24/21	97.07	82.053	21,784.0	0.27	3.0	6
05/25/21	97.32	80.263	21,189.2	0.26	3.0	6
05/26/21	97.32	87.201	22,040.3	0.25	3.0	6
05/27/21	97.24	92.781	23,103.0	0.25	3.0	6
05/28/21	97.29	94.597	22,988.4	0.24	3.0	6
05/29/21	97.42	89.310	22,704.6	0.26	3.0	6
05/30/21	97.34	89.504	23,831.9	0.27	3.0	6
05/31/21	96.88	86.411	23,202.1	0.27	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
06/01/21	12.27	12.27	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/02/21	12.24	12.24	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/03/21	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/04/21	12.17	12.17	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/05/21	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/06/21	12.17	12.17	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/07/21	12.20	12.20	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/08/21	12.22	12.22	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/09/21	12.19	12.19	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/10/21	12.18	12.18	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/11/21	12.15	12.15	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/12/21	12.18	12.18	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/13/21	12.22	12.22	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/14/21	12.34	12.34	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/15/21	12.34	12.34	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/16/21	12.25	12.25	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/17/21	12.24	12.24	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/18/21	12.20	12.20	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/19/21	12.20	12.20	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/20/21	12.28	12.28	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/21/21	12.26	12.26	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/22/21	12.27	12.27	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/23/21	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/24/21	12.12	12.12	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/25/21	12.11	12.11	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/26/21	12.13	12.13	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/27/21	12.14	12.14	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/28/21	12.15	12.15	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/29/21	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/30/21	12.14	12.14	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/21	0.00	4.07	2.20	6.00	0.00	12.27
06/02/21	0.00	4.04	2.20	6.00	0.00	12.24
06/03/21	0.00	4.01	2.14	6.00	0.00	12.15
06/04/21	0.00	4.03	2.14	6.00	0.00	12.17
06/05/21	0.00	4.04	2.15	6.00	0.00	12.19
06/06/21	0.00	4.02	2.14	6.00	0.00	12.17
06/07/21	0.00	4.06	2.15	6.00	0.00	12.20
06/08/21	0.00	4.03	2.19	6.00	0.00	12.22
06/09/21	0.00	4.04	2.14	6.00	0.00	12.19
06/10/21	0.00	4.04	2.13	6.00	0.00	12.18
06/11/21	0.00	4.02	2.12	6.00	0.00	12.15
06/12/21	0.00	4.03	2.14	6.00	0.00	12.18
06/13/21	0.00	4.08	2.14	6.00	0.00	12.22
06/14/21	0.00	4.17	2.17	6.00	0.00	12.34
06/15/21	0.00	4.15	2.19	6.00	0.00	12.34
06/16/21	0.00	4.12	2.13	6.00	0.00	12.25
06/17/21	0.00	4.12	2.12	6.00	0.00	12.24
06/18/21	0.00	4.09	2.11	6.00	0.00	12.20
06/19/21	0.00	4.07	2.13	6.00	0.00	12.20
06/20/21	0.00	4.13	2.15	6.00	0.00	12.28
06/21/21	0.00	4.09	2.16	6.00	0.00	12.26
06/22/21	0.00	4.09	2.18	6.00	0.00	12.27
06/23/21	0.00	4.02	2.13	6.00	0.00	12.16
06/24/21	0.00	4.00	2.11	6.00	0.00	12.12
06/25/21	0.00	4.00	2.10	6.00	0.00	12.11
06/26/21	0.00	4.02	2.11	6.00	0.00	12.13
06/27/21	0.00	4.03	2.11	6.00	0.00	12.14
06/28/21	0.00	4.02	2.13	6.00	0.00	12.15
06/29/21	0.00	4.02	2.15	6.00	0.00	12.16
06/30/21	0.00	4.03	2.11	6.00	0.00	12.14

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/21	0.00	0.00	2.20	6.00	4.00	12.20
06/02/21	0.00	0.00	2.20	6.00	4.00	12.20
06/03/21	0.00	0.00	2.14	6.00	4.00	12.14
06/04/21	0.00	0.00	2.14	6.00	4.00	12.14
06/05/21	0.00	0.00	2.15	6.00	4.00	12.15
06/06/21	0.00	0.00	2.14	6.00	4.00	12.14
06/07/21	0.00	0.00	2.15	6.00	4.00	12.15
06/08/21	0.00	0.00	2.19	6.00	4.00	12.19
06/09/21	0.00	0.00	2.14	6.00	4.00	12.14
06/10/21	0.00	0.00	2.13	6.00	4.00	12.13
06/11/21	0.00	0.00	2.12	6.00	4.00	12.12
06/12/21	0.00	0.00	2.14	6.00	4.00	12.14
06/13/21	0.00	0.00	2.14	6.00	4.00	12.14
06/14/21	0.00	0.00	2.17	6.00	4.00	12.17
06/15/21	0.00	0.00	2.19	6.00	4.00	12.19
06/16/21	0.00	0.00	2.13	6.00	4.00	12.13
06/17/21	0.00	0.00	2.12	6.00	4.00	12.12
06/18/21	0.00	0.00	2.11	6.00	4.00	12.11
06/19/21	0.00	0.00	2.13	6.00	4.00	12.13
06/20/21	0.00	0.00	2.15	6.00	4.00	12.15
06/21/21	0.00	0.00	2.16	6.00	4.00	12.16
06/22/21	0.00	0.00	2.18	6.00	4.00	12.18
06/23/21	0.00	0.00	2.13	6.00	4.00	12.13
06/24/21	0.00	0.00	2.11	6.00	4.00	12.11
06/25/21	0.00	0.00	2.10	6.00	4.00	12.10
06/26/21	0.00	0.00	2.11	6.00	4.00	12.11
06/27/21	0.00	0.00	2.11	6.00	4.00	12.11
06/28/21	0.00	0.00	2.13	6.00	4.00	12.13
06/29/21	0.00	0.00	2.15	6.00	4.00	12.15
06/30/21	0.00	0.00	2.11	6.00	4.00	12.11

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
06/01/21	4.50	4.66	4.25	4.20	4.32	4.46	4.55	4.37	4.12	4.32	4.55	4.52	4.23	4.07	4.31	4.25
06/02/21	4.40	4.62	4.18	4.18	4.25	4.36	4.49	4.36	4.39	4.22	4.57	4.45	4.43	4.04	4.29	4.24
06/03/21	4.39	4.45	4.21	4.18	4.21	4.35	4.46	4.31	4.33	4.24	4.51	4.46	4.44	4.01	4.24	4.19
06/04/21	4.41	4.48	4.21	4.15	4.19	4.39	4.49	4.34	4.41	4.25	4.49	4.47	4.44	4.03	4.23	4.19
06/05/21	4.41	4.45	4.20	4.12	4.17	4.37	4.48	4.32	4.41	4.19	4.47	4.44	4.42	4.04	4.22	4.33
06/06/21	4.43	4.52	4.11	4.04	4.21	4.31	4.41	4.32	4.36	4.22	4.50	4.44	4.41	4.02	4.21	4.37
06/07/21	4.36	4.53	4.18	4.06	4.22	4.33	4.46	4.28	4.39	4.44	4.50	4.40	4.42	4.26	4.43	4.32
06/08/21	4.42	4.44	4.11	4.05	4.17	4.27	4.44	4.28	4.35	4.51	4.49	4.39	4.37	4.37	4.46	4.30
06/09/21	4.42	4.49	4.22	4.04	4.31	4.31	4.48	4.37	4.30	4.49	4.41	4.66	4.35	4.29	4.46	4.32
06/10/21	4.33	4.50	4.34	4.06	4.38	4.31	4.45	4.33	4.32	4.47	4.39	4.68	4.36	4.23	4.45	4.33
06/11/21	4.29	4.44	4.43	4.02	4.37	4.31	4.42	4.35	4.30	4.44	4.41	4.65	4.30	4.27	4.45	4.28
06/12/21	4.36	4.34	4.41	4.03	4.36	4.29	4.42	4.35	4.27	4.45	4.38	4.63	4.28	4.26	4.45	4.29
06/13/21	4.28	4.39	4.38	4.12	4.33	4.23	4.35	4.32	4.28	4.44	4.35	4.61	4.33	4.22	4.41	4.29
06/14/21	4.34	4.41	4.43	4.29	4.37	4.25	4.38	4.33	4.22	4.40	4.33	4.62	4.29	4.21	4.39	4.28
06/15/21	4.51	4.76	4.36	4.28	4.34	4.25	4.37	4.31	4.22	4.42	4.47	4.56	4.30	4.21	4.41	4.26
06/16/21	4.53	4.68	4.27	4.24	4.35	4.22	4.37	4.27	4.21	4.35	4.59	4.52	4.25	4.20	4.38	4.26
06/17/21	4.47	4.68	4.27	4.24	4.33	4.19	4.48	4.25	4.14	4.32	4.56	4.50	4.21	4.16	4.35	4.22
06/18/21	4.53	4.65	4.21	4.18	4.32	4.16	4.53	4.32	4.09	4.29	4.55	4.41	4.20	4.10	4.33	4.21
06/19/21	4.53	4.65	4.20	4.22	4.32	4.17	4.54	4.33	4.12	4.31	4.55	4.48	4.12	4.12	4.31	4.21
06/20/21	4.51	4.64	4.20	4.15	4.31	4.36	4.48	4.33	4.42	4.29	4.56	4.50	4.13	4.13	4.32	4.17
06/21/21	4.49	4.63	4.19	4.17	4.30	4.38	4.53	4.34	4.45	4.28	4.53	4.47	4.43	4.09	4.31	4.19
06/22/21	4.49	4.55	4.18	4.14	4.24	4.32	4.51	4.34	4.38	4.21	4.54	4.48	4.43	4.09	4.31	4.15
06/23/21	4.40	4.58	4.05	4.02	4.25	4.33	4.48	4.30	4.41	4.23	4.50	4.42	4.40	4.04	4.28	4.13
06/24/21	4.44	4.57	4.11	4.02	4.23	4.34	4.48	4.27	4.32	4.17	4.50	4.43	4.38	4.00	4.24	4.29
06/25/21	4.41	4.55	4.10	4.02	4.21	4.32	4.48	4.28	4.31	4.59	4.48	4.42	4.40	4.00	4.24	4.35
06/26/21	4.36	4.44	4.04	4.02	4.17	4.31	4.42	4.21	4.32	4.55	4.46	4.36	4.38	4.27	4.22	4.34
06/27/21	4.36	4.46	4.03	4.05	4.33	4.28	4.44	4.43	4.35	4.50	4.48	4.57	4.40	4.35	4.22	4.34
06/28/21	4.39	4.42	4.07	4.02	4.35	4.28	4.42	4.40	4.33	4.46	4.47	4.68	4.36	4.30	4.39	4.36
06/29/21	4.37	4.39	4.16	4.02	4.36	4.29	4.39	4.39	4.31	4.44	4.42	4.60	4.31	4.28	4.46	4.33
06/30/21	4.35	4.41	4.28	* N/A	4.36	4.25	4.38	4.34	4.31	4.44	4.42	4.60	4.32	4.27	4.45	4.31

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell out of service for repairs

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
06/01/21	5.15	5.23	4.86	4.78	5.26	5.16	5.25	5.09	4.38	4.17	4.33	4.29	4.39	4.37	4.11	4.29
06/02/21	5.10	5.23	4.86	4.73	5.17	5.14	5.23	5.05	4.32	4.16	4.30	4.23	4.38	4.32	4.04	4.25
06/03/21	5.09	5.22	4.84	4.73	5.15	5.13	5.23	5.00	4.28	4.18	4.33	4.17	4.34	4.32	4.20	4.21
06/04/21	5.10	5.20	4.88	4.70	5.17	5.10	5.17	5.01	4.29	4.12	4.31	4.17	4.31	4.34	4.36	4.22
06/05/21	5.15	5.22	4.89	4.72	5.13	5.10	5.16	5.03	4.27	4.10	4.26	4.20	4.29	4.34	4.32	4.16
06/06/21	5.13	5.21	4.86	4.72	5.15	5.12	5.19	5.28	4.27	4.13	4.30	4.21	4.29	4.60	4.28	4.20
06/07/21	5.12	5.18	4.88	4.69	5.16	5.11	5.18	5.36	4.27	4.07	4.29	4.15	4.33	4.56	4.29	4.18
06/08/21	5.10	5.18	5.12	4.90	5.10	5.14	5.17	5.32	4.27	4.03	4.27	4.14	4.55	4.54	4.27	4.27
06/09/21	5.09	5.17	5.21	5.05	5.11	5.16	5.16	5.31	4.24	4.05	4.27	4.13	4.54	4.50	4.22	4.40
06/10/21	5.06	5.17	5.16	4.95	5.09	5.12	5.16	5.32	4.20	4.04	4.26	4.09	4.52	4.50	4.27	4.38
06/11/21	5.03	5.15	5.11	4.94	5.07	5.12	5.16	5.28	4.16	4.15	4.27	4.11	4.54	4.49	4.29	4.43
06/12/21	5.05	5.11	5.14	4.96	5.04	5.13	5.18	5.25	4.26	4.30	4.25	4.10	4.53	4.48	4.26	4.39
06/13/21	5.02	5.09	5.15	4.98	5.03	5.11	5.15	5.27	4.37	4.31	4.19	4.08	4.53	4.51	4.22	4.35
06/14/21	4.99	5.08	5.10	4.98	5.19	5.09	5.12	5.26	4.38	4.27	4.21	4.21	4.52	4.51	4.23	4.35
06/15/21	4.99	5.08	5.11	4.98	5.33	5.20	5.12	5.26	4.39	4.23	4.15	4.35	4.49	4.50	4.19	4.34
06/16/21	4.94	5.07	5.09	4.95	5.37	5.29	5.09	5.26	4.33	4.23	4.12	4.30	4.47	4.47	4.17	4.32
06/17/21	4.92	5.04	5.05	4.91	5.37	5.27	5.05	5.22	4.35	4.22	4.12	4.25	4.44	4.38	4.17	4.35
06/18/21	4.88	5.08	5.09	4.89	5.35	5.26	5.03	5.20	4.35	4.21	4.14	4.24	4.43	4.43	4.16	4.26
06/19/21	5.19	5.01	5.05	4.88	5.33	5.27	5.02	5.16	4.35	4.20	4.33	4.24	4.45	4.44	4.12	4.23
06/20/21	5.28	5.01	5.07	4.85	5.32	5.29	5.03	5.14	4.36	4.19	4.34	4.25	4.44	4.43	4.13	4.25
06/21/21	5.22	5.01	5.10	4.87	5.28	5.27	5.17	5.16	4.34	4.18	4.35	4.24	4.41	4.40	4.11	4.28
06/22/21	5.22	4.96	5.04	4.88	5.24	5.26	5.30	5.18	4.32	4.15	4.32	4.19	4.39	4.38	4.10	4.26
06/23/21	5.21	5.19	5.01	4.86	5.29	5.25	5.27	5.16	4.27	4.14	4.30	4.17	4.33	4.35	4.28	4.23
06/24/21	5.17	5.26	5.27	4.83	5.32	5.18	5.25	5.15	4.23	4.11	4.27	4.19	4.27	4.39	4.27	4.23
06/25/21	5.16	5.22	5.32	4.82	5.22	5.22	5.28	5.13	4.22	4.09	4.27	4.17	4.24	4.50	4.28	4.22
06/26/21	5.19	5.20	5.27	4.82	5.20	5.21	5.29	5.13	4.19	4.09	4.27	4.15	4.23	4.50	4.28	4.26
06/27/21	5.20	5.24	5.25	4.83	5.19	5.19	5.29	5.13	4.21	4.04	4.27	4.13	4.35	4.48	4.28	4.49
06/28/21	5.18	5.26	5.29	4.81	5.19	5.21	5.27	5.11	4.22	4.03	4.26	4.13	4.53	4.47	4.30	4.43
06/29/21	5.21	5.21	5.24	4.80	5.20	5.23	5.24	5.06	4.14	4.02	4.21	4.10	4.54	4.49	4.28	4.37
06/30/21	5.17	5.22	5.24	4.74	5.17	5.19	5.22	5.05	4.08	4.22	4.20	4.03	4.54	4.47	4.20	4.37

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value			
	E01	**E02**	**E03**	**E04**
Date	LRV	LRV	LRV	LRV
06/01/21	4.42	4.29	4.22	4.41
06/02/21	4.39	4.31	4.28	4.36
06/03/21	4.37	4.29	4.18	4.29
06/04/21	4.32	4.25	4.13	4.34
06/05/21	4.26	4.22	4.26	4.22
06/06/21	4.25	4.18	4.10	4.26
06/07/21	4.23	4.22	4.07	4.34
06/08/21	4.24	4.23	4.18	4.33
06/09/21	4.28	4.20	4.21	4.38
06/10/21	4.32	4.19	4.12	4.51
06/11/21	4.38	4.17	4.24	4.38
06/12/21	4.31	4.15	4.24	4.41
06/13/21	4.33	4.13	4.26	4.55
06/14/21	4.31	4.17	4.31	4.29
06/15/21	4.25	4.31	4.18	4.31
06/16/21	4.22	4.34	4.15	* N/A
06/17/21	4.20	4.32	4.21	* N/A
06/18/21	4.21	4.26	4.15	5.11
06/19/21	4.37	4.26	4.07	5.04
06/20/21	4.35	4.25	4.20	4.95
06/21/21	4.36	4.24	4.17	4.98
06/22/21	4.35	4.27	4.28	4.82
06/23/21	4.34	4.27	4.42	4.82
06/24/21	4.33	4.24	4.45	5.03
06/25/21	4.32	4.24	4.52	4.82
06/26/21	4.31	4.23	4.42	4.82
06/27/21	4.40	4.20	4.41	4.90
06/28/21	4.40	4.21	4.34	4.86
06/29/21	4.35	4.18	4.41	4.75
06/30/21	4.32	4.11	4.49	4.82

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell out of service for repairs.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
06/01/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.06	0.07	0.04	0.04	0.02	0.03	0.07	0.07	0.04
06/02/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.07	0.07	0.04	0.04	0.02	0.03	0.07	0.07	0.04
06/03/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.07	0.07	0.04	0.04	0.03	0.03	0.07	0.08	0.04
06/04/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.07	0.08	0.04	0.04	0.03	0.03	0.08	0.08	0.04
06/05/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.08	0.08	0.04	0.04	0.03	0.03	0.08	0.08	0.04
06/06/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.08	0.08	0.04	0.05	0.03	0.03	0.08	0.08	0.04
06/07/21	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.08	0.08	0.04	0.04	0.03	0.03	0.08	0.09	0.04
06/08/21	0.03	0.03	0.02	0.02	0.03	0.03	0.04	0.05	0.03	0.04	0.08	0.09	0.04	0.04	0.03	0.03	0.09	0.09	0.04
06/09/21	0.03	0.03	0.02	0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.08	0.08	0.04	0.04	0.03	0.03	0.09	0.09	0.04
06/10/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.08	0.09	0.04	0.04	0.02	0.03	0.09	0.10	0.04
06/11/21	0.03	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.08	0.09	0.04	0.04	0.03	0.03	0.10	0.10	0.04
06/12/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.08	0.09	0.04	0.05	0.03	0.03	0.10	0.10	0.04
06/13/21	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.08	0.10	0.04	0.05	0.03	0.03	0.10	0.11	0.04
06/14/21	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.09	0.09	0.04	0.05	0.03	0.03	0.11	0.11	0.04
06/15/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.09	0.10	0.04	0.05	0.03	0.03	0.11	0.11	0.05
06/16/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.09	0.10	0.04	0.04	0.03	0.03	0.11	0.12	0.05
06/17/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.10	0.10	0.04	0.05	0.03	0.03	0.11	0.12	0.05
06/18/21	0.03	0.04	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.10	0.10	0.04	0.05	0.03	0.03	0.12	0.12	0.05
06/19/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.06	0.10	0.04	0.05	0.02	0.03	0.07	0.12	0.04
06/20/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.02	0.03	0.03	0.03	0.03
06/21/21	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.03	0.03	0.03
06/22/21	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.03	0.03	0.03
06/23/21	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.04	0.06	0.04	0.05	0.04	0.04	0.03	0.03	0.03	0.05	0.03
06/24/21	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.06	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.02	0.03	0.04
06/25/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.06	0.07	0.05	0.06	0.04	0.05	0.03	0.04	0.02	0.03	0.04
06/26/21	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.06	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.02	0.03	0.04
06/27/21	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.05	0.06	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.02	0.03	0.04
06/28/21	0.02	0.03	0.03	0.05	0.02	0.03	0.04	0.04	0.06	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.03	0.03	0.04
06/29/21	0.02	0.03	0.03	0.03	0.02	0.03	0.04	0.04	0.06	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.03	0.03	0.04
06/30/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.04	0.06	0.05	0.06	0.04	0.05	0.03	0.03	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																		
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
06/01/21	0.016	0.016	7.947	7.276	9.069	0.050	0.049	0.056	1,549	1,458	1,691	28	25	33	99.36	2.20	98.17	1.74
06/02/21	0.016	0.016	8.347	7.715	9.069	0.053	0.048	0.064	1,685	1,579	1,801	31	27	36	99.36	2.20	98.15	1.73
06/03/21	0.015	0.016	8.567	7.989	9.511	0.062	0.053	0.069	1,706	1,626	1,789	32	28	36	99.28	2.14	98.14	1.73
06/04/21	0.016	0.020	8.394	7.877	9.175	0.060	0.057	0.068	1,687	1,626	1,759	32	28	36	99.28	2.14	98.13	1.73
06/05/21	0.016	0.016	8.406	7.839	9.208	0.060	0.051	0.068	1,675	1,620	1,738	32	29	37	99.29	2.15	98.08	1.72
06/06/21	0.016	0.016	8.391	7.780	9.184	0.060	0.056	0.069	1,631	1,597	1,673	31	28	34	99.28	2.14	98.09	1.72
06/07/21	0.016	0.016	8.262	7.645	8.966	0.059	0.052	0.067	1,605	1,511	1,731	31	28	36	99.29	2.15	98.08	1.72
06/08/21	0.016	0.016	8.448	7.724	9.503	0.054	0.050	0.070	1,685	1,591	1,816	32	28	38	99.36	2.19	98.08	1.72
06/09/21	0.016	0.016	8.602	8.044	9.503	0.062	0.055	0.070	1,713	1,629	1,812	34	29	39	99.28	2.14	98.03	1.71
06/10/21	0.016	0.016	8.277	7.796	9.121	0.061	0.057	0.070	1,723	1,676	1,782	34	30	37	99.27	2.13	98.03	1.71
06/11/21	0.016	0.016	8.295	7.730	9.302	0.062	0.052	0.080	1,725	1,649	1,834	34	30	42	99.25	2.12	98.02	1.70
06/12/21	0.016	0.016	8.395	7.817	9.157	0.061	0.056	0.069	1,728	1,679	1,806	35	30	62	99.28	2.14	98.00	1.70
06/13/21	0.016	0.016	8.261	7.757	9.208	0.059	0.055	0.068	1,662	1,607	1,722	33	29	37	99.28	2.14	98.03	1.71
06/14/21	0.016	0.016	8.122	7.582	8.856	0.055	0.048	0.060	1,622	1,527	1,732	33	28	48	99.32	2.17	97.99	1.70
06/15/21	0.015	0.015	8.247	7.593	9.255	0.053	0.049	0.064	1,701	1,627	1,798	34	30	40	99.35	2.19	97.98	1.69
06/16/21	0.015	0.016	8.528	7.833	9.521	0.063	0.057	0.072	1,730	1,656	1,852	35	31	41	99.26	2.13	98.00	1.70
06/17/21	0.016	0.016	8.359	7.708	9.641	0.063	0.058	0.074	1,735	1,650	1,840	36	31	42	99.24	2.12	97.95	1.69
06/18/21	0.016	0.016	8.526	7.897	9.427	0.067	0.059	0.076	1,756	1,683	1,845	33	29	38	99.22	2.11	98.09	1.72
06/19/21	0.016	0.016	8.322	7.728	9.104	0.061	0.058	0.069	1,730	1,686	1,782	32	29	36	99.26	2.13	98.16	1.74
06/20/21	0.016	0.016	8.328	7.715	10.392	0.059	0.054	0.066	1,657	1,608	1,707	30	28	34	99.30	2.15	98.17	1.74
06/21/21	0.016	0.016	8.039	7.431	8.658	0.055	0.049	0.060	1,650	1,571	1,772	31	27	36	99.31	2.16	98.15	1.73
06/22/21	0.016	0.016	8.171	7.447	9.155	0.054	0.045	0.065	1,742	1,638	1,882	33	28	42	99.34	2.18	98.08	1.72
06/23/21	0.015	0.020	8.501	7.841	9.230	0.062	0.054	0.077	1,778	1,697	1,869	35	31	41	99.27	2.13	98.01	1.70
06/24/21	0.015	0.015	8.349	7.714	9.195	0.064	0.053	0.081	1,798	1,716	1,913	36	32	42	99.23	2.11	97.98	1.69
06/25/21	0.015	0.015	8.280	7.676	9.208	0.065	0.060	0.082	1,794	1,716	1,891	36	32	40	99.21	2.10	98.02	1.70
06/26/21	0.015	0.015	8.290	7.602	9.193	0.064	0.059	0.079	1,767	1,692	1,845	35	31	40	99.23	2.11	98.01	1.70
06/27/21	0.015	0.015	8.239	7.644	9.211	0.065	0.053	0.074	1,689	1,641	1,755	34	31	39	99.22	2.11	97.99	1.70
06/28/21	0.015	0.015	8.084	7.428	8.916	0.060	0.058	0.066	1,655	1,578	1,768	33	29	38	99.25	2.13	98.01	1.70
06/29/21	0.015	0.015	8.170	7.459	9.104	0.058	0.051	0.071	1,744	1,652	1,900	34	29	41	99.29	2.15	98.04	1.71
06/30/21	0.015	0.015	8.342	7.641	9.191	0.064	0.058	0.077	1,787	1,718	1,884	35	30	42	99.23	2.11	98.02	1.70

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
Date	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
06/01/21	96.88	86.411	23,202.1	0.27	3.0	6
06/02/21	97.61	90.698	23,617.7	0.26	3.0	6
06/03/21	97.58	92.715	24,297.3	0.25	3.0	6
06/04/21	97.54	93.522	23,549.1	0.25	3.0	6
06/05/21	97.62	94.233	22,797.8	0.25	3.0	6
06/06/21	97.78	90.849	22,820.1	0.25	3.0	6
06/07/21	97.51	89.138	22,991.8	0.26	3.0	6
06/08/21	97.63	89.365	23,042.7	0.26	3.0	6
06/09/21	97.69	89.656	23,055.3	0.26	3.0	6
06/10/21	97.87	90.348	22,853.8	0.25	3.0	6
06/11/21	97.80	93.282	23,140.8	0.25	3.0	6
06/12/21	97.79	90.993	23,061.4	0.25	3.0	6
06/13/21	97.98	91.060	22,908.5	0.25	3.0	6
06/14/21	98.11	90.456	23,040.4	0.26	3.0	6
06/15/21	98.23	88.618	23,144.5	0.26	3.0	6
06/16/21	98.13	92.624	23,237.0	0.25	3.0	6
06/17/21	98.16	91.475	23,052.7	0.25	3.0	6
06/18/21	98.15	90.990	23,052.7	0.25	3.0	6
06/19/21	98.15	89.500	23,055.0	0.26	3.0	6
06/20/21	98.07	89.159	22,964.4	0.26	3.0	6
06/21/21	97.90	89.410	23,033.0	0.26	3.0	6
06/22/21	97.94	90.422	23,033.4	0.25	3.0	6
06/23/21	97.95	94.117	23,050.1	0.25	3.0	6
06/24/21	97.81	92.113	22,234.9	0.24	3.0	6
06/25/21	97.83	93.096	23,128.3	0.24	3.0	6
06/26/21	97.84	94.687	23,001.7	0.24	3.0	6
06/27/21	97.90	90.816	22,618.4	0.25	3.0	6
06/28/21	97.85	89.836	22,705.6	0.25	3.0	6
06/29/21	97.95	94.213	23,274.3	0.25	3.0	6
06/30/21	97.94	94.242	23,087.9	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
07/01/21	12.14	12.14	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/02/21	12.15	12.15	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/03/21	12.13	12.13	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/04/21	12.14	12.14	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/05/21	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/06/21	12.31	12.31	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/07/21	12.19	12.19	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/08/21	12.17	12.17	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/09/21	12.20	12.20	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/10/21	12.17	12.17	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/11/21	12.21	12.21	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/12/21	12.17	12.17	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/13/21	12.14	12.14	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/14/21	12.12	12.12	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/15/21	12.17	12.17	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/16/21	12.11	12.11	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/17/21	12.23	12.23	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/18/21	12.26	12.26	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/19/21	12.27	12.27	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/20/21	12.22	12.22	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/21/21	12.17	12.17	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/22/21	12.20	12.20	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/23/21	12.22	12.22	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/24/21	12.19	12.19	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/25/21	12.23	12.23	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/26/21	12.27	12.27	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/27/21	12.28	12.28	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/28/21	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/29/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/30/21	12.22	12.22	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/31/21	12.25	12.25	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
07/01/21	0.00	4.03	2.11	6.00	0.00	12.14
07/02/21	0.00	4.02	2.13	6.00	0.00	12.15
07/03/21	0.00	4.00	2.12	6.00	0.00	12.13
07/04/21	0.00	4.01	2.14	6.00	0.00	12.14
07/05/21	0.00	4.02	2.17	6.00	0.00	12.19
07/06/21	0.00	4.12	2.19	6.00	0.00	12.31
07/07/21	0.00	4.09	2.11	6.00	0.00	12.19
07/08/21	0.00	4.06	2.11	6.00	0.00	12.17
07/09/21	0.00	4.10	2.10	6.00	0.00	12.20
07/10/21	0.00	4.06	2.11	6.00	0.00	12.17
07/11/21	0.00	4.07	2.14	6.00	0.00	12.21
07/12/21	0.00	4.05	2.12	6.00	0.00	12.17
07/13/21	0.00	4.04	2.10	6.00	0.00	12.14
07/14/21	0.00	4.04	2.08	6.00	0.00	12.12
07/15/21	0.00	4.09	2.08	6.00	0.00	12.17
07/16/21	0.00	4.05	2.06	6.00	0.00	12.11
07/17/21	0.00	4.13	2.09	6.00	0.00	12.23
07/18/21	0.00	4.14	2.13	6.00	0.00	12.26
07/19/21	0.00	4.12	2.15	6.00	0.00	12.27
07/20/21	0.00	4.11	2.12	6.00	0.00	12.22
07/21/21	0.00	4.07	2.10	6.00	0.00	12.17
07/22/21	0.00	4.08	2.12	6.00	0.00	12.20
07/23/21	0.00	4.07	2.15	6.00	0.00	12.22
07/24/21	0.00	4.05	2.14	6.00	0.00	12.19
07/25/21	0.00	4.03	2.20	6.00	0.00	12.23
07/26/21	0.00	4.04	2.22	6.00	0.00	12.27
07/27/21	0.00	4.09	2.19	6.00	0.00	12.28
07/28/21	0.00	4.06	2.18	6.00	0.00	12.24
07/29/21	0.00	4.03	2.16	6.00	0.00	12.20
07/30/21	0.00	4.06	2.15	6.00	0.00	12.22
07/31/21	0.00	4.08	2.18	6.00	0.00	12.25

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
07/01/21	0.00	0.00	2.11	6.00	4.00	12.11
07/02/21	0.00	0.00	2.13	6.00	4.00	12.13
07/03/21	0.00	0.00	2.12	6.00	4.00	12.12
07/04/21	0.00	0.00	2.14	6.00	4.00	12.14
07/05/21	0.00	0.00	2.17	6.00	4.00	12.17
07/06/21	0.00	0.00	2.19	6.00	4.00	12.19
07/07/21	0.00	0.00	2.11	6.00	4.00	12.11
07/08/21	0.00	0.00	2.11	6.00	4.00	12.11
07/09/21	0.00	0.00	2.10	6.00	4.00	12.10
07/10/21	0.00	0.00	2.11	6.00	4.00	12.11
07/11/21	0.00	0.00	2.14	6.00	4.00	12.14
07/12/21	0.00	0.00	2.12	6.00	4.00	12.12
07/13/21	0.00	0.00	2.10	6.00	4.00	12.10
07/14/21	0.00	0.00	2.08	6.00	4.00	12.08
07/15/21	0.00	0.00	2.08	6.00	4.00	12.08
07/16/21	0.00	0.00	2.06	6.00	4.00	12.06
07/17/21	0.00	0.00	2.09	6.00	4.00	12.09
07/18/21	0.00	0.00	2.13	6.00	4.00	12.13
07/19/21	0.00	0.00	2.15	6.00	4.00	12.15
07/20/21	0.00	0.00	2.12	6.00	4.00	12.12
07/21/21	0.00	0.00	2.10	6.00	4.00	12.10
07/22/21	0.00	0.00	2.12	6.00	4.00	12.12
07/23/21	0.00	0.00	2.15	6.00	4.00	12.15
07/24/21	0.00	0.00	2.14	6.00	4.00	12.14
07/25/21	0.00	0.00	2.20	6.00	4.00	12.20
07/26/21	0.00	0.00	2.22	6.00	4.00	12.22
07/27/21	0.00	0.00	2.19	6.00	4.00	12.19
07/28/21	0.00	0.00	2.18	6.00	4.00	12.18
07/29/21	0.00	0.00	2.16	6.00	4.00	12.16
07/30/21	0.00	0.00	2.15	6.00	4.00	12.15
07/31/21	0.00	0.00	2.18	6.00	4.00	12.18

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
07/01/21	4.33	4.37	4.32	4.03	4.32	4.26	4.37	4.32	4.29	4.41	4.39	4.57	4.31	4.22	4.45	4.30
07/02/21	4.30	4.33	4.31	4.26	4.33	4.25	4.34	4.31	4.27	4.41	4.35	4.56	4.28	4.21	4.42	4.28
07/03/21	4.30	4.33	4.30	4.33	4.34	4.24	4.33	4.29	4.24	4.41	4.34	4.57	4.24	4.20	4.39	4.28
07/04/21	4.26	4.32	4.32	4.39	4.34	4.22	4.35	4.31	4.16	4.40	4.32	4.55	4.23	4.18	4.36	4.25
07/05/21	4.19	4.32	4.26	4.42	4.35	4.18	4.38	4.25	4.20	4.39	4.31	4.56	4.22	4.22	4.40	4.25
07/06/21	4.17	4.67	4.26	4.32	4.37	4.18	4.30	4.36	4.20	4.38	4.37	4.55	4.21	4.21	4.41	4.24
07/07/21	4.51	4.71	4.23	4.29	4.31	4.15	4.29	4.30	4.12	4.33	4.56	4.52	4.20	4.15	4.38	4.21
07/08/21	4.57	4.73	4.25	4.38	4.32	4.19	4.52	4.35	4.12	4.31	4.62	4.48	4.18	4.16	4.38	4.21
07/09/21	4.49	4.66	4.14	4.33	4.25	4.10	4.50	4.32	4.10	4.30	4.61	4.47	4.16	4.14	4.38	4.18
07/10/21	4.48	4.66	4.15	4.29	4.24	4.09	4.50	4.31	4.08	4.28	4.58	4.48	4.13	4.13	4.36	4.16
07/11/21	4.52	4.64	4.10	4.24	4.30	4.36	4.49	4.35	4.07	4.27	4.57	4.45	4.10	4.09	4.33	4.14
07/12/21	4.46	4.65	4.12	4.25	4.23	4.38	4.51	4.33	4.43	4.21	4.56	4.45	4.38	4.05	4.29	4.13
07/13/21	4.47	4.60	4.04	4.27	4.25	4.37	4.50	4.26	4.41	4.21	4.58	4.44	4.48	4.04	4.29	4.12
07/14/21	4.49	4.53	4.04	4.25	4.25	4.37	4.49	4.26	4.41	4.17	4.56	4.42	4.45	4.04	4.28	4.10
07/15/21	4.46	4.49	4.09	4.19	4.22	4.37	4.45	4.35	4.39	4.15	4.52	4.41	4.43	4.10	4.22	4.18
07/16/21	4.37	4.50	4.05	4.18	4.15	4.48	4.42	4.32	4.38	4.12	4.47	4.38	4.44	4.37	4.20	4.33
07/17/21	4.38	4.57	*N/A	4.13	4.15	4.26	4.44	4.29	4.31	4.50	4.48	4.31	4.39	4.33	4.18	4.35
07/18/21	4.40	4.51	*N/A	4.14	4.14	*N/A	4.44	4.26	4.32	4.50	4.50	4.30	4.36	4.30	4.19	4.33
07/19/21	4.40	4.44	*N/A	4.12	4.31	4.46	4.38	4.30	4.32	4.44	4.48	4.53	4.38	4.27	4.16	4.34
07/20/21	4.43	4.49	4.69	4.11	4.38	4.40	4.39	4.28	4.25	4.44	4.45	4.62	4.35	4.26	4.37	4.33
07/21/21	4.33	4.41	4.50	4.09	4.39	4.28	4.42	4.22	4.26	4.39	4.39	4.57	4.31	4.26	4.45	4.31
07/22/21	4.36	4.41	4.40	4.09	4.39	4.27	4.42	4.24	4.28	4.40	4.37	4.58	4.28	4.25	4.43	4.31
07/23/21	4.27	4.37	4.42	4.22	4.35	4.28	4.36	4.22	4.24	4.36	4.36	4.52	4.29	4.21	4.38	4.27
07/24/21	4.23	4.42	4.45	4.40	4.34	4.28	4.33	4.35	4.23	4.35	4.35	4.55	4.28	4.20	4.39	4.24
07/25/21	4.28	4.33	4.47	4.42	4.36	4.26	4.36	4.34	4.25	4.38	4.37	4.55	4.27	4.20	4.42	4.23
07/26/21	4.18	4.40	4.45	4.38	4.36	4.26	4.37	4.31	4.21	4.40	4.35	4.54	4.27	4.20	4.43	4.24
07/27/21	4.17	4.36	4.41	4.35	4.35	4.25	4.34	4.28	4.17	4.36	4.31	4.51	4.22	4.16	4.39	4.23
07/28/21	4.37	4.67	4.40	4.34	4.32	4.21	4.32	4.28	4.13	4.29	4.48	4.48	4.20	4.16	4.37	4.22
07/29/21	4.44	4.66	4.39	4.32	4.30	4.21	4.52	4.30	4.12	4.29	4.60	4.49	4.16	4.21	4.36	4.20
07/30/21	4.42	4.60	4.35	4.24	4.28	4.20	4.54	4.26	4.06	4.22	4.60	4.46	4.12	4.17	4.35	4.17
07/31/21	4.41	4.61	4.34	4.24	4.29	4.16	4.53	4.28	4.08	4.24	4.59	4.46	4.12	4.17	4.32	4.17

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cells offline for maintenance.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
07/01/21	5.13	5.22	5.25	4.71	5.14	5.17	5.19	5.07	4.09	4.31	4.18	4.05	4.51	4.48	4.18	4.35
07/02/21	5.07	5.18	5.27	4.71	5.14	5.16	5.19	5.17	4.04	4.29	4.17	4.04	4.46	4.50	4.16	4.36
07/03/21	5.08	5.17	5.23	4.70	5.07	5.16	5.16	5.33	4.21	4.28	4.16	4.02	4.48	4.50	4.20	4.36
07/04/21	5.10	5.17	5.24	4.91	5.09	5.15	5.20	5.29	4.41	4.26	4.11	4.04	4.50	4.49	4.22	4.36
07/05/21	5.10	5.18	5.19	5.04	5.10	5.14	5.20	5.26	4.43	4.20	4.11	4.37	4.47	4.45	4.22	4.34
07/06/21	5.06	5.16	5.17	4.99	5.10	5.13	5.16	5.27	4.39	4.19	4.12	4.35	4.46	4.46	4.19	4.38
07/07/21	5.10	5.12	5.19	4.96	5.09	5.12	5.13	5.26	4.39	4.17	4.09	4.34	4.44	4.44	4.15	4.35
07/08/21	5.13	5.11	5.17	4.97	5.01	5.10	5.12	5.30	4.40	4.14	4.06	4.33	4.45	4.37	4.12	4.33
07/09/21	5.08	5.14	5.12	4.97	5.00	5.07	5.13	5.31	4.34	4.23	4.19	4.34	4.42	4.39	4.12	4.33
07/10/21	5.04	5.14	5.12	4.98	5.11	4.99	5.16	5.28	4.34	4.20	4.33	4.34	4.37	4.39	4.06	4.30
07/11/21	5.05	5.11	5.15	5.00	5.43	5.01	5.13	5.30	4.31	4.22	4.33	4.30	4.37	4.37	4.10	4.27
07/12/21	4.99	5.09	5.13	4.92	5.36	5.23	5.10	5.30	4.29	4.22	4.31	4.29	4.38	4.31	4.11	4.27
07/13/21	4.99	5.09	5.11	4.91	5.39	5.28	5.10	5.30	4.30	4.13	4.27	4.28	4.34	4.30	4.21	4.22
07/14/21	4.96	5.07	5.09	4.91	5.33	5.27	5.08	5.23	4.30	4.11	4.26	4.28	4.32	4.28	4.41	4.12
07/15/21	4.93	5.05	5.13	4.91	5.32	5.25	5.03	5.18	4.25	4.29	4.27	4.24	4.29	4.28	4.32	4.13
07/16/21	5.18	5.04	5.14	4.87	5.31	5.23	5.02	5.18	4.25	4.27	4.27	4.19	4.24	4.31	4.30	4.17
07/17/21	5.24	5.00	5.10	4.88	5.31	5.21	5.11	5.23	4.26	4.18	4.21	4.20	4.24	4.52	4.31	4.16
07/18/21	5.19	5.04	5.07	4.92	5.28	5.21	5.31	5.21	4.23	4.19	4.20	4.17	4.23	4.49	4.31	4.17
07/19/21	5.19	4.95	5.01	4.91	5.27	5.22	5.30	5.18	4.22	4.22	4.24	4.16	4.32	4.49	4.34	4.44
07/20/21	5.19	4.98	5.17	4.88	5.27	5.22	5.28	5.16	4.20	4.18	4.26	4.11	4.51	4.49	4.31	4.43
07/21/21	5.17	5.21	5.32	4.84	5.21	5.23	5.28	5.14	4.20	4.11	4.22	4.07	4.52	4.48	4.24	4.42
07/22/21	5.15	5.21	5.30	4.83	5.20	5.18	5.27	5.15	4.17	4.10	4.17	4.08	4.50	4.48	4.21	4.41
07/23/21	5.15	5.23	5.31	4.83	5.20	5.14	5.26	5.07	4.12	4.30	4.14	4.07	4.49	4.49	4.25	4.37
07/24/21	5.16	5.20	5.32	4.84	5.23	5.15	5.27	5.08	4.08	4.44	4.10	4.05	4.49	4.46	4.23	4.34
07/25/21	5.17	5.19	5.28	4.84	5.24	5.18	5.27	5.13	4.31	4.46	4.11	4.03	4.45	4.46	4.16	4.38
07/26/21	5.15	5.21	5.30	4.80	5.23	5.17	5.22	5.11	4.43	4.44	4.12	4.17	4.48	4.47	4.20	4.37
07/27/21	5.13	5.21	5.30	4.77	5.19	5.15	5.21	5.06	4.40	4.41	4.09	4.30	4.48	4.37	4.20	4.32
07/28/21	5.13	5.20	5.26	4.75	5.15	5.10	5.20	5.03	4.39	4.38	4.06	4.28	4.45	4.40	4.16	4.33
07/29/21	5.12	5.17	5.22	4.76	5.16	5.12	5.19	5.17	4.36	4.37	4.03	4.27	4.44	4.43	4.12	4.32
07/30/21	5.09	5.14	5.21	4.99	5.18	5.13	5.18	5.29	4.33	4.30	4.15	4.26	4.40	4.36	4.11	4.27
07/31/21	5.12	5.15	5.18	5.02	5.16	5.08	5.15	5.31	4.31	4.28	4.35	4.24	4.36	4.34	4.09	4.28

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
Date	**E01** LRV	**E02** LRV	**E03** LRV	**E04** LRV												
07/01/21	4.34	4.14	4.37	4.89												
07/02/21	4.29	4.02	4.28	4.83												
07/03/21	4.29	4.00	4.28	4.81												
07/04/21	4.27	4.01	4.36	4.88												
07/05/21	4.36	4.02	4.34	4.90												
07/06/21	4.44	4.14	4.36	4.89												
07/07/21	4.28	4.37	4.52	4.97												
07/08/21	4.27	4.35	4.47	4.77												
07/09/21	4.31	4.27	4.36	4.76												
07/10/21	4.29	4.30	4.35	4.84												
07/11/21	4.24	4.30	4.36	4.76												
07/12/21	4.24	4.30	4.40	4.77												
07/13/21	4.24	4.29	4.46	4.97												
07/14/21	4.30	4.28	4.33	4.81												
07/15/21	4.45	4.24	4.39	4.76												
07/16/21	4.39	4.28	4.50	4.86												
07/17/21	4.39	4.25	4.43	4.79												
07/18/21	4.37	4.25	4.35	4.73												
07/19/21	4.31	4.21	4.23	4.74												
07/20/21	4.31	4.20	4.36	4.72												
07/21/21	4.29	4.19	4.37	4.82												
07/22/21	4.28	4.15	4.51	4.92												
07/23/21	4.31	4.13	4.41	4.80												
07/24/21	4.38	4.13	4.38	4.78												
07/25/21	4.35	4.08	4.40	4.90												
07/26/21	4.29	4.04	4.38	4.83												
07/27/21	4.29	4.15	4.42	4.81												
07/28/21	4.28	4.37	4.45	4.78												
07/29/21	4.25	4.34	4.37	4.81												
07/30/21	4.23	4.31	4.39	4.76												
07/31/21	4.21	4.29	4.56	4.81												

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Effluent Turbidity - NTU A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
07/01/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.05	0.03	0.03	0.03	0.03	0.03
07/02/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.04	0.03	0.03	0.03	0.04	0.03
07/03/21	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.05	0.03	0.03	0.03	0.04	0.03
07/04/21	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.05	0.03	0.03	0.04	0.04	0.03
07/05/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.04	0.03	0.03	0.04	0.04	0.03
07/06/21	0.03	0.03	0.02	0.02	0.02	0.05	0.04	0.04	0.04	0.04	0.06	0.06	0.04	0.04	0.03	0.03	0.04	0.05	0.04
07/07/21	0.03	0.04	0.02	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.06	0.06	0.04	0.05	0.03	0.03	0.04	0.05	0.04
07/08/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.06	0.06	0.04	0.05	0.03	0.03	0.05	0.05	0.04
07/09/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.06	0.07	0.04	0.05	0.03	0.03	0.05	0.05	0.03
07/10/21	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.07	0.08	0.04	0.05	0.03	0.03	0.05	0.05	0.04
07/11/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.08	0.09	0.04	0.05	0.03	0.03	0.05	0.06	0.04
07/12/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.08	0.09	0.04	0.05	0.03	0.03	0.06	0.06	0.04
07/13/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.08	0.09	0.04	0.05	0.03	0.03	0.06	0.07	0.04
07/14/21	0.03	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.09	0.09	0.04	0.05	0.03	0.03	0.07	0.07	0.04
07/15/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.09	0.09	0.04	0.05	0.03	0.03	0.07	0.08	0.04
07/16/21	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.04	0.05	0.09	0.09	0.04	0.05	0.03	0.03	0.08	0.08	0.04
07/17/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.05	0.04	0.04	0.09	0.09	0.04	0.04	0.03	0.03	0.08	0.08	0.04
07/18/21	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.09	0.09	0.04	0.05	0.03	0.03	0.08	0.09	0.04
07/19/21	0.03	0.03	0.02	0.02	0.02	0.03	0.04	0.05	0.04	0.04	0.09	0.09	0.04	0.05	0.03	0.03	0.09	0.09	0.04
07/20/21	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.09	0.10	0.04	0.05	0.03	0.03	0.09	0.10	0.05
07/21/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.04	0.04	0.07	0.10	0.04	0.05	0.03	0.03	0.06	0.10	0.04
07/22/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.03	0.03	0.03
07/23/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.03	0.03	0.05	0.05	0.03	0.03	0.03	0.04	0.03
07/24/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.05	0.05	0.03	0.03	0.04	0.04	0.03
07/25/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.04	0.04	0.03	0.04	0.05	0.05	0.03	0.04	0.04	0.04	0.04
07/26/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.04	0.04	0.03	0.04	0.05	0.05	0.04	0.04	0.04	0.05	0.04
07/27/21	0.03	0.03	0.04	0.04	0.03	0.03	0.04	0.05	0.04	0.04	0.03	0.04	0.05	0.05	0.04	0.04	0.05	0.05	0.04
07/28/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.04	0.04	0.05	0.05	0.03	0.04	0.04	0.05	0.04
07/29/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.05	0.03	0.03	0.03	0.03	0.03
07/30/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.03	0.03	0.03	0.03	0.03
07/31/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.03	0.04	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
Date	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
07/01/21	0.015	0.015	8.249	7.524	9.368	0.064	0.057	0.071	1,781	1,719	1,856	36	32	40	99.23	2.11	98.00	1.70
07/02/21	0.015	0.015	8.199	7.619	9.127	0.061	0.057	0.072	1,766	1,697	1,849	36	31	41	99.25	2.13	97.97	1.69
07/03/21	0.015	0.015	8.054	7.461	8.815	0.061	0.055	0.068	1,738	1,675	1,798	36	32	40	99.25	2.12	97.94	1.69
07/04/21	0.015	0.015	7.876	7.316	8.789	0.057	0.052	0.066	1,686	1,653	1,727	34	31	38	99.27	2.14	97.97	1.69
07/05/21	0.015	0.015	7.721	7.103	8.878	0.052	0.048	0.057	1,627	1,580	1,676	33	30	38	99.32	2.17	97.95	1.69
07/06/21	0.015	0.015	8.594	7.615	9.739	0.056	0.046	0.076	1,608	1,531	1,749	32	29	37	99.35	2.19	97.99	1.70
07/07/21	0.015	0.015	8.974	8.211	9.976	0.070	0.060	0.092	1,750	1,637	1,892	35	30	41	99.22	2.11	98.02	1.70
07/08/21	0.015	0.015	9.017	8.167	9.653	0.070	0.062	0.086	1,801	1,700	1,931	36	30	43	99.23	2.11	98.02	1.70
07/09/21	0.016	0.016	8.557	7.776	9.515	0.068	0.062	0.086	1,781	1,720	1,876	37	31	49	99.20	2.10	97.90	1.68
07/10/21	0.016	0.016	8.424	7.619	9.440	0.065	0.060	0.079	1,740	1,690	1,804	36	32	40	99.23	2.11	97.96	1.69
07/11/21	0.015	0.016	8.469	7.885	9.448	0.062	0.058	0.069	1,676	1,624	1,721	35	31	41	99.27	2.14	97.90	1.68
07/12/21	0.015	0.015	8.680	7.860	9.731	0.066	0.058	0.082	1,628	1,546	1,738	35	30	40	99.24	2.12	97.87	1.67
07/13/21	0.015	0.015	8.785	7.965	9.674	0.070	0.066	0.083	1,691	1,594	1,819	36	31	43	99.20	2.10	97.87	1.67
07/14/21	0.015	0.015	8.658	7.871	9.587	0.072	0.067	0.084	1,732	1,672	1,826	37	32	43	99.17	2.08	97.87	1.67
07/15/21	0.015	0.015	8.676	7.955	9.605	0.072	0.064	0.086	1,736	1,650	1,839	37	33	42	99.17	2.08	97.88	1.67
07/16/21	0.016	0.020	8.621	7.905	9.565	0.075	0.062	0.084	1,720	1,666	1,784	39	32	44	99.13	2.06	97.74	1.65
07/17/21	0.015	0.015	8.607	7.775	9.528	0.070	0.064	0.079	1,688	1,624	1,770	39	35	44	99.19	2.09	97.70	1.64
07/18/21	0.015	0.015	8.354	7.473	9.410	0.063	0.054	0.067	1,631	1,573	1,691	37	33	42	99.25	2.13	97.73	1.64
07/19/21	0.015	0.015	8.546	7.719	9.484	0.060	0.051	0.102	1,607	1,522	1,742	37	32	44	99.29	2.15	97.71	1.64
07/20/21	0.016	0.016	8.826	8.150	9.748	0.068	0.062	0.078	1,714	1,617	1,858	40	34	47	99.23	2.12	97.69	1.64
07/21/21	0.016	0.016	8.664	7.725	9.653	0.068	0.062	0.080	1,735	1,674	1,799	40	35	46	99.21	2.10	97.68	1.64
07/22/21	0.016	0.016	8.453	7.532	9.432	0.064	0.057	0.168	1,732	1,673	1,811	41	36	50	99.24	2.12	97.64	1.63
07/23/21	0.016	0.020	8.391	7.552	9.357	0.060	0.056	0.072	1,738	1,668	1,830	40	36	46	99.29	2.15	97.69	1.64
07/24/21	0.015	0.015	8.397	7.555	9.443	0.061	0.054	0.084	1,724	1,655	1,800	40	36	45	99.28	2.14	97.68	1.63
07/25/21	0.015	0.015	8.213	7.324	9.230	0.052	0.049	0.058	1,675	1,623	1,720	39	36	43	99.37	2.20	97.67	1.63
07/26/21	0.015	0.015	8.609	7.669	10.190	0.051	0.044	0.066	1,652	1,548	1,797	39	35	45	99.40	2.22	97.66	1.63
07/27/21	0.015	0.015	9.064	8.221	10.038	0.059	0.051	0.065	1,716	1,633	1,821	40	36	45	99.35	2.19	97.68	1.63
07/28/21	0.015	0.016	8.856	7.953	9.852	0.059	0.050	0.067	1,742	1,677	1,820	41	38	46	99.34	2.18	97.64	1.63
07/29/21	0.015	0.015	8.875	8.066	9.764	0.061	0.054	0.071	1,736	1,664	1,827	41	36	47	99.31	2.16	97.63	1.63
07/30/21	0.016	0.020	8.595	7.812	9.604	0.061	0.053	0.074	1,751	1,671	1,854	42	37	47	99.29	2.15	97.62	1.62
07/31/21	0.015	0.016	8.529	7.618	9.494	0.057	0.050	0.065	1,716	1,652	1,794	41	36	46	99.33	2.18	97.64	1.63

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
07/01/21	97.66	93.403	23,097.5	0.25	3.0	6
07/02/21	97.75	94.716	22,804.3	0.24	3.0	6
07/03/21	97.68	92.759	22,611.2	0.24	3.0	6
07/04/21	97.94	89.726	22,533.8	0.24	3.0	6
07/05/21	97.96	87.970	22,349.6	0.25	3.0	6
07/06/21	98.06	90.809	22,475.9	0.25	3.0	6
07/07/21	98.03	90.131	22,717.9	0.25	3.0	6
07/08/21	97.80	89.410	22,345.9	0.25	3.0	6
07/09/21	97.89	80.421	21,762.0	0.24	3.0	6
07/10/21	97.54	91.561	19,952.6	0.25	3.0	6
07/11/21	97.49	91.714	22,370.5	0.24	3.0	6
07/12/21	97.63	93.415	22,111.5	0.24	3.0	6
07/13/21	97.46	94.296	23,113.6	0.24	3.0	6
07/14/21	97.44	93.386	22,366.3	0.24	3.0	6
07/15/21	97.46	88.566	22,390.2	0.24	3.0	6
07/16/21	97.69	90.945	21,818.0	0.25	3.0	6
07/17/21	97.45	91.445	22,415.1	0.25	3.0	6
07/18/21	97.65	89.506	22,414.7	0.25	3.0	6
07/19/21	97.75	91.417	22,417.8	0.25	3.0	6
07/20/21	97.87	94.292	22,669.6	0.25	3.0	6
07/21/21	97.74	94.601	23,009.5	0.24	3.0	6
07/22/21	97.62	95.845	22,587.5	0.24	3.0	6
07/23/21	97.58	95.856	23,300.7	0.24	3.0	6
07/24/21	97.57	93.208	23,248.5	0.24	3.0	6
07/25/21	97.77	90.200	22,831.5	0.25	3.0	6
07/26/21	97.73	93.591	22,384.4	0.25	3.0	6
07/27/21	97.61	93.187	22,962.5	0.24	3.0	6
07/28/21	96.94	95.683	21,925.9	0.24	3.0	6
07/29/21	96.32	97.085	24,476.4	0.25	3.0	6
07/30/21	96.55	95.001	23,796.7	0.24	3.0	6
07/31/21	96.39	97.057	23,466.1	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
08/01/21	12.25	12.25	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/02/21	12.30	12.30	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/03/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/04/21	12.19	12.19	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/05/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/06/21	12.20	12.20	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/07/21	12.23	12.23	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/08/21	12.27	12.27	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/09/21	12.28	12.28	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/10/21	12.21	12.21	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/11/21	12.14	12.14	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/12/21	12.13	12.13	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/13/21	12.30	12.30	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/14/21	12.33	12.33	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/15/21	12.53	12.53	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS offline for planned two-week outage for final expansion construction activity.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/21	0.00	4.06	2.19	6.00	0.00	12.25
08/02/21	0.00	4.10	2.20	6.00	0.00	12.30
08/03/21	0.00	4.04	2.16	6.00	0.00	12.20
08/04/21	0.00	4.03	2.16	6.00	0.00	12.19
08/05/21	0.00	4.05	2.16	6.00	0.00	12.20
08/06/21	0.00	4.05	2.15	6.00	0.00	12.20
08/07/21	0.00	4.06	2.17	6.00	0.00	12.23
08/08/21	0.00	4.09	2.18	6.00	0.00	12.27
08/09/21	0.00	4.08	2.19	6.00	0.00	12.28
08/10/21	0.00	4.06	2.15	6.00	0.00	12.21
08/11/21	0.00	4.02	2.13	6.00	0.00	12.14
08/12/21	0.00	4.02	2.11	6.00	0.00	12.13
08/13/21	0.00	4.20	2.09	6.00	0.00	12.30
08/14/21	0.00	4.28	2.05	6.00	0.00	12.33
08/15/21	0.00	4.47	2.07	6.00	0.00	12.53
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

* GWRS offline for planned two-week outage for final expansion construction activity.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/21	0.00	0.00	2.19	6.00	4.00	12.19
08/02/21	0.00	0.00	2.20	6.00	4.00	12.20
08/03/21	0.00	0.00	2.16	6.00	4.00	12.16
08/04/21	0.00	0.00	2.16	6.00	4.00	12.16
08/05/21	0.00	0.00	2.16	6.00	4.00	12.16
08/06/21	0.00	0.00	2.15	6.00	4.00	12.15
08/07/21	0.00	0.00	2.17	6.00	4.00	12.17
08/08/21	0.00	0.00	2.18	6.00	4.00	12.18
08/09/21	0.00	0.00	2.19	6.00	4.00	12.19
08/10/21	0.00	0.00	2.15	6.00	4.00	12.15
08/11/21	0.00	0.00	2.13	6.00	4.00	12.13
08/12/21	0.00	0.00	2.11	6.00	4.00	12.11
08/13/21	0.00	0.00	2.09	6.00	4.00	12.09
08/14/21	0.00	0.00	2.05	6.00	4.00	12.05
08/15/21	0.00	0.00	2.07	6.00	4.00	12.07
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS offline for planned two-week outage for final expansion construction activity.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	**A02**	**A03**	**A04**	**A05**	**A06**	**A07**	**A08**	**B01**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
08/01/21	4.40	4.60	4.35	4.22	4.28	4.15	4.49	4.29	4.06	4.22	4.57	4.42	4.08	4.17	4.30	4.15
08/02/21	4.35	4.60	4.30	4.24	4.27	4.11	4.51	4.31	4.30	4.15	4.54	4.43	4.41	4.11	4.28	4.10
08/03/21	4.40	4.55	4.17	4.24	4.20	4.07	4.47	4.31	4.38	4.14	4.48	4.40	4.45	4.04	4.26	4.07
08/04/21	4.42	4.56	4.21	4.22	4.19	4.33	4.44	4.31	4.38	4.13	4.47	4.40	4.44	4.03	4.25	4.07
08/05/21	4.41	4.50	4.16	4.17	4.14	4.35	4.44	4.30	4.35	4.12	4.50	4.35	4.42	4.05	4.23	4.05
08/06/21	4.42	4.52	4.17	4.16	4.13	4.36	4.44	4.29	4.36	4.09	4.47	4.26	4.39	4.05	4.21	4.27
08/07/21	4.35	4.43	4.13	4.10	4.12	4.37	4.46	4.26	4.32	4.39	4.45	4.28	4.38	4.06	4.20	4.33
08/08/21	4.33	4.45	4.09	4.11	4.09	4.32	4.44	4.24	4.34	4.48	4.41	4.28	4.37	4.37	4.17	4.33
08/09/21	4.30	4.47	4.09	4.08	* N/A	4.33	4.43	4.24	4.28	4.47	4.39	* N/A	4.36	4.44	4.12	4.32
08/10/21	4.29	4.42	* N/A	4.07	* N/A	4.30	4.37	4.20	4.30	4.45	4.39	* N/A	4.35	4.41	* N/A	4.30
08/11/21	4.26	* N/A	* N/A	* N/A	* N/A	4.26	4.40	4.20	4.27	4.43	4.35	* N/A	4.35	4.41	* N/A	4.26
08/12/21	* N/A	* N/A	* N/A	* N/A	* N/A	4.25	* N/A	4.18	4.29	4.42	* N/A	* N/A	4.32	4.40	* N/A	4.21
08/13/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	4.39	4.41	* N/A	* N/A	4.30	4.39	* N/A	4.24
08/14/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	4.44	* N/A	* N/A	* N/A	4.37	* N/A	4.28
08/15/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	4.47	* N/A	* N/A
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for planned outage.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
08/01/21	5.13	5.17	5.22	5.02	5.14	5.09	5.16	5.33	4.34	4.28	4.35	4.25	4.42	4.34	4.09	4.25
08/02/21	5.06	5.13	5.24	5.00	5.14	5.09	5.18	5.31	4.34	4.27	4.31	4.24	4.41	4.32	4.10	4.19
08/03/21	5.04	5.13	5.20	4.98	5.13	5.08	5.15	5.24	4.28	4.29	4.28	4.22	4.37	4.30	4.07	4.17
08/04/21	5.04	5.13	5.18	4.97	5.05	5.05	5.08	5.22	4.28	4.22	4.31	4.22	4.30	4.28	4.38	4.14
08/05/21	5.00	5.06	5.15	4.95	4.99	5.02	5.06	5.24	4.29	4.22	4.29	4.20	4.27	4.23	4.35	4.10
08/06/21	4.96	5.02	5.12	4.92	5.22	4.98	5.07	5.24	4.26	4.19	4.25	4.20	4.25	4.36	4.34	4.08
08/07/21	4.92	5.02	5.09	4.94	5.36	5.15	5.09	5.23	4.19	4.16	4.22	4.17	4.19	4.54	4.30	4.06
08/08/21	4.93	5.03	5.07	4.93	5.34	5.26	5.07	5.22	4.18	4.15	4.24	4.09	4.15	4.49	4.31	4.19
08/09/21	4.92	4.98	5.05	4.92	5.33	5.25	5.04	5.23	4.17	4.09	4.24	4.10	* N/A	4.50	4.27	4.45
08/10/21	* N/A	4.98	5.05	4.89	5.31	5.23	5.05	5.20	4.16	* N/A	4.24	4.06	* N/A	4.47	4.23	4.42
08/11/21	* N/A	* N/A	5.04	4.89	5.31	5.20	* N/A	5.17	4.25	* N/A	4.16	4.02	* N/A	4.47	4.27	4.40
08/12/21	* N/A	* N/A	* N/A	4.88	5.33	5.20	* N/A	5.16	* N/A	* N/A	4.15	4.02	* N/A	4.47	4.24	4.42
08/13/21	* N/A	* N/A	* N/A	4.87	5.30	5.22	* N/A	5.15	* N/A	* N/A	* N/A	* N/A	* N/A	4.47	4.23	4.39
08/14/21	* N/A	* N/A	* N/A	4.84	5.30	5.20	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	4.32	4.37
08/15/21	* N/A	* N/A	* N/A	* N/A	5.33	5.17	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for planned outage.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
08/01/21	4.20	4.31	4.40	4.82
08/02/21	4.23	4.32	4.43	4.78
08/03/21	4.33	4.32	4.43	4.91
08/04/21	4.29	4.29	4.36	4.90
08/05/21	4.21	4.27	4.33	4.81
08/06/21	4.22	4.22	4.45	4.82
08/07/21	4.22	4.22	4.41	4.77
08/08/21	4.19	4.19	4.39	4.76
08/09/21	4.22	4.18	4.50	4.85
08/10/21	* N/A	4.15	4.38	4.76
08/11/21	* N/A	4.15	4.40	* N/A
08/12/21	* N/A	4.13	4.53	* N/A
08/13/21	* N/A	4.20	4.40	* N/A
08/14/21	* N/A	* N/A	* N/A	* N/A
08/15/21	* N/A	* N/A	* N/A	* N/A
08/16/21	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for planned outage.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
08/01/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.03	0.03	0.03	0.03	0.03
08/02/21	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.05	0.04	0.04	0.04	0.05	0.05	0.05	0.03	0.03	0.03	0.04	0.04
08/03/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.03	0.03	0.04	0.04	0.04
08/04/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.04	0.04	0.04	0.05	0.05	0.06	0.03	0.04	0.03	0.04	0.04
08/05/21	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.07	0.05	0.06	0.02	0.03	0.02	0.03	0.03
08/06/21	0.03	0.04	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.05	0.05	0.03	0.03	0.03	0.03	0.03
08/07/21	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.05	0.06	0.02	0.03	0.02	0.03	0.03
08/08/21	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.05	0.04	0.04	0.04	0.04	0.05	0.06	0.03	0.03	0.03	0.03	0.03
08/09/21	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.06	0.06	0.03	0.03	0.03	0.03	0.03
08/10/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.04	0.05	0.04	0.05	0.06	0.06	0.03	0.03	0.03	0.03	0.03
08/11/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.07	0.06	0.07	0.03	0.03	0.03	0.04	0.03
08/12/21	* N/A	* N/A	0.03	0.05	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.06	0.06	0.02	0.03	0.03	0.03	0.03
08/13/21	* N/A	* N/A	* N/A	* N/A	0.02	0.04	0.04	0.05	0.03	0.03	0.04	0.05	* N/A	* N/A	0.02	0.03	0.03	0.03	0.03
08/14/21	* N/A	* N/A	* N/A	* N/A	0.02	0.03	0.04	0.04	0.03	0.05	0.04	0.05	* N/A	* N/A	0.03	0.04	0.03	0.03	0.03
08/15/21	* N/A	* N/A	* N/A	* N/A	0.03	0.03	0.04	0.05	* N/A	* N/A	0.04	0.06	* N/A	*N/A	* N/A	* N/A	* N/A	* N/A	0.04
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Cell offline for planned outage.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
08/01/21	0.015	0.015	8.412	7.597	9.400	0.055	0.050	0.062	1,656	1,603	1,712	39	36	44	99.35	2.19	97.64	1.63
08/02/21	0.015	0.015	8.571	7.623	9.756	0.054	0.043	0.068	1,638	1,563	1,762	39	35	46	99.37	2.20	97.60	1.62
08/03/21	0.015	0.015	8.701	7.799	9.890	0.061	0.052	0.074	1,734	1,651	1,841	42	37	47	99.30	2.16	97.60	1.62
08/04/21	0.015	0.015	8.436	7.632	9.713	0.059	0.052	0.074	1,768	1,692	1,850	42	37	46	99.30	2.16	97.64	1.63
08/05/21	0.015	0.015	8.473	7.749	9.546	0.059	0.052	0.071	1,736	1,656	1,821	40	36	45	99.30	2.16	97.70	1.64
08/06/21	0.016	0.020	8.681	7.880	9.566	0.061	0.051	0.073	1,746	1,659	1,835	42	36	49	99.29	2.15	97.62	1.62
08/07/21	0.016	0.016	8.527	7.807	9.602	0.058	0.051	0.075	1,719	1,651	1,793	41	37	46	99.32	2.17	97.62	1.62
08/08/21	0.016	0.016	8.336	7.697	9.360	0.055	0.050	0.061	1,659	1,592	1,721	41	37	46	99.35	2.18	97.53	1.61
08/09/21	0.016	0.016	8.561	7.695	9.438	0.055	0.048	0.066	1,630	1,563	1,732	40	36	46	99.36	2.19	97.55	1.61
08/10/21	0.016	0.016	8.497	7.889	9.330	0.060	0.054	0.067	1,726	1,646	1,843	41	36	46	99.29	2.15	97.65	1.63
08/11/21	0.017	0.017	8.233	7.577	9.013	0.061	0.056	0.070	1,744	1,686	1,844	44	39	49	99.26	2.13	97.48	1.60
08/12/21	0.018	0.018	8.261	7.615	8.825	0.064	0.057	0.071	1,720	1,660	1,797	45	41	51	99.23	2.11	97.36	1.58
08/13/21	0.019	0.020	8.301	7.814	9.029	0.067	0.057	0.079	1,703	1,626	1,798	45	42	49	99.19	2.09	97.37	1.58
08/14/21	0.018	0.018	8.366	7.851	9.176	0.074	0.065	0.082	1,700	1,638	1,782	44	40	50	99.12	2.05	97.41	1.59
08/15/21	0.023	0.025	8.566	8.111	9.093	0.073	0.067	0.080	1,663	1,591	1,738	43	39	49	99.14	2.07	97.42	1.59
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

* GWRS offline for planned two-week outage for final expansion construction activity.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
08/01/21	96.42	90.778	23,533.1	0.25	3.0	6
08/02/21	96.47	94.530	22,634.7	0.25	3.0	6
08/03/21	96.62	95.608	22,809.9	0.24	3.0	6
08/04/21	96.98	97.172	23,128.4	0.24	3.0	6
08/05/21	97.09	93.524	24,116.8	0.25	3.0	6
08/06/21	96.91	94.649	22,900.2	0.24	3.0	6
08/07/21	97.03	93.493	22,655.1	0.24	3.0	6
08/08/21	97.16	90.952	22,444.3	0.24	3.0	6
08/09/21	97.83	82.467	22,353.2	0.25	3.0	6
08/10/21	98.41	67.490	20,447.9	0.25	3.0	6
08/11/21	98.35	51.543	17,168.1	0.26	3.0	6
08/12/21	98.25	43.519	13,842.5	0.27	3.0	6
08/13/21	98.20	29.990	12,429.9	0.28	3.0	6
08/14/21	97.99	17.111	9,170.6	0.30	3.0	6
08/15/21	97.87	7.830	5,657.7	0.37	3.0	6
08/16/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/17/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/18/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/19/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/20/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/21/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/22/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/23/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/24/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/25/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/26/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/27/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/28/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/29/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/30/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
08/31/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

* GWRS offline for planned two-week outage for final expansion construction activity.

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	12.42	12.42	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/03/21	12.32	12.32	12.01	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/04/21	12.36	12.36	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/05/21	12.42	12.42	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/06/21	12.45	12.45	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/07/21	12.38	12.38	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/08/21	12.36	12.36	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/09/21	12.34	12.34	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/10/21	12.31	12.31	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/11/21	12.30	12.30	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/12/21	12.35	12.35	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/13/21	12.31	12.31	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/14/21	12.22	12.22	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/15/21	12.23	12.23	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/16/21	12.10	12.10	12.01	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/17/21	12.18	12.18	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/18/21	12.20	12.20	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/19/21	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/20/21	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/21/21	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/22/21	12.21	12.21	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/23/21	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/24/21	12.34	12.34	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/25/21	12.35	12.35	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/26/21	12.41	12.41	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/27/21	12.41	12.41	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/28/21	12.34	12.34	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/29/21	12.36	12.36	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/30/21	12.32	12.32	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS offline for planned outage.

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	0.00	4.38	2.04	6.00	0.00	12.42
09/03/21	0.00	4.31	2.01	6.00	0.00	12.32
09/04/21	0.00	4.30	2.06	6.00	0.00	12.36
09/05/21	0.00	4.26	2.16	6.00	0.00	12.42
09/06/21	0.00	4.27	2.18	6.00	0.00	12.45
09/07/21	0.00	4.21	2.18	6.00	0.00	12.38
09/08/21	0.00	4.22	2.14	6.00	0.00	12.36
09/09/21	0.00	4.22	2.11	6.00	0.00	12.34
09/10/21	0.00	4.21	2.10	6.00	0.00	12.31
09/11/21	0.00	4.19	2.11	6.00	0.00	12.30
09/12/21	0.00	4.20	2.15	6.00	0.00	12.35
09/13/21	0.00	4.14	2.17	6.00	0.00	12.31
09/14/21	0.00	4.10	2.12	6.00	0.00	12.22
09/15/21	0.00	4.10	2.13	6.00	0.00	12.23
09/16/21	0.00	4.09	2.01	6.00	0.00	12.10
09/17/21	0.00	4.07	2.10	6.00	0.00	12.18
09/18/21	0.00	4.04	2.16	6.00	0.00	12.20
09/19/21	0.00	4.04	2.19	6.00	0.00	12.23
09/20/21	0.00	4.01	2.19	6.00	0.00	12.19
09/21/21	0.00	4.01	2.14	6.00	0.00	12.15
09/22/21	0.00	4.10	2.11	6.00	0.00	12.21
09/23/21	0.00	4.04	2.13	6.00	0.00	12.16
09/24/21	0.00	4.20	2.14	6.00	0.00	12.34
09/25/21	0.00	4.19	2.16	6.00	0.00	12.35
09/26/21	0.00	4.22	2.19	6.00	0.00	12.41
09/27/21	0.00	4.21	2.19	6.00	0.00	12.41
09/28/21	0.00	4.18	2.16	6.00	0.00	12.34
09/29/21	0.00	4.20	2.16	6.00	0.00	12.36
09/30/21	0.00	4.17	2.15	6.00	0.00	12.32

Notes:

* GWRS offline for planned outage.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	MF+Cl_2	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	0.00	0.00	2.04	6.00	4.00	12.04
09/03/21	0.00	0.00	2.01	6.00	4.00	12.01
09/04/21	0.00	0.00	2.06	6.00	4.00	12.06
09/05/21	0.00	0.00	2.16	6.00	4.00	12.16
09/06/21	0.00	0.00	2.18	6.00	4.00	12.18
09/07/21	0.00	0.00	2.18	6.00	4.00	12.18
09/08/21	0.00	0.00	2.14	6.00	4.00	12.14
09/09/21	0.00	0.00	2.11	6.00	4.00	12.11
09/10/21	0.00	0.00	2.10	6.00	4.00	12.10
09/11/21	0.00	0.00	2.11	6.00	4.00	12.11
09/12/21	0.00	0.00	2.15	6.00	4.00	12.15
09/13/21	0.00	0.00	2.17	6.00	4.00	12.17
09/14/21	0.00	0.00	2.12	6.00	4.00	12.12
09/15/21	0.00	0.00	2.13	6.00	4.00	12.13
09/16/21	0.00	0.00	2.01	6.00	4.00	12.01
09/17/21	0.00	0.00	2.10	6.00	4.00	12.10
09/18/21	0.00	0.00	2.16	6.00	4.00	12.16
09/19/21	0.00	0.00	2.19	6.00	4.00	12.19
09/20/21	0.00	0.00	2.19	6.00	4.00	12.19
09/21/21	0.00	0.00	2.14	6.00	4.00	12.14
09/22/21	0.00	0.00	2.11	6.00	4.00	12.11
09/23/21	0.00	0.00	2.13	6.00	4.00	12.13
09/24/21	0.00	0.00	2.14	6.00	4.00	12.14
09/25/21	0.00	0.00	2.16	6.00	4.00	12.16
09/26/21	0.00	0.00	2.19	6.00	4.00	12.19
09/27/21	0.00	0.00	2.19	6.00	4.00	12.19
09/28/21	0.00	0.00	2.16	6.00	4.00	12.16
09/29/21	0.00	0.00	2.16	6.00	4.00	12.16
09/30/21	0.00	0.00	2.15	6.00	4.00	12.15

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* GWRS offline for planned outage.

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	**A02**	**A03**	**A04**	**A05**	**A06**	**A07**	**A08**	**B01**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	4.49	4.87	4.70	4.53	4.46	** N/A	4.61	** N/A	** N/A	** N/A	** N/A	** N/A	** N/A	** N/A	** N/A	4.50
09/03/21	4.42	4.73	4.60	4.48	4.42	4.52	4.53	4.49	4.42	4.56	4.67	4.68	4.37	4.70	4.48	4.36
09/04/21	4.45	4.70	4.52	4.45	4.41	4.39	4.54	4.33	4.42	4.51	4.62	4.65	4.35	4.52	4.47	4.33
09/05/21	4.41	4.63	4.51	4.40	4.36	4.30	4.49	4.26	4.36	4.44	4.57	4.62	4.33	4.44	4.42	4.34
09/06/21	4.39	4.66	4.48	4.39	4.35	4.29	4.44	4.27	4.35	4.41	4.57	4.59	4.32	4.42	4.43	4.34
09/07/21	4.35	4.60	4.50	4.35	4.32	4.33	4.44	4.30	4.35	4.43	4.56	4.58	4.32	4.40	4.42	4.32
09/08/21	4.38	4.63	4.44	4.38	4.33	4.31	4.42	4.29	4.30	4.36	4.53	4.60	4.29	4.39	4.40	4.32
09/09/21	4.34	4.57	4.47	4.34	4.30	4.27	4.45	4.26	4.36	4.39	4.52	4.57	4.27	4.36	4.37	4.31
09/10/21	4.38	4.57	4.43	4.38	4.32	4.28	4.45	4.26	4.31	4.33	4.48	4.53	4.27	4.33	4.38	4.29
09/11/21	4.32	4.62	4.42	4.35	4.29	4.29	4.43	4.23	4.30	4.38	4.47	4.55	4.25	4.35	4.37	4.25
09/12/21	4.33	4.56	4.37	4.34	4.30	4.28	4.44	4.24	4.30	4.37	4.48	4.53	4.23	4.31	4.35	4.20
09/13/21	4.31	4.58	4.40	4.31	4.29	4.26	4.42	4.33	4.27	4.35	4.45	4.52	4.22	4.30	4.34	4.22
09/14/21	4.29	4.55	4.33	4.24	4.28	4.26	4.40	4.29	4.26	4.31	4.41	***N/A	4.21	4.27	4.32	4.21
09/15/21	4.29	4.46	4.29	4.25	4.24	4.24	4.39	4.27	4.47	4.27	4.36	***N/A	4.20	4.24	4.30	4.20
09/16/21	4.29	4.48	4.27	4.16	4.34	4.23	4.39	4.26	4.40	4.27	4.35	***N/A	4.17	4.21	4.29	4.19
09/17/21	4.20	4.39	4.27	4.13	4.38	4.14	4.33	4.25	4.38	4.24	4.30	***N/A	4.15	4.21	4.27	4.14
09/18/21	4.25	4.42	4.34	4.17	4.39	4.18	4.52	4.24	4.33	4.19	4.30	5.10	4.11	4.19	4.24	4.13
09/19/21	4.21	4.40	4.48	4.12	4.36	4.14	4.52	4.22	4.35	4.20	4.42	5.08	4.10	4.16	4.23	4.13
09/20/21	4.18	4.38	4.42	4.25	4.37	4.11	4.46	4.24	4.33	4.18	4.53	5.06	4.08	4.16	4.23	4.07
09/21/21	4.18	4.36	4.43	4.33	4.38	4.08	4.46	4.24	4.33	4.18	4.53	5.04	4.07	4.14	4.22	4.22
09/22/21	4.16	4.38	4.47	4.39	4.38	4.11	4.49	4.31	4.35	4.17	4.55	5.04	4.21	4.30	4.19	4.31
09/23/21	4.49	4.41	4.43	4.32	4.35	4.04	4.48	4.28	4.33	4.12	4.51	5.06	4.31	4.40	4.17	4.31
09/24/21	4.43	4.70	4.40	4.34	4.32	4.36	4.49	4.27	4.32	4.38	4.48	5.02	4.33	4.39	4.41	4.29
09/25/21	4.38	4.63	4.40	4.34	4.32	4.37	4.48	4.27	4.30	4.43	4.50	5.01	4.33	4.38	4.43	4.29
09/26/21	4.42	4.61	4.41	4.32	4.32	4.34	4.48	4.25	4.26	4.44	4.51	5.03	4.34	4.39	4.42	4.29
09/27/21	4.39	4.59	4.41	4.27	4.31	4.29	4.46	4.24	4.24	4.43	4.50	5.02	4.33	4.35	4.44	4.27
09/28/21	4.41	4.59	4.40	4.25	4.30	4.26	4.44	4.20	4.26	4.43	***N/A	5.03	4.29	4.30	4.43	4.28
09/29/21	4.38	4.56	4.36	4.20	4.27	4.34	4.43	4.20	4.22	4.42	***N/A	5.00	4.28	4.29	4.39	4.27
09/30/21	4.40	4.59	4.38	4.24	4.28	4.30	4.41	4.17	4.19	4.40	***N/A	4.99	4.27	4.29	4.38	4.25

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS offline for planned outage.	** Cell out of service.	*** Cell offline for membrane replacement.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	** N/A	5.43	5.60	5.13	** N/A	** N/A	** N/A	** N/A	4.47	4.40	4.39	4.39	4.61	4.58	4.38	4.53
09/03/21	***N/A	5.39	5.54	5.09	5.52	5.38	5.41	5.42	4.38	4.33	4.33	4.31	4.50	4.49	4.31	4.39
09/04/21	***N/A	5.38	5.47	5.00	5.49	5.33	5.32	5.35	4.37	4.33	4.30	4.30	4.52	4.51	4.31	4.37
09/05/21	***N/A	5.39	5.35	5.00	5.37	5.29	5.22	5.30	4.37	4.32	4.27	4.29	4.47	4.51	4.30	4.38
09/06/21	***N/A	5.33	5.34	4.99	5.34	5.25	5.21	5.29	4.35	4.28	4.28	4.29	4.47	4.49	4.27	4.33
09/07/21	***N/A	5.31	5.36	4.96	5.31	5.21	5.20	5.27	4.34	4.30	4.29	4.24	4.47	4.51	4.21	4.31
09/08/21	***N/A	5.26	5.32	4.93	5.30	5.19	5.20	5.26	4.32	4.28	4.25	4.24	4.46	4.51	4.26	4.33
09/09/21	5.19	5.26	5.29	4.91	5.36	5.18	5.21	5.31	4.29	4.26	4.23	4.22	4.43	4.46	4.24	4.34
09/10/21	5.12	5.25	5.29	4.90	5.35	5.17	5.19	5.28	4.27	4.24	4.24	4.21	4.43	4.44	4.24	4.34
09/11/21	5.08	5.28	5.29	4.89	5.34	5.20	5.16	5.21	4.26	4.23	4.21	4.21	4.41	4.48	4.19	4.32
09/12/21	5.07	5.27	5.30	4.88	5.24	5.22	5.16	5.26	4.27	4.26	4.21	4.21	4.38	4.48	4.24	4.32
09/13/21	5.10	5.21	5.27	4.88	5.21	5.19	5.18	5.31	4.25	4.21	4.21	4.14	4.39	4.48	4.21	4.31
09/14/21	5.07	5.19	5.22	4.85	5.21	5.28	5.15	5.29	4.23	4.19	4.20	4.10	4.39	4.42	4.20	4.29
09/15/21	5.03	5.21	5.21	4.85	5.23	5.30	5.12	5.21	4.20	4.18	4.18	4.10	4.37	4.60	4.17	4.27
09/16/21	5.03	5.21	5.22	4.87	5.18	5.25	5.12	5.15	4.20	4.13	4.20	4.09	4.34	4.53	4.23	4.20
09/17/21	5.00	5.17	5.19	4.86	5.15	5.23	5.11	5.18	4.17	4.08	4.31	4.07	4.32	4.49	4.31	4.17
09/18/21	5.02	5.22	5.16	4.84	5.15	5.23	5.10	5.26	4.13	4.08	4.30	4.04	4.24	4.49	4.27	4.27
09/19/21	4.99	5.29	5.13	4.85	5.17	5.20	5.10	5.27	4.15	4.09	4.31	4.04	4.27	4.45	4.30	4.46
09/20/21	4.97	5.27	5.13	4.94	5.16	5.18	5.09	5.28	4.15	4.04	4.31	4.01	4.28	4.38	4.32	4.40
09/21/21	4.99	5.29	5.16	4.98	5.20	5.21	5.08	5.31	4.12	4.13	4.31	4.01	4.23	4.42	4.29	4.40
09/22/21	4.97	5.25	5.18	4.94	5.16	5.22	5.06	5.28	4.10	4.33	4.29	4.13	4.20	4.43	4.31	4.39
09/23/21	4.97	5.23	5.17	4.90	5.14	5.19	5.08	5.28	4.07	4.32	4.28	4.26	4.34	4.46	4.30	4.35
09/24/21	4.98	5.22	5.28	4.90	5.10	5.15	5.08	5.24	4.32	4.30	4.27	4.26	4.52	4.47	4.32	4.36
09/25/21	4.98	5.24	5.32	4.93	5.09	5.15	5.06	5.24	4.37	4.31	4.27	4.26	4.55	4.45	4.32	4.34
09/26/21	4.98	5.25	5.29	4.93	5.13	5.15	5.06	5.27	4.35	4.29	4.27	4.23	4.53	4.42	4.31	4.32
09/27/21	4.99	5.22	5.26	4.92	5.11	5.12	5.02	5.28	4.33	4.26	4.27	4.22	4.53	4.38	4.32	4.31
09/28/21	5.00	5.17	5.28	4.91	5.12	5.09	4.97	5.17	4.32	4.23	4.26	4.22	4.52	4.33	4.29	4.28
09/29/21	4.97	5.20	5.28	4.88	5.10	5.09	5.20	5.16	4.29	4.24	4.23	4.21	4.50	4.35	4.27	4.29
09/30/21	4.94	5.18	5.25	4.86	5.21	5.09	5.26	5.15	4.28	4.24	4.19	4.21	4.42	4.42	4.19	4.31

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS offline for planned outage. ** Cell out of service. *** Cell offline for repairs.

	MicroFiltration Process online monitoring results Log Removal Value			
	E01	**E02**	**E03**	**E04**
Date	LRV	LRV	LRV	LRV
09/01/21	* N/A	* N/A	* N/A	* N/A
09/02/21	** N/A	4.41	** N/A	** N/A
09/03/21	4.45	4.37	4.59	4.87
09/04/21	4.36	4.31	4.52	4.88
09/05/21	4.34	4.30	4.42	4.72
09/06/21	4.33	4.32	4.32	4.69
09/07/21	4.37	4.26	4.40	4.80
09/08/21	4.30	4.22	4.35	4.73
09/09/21	4.26	4.24	4.45	4.76
09/10/21	4.25	4.22	4.51	4.83
09/11/21	4.24	4.25	4.43	***N/A
09/12/21	4.29	4.23	4.42	***N/A
09/13/21	4.34	4.23	4.49	***N/A
09/14/21	4.32	4.21	4.38	***N/A
09/15/21	4.30	4.21	4.46	4.89
09/16/21	4.27	4.38	4.50	4.76
09/17/21	4.24	4.38	4.36	4.85
09/18/21	4.19	4.35	4.39	4.78
09/19/21	4.22	4.36	4.43	4.80
09/20/21	4.25	4.38	4.38	4.83
09/21/21	4.29	4.38	4.41	4.75
09/22/21	4.28	4.35	4.52	4.84
09/23/21	4.26	4.26	4.44	4.99
09/24/21	4.20	4.26	4.35	4.72
09/25/21	4.19	4.29	4.45	4.71
09/26/21	4.22	4.27	4.39	4.76
09/27/21	4.21	4.24	4.39	4.82
09/28/21	4.18	4.18	4.39	4.79
09/29/21	4.27	4.20	4.42	4.82
09/30/21	4.36	4.18	4.40	4.75

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS offline for planned outage. ** Cell out of service. *** Cell offline for repairs.

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	0.04	0.33*[1]	0.04	0.19	0.03	0.06	0.05	0.25*[2]	0.06	0.24*[1]	0.11	0.34*[1]	0.08	0.13	0.03	0.04	0.04	0.31*[2]	0.04
09/03/21	0.03	0.04	0.04	0.12	0.03	0.08	0.04	0.11	0.04	0.07	0.06	0.32*[2]	0.05	0.20*[2]	0.02	0.09	0.03	0.05	0.04
09/04/21	0.03	0.13	0.03	0.05	0.03	0.03	0.04	0.11	0.04	0.04	0.04	0.04	0.05	0.06	0.02	0.09	0.03	0.04	0.03
09/05/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.07	0.04	0.04	0.05	0.08	0.02	0.03	0.03	0.03	0.03
09/06/21	0.03	0.07	0.03	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.03	0.04	0.05	0.05	0.02	0.03	0.03	0.04	0.03
09/07/21	0.03	0.04	0.03	0.16	0.03	0.04	0.04	0.14	0.03	0.03	0.03	0.06	0.05	0.10	0.03	0.15	0.03	0.04	0.03
09/08/21	0.03	0.04	0.03	0.22*[2]	0.02	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.05	0.05	0.02	0.03	0.03	0.03	0.03
09/09/21	0.03	0.03	0.03	0.04	0.03	0.27*[2]	0.04	0.05	0.03	0.05	0.03	0.04	0.05	0.05	0.02	0.09	0.02	0.03	0.03
09/10/21	0.03	0.14	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.05	0.06	0.02	0.05	0.02	0.03	0.03
09/11/21	0.03	0.04	0.03	0.04	0.02	0.05	0.04	0.05	0.03	0.04	0.03	0.04	0.05	0.05	0.02	0.03	0.03	0.03	0.03
09/12/21	0.03	0.04	0.03	0.06	0.02	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.05	0.06	0.02	0.03	0.03	0.04	0.03
09/13/21	0.03	0.04	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.10	0.03	0.04	0.05	0.07	0.02	0.03	0.03	0.04	0.03
09/14/21	0.03	0.03	0.03	0.05	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.06	0.05	0.10	0.03	0.07	0.03	0.04	0.03
09/15/21	0.03	0.06	0.03	0.04	0.03	0.10	0.04	0.05	0.03	0.05	0.04	0.04	0.04	0.11	0.03	0.18	0.03	0.04	0.03
09/16/21	0.03	0.12	0.03	0.05	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.13	0.04	0.16	0.03	0.04	0.02	0.06	0.03
09/17/21	0.03	0.04	0.03	0.09	0.03	0.05	0.04	0.08	0.03	0.18	0.04	0.05	0.03	0.05	0.03	0.03	0.02	0.07	0.03
09/18/21	0.03	0.21*[2]	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.21*[2]	0.03	0.05	0.02	0.04	0.03
09/19/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.05	0.03	0.03	0.02	0.03	0.03
09/20/21	0.03	0.05	0.03	0.04	0.02	0.05	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.09	0.03	0.13	0.03	0.03	0.03
09/21/21	0.03	0.04	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.05	0.04	0.15	0.04	0.10	0.03	0.06	0.03	0.07	0.03
09/22/21	0.03	0.04	0.03	0.08	0.02	0.03	0.04	0.05	0.03	0.04	0.04	0.04	0.04	0.07	0.03	0.03	0.03	0.04	0.03
09/23/21	0.03	0.04	0.03	0.04	0.02	0.03	0.04	0.06	0.03	0.03	0.04	0.04	0.04	0.09	0.02	0.03	0.03	0.03	0.03
09/24/21	0.03	0.03	0.03	0.12	0.03	0.10	0.04	0.05	0.03	0.05	0.04	0.04	0.04	0.15	0.02	0.03	0.03	0.04	0.03
09/25/21	0.03	0.11	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.05	0.04	0.04	0.03	0.07	0.02	0.03	0.03	0.04	0.03
09/26/21	0.03	0.04	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.06	0.02	0.03	0.04	0.04	0.03
09/27/21	0.03	0.05	0.03	0.04	0.03	0.06	0.04	0.04	0.03	0.08	0.04	0.05	0.04	0.07	0.03	0.03	0.04	0.05	0.03
09/28/21	0.03	0.08	0.03	0.04	0.03	0.10	0.04	0.27*[2]	0.03	0.04	0.04	0.04	0.04	0.13	0.03	0.12	0.04	0.05	0.03
09/29/21	0.03	0.04	0.03	0.13	0.03	0.05	0.04	0.06	0.03	0.03	0.04	0.11	0.04	0.12	0.03	0.19	0.04	0.05	0.03
09/30/21	0.03	0.05	0.03	0.04	0.03	0.03	0.04	0.08	0.03	0.03	0.04	0.05	0.03	0.05	0.02	0.03	0.05	0.05	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* GWRS offline for planned outage.

*[1] Spike occurred while bringing a cell online after a scheduled shutdown for GWRSFE construction work.

*[2] Spike occurred during cell daily programmed PDT cycles.

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	0.015	0.015	8.432	7.886	8.913	0.077	0.067	0.093	1,758	1,686	1,838	48	42	53	99.09	2.04	97.29	1.57
09/03/21	0.014	0.014	8.408	7.780	9.121	0.082	0.066	0.105*1	1,767	1,689	1,838	46	42	51	99.02	2.01	97.39	1.58
09/04/21	0.014	0.014	8.240	7.680	8.928	0.072	0.056	0.086	1,726	1,672	1,806	44	41	48	99.13	2.06	97.42	1.59
09/05/21	0.014	0.014	8.064	7.521	8.658	0.056	0.048	0.061	1,621	1,568	1,684	41	37	45	99.31	2.16	97.49	1.60
09/06/21	0.014	0.014	7.990	7.267	9.133	0.053	0.049	0.057	1,568	1,502	1,646	39	36	43	99.34	2.18	97.51	1.60
09/07/21	0.014	0.014	8.597	7.951	9.447	0.057	0.054	0.065	1,566	1,469	1,702	38	34	42	99.33	2.18	97.59	1.62
09/08/21	0.014	0.014	8.739	8.165	9.526	0.064	0.059	0.069	1,675	1,580	1,807	39	34	47	99.27	2.14	97.69	1.64
09/09/21	0.014	0.014	8.593	7.859	9.416	0.066	0.061	0.074	1,726	1,640	1,821	40	35	48	99.23	2.11	97.66	1.63
09/10/21	0.014	0.014	8.395	7.697	9.338	0.066	0.059	0.079	1,723	1,648	1,801	40	34	48	99.21	2.10	97.66	1.63
09/11/21	0.014	0.014	8.533	7.721	9.599	0.066	0.058	0.105*2	1,717	1,676	1,779	40	37	45	99.22	2.11	97.65	1.63
09/12/21	0.014	0.014	8.412	7.712	9.441	0.059	0.056	0.064	1,653	1,610	1,690	38	34	42	99.29	2.15	97.72	1.64
09/13/21	0.014	0.014	8.580	7.877	9.676	0.059	0.053	0.067	1,619	1,524	1,790	37	33	59	99.32	2.17	97.70	1.64
09/14/21	0.014	0.014	8.777	7.660	9.778	0.066	0.062	0.075	1,730	1,656	1,842	39	35	47	99.24	2.12	97.74	1.65
09/15/21	0.014	0.014	8.633	7.877	9.778	0.065	0.057	0.075	1,751	1,659	1,894	40	36	46	99.25	2.13	97.72	1.64
09/16/21	0.014	0.014	8.741	7.852	9.603	0.086	0.062	0.207*2	1,757	1,698	1,825	39	35	44	99.02	2.01	97.78	1.65
09/17/21	0.014	0.014	8.960	8.012	9.800	0.071	0.060	0.114*3	1,749	1,686	1,858	39	34	44	99.21	2.10	97.80	1.66
09/18/21	0.014	0.014	8.994	8.056	9.969	0.062	0.054	0.069	1,725	1,671	1,801	38	35	44	99.31	2.16	97.77	1.65
09/19/21	0.014	0.014	8.775	7.899	9.867	0.057	0.054	0.062	1,631	1,571	1,687	36	33	41	99.35	2.19	97.78	1.65
09/20/21	0.014	0.014	8.868	7.868	10.078	0.058	0.054	0.070	1,607	1,503	1,752	36	31	43	99.35	2.19	97.76	1.65
09/21/21	0.014	0.014	8.972	8.323	10.098	0.065	0.059	0.073	1,724	1,620	1,873	39	34	45	99.28	2.14	97.74	1.65
09/22/21	0.014	0.014	8.717	7.873	9.426	0.067	0.062	0.076	1,758	1,662	1,875	40	35	46	99.23	2.11	97.75	1.65
09/23/21	0.014	0.014	8.781	8.024	9.537	0.066	0.056	0.075	1,755	1,678	1,838	40	36	44	99.25	2.13	97.75	1.65
09/24/21	0.014	0.014	8.665	7.893	9.442	0.063	0.053	0.074	1,758	1,695	1,819	39	35	45	99.27	2.14	97.77	1.65
09/25/21	0.014	0.014	8.632	7.794	9.492	0.060	0.054	0.068	1,720	1,670	1,789	38	35	45	99.30	2.16	97.77	1.65
09/26/21	0.014	0.014	8.662	7.961	9.736	0.056	0.045	0.064	1,641	1,568	1,705	36	32	41	99.35	2.19	97.82	1.66
09/27/21	0.014	0.014	8.810	7.543	9.800	0.056	0.052	0.065	1,633	1,543	1,732	36	31	42	99.36	2.19	97.80	1.66
09/28/21	0.014	0.014	8.859	8.080	9.697	0.061	0.055	0.067	1,713	1,620	1,855	37	32	44	99.31	2.16	97.82	1.66
09/29/21	0.014	0.014	8.694	7.835	9.417	0.060	0.053	0.067	1,734	1,682	1,818	38	33	42	99.31	2.16	97.83	1.66
09/30/21	0.014	0.014	8.552	7.699	9.239	0.061	0.053	0.071	1,749	1,685	1,842	38	34	47	99.29	2.15	97.80	1.66

Notes:

* GWRS offline for planned outage.	*1 Elevated TOC lasted for approximately 1 hour, samples taken indicated the presence of acetone
	*2 One RO unit was restarted w/o normal pre-flush to waste
	*3 TOC decline to typical level after spike on 9/16 extended partially into the following day

	UltraViolet / AOP Process online monitoring results					
Date	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
09/01/21	* N/A	* N/A	* N/A	* N/A	* N/A	* N/A
09/02/21	96.56	46.966	5,104.1	0.32	3.0	6
09/03/21	96.60	68.187	13,477.7	0.29	3.0	6
09/04/21	96.43	82.942	18,324.5	0.27	3.0	6
09/05/21	97.46	84.303	21,372.0	0.26	3.0	6
09/06/21	97.94	85.113	21,332.5	0.25	3.0	6
09/07/21	96.97	88.884	21,243.6	0.25	3.0	6
09/08/21	96.47	89.182	22,009.9	0.25	3.0	6
09/09/21	96.58	86.888	22,292.2	0.25	3.0	6
09/10/21	96.46	87.527	21,812.9	0.25	3.0	6
09/11/21	96.32	90.063	21,930.5	0.25	3.0	6
09/12/21	97.04	89.769	22,160.4	0.25	3.0	6
09/13/21	97.29	89.679	22,724.7	0.25	3.0	6
09/14/21	96.66	88.714	22,673.1	0.25	3.0	6
09/15/21	96.55	91.685	22,617.5	0.25	3.0	6
09/16/21	96.44	91.811	22,962.5	0.25	3.0	6
09/17/21	96.41	92.967	23,185.3	0.25	3.0	6
09/18/21	96.48	92.476	22,880.9	0.25	3.0	6
09/19/21	96.51	92.780	23,008.5	0.25	3.0	6
09/20/21	96.60	94.645	23,388.2	0.25	3.0	6
09/21/21	96.56	94.403	23,320.3	0.25	3.0	6
09/22/21	96.68	95.203	23,239.5	0.25	3.0	6
09/23/21	96.75	94.414	23,726.2	0.25	3.0	6
09/24/21	96.75	95.455	23,279.5	0.24	3.0	6
09/25/21	96.97	96.308	23,727.1	0.24	3.0	6
09/26/21	96.70	93.153	23,568.1	0.25	3.0	6
09/27/21	96.90	94.439	23,230.5	0.25	3.0	6
09/28/21	96.55	94.065	23,156.3	0.25	3.0	6
09/29/21	96.54	92.743	23,716.6	0.25	3.0	6
09/30/21	96.61	93.546	23,514.8	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

* GWRS offline for planned outage.

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
10/01/21	12.28	12.28	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/02/21	12.27	12.27	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/03/21	12.29	12.29	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/04/21	12.30	12.30	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/05/21	12.25	12.25	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/06/21	12.20	12.20	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/07/21	12.25	12.25	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/08/21	12.30	12.30	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/09/21	12.24	12.24	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/10/21	12.25	12.25	12.14	Y	Y	Y	0.0	0.0	0.01*	0.0	0.0
10/11/21	12.29	12.29	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/12/21	12.25	12.25	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/13/21	12.21	12.21	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/14/21	12.27	12.27	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/15/21	12.32	12.32	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/16/21	12.43	12.43	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/17/21	12.45	12.45	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/18/21	12.47	12.47	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/19/21	12.44	12.44	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/20/21	12.34	12.34	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/21/21	12.34	12.34	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/22/21	12.36	12.36	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/23/21	12.28	12.28	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/24/21	12.22	12.22	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/25/21	12.26	12.26	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/26/21	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/27/21	12.18	12.18	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/28/21	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/29/21	12.12	12.12	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/30/21	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/31/21	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

* Turbidity spike immediately following plant restart from unplanned SCE power interruption.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
10/01/21	0.00	4.15	2.13	6.00	0.00	12.28
10/02/21	0.00	4.15	2.12	6.00	0.00	12.27
10/03/21	0.00	4.14	2.15	6.00	0.00	12.29
10/04/21	0.00	4.14	2.17	6.00	0.00	12.30
10/05/21	0.00	4.09	2.16	6.00	0.00	12.25
10/06/21	0.00	4.10	2.11	6.00	0.00	12.20
10/07/21	0.00	4.09	2.17	6.00	0.00	12.25
10/08/21	0.00	4.12	2.19	6.00	0.00	12.30
10/09/21	0.00	4.09	2.16	6.00	0.00	12.24
10/10/21	0.00	4.11	2.14	6.00	0.00	12.25
10/11/21	0.00	4.09	2.21	6.00	0.00	12.29
10/12/21	0.00	4.05	2.20	6.00	0.00	12.25
10/13/21	0.00	4.04	2.17	6.00	0.00	12.21
10/14/21	0.00	4.09	2.18	6.00	0.00	12.27
10/15/21	0.00	4.11	2.20	6.00	0.00	12.32
10/16/21	0.00	4.20	2.23	6.00	0.00	12.43
10/17/21	0.00	4.20	2.24	6.00	0.00	12.45
10/18/21	0.00	4.23	2.24	6.00	0.00	12.47
10/19/21	0.00	4.22	2.22	6.00	0.00	12.44
10/20/21	0.00	4.14	2.20	6.00	0.00	12.34
10/21/21	0.00	4.14	2.20	6.00	0.00	12.34
10/22/21	0.00	4.16	2.21	6.00	0.00	12.36
10/23/21	0.00	4.07	2.21	6.00	0.00	12.28
10/24/21	0.00	4.01	2.20	6.00	0.00	12.22
10/25/21	0.00	4.05	2.21	6.00	0.00	12.26
10/26/21	0.00	4.04	2.19	6.00	0.00	12.23
10/27/21	0.00	4.01	2.17	6.00	0.00	12.18
10/28/21	0.00	4.02	2.15	6.00	0.00	12.17
10/29/21	0.00	4.00	2.11	6.00	0.00	12.12
10/30/21	0.00	4.01	2.15	6.00	0.00	12.16
10/31/21	0.00	4.01	2.18	6.00	0.00	12.19

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	LRV	LRV	LRV	LRV	LRV	LRV
10/01/21	0.00	0.00	2.13	6.00	4.00	12.13
10/02/21	0.00	0.00	2.12	6.00	4.00	12.12
10/03/21	0.00	0.00	2.15	6.00	4.00	12.15
10/04/21	0.00	0.00	2.17	6.00	4.00	12.17
10/05/21	0.00	0.00	2.16	6.00	4.00	12.16
10/06/21	0.00	0.00	2.11	6.00	4.00	12.11
10/07/21	0.00	0.00	2.17	6.00	4.00	12.17
10/08/21	0.00	0.00	2.19	6.00	4.00	12.19
10/09/21	0.00	0.00	2.16	6.00	4.00	12.16
10/10/21	0.00	0.00	2.14	6.00	4.00	12.14
10/11/21	0.00	0.00	2.21	6.00	4.00	12.21
10/12/21	0.00	0.00	2.20	6.00	4.00	12.20
10/13/21	0.00	0.00	2.17	6.00	4.00	12.17
10/14/21	0.00	0.00	2.18	6.00	4.00	12.18
10/15/21	0.00	0.00	2.20	6.00	4.00	12.20
10/16/21	0.00	0.00	2.23	6.00	4.00	12.23
10/17/21	0.00	0.00	2.24	6.00	4.00	12.24
10/18/21	0.00	0.00	2.24	6.00	4.00	12.24
10/19/21	0.00	0.00	2.22	6.00	4.00	12.22
10/20/21	0.00	0.00	2.20	6.00	4.00	12.20
10/21/21	0.00	0.00	2.20	6.00	4.00	12.20
10/22/21	0.00	0.00	2.21	6.00	4.00	12.21
10/23/21	0.00	0.00	2.21	6.00	4.00	12.21
10/24/21	0.00	0.00	2.20	6.00	4.00	12.20
10/25/21	0.00	0.00	2.21	6.00	4.00	12.21
10/26/21	0.00	0.00	2.19	6.00	4.00	12.19
10/27/21	0.00	0.00	2.17	6.00	4.00	12.17
10/28/21	0.00	0.00	2.15	6.00	4.00	12.15
10/29/21	0.00	0.00	2.11	6.00	4.00	12.11
10/30/21	0.00	0.00	2.15	6.00	4.00	12.15
10/31/21	0.00	0.00	2.18	6.00	4.00	12.18

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

	MicroFiltration Process online monitoring results Log Removal Value															
	A01	**A02**	**A03**	**A04**	**A05**	**A06**	**A07**	**A08**	**B01**	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
10/01/21	4.35	4.57	4.29	4.18	4.24	4.28	4.42	4.24	4.16	4.34	5.10	4.96	4.27	4.25	4.37	4.25
10/02/21	4.31	4.51	4.27	4.21	4.23	4.22	4.39	4.29	4.18	4.32	5.18	4.95	4.27	4.27	4.34	4.23
10/03/21	4.32	4.53	4.30	4.20	4.21	4.27	4.38	4.28	4.15	4.37	5.07	4.97	4.27	4.29	4.36	4.23
10/04/21	4.33	4.54	4.22	4.14	4.22	4.28	4.38	4.30	4.14	4.38	5.11	4.99	4.26	4.24	4.38	4.24
10/05/21	4.34	4.57	4.19	4.12	4.15	4.29	4.37	4.29	4.14	4.34	5.11	4.98	4.24	4.24	4.36	4.23
10/06/21	4.31	4.57	4.16	4.17	4.17	4.26	4.36	4.24	4.10	4.29	5.04	4.98	4.22	4.22	4.34	4.20
10/07/21	4.35	4.55	4.21	4.14	4.22	4.24	4.36	4.21	4.32	4.27	5.01	4.96	4.19	4.18	4.32	4.19
10/08/21	4.32	4.48	4.22	4.12	4.30	4.19	4.37	4.26	4.37	4.26	5.03	4.94	4.14	4.17	4.31	4.17
10/09/21	4.30	4.44	4.12	4.09	4.32	4.18	4.43	4.20	4.37	4.22	5.00	4.94	4.12	4.15	4.30	4.14
10/10/21	4.35	4.52	4.39	4.15	4.33	4.23	4.45	4.41	4.40	4.29	4.99	4.97	4.16	4.18	4.31	4.16
10/11/21	4.32	4.47	4.44	4.10	4.35	4.21	4.46	4.33	4.35	4.29	4.99	4.97	4.15	4.18	4.31	4.15
10/12/21	4.25	4.49	4.44	4.20	4.36	4.18	4.48	4.31	4.34	N/A*	4.93	4.94	4.05	4.15	4.29	4.13
10/13/21	4.24	4.40	4.42	4.24	4.36	4.14	4.45	4.28	4.34	N/A*	4.95	4.90	4.04	4.12	4.26	4.24
10/14/21	4.21	4.41	4.41	4.26	4.33	4.14	4.43	4.28	4.25	N/A*	4.95	4.89	4.28	4.30	4.24	4.27
10/15/21	4.41	4.31	4.34	4.30	4.31	4.11	4.44	4.27	4.28	4.94	4.95	4.98	4.32	4.37	4.22	4.27
10/16/21	4.46	4.65	4.32	4.32	4.33	4.35	4.46	4.25	4.26	5.03	4.94	4.99	4.33	4.34	4.20	4.25
10/17/21	4.43	4.64	4.33	4.27	4.32	4.32	4.43	4.25	4.26	5.04	4.90	5.02	4.32	4.31	4.20	4.27
10/18/21	4.35	4.64	4.32	4.27	4.28	4.24	4.45	4.23	4.25	5.02	4.95	5.00	4.30	4.29	4.36	4.29
10/19/21	4.41	4.55	4.35	4.31	4.29	4.26	4.42	4.28	4.24	5.01	4.95	4.96	4.25	4.28	4.39	4.22
10/20/21	4.36	4.62	4.30	4.24	4.22	4.25	4.44	4.27	4.23	5.06	4.92	4.93	4.23	4.30	4.36	4.23
10/21/21	4.37	4.50	4.22	4.20	4.23	4.20	4.41	4.20	4.20	5.07	4.92	4.90	4.23	4.27	4.35	4.21
10/22/21	4.38	4.58	4.25	4.20	4.23	4.28	4.44	4.22	4.21	5.08	4.89	4.92	4.21	4.25	4.34	4.19
10/23/21	4.26	4.46	4.16	4.07	4.12	4.25	4.33	4.19	4.13	5.07	5.08	4.92	4.20	4.24	4.35	4.16
10/24/21	4.29	4.45	4.19	4.01	4.20	4.21	4.35	4.18	4.05	5.03	5.01	4.89	4.19	4.22	4.34	4.13
10/25/21	4.33	4.50	4.15	4.06	4.13	4.22	4.32	4.13	4.05	4.96	4.95	4.91	4.17	4.18	4.32	4.11
10/26/21	4.31	4.47	4.13	4.05	4.04	4.14	4.28	4.07	N/A*	4.89	4.92	4.87	4.13	4.10	4.27	4.05
10/27/21	4.28	4.43	4.08	4.01	4.11	4.14	4.28	4.08	N/A*	4.91	4.91	4.83	4.12	4.08	4.26	4.04
10/28/21	4.18	4.38	4.07	4.04	4.06	4.04	4.24	4.25	N/A*	4.91	4.92	4.85	4.05	4.07	4.25	4.02
10/29/21	4.21	4.41	4.08	4.04	4.23	4.08	4.28	4.27	5.35	4.91	4.94	4.88	4.10	4.10	4.29	4.00
10/30/21	4.26	4.35	N/A**	4.06	4.36	4.13	4.41	4.25	5.42	4.97	4.93	4.88	4.10	4.11	4.30	4.01
10/31/21	4.16	4.33	N/A**	4.10	4.30	4.10	4.45	4.25	5.35	4.93	4.89	4.84	4.04	4.03	4.22	4.02

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell out of service for membrane replacement. ** Cell offline for corrective maintenance.

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
10/01/21	4.92	5.16	5.22	4.84	5.32	5.07	5.21	5.14	4.30	4.19	4.17	4.21	4.44	4.40	4.20	4.28
10/02/21	4.95	5.18	5.21	4.86	5.33	5.08	5.22	5.16	4.31	4.16	4.15	4.20	4.47	4.33	4.22	4.25
10/03/21	4.96	5.18	5.20	4.89	5.34	5.11	5.27	5.18	4.32	4.17	4.18	4.21	4.45	4.34	4.23	4.25
10/04/21	4.97	5.15	5.20	4.91	5.30	5.14	5.24	5.19	4.33	4.18	4.19	4.18	4.46	4.33	4.24	4.26
10/05/21	5.09	5.13	5.25	4.85	5.26	5.12	5.20	5.20	4.31	4.21	4.16	4.16	4.47	4.28	4.23	4.22
10/06/21	5.14	5.11	5.25	4.83	5.26	5.08	5.21	5.18	4.29	4.21	4.15	4.15	4.42	4.39	4.26	4.20
10/07/21	5.09	5.12	5.23	4.83	5.24	5.06	5.20	5.14	4.27	4.16	4.13	4.16	4.41	4.51	4.26	4.19
10/08/21	5.12	5.09	5.21	4.81	5.22	5.03	5.20	5.13	4.26	4.14	4.22	4.13	4.39	4.53	4.25	4.16
10/09/21	5.11	5.07	5.19	4.80	5.21	5.01	5.13	5.16	4.23	4.12	4.33	4.10	4.40	4.51	4.28	4.13
10/10/21	5.10	5.09	5.20	4.81	5.21	5.08	5.15	5.12	4.23	4.12	4.31	4.11	4.37	4.51	4.52	4.45
10/11/21	5.11	5.11	5.15	4.82	5.21	5.18	5.14	5.11	4.22	4.13	4.31	4.09	4.36	4.52	4.50	4.33
10/12/21	5.09	5.09	5.15	4.79	5.21	5.21	5.12	5.11	4.19	4.26	4.31	4.05	4.31	4.51	4.46	4.32
10/13/21	5.07	5.02	5.13	4.76	5.17	5.17	5.11	5.18	4.16	4.35	4.30	4.20	4.30	4.49	4.45	4.38
10/14/21	5.02	5.00	5.11	4.73	5.13	5.15	5.10	5.30	4.09	4.32	4.27	4.35	4.26	4.48	4.45	4.38
10/15/21	5.01	5.16	5.16	4.70	5.16	5.13	5.09	5.28	4.12	4.33	4.24	4.25	4.34	4.48	4.47	4.38
10/16/21	5.02	5.25	5.15	4.88	5.21	5.17	5.12	5.24	4.36	4.32	4.22	4.23	4.46	4.45	4.46	4.37
10/17/21	5.03	5.25	5.14	4.99	5.22	5.20	5.15	5.22	4.32	4.32	4.25	4.23	4.50	4.42	4.49	4.32
10/18/21	5.03	5.24	5.16	4.97	5.24	5.19	5.12	5.25	4.36	4.32	4.25	4.24	4.55	4.42	4.46	4.34
10/19/21	5.03	5.23	5.18	4.93	5.19	5.13	5.10	5.23	4.38	4.31	4.23	4.22	4.54	4.42	4.43	4.36
10/20/21	5.00	5.21	5.05	4.91	5.17	5.10	5.06	5.23	4.32	4.27	4.22	4.21	4.45	4.40	4.36	4.30
10/21/21	4.93	5.17	5.16	4.91	5.14	5.08	4.99	5.23	4.24	4.19	4.20	4.20	4.44	4.29	4.36	4.25
10/22/21	4.99	5.17	5.31	4.89	5.08	5.09	4.97	5.21	4.25	4.21	4.16	4.16	4.43	4.28	4.36	4.19
10/23/21	4.93	5.19	5.27	4.85	5.08	5.08	4.99	5.20	4.29	4.22	4.14	4.13	4.40	4.30	4.30	4.21
10/24/21	4.88	5.15	5.27	4.83	5.08	5.10	5.00	5.21	4.29	4.21	4.15	4.12	4.41	4.30	4.34	4.21
10/25/21	4.96	5.13	5.26	4.83	5.02	5.10	4.97	5.16	4.25	4.18	4.11	4.08	4.38	4.26	4.33	4.20
10/26/21	4.91	5.09	5.22	4.83	4.97	5.07	5.09	5.08	4.18	4.09	4.06	4.04	4.27	4.24	4.28	4.15
10/27/21	4.87	5.06	5.24	4.83	5.14	5.06	5.16	5.06	4.14	4.06	4.03	4.07	4.25	4.37	4.24	4.08
10/28/21	4.84	5.08	5.25	4.82	5.29	4.99	5.12	5.13	4.06	4.10	4.02	4.05	4.28	4.51	4.17	4.09
10/29/21	4.88	5.09	5.24	4.81	5.29	5.03	5.14	5.15	4.11	4.04	4.16	4.04	4.27	4.49	4.19	4.07
10/30/21	4.90	5.12	5.25	4.84	5.32	5.08	5.16	5.15	4.12	4.05	4.31	4.01	4.25	4.45	4.14	4.18
10/31/21	4.83	5.08	5.21	4.80	5.20	5.02	5.17	5.13	4.07	4.06	4.31	4.01	4.23	4.47	4.26	4.40

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
10/01/21	4.34	4.15	4.48	4.70
10/02/21	4.32	4.15	4.40	4.73
10/03/21	4.30	4.14	4.38	4.76
10/04/21	4.30	4.14	4.49	4.85
10/05/21	4.29	4.09	4.42	4.85
10/06/21	4.28	4.10	4.38	4.82
10/07/21	4.26	4.09	4.40	4.83
10/08/21	4.26	4.19	4.39	4.92
10/09/21	4.24	4.34	4.36	4.79
10/10/21	4.30	4.30	4.43	4.75
10/11/21	4.27	4.26	4.39	4.79
10/12/21	4.28	4.27	4.29	4.69
10/13/21	4.25	4.29	4.38	4.59
10/14/21	4.24	4.29	4.23	4.75
10/15/21	4.20	4.26	4.27	4.63
10/16/21	4.23	4.30	4.42	4.65
10/17/21	4.28	4.30	4.30	4.73
10/18/21	4.31	4.29	4.28	4.69
10/19/21	4.29	4.31	4.36	4.77
10/20/21	4.26	4.21	4.14	4.75
10/21/21	4.20	4.15	4.14	4.67
10/22/21	4.20	4.16	4.24	4.57
10/23/21	4.16	4.18	4.23	4.75
10/24/21	4.21	4.13	4.16	4.65
10/25/21	4.31	4.06	4.20	4.58
10/26/21	4.36	4.05	4.16	4.62
10/27/21	4.27	4.01	4.06	4.49
10/28/21	4.22	4.02	4.18	4.46
10/29/21	4.21	4.10	4.12	4.64
10/30/21	4.24	4.35	4.15	4.68
10/31/21	4.24	4.36	4.21	4.58

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results
Effluent Turbidity - NTU

Date	A01-A04 avg	A01-A04 max	A05-A08 avg	A05-A08 max	B01-B04 avg	B01-B04 max	B05-B08 avg	B05-B08 max	C01-C04 avg	C01-C04 max	C05-C08 avg	C05-C08 max	D01-D04 avg	D01-D04 max	D05-D08 avg	D05-D08 max	E01-E04 avg	E01-E04 max	MFE avg
10/01/21	0.03	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.05	0.03	0.12	0.05	0.06	0.04
10/02/21	0.03	0.08	0.03	0.04	0.03	0.03	0.04	0.22**	0.03	0.04	0.04	0.06	0.03	0.04	0.02	0.03	0.06	0.24**	0.04
10/03/21	0.03	0.07	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.11	0.04	0.05	0.03	0.04	0.02	0.03	0.06	0.21**	0.04
10/04/21	0.03	0.04	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.08	0.05	0.08	0.03	0.04	0.02	0.03	0.07	0.10	0.04
10/05/21	0.03	0.04	0.03	0.05	0.03	0.03	0.04	0.04	0.03	0.07	0.05	0.05	0.04	0.07	0.03	0.07	0.07	0.08	0.04
10/06/21	0.03	0.04	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.05	0.06	0.03	0.04	0.03	0.03	0.08	0.08	0.04
10/07/21	0.03	0.08	0.04	0.07	0.03	0.04	0.04	0.21**	0.03	0.07	0.05	0.05	0.04	0.13	0.03	0.03	0.08	0.09	0.04
10/08/21	0.03	0.12	0.04	0.10	0.03	0.05	0.04	0.05	0.03	0.04	0.05	0.06	0.04	0.07	0.03	0.03	0.09	0.18	0.04
10/09/21	0.03	0.04	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.09	0.05	0.08	0.04	0.13	0.03	0.03	0.09	0.09	0.04
10/10/21	0.04	0.57*	0.04	0.05	0.03	0.03	0.04	0.14	0.03	0.03	0.05	0.06	0.04	0.08	0.03	0.04	0.10	0.19	0.04
10/11/21	0.03	0.04	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.03	0.05	0.06	0.04	0.06	0.03	0.03	0.10	0.21**	0.04
10/12/21	0.03	0.04	0.03	0.04	0.03	0.04	0.04	0.13	0.03	0.17	0.04	0.06	0.03	0.04	0.02	0.03	0.06	0.11	0.04
10/13/21	0.03	0.04	0.03	0.05	0.02	0.03	0.04	0.18	0.03	0.08	0.04	0.04	0.03	0.08	0.02	0.04	0.03	0.30**	0.03
10/14/21	0.03	0.05	0.03	0.04	0.02	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.02	0.08	0.02	0.03	0.03
10/15/21	0.03	0.03	0.03	0.29**	0.03	0.06	0.04	0.05	0.03	0.04	0.04	0.04	0.03	0.13	0.02	0.03	0.02	0.03	0.03
10/16/21	0.03	0.03	0.03	0.05	0.03	0.03	0.04	0.04	0.03	0.05	0.04	0.04	0.03	0.04	0.02	0.03	0.02	0.08	0.03
10/17/21	0.03	0.04	0.03	0.07	0.02	0.03	0.04	0.05	0.03	0.03	0.04	0.07	0.03	0.08	0.02	0.02	0.03	0.24**	0.03
10/18/21	0.03	0.03	0.03	0.11	0.02	0.03	0.04	0.04	0.03	0.05	0.04	0.04	0.03	0.04	0.02	0.03	0.02	0.03	0.03
10/19/21	0.03	0.04	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.02	0.03	0.03	0.04	0.03
10/20/21	0.03	0.10	0.03	0.03	0.03	0.05	0.04	0.04	0.03	0.04	0.04	0.05	0.04	0.06	0.03	0.20**	0.03	0.05	0.03
10/21/21	0.03	0.04	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.06	0.04	0.04	0.03	0.03	0.03	0.35**	0.03
10/22/21	0.03	0.04	0.03	0.03	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.03	0.05	0.03
10/23/21	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.06	0.04	0.04	0.03	0.03	0.03	0.03	0.03
10/24/21	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.05	0.03	0.04	0.03	0.03	0.03	0.20**	0.03
10/25/21	0.03	0.05	0.03	0.04	0.02	0.03	0.04	0.04	0.03	0.03	0.05	0.08	0.03	0.04	0.03	0.10	0.03	0.04	0.03
10/26/21	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.06	0.04	0.05	0.02	0.04	0.03	0.04	0.03
10/27/21	0.03	0.04	0.02	0.07	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.08	0.02	0.03	0.03	0.03	0.03
10/28/21	0.03	0.04	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.02	0.03	0.03	0.03	0.03
10/29/21	0.03	0.05	0.02	0.03	0.03	0.05	0.04	0.05	0.04	0.05	0.04	0.04	0.04	0.10	0.02	0.03	0.03	0.03	0.03
10/30/21	0.04	0.04	0.02	0.03	0.03	0.04	0.04	0.12	0.04	0.04	0.04	0.06	0.04	0.06	0.03	0.03	0.03	0.03	0.03
10/31/21	0.03	0.04	0.02	0.03	0.03	0.03	0.04	0.08	0.04	0.04	0.05	0.05	0.04	0.05	0.02	0.03	0.03	0.03	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Turbidity spike during unexpected plant shutdown due to power issue from SCE.

** Turbidity spike due to entrained air to analyzer from daily PDT.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results															
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
10/01/21	0.014	0.014	8.345	7.720	9.353	0.062	0.057	0.070	1,759	1,685	1,835	38	34	44	99.26	2.13	97.83	1.66
10/02/21	0.014	0.014	8.188	7.328	9.016	0.062	0.054	0.075	1,729	1,681	1,789	38	35	44	99.24	2.12	97.77	1.65
10/03/21	0.014	0.014	8.167	7.314	9.326	0.058	0.051	0.069	1,655	1,598	1,716	36	32	42	99.29	2.15	97.80	1.66
10/04/21	0.014	0.014	8.437	7.454	9.587	0.058	0.053	0.065	1,620	1,537	1,721	36	31	42	99.32	2.17	97.80	1.66
10/05/21	0.014	0.014	8.890	7.916	9.788	0.062	0.057	0.073	1,688	1,624	1,788	37	32	43	99.30	2.16	97.81	1.66
10/06/21	0.014	0.014	8.581	7.706	9.640	0.067	0.057	0.077	1,720	1,658	1,791	38	33	42	99.22	2.11	97.80	1.66
10/07/21	0.014	0.014	8.852	7.885	9.857	0.060	0.050	0.077	1,739	1,647	1,848	39	33	52	99.32	2.17	97.78	1.65
10/08/21	0.014	0.014	8.616	7.967	9.423	0.056	0.049	0.065	1,747	1,671	1,846	38	34	43	99.35	2.19	97.82	1.66
10/09/21	0.014	0.014	8.422	7.816	9.351	0.059	0.050	0.066	1,709	1,666	1,790	35	33	39	99.30	2.16	97.93	1.68
10/10/21	0.022	0.211*	8.023	7.338	8.909	0.058	0.049	0.087	1,670	1,609	1,804	37	33	45	99.27	2.14	97.81	1.66
10/11/21	0.014	0.014	8.355	7.446	9.282	0.052	0.047	0.058	1,628	1,522	1,758	35	31	41	99.38	2.21	97.86	1.67
10/12/21	0.014	0.014	8.567	7.705	9.264	0.054	0.049	0.064	1,723	1,630	1,869	35	32	41	99.37	2.20	97.95	1.69
10/13/21	0.014	0.014	8.318	7.575	9.086	0.056	0.050	0.063	1,770	1,703	1,842	36	32	40	99.32	2.17	97.97	1.69
10/14/21	0.014	0.014	8.426	7.637	9.391	0.056	0.048	0.067	1,763	1,685	1,860	35	32	41	99.34	2.18	97.99	1.70
10/15/21	0.014	0.014	8.407	7.719	9.175	0.052	0.042	0.072	1,727	1,634	1,803	36	32	41	99.38	2.20	97.94	1.69
10/16/21	0.014	0.014	8.551	7.815	9.113	0.050	0.036	0.059	1,707	1,649	1,786	35	32	41	99.41	2.23	97.92	1.68
10/17/21	0.014	0.014	8.362	7.718	9.120	0.048	0.043	0.055	1,642	1,584	1,715	35	32	40	99.43	2.24	97.89	1.68
10/18/21	0.014	0.014	8.372	7.675	9.715	0.048	0.043	0.058	1,572	1,512	1,673	32	30	36	99.42	2.24	97.94	1.69
10/19/21	0.014	0.014	8.719	8.055	9.740	0.052	0.047	0.061	1,681	1,591	1,838	34	29	41	99.40	2.22	97.95	1.69
10/20/21	0.014	0.014	8.700	7.996	9.577	0.055	0.051	0.067	1,718	1,658	1,777	36	31	40	99.37	2.20	97.93	1.68
10/21/21	0.014	0.014	8.683	7.960	9.744	0.055	0.049	0.060	1,703	1,636	1,781	37	32	44	99.37	2.20	97.83	1.66
10/22/21	0.014	0.014	8.572	7.919	9.501	0.053	0.049	0.060	1,719	1,627	1,826	37	33	43	99.38	2.21	97.86	1.67
10/23/21	0.014	0.014	8.801	8.010	9.516	0.054	0.049	0.060	1,706	1,643	1,783	36	31	41	99.39	2.21	97.89	1.68
10/24/21	0.014	0.014	8.667	7.924	9.582	0.054	0.046	0.067	1,641	1,574	1,710	37	32	42	99.37	2.20	97.77	1.65
10/25/21	0.014	0.014	8.763	7.976	9.730	0.054	0.049	0.073	1,619	1,493	1,768	37	32	43	99.39	2.21	97.73	1.64
10/26/21	0.014	0.014	8.864	7.904	9.608	0.057	0.044	0.077	1,691	1,592	1,818	38	33	44	99.36	2.19	97.77	1.65
10/27/21	0.014	0.014	8.850	8.038	9.857	0.060	0.052	0.068	1,730	1,650	1,826	41	36	47	99.33	2.17	97.64	1.63
10/28/21	0.014	0.014	8.851	8.226	9.857	0.062	0.052	0.079	1,730	1,652	1,820	41	37	46	99.29	2.15	97.61	1.62
10/29/21	0.014	0.014	8.851	8.105	9.654	0.068	0.054	0.079	1,746	1,665	1,855	43	37	49	99.23	2.11	97.55	1.61
10/30/21	0.014	0.014	9.244	8.631	9.976	0.065	0.051	0.078	1,758	1,686	1,853	43	37	47	99.30	2.15	97.54	1.61
10/31/21	0.014	0.014	8.897	8.125	9.852	0.059	0.054	0.071	1,676	1,597	1,751	43	38	49	99.33	2.18	97.45	1.59

Notes:

* Turbidity spike immediately following plant restart from unplanned SCE power interruption.

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
10/01/21	96.45	95.562	23,450.2	0.25	3.0	6
10/02/21	96.83	96.528	23,945.7	0.25	3.0	6
10/03/21	97.02	93.134	24,079.3	0.25	3.0	6
10/04/21	96.91	96.169	23,326.0	0.25	3.0	6
10/05/21	96.79	96.600	24,238.0	0.25	3.0	6
10/06/21	96.79	96.814	24,117.3	0.25	3.0	6
10/07/21	96.87	94.338	24,258.7	0.25	3.0	6
10/08/21	96.92	96.634	23,519.2	0.25	3.0	6
10/09/21	97.21	64.045	23,790.3	0.25	3.0	6
10/10/21	97.27	85.752	15,719.9	0.24	3.0	6
10/11/21	96.80	95.135	21,885.0	0.25	3.0	6
10/12/21	96.78	94.167	23,802.8	0.25	3.0	6
10/13/21	96.87	93.117	23,520.6	0.25	3.0	6
10/14/21	97.09	92.331	23,440.0	0.25	3.0	6
10/15/21	97.16	92.161	23,193.5	0.25	3.0	6
10/16/21	97.34	94.719	23,292.9	0.25	3.0	6
10/17/21	97.32	94.171	23,631.1	0.25	3.0	6
10/18/21	97.46	86.416	23,570.1	0.25	3.0	6
10/19/21	97.48	96.401	22,534.3	0.26	3.0	6
10/20/21	97.50	94.545	24,083.8	0.25	3.0	6
10/21/21	97.79	94.275	23,901.2	0.25	3.0	6
10/22/21	97.88	91.629	23,870.5	0.25	3.0	6
10/23/21	97.80	94.836	23,437.0	0.26	3.0	6
10/24/21	97.46	95.216	24,071.6	0.25	3.0	6
10/25/21	97.46	94.415	24,504.2	0.26	3.0	6
10/26/21	97.62	92.519	24,102.7	0.25	3.0	6
10/27/21	97.37	91.364	23,653.1	0.25	3.0	6
10/28/21	97.65	88.194	23,304.7	0.26	3.0	6
10/29/21	97.71	81.681	22,406.6	0.26	3.0	6
10/30/21	97.50	77.032	21,262.5	0.26	3.0	6
10/31/21	97.22	91.027	20,391.1	0.26	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
							MFE		ROP		
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	NTU		NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
11/01/21	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/02/21	12.21	12.21	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/03/21	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/04/21	12.18	12.18	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/05/21	12.20	12.20	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/06/21	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/07/21	12.23	12.23	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/08/21	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/09/21	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/10/21	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/11/21	12.16	12.16	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/12/21	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/13/21	12.16	12.16	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/14/21	12.20	12.20	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/15/21	12.18	12.18	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/16/21	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/17/21	12.20	12.20	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/18/21	12.22	12.22	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/19/21	12.17	12.17	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/20/21	11.54	11.54	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/21/21	12.26	12.26	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/22/21	12.25	12.25	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/23/21	12.29	12.29	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/24/21	12.25	12.25	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/25/21	12.30	12.30	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/26/21	12.23	12.23	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/27/21	12.24	12.24	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/28/21	12.23	12.23	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/29/21	12.20	12.20	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/30/21	12.15	12.15	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	LRV	LRV	LRV	LRV	LRV	LRV
11/01/21	0.00	4.02	2.19	6.00	0.00	12.21
11/02/21	0.00	4.04	2.17	6.00	0.00	12.21
11/03/21	0.00	4.02	2.14	6.00	0.00	12.15
11/04/21	0.00	4.06	2.12	6.00	0.00	12.18
11/05/21	0.00	4.06	2.14	6.00	0.00	12.20
11/06/21	0.00	4.03	2.15	6.00	0.00	12.19
11/07/21	0.00	4.05	2.17	6.00	0.00	12.23
11/08/21	0.00	4.03	2.19	6.00	0.00	12.23
11/09/21	0.00	4.02	2.15	6.00	0.00	12.16
11/10/21	0.00	4.03	2.15	6.00	0.00	12.17
11/11/21	0.00	4.02	2.14	6.00	0.00	12.16
11/12/21	0.00	4.01	2.16	6.00	0.00	12.16
11/13/21	0.00	4.00	2.16	6.00	0.00	12.16
11/14/21	0.00	4.00	2.19	6.00	0.00	12.20
11/15/21	0.00	3.99	2.19	6.00	0.00	12.18
11/16/21	0.00	4.02	2.16	6.00	0.00	12.17
11/17/21	0.00	4.03	2.17	6.00	0.00	12.20
11/18/21	0.00	4.04	2.18	6.00	0.00	12.22
11/19/21	0.00	4.02	2.15	6.00	0.00	12.17
11/20/21	0.00	3.37	2.17	6.00	0.00	11.54
11/21/21	0.00	4.03	2.23	6.00	0.00	12.26
11/22/21	0.00	4.01	2.24	6.00	0.00	12.25
11/23/21	0.00	4.07	2.22	6.00	0.00	12.29
11/24/21	0.00	4.04	2.21	6.00	0.00	12.25
11/25/21	0.00	4.04	2.26	6.00	0.00	12.30
11/26/21	0.00	4.00	2.23	6.00	0.00	12.23
11/27/21	0.00	4.00	2.24	6.00	0.00	12.24
11/28/21	0.00	4.00	2.23	6.00	0.00	12.23
11/29/21	0.00	4.01	2.20	6.00	0.00	12.20
11/30/21	0.00	4.00	2.14	6.00	0.00	12.15

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
11/01/21	0.00	0.00	2.19	6.00	4.00	12.19
11/02/21	0.00	0.00	2.17	6.00	4.00	12.17
11/03/21	0.00	0.00	2.14	6.00	4.00	12.14
11/04/21	0.00	0.00	2.12	6.00	4.00	12.12
11/05/21	0.00	0.00	2.14	6.00	4.00	12.14
11/06/21	0.00	0.00	2.15	6.00	4.00	12.15
11/07/21	0.00	0.00	2.17	6.00	4.00	12.17
11/08/21	0.00	0.00	2.19	6.00	4.00	12.19
11/09/21	0.00	0.00	2.15	6.00	4.00	12.15
11/10/21	0.00	0.00	2.15	6.00	4.00	12.15
11/11/21	0.00	0.00	2.14	6.00	4.00	12.14
11/12/21	0.00	0.00	2.16	6.00	4.00	12.16
11/13/21	0.00	0.00	2.16	6.00	4.00	12.16
11/14/21	0.00	0.00	2.19	6.00	4.00	12.19
11/15/21	0.00	0.00	2.19	6.00	4.00	12.19
11/16/21	0.00	0.00	2.16	6.00	4.00	12.16
11/17/21	0.00	0.00	2.17	6.00	4.00	12.17
11/18/21	0.00	0.00	2.18	6.00	4.00	12.18
11/19/21	0.00	0.00	2.15	6.00	4.00	12.15
11/20/21	0.00	0.00	2.17	6.00	4.00	12.17
11/21/21	0.00	0.00	2.23	6.00	4.00	12.23
11/22/21	0.00	0.00	2.24	6.00	4.00	12.24
11/23/21	0.00	0.00	2.22	6.00	4.00	12.22
11/24/21	0.00	0.00	2.21	6.00	4.00	12.21
11/25/21	0.00	0.00	2.26	6.00	4.00	12.26
11/26/21	0.00	0.00	2.23	6.00	4.00	12.23
11/27/21	0.00	0.00	2.24	6.00	4.00	12.24
11/28/21	0.00	0.00	2.23	6.00	4.00	12.23
11/29/21	0.00	0.00	2.20	6.00	4.00	12.20
11/30/21	0.00	0.00	2.14	6.00	4.00	12.14

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results															
	Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
11/01/21	4.19	4.26	N/A *	4.24	4.35	4.05	4.49	4.23	5.42	4.88	4.91	4.83	4.03	4.02	4.19	4.11
11/02/21	4.11	4.24	4.66	4.28	4.28	4.20	4.46	4.21	5.33	4.87	4.88	4.84	4.17	4.27	4.17	4.12
11/03/21	4.47	4.24	4.40	4.25	4.26	4.21	4.42	4.18	5.37	4.87	4.85	4.80	4.20	4.32	4.12	4.13
11/04/21	4.42	4.56	4.37	4.19	4.23	4.20	4.41	4.09	5.34	4.85	4.87	4.80	4.25	4.31	4.12	4.07
11/05/21	4.42	4.50	4.37	4.14	4.21	4.15	4.37	4.06	5.33	4.80	4.82	4.80	4.23	4.27	4.09	4.06
11/06/21	4.39	4.58	4.38	4.08	4.26	4.23	4.36	4.22	5.31	4.77	4.81	4.77	4.06	4.23	4.03	4.09
11/07/21	4.38	4.57	4.33	4.05	4.25	4.21	4.35	4.24	5.28	4.80	4.85	4.75	4.17	4.21	4.25	4.07
11/08/21	4.37	4.53	4.28	4.11	4.20	4.19	4.37	4.21	5.30	4.79	4.84	4.78	4.21	4.20	4.33	4.03
11/09/21	4.31	4.47	4.26	4.07	4.13	4.15	4.32	4.17	5.29	4.73	4.81	4.88	4.18	4.17	4.27	4.02
11/10/21	4.33	4.41	4.25	4.05	4.11	4.05	4.30	4.17	5.23	4.73	4.81	4.88	4.18	4.12	4.26	N/A *
11/11/21	4.33	4.38	4.21	4.02	4.09	4.04	4.23	4.14	5.27	4.96	4.74	4.88	4.08	4.13	4.24	N/A *
11/12/21	4.26	4.39	4.12	4.01	4.07	4.03	4.20	4.10	5.23	5.01	4.75	N/A *	4.07	4.10	4.21	N/A *
11/13/21	4.27	4.40	4.12	N/A *	4.06	4.05	4.19	4.06	5.24	4.96	4.75	N/A *	4.06	4.10	4.20	N/A *
11/14/21	4.18	4.38	4.10	N/A *	4.02	4.03	4.18	4.06	5.30	4.94	4.72	N/A *	4.03	4.09	4.18	N/A *
11/15/21	4.21	4.31	4.12	4.40	4.03	4.02	4.18	4.16	5.19	4.97	4.72	5.51	4.04	4.02	4.16	4.43
11/16/21	4.15	4.27	4.07	4.29	4.02	4.26	4.18	4.17	5.11	4.99	4.69	5.42	4.12	4.02	4.14	4.34
11/17/21	4.11	4.28	4.03	4.24	4.24	4.31	4.39	4.16	5.15	5.08	4.69	5.37	4.35	4.23	4.12	4.28
11/18/21	4.08	4.30	4.04	4.27	4.28	4.31	4.46	4.10	5.18	5.15	4.69	5.32	4.26	4.35	4.09	4.26
11/19/21	4.06	4.21	4.02	4.22	4.30	4.27	4.48	4.08	5.12	5.13	4.87	5.26	4.18	4.32	4.08	4.24
11/20/21	4.08	4.21	3.37	4.20	4.29	4.27	4.46	4.05	5.08	5.13	4.92	5.23	4.21	4.30	4.05	4.20
11/21/21	4.05	4.20	N/A *	4.16	4.29	4.26	4.43	4.05	5.02	5.12	4.90	5.25	4.25	4.26	4.03	4.17
11/22/21	4.39	4.70	4.01	4.11	4.27	4.23	4.41	4.01	5.02	5.15	4.91	5.26	4.24	4.25	4.01	4.16
11/23/21	4.44	4.54	4.29	4.07	4.24	4.19	4.40	4.18	5.00	5.07	4.94	5.30	4.26	4.17	4.23	4.13
11/24/21	4.42	4.52	4.30	4.04	4.14	4.16	4.36	4.20	4.88	5.05	4.89	5.29	4.24	4.17	4.35	4.08
11/25/21	4.32	4.49	4.30	4.06	4.16	4.18	4.35	4.16	5.30	5.13	4.87	5.23	4.20	4.16	4.38	4.04
11/26/21	4.38	4.56	4.30	4.01	4.12	4.13	4.35	4.24	5.31	5.13	4.87	5.16	4.20	4.15	4.34	4.00
11/27/21	4.32	4.46	4.18	4.00	4.10	4.12	4.30	4.21	5.23	5.08	4.84	5.11	4.16	4.11	4.34	4.00
11/28/21	4.34	4.51	4.18	4.03	4.08	4.01	4.28	4.22	5.28	5.04	4.86	5.18	4.03	4.12	4.33	4.00
11/29/21	4.32	4.52	4.17	4.02	4.03	4.03	4.25	4.20	5.32	5.02	4.88	5.19	4.10	4.13	4.26	4.04
11/30/21	4.28	4.45	4.17	4.12	4.05	4.01	4.24	4.18	5.31	4.98	4.81	5.22	4.04	4.07	4.26	4.22

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell offline for repairs

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
11/01/21	5.09	5.11	5.17	4.79	5.26	5.00	5.15	5.09	4.04	4.19	4.28	4.32	4.23	4.49	4.47	4.38
11/02/21	5.11	5.08	5.11	4.75	5.26	4.99	5.15	5.08	4.04	4.34	4.25	4.32	4.33	4.39	4.53	4.37
11/03/21	5.09	5.00	5.14	4.69	5.18	4.91	5.09	5.06	4.02	4.31	4.22	4.22	4.43	4.39	4.49	4.30
11/04/21	5.09	4.98	5.15	4.66	5.15	4.87	5.03	4.98	4.14	4.30	4.21	4.18	4.45	4.36	4.49	4.26
11/05/21	5.05	4.94	5.08	4.63	5.13	4.85	5.03	4.89	4.30	4.28	4.20	4.20	4.45	4.30	4.44	4.27
11/06/21	5.03	4.90	5.03	4.56	5.10	5.01	5.05	4.89	4.30	4.24	4.17	4.18	4.44	4.25	4.36	4.27
11/07/21	5.04	4.89	5.05	4.59	5.14	5.16	5.06	4.88	4.31	4.19	4.16	4.12	4.45	4.23	4.32	4.23
11/08/21	5.03	4.89	5.07	4.59	5.16	5.18	5.04	5.25	4.29	4.16	4.13	4.14	4.41	4.19	4.37	4.19
11/09/21	4.99	4.83	4.97	4.52	5.10	5.13	5.01	5.28	4.23	4.11	4.09	4.14	4.37	4.18	4.32	4.17
11/10/21	4.96	5.14	4.88	4.47	5.05	5.08	4.98	5.23	4.13	4.07	4.05	4.17	4.34	4.16	4.26	4.13
11/11/21	4.93	5.27	4.85	4.57	5.06	5.12	4.96	5.25	4.16	4.06	4.05	4.15	4.30	4.11	4.22	4.05
11/12/21	4.96	5.19	4.88	4.96	5.05	5.12	4.97	5.21	4.18	4.03	4.02	4.07	4.29	4.11	4.22	4.06
11/13/21	4.96	5.19	4.85	4.89	5.03	5.11	4.96	5.20	4.13	4.02	4.00	4.05	4.27	4.05	4.21	4.05
11/14/21	4.95	5.15	4.81	4.87	5.02	5.09	4.92	5.23	4.12	4.04	4.31	4.04	4.24	4.18	4.20	4.02
11/15/21	4.89	5.13	4.77	4.84	5.00	5.08	4.89	5.21	4.08	4.02	4.26	4.01	4.20	4.45	4.17	3.99
11/16/21	4.89	5.12	5.26	4.84	4.89	5.02	4.85	5.19	4.05	4.08	4.24	4.02	4.14	4.45	4.14	4.32
11/17/21	4.88	5.13	5.34	4.87	4.85	4.98	4.81	5.18	4.13	4.35	4.25	4.27	4.12	4.42	4.12	4.38
11/18/21	4.84	5.15	5.28	4.85	4.85	4.99	4.82	5.16	4.35	4.34	4.24	4.45	4.09	4.45	4.08	4.41
11/19/21	4.78	5.14	5.23	4.82	4.83	5.00	4.76	5.08	4.33	4.32	4.20	4.45	4.09	4.45	4.23	4.37
11/20/21	4.73	5.08	5.21	4.79	4.78	4.98	4.67	5.03	4.31	4.27	4.19	4.39	4.09	4.37	4.47	4.30
11/21/21	4.75	5.04	5.24	4.77	4.76	4.94	4.90	5.09	4.30	4.28	4.17	4.36	4.18	4.36	4.48	4.27
11/22/21	4.64	5.02	5.25	4.75	5.22	4.92	5.13	5.08	4.29	4.24	4.16	4.31	4.42	4.33	4.47	4.24
11/23/21	4.61	4.99	5.15	4.71	5.39	4.85	5.12	5.04	4.19	4.18	4.13	4.30	4.48	4.31	4.38	4.23
11/24/21	4.60	4.98	5.11	4.69	5.26	4.84	5.07	4.94	4.15	4.12	4.10	4.32	4.44	4.26	4.38	4.17
11/25/21	4.60	4.97	5.14	4.68	5.32	4.81	5.06	4.96	4.14	4.12	4.08	4.25	4.43	4.23	4.38	4.14
11/26/21	4.60	4.89	5.14	4.65	5.27	4.82	5.12	4.94	4.15	4.11	4.05	4.23	4.43	4.22	4.37	4.15
11/27/21	4.95	4.77	5.09	4.62	5.24	4.76	5.08	4.89	4.11	4.05	4.03	4.22	4.41	4.18	4.34	4.13
11/28/21	5.12	4.78	5.09	4.58	5.23	4.70	5.05	4.86	4.07	4.03	4.02	4.17	4.36	4.17	4.29	4.10
11/29/21	5.10	4.75	5.02	4.55	5.24	4.70	5.03	4.83	4.06	4.01	4.26	4.10	4.35	4.09	4.28	4.05
11/30/21	5.06	4.73	4.97	4.53	5.18	4.66	5.04	4.78	4.01	4.00	4.25	4.11	4.28	4.10	4.17	4.01

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results Log Removal Value			
	E01	E02	E03	E04
	LRV	LRV	LRV	LRV
11/01/21	4.16	4.29	4.10	4.65
11/02/21	4.15	4.29	4.14	4.57
11/03/21	4.06	4.23	4.12	4.57
11/04/21	4.20	4.25	4.06	4.73
11/05/21	4.24	4.18	4.09	4.59
11/06/21	4.10	4.17	4.09	4.56
11/07/21	4.09	4.18	4.07	4.59
11/08/21	4.08	4.09	4.30	4.50
11/09/21	4.06	4.07	4.15	4.42
11/10/21	4.09	4.03	4.03	4.49
11/11/21	4.03	4.04	4.15	4.47
11/12/21	4.12	4.04	4.24	4.47
11/13/21	4.18	4.04	4.13	4.62
11/14/21	4.13	4.00	4.17	4.56
11/15/21	4.14	4.32	4.27	4.55
11/16/21	4.12	4.27	4.05	4.70
11/17/21	4.07	4.29	4.03	4.58
11/18/21	4.08	4.32	4.19	4.61
11/19/21	4.08	4.33	4.08	4.71
11/20/21	4.05	4.26	4.03	4.60
11/21/21	4.21	4.24	4.08	4.62
11/22/21	4.27	4.22	4.11	4.64
11/23/21	4.24	4.21	4.20	4.59
11/24/21	4.26	4.16	4.12	4.57
11/25/21	4.24	4.15	4.08	4.68
11/26/21	4.19	4.07	4.28	4.46
11/27/21	4.16	4.04	4.16	4.51
11/28/21	4.11	4.02	4.16	4.53
11/29/21	4.16	4.34	4.20	4.39
11/30/21	4.29	4.29	4.10	4.48

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

MicroFiltration Process online monitoring results

Effluent Turbidity - NTU

Date	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
11/01/21	0.03	0.05	0.02	0.04	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.07	0.04	0.04	0.03	0.03	0.03	0.03	0.03
11/02/21	0.04	0.05	0.02	0.03	0.03	0.03	0.04	0.05	0.04	0.04	0.06	0.06	0.04	0.04	0.03	0.03	0.03	0.03	0.03
11/03/21	0.04	0.04	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.06	0.06	0.04	0.04	0.03	0.03	0.03	0.05	0.04
11/04/21	0.04	0.04	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.06	0.06	0.06	0.04	0.05	0.03	0.03	0.04	0.04	0.04
11/05/21	0.04	0.04	0.02	0.02	0.03	0.03	0.04	0.04	0.06	2.17 *	0.07	0.07	0.04	0.04	0.03	0.03	0.04	0.04	0.04
11/06/21	0.04	0.04	0.02	0.02	0.03	0.03	0.04	0.08	0.04	0.04	0.07	0.07	0.04	0.05	0.03	0.04	0.04	0.04	0.04
11/07/21	0.04	0.04	0.02	0.02	0.03	0.03	0.04	0.08	0.04	0.04	0.06	0.07	0.04	0.07	0.02	0.03	0.04	0.04	0.04
11/08/21	0.04	0.04	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.06	0.07	0.04	0.05	0.03	0.03	0.05	0.05	0.04
11/09/21	0.04	0.04	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.08	0.10	0.04	0.06	0.03	0.04	0.05	0.05	0.04
11/10/21	0.04	0.04	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.07	0.08	0.04	0.04	0.03	0.03	0.05	0.05	0.04
11/11/21	0.04	0.04	0.02	0.03	0.03	0.08	0.03	0.04	0.04	0.04	0.07	0.10	0.04	0.05	0.03	0.03	0.05	0.06	0.04
11/12/21	0.04	0.05	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.04	0.08	0.09	0.04	0.04	0.03	0.03	0.06	0.06	0.04
11/13/21	0.04	0.04	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.07	0.07	0.04	0.08	0.02	0.03	0.06	0.06	0.04
11/14/21	0.04	0.04	0.02	0.02	0.03	0.06	0.03	0.04	0.04	0.04	0.07	0.07	0.04	0.05	0.03	0.03	0.06	0.07	0.04
11/15/21	0.04	0.07	0.02	0.03	0.03	0.06	0.03	0.04	0.04	0.04	0.07	0.07	0.04	0.04	0.03	0.03	0.06	0.07	0.04
11/16/21	0.04	0.04	0.02	0.04	0.04	0.04	0.03	0.05	0.04	0.04	0.07	0.09	0.04	0.05	0.02	0.03	0.05	0.07	0.04
11/17/21	0.04	0.04	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.08	0.08	0.04	0.05	0.02	0.03	0.03	0.03	0.04
11/18/21	0.04	0.04	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.05	0.08	0.04	0.04	0.03	0.03	0.03	0.03	0.03
11/19/21	0.03	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.07	0.04	0.04	0.02	0.03	0.03	0.03	0.03
11/20/21	0.03	0.04	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.05	0.03	0.03	0.03
11/21/21	0.04	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.03	0.04	0.03
11/22/21	0.04	0.04	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.06	0.04	0.07	0.02	0.03	0.03	0.03	0.03
11/23/21	0.03	0.04	0.02	0.04	0.02	0.03	0.03	0.04	0.04	0.04	0.05	0.07	0.04	0.04	0.02	0.03	0.03	0.03	0.03
11/24/21	0.03	0.03	0.02	0.02	0.03	0.21 **	0.03	0.03	0.04	0.04	0.04	0.05	0.04	0.05	0.02	0.04	0.03	0.03	0.03
11/25/21	0.03	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.04	0.03	0.03	0.03
11/26/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.04	0.05	0.02	0.03	0.03	0.03	0.03
11/27/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.02	0.02	0.03	0.03	0.03
11/28/21	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.05	0.04	0.06	0.04	0.05	0.02	0.03	0.03	0.04	0.03
11/29/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.03	0.04	0.04	0.03
11/30/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.07	0.04	0.05	0.02	0.03	0.04	0.09	0.03

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* 4 minute spike occurred while cells C01 and C03 were offline during or waiting for backwash. No root cause identified to date, no effect evident in bulk MFE turbidity.

** Occurred while cell was offline during scheduled PDT

Date	Reverse Osmosis Process online monitoring results																	
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
11/01/21	0.014	0.014	8.875	7.927	9.977	0.058	0.044	0.074	1,621	1,565	1,695	42	38	46	99.35	2.19	97.43	1.59
11/02/21	0.014	0.014	9.112	8.403	10.166	0.062	0.054	0.076	1,695	1,598	1,840	41	37	47	99.32	2.17	97.56	1.61
11/03/21	0.016	0.026	9.026	8.339	9.874	0.066	0.053	0.156 *	1,747	1,673	1,842	44	40	49	99.27	2.14	97.50	1.60
11/04/21	0.014	0.014	8.957	8.228	9.852	0.068	0.058	0.081	1,769	1,684	1,886	44	40	50	99.24	2.12	97.52	1.61
11/05/21	0.014	0.014	8.724	8.051	9.818	0.063	0.057	0.081	1,797	1,722	1,899	45	40	52	99.28	2.14	97.52	1.61
11/06/21	0.014	0.014	8.691	7.892	9.574	0.061	0.052	0.071	1,793	1,720	1,869	45	42	51	99.30	2.15	97.48	1.60
11/07/21	0.014	0.014	8.377	7.557	9.210	0.056	0.053	0.067	1,720	1,648	1,792	42	38	47	99.33	2.17	97.54	1.61
11/08/21	0.014	0.014	8.342	7.421	9.397	0.053	0.038	0.067	1,670	1,571	1,768	41	37	46	99.36	2.19	97.55	1.61
11/09/21	0.014	0.014	8.423	7.527	9.476	0.060	0.052	0.067	1,748	1,657	1,896	43	38	49	99.29	2.15	97.56	1.61
11/10/21	0.014	0.014	8.312	7.468	8.925	0.059	0.052	0.070	1,798	1,719	1,872	43	39	48	99.29	2.15	97.59	1.62
11/11/21	0.014	0.014	8.146	7.419	9.176	0.059	0.051	0.070	1,797	1,738	1,867	44	40	50	99.28	2.14	97.56	1.61
11/12/21	0.014	0.014	8.133	7.176	8.837	0.057	0.049	0.074	1,750	1,655	1,826	41	37	47	99.30	2.16	97.63	1.63
11/13/21	0.014	0.014	8.023	7.196	8.763	0.056	0.049	0.071	1,728	1,655	1,832	40	35	47	99.31	2.16	97.69	1.64
11/14/21	0.014	0.014	8.057	7.215	8.785	0.052	0.046	0.061	1,679	1,616	1,751	38	34	44	99.36	2.19	97.76	1.65
11/15/21	0.014	0.014	8.412	7.458	9.179	0.054	0.045	0.070	1,614	1,523	1,721	37	32	42	99.35	2.19	97.72	1.64
11/16/21	0.014	0.014	8.589	7.661	9.304	0.060	0.051	0.071	1,715	1,609	1,855	39	34	46	99.30	2.16	97.75	1.65
11/17/21	0.014	0.014	8.377	7.634	9.091	0.057	0.052	0.064	1,736	1,648	1,815	37	33	43	99.32	2.17	97.85	1.67
11/18/21	0.014	0.014	8.278	7.469	9.070	0.054	0.046	0.062	1,735	1,671	1,807	36	30	52	99.35	2.18	97.92	1.68
11/19/21	0.014	0.014	8.391	0.000	9.305	0.059	0.000	0.078	1,738	1,686	1,816	37	33	43	99.29	2.15	97.86	1.67
11/20/21	0.014	0.014	8.310	7.507	9.231	0.056	0.050	0.074	1,738	1,691	1,814	38	34	44	99.32	2.17	97.80	1.66
11/21/21	0.014	0.014	8.384	7.452	9.219	0.050	0.038	0.057	1,700	1,637	1,774	37	33	43	99.41	2.23	97.84	1.67
11/22/21	0.014	0.014	8.727	7.733	10.056	0.050	0.045	0.061	1,637	1,537	1,737	35	31	40	99.42	2.24	97.86	1.67
11/23/21	0.014	0.014	9.182	8.298	9.954	0.055	0.047	0.062	1,715	1,627	1,824	36	32	41	99.40	2.22	97.90	1.68
11/24/21	0.014	0.014	9.089	8.268	10.175	0.056	0.050	0.064	1,759	1,685	1,858	37	33	42	99.39	2.21	97.91	1.68
11/25/21	0.014	0.014	8.636	7.851	9.550	0.048	0.044	0.052	1,773	1,705	1,834	35	33	39	99.45	2.26	98.01	1.70
11/26/21	0.014	0.014	8.092	7.302	9.069	0.048	0.043	0.056	1,671	1,576	1,742	35	31	44	99.41	2.23	97.89	1.68
11/27/21	0.014	0.014	8.282	7.382	9.315	0.048	0.040	0.059	1,655	1,592	1,714	36	33	40	99.42	2.24	97.81	1.66
11/28/21	0.014	0.014	8.413	7.504	9.421	0.049	0.042	0.061	1,628	1,556	1,710	36	32	41	99.41	2.23	97.80	1.66
11/29/21	0.014	0.014	8.686	7.758	9.621	0.055	0.039	0.071	1,649	1,555	1,784	36	31	45	99.37	2.20	97.79	1.66
11/30/21	0.014	0.014	8.588	7.727	9.591	0.062	0.051	0.073	1,753	1,657	1,847	40	35	45	99.28	2.14	97.74	1.65

Notes:

* Higher than normal max value due to temporary analyzer issue; increase not corroborated by redundant analyzer that remained <0.1 mg/L.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	UltraViolet / AOP Process online monitoring results					
	UVT %	FLOW	POWER	EED	Peroxide Dose	Log
Date	avg	MG	kW	kWh/kgal	mg/l	Removal
11/01/21	96.97	76.988	22,876.0	0.25	3.0	6
11/02/21	96.80	92.657	20,876.6	0.27	3.0	6
11/03/21	96.60	95.362	23,533.4	0.25	3.0	6
11/04/21	96.54	96.988	23,885.8	0.25	3.0	6
11/05/21	96.39	95.773	24,447.8	0.25	3.0	6
11/06/21	96.42	93.852	24,177.9	0.25	3.0	6
11/07/21	96.37	93.753	23,723.0	0.25	3.0	6
11/08/21	96.46	96.655	24,947.4	0.26	3.0	6
11/09/21	96.64	93.303	24,569.9	0.25	3.0	6
11/10/21	97.08	90.454	23,730.5	0.26	3.0	6
11/11/21	97.14	88.700	23,143.0	0.26	3.0	6
11/12/21	97.25	88.109	22,899.5	0.26	3.0	6
11/13/21	97.66	86.502	22,798.8	0.26	3.0	6
11/14/21	97.94	83.721	22,129.1	0.26	3.0	6
11/15/21	97.95	86.993	21,294.9	0.25	3.0	6
11/16/21	97.66	86.691	22,298.6	0.26	3.0	6
11/17/21	97.82	86.146	22,440.5	0.26	3.0	6
11/18/21	98.06	84.291	22,201.2	0.26	3.0	6
11/19/21	96.86	94.129	21,547.9	0.26	3.0	6
11/20/21	98.05	91.080	23,291.9	0.25	3.0	6
11/21/21	97.85	90.523	23,723.3	0.26	3.0	6
11/22/21	97.92	91.235	23,728.3	0.26	3.0	6
11/23/21	97.82	94.189	23,750.1	0.26	3.0	6
11/24/21	97.67	94.500	23,448.7	0.25	3.0	6
11/25/21	97.68	93.675	23,315.1	0.25	3.0	6
11/26/21	97.68	90.489	23,306.7	0.25	3.0	6
11/27/21	97.53	90.797	23,300.3	0.26	3.0	6
11/28/21	97.55	90.006	23,723.4	0.26	3.0	6
11/29/21	97.57	89.490	23,800.2	0.27	3.0	6
11/30/21	97.71	89.524	23,711.6	0.26	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

Date	Total Documented Pathogenic Microorganism Reduction Achieved			Minimum Required Log Reduction Achieved			Compliance % Exceedance Time				
	Giardia	Cryptosporidium	Virus(1)	Giardia (10)	Cryptosporidium (10)	Virus (12)	MFE NTU		ROP NTU		TOC
	LRV	LRV	LRV	Y/N	Y/N	Y/N	>0.2	>0.5	>0.2	>0.5	>0.5
12/01/21	12.14	12.14	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/02/21	12.17	12.17	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/03/21	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/04/21	12.23	12.23	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/05/21	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/06/21	12.28	12.28	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/07/21	12.24	12.24	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/08/21	12.18	12.18	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/09/21	12.11	12.11	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/10/21	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/11/21	12.16	12.16	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/12/21	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/13/21	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/14/21	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/15/21	12.19	12.19	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/16/21	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/17/21	12.18	12.18	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/18/21	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/19/21	12.24	12.24	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/20/21	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/21/21	12.21	12.21	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/22/21	12.21	12.21	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/23/21	12.22	12.22	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/24/21	12.24	12.24	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/25/21	12.19	12.19	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/26/21	12.29	12.29	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/27/21	12.29	12.29	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/28/21	12.26	12.26	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/29/21	12.23	12.23	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/30/21	12.25	12.25	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/31/21	12.26	12.26	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
12/01/21	0.00	4.00	2.14	6.00	0.00	12.14
12/02/21	0.00	4.00	2.17	6.00	0.00	12.17
12/03/21	0.00	4.01	2.18	6.00	0.00	12.19
12/04/21	0.00	4.06	2.17	6.00	0.00	12.23
12/05/21	0.00	4.04	2.22	6.00	0.00	12.26
12/06/21	0.00	4.05	2.23	6.00	0.00	12.28
12/07/21	0.00	4.05	2.18	6.00	0.00	12.24
12/08/21	0.00	4.02	2.16	6.00	0.00	12.18
12/09/21	0.00	4.01	2.10	6.00	0.00	12.11
12/10/21	0.00	4.04	2.15	6.00	0.00	12.19
12/11/21	0.00	4.01	2.15	6.00	0.00	12.16
12/12/21	0.00	4.01	2.20	6.00	0.00	12.21
12/13/21	0.00	4.00	2.18	6.00	0.00	12.18
12/14/21	0.00	4.00	2.20	6.00	0.00	12.21
12/15/21	0.00	4.01	2.17	6.00	0.00	12.19
12/16/21	0.00	4.00	2.19	6.00	0.00	12.19
12/17/21	0.00	4.00	2.18	6.00	0.00	12.18
12/18/21	0.00	4.02	2.20	6.00	0.00	12.21
12/19/21	0.00	4.00	2.24	6.00	0.00	12.24
12/20/21	0.00	4.01	2.21	6.00	0.00	12.22
12/21/21	0.00	4.00	2.21	6.00	0.00	12.21
12/22/21	0.00	4.03	2.19	6.00	0.00	12.21
12/23/21	0.00	4.01	2.21	6.00	0.00	12.22
12/24/21	0.00	4.02	2.22	6.00	0.00	12.24
12/25/21	0.00	4.00	2.19	6.00	0.00	12.19
12/26/21	0.00	4.04	2.25	6.00	0.00	12.29
12/27/21	0.00	4.06	2.23	6.00	0.00	12.29
12/28/21	0.00	4.06	2.20	6.00	0.00	12.26
12/29/21	0.00	4.04	2.19	6.00	0.00	12.23
12/30/21	0.00	4.02	2.23	6.00	0.00	12.25
12/31/21	0.00	4.04	2.22	6.00	0.00	12.26

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	Documented Virus Reduction Achieved					
	OC San	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
12/01/21	0.00	0.00	2.14	6.00	4.00	12.14
12/02/21	0.00	0.00	2.17	6.00	4.00	12.17
12/03/21	0.00	0.00	2.18	6.00	4.00	12.18
12/04/21	0.00	0.00	2.17	6.00	4.00	12.17
12/05/21	0.00	0.00	2.22	6.00	4.00	12.22
12/06/21	0.00	0.00	2.23	6.00	4.00	12.23
12/07/21	0.00	0.00	2.18	6.00	4.00	12.18
12/08/21	0.00	0.00	2.16	6.00	4.00	12.16
12/09/21	0.00	0.00	2.10	6.00	4.00	12.10
12/10/21	0.00	0.00	2.15	6.00	4.00	12.15
12/11/21	0.00	0.00	2.15	6.00	4.00	12.15
12/12/21	0.00	0.00	2.20	6.00	4.00	12.20
12/13/21	0.00	0.00	2.18	6.00	4.00	12.18
12/14/21	0.00	0.00	2.20	6.00	4.00	12.20
12/15/21	0.00	0.00	2.17	6.00	4.00	12.17
12/16/21	0.00	0.00	2.19	6.00	4.00	12.19
12/17/21	0.00	0.00	2.18	6.00	4.00	12.18
12/18/21	0.00	0.00	2.20	6.00	4.00	12.20
12/19/21	0.00	0.00	2.24	6.00	4.00	12.24
12/20/21	0.00	0.00	2.21	6.00	4.00	12.21
12/21/21	0.00	0.00	2.21	6.00	4.00	12.21
12/22/21	0.00	0.00	2.19	6.00	4.00	12.19
12/23/21	0.00	0.00	2.21	6.00	4.00	12.21
12/24/21	0.00	0.00	2.22	6.00	4.00	12.22
12/25/21	0.00	0.00	2.19	6.00	4.00	12.19
12/26/21	0.00	0.00	2.25	6.00	4.00	12.25
12/27/21	0.00	0.00	2.23	6.00	4.00	12.23
12/28/21	0.00	0.00	2.20	6.00	4.00	12.20
12/29/21	0.00	0.00	2.19	6.00	4.00	12.19
12/30/21	0.00	0.00	2.23	6.00	4.00	12.23
12/31/21	0.00	0.00	2.22	6.00	4.00	12.22

Notes:

1. One additional log-virus credit taken for 1 month travel time between the primary and secondary project boundary where no drinking water wells operate.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results — Log Removal Value															
	A01	A02	A03	A04	A05	A06	A07	A08	B01	B02	B03	B04	B05	B06	B07	B08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
12/01/21	4.27	4.46	4.13	4.13	4.02	4.00	4.22	4.15	5.25	5.01	4.77	5.19	4.08	4.04	4.26	4.26
12/02/21	4.26	4.38	4.07	4.07	4.01	4.00	4.18	4.06	5.25	4.98	4.75	5.12	4.16	4.04	4.23	4.21
12/03/21	4.18	4.36	* N/A	4.09	4.16	4.32	4.19	4.24	5.22	4.94	4.76	4.82	4.16	4.01	4.19	4.21
12/04/21	4.21	4.30	* N/A	4.06	4.19	4.30	4.17	4.24	5.30	4.95	4.72	4.69	4.23	4.14	4.15	4.22
12/05/21	4.21	4.27	* N/A	4.04	4.16	4.26	4.16	4.19	5.21	4.95	4.73	4.67	4.26	4.35	4.16	4.15
12/06/21	4.15	4.22	4.19	4.05	4.24	4.24	4.42	4.15	5.23	4.86	4.71	4.71	4.24	4.34	4.16	4.16
12/07/21	4.08	4.22	4.09	4.05	4.21	4.20	4.45	4.16	5.26	5.15	4.67	4.69	4.20	4.31	4.09	4.15
12/08/21	4.08	4.22	4.03	4.02	4.21	4.20	4.44	4.14	5.20	5.26	4.64	4.65	4.17	4.27	4.07	4.12
12/09/21	4.11	4.22	4.01	4.07	4.19	4.22	4.44	4.13	5.24	5.26	4.65	4.68	4.09	4.25	4.05	4.10
12/10/21	4.10	4.21	4.04	4.11	4.18	4.23	4.44	4.11	5.18	5.21	4.64	4.96	4.18	4.23	4.04	4.05
12/11/21	4.49	4.19	4.01	4.09	4.17	4.19	4.39	4.08	5.14	5.15	4.81	4.97	4.21	4.20	4.03	4.04
12/12/21	4.48	4.56	4.04	4.01	4.15	4.11	4.40	4.16	5.12	5.25	4.84	4.91	4.30	4.16	* N/A	4.04
12/13/21	4.44	4.52	4.00	4.08	4.13	4.09	4.37	4.18	5.10	5.21	4.94	4.88	4.07	4.15	* N/A	** N/A
12/14/21	4.33	4.57	* N/A	4.05	4.06	4.11	4.34	4.19	5.03	5.26	5.10	4.86	4.08	4.10	* N/A	** N/A
12/15/21	4.41	4.53	4.08	4.02	4.04	4.03	4.34	4.15	5.02	5.16	5.14	4.86	4.04	4.06	* N/A	** N/A
12/16/21	4.37	4.52	4.11	4.01	4.03	4.05	4.32	4.12	5.01	5.11	5.26	4.88	4.00	4.03	4.50	** N/A
12/17/21	4.36	4.47	4.20	* N/A	4.00	4.04	4.29	4.08	5.00	5.15	5.17	4.85	4.09	4.01	4.38	** N/A
12/18/21	4.36	4.42	4.16	* N/A	* N/A	4.02	4.28	4.06	4.95	5.07	5.13	4.85	4.04	4.02	4.32	5.07
12/19/21	4.30	4.42	4.12	4.14	4.13	4.00	4.24	4.07	4.90	5.10	5.15	4.86	4.02	4.02	4.33	5.08
12/20/21	4.28	4.38	4.19	4.09	4.05	4.01	4.25	4.05	4.95	5.10	5.07	4.84	4.05	4.01	4.32	5.05
12/21/21	4.22	4.42	4.15	4.05	4.03	4.00	4.23	4.22	4.80	5.11	5.10	4.80	4.06	4.16	4.31	5.01
12/22/21	4.21	4.42	4.17	4.11	4.06	4.36	4.22	4.24	5.12	5.12	5.12	4.79	4.03	4.31	4.31	5.03
12/23/21	4.23	4.38	4.14	4.05	4.06	4.23	4.19	4.24	5.22	5.10	5.11	4.83	4.12	4.23	4.30	5.03
12/24/21	4.19	4.33	4.09	4.11	4.02	4.26	4.15	4.23	5.20	5.05	5.08	4.81	4.24	4.23	4.25	4.93
12/25/21	4.21	4.30	4.09	4.05	4.01	4.26	4.44	4.18	5.16	5.03	5.05	4.78	4.26	4.24	4.22	4.91
12/26/21	4.21	4.29	4.09	* N/A	4.04	4.22	4.47	4.21	5.20	4.99	5.03	4.79	4.25	4.20	4.25	4.89
12/27/21	4.19	4.27	4.06	* N/A	* N/A	4.26	4.44	4.19	5.13	4.93	5.06	4.77	4.20	4.14	4.21	4.87
12/28/21	4.17	4.29	4.11	4.08	* N/A	4.21	4.42	4.17	5.12	4.93	5.09	4.75	4.19	4.16	4.16	4.78
12/29/21	4.12	4.26	4.26	* N/A	* N/A	4.19	4.39	4.18	5.15	4.97	5.06	4.70	4.18	4.15	4.19	4.74
12/30/21	4.33	4.64	4.38	4.12	* N/A	4.18	4.39	4.13	5.09	4.97	5.06	4.70	4.13	4.12	4.16	4.77
12/31/21	4.39	4.59	4.33	4.14	* N/A	4.09	4.41	4.20	5.10	4.94	5.05	4.71	4.16	4.10	4.11	4.73

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* MF Cell A03, A04, A05, & B07 out of service for maintenance

** MF Cell B08 out of service for installation of new membranes

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value															
	C01	C02	C03	C04	C05	C06	C07	C08	D01	D02	D03	D04	D05	D06	D07	D08
Date	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV	LRV
12/01/21	5.06	4.69	4.94	4.47	5.13	4.65	5.04	4.74	4.03	4.07	4.26	4.08	4.26	4.09	4.13	4.02
12/02/21	5.06	4.61	4.93	4.44	5.13	4.88	5.00	4.69	4.04	4.33	4.21	4.06	4.20	4.07	4.18	4.37
12/03/21	5.00	4.61	4.85	4.42	5.10	5.10	4.99	4.68	4.01	4.25	4.22	4.06	4.19	4.19	4.15	4.36
12/04/21	4.96	4.52	4.82	4.41	5.05	5.11	4.96	4.82	4.34	4.23	4.19	4.06	4.19	4.37	4.11	4.32
12/05/21	4.97	4.56	4.83	4.40	5.04	5.08	4.92	5.20	4.30	4.25	4.13	4.05	4.13	4.37	4.12	4.29
12/06/21	5.00	4.57	4.84	4.36	5.04	5.09	4.95	5.20	4.31	4.26	4.15	4.44	4.11	4.44	4.11	4.31
12/07/21	4.98	5.02	4.75	4.68	5.05	5.06	4.94	5.17	4.32	4.24	4.14	4.38	4.10	4.48	4.13	4.31
12/08/21	4.88	5.17	4.71	4.86	4.99	4.99	4.87	5.14	4.36	4.21	4.08	4.33	4.04	4.38	4.48	4.27
12/09/21	4.92	5.12	4.72	4.88	4.95	5.03	4.80	5.17	4.36	4.12	4.06	4.32	4.01	4.35	4.51	4.28
12/10/21	4.93	5.13	4.70	4.91	4.91	5.05	4.81	5.20	4.27	4.17	4.07	4.31	4.16	4.38	4.50	4.29
12/11/21	4.83	5.04	4.72	4.84	4.91	4.99	4.74	5.18	4.28	4.15	4.07	4.27	4.39	4.37	4.45	4.17
12/12/21	4.82	4.88	5.00	4.84	4.89	4.95	4.70	5.14	4.28	4.12	4.02	4.26	4.45	4.25	4.40	4.18
12/13/21	4.84	4.77	5.27	4.83	4.79	4.97	4.66	5.12	4.24	4.09	4.01	4.25	4.36	4.26	4.38	4.15
12/14/21	4.76	4.69	5.23	4.78	4.77	4.96	4.66	5.10	4.22	4.06	4.00	4.15	4.40	4.22	4.41	4.12
12/15/21	4.73	4.63	5.17	4.79	4.65	4.91	4.66	5.07	4.20	4.04	4.34	4.11	4.42	4.22	4.37	4.09
12/16/21	4.69	4.57	5.17	4.76	4.63	4.88	4.63	5.04	4.14	4.01	4.30	4.10	4.40	4.20	4.33	4.03
12/17/21	4.67	4.54	5.16	4.76	4.71	4.89	4.91	5.02	4.12	4.21	4.26	4.08	4.38	4.19	4.30	4.04
12/18/21	4.66	4.51	5.13	4.75	4.70	4.87	5.18	5.00	4.11	4.32	4.23	4.06	4.33	4.12	4.30	4.05
12/19/21	4.65	4.49	5.11	4.73	5.05	4.88	5.15	4.99	4.10	4.27	4.21	4.12	4.28	4.10	4.27	4.03
12/20/21	4.64	4.43	5.12	4.73	5.26	4.88	5.11	4.94	4.06	4.28	4.21	4.34	4.32	4.09	4.25	4.03
12/21/21	4.62	4.23	5.06	4.68	5.22	4.80	5.08	4.95	4.06	4.22	4.13	4.30	4.31	4.06	4.24	4.28
12/22/21	4.58	4.78	5.06	4.65	5.25	4.73	5.06	4.95	4.04	4.16	4.14	4.37	4.28	4.12	4.21	4.31
12/23/21	4.53	4.96	5.06	4.63	5.25	4.71	5.06	4.93	4.04	4.17	4.16	4.31	4.26	4.35	4.16	4.27
12/24/21	4.97	4.96	5.01	4.59	5.18	4.68	5.05	4.86	4.21	4.15	4.16	4.24	4.12	4.33	4.09	4.17
12/25/21	5.07	4.92	4.99	4.57	5.14	4.65	5.06	4.84	4.30	4.17	4.14	4.26	4.13	4.36	4.12	4.22
12/26/21	5.02	4.91	5.05	4.56	5.16	4.66	5.04	4.83	4.33	4.18	4.12	4.27	4.15	4.40	4.24	4.25
12/27/21	5.03	4.86	4.99	4.54	5.16	4.65	5.00	4.80	4.33	4.13	4.08	4.18	4.10	4.40	4.56	4.23
12/28/21	5.03	4.86	4.89	4.52	5.14	4.99	4.95	4.78	4.32	4.11	4.06	4.21	4.09	4.38	4.48	4.25
12/29/21	4.99	4.83	4.91	4.48	5.11	5.09	4.95	4.73	4.30	4.11	4.04	4.19	4.10	4.31	4.45	4.20
12/30/21	4.99	4.81	4.92	4.47	5.06	5.05	4.96	4.87	4.19	4.08	4.02	4.13	4.40	4.30	4.38	4.18
12/31/21	4.93	4.78	4.87	4.46	5.05	5.02	4.95	5.17	4.20	4.04	4.04	4.13	4.41	4.27	4.34	4.14

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

Orange County Water District - Ground Water Replenishment System (GWRS)

State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report

system no. 3090001 , Project no. 745

	MicroFiltration Process online monitoring results Log Removal Value			
Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
12/01/21	4.21	4.26	4.07	4.60
12/02/21	4.16	4.27	4.02	4.50
12/03/21	4.17	4.25	4.05	4.53
12/04/21	4.10	4.17	4.06	4.69
12/05/21	4.10	4.17	4.04	4.43
12/06/21	4.08	4.15	4.09	4.41
12/07/21	4.05	4.12	4.08	4.62
12/08/21	4.09	4.11	4.11	4.48
12/09/21	4.19	4.10	4.40	4.49
12/10/21	4.17	4.10	4.55	4.54
12/11/21	4.13	4.07	4.07	4.60
12/12/21	4.13	4.04	4.05	4.51
12/13/21	4.11	4.03	4.10	4.40
12/14/21	4.09	4.01	4.02	4.40
12/15/21	4.02	4.22	4.01	4.39
12/16/21	4.03	4.29	* N/A	4.48
12/17/21	4.14	4.21	4.17	4.47
12/18/21	4.29	4.29	4.13	4.44
12/19/21	4.21	4.26	4.11	4.50
12/20/21	4.21	4.21	4.32	4.41
12/21/21	4.22	4.20	4.05	4.40
12/22/21	4.20	4.21	4.06	4.50
12/23/21	4.18	4.23	4.01	4.47
12/24/21	4.19	4.14	4.12	4.49
12/25/21	4.10	4.10	4.00	4.53
12/26/21	4.13	4.11	4.20	4.46
12/27/21	4.22	4.13	* N/A	4.46
12/28/21	4.24	4.11	4.08	4.60
12/29/21	4.19	4.10	* N/A	4.51
12/30/21	4.12	4.05	4.25	4.40
12/31/21	4.15	4.07	* N/A	4.54

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* MF Cell E03 out of service for maintenance

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	MicroFiltration Process online monitoring results — Effluent Turbidity - NTU																		
	A01-A04		A05-A08		B01-B04		B05-B08		C01-C04		C05-C08		D01-D04		D05-D08		E01-E04		MFE
	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
12/01/21	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.03	0.03	0.04	0.05	0.03
12/02/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.05	0.05	0.03
12/03/21	0.03	0.05	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.05	0.04	0.04	0.04	0.05	0.03	0.03	0.05	0.06	0.03
12/04/21	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.03	0.03	0.06	0.06	0.03
12/05/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.02	0.04	0.06	0.06	0.03
12/06/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.04	0.05	0.02	0.03	0.07	0.07	0.04
12/07/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.04	0.07	0.04	0.05	0.03	0.07	0.05	0.07	0.03
12/08/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
12/09/21	0.03	0.05	0.02	0.04	0.03	0.08	0.03	0.08	0.04	0.05	0.04	0.07	0.03	0.05	0.03	0.07	0.03	0.04	0.03
12/10/21	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.05	0.02	0.03	0.02	0.03	0.03
12/11/21	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.09	0.03	0.03	0.02	0.04	0.02	0.03	0.03
12/12/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.03	0.05	0.04	0.04	0.03	0.04	0.02	0.03	0.03	0.03	0.03
12/13/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.05	0.04	0.04	0.03	0.03	0.02	0.03	0.03	0.03	0.03
12/14/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.07	0.04	0.04	0.02	0.03	0.02	0.03	0.03
12/15/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.06	0.05	0.05	0.04	0.05	0.02	0.03	0.02	0.04	0.03
12/16/21	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.07	0.05	0.05	0.04	0.05	0.02	0.02	0.02	0.03	0.03
12/17/21	0.03	0.03	0.02	0.02	0.02	0.03	0.04	0.07	0.03	0.04	0.05	0.06	0.05	0.06	0.02	0.03	0.03	0.03	0.03
12/18/21	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.06	0.07	0.05	0.05	0.03	0.03	0.03	0.03	0.03
12/19/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.08	0.06	0.06	0.05	0.05	0.02	0.03	0.03	0.03	0.03
12/20/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.05	0.03	0.04	0.06	0.07	0.05	0.05	0.03	0.03	0.03	0.03	0.03
12/21/21	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.07	0.08	0.05	0.05	0.03	0.03	0.03	0.03	0.04
12/22/21	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.04	0.04	0.04	0.05	0.08	0.05	0.06	0.03	0.03	0.03	0.03	0.03
12/23/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.06	0.06	0.03	0.03	0.03	0.03	0.03
12/24/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.04	0.03	0.05	0.06	0.07	0.03	0.03	0.03	0.03	0.03
12/25/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.06	0.06	0.07	0.02	0.03	0.03	0.03	0.03
12/26/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.07	0.07	0.02	0.03	0.03	0.04	0.03
12/27/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.05	0.03	0.04	0.08	0.08	0.02	0.03	0.03	0.04	0.03
12/28/21	0.03	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.08	0.09	0.02	0.03	0.04	0.04	0.03
12/29/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.09	0.10	0.02	0.03	0.04	0.04	0.04
12/30/21	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.10	0.10	0.03	0.04	0.04	0.04	0.04
12/31/21	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.11	0.11	0.02	0.03	0.04	0.06	0.04

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	Reverse Osmosis Process online monitoring results																
	Turbidity (ntu)		Total Organic Carbon (TOC - ppm)						Electro Conductivity (EC)						Calculated TOC removal based on Daily Avg		Calculated EC removal based on Daily Avg	
	ROP		ROF			ROP			ROF			ROP						
	avg	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	%	Log	%	Log
12/01/21	0.014	0.014	8.343	7.606	9.071	0.061	0.051	0.076	1,752	1,682	1,829	39	35	45	99.27	2.14	97.76	1.65
12/02/21	0.014	0.014	8.408	7.588	9.163	0.056	0.051	0.066	1,752	1,671	1,858	38	34	48	99.33	2.17	97.84	1.67
12/03/21	0.015	0.016	8.436	7.682	9.314	0.055	0.048	0.071	1,764	1,671	1,877	37	33	43	99.34	2.18	97.89	1.68
12/04/21	0.016	0.016	8.352	7.586	9.148	0.057	0.046	0.071	1,756	1,676	1,861	38	34	45	99.32	2.17	97.83	1.66
12/05/21	0.016	0.016	8.317	7.530	9.233	0.050	0.046	0.067	1,696	1,646	1,762	37	34	42	99.40	2.22	97.80	1.66
12/06/21	0.016	0.016	8.402	7.574	9.301	0.049	0.044	0.057	1,588	1,489	1,694	34	30	49	99.41	2.23	97.83	1.66
12/07/21	0.016	0.016	8.711	7.954	9.607	0.057	0.047	0.064	1,710	1,598	1,863	37	32	45	99.35	2.18	97.82	1.66
12/08/21	0.016	0.016	8.464	7.694	9.382	0.059	0.050	0.071	1,768	1,671	1,908	40	35	46	99.30	2.16	97.76	1.65
12/09/21	0.026	0.080	8.883	8.419	9.333	0.070	0.021	0.217*	1,814	1,763	1,855	45	41	65	99.21	2.10	97.53	1.61
12/10/21	0.016	0.020	8.350	7.559	9.219	0.059	0.051	0.071	1,724	1,649	1,822	39	34	45	99.30	2.15	97.75	1.65
12/11/21	0.014	0.014	8.509	7.674	9.468	0.060	0.056	0.072	1,701	1,651	1,774	40	36	45	99.29	2.15	97.65	1.63
12/12/21	0.014	0.014	8.387	7.644	9.238	0.053	0.044	0.061	1,627	1,562	1,698	39	35	45	99.36	2.20	97.61	1.62
12/13/21	0.014	0.014	8.667	7.720	9.888	0.058	0.048	0.081	1,569	1,482	1,665	36	32	41	99.33	2.18	97.68	1.63
12/14/21	0.014	0.014	8.991	8.269	9.995	0.056	0.051	0.068	1,607	1,560	1,658	34	32	39	99.37	2.20	97.87	1.67
12/15/21	0.014	0.014	8.658	7.717	9.432	0.058	0.051	0.071	1,633	1,549	1,765	34	31	40	99.33	2.17	97.90	1.68
12/16/21	0.014	0.014	8.604	7.828	9.502	0.056	0.050	0.065	1,674	1,594	1,762	35	32	40	99.35	2.19	97.89	1.68
12/17/21	0.014	0.020	8.599	7.772	9.713	0.057	0.052	0.067	1,683	1,600	1,800	35	30	40	99.34	2.18	97.92	1.68
12/18/21	0.014	0.014	8.790	7.852	9.713	0.056	0.051	0.068	1,676	1,596	1,758	34	31	39	99.36	2.20	97.95	1.69
12/19/21	0.014	0.014	8.781	7.934	9.760	0.051	0.048	0.059	1,598	1,531	1,663	33	29	37	99.42	2.24	97.96	1.69
12/20/21	0.014	0.014	8.851	7.912	9.848	0.055	0.038	0.072	1,546	1,447	1,648	32	28	39	99.38	2.21	97.95	1.69
12/21/21	0.014	0.014	9.017	8.142	9.891	0.056	0.052	0.073	1,619	1,518	1,754	32	28	37	99.38	2.21	98.02	1.70
12/22/21	0.014	0.014	8.947	8.190	9.862	0.058	0.038	0.069	1,675	1,610	1,763	33	30	38	99.35	2.19	98.00	1.70
12/23/21	0.014	0.014	8.784	8.108	9.407	0.054	0.051	0.062	1,682	1,627	1,770	34	31	38	99.38	2.21	97.99	1.70
12/24/21	0.014	0.014	8.254	7.566	9.418	0.049	0.044	0.057	1,482	1,374	1,669	27	24	34	99.40	2.22	98.15	1.73
12/25/21	0.014	0.014	7.697	7.209	8.541	0.050	0.044	0.056	1,483	1,419	1,593	28	25	35	99.35	2.19	98.10	1.72
12/26/21	0.014	0.014	7.791	7.004	8.964	0.044	0.036	0.058	1,478	1,407	1,550	30	28	33	99.43	2.25	97.96	1.69
12/27/21	0.014	0.014	8.335	7.406	9.438	0.049	0.042	0.059	1,531	1,442	1,672	30	27	35	99.41	2.23	98.02	1.70
12/28/21	0.014	0.014	8.515	7.834	9.463	0.054	0.049	0.070	1,625	1,523	1,750	31	27	36	99.36	2.20	98.07	1.71
12/29/21	0.015	0.018	8.563	7.891	9.360	0.055	0.045	0.068	1,657	1,590	1,724	33	30	37	99.35	2.19	98.02	1.70
12/30/21	0.014	0.014	8.414	7.887	9.305	0.050	0.041	0.059	1,616	1,515	1,727	31	27	35	99.40	2.23	98.10	1.72
12/31/21	0.014	0.014	8.384	7.781	8.953	0.051	0.044	0.057	1,594	1,506	1,703	30	26	34	99.40	2.22	98.14	1.73

Notes:

* RO permeate momentary TOC spike occurred upon plant restart after a scheduled 11 hour outage.

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
system no. 3090001 , Project no. 745

Date	UltraViolet / AOP Process online monitoring results					
	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
12/01/21	97.78	89.546	23,718.7	0.26	3.0	6
12/02/21	97.49	89.993	23,723.1	0.26	3.0	6
12/03/21	97.61	90.408	23,348.9	0.26	3.0	6
12/04/21	97.62	87.506	23,179.8	0.26	3.0	6
12/05/21	97.83	89.813	22,589.9	0.26	3.0	6
12/06/21	97.87	80.696	23,765.5	0.27	3.0	6
12/07/21	97.71	89.428	22,201.8	0.27	3.0	6
12/08/21	97.66	89.360	23,813.1	0.27	3.0	6
12/09/21	97.99	37.033	23,787.4	0.27	3.0	6
12/10/21	97.55	92.104	10,320.5	0.28	3.0	6
12/11/21	97.65	91.386	23,467.9	0.26	3.0	6
12/12/21	97.75	88.461	23,463.3	0.26	3.0	6
12/13/21	97.46	90.027	23,014.7	0.26	3.0	6
12/14/21	97.65	84.697	23,555.0	0.26	3.0	6
12/15/21	97.66	83.380	21,998.6	0.26	3.0	6
12/16/21	97.72	84.695	21,834.2	0.26	3.0	6
12/17/21	97.81	84.604	21,755.0	0.26	3.0	6
12/18/21	97.81	90.062	22,243.5	0.26	3.0	6
12/19/21	97.69	89.748	23,809.2	0.26	3.0	6
12/20/21	97.70	89.634	23,839.1	0.27	3.0	6
12/21/21	97.78	88.722	23,778.7	0.26	3.0	6
12/22/21	97.75	89.624	23,565.9	0.26	3.0	6
12/23/21	97.58	94.434	23,779.2	0.27	3.0	6
12/24/21	97.78	92.343	23,872.9	0.25	3.0	6
12/25/21	97.97	89.968	23,847.7	0.26	3.0	6
12/26/21	97.76	87.336	23,484.8	0.26	3.0	6
12/27/21	97.83	84.816	23,129.3	0.27	3.0	6
12/28/21	97.82	84.635	22,142.1	0.26	3.0	6
12/29/21	97.75	84.772	21,985.0	0.26	3.0	6
12/30/21	97.89	85.697	22,696.0	0.26	3.0	6
12/31/21	97.98	89.059	23,746.9	0.27	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

Appendix G

Groundwater Quality Data at the Talbert Barrier

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

GWRS 2021 Quarterly Sampling Dates
OCWD Water Quality Department
TALBERT BARRIER - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
OCWD-M10/1-4	01/18/2021	04/19/2021	07/19/2021	10/18/2021
OCWD-M11/1-4	01/20/2021	04/21/2021	07/21/2021	10/20/2021
OCWD-M19/3	01/05/2021	04/06/2021	07/07/2021	10/05/2021
OCWD-M45/1-5	02/01/2021	05/03/2021	08/09/2021	11/01/2021
OCWD-M46/2-5	01/04/2021	04/05/2021	07/06/2021	10/04/2021
OCWD-M46A/1	01/04/2021	04/05/2021	07/06/2021	10/04/2021
OCWD-M47/1-5	01/19/2021	04/20/2021	07/20/2021	10/19/2021

Notes for Appendix G Tables:

► Water quality data are summarized for monitoring wells M10, M11, M19, M45, M46, M46A and M47 in the following tables. OCWD-M19/3 is a non-compliance monitoring well.

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Results listed in the table for each quarter are the range of the minimum and maximum values detected at the well location, which may consist of one to five well casings. Figures and report text list the well ID (e.g. OCWD-M10), casing number (e.g., M10/1, M10/2, M10/3 and M10/4), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB Division of Drinking Water (DDW) Notification Level

► NR: Not required

► nr: Not reported

► NS: Not sampled

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace

Notes for Appendix G Tables (continued):

► A comprehensive suite of tests covering inorganics, metals, volatile organics (VOCs), synthetic organic compounds (SOCs), radiological and microbial parameters were analyzed at 35 permit-specified groundwater monitoring wells since the commencement of the GWRS treatment facility. In June 2010, OCWD proposed a revised groundwater monitoring frequency from quarterly to annually for selected analytes that have reported no detections. The proposed reduced frequency of testing was (1) based on real-time data for analytes reported as non-detect at the reporting detection limit, (2) supported by two Independent Advisory Panels having oversight for the GWRS project and the Santa Ana River (SARMON) long-term monitoring program, and (3) a condition of the GWRS permit to routinely review data and based on results, to modify the groundwater monitoring program every two years or sooner with approval by the RWQCB and SWRCB DDW (formerly CDPH - July 2014 CDPH moved to the SWRCB with a new name, Division of Drinking Water [DDW]).

The revised monitoring frequency was approved by the RWQCB (3/14/2011) and SWRCB DDW (9/20/2010) and consists of reduction in asbestos, dioxin, selected SOCs, and radionuclides monitoring from quarterly to annually (see Table 1) for monitoring well locations. Julio Lara/RWQCB advised that monitoring for these analytes are not permit required but OCWD voluntarily performed the monitoring. OCWD elected to conduct comprehensive testing at the start-up of GWRS; however, with years of a robust database for these non-compliance targets (asbestos, dioxin, EPA 625), OCWD concurred with the RWQCB and ceased testing for these analytes in January 2014. Samples may have been collected for other analytes (cyanide, some radionuclides, etc.) but consensus is to cease testing and use resources more effectively in the future. Comprehensive testing was performed during the first quarter 2011 and served as the "annual comprehensive testing" and "initial anchor date." Future "annual comprehensive testing" rotated sequentially through the quarters (e.g., 2Q2012, 3Q2013, 4Q2014, etc.).

Table 1

Talbert Barrier and Forebay Area GWRS Groundwater Monitoring Well
Approved Revised Monitoring Program[1]
Inorganic, Organic, and Radiological Analytes

Q - Year	Comprehensive	Reduced[3,4,5,6]	Q - Year	Comprehensive	Reduced[3,4,5,6]
Q1 - 2018		x	Q1 - 2021		x
Q2 - 2018		x	Q2 - 2021		x
Q3 - 2018		x	Q3 - 2021	x	
Q4 - 2018	x		Q4 - 2021		x
Q1 - 2019	x		Q1 - 2022		x
Q2 - 2019		x	Q2 - 2022		x
Q3 - 2019		x	Q3 - 2022		x
Q4 - 2019		x	Q4 - 2022	x	
Q1 - 2020		x	Q1 - 2023	x	
Q2 - 2020	x		Q2 - 2023		x
Q3 - 2020		x	Q3 - 2023		x
Q4 - 2020		x	Q4 - 2023		x

[1]Approved RWQCB (03/14/2011) and CDPH (09/20/10)

[2]Comprehensive: OCWD voluntarily screens for inorganic and organic analytes and radionuclides beyond the permit specific analytes

[3]Reduced: Annual asbestos, cyanide, selected SOC's, EPA 625, and radionuclides

[4]GWRS IAP Meeting 08/27/13: Panel Concurs to cease monitoring for asbestos and dioxin based on years of non-detections

[5]Reduced: Annual cyanide, selected SOC's and radionuclide

[6]GWRS IAP Meeting 08/29/17: Panel concurs to reduce select inorganic and organic monitoring. In addition, Panel concurs to cease select inorganic and organic voluntary monitoring.

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M10 Qtr 1	OCWD-M10 Qtr 2	OCWD-M10 Qtr 3	OCWD-M10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 7.7	ND - 16.9	ND - 10.6	ND - 8.2
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.4	ND - 2.5	ND - 2.3	ND - 2.3
Barium (Ba), ug/L	OCWD	1000	10.6 - 136	10.4 - 134	12.3 - 155	14.2 - 66.4
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.21 - 0.55	0.2 - 0.57	0.24 - 0.64	0.18 - 0.62
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 4.4	ND - 4.4	ND - 4.2	ND - 2.1
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.93	ND - 2.02	ND - 1.89	ND - 1.35
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND - 0.009	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.2	ND - 1.3	ND - 1.2	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), um/cm	OCWD	900	208 - 1160	216 - 1160	232 - 1180	268 - 689
Iron (Fe), ug/L	OCWD	300	ND - 23	ND - 35.9	ND - 19.9	ND - 38
Manganese (Mn), ug/L	OCWD	50	1.7 - 32.1	1.8 - 30.8	1.4 - 30.2	ND - 32.4
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	1.9 - 33	1.9 - 32	1.6 - 27.6	ND - 34
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	ND - 2	ND - 2	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	131 - 813	128 - 794	134 - 792	148 - 384
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.1	ND - 0.1	ND - 0.1	ND - 0.22
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND - 1	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.12 - 0.25	0.12 - 0.24	0.13 - 0.24	0.16 - 0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.3	ND - 3.9	ND - 2.7	ND - 3.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND - 0.2	ND - 0.2	ND - 0.3	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M10 Qtr 1	OCWD-M10 Qtr 2	OCWD-M10 Qtr 3	OCWD-M10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < MCL	<NL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M10/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
1/18/2021 11:40	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
4/19/2021 12:40	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
7/19/2021 9:35	1,4-Dioxane (14DIOX)	1.1	ug/L	0.5

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/18/2021 10:15	1,4-Dioxane (14DIOX)	1.5	ug/L	0.5

OCWD-M10/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/18/2021	11:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
1/18/2021	11:05	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/19/2021	12:00	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
4/19/2021	12:00	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/19/2021	10:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
7/19/2021	10:05	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/18/2021	10:50	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

OCWD-M10/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
1/18/2021 10:20	1,4-Dioxane (14DIOX)	4.5	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
4/19/2021 11:25	1,4-Dioxane (14DIOX)	5	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
7/19/2021 10:45	1,4-Dioxane (14DIOX)	4.3	ug/L	0.5

METHOD: CEC

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
7/19/2021 10:45	Primidone (PRIMDN)	3.2	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/18/2021 11:30	1,4-Dioxane (14DIOX)	4.7	ug/L	0.5

OCWD-M10/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/18/2021	9:35	1,4-Dioxane (14DIOX)	1.9	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/19/2021	10:50	1,4-Dioxane (14DIOX)	1.8	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/19/2021	11:25	1,4-Dioxane (14DIOX)	2	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/19/2021	11:25	Carbamazepine (CBMAZP)	1.2	ng/L	1
7/19/2021	11:25	Gemfibrozil (GMFIBZ)	5.3	ng/L	1
7/19/2021	11:25	N,N-diethyl-m-toluamide (DEET)	5	ng/L	1
7/19/2021	11:25	Primidone (PRIMDN)	1.5	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/18/2021	12:05	1,4-Dioxane (14DIOX)	2.5	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M11 Qtr 1	OCWD-M11 Qtr 2	OCWD-M11 Qtr 3	OCWD-M11 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 4.2	ND - 4.5	1 - 4.9	ND - 4.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 1.5	ND - 1.3	ND - 1.6	ND - 1.7
Barium (Ba), ug/L	OCWD	1000	13 - 141	12.4 - 137	12 - 143	12.2 - 139
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.35 - 0.58	0.35 - 0.55	0.4 - 0.64	0.35 - 0.6
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.24	ND - 0.22	ND - 0.26	ND - 0.23
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 3.3	ND - 3.8	ND - 3.2	ND - 2.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.18 - 1.96	1.2 - 2.01	1.35 - 1.95	1.32 - 1.92
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.004 - 0.007	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2.4	ND - 2.4	ND - 2.1	ND - 2.1
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	201 - 933	193 - 959	195 - 951	197 - 979
Iron (Fe), ug/L	OCWD	300	ND - 15.1	ND	ND - 11.8	ND
Manganese (Mn), ug/L	OCWD	50	ND - 7.8	ND - 6.7	ND - 18.2	ND - 10.8
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 4.4	ND - 6	ND - 10.3	ND - 11.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	126 - 612	128 - 604	124 - 626	104 - 574
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.2	ND	ND	ND
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.12 - 0.25	0.12 - 0.25	0.13 - 0.25	0.13 - 0.26
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 5.5	2 - 3.5	2 - 2.6	1.9 - 2.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M11 Qtr 1	OCWD-M11 Qtr 2	OCWD-M11 Qtr 3	OCWD-M11 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < MCL	ND < NL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M11/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/20/2021	10:30	1,4-Dioxane (14DIOX)	1.8	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/21/2021	9:45	1,4-Dioxane (14DIOX)	1.4	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/21/2021	10:30	1,4-Dioxane (14DIOX)	1.6	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/21/2021	10:30	Triclosan (TRICLN)	1	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/20/2021	10:05	1,4-Dioxane (14DIOX)	1.5	ug/L	0.5

OCWD-M11/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/20/2021	11:00	1,4-Dioxane (14DIOX)	1.0	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/21/2021	10:55	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/21/2021	11:15	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/20/2021	10:45	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

OCWD-M11/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/20/2021 10:05	1,4-Dioxane (14DIOX)	1.3	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/21/2021 10:30	1,4-Dioxane (14DIOX)	0.7	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/21/2021 11:55	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/21/2021 11:55	Carbamazepine (CBMAZP)	1.1	ng/L	1
7/21/2021 11:55	Sulfamethoxazole (SULTHZ)	1.9	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/20/2021 11:20	1,4-Dioxane (14DIOX)	1	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	Permit Limit	OCWD-M19/3 Qtr 1	OCWD-M19/3 Qtr 2	OCWD-M19/3 Qtr 3	OCWD-M19/3 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	5.2	8.8	3.5	5.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.1	1.2	ND	1
Barium (Ba), ug/L	OCWD	1000	11.4	11.2	16.7	15.7
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.12	0.11	0.1	0.16
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	0.23	ND	0.32	0.34
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.13	1	1.4	1.44
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.7	1.1	1.6	1.5
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	104	98	155	151
Iron (Fe), ug/L	OCWD	300	ND	5.8	ND	ND
Manganese (Mn), ug/L	OCWD	50	ND	5.5	ND	3.2
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	70	60	120	92
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND	0.2	ND	0.11
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.24	0.23	0.23	0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	3.4	3.6	3.1	3.5
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M19/3 Qtr 1	OCWD-M19/3 Qtr 2	OCWD-M19/3 Qtr 3	OCWD-M19/3 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M19/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/5/2021	10:15	Chloroform (CHCl3)	1.7	ug/L	0.5
1/5/2021	10:15	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/6/2021	11:00	Chloroform (CHCl3)	1.1	ug/L	0.5
4/6/2021	11:00	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/7/2021	9:50	Chloroform (CHCl3)	1.6	ug/L	0.5
7/7/2021	9:50	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2021	10:00	Chloroform (CHCl3)	1.5	ug/L	0.5
10/5/2021	10:00	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M45 Qtr 1	OCWD-M45 Qtr 2	OCWD-M45 Qtr 3	OCWD-M45 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 15.3	ND - 15.1	ND - 10.6	ND - 12.1
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.5	ND - 2.5	ND - 2.3	ND - 3
Barium (Ba), ug/L	OCWD	1000	9 - 58	9 - 55.9	8.8 - 63.5	8.8 - 62.5
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.31 - 0.85	0.29 - 0.82	0.28 - 0.85	0.28 - 0.86
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.23	ND - 0.22	ND - 0.21	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 4.2	ND - 3.8	ND - 4	ND - 3.1
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 2.58	ND - 2.59	ND - 2.65	ND - 2.61
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND - 0.223	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2	ND - 1.9	ND - 1.8	ND - 3.1
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 0.5	ND - 0.6	ND - 0.25	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 110	ND - 100	ND - 100	ND - 96
Electrical Conductivity (EC), uS/cm	OCWD	900	186 - 1100	185 - 1120	186 - 1120	200 - 1130
Iron (Fe), ug/L	OCWD	300	ND - 135	ND - 180	ND - 139	ND - 132
Manganese (Mn), ug/L	OCWD	50	ND - 14.2	ND - 16.1	1.7 - 13.6	3.9 - 14
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 12.7	1.1 - 16.1	1.7 - 13.3	3.8 - 13.6
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	ND	ND - 2	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	87 - 683	118 - 720	110 - 736	96 - 702
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.3	ND - 0.2	ND - 0.19	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.5	ND - 1.9	ND - 1.6	ND - 1.9
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.11 - 0.33	0.11 - 0.32	0.12 - 0.31	0.12 - 0.31
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 3.6	ND - 4	ND - 4.2	ND - 3.9
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND - 0.3	ND - 0.3	ND - 0.3	ND - 0.3
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M45 Qtr 1	OCWD-M45 Qtr 2	OCWD-M45 Qtr 3	OCWD-M45 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < MCL	ND < NL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	ND	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M45/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/1/2021	9:55	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
2/1/2021	9:55	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
2/1/2021	9:55	Tetrachloroethene (PCE)	TR	ug/L	0.5
2/1/2021	9:55	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/3/2021	10:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
5/3/2021	10:05	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
5/3/2021	10:05	Tetrachloroethene (PCE)	TR	ug/L	0.5
5/3/2021	10:05	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/9/2021	9:50	cis-1,2-Dichloroethene (c12DCE)	0.6	ug/L	0.5
8/9/2021	9:50	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
8/9/2021	9:50	Tetrachloroethene (PCE)	TR	ug/L	0.5
8/9/2021	9:50	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2021	8:45	cis-1,2-Dichloroethene (c12DCE)	0.6	ug/L	0.5
11/1/2021	8:45	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
11/1/2021	8:45	Tetrachloroethene (PCE)	TR	ug/L	0.5
11/1/2021	8:45	Trichloroethene (TCE)	TR	ug/L	0.5

OCWD-M45/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
2/1/2021 10:55	Chloroform (CHCl3)	0.5	ug/L	0.5
2/1/2021 10:55	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
5/3/2021 11:05	Chloroform (CHCl3)	0.6	ug/L	0.5
5/3/2021 11:05	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
8/9/2021 11:15	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

METHOD: 524.2

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
8/9/2021 11:15	Chloroform (CHCl3)	TR	ug/L	0.5
8/9/2021 11:15	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

OCWD-M45/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/1/2021	11:55	1,4-Dioxane (14DIOX)	2.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/3/2021	10:45	1,4-Dioxane (14DIOX)	7.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/9/2021	9:55	1,4-Dioxane (14DIOX)	3.1	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/9/2021	9:55	Gemfibrozil (GMFIBZ)	4.5	ng/L	1
8/9/2021	9:55	Primidone (PRIMDN)	2.4	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/1/2021	10:20	1,4-Dioxane (14DIOX)	4.2	ug/L	0.5

OCWD-M45/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/1/2021 11:10	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/3/2021 11:35	1,4-Dioxane (14DIOX)	1.3	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/9/2021 10:45	1,4-Dioxane (14DIOX)	1.1	ug/L	0.5

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/1/2021 11:00	1,4-Dioxane (14DIOX)	1.7	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M46 & 46A Qtr 1	OCWD-M46 & 46A Qtr 2	OCWD-M46 & 46A Qtr 3	OCWD-M46 & 46A Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	8.1 - 19	7.7 - 19.1	6.2 - 17	3.8 - 17.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 4.3	ND - 3.9	ND - 4	ND - 3.7
Barium (Ba), ug/L	OCWD	1000	4.1 - 16.5	5 - 17.5	4.1 - 17.4	4.3 - 17.1
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND - 1	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.68	ND - 0.7	ND - 0.71	ND - 0.71
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.22	ND - 0.23	ND - 0.25	ND - 0.26
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.19	ND - 1.2	ND - 1.24	ND - 1.22
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND - 0.004	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.5	ND - 1.7	ND - 2.2	ND - 1.8
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 2.2	ND - 2.2	ND - 2	ND - 1.5
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 55	ND - 55	ND - 63	ND - 60
Electrical Conductivity (EC), uS/cm	OCWD	900	116 - 372	116 - 372	125 - 382	123 - 378
Iron (Fe), ug/L	OCWD	300	8.1 - 30.8	5.3 - 28.5	ND - 31	ND - 35
Manganese (Mn), ug/L	OCWD	50	ND - 5.6	ND - 4.9	ND - 5.9	ND - 5.1
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 5.5	ND - 5.3	ND - 5.4	ND - 5.9
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	ND	ND - 64	ND - 2
Total Dissolved Solids (TDS), mg/L	OCWD	500	72 - 252	60 - 224	120 - 282	79 - 230
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.2	0.1 - 0.2	ND - 0.2	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.2	ND - 1.2	ND - 1.4	ND - 1.2
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.11 - 0.22	0.11 - 0.24	0.1 - 0.26	0.11 - 0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 10.9	2 - 11.5	ND - 9.8	ND - 8.8
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M46 & 46A Qtr 1	OCWD-M46 & 46A Qtr 2	OCWD-M46 & 46A Qtr 3	OCWD-M46 & 46A Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < MCL	ND < NL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

OCWD-M46A/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/4/2021	9:25	Chloroform (CHCl3)	2.2	ug/L	0.5
1/4/2021	9:25	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/4/2021	9:25	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/5/2021	13:05	Chloroform (CHCl3)	2.2	ug/L	0.5
4/5/2021	13:05	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/5/2021	13:05	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2021	13:00	Chloroform (CHCl3)	2	ug/L	0.5
7/6/2021	13:00	Total Trihalomethanes (TTHMs)	2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2021	13:00	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2

OCWD-M46A/1
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/4/2021	11:00	Chloroform (CHCl3)	1.5	ug/L	0.5
10/4/2021	11:00	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/4/2021	11:00	n-Nitrosodimethylamine (NDMA)	3	ng/L	2

OCWD-M46/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/4/2021	10:15	Chloroform (CHCl3)	1.9	ug/L	0.5
1/4/2021	10:15	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/5/2021	12:30	Chloroform (CHCl3)	1.6	ug/L	0.5
4/5/2021	12:30	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2021	12:15	Chloroform (CHCl3)	2	ug/L	0.5
7/6/2021	12:15	Total Trihalomethanes (TTHMs)	2	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/4/2021	11:40	Chloroform (CHCl3)	1.5	ug/L	0.5
10/4/2021	11:40	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

OCWD-M46/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/4/2021	11:15	Chloroform (CHCl3)	TR	ug/L	0.5
1/4/2021	11:15	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/5/2021	11:50	Chloroform (CHCl3)	TR	ug/L	0.5
4/5/2021	11:50	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2021	11:45	Chloroform (CHCl3)	TR	ug/L	0.5
7/6/2021	11:45	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2021	11:45	Caffeine (CAFFEI)	3.1	ng/L	3

Year 2021, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/4/2021	12:25	Chloroform (CHCl3)	TR	ug/L	0.5
10/4/2021	12:25	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

OCWD-M46/5
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/4/2021 10:00	1,4-Dioxane (14DIOX)	3.1	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/5/2021 10:05	1,4-Dioxane (14DIOX)	3.1	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2021 10:25	1,4-Dioxane (14DIOX)	2.6	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2021 10:25	Primidone (PRIMDN)	2.1	ng/L	1

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/4/2021 11:35	1,4-Dioxane (14DIOX)	2.7	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-M47 Qtr 1	OCWD-M47 Qtr 2	OCWD-M47 Qtr 3	OCWD-M47 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2.4 - 31.7	2 - 61.6	2.9 - 26.2	2.3 - 18.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 5.4	ND - 5	ND - 4.8	ND - 4.1
Barium (Ba), ug/L	OCWD	1000	3.9 - 32.2	3.3 - 31.9	3.8 - 33.7	3.8 - 34.3
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.28 - 0.82	0.29 - 0.83	0.33 - 0.89	0.29 - 0.87
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.25	ND - 0.28	ND - 0.33	ND - 0.37
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.29	ND - 1.31	ND - 1.34	ND - 1.34
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.002 - 0.007	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 1.8	ND - 1.6	ND - 1.5	ND - 1.3
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 60	ND - 70	ND - 60	ND - 76
Electrical Conductivity (EC), uS/cm	OCWD	900	167 - 354	171 - 356	169 - 362	172 - 362
Iron (Fe), ug/L	OCWD	300	6.3 - 75.6	5.7 - 65.5	5.2 - 34.9	7 - 38.7
Manganese (Mn), ug/L	OCWD	50	ND - 16.8	ND - 17.3	ND - 15.1	ND - 17.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 16.6	ND - 15.9	ND - 15.3	ND - 16.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 2	ND - 4	ND - 4	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	111 - 231	118 - 244	132 - 246	92 - 214
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.6	ND - 0.9	ND - 0.4	ND - 0.27
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 2.3	ND - 1.6	ND - 1.2	ND - 1.4
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.23	ND - 0.22	ND - 0.23	ND - 0.23
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 7.5	ND - 5.9	ND - 3.3	ND - 3.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-M47 Qtr 1	OCWD-M47 Qtr 2	OCWD-M47 Qtr 3	OCWD-M47 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND < NL	ND < NL	ND < MCL	ND < NL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M47/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/19/2021	9:25	1,4-Dioxane (14DIOX)	0.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/20/2021	9:55	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2021	9:00	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/19/2021	12:25	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/19/2021	10:15	Chloroform (CHCl3)	1.8	ug/L	0.5
1/19/2021	10:15	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/20/2021	11:55	Chloroform (CHCl3)	1.6	ug/L	0.5
4/20/2021	11:55	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2021	9:45	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2021	9:45	Chloroform (CHCl3)	1.5	ug/L	0.5
7/20/2021	9:45	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2021	9:45	Caffeine (CAFFEI)	3.3	ng/L	3

Year 2021, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/19/2021	11:50	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/19/2021	11:50	Chloroform (CHCl3)	1.3	ug/L	0.5
10/19/2021	11:50	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Appendix H

Talbert Barrier Monitoring Well Groundwater Quality Data

1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

TABLE H-1
MONITORING WELL OCWD-M10
1,4-dioxane and NDMA Concentrations, 2017 - 2021

M10/1 *Talbert, Alpha-III Aquifers* *Perforations: 80-160 ft bgs*			**M10/2** *Beta-I,II Aquifers* *Perforations: 175-195 ft bgs*			**M10/3** *Beta-III Aquifer* *Perforations: 215-240 ft bgs*			**M10/4** *Lambda, Omicron, Upper Rho Aquifers* *Perforations: 280-305 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/23/2017	1.8	<2	1/23/2017	<1	<2	1/23/2017	6.6	<2	1/23/2017	<1	<2
4/17/2017	1.4	<2	4/17/2017	<1	<2	4/17/2017	5.7	<2	4/17/2017	<1	<2
7/24/2017	1	<2	7/24/2017	<1	<2	7/24/2017	6.5	<2	7/24/2017	<1	<2
10/16/2017	1.7	<2	10/16/2017	<1	<2	10/16/2017	8.1	<2	10/16/2017	<1	<2
12/12/2017	0.1	na	12/12/2017	<1	na	12/12/2017	4.8	na	12/12/2017	<1	na
1/22/2018	0.1	<2	1/22/2018	<1	<2	1/22/2018	4.7	<2	1/22/2018	<1	<2
4/23/2018	1.4	<2	4/23/2018	<1	<2	4/23/2018	5.4	<2	4/23/2018	<1	<2
7/23/2018	1.6	<2	7/23/2018	<1	<2	7/23/2018	5.9	<2	7/23/2018	<1	<2
10/22/2018	1.2	<2	10/22/2018	<1	<2	10/22/2018	6.5	<2	10/22/2018	<1	<2
1/21/2019	1.7	<2	1/21/2019	<1	<2	1/21/2019	6.8	<2	1/21/2019	<1	<2
4/15/2019	1.5	<2	4/15/2019	<1	<2	4/15/2019	6.4	<2	4/15/2019	<1	<2
7/22/2019	1.4	<2	7/22/2019	<1	<2	7/22/2019	6.4	<2	7/22/2019	1	<2
10/21/2019	1.5	<2	10/21/2019	<1	<2	10/21/2019	6.7	<2	10/21/2019	1.5	<2
1/20/2020	<1	<2	1/20/2020	<1	<2	1/20/2020	4.8	<2	1/20/2020	1.1	<2
4/20/2020	1	<2	4/20/2020	<1	<2	2/18/2020	5.8	<2	4/20/2020	1.4	<2
7/20/2020	0.8	<2	7/20/2020	<0.5	<2	4/20/2020	5.8	<2	7/20/2020	1.5	<2
10/19/2020	1	<2	10/19/2020	<0.5	<2	7/20/2020	5.2	<2	10/19/2020	1.9	<2
1/18/2021	0.8	<2	1/18/2021	<0.5	<2	10/19/2020	5.2	<2	1/18/2021	1.9	<2
4/19/2021	0.8	<2	4/19/2021	<0.5	<2	1/18/2021	4.5	<2	4/19/2021	1.8	<2
7/19/2021	1.1	<2	7/19/2021	<0.5	<2	4/19/2021	5	<2	7/19/2021	2	<2
10/18/2021	1.5	<2	10/18/2021	0.6	<2	7/19/2021	4.3	<2	10/18/2021	2.5	<2
						10/18/2021	4.7	<2			

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-2
MONITORING WELL OCWD-M11
1,4-dioxane and NDMA Concentrations, 2017 - 2021

M11/1 *Talbert Aquifer* *Perforations* *70-105 ft bgs*			**M11/2** *Talbert, Alpha-III Aquifers* *Perforations* *125-150 ft bgs*			**M11/3** *Beta-I, Beta-II, Beta-III Aquifers* *Perforations* *170-225 ft bgs*			**M11/4** *Lambda, Omicron Aquifers* *Perforations* *260-290 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/25/2017	<1	<2	1/25/2017	<1	<2	1/25/2017	<1	<2	1/25/2017	2.5	<2
4/19/2017	<1	<2	4/19/2017	<1	<2	4/19/2017	<1	<2	4/19/2017	2.6	<2
7/26/2017	<1	<2	7/26/2017	<1	<2	7/26/2017	<1	<2	7/26/2017	1.5	<2
10/18/2017	<1	<2	10/18/2017	<1	<2	10/18/2017	<1	<2	10/18/2017	1.6	<2
2/7/2018	<1	<2	2/7/2018	<1	<2	2/7/2018	<1	<2	2/7/2018	1.9	<2
4/25/2018	<1	<2	4/25/2018	<1	<2	4/25/2018	<1	<2	4/25/2018	1.3	<2
7/25/2018	<1	<2	7/25/2018	<1	<2	7/25/2018	<1	<2	7/25/2018	<1	<2
10/24/2018	<1	<2	10/24/2018	<1	<2	10/24/2018	<1	<2	10/24/2018	<1	<2
2/7/2019	1	na	2/7/2019	<1	na	2/7/2019	<1	na	2/7/2019	1.2	na
4/17/2019	<1	<2	4/17/2019	1	<2	4/17/2019	<1	<2	4/17/2019	1.3	<2
7/24/2019	1.5	<2	7/24/2019	1.2	<2	7/24/2019	<1	<2	7/24/2019	1.3	<2
11/5/2019	1.6	<2	11/5/2019	1.4	<2	11/5/2019	<1	<2	11/5/2019	1.3	<2
1/22/2020	1.6	<2	1/22/2020	<1	<2	1/22/2020	<1	<2	1/22/2020	<1	<2
4/22/2020	1.1	<2	4/22/2020	<1	<2	4/22/2020	<1	<2	4/22/2020	1	<2
7/22/2020	1.2	<2	7/22/2020	0.6	<2	7/22/2020	<0.5	<2	7/22/2020	0.9	<2
10/21/2020	1.3	<2	10/21/2020	0.8	<2	10/21/2020	<0.5	<2	10/21/2020	1.1	<2
1/20/2021	1.8	<2	1/20/2021	1	<2	1/20/2021	<0.5	<2	1/20/2021	1.3	<2
4/21/2021	1.4	<2	4/21/2021	0.6	<2	4/21/2021	<0.5	<2	4/21/2021	0.7	<2
7/21/2021	1.6	<2	7/21/2021	0.9	<2	7/21/2021	<0.5	<2	7/21/2021	0.9	<2
10/20/2021	1.5	<2	10/20/2021	0.9	<2	10/20/2021	<0.5	<2	10/20/2021	1	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-3
MONITORING WELL OCWD-M19
1,4-dioxane and NDMA Concentrations, 2017 - 2021

M19/1 *Talbert Aquifer* *Perforations: 60-110 ft bgs*			M19/2 *Alpha Aquifer* *Perforations: 130-195 ft bgs*			M19/3 *Beta Aquifer* *Perforations: 215-265 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/23/17	<1	na	02/23/17	<1	na	02/23/17	<1	<2
10/04/17	<1	na	10/04/17	<1	na	04/05/17	<1	<2
04/11/18	<1	na	04/11/18	<1	na	07/12/17	<1	<2
10/10/18	<1	na	10/10/18	<1	na	10/04/17	<1	<2
						02/08/18	<1	<2
						04/11/18	<1	<2
						07/11/18	<1	<2
						10/10/18	<1	<2
						01/09/19	<1	<2
						04/03/19	<1	<2
						07/11/19	<1	<2
						10/10/19	<1	2.5
						01/07/20	<1	<2
						04/23/20	<1	<2
						07/07/20	<0.5	<2
						10/07/20	<0.5	<2
						01/05/21	<0.5	<2
						04/06/21	<0.5	<2
						07/07/21	<0.5	<2
						10/05/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-4
MONITORING WELL OCWD-M45
1,4-dioxane and NDMA Concentrations, 2017 - 2021

M45/1 *Alpha-III, Beta-I,II Perforations 195-205 ft bgs*			**M45/2** *Beta-III Aquifer Perforations 250-260 ft bgs*			**M45/3** *Omicron Aquifer Perforations 335-345 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/10/17	<1	<2	01/10/17	<1	<2	01/10/17	10.3	<2
4/4/17	<1	<2	04/04/17	<1	<2	04/04/17	9.1	<2
7/11/17	<1	<2	07/11/17	<1	<2	07/11/17	7.7	<2
10/3/17	<1	<2	10/03/17	<1	<2	10/03/17	5.5	<2
1/10/18	<1	<2	01/10/18	<1	<2	01/10/18	6.7	<2
4/10/18	<1	<2	04/10/18	<1	<2	04/10/18	4.9	<2
7/10/18	<1	<2	07/10/18	<1	<2	07/10/18	3.7	<2
10/9/18	<1	<2	10/09/18	<1	<2	10/09/18	5.1	<2
1/24/19	<1	<2	01/07/19	<1	<2	01/07/19	5.5	<2
5/7/19	<1	<2	05/07/19	<1	<2	05/07/19	3.5	<2
7/9/19	<1	<2	07/09/19	<1	<2	07/09/19	7.2	<2
10/8/19	<1	<2	10/08/19	<1	<2	10/08/19	3.8	<2
2/5/20	<1	<2	02/05/20	<1	<2	02/05/20	3.1	<2
5/4/20	<1	<2	05/04/20	<1	<2	05/04/20	7.4	<2
8/3/20	<0.5	<2	08/03/20	0.5	<2	08/03/20	5.6	<2
11/2/20	<0.5	<2	11/02/20	<0.5	<2	11/02/20	3.9	<2
2/1/21	<0.5	<2	02/01/21	<0.5	<2	02/01/21	2.7	<2
5/3/21	<0.5	<2	05/03/21	<0.5	<2	05/03/21	7.6	<2
8/9/21	<0.5	<2	08/09/21	0.5	<2	08/09/21	3.1	<2
11/1/21	<0.5	<2	11/01/21	<0.5	<2	11/01/21	4.2	<2

M45/4 *Upper Rho Aquifer Perforations 380-390 ft bgs*			**M45/5** *Main Aquifer Perforations 780-790 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/10/17	<1	<2	01/10/17	<1	<2
04/04/17	<1	<2	04/04/17	<1	<2
07/11/17	1.3	<2	07/11/17	<1	<2
07/19/17	1.1	na	10/03/17	<1	<2
10/03/17	<1	<2	01/10/18	<1	<2
01/10/18	2.4	<2	04/10/18	<1	<2
04/10/18	1.8	<2	07/10/18	<1	<2
07/10/18	1.6	<2	10/09/18	<1	<2
10/09/18	1.2	<2	01/07/19	<1	<2
01/07/19	1.9	<2	05/07/19	<1	<2
05/07/19	<1	<2	07/09/19	<1	<2
07/09/19	<1	<2	10/08/19	<1	<2
10/08/19	<1	<2	02/05/20	<1	<2
02/05/20	1.3	<2	05/04/20	<1	<2
05/04/20	1.8	<2	08/03/20	<0.5	<2
08/03/20	1.6	<2	11/02/20	<0.5	<2
11/02/20	1.3	<2	02/01/21	<0.5	<2
02/01/21	1.2	<2	05/03/21	<0.5	<2
05/03/21	1.3	<2	08/09/21	<0.5	<2
08/09/21	1.1	<2	11/01/21	<0.5	<2
11/01/21	1.7	<2			

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-5
MONITORING WELL OCWD-M46
1,4-dioxane and NDMA Concentrations, 2017 - 2021

M46A/1 *Lambda/Omicron Aquifers Perforations 350-370 ft bgs*			**M46/2** *Upper Rho Aquifer Perforations 420-430 ft bgs*			**M46/3** *Lower Rho Aquifer Perforations 515-535 ft bgs*			**M46/4** *Main Aquifer Perforations 640-660 ft bgs*			**M46/5** *Main Aquifer Perforations 890-910 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/07/17	<1	3.3	02/07/17	<1	<2	02/07/17	<1	<2	02/07/17	<1	<2	02/07/17	1.3	<2
05/02/17	<1	<2	05/02/17	<1	<2	05/02/17	<1	<2	05/02/17	<1	<2	05/02/17	<1	<2
08/08/17	<1	2.7	08/08/17	<1	<2	08/08/17	<1	<2	08/08/17	<1	<2	08/08/17	1.2	<2
10/31/17	<1	2.2	10/31/17	<1	<2	10/31/17	<1	<2	10/31/17	<1	<2	10/31/17	1.4	<2
01/23/18	<1	2.2	01/23/18	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2
05/07/18	<1	3.1	05/07/18	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2
08/07/18	<1	2.5	08/07/18	<1	<2	08/07/18	<1	<2	08/07/18	<1	<2	08/07/18	1.1	<2
10/08/18	<1	2.8	10/08/18	<1	<2	10/08/18	<1	<2	10/08/18	<1	<2	10/08/18	1	<2
01/23/19	<1	3.5	01/23/19	<1	<2	01/23/19	<1	<2	01/23/19	<1	<2	01/23/19	1	<2
04/02/19	<1	3.3	04/02/19	<1	<2	04/02/19	<1	<2	04/02/19	<1	<2	04/02/19	1.9	<2
08/06/19	<1	3.1	08/06/19	<1	<2	08/06/19	<1	<2	08/06/19	<1	<2	08/06/19	2.5	<2
10/07/19	<1	2.2	10/07/19	<1	<2	10/07/19	<1	<2	10/07/19	<1	<2	10/07/19	2.6	<2
01/06/20	<1	3.1	01/06/20	<1	<2	01/06/20	<1	<2	01/06/20	<1	<2	01/06/20	2.8	<2
04/08/20	<1	3.5	04/08/20	<1	<2	04/08/20	<1	<2	04/08/20	<1	<2	04/08/20	3.5	<2
07/06/20	<0.5	2.8	07/06/20	<0.5	<2	07/06/20	<0.5	<2	07/06/20	<0.5	<2	07/06/20	3.5	<2
10/05/20	<0.5	2.8	10/05/20	<0.5	<2	10/05/20	<0.5	<2	10/05/20	<0.5	<2	10/05/20	3.5	<2
01/04/21	<0.5	3.5	01/04/21	<0.5	<2	01/04/21	<0.5	<2	01/04/21	<0.5	<2	01/04/21	3.1	<2
04/05/21	<0.5	3.4	04/05/21	<0.5	<2	04/05/21	<0.5	<2	04/05/21	<0.5	<2	04/05/21	3.1	<2
07/06/21	<0.5	2.6	07/06/21	<0.5	<2	07/06/21	<0.5	<2	07/06/21	<0.5	<2	07/06/21	2.6	<2
10/04/21	<0.5	3	10/04/21	<0.5	<2	10/04/21	<0.5	<2	10/04/21	<0.5	<2	10/04/21	2.7	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-6
MONITORING WELL OCWD-M47
1,4-dioxane and NDMA Concentrations
2017 - 2021

M47/1 *Beta-III Aquifer* *Perforations* *355-375 bgs*			M47/2 *Upper Rho Aquifer* *Perforations* *470-480 ft bgs*			M47/3 *Lower Rho Aquifer* *Perforations* *580-600 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/24/17	<1	<2	01/24/17	<1	<2	01/24/17	<1	<2
04/18/17	<1	<2	04/18/17	<1	<2	04/18/17	<1	<2
07/25/17	<1	<2	07/25/17	<1	<2	07/25/17	<1	<2
10/17/17	<1	<2	10/17/17	<1	<2	10/17/17	<1	<2
01/24/18	<1	<2	01/24/18	<1	<2	01/24/18	<1	<2
04/24/18	<1	<2	04/24/18	<1	<2	04/24/18	<1	<2
07/24/18	<1	<2	07/24/18	<1	<2	07/24/18	<1	<2
10/23/18	<1	<2	10/23/18	<1	<2	10/23/18	<1	<2
01/22/19	<1	<2	01/22/19	<1	<2	01/22/19	<1	<2
04/16/19	<1	<2	04/16/19	<1	<2	04/16/19	<1	<2
07/23/19	<1	<2	07/23/19	<1	<2	07/23/19	<1	<2
10/22/19	<1	<2	10/22/19	<1	<2	10/22/19	<1	<2
01/21/20	<1	<2	01/21/20	<1	<2	01/21/20	<1	<2
04/21/20	<1	<2	04/21/20	<1	<2	04/21/20	<1	<2
07/21/20	0.6	<2	07/21/20	0.5	<2	07/21/20	<0.5	<2
10/20/20	0.7	<2	10/20/20	0.6	<2	10/20/20	<0.5	<2
01/19/21	0.7	<2	01/19/21	<0.5	<2	01/19/21	<0.5	<2
04/20/21	0.6	<2	04/20/21	<0.5	<2	04/20/21	<0.5	<2
07/20/21	0.5	<2	07/20/21	0.5	<2	07/20/21	<0.5	<2
10/19/21	0.6	<2	10/19/21	0.5	<2	10/19/21	<0.5	<2

M47/4 *Main Aquifer* *Perforations* *745-765 ft bgs*			M47/5 *Main Aquifer* *Perforations* *940-960 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
01/24/17	<1	<2	01/24/17	<1	<2
04/18/17	<1	<2	04/18/17	<1	<2
07/25/17	<1	<2	07/25/17	<1	<2
10/17/17	<1	<2	10/17/17	<1	<2
01/24/18	<1	<2	01/24/18	<1	<2
04/24/18	<1	<2	04/24/18	<1	<2
07/24/18	<1	<2	07/24/18	<1	<2
10/23/18	<1	<2	10/23/18	<1	<2
01/22/19	<1	<2	01/22/19	<1	<2
04/16/19	<1	<2	04/16/19	<1	<2
07/23/19	<1	<2	07/23/19	<1	<2
10/22/19	<1	<2	10/22/19	<1	<2
01/21/20	<1	<2	01/21/20	<1	<2
04/21/20	<1	<2	04/21/20	<1	<2
07/21/20	<0.5	<2	07/21/20	<0.5	<2
10/20/20	<0.5	<2	10/20/20	<0.5	<2
01/19/21	<0.5	<2	01/19/21	<0.5	<2
04/20/21	<0.5	<2	04/20/21	<0.5	<2
07/20/21	<0.5	<2	07/20/21	<0.5	<2
10/19/21	<0.5	<2	10/19/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE H-7
MONITORING WELL OCWD-M10
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M10/1 Talbert, Alpha-III Perforations 80-160 ft bgs	01/23/17	0.031	13.7	130	60	<0.2	0.003	1.48	0.13
	04/17/17	0.049	18	218	89.2	<0.2	0.004	1.24	0.17
	07/24/17	0.029	12.2	186	56.7	<0.2	0.003	1.5	0.13
	01/22/18	0.168	45.0	350	209	<0.2	<0.002	1.14	0.21
	04/23/18	0.208	51.5	424	255	na	na	1.14	0.24
	07/23/18	0.103	29.9	276	149	na	na	1.14	0.18
	10/22/18	0.048	16.4	184	85.4	<0.2	<0.002	1.38	0.17
	01/21/19	0.167	45.0	354	213	<0.2	0.004	1.14	0.14
	04/15/19	0.210	53.6	414	268	na	na	1.00	0.29
	07/22/19	0.246	61.3	474	288	na	na	1.17	0.39
	10/21/19	0.237	59.4	464	255	na	na	0.89	0.29
	01/20/20	0.299	72.1	562	437	na	na	1.06	0.39
	04/20/20	0.344	79.2	672	408	<0.2	0.004	1.52	0.44
	07/20/20	0.347	78.9	634	424	na	na	1.27	0.42
	10/19/20	0.357	74.3	612	381	na	na	1.10	0.38
	01/18/21	0.372	77.3	641	394	na	na	1.09	0.43
	04/19/21	0.397	81.6	660	422	na	na	1.06	0.45
	07/19/21	0.324	69.6	558	353	<0.2	0.003	0.81	0.39
	10/18/21	0.205	46.5	384	252	na	na	1.03	0.25
M10/2 Beta-I,II Perforations 175-195 ft bgs	01/23/17	0.022	9.6	64	29.6	<0.2	<0.002	2.19	0.09
	04/17/17	0.023	10.1	102	30.7	<0.2	0.003	2.23	0.09
	07/24/17	0.027	11	98	38.2	<0.2	0.002	2.23	0.09
	10/16/17	0.027	11.4	104	46.0	<0.2	0.004	2.11	0.09
	01/22/18	0.029	11.4	130	48.8	<0.2	0.004	2.05	0.10
	04/23/18	0.222	53.2	387	227	na	na	1.45	0.28
	07/23/18	0.316	75.1	578	356	na	na	1.26	0.35
	10/22/18	0.124	32.0	270	164	0.3	<0.002	1.42	0.19
	01/21/19	0.108	30.3	238	149	<0.2	0.005	1.47	0.11
	04/15/19	0.320	79.9	580	380	na	na	1.07	0.36
	07/22/19	0.420	99.7	732	490	na	na	1.29	0.53
	10/21/19	0.407	97.5	694	418	na	na	1.05	0.45
	01/20/20	0.415	99.4	714	560	na	na	1.32	0.58
	04/20/20	0.369	86.6	662	430	<0.2	<0.002	1.66	0.46
	07/20/20	0.423	95.0	768	508	na	na	2.20	0.48
	10/19/20	0.474	96.8	778	511	na	na	1.99	0.46
	01/18/21	0.468	97.2	813	487	na	na	1.93	0.49
	04/19/21	0.468	97.3	794	493	na	na	2.02	0.51
	07/19/21	0.473	98.0	792	493	<0.2	<0.002	1.89	0.52
	10/18/21	0.212	46.5	376	248	na	na	1.35	0.23
M10/3 Beta-III Perforations 215-240 ft bgs	01/23/17	0.101	42.3	268	113	<0.2	0.013	0.15	0.28
	04/17/17	0.106	42.3	300	124	<0.2	0.015	0.15	0.31
	07/24/17	0.105	40.6	262	106	<0.2	0.014	0.26	0.33
	10/16/17	0.109	43.1	298	123	<0.2	0.01	0.11	0.32
	01/22/18	0.176	55.7	390	198	<0.2	0.010	0.12	0.29
	04/23/18	0.191	57.6	378	205	na	na	0.22	0.32
	07/23/18	0.142	47.8	322	149	na	na	0.13	0.29
	10/22/18	0.106	39.1	274	113	<0.2	0.013	0.17	0.27
	01/21/19	0.166	53.4	342	174	<0.2	0.014	0.15	0.20
	04/15/19	0.160	54.6	358	189	na	na	0.16	0.33
	07/22/19	0.140	47.5	326	147	na	na	<0.1	0.34
	10/21/19	0.144	46.2	274	145	na	na	<0.1	0.29
	01/20/20	0.139	46.1	316	177	na	na	<0.1	0.35
	04/20/20	0.137	44.0	326	141	<0.2	0.011	0.17	0.29
	07/20/20	0.136	42.6	320	148	na	na	0.14	0.27
	10/19/20	0.155	43.2	316	141	na	na	0.14	0.27
	01/18/21	0.150	42.3	320	146	na	na	0.2	0.32
	04/19/21	0.151	41.8	324	146	na	na	0.19	0.28
	07/19/21	0.137	40.2	284	133	<0.2	0.009	0.17	0.27
	10/18/21	0.116	35.1	250	115	na	na	<0.1	0.24

TABLE H-7
MONITORING WELL OCWD-M10
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M10/4 Lambda, Omicron, Upper Rho Perforations 280-305 ft bgs	01/23/17	0.018	9.4	102	30.9	0.2	<0.002	<0.1	0.2
	04/17/17	0.018	9.5	92	31	0.4	<0.002	<0.1	0.2
	07/24/17	0.018	9.2	76	29.7	<0.2	<0.002	<0.1	0.26
	10/16/17	0.017	9.1	112	31.6	0.2	<0.002	<0.1	0.23
	01/22/18	0.018	9.4	92	31.7	0.2	<0.002	<0.1	0.17
	04/23/18	0.024	9.1	95	31.4	na	na	<0.1	0.17
	07/23/18	0.017	8.9	88	30.3	na	na	<0.1	0.19
	10/22/18	0.016	8.4	78	30.2	<0.2	<0.002	<0.1	0.18
	01/21/19	0.020	8.1	82	31.3	0.3	0.007	<0.1	0.16
	04/15/19	0.020	8.5	88	34.0	na	na	<0.1	0.19
	07/22/19	0.026	10.7	130	36.5	na	na	<0.1	0.21
	10/21/19	0.029	9.9	96	33.7	na	na	<0.1	0.17
	01/20/20	0.027	11.2	98	43.3	na	na	<0.1	0.20
	04/20/20	0.027	12.0	110	39.6	0.2	0.002	<0.1	0.20
	07/20/20	0.031	12.9	116	43.1	na	na	<0.1	0.20
	10/19/20	0.039	14.3	128	45.6	na	na	<0.1	0.20
	01/18/21	0.040	15.1	131	48.9	na	na	<0.1	0.21
	04/19/21	0.039	15.0	128	51.1	na	na	<0.1	0.21
	07/19/21	0.044	16.9	134	55.7	0.4	0.002	<0.1	0.22
	10/18/21	0.050	19.0	148	69.7	na	na	<0.1	0.21

Note: Monitoring Well OCWD-M10 is located approximately 1,300 feet north of the nearest injection well site (I-19).

TABLE H-8
MONITORING WELL OCWD-M11
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M11/1 Talbert Perforations 70-105 ft bgs	01/25/17	0.020	134	134	68.6	<0.2	<0.002	1.3	0.1
	04/19/17	0.021	130	130	72.8	<0.2	<0.002	1.3	0.12
	07/26/17	0.022	154	154	66.8	<0.2	<0.002	1.3	0.11
	10/18/17	0.021	156	156	88.8	<0.2	<0.002	1.1	0.17
	02/07/18	0.024	10.9	186	101	<0.2	<0.002	1.14	0.17
	04/25/18	0.030	11.8	172	103	na	na	1.04	0.20
	07/25/18	0.031	11.8	166	98.5	na	na	1.04	0.11
	10/24/18	0.082	23.8	166	130	<0.2	0.002	1.19	0.14
	02/07/19	0.091	28.3	226	136	<0.2	0.004	1.2	0.14
	04/17/19	0.096	29.5	232	153	na	na	1.2	0.22
	07/24/19	0.130	40.0	290	185	na	na	1.29	0.19
	11/05/19	0.132	42.4	304	169	na	na	1.24	0.20
	01/22/20	0.170	48.8	368	279	na	na	1.18	0.22
	04/22/20	0.202	54.3	438	317	<0.2	0.003	1.03	0.28
	07/22/20	0.233	60.3	494	329	na	na	1.16	0.26
	10/21/20	0.255	59.5	444	319	na	na	1.08	0.28
	01/20/21	0.261	63.6	501	314	na	na	1.18	0.28
	04/21/21	0.290	65.6	510	340	na	na	1.2	0.32
	07/21/21	0.299	68.3	510	338	<0.2	0.004	1.35	0.31
	10/20/21	0.305	68.3	468	347	na	na	1.32	0.34
M11/2 Talbert, Alpha-III Perforations 125-150 ft bgs	01/25/17	0.019	9	112	52.1	<0.2	<0.002	1.92	0.08
	04/19/17	0.048	17.2	158	82.5	<0.2	0.003	1.94	0.11
	07/26/17	0.026	10.2	142	53.7	<0.2	<0.002	1.82	0.08
	10/18/17	0.124	34.3	284	172	<0.2	<0.002	1.76	0.17
	02/07/18	0.236	64.3	526	333	<0.2	<0.002	2.05	0.34
	04/25/18	0.247	64.4	484	336	na	na	1.99	0.3
	07/25/18	0.233	63.2	488	310	na	na	1.93	0.23
	10/24/18	0.187	45.3	338	239	<0.2	<0.002	1.72	0.19
	02/07/19	0.222	56.3	426	271	<0.2	0.005	1.70	0.27
	04/17/19	0.250	62.7	520	308	na	na	1.37	0.35
	07/24/19	0.252	64.6	500	323	na	na	1.66	0.32
	11/05/19	0.226	61.1	466	315	na	na	1.63	0.46
	01/22/20	0.296	76.0	588	447	na	na	1.78	0.36
	04/22/20	0.295	78.6	618	407	<0.2	0.002	2.06	0.31
	07/22/20	0.306	80.1	602	404	na	na	2.03	0.30
	10/21/20	0.338	80.3	570	397	na	na	2.11	0.31
	01/20/21	0.345	81.9	612	382	na	na	1.85	0.33
	04/21/21	0.346	82.7	604	411	na	na	2.01	0.34
	07/21/21	0.347	81.4	626	394	<0.2	0.007	1.79	0.31
	10/20/21	0.340	80.0	574	399	na	na	1.80	0.36
M11/3 Beta-I, -II, -III Perforations 170-225 ft bgs	01/25/17	0.016	8.5	90	29.2	<0.2	<0.002	2.65	0.07
	04/19/17	0.017	8.6	84	29.5	<0.2	<0.002	2.62	0.08
	07/26/17	0.018	8.2	112	28.4	<0.2	<0.002	2.52	0.08
	10/18/17	0.016	8.3	108	30.5	<0.2	<0.002	2.57	0.09
	02/07/18	0.017	8.1	96	8.1	<0.2	<0.002	2.54	0.12
	04/25/18	0.022	8.4	98	31.7	na	na	2.38	0.19
	07/25/18	0.021	8.2	102	30	na	na	2.27	0.06
	10/24/18	0.025	8.9	106	29.8	<0.2	<0.002	2.30	0.11
	02/07/19	0.028	10.3	90	33.9	<0.2	<0.002	2.25	0.07
	04/17/19	0.028	10.7	144	39.8	na	na	2.19	0.14
	07/24/19	0.030	10.7	98	40.8	na	na	2.05	0.10
	11/05/19	0.029	10.0	108	39.3	na	na	1.99	0.09
	01/22/20	0.029	9.8	116	47.7	na	na	1.99	0.09
	04/22/20	0.026	9.5	98	40.3	<0.2	<0.002	1.96	0.07
	07/22/20	0.026	9.9	106	41.2	na	na	1.90	0.07
	10/21/20	0.027	8.3	96	37.8	na	na	1.91	0.07
	01/20/21	0.058	15.8	149	62.2	na	na	1.96	0.09
	04/21/21	0.063	16.8	156	70.9	na	na	1.95	0.10
	07/21/21	0.058	15.7	158	65.6	<0.2	0.004	1.95	0.09
	10/20/21	0.048	12.9	120	56.0	na	na	1.92	0.14

TABLE H-8
MONITORING WELL OCWD-M11
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M11/4 Lambda, Omicron Perforations 260-290 ft bgs	01/25/17	0.063	21.2	188	65.9	<0.2	0.002	1.51	0.15
	04/19/17	0.050	17.6	142	55.4	<0.2	<0.002	1.51	0.14
	07/26/17	0.053	17.6	178	51.4	<0.2	<0.002	1.5	0.12
	10/18/17	0.052	18.5	144	54.6	<0.2	<0.002	1.51	0.12
	02/07/18	0.059	20.5	170	61.4	<0.2	<0.002	1.50	0.18
	04/25/18	0.044	15.2	134	49.1	na	na	1.51	0.23
	07/25/18	0.030	11.3	132	41.9	na	na	1.45	0.08
	10/24/18	0.034	10.9	104	40	<0.2	0.002	1.47	0.09
	02/07/19	0.047	15.6	126	46.5	<0.2	0.006	1.45	0.10
	04/17/19	0.046	16.2	152	58.3	na	na	1.63	0.18
	07/24/19	0.039	14.3	122	53.1	na	na	1.69	0.13
	11/05/19	0.032	12.7	130	50.8	na	na	1.70	0.12
	01/22/20	0.029	11.6	108	55.8	na	na	1.85	0.11
	04/22/20	0.029	12.1	114	49.6	<0.2	<0.002	1.82	0.09
	07/22/20	0.029	12.1	124	48.0	na	na	1.90	0.09
	10/21/20	0.036	12.4	118	45.7	na	na	1.78	0.09
	01/20/21	0.034	12.2	126	47.6	na	na	1.74	0.10
	04/21/21	0.031	11.1	128	45.5	na	na	1.75	0.09
	07/21/21	0.031	11.1	124	43.3	<0.2	0.004	1.81	0.09
	10/20/21	0.032	11.2	104	44.6	na	na	1.71	0.09

Note: OCWD-M11 is located approximately 950 feet north of the nearest injection well site (I-14).

TABLE H-9
MONITORING WELL OCWD-M19
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M19/1	02/23/17	0.37	79.9	588	404	<0.2	<0.002	2.52	na
Talbert	10/04/17	0.18	78.5	548	393	<0.2	<0.002	2.48	na
Perforations	04/11/18	0.3	77.8	512	389	<0.2	<0.002	3.01	na
60-110 ft bgs	10/10/18	0.25	81.2	566	392	<0.2	<0.002	3.65	na
M19/2	02/23/17	<0.1	25	198	117	<0.2	<0.002	1.85	na
Alpha	10/04/17	<0.1	31.1	230	145	<0.2	<0.002	1.62	na
Perforations	04/11/18	<0.1	29.6	202	136	<0.2	<0.002	1.58	na
130-195 ft bgs	10/10/18	0.13	36.5	258	184	<0.2	<0.002	1.77	na
	02/23/17	0.012	5.8	60	30.6	<0.2	<0.002	1.48	0.08
	04/05/17	0.010	5	58	28.2	<0.2	<0.002	1.31	0.08
	07/12/17	0.014	6.1	80	31.7	<0.2	<0.002	1.42	0.08
	10/04/17	0.016	6	62	32.8	<0.2	<0.002	1.41	0.08
	02/08/18	0.011	4.8	64	31.3	<0.3	0.004	1.17	0.09
	04/11/18	<0.01	4.6	60	32.8	na	na	1.09	0.15
	07/11/18	<0.01	7.1	76	37.1	na	na	1.64	0.08
M19/3	10/10/18	0.018	7.4	79	42.9	<0.2	<0.002	1.43	0.06
Beta	01/09/19	0.025	9.1	89	59.6	<0.2	<0.002	1.58	0.08
Perforations	04/03/19	0.017	6.1	64	41.0	na	na	1.38	0.09
215-265 ft bgs	07/11/19	0.018	6.7	76	42.8	na	na	1.33	0.11
	10/10/19	0.017	6.6	76	31.2	na	<0.002	1.35	0.06
	01/07/20	0.016	5.1	54	34.1	na	na	1.13	0.23
	04/23/20	0.020	7.5	86	47.2	<0.2	0.004	1.29	0.08
	07/07/20	0.017	6.3	70	28.0	na	na	1.27	0.07
	10/07/20	0.017	6.4	68	35.0	na	na	1.29	0.06
	01/05/21	0.014	4.9	70	32.1	na	na	1.13	0.07
	04/06/21	0.011	4.5	60	32.1	na	na	1	0.06
	07/07/21	0.022	8.4	120	32.1	<0.2	<0.002	1.4	0.12
	10/05/21	0.018	7.7	92	32.1	na	na	1.44	0.09

Note: OCWD-M19 is located approximately 500 feet north of the nearest injection well site (I-5).
na = not analyzed

TABLE H-10
MONITORING WELL OCWD-M45
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M45/1 Alpha-III, Beta-I,II Perforations 195-205 ft bgs	01/10/17	0.379	87.7	514	462	<0.2	0.103	1.45	0.39
	04/04/17	0.377	90.5	722	441	<0.2	0.154	1.36	0.46
	07/11/17	0.367	90.1	652	419	<0.2	0.06	1.78	0.43
	10/03/17	0.369	86.0	668	467	<0.2	0.063	1.72	0.52
	01/23/18	0.387	91.0	732	466	<0.2	0.047	1.95	0.37
	05/07/18	0.395	90.2	720	459	na	na	1.83	0.37
	08/07/18	0.407	91.1	710	454	na	na	1.98	0.37
	10/08/18	0.405	90.3	708	417	<0.2	0.085	1.98	0.37
	01/24/19	0.394	92.2	680	453	0.2	0.117	1.71	0.57
	05/07/19	0.407	92.1	716	473	na	na	2.21	0.44
	07/09/19	0.417	92.8	750	511	na	na	2.34	0.48
	10/08/19	0.409	93.0	758	480	na	na	2.40	0.42
	02/05/20	0.397	92.9	608	510	na	na	2.70	0.47
	05/04/20	0.405	90.8	704	481	<0.2	0.069	2.74	0.44
	08/03/20	0.409	92.5	718	490	na	na	3.23	0.37
	11/02/20	0.425	90.5	766	475	na	na	2.66	0.40
	02/01/21	0.422	90.5	683	469	na	na	2.58	0.40
	05/03/21	0.427	90.9	720	482	na	na	2.59	0.37
	08/09/21	0.441	91.5	736	482	<0.2	0.733	2.65	0.44
	11/01/21	0.428	92.5	702	492	na	na	2.61	0.36
M45/2 Beta-III Perforations 250-260 ft bgs	01/10/17	0.033	13.0	116	46.8	<0.2	0.046	2.31	0.11
	04/04/17	0.029	12.3	110	46.4	<0.2	0.048	2.47	0.1
	07/11/17	0.034	12.6	134	44.4	<0.2	0.036	2.39	0.4
	10/03/17	0.030	12.3	114	46.8	<0.2	0.062	2.14	0.18
	01/10/18	0.041	14.8	130	60.2	<0.2	0.062	2.18	0.09
	04/10/18	0.038	14.4	126	60.4	na	na	2.19	0.12
	07/10/18	0.030	13.3	132	56.1	na	na	2.05	0.09
	10/09/18	0.040	13.3	132	58.7	<0.2	0.029	1.82	0.09
	01/24/19	0.045	14.1	131	60.4	<0.2	0.038	1.9	0.12
	05/07/19	0.053	16.1	142	65.8	na	na	1.87	0.16
	07/09/19	0.048	17.2	156	73.9	na	na	1.77	0.14
	10/08/19	0.049	16.0	154	71.1	na	na	1.66	0.11
	02/05/20	0.049	15.5	154	78.0	na	na	1.61	0.11
	05/04/20	0.054	17.1	154	79.5	<0.2	0.028	1.54	0.13
	08/03/20	0.087	24.7	220	113	na	na	1.72	0.13
	11/02/20	0.095	24.9	242	119	na	na	1.43	0.13
	02/01/21	0.097	25.3	204	117	na	na	1.43	0.14
	05/03/21	0.122	30.2	254	141	na	na	1.46	0.14
	08/09/21	0.155	37.9	278	175	<0.2	0.022	1.44	0.17
	11/01/21	0.152	38.3	246	184	na	na	1.40	0.18
M45/3 Omicron Perforations 335-345 ft bgs	01/10/17	0.116	39.1	272	105	<0.2	<0.002	<0.1	0.28
	04/04/17	0.122	43.5	292	112	<0.2	<0.002	<0.1	0.33
	07/11/17	0.083	30.9	248	81.6	<0.2	<0.002	<0.1	0.31
	10/03/17	0.066	25.2	232	78.8	<0.2	<0.002	<0.1	0.41
	01/10/18	0.086	31.5	248	91.8	<0.2	<0.002	<0.1	0.25
	04/10/18	0.067	26.5	232	81.1	na	na	<0.1	0.29
	07/10/18	0.044	18.5	204	64	na	na	<0.1	0.24
	10/09/18	0.058	22.0	196	70.6	<0.2	<0.002	<0.1	0.25
	01/24/19	0.068	24.6	212	75.6	<0.2	<0.002	<0.1	0.18
	05/07/19	0.049	18.7	182	57.7	na	na	<0.1	0.33
	07/09/19	0.095	31.9	246	92.8	na	na	<0.1	0.31
	10/08/19	0.041	18.6	194	56.9	na	na	<0.1	0.22
	02/05/20	0.043	17.7	188	61.2	na	na	<0.1	0.23
	05/04/20	0.093	32.3	236	94.9	<0.2	<0.002	<0.1	0.24
	08/03/20	0.075	26.8	212	73.1	na	na	<0.1	0.24
	11/02/20	0.052	19.1	176	57.8	na	na	<0.1	0.20
	02/01/21	0.044	16.9	152	52.7	na	na	<0.1	0.22
	05/03/21	0.099	31.1	256	88.4	na	na	<0.1	0.22
	08/09/21	0.049	17.6	168	54.2	<0.2	<0.002	<0.1	0.25
	11/01/21	0.117	33.3	158	66.5	na	na	<0.1	0.20

TABLE H-10
MONITORING WELL OCWD-M45
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M45/4 Upper Rho Perforations 380-390 ft bgs	01/10/17	0.022	10.7	110	39.7	<0.2	<0.002	<0.1	0.23
	04/04/17	0.022	11.2	116	41.4	<0.2	<0.002	<0.1	0.22
	07/11/17	0.025	14.9	118	42.7	<0.2	<0.002	<0.1	0.21
	10/03/17	0.018	10.1	118	42.1	<0.2	<0.002	<0.1	0.29
	01/10/18	0.035	15.8	154	57.1	0.3	<0.002	<0.1	0.10
	04/10/18	0.032	13.8	134	51.2	na	na	<0.1	0.21
	07/10/18	0.027	13.4	132	47.5	na	na	<0.1	0.22
	10/09/18	0.022	9.9	108	42.9	<0.2	<0.002	<0.1	0.20
	01/24/19	0.028	10.4	125	44.8	0.5	<0.002	<0.1	0.16
	05/07/19	0.018	8.3	102	40.5	na	na	<0.1	0.86
	07/09/19	0.021	8.7	120	45.3	na	na	<0.1	2.43
	10/08/19	0.020	9.2	114	42.2	na	na	<0.1	0.23
	02/05/20	0.023	10.3	110	52.0	na	na	<0.1	0.21
	05/04/20	0.026	12.0	130	52.4	0.3	<0.002	<0.1	0.33
	08/03/20	0.026	11.3	134	51.0	na	na	<0.1	0.37
	11/02/20	0.025	9.9	122	45.0	na	na	<0.1	0.24
	02/01/21	0.025	9.9	87	45.9	na	na	<0.1	0.20
	05/03/21	0.026	9.2	118	44.7	na	na	<0.1	0.34
	08/09/21	0.027	9.6	110	46.2	0.3	<0.002	<0.1	0.24
	11/01/21	0.035	12.1	96	51.4	na	na	<0.1	0.31
M45/5 Main Perforations 780-790 ft bgs	01/10/17	0.135	13.3	290	30.9	0.7	<0.002	<0.1	5.98
	04/04/17	0.136	13.9	300	30	0.7	<0.002	<0.1	5.86
	07/11/17	0.148	13.8	316	28.5	0.6	0.007	<0.1	6.26
	10/03/17	0.141	13.5	300	28.9	0.7	0.007	<0.1	5.69
	01/10/18	0.145	13.8	316	30.4	0.8	0.009	0.18	6.63
	04/10/18	0.194	13.5	290	30.9	na	na	<0.1	5.86
	07/10/18	0.149	13.8	298	30.5	na	na	<0.1	6.66
	10/09/18	0.153	13.5	302	29.9	0.6	0.007	<0.1	7.0
	01/24/19	0.154	13.7	272	31.1	0.8	0.008	<0.1	7.15
	05/07/19	0.161	15.0	304	37.4	na	na	<0.1	8.90
	07/09/19	0.155	14.1	306	34.8	na	na	<0.1	7.28
	10/08/19	0.157	14.3	316	31.5	na	na	<0.1	7.37
	02/05/20	0.151	14.9	306	34.8	na	na	<0.1	6.52
	05/04/20	0.161	14.0	316	33.4	0.6	0.008	<0.1	6.28
	08/03/20	0.167	14.4	310	31.9	na	na	<0.1	7.54
	11/02/20	0.176	13.9	312	31.8	na	na	<0.1	6.79
	02/01/21	0.181	13.8	290	31.7	na	na	<0.1	7.49
	05/03/21	0.186	13.8	314	32.2	na	na	<0.1	6.23
	08/09/21	0.192	14.0	310	31.9	0.6	<0.002	<0.1	8.07
	11/01/21	0.187	14.2	284	32.2	na	na	<0.1	7.09

Note: OCWD-M45 is located approximately 2,900 feet north of the nearest injection well site (I-15).

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46A/1 Lambda/Omicron Perforations 350-370 ft bgs	02/07/17	0.016	7.9	92	44.1	<0.2	0.003	1.74	0.17
	05/02/17	0.015	7.6	87.5	42.9	<0.2	0.003	1.79	0.1
	08/08/17	0.014	8.5	66	41.1	<0.2	<0.002	1.66	0.06
	10/31/17	0.012	6.4	88	42.2	<0.2	<0.002	1.51	0.06
	01/23/18	0.011	5.8	80	42.0	<0.2	<0.002	1.39	0.43
	05/07/18	0.018	6.4	92	39.9	na	na	1.45	0.05
	08/07/18	0.011	5.6	71	39.8	na	na	1.36	0.06
	10/08/18	0.014	5.3	76	38.8	<0.2	<0.002	1.18	0.06
	01/23/19	0.014	6.5	80	44.6	<0.2	<0.002	1.39	0.09
	04/02/19	0.016	5.9	75	41.0	na	na	1.30	0.12
	08/06/19	0.014	5.5	90	43.0	na	na	1.13	0.12
	10/07/19	0.013	6.1	82	40.6	na	<0.002	1.12	0.06
	01/06/20	0.017	5.7	82	41.7	na	na	1.11	0.20
	04/08/20	0.016	5.9	81	41.8	<0.2	<0.002	1.10	0.06
	07/06/20	0.017	5.4	78	43.1	na	na	1.05	<0.05
	10/05/20	0.017	5.6	78	42.0	na	na	0.98	<0.05
	01/04/21	0.019	6	78	41.7	na	na	1.19	<0.05
	04/05/21	0.019	6.2	76	43.1	na	na	1.20	<0.05
	07/06/21	0.015	5.7	120	43.3	<0.2	<0.002	1.17	<0.05
	10/04/21	0.013	5.1	79	42.2	na	na	1.04	0.05
M46/2 Upper Rho Perforations 420-430 ft bgs	02/07/17	0.027	11.8	124	55.4	<0.2	0.002	1.73	0.11
	05/02/17	0.024	10.5	118	49.7	<0.2	0.003	1.66	0.08
	08/08/17	0.023	10.4	100	49.4	<0.2	<0.002	1.64	0.08
	10/31/17	0.021	8.8	106	45.7	<0.2	<0.002	1.56	0.12
	01/23/18	0.014	6.0	74	34.6	<0.2	<0.002	1.27	0.12
	05/07/18	0.024	8.7	118	46	na	na	1.44	0.06
	08/07/18	0.017	8.6	82	46.7	na	na	1.61	0.06
	10/08/18	0.020	8.3	94	44.2	<0.2	<0.002	1.5	0.05
	01/23/19	0.013	5.6	64	32.3	<0.2	<0.002	1.16	<0.05
	04/02/19	0.015	5.4	74	32.1	na	na	1.04	0.08
	08/06/19	0.018	6.1	78	37.0	na	na	1.19	0.09
	10/07/19	0.017	6.9	96	40.0	na	<0.002	1.25	0.06
	01/06/20	0.019	6.5	85	40.8	na	na	1.18	0.12
	04/08/20	0.015	5.7	74	35.3	<0.2	<0.002	1.07	<0.05
	07/06/20	0.018	6.3	82	41.3	na	na	1.14	<0.05
	10/05/20	0.018	6.4	82	39.0	na	na	1.23	<0.05
	01/04/21	0.016	5.6	72	35.4	na	na	1.14	<0.05
	04/05/21	0.016	5.6	60	35.6	na	na	1.13	<0.05
	07/06/21	0.016	6.1	120	40.1	<0.2	<0.002	1.24	0.13
	10/04/21	0.016	6.2	87	41.2	na	na	1.22	0.05

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46/3 Lower Rho Perforations 515-535 ft bgs	02/07/17	0.025	11.7	146	39.3	<0.2	0.004	0.2	0.23
	05/02/17	0.026	12.1	150	39.1	<0.2	0.003	0.26	0.15
	08/08/17	0.022	11.6	134	37.1	<0.2	<0.002	0.23	0.12
	10/31/17	0.025	11.6	151	38.9	<0.2	<0.002	0.19	0.17
	01/23/18	0.025	11.3	160	37.0	<0.2	<0.002	0.17	0.12
	05/07/18	0.028	11.3	150	35.7	na	na	0.19	0.1
	08/07/18	0.023	11.6	144	34.8	na	na	0.24	0.11
	10/08/18	0.027	11.5	136	32.9	<0.2	<0.002	0.2	0.12
	01/23/19	0.024	11.5	120	37.3	<0.2	0.003	0.26	0.07
	04/02/19	0.023	11	132	34.6	na	na	0.27	0.13
	08/06/19	0.023	10.7	124	33.9	na	na	0.25	0.26
	10/07/19	0.023	11.2	144	32.3	na	<0.002	0.25	0.11
	01/06/20	0.022	10.6	150	29.2	na	na	0.24	0.17
	04/08/20	0.021	10.4	132	32.2	<0.2	<0.002	0.21	0.1
	07/06/20	0.023	10.8	130	34.1	na	na	0.19	0.12
	10/05/20	0.024	10.8	126	33.2	na	na	0.28	0.1
	01/04/21	0.026	10.6	130	33.1	na	na	0.28	0.09
	04/05/21	0.026	10.9	130	33.1	<0.2	<0.002	0.29	0.24
	07/06/21	0.025	11	180	34.4	na	na	0.32	0.09
	10/04/21	0.024	10.6	130	33.9	na	na	0.26	0.12
M46/4 Main Perforations 640-660 ft bgs	02/07/17	0.056	15.4	222	17	0.2	0.002	0.11	1.13
	05/02/17	0.06	16.1	214	16.4	<0.2	0.003	<0.1	1.04
	08/08/17	0.057	15.1	220	15.6	<0.2	<0.002	<0.1	1.13
	10/31/17	0.056	14.7	234	16.5	<0.2	<0.002	<0.1	1.03
	01/23/18	0.056	14.4	200	16.4	<0.2	<0.002	<0.1	0.96
	05/07/18	0.061	14.5	226	15.6	na	na	<0.1	1.08
	08/07/18	0.053	14.6	196	16.3	na	na	<0.1	1.11
	10/08/18	0.059	14.5	204	16.5	<0.2	<0.002	<0.1	1.02
	01/23/19	0.056	14.6	200	15.8	0.3	0.003	<0.1	0.92
	04/02/19	0.057	14.4	176	16.7	na	na	<0.1	1.11
	08/06/19	0.054	14.4	218	16.3	na	na	<0.1	0.97
	10/07/19	0.052	14.5	234	15.0	na	0.002	<0.1	1.18
	01/06/20	0.049	14.1	230	16.4	na	na	<0.1	1.16
	04/08/20	0.048	13.6	222	16.1	<0.2	<0.002	<0.1	1.03
	07/06/20	0.049	13.6	220	16.2	na	na	<0.1	1.03
	10/05/20	0.05	13.5	226	15.9	na	na	<0.1	0.97
	01/04/21	0.056	13.4	219	15.8	na	na	<0.1	0.95
	04/05/21	0.052	13.6	198	15.9	na	<0.002	<0.1	0.89
	07/06/21	0.053	13.7	266	16.6	0.2	na	<0.1	0.91
	10/04/21	0.05	13.5	206	16.1	na	na	<0.1	1

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2017 - 2021

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M46/5 Main Perforations 890-910 ft bgs	02/07/17	0.045	14.5	220	14	0.4	0.004	<0.1	1.78
	05/02/17	0.046	14.3	222	13.5	0.4	0.004	<0.1	1.64
	08/08/17	0.043	14.7	192	12.9	0.2	0.002	<0.1	1.73
	10/31/17	0.045	14.7	238	13.9	0.4	0.002	<0.1	1.68
	01/23/18	0.046	14.5	208	13.7	0.4	0.004	<0.1	1.41
	05/07/18	0.01	14.6	228	13	na	na	<0.1	1.91
	08/07/18	0.051	14.8	194	13.6	na	na	<0.1	1.87
	10/08/18	0.01	14.9	216	14	0.4	<0.002	<0.1	1.64
	01/23/19	0.051	16.2	216	13.4	0.5	0.004	<0.1	1.91
	04/02/19	0.056	17.3	200	14.5	na	na	<0.1	1.93
	08/06/19	0.06	18.7	240	14.3	na	na	<0.1	1.64
	10/07/19	0.06	19.1	218	12.7	na	0.003	<0.1	2.05
	01/06/20	0.059	19.0	238	15.3	na	na	<0.1	1.95
	04/08/20	0.062	19.1	242	14.5	0.5	0.003	<0.1	1.98
	07/06/20	0.065	19.4	236	14.7	na	na	<0.1	2.25
	10/05/20	0.068	18.9	242	14.9	na	na	<0.1	2.09
	01/04/21	0.073	19.0	252	15.1	na	na	<0.1	2.02
	04/05/21	0.07	19.0	224	15	na	na	<0.1	1.83
	07/06/21	0.073	18.7	282	15.3	0.5	0.004	<0.1	1.88
	10/04/21	0.068	17.9	230	15	na	na	<0.1	2.5

Notes: OCWD-M46 is located approximately 900 feet northeast of the nearest injection well site (I-26).
na = not analyzed

TABLE H-12
MONITORING WELL OCWD-M47
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/1 Beta-III Perforations 355-375 ft bgs	01/24/17	0.027	11.9	164	40.7	<0.2	<0.002	<0.1	0.17
	04/18/17	0.024	11.4	132	38	<0.2	<0.002	<0.1	0.18
	07/25/17	0.024	13.1	114	38.6	<0.2	<0.002	0.12	0.14
	10/17/17	0.023	22.6	144	38.1	<0.2	<0.002	<0.1	0.19
	01/24/18	0.023	11	124	38.1	<0.2	<0.002	<0.1	0.14
	04/24/18	0.025	11.5	130	38.8	na	na	<0.1	0.2
	07/24/18	0.025	11.8	140	40.1	na	na	<0.1	0.13
	10/23/18	0.029	12	112	39.9	<0.2	<0.002	<0.1	0.16
	01/22/19	0.027	12.4	110	40.3	<0.2	<0.002	<0.1	0.1
	04/16/19	0.025	12.1	106	39.2	na	na	<0.1	0.15
	07/23/19	0.025	11.7	126	39.4	na	na	<0.1	0.15
	10/22/19	0.023	9.3	138	36	na	na	<0.1	0.19
	01/21/20	0.021	9.9	128	43.1	na	na	<0.1	0.15
	04/21/20	0.018	9.4	108	36.2	<0.2	<0.002	<0.1	0.11
	07/21/20	0.018	9.1	108	36.3	na	na	<0.1	0.13
	10/20/20	0.021	8.6	116	34.3	na	na	<0.1	0.11
	01/19/21	0.02	8.2	115	34.2	na	na	<0.1	0.13
	04/20/21	0.021	8.2	118	34.4	<0.2	na	<0.1	0.12
	07/20/21	0.018	7.5	132	34.2	na	0.002	<0.1	0.13
	10/19/21	0.019	7.6	92	34.7	na	na	<0.1	0.12
M47/2 Upper Rho Perforations 470-480 ft bgs	01/24/17	0.026	11.8	124	57.8	<0.2	0.004	1.84	0.09
	04/18/17	0.026	12.5	136	58.3	<0.2	0.006	1.94	0.1
	07/25/17	0.026	11.6	106	55	<0.2	<0.002	1.81	0.09
	10/17/17	0.024	12.4	140	57.2	<0.2	0.003	1.75	0.11
	01/24/18	0.024	10.6	124	58.4	<0.2	0.004	1.66	0.09
	04/24/18	0.027	10.7	120	57.7	na	na	1.61	0.07
	07/24/18	0.027	10.1	132	55.8	na	na	1.5	0.08
	10/23/18	0.030	10.9	92	58.9	<0.2	0.002	1.51	0.09
	01/22/19	0.026	10.7	100	55.9	<0.2	0.006	1.53	0.08
	04/16/19	0.024	10.2	102	55.9	na	na	1.52	0.10
	07/23/19	0.026	10.2	104	56	na	na	1.36	0.13
	10/22/19	0.027	8.8	140	52.6	na	na	1.13	0.12
	01/21/20	0.027	9.5	140	62.9	na	na	1.26	0.12
	04/21/20	0.025	9.7	118	54.7	<0.2	0.003	1.27	0.07
	07/21/20	0.026	9.4	110	55.5	na	na	1.23	0.07
	10/20/20	0.028	8.7	114	52.0	na	na	1.19	0.06
	01/19/21	0.026	8.6	111	50.5	na	na	1.29	0.07
	04/20/21	0.031	9.5	140	53.0	na	na	1.31	0.08
	07/20/21	0.041	12.3	132	61.6	<0.2	0.002	1.34	0.09
	10/19/21	0.049	14.7	136	72.2	na	na	1.34	0.06

TABLE H-12
MONITORING WELL OCWD-M47
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/3 Lower Rho Perforations 580-600 ft bgs	01/24/17	0.045	17.5	206	69.5	<0.2	<0.002	<0.1	0.12
	04/18/17	0.041	16.8	220	65.6	<0.2	<0.002	<0.1	0.18
	07/25/17	0.041	15.2	186	63.4	<0.2	<0.002	<0.1	0.09
	10/17/17	0.037	15.5	216	66.3	<0.2	<0.002	<0.1	0.07
	01/24/18	0.038	14.5	210	65.5	<0.2	<0.002	<0.1	0.06
	04/24/18	0.040	14.6	196	65.6	na	na	<0.1	0.09
	07/24/18	0.055	14.2	208	64.4	na	na	<0.1	0.08
	10/23/18	0.043	14.6	188	65.4	<0.2	<0.002	<0.1	0.09
	01/22/19	0.038	13.6	184	65.1	0.2	<0.002	<0.1	<0.05
	04/16/19	0.035	13.7	176	66.6	na	na	<0.1	0.1
	07/23/19	0.037	13.7	212	66	na	na	<0.1	0.12
	10/22/19	0.037	12.5	210	63.8	na	na	<0.1	0.07
	01/21/20	0.035	13.1	204	69.2	na	na	<0.1	0.16
	04/21/20	0.033	13.1	206	60.8	<0.2	<0.002	<0.1	0.08
	07/21/20	0.035	13.3	208	63.2	na	na	<0.1	0.06
	10/20/20	0.042	12.9	210	62.2	na	na	<0.1	0.01
	01/19/21	0.041	12.6	214	61.8	na	na	<0.1	0.13
	04/20/21	0.04	12.6	234	61.4	<0.2	na	<0.1	0.09
	07/20/21	0.04	12.6	242	61.4	na	0.002	<0.1	0.06
	10/19/21	0.039	12.3	206	61.7	na	na	<0.1	0.07
M47/4 Main Perforations 745-765 ft bgs	01/24/17	0.039	12.5	218	22.2	<0.2	0.003	<0.1	1.03
	04/18/17	0.038	12.9	222	23.3	0.2	0.003	<0.1	0.93
	07/25/17	0.044	12.3	186	21.6	<0.2	<0.002	<0.1	0.87
	10/17/17	0.037	12.8	230	22.8	<0.2	<0.002	<0.1	0.83
	01/24/18	0.037	12.1	224	22.9	0.2	<0.002	<0.1	0.75
	04/24/18	0.038	12.2	228	22.3	na	na	<0.1	0.8
	07/24/18	0.048	12.1	226	23	na	na	<0.1	0.76
	10/23/18	0.043	12.3	194	23	<0.2	0.002	<0.1	0.8
	1/22/19	0.039	12.4	192	23.2	0.2	0.005	<0.1	0.74
	4/16/19	0.038	12.4	194	23.6	na	na	<0.1	0.98
	7/23/19	0.038	12.5	228	23.6	na	na	<0.1	0.91
	10/22/19	0.041	11.3	212	23.7	na	na	<0.1	0.86
	1/21/20	0.038	12.1	206	25.2	na	na	<0.1	0.84
	4/21/20	0.037	12.2	222	22.8	<0.2	0.003	<0.1	0.94
	7/21/20	0.038	12.4	220	23.1	na	na	<0.1	0.82
	10/20/20	0.044	12.3	220	22.7	na	na	<0.1	0.83
	1/19/21	0.043	12.2	223	22.3	na	na	<0.1	0.83
	4/20/21	0.042	12.2	232	22.7	na	na	<0.1	0.77
	7/20/21	0.042	12.3	246	22.6	0.3	0.004	<0.1	0.73
	10/19/21	0.041	12.1	204	22.6	na	na	<0.1	0.73

TABLE H-12
MONITORING WELL OCWD-M47
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
M47/5 Main Perforations 940-960 ft bgs	01/24/17	0.056	12.9	234	11.3	0.3	<0.002	<0.1	2.75
	04/18/17	0.055	13.2	236	10.9	0.4	0.006	<0.1	2.89
	07/25/17	0.059	12.4	204	10.7	0.3	0.005	<0.1	2.76
	10/17/17	0.054	14.7	238	11.2	0.4	0.005	<0.1	2.85
	01/24/18	0.054	12.6	222	11.4	0.4	0.005	<0.1	2.81
	04/24/18	0.057	12.6	226	11.3	na	na	<0.1	2.97
	07/24/18	0.073	12.6	232	11.4	na	na	<0.1	2.2
	10/23/18	0.065	12.8	204	11.6	0.3	0.005	<0.1	2.3
	01/22/19	0.058	12.8	202	11.6	0.3	0.008	<0.1	2.89
	04/16/19	0.056	12.8	200	12	na	na	<0.1	3.24
	07/23/19	0.06	12.9	222	11.9	na	na	<0.1	2.91
	10/22/19	0.06	11.5	238	10.6	na	na	<0.1	2.54
	01/21/20	0.056	12.6	218	12.9	na	na	<0.1	2.7
	04/21/20	0.056	12.6	226	11.6	0.4	0.005	<0.1	3.22
	07/21/20	0.057	12.8	232	11.3	na	na	<0.1	3.34
	10/20/20	0.066	12.7	226	11.2	na	na	<0.1	3.25
	01/19/21	0.064	12.6	231	11.5	na	na	<0.1	3.26
	04/20/21	0.064	12.7	244	11.5	na	na	<0.1	3.49
	07/20/21	0.065	12.6	226	11.6	0.5	0.007	<0.1	3.19
	10/19/21	0.064	12.5	214	11.2	na	na	<0.1	3.19

Note: OCWD-M47 is located approximately 2,250 feet northeast of the nearest injection well site (I-26).

Appendix I

Groundwater Quality Data at the Anaheim Forebay

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

GWRS 2021 Quarterly Sampling Dates
OCWD Water Quality Department
ANAHEIM FOREBAY - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
AM-7/1	03/16/2021	06/22/2021	09/15/2021	12/13/2021
AM-8/1	03/16/2021	06/22/2021	09/15/2021	12/13/2021
AM-10/1	03/16/2021	06/22/2021	09/15/2021	12/13/2021
AMD-10/1-5	02/17/2021	05/18/2021	08/24/2021	11/16/2021
AMD-12/1-5	02/16/2021	05/17/2021	08/23/2021	11/15/2021
OCWD-KB1/1	03/16/2021	06/22/2021	09/15/2021	12/13/2021

Notes for Appendix I Tables:

► Water quality data are summarized for compliance monitoring wells AM-7, AM-8, AM-10, AMD-10, AMD-12, and also a non-compliance monitoring well OCWD-KB1 in the following tables.

► Listed dates (above) are the quarterly compliance monitoring dates; other samples may have been collected during the year. Detections of organic chemicals are reported for all samples collected in 2021 and are not limited to the quarterly compliance samples.

► Results listed in the table for each quarter are the range of the minimum to maximum value detected at the well location, which may consist of one to five well casings. Figures and report text list the well ID (e.g., AMD-10) and casing number (e.g., AMD-10 has five well casings: AMD-10/1, AMD-10/2, AMD-10/3, AMD-10/4 and AMD10/5), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NR: Not required

► NS: Not sampled

► TR: Trace

GWRS 2021 Quarterly Sampling Dates
OCWD Water Quality Department
ANAHEIM FOREBAY - GROUNDWATER

Notes for Appendix I Tables (continued):

► A comprehensive suite of tests covering inorganics, metals, volatile organics (VOCs), synthetic organic compounds (SOCs), radiological and microbial parameters were analyzed at 35 permit-specified groundwater monitoring wells since the commencement of the GWRS treatment facility. In June 2010, OCWD proposed a revised groundwater monitoring frequency from quarterly to annually for selected analytes that have reported no detections. The proposed reduced frequency of testing was (1) based on real-time data for analytes reported as non-detect at the reporting detection limit, (2) supported by two Independent Advisory Panels having oversight for the GWRS project and the Santa Ana River (SARMON) long-term monitoring program, and (3) a condition of the GWRS permit to routinely review data and based on results, to modify the groundwater monitoring program every two years or sooner with approval by the RWQCB and SWRCB DDW (formerly CDPH - July 2014 CDPH moved to the SWRCB with a new name, Division of Drinking Water [DDW]).

The revised monitoring frequency was approved by the RWQCB (3/14/2011) and SWRCB DDW (9/20/2010) and consists of reduction in asbestos, dioxin, selected SOCs, and radionuclides monitoring from quarterly to annually (see Table 1) for monitoring well locations. Julio Lara/RWQCB advised that monitoring for these analytes are not permit required but OCWD voluntarily performed the monitoring. OCWD elected to conduct comprehensive testing at the start-up of GWRS; however, with years of a robust database for these non-compliance targets (asbestos, dioxin, EPA 625), OCWD concurred with the RWQCB and ceased testing for these analytes in January 2014. Samples may have been collected for other analytes (cyanide, some radionuclides, etc.) but consensus is to cease testing and use resources more effectively in the future. Comprehensive testing was performed during the first quarter 2011 and served as the "annual comprehensive testing" and "initial anchor date." Future "annual comprehensive testing" rotated sequentially through the quarters (e.g., 2Q2012, 3Q2013, 4Q2014, etc.).

Table 1

Talbert Barrier and Forebay Area GWRS Groundwater Monitoring Well Approved Revised Monitoring Program[1] Inorganic, Organic, and Radiological Analytes

Q - Year	Comprehensive	Reduced[3,4,5,6]	Q - Year	Comprehensive	Reduced[3,4,5,6]
Q1 - 2018		x	Q1 - 2021		x
Q2 - 2018		x	Q2 - 2021		x
Q3 - 2018		x	Q3 - 2021	x	
Q4 - 2018	x		Q4 - 2021		x
Q1 - 2019	x		Q1 - 2022		x
Q2 - 2019		x	Q2 - 2022		x
Q3 - 2019		x	Q3 - 2022		x
Q4 - 2019		x	Q4 - 2022	x	
Q1 - 2020		x	Q1 - 2023	x	
Q2 - 2020	x		Q2 - 2023		x
Q3 - 2020		x	Q3 - 2023		x
Q4 - 2020		x	Q4 - 2023		x

[1]Approved RWQCB (03/14/2011) and CDPH (09/20/10)

[2]Comprehensive: OCWD voluntarily screens for inorganic and organic analytes and radionuclides beyond the permit specific analytes

[3]Reduced: Annual asbestos, cyanide, selected SOC's, EPA 625, and radionuclides

[4]GWRS IAP Meeting 08/27/13: Panel Concurs to cease monitoring for asbestos and dioxin based on years of non-detections

[5]Reduced: Annual cyanide, selected SOC's and radionuclide

[6]GWRS IAP Meeting 08/29/17: Panel concurs to reduce select inorganic and organic monitoring. In addition, Panel concurs to cease select inorganic and organic voluntary monitoring.

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-7 Qtr 1	AM-7 Qtr 2	AM-7 Qtr 3	AM-7 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	46.6	9.3	3.6	3.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.4	1.6	1.5	2.3
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.1	1.1	1.1	1.7
Barium (Ba), ug/L	OCWD	1000	53.5	49.5	46.8	49.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.1	0.11	0.11	0.13
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	2.6	2.4	2.4	2.4
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.46	1.2	1.71	1.87
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.007	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	0.25	0.7	0.7	0.6
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	3	3	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	693	713	620	716
Iron (Fe), ug/L	OCWD	300	764	309	180	433
Manganese (Mn), ug/L	OCWD	50	11.8	12.1	7.3	8.4
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	9.2	12.9	6.6	6.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	1	8	4
Total Dissolved Solids (TDS), mg/L	OCWD	500	420	408	324	388
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	2.4	1.8	1.1	1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	2.1	1.8	1.4	1.7
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.18	0.17	0.2	0.21
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2.6	Not Reported	3	2.9
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	**Description**	**Lab**	**AM-7 Qtr 1**	**AM-7 Qtr 2**	**AM-7 Qtr 3**	**AM-7 Qtr 4**
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

AM-7/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2021	9:05	Chloroform (CHCl3)	TR	ug/L	0.5
3/16/2021	9:05	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
6/22/2021	11:35	Chloroform (CHCl3)	0.7	ug/L	0.5
6/22/2021	11:35	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
9/15/2021	10:35	Chloroform (CHCl3)	0.7	ug/L	0.5
9/15/2021	10:35	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
9/15/2021	10:35	Atrazine (ATRAZ)	0.001	ug/L	0.001
9/15/2021	10:35	Carbamazepine (CBMAZP)	27.8	ng/L	1
9/15/2021	10:35	Dilantin (DILANT)	13	ng/L	10
9/15/2021	10:35	Diuron (DIURON)	0.006	ug/L	0.005
9/15/2021	10:35	Primidone (PRIMDN)	35.9	ng/L	1
9/15/2021	10:35	Simazine (SIMAZ)	0.014	ug/L	0.005
9/15/2021	10:35	Sucralose (SUCRAL)	7810	ng/L	100
9/15/2021	10:35	Sulfamethoxazole (SULTHZ)	35.1	ng/L	1

AM-7/1

Organic Detections by Method

Year 2021, Quarter 4

METHOD:* *524.2

Sample Date &	*Time*	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
12/13/2021	10:45	Chloroform (CHCl3)	0.6	ug/L	0.5
12/13/2021	10:45	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-8 Qtr 1	AM-8 Qtr 2	AM-8 Qtr 3	AM-8 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	1.7	1.5	ND	ND
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	ND	1.3
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	38.9	51.5	65.8	48.1
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	1.1	ND	ND
Fluoride (F), mg/L	OCWD	2	0.2	0.17	0.16	0.18
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.3	1.8	2.4	1.9
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.15	1.12	1.27	1.33
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.022	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.2	0.7	1	0.6
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	3	5	3	3
Electrical Conductivity (EC), uS/cm	OCWD	900	471	645	695	611
Iron (Fe), ug/L	OCWD	300	1340	1140	878	617
Manganese (Mn), ug/L	OCWD	50	32.4	22.4	13.6	10.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	10.2	14.6	11	8.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	4	4	4
Total Dissolved Solids (TDS), mg/L	OCWD	500	284	362	382	338
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	2.9	2.6	1.7	1.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	1.3	1.2	1.1
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.16	0.17	0.18	0.17
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2.3	Not Reported	2.1	2.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AM-8 Qtr 1	AM-8 Qtr 2	AM-8 Qtr 3	AM-8 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

AM-8/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/16/2021	10:15	Chloroform (CHCl3)	1.2	ug/L	0.5
3/16/2021	10:15	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

Year 2021, Quarter 2

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/22/2021	11:00	Chloroform (CHCl3)	0.7	ug/L	0.5
6/22/2021	11:00	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2021, Quarter 3

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	9:50	Chloroform (CHCl3)	1	ug/L	0.5
9/15/2021	9:50	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	9:50	Atrazine (ATRAZ)	0.001	ug/L	0.001
9/15/2021	9:50	Carbamazepine (CBMAZP)	22.9	ng/L	1
9/15/2021	9:50	Dilantin (DILANT)	13.4	ng/L	10
9/15/2021	9:50	Primidone (PRIMDN)	31.1	ng/L	1
9/15/2021	9:50	Simazine (SIMAZ)	0.016	ug/L	0.005
9/15/2021	9:50	Sucralose (SUCRAL)	6960	ng/L	100
9/15/2021	9:50	Sulfamethoxazole (SULTHZ)	30.7	ng/L	1

Year 2021, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/13/2021	10:00	Chloroform (CHCl3)	0.6	ug/L	0.5

AM-8/1
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
12/13/2021 10:00	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AM-10 Qtr 1	AM-10 Qtr 2	AM-10 Qtr 3	AM-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	45.9	5.6	12.6	1.1
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	1.2	ND	1.1
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.2	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	8.8	7.9	11.9	20.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.15	0.13	0.11	ND
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	0.25
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.05	0.91	1.2	1.62
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.003	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.7	0.9	0.7	0.7
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	102	107	132	258
Iron (Fe), ug/L	OCWD	300	345	370	295	84.6
Manganese (Mn), ug/L	OCWD	50	8	5.6	7.4	3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	2.3	2	3.1	2.8
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	79	69	83	149
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	1.2	0.4	0.53	0.4
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.22	0.2	0.22	0.24
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	3.3	Not Reported	3.1	2.4
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AM-10 Qtr 1	AM-10 Qtr 2	AM-10 Qtr 3	AM-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

AM-10/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/16/2021	10:55	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
3/16/2021	10:55	Chloroform (CHCl3)	1.1	ug/L	0.5
3/16/2021	10:55	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/22/2021	9:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
6/22/2021	9:40	Chloroform (CHCl3)	0.9	ug/L	0.5
6/22/2021	9:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	11:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/15/2021	11:30	Chloroform (CHCl3)	0.7	ug/L	0.5
9/15/2021	11:30	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	11:30	Simazine (SIMAZ)	0.005	ug/L	0.005

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/13/2021	9:00	Chloroform (CHCl3)	0.7	ug/L	0.5
12/13/2021	9:00	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AMD-10 Qtr 1	AMD-10 Qtr 2	AMD-10 Qtr 3	AMD-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 1.7	ND - 5.2	ND - 9.9	ND - 5.7
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 1.6	ND	ND - 1.6	ND - 3.3
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND - 1.3	ND	ND - 1.6	1.2 - 3.9
Barium (Ba), ug/L	OCWD	1000	41.2 - 78.7	35.6 - 82.2	16.2 - 92.2	8.2 - 85.5
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND - 3.4	ND - 3.5	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.49	ND - 0.5	ND - 0.51	0.11 - 0.48
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.6 - 3.5	1.6 - 9.7	ND - 7.2	ND - 2.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.3 - 1.25	0.3 - 1.19	0.4 - 1.13	0.54 - 1.37
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.014 - 0.118	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND - 1.3
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 0.7	ND - 0.6	ND - 0.7	ND - 1.2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 10	ND - 20	ND - 30	ND - 20
Electrical Conductivity (EC), uS/cm	OCWD	900	482 - 864	416 - 879	242 - 932	151 - 964
Iron (Fe), ug/L	OCWD	300	86.7 - 833	57 - 1040	125 - 1300	214 - 1220
Manganese (Mn), ug/L	OCWD	50	13.5 - 45.6	12.4 - 71.7	7.2 - 56.2	3.2 - 48.5
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	10.3 - 40.6	9.4 - 76.6	3.1 - 55.8	1.9 - 49.3
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 32	1 - 4	ND - 2	ND - 2
Total Dissolved Solids (TDS), mg/L	OCWD	500	297 - 550	166 - 542	120 - 552	62 - 550
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.3 - 2.8	0.3 - 4.3	0.4 - 9.1	0.25 - 3.3
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND - 1.5	ND - 1.4	ND - 1
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.14 - 0.23	0.13 - 0.21	0.12 - 0.22	0.13 - 0.27
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 1.4	ND - 2.9	ND - 2.3	ND - 3.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AMD-10 Qtr 1	AMD-10 Qtr 2	AMD-10 Qtr 3	AMD-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

AMD-10/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/17/2021	9:30	Chloroform (CHCl3)	TR	ug/L	0.5
2/17/2021	9:30	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/18/2021	10:10	Chloroform (CHCl3)	0.6	ug/L	0.5
5/18/2021	10:10	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/24/2021	10:30	Chloroform (CHCl3)	0.7	ug/L	0.5
8/24/2021	10:30	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/24/2021	10:30	Carbamazepine (CBMAZP)	4.1	ng/L	1
8/24/2021	10:30	Primidone (PRIMDN)	6.7	ng/L	1
8/24/2021	10:30	Simazine (SIMAZ)	0.008	ug/L	0.005
8/24/2021	10:30	Sucralose (SUCRAL)	914	ng/L	100
8/24/2021	10:30	Sulfamethoxazole (SULTHZ)	7.7	ng/L	1

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/16/2021	9:40	Chloroform (CHCl3)	1.2	ug/L	0.5
11/16/2021	9:40	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

AMD-10/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/17/2021	10:25	Chloroform (CHCl3)	0.7	ug/L	0.5
2/17/2021	10:25	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2021	11:25	Chloroform (CHCl3)	TR	ug/L	0.5
5/18/2021	11:25	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/24/2021	13:30	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/24/2021	13:30	Carbamazepine (CBMAZP)	39	ng/L	1
8/24/2021	13:30	Dilantin (DILANT)	19.5	ng/L	10
8/24/2021	13:30	Primidone (PRIMDN)	46.7	ng/L	1
8/24/2021	13:30	Simazine (SIMAZ)	0.023	ug/L	0.005
8/24/2021	13:30	Sucralose (SUCRAL)	17700	ng/L	1000
8/24/2021	13:30	Sulfamethoxazole (SULTHZ)	34.6	ng/L	1

Year 2021, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/16/2021	12:05	Chloroform (CHCl3)	TR	ug/L	0.5
11/16/2021	12:05	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

AMD-10/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/17/2021	11:35	Chloroform (CHCl3)	TR	ug/L	0.5
2/17/2021	11:35	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/18/2021	12:40	Chloroform (CHCl3)	TR	ug/L	0.5
5/18/2021	12:40	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/24/2021	12:50	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/24/2021	12:50	Carbamazepine (CBMAZP)	38.9	ng/L	1
8/24/2021	12:50	Dilantin (DILANT)	15.1	ng/L	10
8/24/2021	12:50	Primidone (PRIMDN)	42.8	ng/L	1
8/24/2021	12:50	Simazine (SIMAZ)	0.017	ug/L	0.005
8/24/2021	12:50	Sucralose (SUCRAL)	13400	ng/L	1000
8/24/2021	12:50	Sulfamethoxazole (SULTHZ)	32.3	ng/L	1

AMD-10/4

Organic Detections by Method

Year 2021, Quarter 3

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/24/2021	12:20	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/24/2021	12:20	Carbamazepine (CBMAZP)	16.4	ng/L	1
8/24/2021	12:20	Primidone (PRIMDN)	22.9	ng/L	1
8/24/2021	12:20	Simazine (SIMAZ)	0.022	ug/L	0.005
8/24/2021	12:20	Sucralose (SUCRAL)	3750	ng/L	100
8/24/2021	12:20	Sulfamethoxazole (SULTHZ)	24	ng/L	1

AMD-10/5
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/17/2021	10:35	Chloroform (CHCl3)	0.5	ug/L	0.5
2/17/2021	10:35	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2021	11:15	Chloroform (CHCl3)	0.6	ug/L	0.5
5/18/2021	11:15	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/24/2021	11:35	Chloroform (CHCl3)	0.6	ug/L	0.5
8/24/2021	11:35	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/24/2021	11:35	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/24/2021	11:35	Carbamazepine (CBMAZP)	2	ng/L	1
8/24/2021	11:35	Primidone (PRIMDN)	4.9	ng/L	1
8/24/2021	11:35	Simazine (SIMAZ)	0.033	ug/L	0.005
8/24/2021	11:35	Sucralose (SUCRAL)	216	ng/L	100
8/24/2021	11:35	Sulfamethoxazole (SULTHZ)	11.1	ng/L	1

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/16/2021	10:50	Chloroform (CHCl3)	0.5	ug/L	0.5
11/16/2021	10:50	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

AMD-10/5
Organic Detections by Method

Year 2021, Quarter 4

METHOD: ***524.2***

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	AMD-12 Qtr 1	AMD-12 Qtr 2	AMD-12 Qtr 3	AMD-12 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	ND - 1.6	ND	ND - 1.3	ND - 1.5
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 1.3	ND - 1.3	ND - 1.7	ND - 3.1
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND - 1.5	ND - 1.2	ND - 1.6	1.1 - 3.7
Barium (Ba), ug/L	OCWD	1000	24.8 - 67.5	30.9 - 70.5	40 - 74.1	15.1 - 68.7
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND - 2.1	ND - 2.3	ND - 1.2
Fluoride (F), mg/L	OCWD	2	ND - 0.55	ND - 0.52	0.1 - 0.54	0.11 - 0.5
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.21	ND - 0.4	ND - 0.28	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.9 - 8.3	1.9 - 7.7	2.7 - 9.5	1.5 - 6.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.49 - 1.48	0.63 - 1.31	0.73 - 1.35	0.78 - 1.32
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND - 0.002	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 0.7	ND - 0.6	ND - 0.6	ND - 0.8
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	321 - 848	368 - 855	485 - 829	242 - 820
Iron (Fe), ug/L	OCWD	300	ND - 11.2	ND - 7.4	ND - 10.4	ND - 16.2
Manganese (Mn), ug/L	OCWD	50	ND - 1.2	ND	ND - 1.4	ND - 1.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 1.2	ND	ND - 1.3	ND - 1.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	188 - 533	214 - 542	260 - 516	112 - 434
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND	ND	ND - 0.11	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.4	ND - 1.5	ND - 1.4	ND - 1.4
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.17 - 0.23	0.17 - 0.24	0.17 - 0.24	0.16 - 0.2
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	2 - 3.4	1.7 - 3.7	2.4 - 3.9	2.4 - 4.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeclkLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	AMD-12 Qtr 1	AMD-12 Qtr 2	AMD-12 Qtr 3	AMD-12 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

AMD-12/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2021	10:20	Chloroform (CHCl3)	0.5	ug/L	0.5
2/16/2021	10:20	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/17/2021	10:35	Chloroform (CHCl3)	TR	ug/L	0.5
5/17/2021	10:35	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	9:50	Chloroform (CHCl3)	0.6	ug/L	0.5
8/23/2021	9:50	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	9:50	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/23/2021	9:50	Caffeine (CAFFEI)	4.4	ng/L	3
8/23/2021	9:50	Carbamazepine (CBMAZP)	14	ng/L	1
8/23/2021	9:50	Primidone (PRIMDN)	19.7	ng/L	1
8/23/2021	9:50	Simazine (SIMAZ)	0.014	ug/L	0.005
8/23/2021	9:50	Sucralose (SUCRAL)	2620	ng/L	100
8/23/2021	9:50	Sulfamethoxazole (SULTHZ)	20.6	ng/L	1

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2021	9:55	Chloroform (CHCl3)	0.8	ug/L	0.5

AMD-12/1

Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/15/2021	9:55	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

AMD-12/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2021	11:05	Chloroform (CHCl3)	0.7	ug/L	0.5
2/16/2021	11:05	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/17/2021	11:25	Chloroform (CHCl3)	0.6	ug/L	0.5
5/17/2021	11:25	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	10:50	Chloroform (CHCl3)	TR	ug/L	0.5
8/23/2021	10:50	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	10:50	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/23/2021	10:50	Carbamazepine (CBMAZP)	13.4	ng/L	1
8/23/2021	10:50	Dilantin (DILANT)	11.2	ng/L	10
8/23/2021	10:50	Primidone (PRIMDN)	24.6	ng/L	1
8/23/2021	10:50	Simazine (SIMAZ)	0.011	ug/L	0.005
8/23/2021	10:50	Sucralose (SUCRAL)	3390	ng/L	100
8/23/2021	10:50	Sulfamethoxazole (SULTHZ)	25.4	ng/L	1

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/15/2021	11:20	Chloroform (CHCl3)	TR	ug/L	0.5

AMD-12/2
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/15/2021 11:20	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

AMD-12/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/16/2021	12:00	Chloroform (CHCl3)	0.5	ug/L	0.5
2/16/2021	12:00	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/17/2021	12:50	Chloroform (CHCl3)	0.5	ug/L	0.5
5/17/2021	12:50	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	11:50	Chloroform (CHCl3)	TR	ug/L	0.5
8/23/2021	11:50	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	11:50	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/23/2021	11:50	Carbamazepine (CBMAZP)	19.3	ng/L	1
8/23/2021	11:50	Dilantin (DILANT)	14.2	ng/L	10
8/23/2021	11:50	Primidone (PRIMDN)	27.4	ng/L	1
8/23/2021	11:50	Simazine (SIMAZ)	0.014	ug/L	0.005
8/23/2021	11:50	Sucralose (SUCRAL)	5640	ng/L	500
8/23/2021	11:50	Sulfamethoxazole (SULTHZ)	33.6	ng/L	1

AMD-12/4
Organic Detections by Method

Year 2021, Quarter 3

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/23/2021	11:40	Atrazine (ATRAZ)	0.001	ug/L	0.001
8/23/2021	11:40	Carbamazepine (CBMAZP)	14.4	ng/L	1
8/23/2021	11:40	Dilantin (DILANT)	10.4	ng/L	10
8/23/2021	11:40	Diuron (DIURON)	0.008	ug/L	0.005
8/23/2021	11:40	Primidone (PRIMDN)	22.4	ng/L	1
8/23/2021	11:40	Simazine (SIMAZ)	0.025	ug/L	0.005
8/23/2021	11:40	Sucralose (SUCRAL)	3270	ng/L	100
8/23/2021	11:40	Sulfamethoxazole (SULTHZ)	31.3	ng/L	1

AMD-12/5
Organic Detections by Method

Year 2021, Quarter 3

METHOD: ***CEC***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/23/2021	10:30	Atrazine (ATRAZ)	0.003	ug/L	0.001
8/23/2021	10:30	Carbamazepine (CBMAZP)	12.5	ng/L	1
8/23/2021	10:30	Primidone (PRIMDN)	13.9	ng/L	1
8/23/2021	10:30	Simazine (SIMAZ)	0.066	ug/L	0.005
8/23/2021	10:30	Sucralose (SUCRAL)	2750	ng/L	100
8/23/2021	10:30	Sulfamethoxazole (SULTHZ)	22	ng/L	1

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	OCWD-KB1 Qtr 1	OCWD-KB1 Qtr 2	OCWD-KB1 Qtr 3	OCWD-KB1 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	3.6	5.2	59.2	3.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	1.6	3.3	1.2
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND	1.6	3.4	1
Barium (Ba), ug/L	OCWD	1000	54.1	7.9	4.2	62.2
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.12	0.32	0.66	0.18
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	0.08	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	4	ND	ND	2.2
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	2.41	1.11	1.33	0.31
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	1.9
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	1.1	1	1.1	2.8
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	3	3	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	877	230	120	927
Iron (Fe), ug/L	OCWD	300	ND	ND	28.5	6.2
Manganese (Mn), ug/L	OCWD	50	ND	ND	ND	ND
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	1	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	531	138	87	552
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND	0.2	0.74	0.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	4.5	2	ND	1.4
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.23	0.26	0.28	0.12
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	1.3	Not Reported	7.1	2.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	OCWD-KB1 Qtr 1	OCWD-KB1 Qtr 2	OCWD-KB1 Qtr 3	OCWD-KB1 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	Not Required	ND	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	Not Required	ND	Not Required
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detections	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	Not Required	ND	Not Required

OCWD-KB1/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/16/2021	11:35	Chloroform (CHCl3)	1.1	ug/L	0.5
3/16/2021	11:35	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/22/2021	12:10	Chloroform (CHCl3)	1	ug/L	0.5
6/22/2021	12:10	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	12:30	Chloroform (CHCl3)	1.1	ug/L	0.5
9/15/2021	12:30	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/15/2021	12:30	Sulfamethoxazole (SULTHZ)	1.1	ng/L	1

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/13/2021	11:30	Chloroform (CHCl3)	2.8	ug/L	0.5
12/13/2021	11:30	Total Trihalomethanes (TTHMs)	2.8	ug/L	0.5

Appendix J

Anaheim Forebay Monitoring Well
Groundwater Quality
1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

TABLE J-1
OCWD MONITORING WELL AM-7
1,4-dioxane and NDMA
Concentrations
2017 - 2021

AM-7/1 *Shallow Aquifer* *Perforations: 210-225 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/23/2017	<1	<2
5/17/2017	<1	<2
8/23/2017	<1	<2
11/7/2018	<1	<2
2/20/2019	<1	<2
1/28/2020	<1	na
3/17/2020	<1	na
6/16/2020	<1	<2
9/15/2021	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-2
OCWD MONITORING WELL AM-8
Concentrations
2017 - 2021

AM-8/1 *Shallow Aquifer* *Perforations: 268-285 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/23/2017	<1	<2
5/17/2017	<1	<2
8/23/2017	<1	<2
11/7/2018	<1	<2
2/20/2019	<1	<2
3/17/2020	<1	na
6/16/2020	<1	<2
9/15/2021	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-3
OCWD MONITORING WELL AMD-10
1,4-dioxane and NDMA Concentrations
2017 - 2021

AMD-10/1 *Principal Aquifer* *Perforations: 292-312 ft bgs*			**AMD-10/2** *Principal Aquifer* *Perforations: 440-460 ft bgs*			**AMD-10/3** *Principal Aquifer* *Perforations: 550-570 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/08/17	<1	<2	02/08/17	<1	<2	02/08/17	<1	<2
05/03/17	<1	<2	05/03/17	<1	<2	05/03/17	<1	<2
08/09/17	<1	<2	08/09/17	<1	<2	08/09/17	<1	<2
04/16/18	<1	na	04/16/18	<1	na	04/16/18	na	na
11/05/18	<1	<2	11/05/18	<1	<2	11/05/18	<1	<2
02/04/19	<1	na	02/04/19	<1	na	02/04/19	<1	na
05/08/19	na	<2	05/08/19	na	<2	05/08/19	na	<2
05/19/20	<1	<2	05/19/20	<1	<2	05/19/20	<1	<2
08/24/21	<0.5	<2	08/24/21	<0.5	<2	08/24/21	<0.5	<2

AMD-10/4 *Principal Aquifer* *Perforations: 774-794 ft bgs*			**AMD-10/5** *Principal Aquifer* *Perforations: 934-954 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/08/17	<1	<2	02/08/17	<1	<2
05/03/17	<1	<2	05/03/17	<1	<2
08/09/17	<1	<2	08/09/17	<1	<2
04/16/18	na	na	04/16/18	na	na
11/05/18	<1	<2	11/05/18	<1	<2
02/04/19	<1	na	02/04/19	<1	na
05/08/19	na	<2	05/08/19	na	<2
05/19/20	<1	<2	05/19/20	<1	<2
08/24/21	<0.5	<2	08/24/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-4
OCWD MONITORING WELL AMD-12
1,4-dioxane and NDMA Concentrations
2017 - 2021

AMD-12/1
Principal Aquifer
Perforations: 330-350 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/22/17	<1	<2
05/16/17	<1	<2
08/22/17	<1	<2
11/06/18	<1	<2
02/19/19	<1	<2
05/18/20	<1	<2
08/23/21	<0.5	<2

AMD-12/2
Principal Aquifer
Perforations: 490-520 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/22/2017	<1	<2
5/16/2017	<1	<2
8/22/2017	<1	<2
11/06/18	<1	<2
02/19/19	<1	<2
05/18/20	<1	<2
08/23/21	<0.5	<2

AMD-12/3
Principal Aquifer
Perforations: 595-615 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/22/2017	<1	<2
5/16/2017	<1	<2
8/22/2017	<1	<2
11/06/18	<1	<2
02/19/19	<1	<2
05/18/20	<1	<2
08/23/21	<0.5	<2

AMD-12/4
Principal Aquifer
Perforations: 725-745 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/22/17	<1	<2
05/16/17	<1	<2
08/22/17	<1	<2
11/06/18	<1	<2
02/19/19	<1	<2
05/18/20	<1	<2
08/23/21	<0.5	<2

AMD-12/5
Principal Aquifer
Perforations: 940-960 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/22/17	<1	<2
05/16/17	<1	<2
08/22/17	<1	<2
11/06/18	<1	<2
02/19/19	<1	<2
05/18/20	<1	<2
08/23/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-5
OCWD MONITORING WELL AM-10
1,4-dioxane and NDMA
Concentrations
2017 - 2021

AM-10/1 *Shallow Aquifer* *Perforations: 217-235 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
03/07/17	<1	<2
06/13/17	<1	<2
11/14/17	<1	<2
11/07/18	<1	<2
02/20/19	<1	<2
03/17/20	<1	na
06/16/20	<1	<2
09/15/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-6
OCWD MONITORING WELL KB1
1,4-dioxane and NDMA
Concentrations
2017 - 2021

KB1 *Shallow Aquifer* *Perforations: 180-200 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/08/17	<1	<2
05/03/17	<1	<2
08/09/17	<1	<2
11/05/18	<1	<2
02/04/19	<1	na
05/06/19	na	<2
03/17/20	<1	na
06/16/20	<1	<2
09/15/21	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-7
OCWD MONITORING WELL AM-7
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-7/1 Shallow Perforations 210-225 ft bgs	02/23/17	0.017	9.7	92	26.2	<0.2	0.004	1.78	0.18
	04/11/17	na	57.8	290	na	na	0.005	1.47	0.64
	05/17/17	0.074	54.3	320	165	<0.2	0.004	1.58	0.73
	06/20/17	na	54.7	314	na	na	0.005	1.73	1.11
	08/23/17	0.073	37.7	208	132	<0.2	0.004	0.95	0.88
	10/03/17	na	28.1	178	na	na	0.003	0.46	0.75
	11/15/17	0.026	32.5	208	97.4	<0.2	0.003	0.46	0.54
	12/13/17	na	30.7	134	na	na	0.003	0.24	0.69
	02/21/18	0.064	42.5	240	136	<0.2	0.004	0.51	0.48
	04/18/18	na	29.9	184	na	na	0.004	0.66	0.31
	05/21/18	0.189	32.8	202	106	na	na	0.64	0.32
	06/14/18	na	53.9	330	na	na	0.003	0.52	0.38
	08/22/18	0.081	46.4	282	150	na	na	0.64	0.35
	10/17/18	na	88.4	564	na	na	0.003	0.27	0.66
	11/07/18	0.065	89.6	570	303	<0.2	0.004	0.26	0.68
	12/11/18	na	81.4	548	na	na	0.006	0.25	0.66
	02/20/19	0.056	75.0	460	252	<0.2	0.005	0.36	0.54
	04/11/19	na	58.7	400	na	na	0.006	0.51	0.45
	05/21/19	0.045	56.4	372	184	na	na	0.57	0.43
	06/11/19	na	36.8	268	na	na	0.004	0.72	0.29
	07/15/19	na	29.3	218	na	na	0.003	0.71	0.25
	08/19/19	0.042	47.2	322	166	na	na	0.7	0.37
	11/26/19	0.019	54.6	328	135	na	na	0.96	0.4
	01/28/20	na	42.2	296	na	na	0.005	0.7	0.36
	03/17/20	0.067	52.8	332	144	na	na	0.63	0.4
	05/20/20	na	67.0	366	na	na	0.004	0.9	0.52
	06/16/20	0.119	71.4	396	174	<0.2	0.004	1.04	0.59
	07/28/20	na	83.4	440	na	na	0.007	1.5	0.8
	09/16/20	0.137	82.6	440	221	na	na	1.62	0.86
	10/27/20	na	69.8	392	na	na	0.007	1.38	0.65
	12/15/20	0.113	66.6	346	158	na	na	1.35	0.66
	03/16/21	0.146	78.0	420	202	na	na	1.46	0.78
	06/22/21	0.131	79.6	408	197	na	na	1.2	0.79
	09/15/21	0.1	64.7	324	175	<0.2	0.007	1.71	0.55
	12/13/21	0.117	80.9	388	215	na	na	1.87	0.61

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-8
OCWD MONITORING WELL AM-8
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-8/1 Shallow Perforations 268-285 ft bgs	02/23/17	0.022	14.7	142	41.9	<0.2	0.013	1.64	0.16
	04/11/17	na	16.6	140	na	na	0.011	1.59	0.15
	05/17/17	0.03	23	166	50.6	<0.2	0.01	1.57	0.62
	06/20/17	na	28.2	184	na	na	0.01	1.58	0.26
	08/23/17	0.046	32.6	222	78.8	<0.2	0.014	1.56	0.36
	10/03/17	na	28.8	156	na	na	0.014	1.37	0.33
	11/14/17	0.048	28.2	168	74.4	<0.2	0.014	1.22	0.32
	12/13/17	na	27.8	180	na	na	0.014	1.16	0.33
	02/21/18	0.046	28.0	150	75.6	<0.2	0.017	1.01	0.34
	04/18/18	na	42.9	228	na	na	0.018	0.78	0.54
	05/21/18	0.078	46.0	256	114	na	na	0.86	0.38
	06/14/18	na	45.6	272	na	na	0.015	0.89	0.39
	08/22/18	0.068	39.6	240	109	na	na	0.99	0.36
	10/17/18	na	41.8	252	na	na	0.02	0.83	0.38
	11/07/18	0.075	42.2	214	114	<0.2	0.017	0.70	0.37
	12/11/18	na	43.3	276	na	na	0.017	0.51	0.52
	02/20/19	0.068	64.0	376	219	<0.2	0.016	0.35	0.42
	04/10/19	na	69.0	446	na	na	0.022	0.36	0.52
	05/21/19	0.062	61.4	390	212	na	na	0.41	0.49
	08/19/19	0.073	59.8	356	179	na	na	0.65	0.45
	11/19/19	0.054	50.7	334	156	na	na	0.62	0.32
	03/17/20	0.07	73.0	454	241	na	na	0.46	0.46
	06/16/20	0.101	69.0	434	224	<0.2	0.01	0.53	0.43
	09/16/20	0.106	85.4	478	254	na	na	0.96	0.47
	12/15/20	0.109	70.3	388	201	na	na	1.07	0.48
	03/16/21	0.076	43.4	284	126	na	na	1.15	0.32
	06/22/21	0.119	73.7	362	180	na	na	1.12	0.51
	09/15/21	0.123	77.0	382	202	<0.2	0.022	1.27	0.68
	12/13/21	0.109	68.7	338	177	na	na	1.33	0.5

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-9
OCWD MONITORING WELL AMD-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-10/1 Principal Perforations 292-312 ft bgs	02/08/17	0.016	11.2	96	24.9	<0.2	0.023	1.62	0.1
	04/10/17	na	46.4	250	na	na	0.021	1.43	0.45
	05/03/17	0.047	33.3	210	85.2	<0.2	0.023	1.47	0.38
	06/21/17	na	7.2	87.5	na	na	0.017	1.21	0.09
	08/09/17	0.026	10.2	88	31.7	<0.2	0.016	1.02	0.15
	10/24/17	na	32.3	178	na	na	0.006	0.31	0.42
	11/01/17	0.061	36.6	202	110	<0.2	0.005	0.29	0.44
	12/13/17	na	64.2	382	na	na	0.008	0.4	0.48
	02/07/18	0.017	10.2	118	49.8	<0.2	0.016	1.17	0.15
	04/16/18	na	4.8	50	na	na	0.017	0.95	0.06
	05/08/18	0.016	4.7	64	23.2	na	na	0.92	0.1
	06/11/18	na	33.6	196	na	na	0.017	0.74	0.24
	08/08/18	0.062	88.8	598	361	na	na	0.281	0.69
	10/15/18	na	88.1	562	na	na	0.004	0.31	0.64
	11/05/18	0.070	90	588	297	<0.2	0.005	0.27	0.7
	12/11/18	na	86.7	588	na	na	0.006	0.17	0.7
	02/04/19	0.037	46	330	144	<0.2	0.009	0.74	0.3
	04/10/19	na	6.8	80	na	na	0.013	0.94	0.11
	05/08/19	0.016	6.5	84	17.6	na	na	0.91	0.09
	06/11/19	na	9.8	82.5	na	na	0.013	0.92	0.12
	07/15/19	na	17.1	96	na	na	0.013	0.86	0.15
	08/07/19	0.040	26.5	126	46.7	na	na	1.05	0.19
	11/04/19	0.041	48.6	286	124	na	na	0.62	0.37
	01/13/20	na	18.6	173	na	na	0.015	1	0.16
	02/19/20	0.018	8.4	100	34.2	na	na	0.99	0.07
	04/07/20	na	13.3	108	na	na	0.017	0.97	0.09
	05/19/20	0.052	34.6	210	107	<0.2	0.019	1.16	0.24
	07/15/20	na	25	178	na	na	0.018	1.19	0.24
	08/19/20	0.066	39.3	236	120	na	na	1.26	0.24
	11/02/20	na	67.3	382	na	na	0.021	1.51	0.47
	11/18/20	0.119	73.7	402	234	na	na	1.47	0.47
	02/17/21	0.158	87.7	444	287	na	na	1.11	0.49
	05/18/21	0.054	29.9	166	128	na	na	0.98	0.49
	08/24/21	0.034	18.9	120	60.2	<0.2	0.014	1.13	0.49
	11/16/21	0.015	8.2	62	31.2	na	na	1.37	0.49

TABLE J-9
OCWD MONITORING WELL AMD-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-10/2 Principal Perforations 440-460 ft bgs	02/08/17	0.021	16.9	154	64.3	<0.2	0.068	1.55	0.13
	04/10/17	na	20.5	162	na	na	0.041	1.61	0.14
	05/03/17	0.023	21.8	168	75	<0.2	0.061	1.5	0.17
	06/21/17	na	32.2	178	na	na	0.054	1.35	0.22
	08/09/17	0.061	25.5	188	91.4	<0.2	0.084	1.25	0.18
	10/24/17	na	11.6	126	na	na	0.045	1.26	0.12
	11/01/17	0.018	11.3	113	49.3	<0.2	0.04	1.28	0.20
	12/13/17	na	8.4	95	na	na	0.038	1.33	0.08
	02/07/18	0.021	10.2	92	36.6	<0.2	0.042	1.21	0.13
	04/16/18	na	16.6	124	na	na	0.049	1.01	0.15
	05/08/18	0.032	17.4	122	54.8	na	na	1.05	0.15
	06/11/18	na	15.9	140	na	na	0.045	1.03	0.13
	08/08/18	0.012	6.0	110	32.9	na	na	0.95	0.08
	10/15/18	na	35.2	196	na	na	0.034	0.81	0.24
	11/05/18	0.054	56.2	334	183	<0.2	0.038	0.61	0.38
	12/11/18	na	62.7	432	na	na	0.049	0.51	0.46
	02/04/19	0.045	51.5	366	205	<0.2	0.042	0.78	0.32
	04/10/19	na	59.6	382	na	na	0.046	0.64	0.4
	05/08/19	0.047	55.5	390	229	na	na	0.7	0.36
	06/11/19	na	40.8	342	na	na	0.04	0.87	0.28
	07/15/19	na	34.0	258	na	na	0.043	0.84	0.22
	08/07/19	0.035	32.6	234	151	na	na	0.93	0.2
	11/04/19	0.021	10.9	132	57.2	na	na	0.92	0.1
	01/13/20	na	32.8	194	na	na	1.18	1.18	0.2
	02/19/20	0.033	22.0	194	96.3	na	na	1.13	0.13
	04/07/20	na	21.1	158	na	na	0.038	0.96	0.14
	05/19/20	0.032	20.9	178	86.1	<0.2	0.046	1.07	0.14
	07/15/20	na	19.2	144	na	na	0.038	0.99	0.12
	08/19/20	0.040	25.1	166	83.9	na	na	0.94	0.15
	11/02/20	na	36.7	222	na	na	0.04	1.12	0.25
	11/18/20	0.058	37.5	226	111	na	na	1.1	0.20
	02/17/21	0.086	51.7	297	157	na	na	1.25	0.28
	05/18/21	0.138	77.9	448	240	na	na	1.07	0.51
	08/24/21	0.178	103.0	540	290	0.3	0.067	1.1	0.84
	11/16/21	0.146	87.7	402	248	na	na	1.03	0.65
AMD-10/3 Principal Perforations 550-570 ft bgs	02/08/17	0.099	90.9	560	258	<0.2	0.1	0.75	0.89
	05/03/17	0.089	90.2	560	267	<0.2	0.089	0.64	0.9
	08/09/17	0.075	83.6	620	273	<0.2	0.055	0.55	0.82
	11/01/17	0.085	89.7	512	276	<0.2	0.064	0.63	0.8
	02/07/18	0.091	73.7	498	221	<0.2	0.076	1.2	0.72
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.092	50.4	328	139	na	na	0.94	0.6
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.060	36.6	256	88.3	na	na	0.4	0.5
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.066	45	300	111	<0.2	0.034	0.55	0.52
	02/04/19	0.094	78.4	422	190	<0.2	0.043	0.64	0.53
	04/10/19	na	na	na	na	na	na	na	na
	05/08/19	0.087	90.4	598	254	na	na	0.36	0.75
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/07/19	0.079	91.4	584	279	na	na	0.34	0.73
	11/04/19	0.099	99.1	602	287	na	na	0.71	0.7
	02/19/20	0.108	80.5	534	216	na	na	1.37	0.60
	05/19/20	0.113	73.8	448	199	<0.2	0.066	1.36	0.59
	08/19/20	0.107	67.4	394	186	na	na	1.11	0.53
	11/18/20	0.113	76.9	432	209	na	na	1.02	0.56
	02/17/21	0.136	85.8	464	215	na	na	1.17	0.63
	05/18/21	0.142	85.6	480	225	na	na	1.19	0.73
	08/24/21	0.148	86.3	432	223	<0.2	0.099	1.05	0.80
	11/16/21	0.159	95.2	414	234	na	na	0.94	0.86

TABLE J-9
OCWD MONITORING WELL AMD-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-10/4 Principal Perforations 774-794 ft bgs	02/08/17	0.095	94.5	608	279	<0.2	0.086	0.31	0.69
	05/03/17	0.105	95.2	590	269	<0.2	0.097	0.37	0.66
	08/09/17	0.104	96.1	666	270	<0.2	0.091	0.55	0.62
	11/01/17	0.097	94.9	600	289	<0.2	0.12	0.48	0.63
	02/07/18	0.086	97.8	640	308	<0.2	0.099	0.45	0.61
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.094	97.1	626	288	na	na	0.34	0.59
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.078	89.5	626	254	na	na	0.23	0.57
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.088	87.4	572	273	<0.2	0.093	0.48	0.57
	02/04/19	0.093	76.5	490	226	<0.2	0.097	0.61	0.4
	04/10/19	na	na	na	na	na	na	na	na
	05/08/19	0.091	59.2	384	166	na	na	0.45	0.49
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/07/19	0.086	58.8	398	155	na	na	0.23	0.54
	11/04/19	0.083	68	438	171	na	na	0.12	0.61
	02/19/20	0.090	80.3	508	208	na	na	0.11	0.66
	05/19/20	0.088	89.7	572	256	<0.2	0.039	0.14	0.62
	08/19/20	0.099	93.5	578	269	na	na	0.27	0.61
	11/18/20	0.107	93.2	566	270	na	na	0.53	0.63
	02/17/21	0.120	88.4	550	240	na	na	0.69	0.57
	05/18/21	0.127	86.5	534	237	na	na	0.82	0.55
	08/24/21	0.138	90.4	496	234	0.2	0.071	0.85	0.54
	11/16/21	0.141	94.6	440	242	na	na	0.86	0.49
AMD-10/5 Principal Perforations 934-954 ft bgs	02/08/17	0.145	93.2	564	265	<0.2	0.259	0.65	0.46
	05/03/17	0.141	92.9	568	263	<0.2	0.227	0.65	0.46
	08/09/17	0.129	93.0	598	262	<0.2	0.187	0.54	0.46
	11/01/17	0.127	94.3	544	273	<0.2	0.192	0.49	0.47
	02/07/18	0.122	99.2	612	284	<0.2	0.221	0.48	0.47
	04/16/18	na	na	na	na	na	na	na	na
	05/08/18	0.123	94.8	520	275	na	na	0.41	0.46
	06/11/18	na	na	na	na	na	na	na	na
	08/08/18	0.099	93.5	608	255	na	na	0.21	0.47
	10/15/18	na	na	na	na	na	na	na	na
	11/05/18	0.094	95.6	614	295	<0.2	0.145	0.32	0.49
	02/04/19	0.099	94.1	578	276	<0.2	0.147	0.36	0.36
	04/10/19	na	na	na	na	na	na	na	na
	05/08/19	0.099	87.2	576	270	na	na	0.48	0.48
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/07/19	0.095	82.9	566	254	na	na	0.47	0.46
	11/04/19	0.088	79.0	562	243	na	na	0.41	0.46
	02/19/20	0.091	73.6	530	225	na	na	0.33	0.43
	05/19/20	0.010	72.8	510	218	<0.2	0.108	0.28	0.4
	08/19/20	0.010	73.4	476	212	na	na	0.19	0.4
	11/18/20	0.090	75.3	478	209	na	na	0.29	0.45
	02/17/21	0.130	80.5	499	209	na	na	0.3	0.39
	05/18/21	0.166	90.0	542	260	na	na	0.3	0.4
	08/24/21	0.196	97.2	552	272	0.2	0.118	0.4	0.38
	11/16/21	0.207	98.8	550	270	na	na	0.54	0.38

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-10
OCWD MONITORING WELL AMD-12
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-12/1 Principal Perforations 330-350 ft bgs	02/22/17	0.024	22.5	182	72	<0.2	<0.002	1.63	0.2
	04/11/17	na	23.2	152	na	na	<0.002	1.53	0.15
	05/16/17	0.054	40.4	234	74.2	<0.2	<0.002	1.47	0.29
	06/20/17	na	44	238	na	na	<0.002	1.52	0.39
	08/22/17	0.029	16.5	138	42.6	<0.2	<0.002	1.28	0.18
	10/03/17	na	20	130	na	na	<0.002	0.68	0.34
	11/15/17	0.059	26.9	174	59.2	<0.2	<0.002	0.40	0.1
	12/13/17	na	45.4	256	na	na	<0.002	0.26	0.39
	02/20/18	0.056	56.3	350	191	<0.2	<0.002	0.54	0.49
	04/18/18	na	20.8	154	na	na	<0.002	0.99	0.20
	05/22/18	0.021	9.4	114	41	na	na	1.02	0.17
	06/14/18	na	6.7	84	na	na	<0.002	1.01	0.06
	08/21/18	0.059	69.2	418	228	na	na	0.36	0.46
	10/15/18	na	92.7	586	na	na	<0.002	0.28	0.65
	11/06/18	0.069	92.4	626	342	<0.2	<0.002	0.27	0.67
	12/11/18	na	87.1	568	na	na	0.004	0.22	0.67
	02/19/19	0.065	91.2	570	310	<0.2	<0.002	0.26	0.53
	05/20/19	0.019	16	190	61.7	na	na	0.99	0.27
	06/11/19	na	9.9	128	na	na	<0.002	1.01	0.13
	07/15/19	na	7.6	72	na	na	<0.002	0.88	0.11
	08/20/19	0.019	9	120	17.4	na	na	0.97	0.13
	11/18/19	0.024	12.9	112	25	na	na	1.02	0.10
	01/13/20	na	58.6	304	na	na	<0.002	0.53	0.34
	02/18/20	0.051	59.8	424	171	na	na	0.50	0.39
	05/18/20	0.058	38.6	208	74.6	<0.2	<0.002	1.02	0.19
	07/15/20	na	35.4	204	na	na	<0.002	1.24	0.21
	08/17/20	0.054	34.4	206	84.8	na	na	1.33	0.20
	11/02/20	na	39.8	236	na	na	<0.002	1.38	0.29
	11/16/20	0.071	43	246	107	na	na	1.37	0.29
	02/16/21	0.115	67.7	337	176	na	na	1.48	0.34
	05/17/21	0.151	85.3	470	253	na	na	1.31	0.48
	08/23/21	0.067	41.4	260	152	<0.2	<0.002	1.31	0.27
	11/15/21	0.028	15.7	112	59.4	na	na	1.28	0.16
AMD-12/2 Principal Perforations 490-520 ft bgs	02/22/17	0.028	28.4	212	94.3	<0.2	<0.002	1.45	0.22
	05/16/17	0.022	19.6	162	59.9	<0.2	<0.002	1.69	0.17
	08/22/17	0.028	26.1	188	73	<0.2	<0.002	1.48	0.17
	11/15/17	0.022	16.2	158	60.8	<0.2	<0.002	1.33	<0.05
	02/20/18	0.016	9.4	102	38	<0.2	<0.002	1.40	0.20
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.027	12.3	104	36.1	na	na	1.22	0.14
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.021	11.4	98	44	na	na	1.13	0.13
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.02	10.3	120	38.6	<0.2	0.003	1.10	0.11
	02/19/19	0.026	25.1	142	75.1	<0.2	<0.002	1.20	0.15
	05/20/19	0.034	39.6	248	129	na	na	0.98	0.31
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.036	40.9	296	136	na	na	0.91	0.29
	11/18/19	0.027	26.7	208	118	na	na	0.85	0.17
	02/18/20	0.037	28	206	91.4	na	na	1.02	0.20
	05/18/20	0.036	29.4	194	107	<0.2	<0.002	1.08	0.14
	08/17/20	0.026	16.8	138	74.2	na	na	1.03	0.10
	11/16/20	0.036	21.5	152	74.3	na	na	1.13	0.21
	02/16/21	0.058	33.9	188	105	na	na	1.27	0.15
	05/17/21	0.067	40.6	214	122	<0.2	na	1.27	0.20
	08/23/21	0.131	74.7	376	230	na	<0.002	1.22	0.36
	11/15/21	0.142	85.2	402	271	na	na	1.17	0.46

TABLE J-10
OCWD MONITORING WELL AMD-12
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AMD-12/3 Principal Perforations 595-615 ft bgs	02/22/17	0.092	80.2	476	213	<0.2	<0.002	1.01	0.58
	05/16/17	0.084	84.1	528	230	<0.2	<0.002	0.97	0.61
	08/22/17	0.068	74.6	520	225	<0.2	<0.002	0.94	0.56
	11/15/17	0.064	77.2	516	236	<0.2	<0.002	0.71	0.37
	02/20/18	0.076	79.7	484	235	<0.2	<0.002	0.86	0.55
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.096	65.3	432	181	na	na	1.15	0.47
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.069	41.7	314	142	na	na	1.06	0.36
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.064	36.1	284	102	<0.2	0.003	1.00	0.35
	02/19/19	0.055	34.4	242	91.2	<0.2	<0.002	0.86	0.26
	05/20/19	0.065	53.1	334	126	na	na	0.85	0.39
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.073	68.5	412	163	na	na	0.70	0.52
	11/18/19	0.071	80.5	472	217	na	na	0.41	0.48
	02/18/20	0.073	78.1	544	246	na	na	0.60	0.50
	05/18/20	0.083	77.6	472	229	<0.2	<0.002	0.89	0.45
	08/17/20	0.091	71.9	410	199	na	na	1.17	0.46
	11/16/20	0.089	61.9	378	188	na	na	1.35	0.41
	02/16/21	0.088	54.9	333	145	na	na	1.28	0.34
	05/17/21	0.102	66.9	396	168	na	na	1.14	0.39
	08/23/21	0.128	80.3	438	213	<0.2	<0.002	1.35	0.48
	11/15/21	0.14	86.4	394	232	na	na	1.28	0.61
AMD-12/4 Principal Perforations 725-745 ft bgs	02/22/17	0.097	90	562	253	<0.2	<0.002	0.57	0.89
	05/16/17	0.099	92.1	588	251	<0.2	<0.002	0.65	1.05
	08/22/17	0.099	91.2	580	254	<0.2	<0.002	0.69	0.83
	11/15/17	0.096	92	584	269	<0.2	<0.002	0.81	0.67
	02/20/18	0.09	92.1	578	281	<0.2	<0.002	0.62	0.83
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.106	93	598	260	na	na	0.60	0.79
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.091	85.5	548	273	na	na	0.82	0.72
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.093	77.4	532	236	<0.2	0.003	1.01	0.74
	02/19/19	0.086	58.9	398	173	<0.2	<0.002	0.84	0.55
	05/20/19	0.076	53.3	340	148	na	na	0.67	0.58
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.079	59.1	382	135	na	na	0.62	0.67
	11/18/19	0.078	73	412	170	na	na	0.37	0.57
	02/18/20	0.083	81.2	514	219	na	na	0.44	0.66
	05/18/20	0.087	89.3	550	244	<0.2	<0.002	0.52	0.68
	08/17/20	0.102	91.2	530	247	na	na	0.81	0.66
	11/16/20	0.108	85.8	496	230	na	na	1.07	0.63
	02/16/21	0.12	83	473	212	na	na	1.22	0.61
	05/17/21	0.123	81	480	207	na	na	1.14	0.57
	08/23/21	0.133	86.4	472	215	<0.2	0.002	1.21	0.58
	11/15/21	0.135	88.9	434	214	na	na	1.32	0.59

TABLE J-10
OCWD MONITORING WELL AMD-12
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
Principal Perforations 940-960 ft bgs	02/22/17	0.141	91.3	518	240	<0.2	<0.002	0.87	0.6
	05/16/17	0.134	92.6	556	241	<0.2	<0.002	0.83	0.6
	08/22/17	0.132	93.2	538	249	<0.2	<0.002	0.73	0.6
	11/15/17	0.129	95.7	568	270	<0.2	<0.002	0.77	0.42
	02/20/18	0.124	92.5	560	263	<0.2	<0.002	0.63	0.69
	04/18/18	na	na	na	na	na	na	na	na
	05/22/18	0.134	93.5	552	244	na	na	0.59	0.60
	06/14/18	na	na	na	na	na	na	na	na
	08/21/18	0.112	92.7	570	276	na	na	0.59	0.60
	10/15/18	na	na	na	na	na	na	na	na
	11/06/18	0.112	94.9	263	269	<0.2	0.002	0.62	0.70
	02/19/19	0.107	97	580	278	<0.2	<0.002	0.61	0.57
	05/20/19	0.1	96.8	592	284	na	na	0.56	0.69
	06/11/19	na	na	na	na	na	na	na	na
	07/15/19	na	na	na	na	na	na	na	na
	08/20/19	0.099	93.5	600	263	na	na	0.63	0.75
	11/18/19	0.091	91.6	578	251	na	na	0.46	0.62
	02/18/20	0.095	84.9	588	244	na	na	0.55	0.64
	05/18/20	0.091	82.9	526	235	<0.2	<0.002	0.48	0.60
	08/17/20	0.094	82.7	504	230	na	na	0.42	0.59
	11/16/20	0.093	83.4	524	249	na	na	0.42	0.61
	02/16/21	0.100	84.2	533	229	na	na	0.49	0.58
	05/17/21	0.102	82.5	542	228	na	na	0.63	0.60
	08/23/21	0.110	81.5	516	223	<0.2	<0.002	0.73	0.57
	11/15/21	0.111	84	432	211	na	na	0.78	0.56

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-11
OCWD MONITORING WELL AM-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
AM-10/1 Shallow Perforations 217-235 ft bgs	3/7/2017	0.015	8.2	88	32	<0.2	0.003	1.74	0.09
	6/13/2017	0.011	5.8	66	23.4	<0.2	0.002	1.29	0.12
	9/19/2017	na	6.8	74.5	na	na	0.003	1.44	0.05
	11/14/2017	0.013	6.2	79.5	27.7	<0.2	0.003	1.37	0.09
	12/5/2017	0.023	6.1	51	26.7	<0.2	0.003	1.36	<0.05
	2/21/2018	0.011	5.1	62	26	<0.2	0.003	1.07	0.07
	5/22/2018	0.022	5.5	62	27.5	na	na	1.13	0.07
	8/23/2018	0.015	7.4	69	35.3	na	na	1.55	0.05
	9/12/2018	na	7.4	75	na	na	0.003	1.53	0.06
	11/7/2018	0.023	16.4	105	57.6	<0.2	0.004	1.48	0.11
	2/20/2019	0.012	5.3	58	33.1	<0.2	0.004	1.06	<0.05
	5/21/2019	0.014	5.3	55	33.5	na	na	0.95	0.08
	8/19/2019	0.015	5.9	32	36.5	na	na	1.12	0.08
	11/26/2019	0.064	5	73	29.8	na	na	1.18	<0.05
	3/17/2020	0.017	5.5	68	33.1	na	na	0.99	0.11
	6/16/2020	0.014	5.2	66	34.4	<0.2	0.002	1	0.07
	9/16/2020	0.016	6.5	78	39.3	na	na	1.41	<0.05
	12/15/2020	0.017	5.9	70	36.5	na	na	1.2	<0.05
	3/16/2021	0.014	5.1	79	33.3	na	na	1.05	0.12
	6/22/2021	0.012	4.6	69	34	na	na	0.91	<0.05
	9/15/2021	0.02	9.2	83	44.2	<0.2	0.003	1.2	0.09
	12/13/2021	0.043	24.5	149	101	na	na	1.62	0.28

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-12
OCWD MONITORING WELL KB1
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
OCWD-KB1 Shallow Perforations 180-200 ft bgs	2/8/2017	0.092	68.8	388	213	0.3	<0.002	1.36	1.76
	5/3/2017	0.094	62.2	362	194	<0.2	<0.002	2.07	1.63
	8/9/2017	0.052	22	132	65.5	<0.2	<0.002	0.36	1.05
	11/1/2017	0.054	41.5	286	163	<0.2	<0.002	0.66	0.56
	2/6/2018	0.05	29	208	86	<0.2	<0.002	1.24	0.40
	5/8/2018	0.025	7.7	78	22	na	na	1.39	0.22
	8/8/2018	0.063	91.1	612	289	na	na	0.01	0.78
	11/5/2018	0.063	92.7	620	273	<0.2	<0.002	0.24	0.96
	2/4/2019	0.072	85.5	514	254	<0.2	<0.002	0.47	0.78
	5/6/2019	0.04	25.4	168	62	na	na	1.25	0.54
	8/7/2019	0.017	5.9	72	16	na	na	1.23	0.28
	11/4/2019	0.063	92.6	606	270	na	na	0.01	0.97
	3/17/2020	0.101	73.1	404	195	na	na	1.39	1.40
	6/16/2020	0.134	76.1	450	210	<0.2	0.014	0.80	1.86
	9/16/2020	0.021	8.7	98	29	na	na	1.54	0.35
	12/15/2020	0.017	6.1	70	21	na	na	1.30	0.16
	3/16/2021	0.162	109.0	531	268	na	na	2.41	1.81
	6/22/2021	0.028	14.6	138	40	na	na	1.11	1.04
	9/15/2021	0.014	5.6	87	14	<0.2	<0.002	1.33	0.38
	12/13/2021	0.064	92.8	552	274	na	na	0.31	1.01

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

Appendix K

Groundwater Quality Data at the Mid-Basin Area

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

GWRS 2021 Quarterly Sampling Dates

OCWD Water Quality Department

MID-BASIN INJECTION (MBI) PROJECT

GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
SAR-10/1-4	03/15/2021	06/21/2021	09/20/2021	11/29/2021
SAR-11/1-3	03/15/2021	06/21/2021	09/20/2021	11/29/2021
SAR-12/1-4	02/02/2021	05/04/2021	08/10/2021	11/02/2021
SAR-13/1-4	02/03/2021	05/05/2021	08/11/2021	11/03/2021

Notes for Appendix K Tables:

► Water quality data are summarized in the following tables for monitoring wells SAR-10/1-4, SAR-11/1-3, SAR-12/1-4 and SAR-13/1-4. These wells were constructed as part of OCWD's Mid-Basin Injection (MBI) Project to comply with existing SWRCB DDW's (formerly CDPH) draft recycled water recharge project regulations. The monitoring wells will provide water quality data located between the point of injection (Mid-Basin Injection Well MBI-1 is located 80 feet upgradient of SAR-10) and the nearest downgradient municipal production wells IRWD-12 and IRWD-17. The multi-depth nested wells are to monitor multiple zones within the Principal aquifer receiving GWRS FPW injected water at MBI-1. SAR-10/1-4 was constructed in May 2012 and SAR-11/1-3 in November 2011; SAR-12/1-4 was constructed in January 2018; SAR-13/1-4 was constructed in December 2017 . Dedicated pumps were installed in each casing prior to routine monitoring. Baseline monitoring continued in 2015 to establish ambient groundwater conditions before and after injection of FPW at MBI-1. MBI-1 began injection FPW on April 15, 2015. The MBI project became fully operational during March 2020.

► Listed dates (above) are the 2021 dates of quarterly baseline monitoring activities.

► Results listed in the table for each quarter are the range of the minimum and maximum values detected at the well location, which may consist of one to four well casings. Figures and report text list the well ID (e.g. SAR-10) and casing number (e.g., SAR-10/1, SAR-10/2, SAR-10/3 and SAR-10/4), as appropriate.

► Appendices B & C contain a list of all methods and reportable detection limits (RDL).

► Detailed data reports are available upon request.

► The more stringent value in the range of secondary MCLs is used in the tables (e.g., <MCL) for TDS, electrical conductivity (EC), chloride and sulfate.

► MCL: Maximum Contaminant Level

► N/A: Not applicable

► ND: Not detected at reportable detection limit (RDL)

► NL: SWRCB DDW (formerly CDPH) Notification Level

► NS: Not sampled

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-10 Qtr 1	SAR-10 Qtr 2	SAR-10 Qtr 3	SAR-10 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	10.4 - 829	8.3 - 148	10.2 - 66.1	8.3 - 149
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 4.5	ND - 4.6	ND - 4.8	ND - 5
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 4.3	ND - 4.7	ND - 4.4	ND - 5.4
Barium (Ba), ug/L	OCWD	1000	11.2 - 20.8	11.7 - 20.6	13.7 - 26	11.2 - 20.3
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.11	ND - 0.1	ND	ND - 0.11
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.24	ND - 0.29	ND - 0.64	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.4	ND - 1.8	ND - 1.6	ND - 1.5
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 0.93	ND - 1.05	ND - 1.33	ND - 1.32
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	0.002 - 0.004	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 0.9	ND - 2.4	ND - 2.6	ND - 1.2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	97 - 164	106 - 171	117 - 142	108 - 164
Iron (Fe), ug/L	OCWD	300	ND - 380	ND - 130	ND - 65.8	ND - 392
Manganese (Mn), ug/L	OCWD	50	ND - 5.1	ND - 5.1	ND - 5.2	ND - 5.2
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 5	ND - 5.9	ND - 4.9	ND - 5
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	55.6 - 113	92 - 132	52 - 84	54 - 88
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 4.1	ND - 1.3	ND - 1.1	ND - 1.4
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND - 1.7
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.22 - 0.26	0.24 - 0.26	0.23 - 0.28	0.23 - 0.25
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 2.3	Not Reported	ND - 3.7	ND - 3.1
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-10 Qtr 1	SAR-10 Qtr 2	SAR-10 Qtr 3	SAR-10 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND-Detection	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-10/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 12:55	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/15/2021 12:55	Chloroform (CHCl3)	0.9	ug/L	0.5
3/15/2021 12:55	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 12:55	n-Nitrosodimethylamine (NDMA)	2.7	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 12:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
6/21/2021 12:00	Chloroform (CHCl3)	1.4	ug/L	0.5
6/21/2021 12:00	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
6/21/2021 12:00	Total Trihalomethanes (TTHMs)	2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 12:00	n-Nitrosodimethylamine (NDMA)	5.5	ng/L	2

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021 11:35	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
9/20/2021 11:35	Chloroform (CHCl3)	1.3	ug/L	0.5
9/20/2021 11:35	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

SAR-10/1
Organic Detections by Method

Year 2021, Quarter 3

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/20/2021	11:35	Atenolol (ATENOL)	5.1	ng/L	5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/20/2021	11:35	n-Nitrosodimethylamine (NDMA)	4	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	11:20	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/29/2021	11:20	Chloroform (CHCl3)	1	ug/L	0.5
11/29/2021	11:20	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	11:20	n-Nitrosodimethylamine (NDMA)	5.6	ng/L	2

SAR-10/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 12:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/15/2021 12:40	Chloroform (CHCl3)	0.9	ug/L	0.5
3/15/2021 12:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 12:40	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 10:45	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
6/21/2021 10:45	Chloroform (CHCl3)	1.5	ug/L	0.5
6/21/2021 10:45	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 10:45	n-Nitrosodimethylamine (NDMA)	5.7	ng/L	2

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021 11:45	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
9/20/2021 11:45	Chloroform (CHCl3)	1.6	ug/L	0.5
9/20/2021 11:45	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021 11:45	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

SAR-10/2
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:30	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/29/2021	10:30	Chloroform (CHCl3)	1.1	ug/L	0.5
11/29/2021	10:30	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:30	n-Nitrosodimethylamine (NDMA)	6.2	ng/L	2

SAR-10/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 11:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/15/2021 11:40	Chloroform (CHCl3)	0.9	ug/L	0.5
3/15/2021 11:40	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021 11:40	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 11:05	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
6/21/2021 11:05	Chloroform (CHCl3)	1.7	ug/L	0.5
6/21/2021 11:05	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021 11:05	n-Nitrosodimethylamine (NDMA)	9.5	ng/L	2

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021 10:25	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
9/20/2021 10:25	Chloroform (CHCl3)	1.8	ug/L	0.5
9/20/2021 10:25	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021 10:25	n-Nitrosodimethylamine (NDMA)	5.3	ng/L	2

SAR-10/4
Organic Detections by Method

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:10	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/29/2021	10:10	Chloroform (CHCl3)	1.2	ug/L	0.5
11/29/2021	10:10	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:10	n-Nitrosodimethylamine (NDMA)	2.1	ng/L	2

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-11 Qtr 1	SAR-11 Qtr 2	SAR-11 Qtr 3	SAR-11 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	5.4 - 13.8	4 - 9.2	5.2 - 7.9	3.6 - 6.5
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.6 - 3.3	1.9 - 3.6	1.3 - 3	2.3 - 3.7
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	2 - 3.3	1.7 - 3.5	1.1 - 2.9	2.5 - 4.2
Barium (Ba), ug/L	OCWD	1000	16.3 - 47.9	14.5 - 24.6	17.3 - 27.1	14.9 - 23.6
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 1.5	ND - 1.5	ND	ND
Fluoride (F), mg/L	OCWD	2	ND - 0.47	ND - 0.47	ND - 0.46	ND - 0.44
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 0.25	ND - 0.3	ND - 0.28	ND - 0.28
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.1	ND	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.09	ND - 1.08	ND - 1.14	ND - 1.14
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	Not Required	ND	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2.8	ND - 3.4	ND - 3.1	ND - 3.6
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
Primary Drinking Water Standards - Disinfection By-Products						
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 2.7	ND - 2.7	ND - 2.6	ND - 2.4
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	142 - 228	143 - 207	133 - 204	131 - 199
Iron (Fe), ug/L	OCWD	300	12.6 - 18.8	8.5 - 12.9	6.1 - 11.4	6.4 - 17
Manganese (Mn), ug/L	OCWD	50	ND - 19.8	ND - 10.1	ND - 9.3	ND - 9.2
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 19.2	ND - 11.3	ND - 9.4	ND - 8.6
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	138 - 161	84 - 116	66 - 130	88 - 114
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	0.1 - 0.2	0.1 - 0.2	ND - 0.14	ND - 0.15
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.19 - 0.23	0.18 - 0.22	0.18 - 0.22	0.18 - 0.22
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 10.2	Not Reported	ND - 9.5	ND - 9.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	Not Required	ND	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	Not Required	ND	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-11 Qtr 1	SAR-11 Qtr 2	SAR-11 Qtr 3	SAR-11 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	Not Required	ND	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	Not Required	ND	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND < NL	ND < NL

SAR-11/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/15/2021	11:15	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/15/2021	11:15	Chloroform (CHCl3)	1.5	ug/L	0.5
3/15/2021	11:15	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021	11:35	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/21/2021	11:35	Chloroform (CHCl3)	1.4	ug/L	0.5
6/21/2021	11:35	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
9/20/2021	10:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
9/20/2021	10:10	Chloroform (CHCl3)	1	ug/L	0.5
9/20/2021	10:10	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/29/2021	9:15	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
11/29/2021	9:15	Chloroform (CHCl3)	1.3	ug/L	0.5
11/29/2021	9:15	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

SAR-11/2
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/15/2021	12:15	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/15/2021	12:15	Chloroform (CHCl3)	1.9	ug/L	0.5
3/15/2021	12:15	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/5/2021	10:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
8/5/2021	10:10	Chloroform (CHCl3)	1.6	ug/L	0.5
8/5/2021	10:10	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
8/5/2021	10:25	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
8/5/2021	10:25	Chloroform (CHCl3)	1.8	ug/L	0.5
8/5/2021	10:25	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
9/20/2021	11:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
9/20/2021	11:10	Chloroform (CHCl3)	1.8	ug/L	0.5
9/20/2021	11:10	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/20/2021	11:10	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:10	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/29/2021	10:10	Chloroform (CHCl3)	1.7	ug/L	0.5
11/29/2021	10:10	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/29/2021	10:10	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2

SAR-11/2
Organic Detections by Method

Year 2021, Quarter 4

METHOD: ***NDMA-LOW***

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*

SAR-11/3

Organic Detections by Method

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
6/21/2021	11:10	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/21/2021	11:10	Chloroform (CHCl3)	1.9	ug/L	0.5
6/21/2021	11:10	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-12 Qtr	SAR-12 Qtr 2	SAR-12 Qtr 3	SAR-12 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	1.3 - 8	2.1 - 7	1.7 - 8.1	1.5 - 6.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 1.8	ND - 2	ND - 2	ND - 2.3
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 1.9	ND - 2.4	ND - 2.4	ND - 2.7
Asbestos (ASBESTOS), MFL	EurofCEI/Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	26 - 54.5	22.8 - 56.5	21.7 - 57.7	17 - 58.4
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 3.3	ND - 3.4	ND - 4	ND - 3.5
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.25 - 0.43	0.24 - 0.4	0.25 - 0.43	0.25 - 0.44
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 4.01	ND - 4.43	ND - 4.89	ND - 4.76
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.1	ND - 1.1	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 0.27	ND - 0.95	ND - 1.16	ND - 1.11
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND - 0.048	ND - 0.004	ND - 0.003	ND - 0.004
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1	ND	ND - 1.1	ND - 1.3
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EuroTSac	30	ND	ND	ND - 0.77	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	1.05 - 3.73	ND - 1.64	0.71 - 1.49	1.49 - 2.53
Other Radionuclides	FGL/PaceGrns	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND	ND - 0.25	ND - 1.8	ND - 2.1
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND - 1	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	222 - 428	213 - 424	191 - 411	174 - 407
Iron (Fe), ug/L	OCWD	300	ND - 21.6	ND - 21.7	ND - 12.3	ND - 16
Manganese (Mn), ug/L	OCWD	50	ND - 19	ND - 20.2	ND - 17.6	ND - 17.1
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 21.1	ND - 21.6	ND - 20.6	ND - 19
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	136 - 266	116 - 304	112 - 254	70 - 242
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.1	ND	ND - 0.13	ND - 0.25
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND	ND	ND - 0.1	ND - 0.1
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 4.5	ND - 5.5	ND - 5.5	ND - 5.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalr-LLC/OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalr-LLC/OCWD	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalr/EurfCLLC	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-12 Qtr 1	SAR-12 Qtr 2	SAR-12 Qtr 3	SAR-12 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND < MCL	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508 / 508.1	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531 / 531.2	Carbamates	OCWD	ND	ND	ND	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	ND
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	WeckLab	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	ND	ND	ND	ND
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	EurfCalr-EurfCLLC	ND	ND	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND < NL	ND < NL

SAR-12/2

Organic Detections by Method

Year 2021, Quarter 3

METHOD: 1613B

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
8/10/2021 12:05	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.77	pg/L	4.8

SAR-12/3
Organic Detections by Method

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/4/2021 12:20	Chloroform (CHCl3)	TR	ug/L	0.5
5/4/2021 12:20	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/10/2021 12:50	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
8/10/2021 12:50	Chloroform (CHCl3)	1.3	ug/L	0.5
8/10/2021 12:50	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/26/2021 12:00	n-Nitrosodimethylamine (NDMA)	2.5	ng/L	2
8/10/2021 12:50	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
8/25/2021 11:20	n-Nitrosodimethylamine (NDMA)	3	ng/L	2
9/9/2021 11:40	n-Nitrosodimethylamine (NDMA)	3	ng/L	2
9/23/2021 10:50	n-Nitrosodimethylamine (NDMA)	2.7	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/2/2021 11:40	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/2/2021 11:40	Chloroform (CHCl3)	1.4	ug/L	0.5
11/2/2021 11:40	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/7/2021 10:55	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2
10/21/2021 10:45	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
11/2/2021 11:40	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2

SAR-12/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/2/2021	10:05	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/4/2021	10:35	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/10/2021	11:20	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/2/2021	10:25	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/7/2021	10:10	n-Nitrosodimethylamine (NDMA)	5.9	ng/L	2

Summary of All 2021 Water Quality Testing for Regulated and Unregulated Chemicals

Category	Lab	MCL	SAR-13* Qtr 1	SAR-13 Qtr 2	SAR-13 Qtr 3	SAR-13 Qtr 4
Primary Drinking Water Standards - Inorganic						
Aluminum (Al), ug/L	OCWD	1000	2.5 - 12.8	3.7 - 12.1	3.1 - 7.5	2.8 - 8.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.4 - 3.4	1.1 - 3.1	1.5 - 2.7	1.8 - 3.5
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 3.1	ND - 3.4	ND - 3.8	1.1 - 3.7
Asbestos (ASBESTOS), MFL	EurofCEI/'Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	10.8 - 39.6	8.8 - 32.8	10.8 - 36.1	9.2 - 34.4
Beryllium (Be), ug/L	OCWD	4	ND	ND	ND	ND
Cadmium (Cd), ug/L	OCWD	5	ND	ND	ND	ND
Chromium (Cr), ug/L	OCWD	50	ND - 1.7	ND - 1.2	ND - 1.4	ND - 1.1
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.26 - 0.67	0.24 - 0.67	0.27 - 0.7	0.3 - 0.68
Hexavalent Chromium (CrVI), ug/L	OCWD	N/A	ND - 2.04	ND - 2.02	ND - 1.35	ND - 1.62
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 2.2	ND - 1.8	ND - 1.4	ND - 1.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.23	ND - 1.12	ND - 1.15	ND - 1.14
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND - 0.006	ND - 0.01	ND - 0.008	ND - 0.004
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND	ND	ND	ND
Thallium (Tl), ug/L	OCWD	2	ND	ND	ND	ND
Primary Drinking Water Standards - Organic						
1,2,3-Trichloropropane (123TCP), ug/L	OCWD	0.005	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EurotSac/EutalKnx	30	ND	ND	ND - 0.94	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	0.086 - 2.028	1.3 - 2.38	1.34 - 2.24	0.894 - 1.49
Other Radionuclides	FGL/Davi/ PaceGrns	Varies	ND < PMCL	ND < PMCL	ND < PMCL	ND < PMCL
Primary Drinking Water Standards - Disinfection By-Products						
Sum of five Haloacetic Acids (HAA5), ug/L	OCWD	60***	ND	ND	ND	ND
Total Trihalomethanes (TTHMs), ug/L	OCWD	80	ND - 2.9	ND - 2.9	ND - 2.7	ND - 2.3
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	ND	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	137 - 388	128 - 391	122 - 377	127 - 321
Iron (Fe), ug/L	OCWD	300	5.4 - 16.6	ND - 11.3	ND	ND - 5.8
Manganese (Mn), ug/L	OCWD	50	ND - 17.4	ND - 18.5	ND - 14.4	ND - 11.8
Manganese (dissolved)**** (Mn-DIS), ug/L	OCWD	N/A	ND - 21.3	ND - 21.4	ND - 18.5	ND - 15.2
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	79 - 239	74 - 262	74 - 236	62 - 206
Other Constituents	OCWD	Varies	ND < SMCL	ND < SMCL	ND < SMCL	ND < SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.4	ND - 0.1	ND	ND - 0.1
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND - 0.19	ND - 0.17	ND - 0.17	ND - 0.18
Dichlorodifluoromethane (CCl2F2), ug/L	OCWD	N/A	ND	ND	ND	ND
Ethyl tert-butyl ether (ETBE), ug/L	OCWD	N/A	ND	ND	ND	ND
Tert-amyl methyl ether (TAME), ug/L	OCWD	N/A	ND	ND	ND	ND
tert-butyl alcohol (TBA), ug/L	OCWD	N/A	ND	ND	ND	ND
Vanadium (V), ug/L	OCWD	N/A	ND - 10.4	ND - 12.5	ND - 11.2	ND - 14
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalr-LLC/OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalr-LLC/OCWD	N/A	ND	ND	ND	ND
4,4'-DDE (DDE), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
Acetochlor (ACETOC), ug/L	OCWD	N/A	ND	ND	ND	ND
DCPA-Dacthal (DCPA), ug/L	OCWD / Weck	N/A	ND	ND	ND	ND
EPTC (EPTC), ug/L	OCWD	N/A	ND	ND	ND	ND
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	ND	ND	ND	ND
Nitrobenzene (NBENZ), ug/L	EurfCalr/EurfCLLC	N/A	ND	ND	ND	ND
Terbacil (TRBACL), ug/L	OCWD	N/A	ND	ND	ND	ND

* Strontium 90 Not Radio-analyzed for Zones 1 & 2; ** CA Secondary MCL; *** CA Primary MCL ; **** MCL based on total not dissolved;

Summary of 2021 Volatile and Semi-Volatile Water Quality Chemicals

Method	Description	Lab	SAR-13 Qtr 1	SAR-13 Qtr 2	SAR-13 Qtr 3	SAR-13 Qtr 4
14DIOX	1,4-Dioxane Analytical Procedure	OCWD	ND	ND	ND	ND
1613B	2,3,7,8-Tetrachlorodibenzo-p-dioxin	EuroTSac	ND	ND	ND < MCL	ND
504.1	EDB, DBCP & 123TCP	OCWD	ND	ND	ND	ND
508 / 508.1	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND < MCL	ND < MCL	ND < MCL	ND < MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531 / 531.2	Carbamates	OCWD	ND	ND	ND	ND
537.1	PFAS Compounds	OCWD	ND	ND	ND	ND
547	Glyphosate	OCWD	ND	ND	ND	ND
548.1	Endothall	WeckLab	ND	ND	ND	ND
549.2	Diquat and Paraquat	OCWD	ND	ND	ND	ND
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	ND	ND	ND	ND
552.2	Disinfection Byproducts (DBPs) - Haloacetic Acids	OCWD	ND	ND	ND	ND
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	EurfCaIr-EurfCLLC	ND	ND	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

SAR-13/1
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
2/3/2021	9:45	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/3/2021	9:45	Chloroform (CHCl3)	1.1	ug/L	0.5
2/3/2021	9:45	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
5/5/2021	9:55	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
5/5/2021	9:55	Chloroform (CHCl3)	1	ug/L	0.5
5/5/2021	9:55	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
8/11/2021	10:00	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
8/11/2021	10:00	Chloroform (CHCl3)	1	ug/L	0.5
8/11/2021	10:00	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
11/3/2021	9:45	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/3/2021	9:45	Chloroform (CHCl3)	1	ug/L	0.5
11/3/2021	9:45	Total Trihalomethanes (TTHMs)	1	ug/L	0.5

SAR-13/3
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/3/2021	11:50	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
2/3/2021	11:50	Chloroform (CHCl3)	1.8	ug/L	0.5
2/3/2021	11:50	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/7/2021	11:30	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
1/21/2021	11:30	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2
2/3/2021	11:50	n-Nitrosodimethylamine (NDMA)	4.5	ng/L	2
2/18/2021	11:45	n-Nitrosodimethylamine (NDMA)	4.4	ng/L	2
3/4/2021	11:00	n-Nitrosodimethylamine (NDMA)	4.5	ng/L	2
3/18/2021	11:25	n-Nitrosodimethylamine (NDMA)	4.3	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/5/2021	11:35	Bromodichloromethane (CHBrCl)	1	ug/L	0.5
5/5/2021	11:35	Chloroform (CHCl3)	1.9	ug/L	0.5
5/5/2021	11:35	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/1/2021	11:20	n-Nitrosodimethylamine (NDMA)	4.4	ng/L	2
4/15/2021	11:05	n-Nitrosodimethylamine (NDMA)	4	ng/L	2
5/5/2021	11:35	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2
5/19/2021	10:40	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
6/3/2021	12:20	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
6/17/2021	11:15	n-Nitrosodimethylamine (NDMA)	3	ng/L	2

SAR-13/3
Organic Detections by Method

Year 2021, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/11/2021	11:45	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
8/11/2021	11:45	Chloroform (CHCl3)	1.3	ug/L	0.5
8/11/2021	11:45	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/1/2021	11:10	n-Nitrosodimethylamine (NDMA)	3	ng/L	2
7/15/2021	10:50	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
7/27/2021	10:58	n-Nitrosodimethylamine (NDMA)	3	ng/L	2
8/11/2021	11:45	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
8/25/2021	11:20	n-Nitrosodimethylamine (NDMA)	4.4	ng/L	2
9/9/2021	10:50	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2
9/23/2021	10:55	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/3/2021	11:50	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
11/3/2021	11:50	Chloroform (CHCl3)	1	ug/L	0.5
11/3/2021	11:50	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/7/2021	10:55	n-Nitrosodimethylamine (NDMA)	4.7	ng/L	2
10/21/2021	11:30	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
11/3/2021	11:50	n-Nitrosodimethylamine (NDMA)	4	ng/L	2

SAR-13/4
Organic Detections by Method

Year 2021, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/3/2021	10:15	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
2/3/2021	10:15	Chloroform (CHCl3)	1.7	ug/L	0.5
2/3/2021	10:15	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/7/2021	10:15	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
1/21/2021	10:10	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2
2/3/2021	10:15	n-Nitrosodimethylamine (NDMA)	4.1	ng/L	2
2/18/2021	10:20	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2
3/4/2021	9:45	n-Nitrosodimethylamine (NDMA)	3.9	ng/L	2
3/18/2021	10:30	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2

Year 2021, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/5/2021	10:20	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
5/5/2021	10:20	Chloroform (CHCl3)	1.6	ug/L	0.5
5/5/2021	10:20	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/1/2021	10:30	n-Nitrosodimethylamine (NDMA)	3.8	ng/L	2
4/15/2021	10:20	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
5/5/2021	10:20	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
5/19/2021	9:55	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
6/3/2021	11:35	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
6/17/2021	10:25	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

SAR-13/4
Organic Detections by Method

Year 2021, Quarter 3

METHOD: 1613B

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/11/2021	11:55	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.94	pg/L	5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/11/2021	11:55	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
8/11/2021	11:55	Chloroform (CHCl3)	1.9	ug/L	0.5
8/11/2021	11:55	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/1/2021	10:00	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
7/15/2021	10:10	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
7/27/2021	10:10	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2
8/11/2021	11:55	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2
8/25/2021	10:45	n-Nitrosodimethylamine (NDMA)	3.2	ng/L	2
9/9/2021	10:05	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2
9/23/2021	10:05	n-Nitrosodimethylamine (NDMA)	4	ng/L	2

Year 2021, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/3/2021	10:20	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
11/3/2021	10:20	Chloroform (CHCl3)	1.5	ug/L	0.5
11/3/2021	10:20	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/7/2021	10:15	n-Nitrosodimethylamine (NDMA)	3.8	ng/L	2
10/21/2021	10:20	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2
11/3/2021	10:20	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2

Appendix L

Mid-Basin Injection Area Monitoring Well Groundwater Quality

1,4-Dioxane, NDMA and Selected Constituents

Orange County Water District
Groundwater Replenishment System
2021 Annual Report

TABLE L-1
OCWD MONITORING WELL SAR-10
1,4-dioxane and NDMA Concentrations
2017- 2021

SAR-10/1 *Upper Rho Aquifer* *Perforations: 590-600 ft bgs*			**SAR-10/2** *Lower Rho Aquifer* *Perforations: 690-710 ft bgs*			**SAR-10/3** *Main 2 Aquifer* *Perforations: 800-820 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/21/2017	<1	2.6	3/21/2017	<1	3.1	3/21/2017	<1	<2
5/30/2017	<1	<2	5/30/2017	<1	<2	5/30/2017	<1	<2
9/6/2017	<1	<2	9/6/2017	<1	2.1	9/6/2017	<1	<2
12/4/2017	<1	2.8	12/4/2017	<1	3	12/4/2017	<1	<2
3/20/2018	<1	2.6	3/20/2018	<1	2.5	3/20/2018	<1	<2
6/18/2018	<1	4.1	6/18/2018	<1	6	6/18/2018	<1	<2
9/5/2018	<1	<2	9/5/2018	<1	5.5	9/5/2018	<1	<2
12/3/2018	<1	4.5	12/3/2018	<1	5.6	12/3/2018	<1	2.3
3/20/2019	<1	4.2	3/20/2019	<1	5.5	3/20/2019	<1	<2
6/18/2019	<1	3.7	6/18/2019	<1	4.9	6/18/2019	<1	2.3
9/4/2019	<1	4.2	9/4/2019	<1	4.9	9/4/2019	<1	2.8
12/4/2019	<1	4.6	12/4/2019	<1	4.2	12/4/2019	<1	2
3/16/2020	<1	3.6	3/16/2020	<1	4.6	3/16/2020	<1	<2
6/15/2020	<1	4.3	6/15/2020	<1	5.2	6/15/2020	<1	<2
9/21/2020	<0.5	3.8	9/21/2020	<0.5	4.2	9/21/2020	<0.5	<2
11/30/2020	<0.5	3.7	11/30/2020	<0.5	4.4	11/30/2020	<0.5	<2
3/15/2021	<0.5	2.7	3/15/2021	<0.5	3.3	3/15/2021	<0.5	<2
6/21/2021	<0.5	5.5	6/21/2021	<0.5	5.7	6/21/2021	<0.5	<2
9/20/2021	<0.5	4	9/20/2021	<0.5	4.2	9/20/2021	<0.5	<2
11/29/2021	<0.5	5.6	11/29/2021	<0.5	6.2	11/29/2021	<0.5	<2

SAR-10/4 *Main 7 Aquifer* *Perforations: 1,100-1,115 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/21/2017	<1	2.9
5/30/2017	<1	<2
9/6/2017	<1	2.4
12/4/2017	<1	6.6
3/20/2018	<1	2.9
6/18/2018	<1	4.4
9/5/2018	<1	4.1
12/3/2018	<1	5.9
3/20/2019	<1	2.8
6/18/2019	<1	4.2
9/4/2019	<1	6.3
12/4/2019	<1	<2
3/16/2020	<1	5
6/15/2020	<1	7.6
9/21/2020	<0.5	4.2
11/30/2020	<0.5	4.2
3/15/2021	<0.5	3.6
6/21/2021	<0.5	9.5
9/20/2021	<0.5	5.3
11/29/2021	<0.5	2.1

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-2
OCWD MONITORING WELL SAR-11
1,4-dioxane and NDMA Concentrations
2017 - 2021

SAR-11/1 *Upper Rho Aquifer* *Perforations: 592-602 ft bgs*			**SAR-11/2** *Lower Rho Aquifer* *Perforations: 675-690 ft bgs*			**SAR-11/3** *Main 7 Aquifer* *Perforations: 1,100-1,110 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
3/20/2017	<1	<2	3/20/2017	<1	2.7	3/20/2017	<1	<2
5/31/2017	<1	<2	5/31/2017	<1	2.5	5/31/2017	<1	<2
9/5/2017	<1	<2	9/5/2017	<1	<2	9/5/2017	<1	<2
12/4/2017	<1	<2	12/4/2017	<1	<2	12/4/2017	<1	<2
3/19/2018	<1	<2	3/19/2018	<1	3.5	3/19/2018	<1	<2
6/18/2018	<1	<2	6/18/2018	<1	2.2	6/18/2018	<1	<2
9/5/2018	<1	<2	9/5/2018	<1	<2	9/5/2018	<1	<2
12/3/2018	<1	<2	12/3/2018	<1	3.4	12/3/2018	<1	<2
3/20/2019	<1	<2	3/20/2019	<1	4.2	3/20/2019	<1	<2
6/17/2019	<1	2.1	6/17/2019	<1	3.7	6/17/2019	<1	<2
9/4/2019	<1	<2	9/4/2019	<1	3.5	9/4/2019	<1	<2
12/4/2019	<1	2.1	12/4/2019	<1	3.7	12/4/2019	<1	<2
3/16/2020	<1	2.1	3/16/2020	<1	4.5	3/16/2020	<1	<2
6/15/2020	<1	<2	6/15/2020	<1	2.9	6/15/2020	<1	<2
9/21/2020	<0.5	<2	9/21/2020	<0.5	2.3	9/21/2020	<0.5	<2
11/30/2020	<0.5	<2	11/30/2020	<0.5	2.2	11/30/2020	<0.5	<2
3/15/2021	<0.5	<2	3/15/2021	<0.5	<2	3/15/2021	<0.5	<2
6/21/2021	<0.5	<2	6/21/2021	<0.5	<2	6/21/2021	<0.5	<2
9/20/2021	<0.5	<2	9/20/2021	<0.5	2.2	9/20/2021	<0.5	<2
11/29/2021	<0.5	<2	11/29/2021	<0.5	2.4	11/29/2021	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-3
OCWD MONITORING WELL SAR-12
1,4-dioxane and NDMA Concentrations
2020- 2021

SAR-12/1 *Lower Rho Aquifer* *Perforations: 605-625 ft bgs*			**SAR-12/2** *Main 2 Aquifer* *Perforations: 755-775 ft bgs*			**SAR-12/3** *Main 4 Aquifer* *Perforations: 915-930 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2	1/8/2020	na	<2	1/8/2020	na	<2
2/4/2020	<1	<2	2/4/2020	<1	<2	2/4/2020	<1	<2
5/5/2020	<1	<2	5/5/2020	<1	<2	5/5/2020	<1	<2
6/4/2020	na	<2	6/4/2020	na	<2	6/4/2020	na	<2
6/30/2020	na	<2	6/30/2020	na	<2	6/30/2020	na	<2
7/13/2020	na	<2	7/13/2020	na	<2	7/13/2020	na	<2
7/27/2020	na	<2	7/27/2020	na	<2	7/27/2020	na	<2
8/4/2020	<0.5	<2	8/4/2020	<0.5	<2	8/4/2020	<0.5	<2
8/20/2020	na	<2	8/20/2020	na	<2	8/20/2020	na	<2
9/2/2020	na	<2	9/2/2020	na	<2	9/2/2020	na	<2
9/17/2020	na	<2	9/17/2020	na	<2	9/17/2020	na	<2
10/1/2020	na	<2	10/1/2020	na	<2	10/1/2020	na	<2
10/14/2020	na	<2	10/14/2020	na	<2	10/14/2020	na	<2
10/26/2020	na	<2	10/26/2020	na	<2	10/26/2020	na	<2
11/5/2020	<0.5	<2	11/5/2020	<0.5	<2	11/5/2020	<0.5	<2
11/18/2020	na	<2	11/18/2020	na	<2	11/18/2020	na	<2
12/2/2020	na	<2	12/2/2020	na	<2	12/2/2020	na	<2
12/14/2020	na	<2	12/14/2020	na	<2	12/14/2020	na	<2
12/31/2020	na	<2	12/31/2020	na	<2	12/31/2020	na	<2
1/7/2021	na	<2	1/7/2021	na	<2	1/7/2021	na	<2
1/21/2021	na	<2	1/21/2021	na	<2	1/21/2021	na	<2
2/2/2021	<0.5	<2	2/2/2021	<0.5	<2	2/2/2021	<0.5	<2
2/18/2021	na	<2	2/18/2021	na	<2	2/18/2021	na	<2
3/4/2021	na	<2	3/4/2021	na	<2	3/4/2021	na	<2
3/18/2021	na	<2	3/18/2021	na	<2	3/18/2021	na	<2
4/1/2021	na	<2	4/1/2021	na	<2	4/1/2021	na	<2
4/15/2021	na	<2	4/15/2021	na	<2	4/15/2021	na	<2
5/4/2021	<0.5	<2	5/4/2021	<0.5	<2	5/4/2021	<0.5	<2
5/19/2021	na	<2	5/19/2021	na	<2	5/19/2021	na	<2
6/3/2021	na	<2	6/3/2021	na	<2	6/3/2021	na	<2
6/17/2021	na	<2	6/17/2021	na	<2	6/17/2021	na	<2
7/1/2021	na	<2	7/1/2021	na	<2	7/1/2021	na	<2
7/15/2021	na	<2	7/15/2021	na	<2	7/15/2021	na	<2
7/26/2021	na	<2	7/26/2021	na	<2	7/26/2021	na	2.5
8/10/2021	<0.5	<2	8/10/2021	<0.5	<2	8/10/2021	<0.5	2.4
8/25/2021	na	<2	8/25/2021	na	<2	8/25/2021	na	3.0
9/9/2021	na	<2	9/9/2021	na	<2	9/9/2021	na	3.0
9/23/2021	na	<2	9/23/2021	na	<2	9/23/2021	na	2.7
10/7/2021	na	<2	10/7/2021	na	<2	10/7/2021	na	3.5
10/21/2021	na	<2	10/21/2021	na	<2	10/21/2021	na	2.9
11/2/2021	<0.5	<2	11/2/2021	<0.5	<2	11/2/2021	<0.5	2.3

SAR-12/4 *Main 7 Aquifer* *Perforations: 1,045-1,055 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
5/5/2020	<1	<2
6/4/2020	na	<2
6/30/2020	na	<2
7/13/2020	na	<2
7/27/2020	na	<2
8/4/2020	<0.5	<2
8/20/2020	na	<2
9/2/2020	na	<2
9/17/2020	na	<2
10/1/2020	na	<2
10/14/2020	na	<2
10/26/2020	na	<2
11/5/2020	<0.5	<2
11/18/2020	na	<2
12/2/2020	na	<2
12/14/2020	na	<2
12/31/2020	na	<2
1/7/2021	na	<2
1/21/2021	na	<2
2/2/2021	<0.5	<2
2/18/2021	na	<2
3/4/2021	na	<2
3/18/2021	na	<2
4/1/2021	na	<2
4/15/2021	na	<2
5/4/2021	<0.5	<2
5/19/2021	na	<2
6/3/2021	na	<2
6/17/2021	na	<2
7/1/2021	na	<2
7/15/2021	na	<2
7/26/2021	na	<2
8/10/2021	<0.5	<2
8/25/2021	na	<2
9/9/2021	na	<2
9/23/2021	na	<2
10/7/2021	na	5.9
10/21/2021	na	<2
11/2/2021	<0.5	<2

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-4
OCWD MONITORING WELL SAR-13
1,4-dioxane and NDMA Concentrations
2020- 2021

SAR-13/1
Lower Rho Aquifer
Perforations: 600-620 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
4/1/2020	na	<2
4/15/2020	na	<2
4/30/2020	na	<2
5/6/2020	<1	<2
5/21/2020	na	<2
6/4/2020	na	<2
6/17/2020	na	<2
6/30/2020	na	<2
7/13/2020	na	<2
7/27/2020	na	<2
8/5/2020	<0.5	<2
8/20/2020	na	<2
9/2/2020	na	<2
9/17/2020	na	<2
10/1/2020	na	<2
10/14/2020	na	<2
10/26/2020	na	<2
11/4/2020	<0.5	<2
11/18/2020	na	<2
12/2/2020	na	<2
12/14/2020	na	<2
12/31/2020	na	<2
1/7/2021	na	<2
1/21/2021	na	<2
2/3/2021	<0.5	<2
2/18/2021	na	<2
3/4/2021	na	<2
3/18/2021	na	<2
4/1/2021	na	<2
4/15/2021	na	<2
5/5/2021	<0.5	<2
5/19/2021	na	<2
6/3/2021	na	<2
6/17/2021	na	<2
7/1/2021	na	<2
7/15/2021	na	<2
7/27/2021	na	<2
8/11/2021	<0.5	<2
8/25/2021	na	<2
9/9/2021	na	<2
9/23/2021	na	<2
10/7/2021	na	<2
10/21/2021	na	<2
11/3/2021	<0.5	<2

SAR-13/2
Main 2 Aquifer
Perforations: 750-770 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
4/1/2020	na	<2
4/15/2020	na	<2
4/30/2020	na	<2
5/6/2020	<1	<2
5/21/2020	na	<2
6/4/2020	na	<2
6/17/2020	na	<2
6/30/2020	na	<2
7/13/2020	na	<2
7/27/2020	na	<2
8/5/2020	<0.5	<2
8/20/2020	na	<2
9/2/2020	na	<2
9/17/2020	na	<2
10/1/2020	na	<2
10/14/2020	na	<2
10/26/2020	na	<2
11/4/2020	<0.5	<2
11/18/2020	na	<2
12/2/2020	na	<2
12/14/2020	na	<2
12/31/2020	na	<2
5/19/2021	na	<2
6/3/2021	na	<2
6/17/2021	<0.5	<2
7/1/2021	na	<2
7/15/2021	na	<2
7/27/2021	na	<2
8/11/2021	na	<2
8/25/2021	na	<2
9/9/2021	<0.5	<2
9/23/2021	na	<2
10/7/2021	na	<2
10/21/2021	na	<2
11/3/2021	na	<2
12/6/2021	na	<2
1/7/2021	na	<2
1/21/2021	<0.5	<2
2/3/2021	na	<2
2/18/2021	na	<2
3/4/2021	na	<2
3/18/2021	na	<2
4/1/2021	na	<2
4/15/2021	<0.5	<2

SAR-13/3
Main 4 Aquifer
Perforations: 910-930 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
4/1/2020	na	<2
4/15/2020	na	<2
4/30/2020	na	<2
5/6/2020	<1	<2
5/21/2020	na	<2
6/1/2020	na	<2
6/17/2020	na	<2
6/30/2020	na	<2
7/13/2020	na	<2
7/27/2020	na	<2
8/5/2020	<0.5	<2
8/20/2020	na	<2
9/2/2020	na	<2
9/17/2020	na	<2
10/1/2020	na	<2
10/14/2020	na	2.2
10/26/2020	na	2.4
11/4/2020	<0.5	2.8
11/18/2020	na	3.1
12/2/2020	na	3.2
12/14/2020	na	3.7
12/31/2020	na	3.2
1/7/2021	na	3.1
1/21/2021	na	3.7
2/3/2021	<0.5	4.5
2/18/2021	na	4.4
3/4/2021	na	4.5
3/18/2021	na	4.3
4/1/2021	na	4.4
4/15/2021	na	4.0
5/5/2021	<0.5	3.7
5/19/2021	na	3.3
6/3/2021	na	2.9
6/17/2021	na	3.0
7/1/2021	na	3.0
7/15/2021	na	2.9
7/27/2021	na	3.0
8/11/2021	<0.5	3.6
8/25/2021	na	4.4
9/9/2021	na	3.7
9/23/2021	na	3.6
10/7/2021	na	4.7
10/21/2021	na	3.6
11/3/2021	<0.5	4.0

SAR-13/4
Main 7 Aquifer
Perforations: 1,045-1,055 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/8/2020	na	<2
2/4/2020	<1	<2
4/1/2020	na	<2
4/15/2020	na	<2
4/30/2020	na	<2
5/6/2020	<1	<2
5/21/2020	na	<2
6/1/2020	na	<2
6/17/2020	na	<2
6/30/2020	na	2.6
7/13/2020	na	2.8
7/27/2020	na	3.0
8/5/2020	<0.5	2.8
8/20/2020	na	3.6
9/2/2020	na	3.4
9/17/2020	na	3.5
10/1/2020	na	3.4
10/14/2020	na	3.2
10/26/2020	na	3.3
11/4/2020	<0.5	3.3
11/18/2020	na	3.4
12/2/2020	na	3.0
12/14/2020	na	3.0
12/31/2020	na	2.9
1/7/2021	na	3.0
1/21/2021	na	3.4
2/3/2021	<0.5	4.1
2/18/2021	na	3.4
3/4/2021	na	3.9
3/18/2021	na	3.7
4/1/2021	na	3.8
4/15/2021	na	3.3
5/5/2021	<0.5	3.3
5/19/2021	na	3.3
6/3/2021	na	3.1
6/17/2021	na	3.5
7/1/2021	na	3.6
7/15/2021	na	3.6
7/27/2021	na	3.5
8/11/2021	<0.5	4.2
8/25/2021	na	3.2
9/9/2021	na	2.6
9/23/2021	na	4.0
10/7/2021	na	3.8
10/21/2021	na	3.7
11/3/2021	<0.5	3.4

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-5
OCWD MONITORING WELL SAR-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-10/1 Upper Rho Perforations 590-600 ft bgs	3/21/2017	0.012	5.2	7.3	90	53.6	<0.2	0.017	0.68	0.18
	5/8/2017	na	5.6	7.6	94	51.6	na	0.009	0.8	0.17
	5/30/2017	0.013	5.5	6.5	84	46.8	<0.2	0.004	0.86	0.08
	9/6/2017	0.023	6.4	6.3	78	47.2	<0.2	0.005	0.88	0.09
	12/4/2017	0.015	5.8	6.5	69	49.3	<0.2	0.01	0.85	0.08
	3/20/2018	0.001	5	6.7	82	51.7	<0.2	0.008	0.58	0.1
	6/18/2018	0.012	6.7	6.7	96	51.5	na	na	0.99	0.07
	9/5/2018	0.015	6.6	8.7	114	63.8	na	na	0.62	0.11
	12/3/2018	0.012	5.1	5.3	75	45.6	<0.2	0.006	0.86	0.07
	3/20/2019	0.014	5.1	5.2	68	47.8	<0.2	0.004	0.74	0.07
	6/18/2019	0.014	5.6	6.1	74	51.6	na	na	0.78	0.1
	9/4/2019	0.016	6.4	6.3	66	49.8	na	na	0.83	0.11
	12/4/2019	0.016	5.4	5.3	92	46.7	na	na	0.76	0.15
	3/16/2020	0.014	5.9	5.5	82	47.1	na	na	0.77	0.12
	6/15/2020	0.016	6.2	5.4	86	50.4	<0.2	0.008	0.94	0.06
	9/21/2020	0.02	6.4	5.8	82	49.8	na	na	0.94	0.06
	11/30/2020	0.013	5.2	5.4	84	46.5	na	na	0.84	<0.05
	3/15/2021	0.014	4.7	4.9	83	48	na	na	0.72	0.07
	6/21/2021	0.012	5.5	4.7	94	47.1	na	na	0.81	0.06
	9/20/2021	0.014	5.9	5.4	84	50.6	<0.2	0.004	0.77	0.07
	11/29/2021	0.014	6.1	4.4	72	47.3	na	na	1.01	0.09
SAR-10/2 Lower Rho Perforations 690-710 ft bgs	3/21/2017	0.01	4.5	0.05	62	36.7	<0.2	0.002	1.18	0.07
	5/30/2017	0.01	5	0.5	64	38.5	<0.2	<0.002	1.3	<0.05
	9/6/2017	0.02	6.1	0.7	60	38.6	<0.2	<0.002	1.36	0.06
	12/4/2017	0.011	4.8	0.05	62	36.2	<0.2	<0.002	1.21	<0.05
	3/20/2018	<0.01	4.6	0.6	60	39	<0.2	0.002	1	0.06
	6/18/2018	0.011	7	0.05	55	42.4	na	na	1.55	<0.05
	9/5/2018	0.011	6.5	0.7	72	41.8	na	na	1.47	<0.05
	12/3/2018	0.011	5	0.6	61	38.1	<0.2	0.003	1.17	<0.05
	3/20/2019	0.014	4.7	0.7	56	40.6	<0.2	0.003	0.95	0.11
	6/18/2019	<0.01	5.6	0.6	64	44.2	na	na	1.16	0.06
	9/4/2019	0.019	6.3	0.6	64	39.6	na	na	1.25	0.08
	12/4/2019	0.017	4.6	0.6	40	34.2	na	na	0.99	0.01
	3/16/2020	0.011	5.4	<0.5	66	39.2	na	na	1.05	<0.05
	6/15/2020	0.014	5.4	<0.5	68	41.3	<0.2	0.002	1.22	<0.05
	9/21/2020	0.019	5.4	0.6	68	40.8	na	na	1.27	0.05
	11/30/2020	0.011	5.4	0.7	66	38.7	na	na	1.08	<0.05
	3/15/2021	0.010	4.2	0.6	55.6	40.4	na	na	0.93	<0.05
	6/21/2021	0.012	5	<0.5	108	40.1	na	na	1.05	<0.05
	9/20/2021	0.010	5.9	<0.5	71	42.9	<0.2	0.003	1.33	0.05
	11/29/2021	0.012	5.9	<0.5	54	39.8	na	na	1.32	<0.05

TABLE L-5
OCWD MONITORING WELL SAR-10
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-10/3 Main 2 Perforations 800-820 ft bgs	3/21/2017	0.012	6.5	12.3	92	48.8	<0.2	<0.002	<0.1	0.11
	5/30/2017	<0.01	5.1	12	82	44.9	<0.2	<0.002	<0.1	0.1
	9/6/2017	0.014	5.4	10.5	70	48	<0.2	<0.002	<0.1	0.1
	12/4/2017	0.014	5.7	11.3	64	50.1	<0.2	<0.002	<0.1	0.09
	3/20/2018	<0.01	4.9	11.3	76	49.2	<0.2	<0.002	<0.1	0.13
	6/18/2018	<0.01	5.1	10.7	92	49.4	na	na	<0.1	0.09
	9/5/2018	0.012	6.6	11.8	86	55.5	na	na	<0.1	0.08
	12/3/2018	0.015	6.8	11.6	98	54.9	<0.2	<0.002	<0.1	0.11
	3/20/2019	0.011	4.9	10.9	78	49.6	<0.2	0.002	<0.1	0.12
	6/18/2019	0.012	4.8	11	80	52.4	na	na	<0.1	0.11
	9/4/2019	0.013	5.5	11.3	76	52.5	na	na	<0.1	0.15
	12/4/2019	0.018	5.8	11.4	74	42.8	na	na	<0.1	0.16
	3/16/2020	0.016	5.4	10.7	86	50.7	na	na	<0.1	0.1
	6/15/2020	0.018	5	10.6	86	51.9	<0.2	<0.002	<0.1	0.1
	9/21/2020	0.019	5.4	9.9	82	53	na	na	<0.1	0.08
	11/30/2020	0.019	5.7	11	90	56.2	na	na	<0.1	0.08
	3/15/2021	0.021	6.6	13.3	113	64.1	na	na	<0.1	0.1
	6/21/2021	0.02	6.7	13.9	132	65.8	na	na	<0.1	0.08
	9/20/2021	0.014	5.2	8.8	74	52.4	<0.2	0.003	<0.1	0.08
	11/29/2021	0.017	6.3	12	88	63.8	na	<0.002	<0.1	0.08
SAR-10/4 Main 7 Perforations 1,100-1,115 ft bgs	3/21/2017	0.01	4.5	6.5	74	43.3	<0.2	0.008	1.13	0.07
	5/30/2017	0.01	5.0	5.3	68	42.2	<0.2	0.008	1.29	0.06
	9/6/2017	0.015	6.0	5.9	64	40.6	<0.2	0.010	1.31	0.06
	12/4/2017	<0.01	4.6	5.7	36	39.8	<0.2	0.006	1.15	0.05
	3/20/2018	<0.01	4.8	4.6	62	41.3	<0.2	0.004	1.10	0.05
	6/18/2018	<0.01	7.6	4.6	88	44	na	na	1.55	0.05
	9/5/2018	0.014	6.2	2.8	74	42.2	na	na	1.51	0.06
	12/3/2018	0.011	4.8	3.0	60	37.5	<0.2	<0.002	1.24	0.05
	3/20/2019	0.012	4.1	3.2	53	38.6	<0.2	<0.002	0.90	0.07
	6/18/2019	0.014	5.4	3.9	64	41.8	na	na	1.07	0.08
	9/4/2019	0.023	6.9	4.8	52	41.5	na	na	1.21	0.13
	12/4/2019	0.015	4.6	3.6	53	33.5	na	na	1.08	0.06
	3/16/2020	0.011	5.1	2.9	60	36.1	na	na	0.99	0.06
	6/15/2020	0.02	6.3	3.6	68	41.6	<0.2	<0.002	1.21	<0.05
	9/21/2020	0.02	6.4	4.7	74	41	na	na	1.28	<0.05
	11/30/2020	<0.01	4.8	3.6	64	40	na	na	1.05	0.08
	3/15/2021	0.011	4.1	2.6	61	38	na	na	0.86	0.05
	6/21/2021	0.012	5.3	1.9	92	38.3	na	na	1.04	<0.05
	9/20/2021	0.010	6.3	2.5	52	40.8	na	0.002	1.04	<0.05
	11/29/2021	0.011	5.5	2.0	56	38.2	<0.2	<0.002	1.20	<0.05

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-6
OCWD MONITORING WELL SAR-11
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-11/1 Upper Rho Perforations 592-602 ft bgs	1/19/2017	na	10.9	22	220	na	na	<0.002	0.77	0.08
	3/20/2017	0.026	10.5	19.5	186	97.4	<0.2	<0.002	0.93	0.09
	5/31/2017	0.026	10.8	20.5	186	95.9	<0.2	<0.002	0.89	0.07
	9/5/2017	0.024	9.6	15.7	174	89.4	<0.2	<0.002	1.0	0.31
	12/4/2017	0.022	9.3	14.8	132	84.3	<0.2	<0.002	1.06	<0.05
	3/19/2018	0.022	9.5	17.3	172	89.5	<0.2	<0.002	0.83	0.07
	6/18/2018	<0.01	8.9	15.9	154	85.8	na	na	0.8	0.05
	9/5/2018	0.028	9.9	20.6	176	92.5	na	na	0.56	0.05
	12/3/2018	0.024	8.8	14.2	156	78.5	<0.2	0.003	0.92	0.06
	3/20/2019	0.021	8.3	12.9	138	73.3	<0.2	<0.002	0.87	0.07
	6/17/2019	0.019	8.1	12.7	138	73.6	na	na	0.8	0.08
	9/4/2019	0.019	8.6	14.7	146	75.4	na	na	0.67	0.11
	12/4/2019	0.020	7.1	9.7	130	59.4	na	na	0.82	0.07
	3/16/2020	0.020	7.5	10.7	138	64.4	na	na	0.77	0.05
	6/15/2020	0.021	7.4	10.7	130	66.7	<0.2	<0.002	0.7	<0.05
	9/21/2020	0.021	7.4	10	136	64.6	na	na	0.82	0.05
	11/30/2020	0.022	7.1	9.6	134	60.2	na	na	0.8	<0.05
	3/15/2021	0.022	7.3	8.5	161	59.8	na	na	0.88	0.05
	6/21/2021	0.021	7.3	9.7	116	63.2	na	na	0.75	<0.05
	9/20/2021	0.020	7.1	9.4	130	62.4	<0.2	<0.002	0.81	0.11
	11/29/2021	0.019	6.8	9.2	114	62.5	na	na	0.77	0.08
SAR-11/2 Lower Rho Perforations 675-690 ft bgs	1/19/2017	na	7.8	3.2	124	na	na	0.002	1.70	0.07
	3/20/2017	0.015	8	2.5	120	63.2	<0.2	0.002	1.79	0.13
	5/31/2017	0.013	7.4	2.3	124	59.5	<0.2	<0.002	1.70	0.11
	9/5/2017	0.01	7.3	2	98	56.6	<0.2	<0.002	1.35	0.07
	12/4/2017	0.013	5.9	1.8	51	58	<0.2	<0.002	1.40	<0.05
	3/19/2018	0.011	5.8	1.5	104	55	<0.2	0.002	1.33	0.10
	6/18/2018	0.011	5.2	1.2	91	53.8	na	na	1.18	0.06
	9/5/2018	0.011	5.4	1.4	100	50.9	na	na	1.21	<0.05
	12/3/2018	0.014	6.5	1.3	100	54.2	<0.2	0.004	1.49	<0.05
	3/20/2019	0.012	5.7	1	90	53.2	<0.2	0.003	1.28	0.07
	6/17/2019	0.013	5	0.9	76	52.6	na	na	1.06	0.07
	9/4/2019	0.013	5.1	1	66	50.6	na	na	1.04	0.10
	12/4/2019	0.016	5.3	1.1	92	37.2	na	na	1.11	0.06
	3/16/2020	0.015	5.6	0.9	84	50.2	na	na	1.14	<0.05
	6/15/2020	0.017	5.2	1	84	50.3	<0.2	0.002	1.03	<0.05
	9/21/2020	0.016	5.5	1.1	90	53.8	na	na	1.14	0.10
	11/30/2020	0.016	5.4	1.2	92	52.8	na	na	1.08	0.10
	3/15/2021	0.017	5.5	1.2	138	53.4	na	na	1.09	0.06
	6/21/2021	0.015	5.4	0.9	108	53.6	na	na	1.08	<0.05
	9/20/2021	0.015	5.4	0.9	94	52.8	<0.2	<0.002	1.14	<0.05
	11/29/2021	0.014	5.2	0.7	114	55	na	na	1.14	<0.05

TABLE L-6
OCWD MONITORING WELL SAR-11
2017 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-11/3 Main 7 Perforations 1,100-1,110 ft bgs	1/19/2017	na	8.9	9.7	120	na	na	<0.002	<0.1	0.10
	3/20/2017	0.014	7.4	8.1	92	25.1	<0.2	<0.002	<0.1	0.12
	5/31/2017	0.012	6.1	8.7	90	24.3	<0.2	<0.002	<0.1	0.09
	9/5/2017	0.012	5.6	6.6	64	27.6	<0.2	<0.002	<0.1	0.11
	12/4/2017	0.014	5.9	8.3	74	30.3	<0.2	<0.002	<0.1	<0.05
	3/19/2018	0.011	5.6	11	89.5	32.1	<0.2	<0.002	<0.1	0.07
	6/18/2018	0.013	5.13	8.62	72	28.2	na	na	<0.1	0.08
	9/5/2018	0.013	6.7	9.3	84	27.8	na	na	<0.1	0.07
	12/3/2018	0.015	6.7	7.9	85	38.1	<0.2	0.003	<0.1	0.09
	3/20/2019	0.011	4.9	8	74	34.9	<0.2	0.002	<0.1	0.08
	6/17/2019	0.014	5.1	8.6	58	33	na	na	<0.1	0.09
	9/4/2019	0.012	5.6	9.2	54	32.4	na	na	<0.1	0.18
	12/4/2019	0.018	6	10	80	33.2	na	na	<0.1	0.08
	3/16/2020	0.02	5.3	9.8	78	36.4	na	na	<0.1	0.07
	6/15/2020	0.016	5.4	11.1	80	43.1	<0.2	<0.002	<0.1	0.05
	9/21/2020	0.01	5.7	13.2	90	48.6	na	na	<0.1	0.06
	11/30/2020	0.017	6.7	16.5	106	55.3	na	na	<0.1	0.05
	3/15/2021	0.034	9.9	25.5	146	85.3	na	na	<0.1	0.06
	6/21/2021	0.017	5.5	12.5	84	48.1	na	na	<0.1	0.10
	9/20/2021	0.012	4.8	10.7	66	42.4	<0.2	<0.002	<0.1	0.05
	11/29/2021	0.012	5.2	10	88	44	na	na	<0.1	0.06

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/1 Lower Rho Perforations 605-625 ft bgs	1/8/2020	na	12	34	274	135	na	<0.002	<0.1	na
	2/4/2020	0.035	12	33.7	250	144	<0.2	<0.002	<0.1	0.08
	5/5/2020	0.034	11.6	33.3	256	132	<0.2	<0.002	<0.1	0.09
	6/4/2020	na	11.6	33.1	234	135	na	<0.002	<0.1	na
	6/30/2020	na	11.8	34.2	236	136	na	<0.002	<0.1	na
	7/13/2020	na	11.9	34.3	246	135	na	<0.002	<0.1	na
	7/27/2020	na	11.5	33.1	232	131	na	<0.002	<0.1	na
	8/4/2020	0.037	11.7	33.9	236	132	<0.2	<0.002	<0.1	<0.05
	8/20/2020	na	11.7	33.3	256	130	na	<0.002	<0.1	na
	9/2/2020	na	11.9	34.2	230	133	na	<0.002	<0.1	na
	9/17/2020	na	11.5	32.8	232	131	na	<0.002	0.13	na
	10/1/2020	na	11.8	33.8	254	130	na	<0.002	0.1	na
	10/14/2020	na	11.6	33.2	248	131	na	<0.002	0.11	na
	10/26/2020	na	11.8	33.6	234	127	na	<0.002	<0.1	na
	11/5/2020	0.037	11.7	33.6	226	127	<0.2	<0.002	0.11	<0.05
	11/18/2020	na	11.6	32.9	260	123	na	<0.002	0.12	<0.05
	12/2/2020	na	11.4	32.5	236	128	na	0.002	0.12	0.06
	12/14/2020	na	11.4	32.7	242	131	na	0.003	0.13	0.12
	12/31/2020	na	11.3	32.7	235	125	na	0.003	0.12	<0.05
	1/7/2021	na	11.4	32.7	228	na	na	0.048	0.13	0.07
	1/21/2021	na	11.4	32.7	235	na	na	<0.002	0.16	<0.05
	2/2/2021	0.04	11.5	32.8	215	125	<0.2	0.002	0.15	0.06
	2/18/2021	na	11.8	34	241	na	na	<0.002	0.16	<0.05
	3/4/2021	na	11.6	32.8	230	na	na	<0.002	0.21	<0.05
	3/18/2021	na	11.3	31.8	213	na	na	<0.002	0.2	<0.05
	4/1/2021	na	11.4	32	234	na	na	<0.002	0.16	<0.05
	4/15/2021	na	11.3	32.1	212	na	na	<0.002	0.17	<0.05
	5/4/2021	0.037	11	31.5	238	129	0.2	<0.002	0.15	<0.05
	5/19/2021	na	11.2	31.6	204	na	na	<0.002	0.17	<0.05
	6/3/2021	na	11.5	32.1	258	na	na	<0.002	0.16	0.06
	6/17/2021	na	11.6	31.9	264	na	na	0.003	0.21	0.07
	7/1/2021	na	11.5	32	240	na	na	0.002	0.17	0.09
	7/15/2021	na	11.2	32	234	na	na	<0.002	0.2	0.07
	7/26/2021	na	11.2	31.6	254	na	na	<0.002	0.19	0.05
	8/10/2021	0.037	11.3	31.9	238	129	<0.2	<0.002	0.17	0.11
	8/25/2021	na	11.6	32.3	242	na	na	<0.002	0.16	<0.05
	9/9/2021	na	11.8	32.2	230	na	na	<0.002	0.26	0.07
	9/23/2021	na	11.8	32.2	228	na	na	<0.002	0.26	<0.05
	10/7/2021	na	11.3	31.3	224	na	na	0.002	0.21	0.06
	10/21/2021	na	11.3	31.6	212	na	na	<0.002	0.2	0.05
	11/2/2021	0.037	11.4	32	214	127	<0.2	<0.002	0.19	<0.05
	12/6/2021	na	11.2	31.6	226	na	na	<0.002	0.18	0.12

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/2 Main 2 Perforations 755-775 ft bgs	1/8/2020	na	12.4	36.3	250	122	na	<0.002	<0.1	na
	2/4/2020	0.035	12.3	35.9	246	132	<0.2	<0.002	<0.1	0.12
	5/5/2020	0.035	12.3	36	266	124	<0.2	<0.002	<0.1	0.13
	6/4/2020	na	12.3	36	254	125	na	<0.002	<0.1	na
	6/30/2020	na	13	37.5	248	137	na	<0.002	<0.1	na
	7/13/2020	na	13.2	37.7	246	130	na	<0.002	<0.1	na
	7/27/2020	na	13.4	37.4	250	130	na	<0.002	<0.1	na
	8/4/2020	0.040	13.9	38.8	250	128	<0.2	<0.002	<0.1	0.12
	8/20/2020	na	14.1	38.3	244	130	na	<0.002	<0.1	na
	9/2/2020	na	14.6	39.6	260	131	na	0.002	<0.1	na
	9/17/2020	na	14.3	38.4	244	133	na	<0.002	<0.1	na
	10/1/2020	na	15.1	40.2	252	132	na	<0.002	<0.1	na
	10/14/2020	na	15.5	40.8	258	132	na	<0.002	<0.1	na
	10/26/2020	na	16.3	42	262	137	na	<0.002	<0.1	na
	11/5/2020	0.050	16.8	43	270	136	<0.2	<0.002	<0.1	0.1
	11/18/2020	na	17.2	43.2	278	na	na	<0.002	<0.1	0.1
	12/2/2020	na	17.1	42.9	266	na	na	<0.002	<0.1	0.1
	12/14/2020	na	17.1	42.5	274	na	na	0.003	<0.1	0.11
	12/31/2020	na	16.8	42	258	na	na	<0.002	<0.1	0.11
	1/7/2021	na	17.2	42.2	259	na	na	0.002	<0.1	0.1
	1/21/2021	na	17.4	42.5	266	na	na	0.003	<0.1	0.1
	2/2/2021	0.053	17.6	43	222	135	<0.2	0.003	<0.1	0.11
	2/18/2021	na	18.1	44.3	263	na	na	<0.002	<0.1	0.1
	3/4/2021	na	17.4	42.7	260	na	na	<0.002	<0.1	0.11
	3/18/2021	na	16.9	41.6	258	na	na	<0.002	<0.1	0.13
	4/1/2021	na	16.8	41.7	262	na	na	<0.002	<0.1	0.11
	4/15/2021	na	16.6	41.9	232	na	na	<0.002	<0.1	0.15
	5/4/2021	0.051	16.5	41.5	280	134	0.2	<0.002	<0.1	0.11
	5/19/2021	na	16.1	40.9	224	na	na	<0.002	<0.1	0.16
	6/3/2021	na	15.8	40.6	276	na	na	<0.002	<0.1	0.11
	6/17/2021	na	15.6	39.9	304	na	na	<0.002	<0.1	0.16
	7/1/2021	na	15.1	39.9	244	na	na	<0.002	<0.1	0.11
	7/15/2021	na	14.3	39	252	na	na	<0.002	<0.1	0.1
	7/26/2021	na	13.6	37.4	244	na	na	<0.002	<0.1	0.1
	8/10/2021	0.043	13.2	37.1	246	127	<0.2	0.002	<0.1	0.1
	8/25/2021	na	13.4	37.6	246	na	na	<0.002	<0.1	0.08
	9/9/2021	na	13.6	37.5	240	na	na	<0.002	<0.1	0.1
	9/23/2021	na	13.6	37.6	250	na	na	<0.002	<0.1	0.09
	10/7/2021	na	13.4	36.8	242	na	na	0.003	<0.1	0.12
	10/21/2021	na	13.5	37.7	226	na	na	<0.002	<0.1	0.1
	11/2/2021	0.043	13.7	37.6	232	128	<0.2	<0.002	<0.1	0.15
	12/6/2021	na	13.6	37.3	238	na	na	<0.002	<0.1	0.14

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/3 Main 4 Perforations 915-930 ft bgs	1/8/2020	na	11.5	33.6	238	110	na	<0.002	0.14	na
	2/4/2020	0.033	11.4	33.1	204	113	<0.2	<0.002	0.11	<0.05
	5/5/2020	0.032	11.2	32.9	222	104	<0.2	<0.002	0.14	<0.05
	6/4/2020	na	11.3	33.2	234	104	na	<0.002	0.14	na
	6/30/2020	na	11.5	33.6	224	105	na	<0.002	0.13	na
	7/13/2020	na	11.5	33.8	230	104	na	<0.002	0.13	na
	7/27/2020	na	11.3	32.9	238	102	na	<0.002	0.13	na
	8/4/2020	0.035	11.5	33.8	224	103	<0.2	<0.002	0.12	<0.05
	8/20/2020	na	11.4	33	238	101	na	<0.002	0.13	na
	9/2/2020	na	11.8	34.4	240	103	na	<0.002	0.14	na
	9/17/2020	na	11.2	32.5	210	102	na	<0.002	0.17	na
	10/1/2020	na	11.4	33.5	226	99.9	na	<0.002	0.15	na
	10/14/2020	na	11.4	33.3	234	99.9	na	<0.002	0.14	na
	10/26/2020	na	11.5	33.6	238	101	na	<0.002	0.14	na
	11/5/2020	0.036	11.4	33.3	226	99.8	<0.2	<0.002	0.15	<0.05
	11/18/2020	na	11.3	32.8	246	na	na	<0.002	0.16	<0.05
	12/2/2020	na	11.2	32.7	228	na	na	0.003	0.14	<0.05
	12/14/2020	na	11.2	32.6	232	na	na	0.004	0.15	0.09
	12/31/2020	na	11	32.6	218	na	na	0.003	0.14	<0.05
	1/7/2021	na	11.1	32.5	215	na	na	0.002	0.16	<0.05
	1/21/2021	na	11.2	32.8	225	na	na	0.002	0.17	<0.05
	2/2/2021	0.037	11.4	33.5	197	98.1	<0.2	0.002	0.15	0.1
	2/18/2021	na	11.5	33.9	224	na	na	<0.002	0.17	<0.05
	3/4/2021	na	11.3	32.8	215	na	na	<0.002	0.25	<0.05
	3/18/2021	na	10.8	30.8	212	na	na	<0.002	0.27	<0.05
	4/1/2021	na	10.2	28.8	224	na	na	<0.002	0.3	<0.05
	4/15/2021	na	9.6	26.5	212	na	na	<0.002	0.43	<0.05
	5/4/2021	0.028	8.8	21.8	208	88.1	<0.2	0.003	0.55	<0.05
	5/19/2021	na	8.4	18.9	198	na	na	<0.002	0.7	0.07
	6/3/2021	na	8.2	15.5	206	na	na	<0.002	0.84	0.07
	6/17/2021	na	8.1	13.4	234	na	na	<0.002	0.95	0.07
	7/1/2021	na	7.8	12.3	170	na	na	<0.002	0.97	<0.05
	7/15/2021	na	7.4	10.4	162	na	na	0.002	1.05	<0.05
	7/26/2021	na	7.5	10	134	na	na	<0.002	1.06	<0.05
	8/10/2021	0.021	7.3	9	136	53.5	<0.2	0.003	1.07	<0.05
	8/25/2021	na	7.4	8	142	na	na	<0.002	1.07	<0.05
	9/9/2021	na	7.6	8.3	126	na	na	<0.002	1.15	<0.05
	9/23/2021	na	7.3	7.6	130	na	na	<0.002	1.16	<0.05
	10/7/2021	na	6.8	6.5	124	na	na	0.004	1.11	0.05
	10/21/2021	na	6.6	6.4	112	na	na	<0.002	1.09	<0.05
	11/2/2021	0.019	6.4	6	112	42.5	<0.2	<0.002	1.08	0.08
	12/6/2021	na	5.9	5.6	108	na	na	<0.002	1.01	<0.05

TABLE L-7
OCWD MONITORING WELL SAR-12
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-12/4 Main 7 Perforations 1,045-1,055 ft bgs	1/8/2020	na	12.7	35.2	228	70.6	na	<0.002	<0.1	na
	2/4/2020	0.036	12.6	35.4	216	70.7	<0.2	<0.002	<0.1	0.07
	5/5/2020	0.035	12.2	34.7	236	65.5	<0.2	<0.002	<0.1	0.11
	6/4/2020	na	12.5	34.6	214	65.8	na	<0.002	<0.1	na
	6/30/2020	na	12.6	35.9	212	66.4	na	<0.002	<0.1	na
	7/13/2020	na	12.5	35.5	212	66.5	na	<0.002	<0.1	na
	7/27/2020	na	12.3	34.2	206	65	na	<0.002	<0.1	na
	8/4/2020	0.038	12.5	34.8	208	64.8	<0.2	<0.002	<0.1	0.06
	8/20/2020	na	12.1	32.3	196	62.8	na	<0.002	<0.1	na
	9/2/2020	na	12.1	32.0	202	61.8	na	<0.002	<0.1	na
	9/17/2020	na	11.2	28.6	188	57.8	na	<0.002	<0.1	na
	10/1/2020	na	11.1	27.9	186	54.8	na	<0.002	<0.1	na
	10/14/2020	na	10.9	26.7	198	52.8	na	<0.002	<0.1	na
	10/26/2020	na	10.4	23.5	178	47.7	na	<0.002	<0.1	na
	11/5/2020	0.029	9.9	22.0	170	44.8	<0.2	<0.002	<0.1	0.12
	11/18/2020	na	9.3	18.9	172	40.5	na	<0.002	<0.1	0.09
	12/2/2020	na	9.2	19.3	152	40.7	na	0.003	<0.1	0.08
	12/14/2020	na	8.8	17.0	156	37.5	na	0.003	<0.1	0.08
	12/31/2020	na	8.9	17.7	145	37.1	na	0.003	<0.1	0.07
	1/7/2021	na	8.8	17.2	142	na	na	<0.002	<0.1	0.11
	1/21/2021	na	8.6	16.2	149	na	na	0.002	<0.1	0.08
	2/2/2021	0.026	8.7	16.4	136	36.2	<0.2	0.003	<0.1	0.10
	2/18/2021	na	8.9	17.1	152	na	na	<0.002	<0.1	0.07
	3/4/2021	na	8.6	15.8	139	na	na	<0.002	<0.1	0.08
	3/18/2021	na	8.3	14.8	139	na	na	<0.002	<0.1	0.10
	4/1/2021	na	8.0	14.2	142	na	na	<0.002	<0.1	0.09
	4/15/2021	na	7.8	14.4	156	na	na	<0.002	<0.1	0.08
	5/4/2021	0.025	7.9	14.7	152	35.4	0.2	0.004	<0.1	0.12
	5/19/2021	na	7.6	13.3	124	na	na	<0.002	<0.1	0.08
	6/3/2021	na	7.6	13.2	148	na	na	<0.002	<0.1	0.12
	6/17/2021	na	7.7	12.7	116	na	na	<0.002	<0.1	0.15
	7/1/2021	na	7.4	12.7	116	na	na	<0.002	<0.1	0.09
	7/15/2021	na	7.0	11.9	136	na	na	<0.002	<0.1	0.09
	7/26/2021	na	7.0	11.2	112	na	na	<0.002	<0.1	0.11
	8/10/2021	0.021	6.9	10.5	112	31.1	<0.2	0.002	<0.1	0.12
	8/25/2021	na	7.0	9.9	126	na	na	<0.002	<0.1	0.09
	9/9/2021	na	7.1	9.7	128	na	na	<0.002	<0.1	0.10
	9/23/2021	na	6.9	9.2	120	na	na	<0.002	<0.1	0.11
	10/7/2021	na	6.3	7.8	74	na	na	<0.002	<0.1	0.19
	10/21/2021	na	6.1	7.5	70	na	na	<0.002	<0.1	0.11
	11/2/2021	0.017	6.3	7.9	136	26.6	<0.2	<0.002	<0.1	0.13
	12/6/2021	na	6.3	7.8	94	na	na	0.003	<0.1	0.11

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
	1/8/2020	na	15.7	39.7	256	151	na	<0.002	0.27	na
	2/4/2020	0.043	16	39.6	250	154	<0.2	<0.002	0.25	0.08
	4/1/2020	na	16	40.1	246	145	na	<0.002	0.26	na
	4/15/2020	na	15.5	39	264	145	na	<0.002	0.26	na
	4/30/2020	na	15.9	40.3	272	148	<0.2	<0.002	0.25	na
	5/6/2020	0.044	15.8	39.9	252	148	<0.2	<0.002	0.26	0.07
	5/21/2020	na	15.8	40.3	260	147	na	<0.002	0.28	na
	6/4/2020	na	15.2	39.4	278	150	na	<0.002	0.25	na
	6/17/2020	na	15	39.2	270	148	na	<0.002	0.23	na
	6/30/2020	na	15.2	40.3	256	146	na	<0.002	0.22	na
	7/13/2020	na	14.7	39.4	254	150	na	<0.002	0.22	na
	7/27/2020	na	14.1	38	268	146	na	<0.002	0.17	na
	8/5/2020	0.041	14	38.1	242	142	<0.2	<0.002	0.19	0.08
	8/20/2020	na	13.1	34.2	242	140	na	<0.002	0.25	na
	9/2/2020	na	12.5	32.4	250	136	na	<0.002	0.3	na
	9/17/2020	na	11.6	28.4	238	133	na	<0.002	0.35	na
	10/1/2020	na	11.7	29.5	228	127	na	<0.002	0.41	na
	10/14/2020	na	12	26.9	240	123	na	<0.002	0.5	na
SAR-13/1	10/26/2020	na	12	25.9	226	119	na	<0.002	0.54	na
Lower Rho	11/4/2020	0.035	12.4	26	228	118	<0.2	<0.002	0.64	0.08
Perforations	11/18/2020	na	12	25.3	220	114	na	<0.002	0.63	<0.05
600-620 ft bgs	12/2/2020	na	11.7	24.3	210	114	na	0.002	0.63	<0.05
	12/14/2020	na	11.4	23.5	218	112	na	0.003	0.63	<0.05
	12/31/2020	na	11.1	23.4	207	106	na	0.003	0.63	<0.05
	1/7/2021	na	10.9	22.6	197	na	na	<0.002	0.62	<0.05
	1/21/2021	na	10.7	22.2	208	na	na	0.005	0.66	<0.05
	2/3/2021	0.032	10.7	22.2	150	103	<0.2	<0.002	0.66	<0.05
	2/18/2021	na	9.9	21	217	na	na	<0.002	0.63	0.06
	3/4/2021	na	9.9	20.9	198	na	na	<0.002	0.68	<0.05
	3/18/2021	na	9.6	19.8	184	na	na	<0.002	0.65	<0.05
	4/1/2021	na	9.2	19	174	na	na	<0.002	0.62	<0.05
	4/15/2021	na	8.9	19	198	na	na	0.002	0.64	<0.05
	5/5/2021	0.028	8.6	17.8	192	93.6	<0.2	<0.002	0.64	0.06
	5/19/2021	na	8.4	17	154	na	na	<0.002	0.7	0.09
	6/3/2021	na	8.4	16.7	190	na	na	<0.002	0.76	0.05
	6/17/2021	na	8.2	15.1	212	na	na	<0.002	0.79	0.06
	7/1/2021	na	8.1	15.1	164	na	na	<0.002	0.76	<0.05
	7/15/2021	na	7.9	14.6	172	na	na	0.002	0.8	<0.05
	7/27/2021	na	8.1	14.9	202	na	na	<0.002	0.8	0.05
	8/11/2021	0.025	8	14.5	202	91	<0.2	0.003	0.76	<0.05
	8/25/2021	na	8.4	14.9	164	na	na	<0.002	0.79	<0.05
	9/9/2021	na	8.8	15.2	168	na	na	<0.002	0.88	0.05
	9/23/2021	na	8.7	15.4	154	na	na	<0.002	0.86	<0.05
	10/7/2021	na	8.6	15.2	152	na	na	0.003	0.81	0.07
	10/21/2021	na	8.6	15.9	140	na	na	<0.002	0.81	<0.05
	11/3/2021	0.024	8.5	15.8	152	89.8	<0.2	<0.002	0.84	0.06
	12/6/2021	na	8.1	14.2	140	na	na	<0.002	0.89	<0.05

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-13/2 Main 2 Perforations 750-770 ft bgs	1/8/2020	na	12.2	36.7	240	112	na	<0.002	<0.1	na
	2/4/2020	0.034	12.2	36.5	242	133	<0.2	<0.002	<0.1	0.1
	4/1/2020	na	12.5	36.8	230	119	na	<0.002	<0.1	na
	4/15/2020	na	11.9	35.7	244	120	na	<0.002	<0.1	na
	4/30/2020	na	12.1	36.3	242	121	<0.2	<0.002	<0.1	na
	5/6/2020	0.034	12	36.2	234	122	<0.2	<0.002	<0.1	0.08
	5/21/2020	na	14.4	36.7	238	121	na	<0.002	<0.1	na
	6/4/2020	na	12	36.3	240	123	na	<0.002	<0.1	na
	6/17/2020	na	12.1	36.3	226	124	na	<0.002	<0.1	na
	6/30/2020	na	12.2	37.1	228	125	na	<0.002	<0.1	na
	7/13/2020	na	12.3	37.1	248	125	na	<0.002	<0.1	na
	7/27/2020	na	12	36.2	232	125	na	<0.002	<0.1	na
	8/5/2020	0.038	12.3	37.3	248	123	<0.2	<0.002	<0.1	0.11
	8/20/2020	na	12.1	36.1	240	122	na	<0.002	<0.1	na
	9/2/2020	na	12.3	37.1	266	123	na	<0.002	<0.1	na
	9/17/2020	na	11.9	35.7	242	125	na	<0.002	<0.1	na
	10/1/2020	na	13	37.1	232	123	na	<0.002	<0.1	na
	10/14/2020	na	12.5	37.7	260	119	na	<0.002	<0.1	na
	10/26/2020	na	12.2	36.7	232	120	na	<0.002	<0.1	na
	11/4/2020	0.038	12.2	36.7	240	120	na	<0.002	<0.1	0.09
	11/18/2020	na	12.1	36.3	270	118	na	<0.002	<0.1	0.07
	12/2/2020	na	12	36.4	232	106	na	0.002	<0.1	0.09
	12/14/2020	na	12	36.3	252	120	na	0.003	<0.1	0.07
	12/31/2020	na	11.9	36.3	244	118	na	0.003	<0.1	0.07
	1/7/2021	na	11.9	35.9	232	na	na	<0.002	<0.1	0.07
	1/21/2021	na	12	36.2	147	na	na	0.003	<0.1	0.07
	2/3/2021	0.100	12.2	37	203	116	<0.2	0.003	<0.1	0.08
	2/18/2021	na	12.3	37.4	234	na	na	<0.002	<0.1	0.08
	3/4/2021	na	12.2	36.6	230	na	na	<0.002	<0.1	0.07
	3/18/2021	na	12	35.7	239	na	na	<0.002	<0.1	0.09
	4/1/2021	na	11.9	35.9	248	na	na	<0.002	<0.1	0.11
	4/15/2021	na	11.8	36.1	232	na	na	<0.002	<0.1	0.09
	5/5/2021	0.200	12.1	36	248	119	<0.2	<0.002	<0.1	0.07
	5/19/2021	na	11.9	35.8	226	na	na	<0.002	<0.1	0.09
	6/3/2021	na	12.2	36.8	258	na	na	<0.002	<0.1	0.2
	6/17/2021	na	11.9	35.1	262	na	na	<0.002	<0.1	0.09
	7/1/2021	na	11	32.3	232	na	na	<0.002	<0.1	0.08
	7/15/2021	na	10.2	28.9	224	na	na	<0.002	<0.1	0.08
	7/27/2021	na	10.4	28.2	196	na	na	<0.002	<0.1	0.1
	8/11/2021	0.010	10	26.6	236	104	<0.2	0.002	<0.1	0.13
	8/25/2021	na	10.3	26.9	212	na	na	<0.002	<0.1	0.07
	9/9/2021	na	10.3	26.3	212	na	na	<0.002	<0.1	0.11
	9/23/2021	na	9.6	24.1	200	na	na	<0.002	<0.1	0.08
	10/7/2021	na	8.5	19.6	206	na	na	<0.002	<0.1	0.13
	10/21/2021	na	7.7	16.9	188	na	na	<0.002	<0.1	0.09
	11/3/2021	0.100	8	15.5	172	83.4	<0.2	<0.002	<0.1	0.18
	12/6/2021	na	7.1	12.9	152	na	na	<0.002	<0.1	0.1

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-13/3 Main 4 Perforations 910-930 ft bgs	1/8/2020	na	11.6	33.7	226	124	na	<0.002	0.17	na
	2/4/2020	0.033	11.7	33.6	198	125	<0.2	<0.002	0.15	0.09
	4/1/2020	na	11.7	33.3	228	114	na	<0.002	0.16	na
	4/15/2020	na	11.5	33	230	114	na	<0.002	0.16	na
	4/30/2020	na	11.6	33.3	242	117	<0.2	<0.002	0.15	na
	5/6/2020	0.036	11.4	33.1	254	114	<0.2	<0.002	0.17	0.06
	5/21/2020	na	11.6	33.7	234	116	na	<0.002	0.18	na
	6/1/2020	na	11.3	32.6	232	117	na	<0.002	0.18	na
	6/17/2020	na	11.1	32.5	238	114	na	<0.002	0.16	na
	6/30/2020	na	11.4	33.2	230	115	na	<0.002	0.18	na
	7/13/2020	na	11.3	32.8	240	114	na	<0.002	0.18	na
	7/27/2020	na	11.1	31.7	238	114	na	<0.002	0.18	na
	8/5/2020	0.032	11.3	32.5	232	111	<0.2	<0.002	0.21	<0.05
	8/20/2020	na	10.2	27.8	216	106	na	<0.002	0.32	na
	9/2/2020	na	9.6	24.6	210	95.8	na	<0.002	0.44	na
	9/17/2020	na	8.2	17.7	190	80.2	na	<0.002	0.64	na
	10/1/2020	na	8	14.7	180	67.3	na	<0.002	0.78	na
	10/14/2020	na	7.7	11.7	172	59.8	na	<0.002	0.92	na
	10/26/2020	na	7.4	9.1	164	51	na	<0.002	1.04	na
	11/4/2020	0.019	7.1	7.4	130	45.8	<0.2	<0.002	1.17	<0.05
	11/18/2020	na	6.9	5.5	134	41.2	na	<0.002	1.2	0.09
	12/2/2020	na	6.8	4.6	104	35.7	na	0.003	1.22	<0.05
	12/14/2020	na	6.6	3.7	104	33.1	na	0.003	1.22	0.07
	12/31/2020	na	6.4	3.5	148	31.9	na	0.003	1.21	<0.05
	1/7/2021	na	6.4	3.3	107	na	na	<0.002	1.19	<0.05
	1/21/2021	na	6.5	3	91	na	na	0.005	1.22	<0.05
	2/3/2021	0.019	6.4	2.9	79	29.6	<0.2	0.006	1.22	<0.05
	2/18/2021	na	6.2	2.7	100	na	na	<0.002	1.23	<0.05
	3/4/2021	na	6.2	3	92	na	na	<0.002	1.22	<0.05
	3/18/2021	na	6	2.9	100	na	na	<0.002	1.15	<0.05
	4/1/2021	na	5.8	2.8	74	na	na	<0.002	1.12	<0.05
	4/15/2021	na	5.5	3.2	96.5	na	na	0.002	1.09	<0.05
	5/5/2021	0.016	5	2.5	92	28	<0.2	0.002	0.99	<0.05
	5/19/2021	na	5.1	3.1	87.5	na	na	<0.002	0.99	0.05
	6/3/2021	na	5.5	3.2	90.5	na	na	<0.002	0.99	<0.05
	6/17/2021	na	5.2	2.9	92	na	na	<0.002	0.98	0.07
	7/1/2021	na	4.8	2.9	87	na	na	<0.002	0.92	<0.05
	7/15/2021	na	4.6	2.5	94	na	na	<0.002	0.95	<0.05
	7/27/2021	na	4.8	2.7	116	na	na	<0.002	0.96	<0.05
	8/11/2021	0.013	4.8	2.6	102	24.7	<0.2	0.002	0.95	<0.05
	8/25/2021	na	5	1.4	74	na	na	<0.002	1	<0.05
	9/9/2021	na	5.6	2.1	78	na	na	<0.002	1.09	0.1
	9/23/2021	na	5.5	2.3	90	na	na	0.004	1.1	<0.05
	10/7/2021	na	5.5	2.4	68	na	na	<0.002	1.09	<0.05
	10/21/2021	na	5.4	2.3	66	na	na	<0.002	1.1	<0.05
	11/3/2021	0.013	5.5	1.8	62	24.7	<0.2	<0.002	1.14	0.09
	12/6/2021	na	5.7	2.3	80	na	na	<0.002	1.07	<0.05

TABLE L-8
OCWD MONITORING WELL SAR-13
2020 - 2021 General Water Quality Data

Aquifer	Date	Bromide (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Total Hardness (mg/L)	TKN (mg/L)	Nitrite-N (mg/L)	Nitrate-N (mg/L)	TOC (mg/L)
SAR-13/4 Main 7 Perforations 1,045-1,055 ft bgs	1/8/2020	na	11.9	35.0	224	24.2	na	0.004	<0.1	0.15
	2/4/2020	0.034	11.9	34.8	212	28.6	<0.2	0.006	<0.1	na
	4/1/2020	na	11.9	34.2	198	47.4	na	0.004	0.12	na
	4/15/2020	na	11.5	33.3	212	53.6	na	0.003	0.11	na
	4/30/2020	na	11.3	32.5	208	49.4	<0.2	0.003	<0.1	na
	5/6/2020	0.033	11.3	32.5	194	46.1	<0.2	0.003	0.12	0.11
	5/21/2020	na	10.7	26.1	190	43.7	na	0.013	0.3	na
	6/1/2020	na	8.7	20.4	168	40.6	na	<0.002	0.42	na
	6/17/2020	na	7.4	14.1	154	35.5	na	0.002	0.55	na
	6/30/2020	na	6.6	8.9	128	31.2	na	0.002	0.71	na
	7/13/2020	na	6.6	7.7	130	28.4	na	<0.002	0.78	na
	7/27/2020	na	6.4	5.8	134	26.8	na	0.003	0.84	na
	8/5/2020	0.018	6.7	5.7	130	26	<0.2	0.003	0.93	0.09
	8/20/2020	na	6.6	4.3	122	24.6	na	0.005	0.96	na
	9/2/2020	na	6.7	3.7	114	23.1	na	0.024	0.99	na
	9/17/2020	na	6.4	2.7	106	22.5	na	0.005	1.19	na
	10/1/2020	na	6.6	2.8	102	21.4	na	0.004	1.22	na
	10/14/2020	na	6.7	2.9	104	20.8	na	0.004	1.25	na
	10/26/2020	na	6.7	3.2	112	21.1	na	0.005	1.24	na
	11/4/2020	0.018	6.6	3.4	106	21.6	<0.2	0.004	1.28	0.08
	11/18/2020	na	6.6	3.7	120	23	na	0.005	1.22	0.08
	12/2/2020	na	6.6	3.8	110	22.9	na	0.006	1.2	0.07
	12/14/2020	na	6.5	4.2	118	24	na	0.009	1.16	0.09
	12/31/2020	na	6.5	4.6	126	23.2	na	0.005	1.16	0.08
	1/7/2021	na	6.5	4.5	96	na	na	0.004	1.13	0.09
	1/21/2021	na	6.5	4.3	113	na	na	0.002	1.16	0.10
	2/3/2021	0.02	6.3	3.6	89	22	<0.2	0.005	1.19	0.07
	2/18/2021	na	6.3	3.6	103	na	na	<0.002	1.2	0.12
	3/4/2021	na	6.0	3.4	108	na	na	0.002	1.16	0.08
	3/18/2021	na	5.8	3.1	113	na	na	0.002	1.11	0.08
	4/1/2021	na	5.2	2.4	126	na	na	0.003	1.02	0.09
	4/15/2021	na	4.8	2.4	110	na	na	0.003	1	0.07
	5/5/2021	0.015	4.8	2.1	128	20.3	<0.2	0.004	0.95	0.08
	5/19/2021	na	5.0	2.6	100	na	na	0.010	0.89	0.09
	6/3/2021	na	5.4	2.6	132	na	na	0.002	1.01	0.07
	6/17/2021	na	5.7	2.3	118	na	na	0.003	1.06	0.07
	7/1/2021	na	5.7	2.5	106	na	na	0.007	1.09	0.06
	7/15/2021	na	5.8	3.2	124	na	na	0.003	1.08	0.05
	7/27/2021	na	6.1	2.8	138	na	na	0.008	1.15	0.06
	8/11/2021	0.018	5.9	2.6	122	23	<0.2	0.006	1.13	0.07
	8/25/2021	na	7.6	11.5	136	na	na	<0.002	0.71	0.17
	9/9/2021	na	8.3	13.8	132	na	na	<0.002	0.73	0.12
	9/23/2021	na	5.9	2.8	110	na	na	0.007	1.15	<0.05
	10/7/2021	na	5.5	2.1	84	na	na	0.004	1.09	0.05
	10/21/2021	na	5.1	2.1	74	na	na	<0.002	1.03	<0.05
	11/3/2021	0.014	5.2	2.1	82	19.8	<0.2	<0.002	1.04	0.06
	12/6/2021	na	6.0	1.8	98	na	na	0.002	1.07	0.05

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed