GWRS

GROUNDWATER REPLENISHMENT SYSTEM

2020 ANNUAL REPORT

Mid-Basin Injection Project in March 2020

ORANGE COUNTY WATER DISTRICT

SINCE 1933

Groundwater Replenishment System
2020 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

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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 2020. 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).

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
- **Two non-potable water customers**: Anaheim Canyon Power Plant (Anaheim CPP) and Anaheim Regional Transportation Intermodal Center (ARTIC).

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 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]),

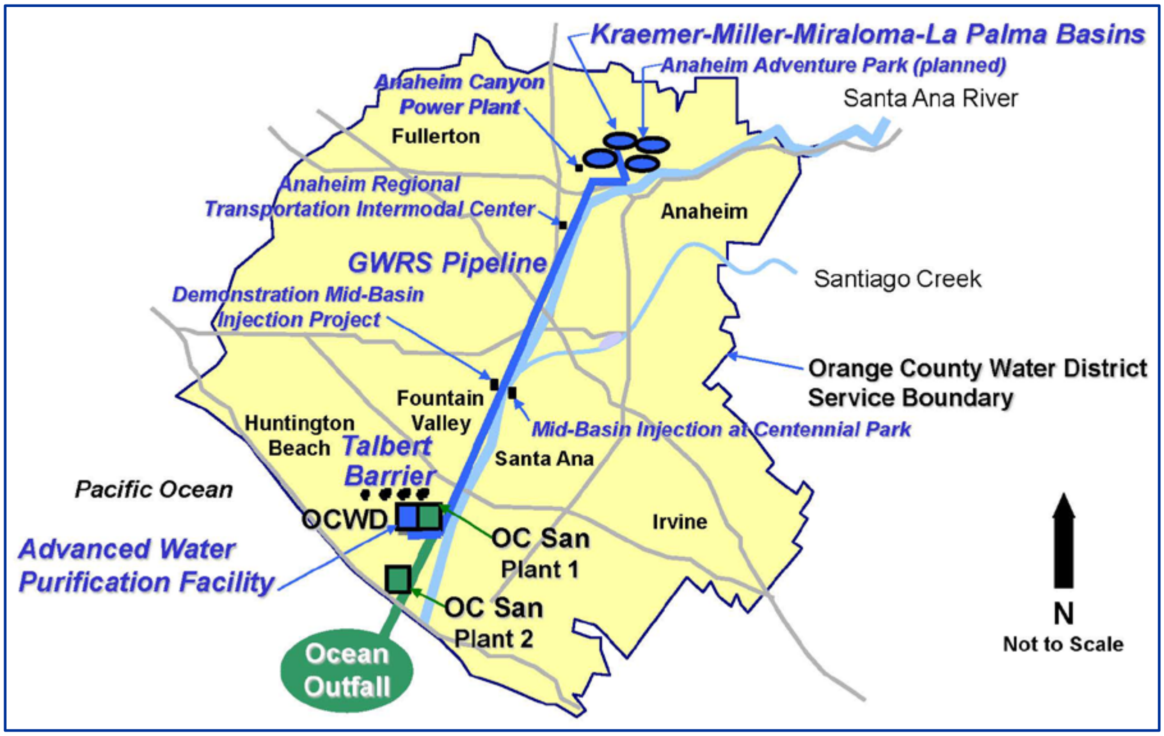


Figure ES-1. Groundwater Replenishment System Location Map

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 2020, 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 Santa Ana River (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. 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.

Advanced Water Purification Facility Performance

During 2020 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 2020 purified recycled water production and discharge by location is presented in Table ES-1 and illustrated on Figure ES-2.

Table ES-1. 2020 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	21.5	7,865	24,138	25.2%
Kraemer Basin	0.35	129	396	0.4%
Miller Basin	3.0	1,089	3,342	3.5%
Miraloma Basin	2.9	1,049	3,220	3.4%
La Palma Basin	50.0	18,293	56,140	58.6%
MBI Project	7.6	2,782	8,536	8.9%
Anaheim CPP	<0.1	24	75	<0.1%
ARTIC	<0.1	4	11	<0.1%
Total	**85.3**	**31,235**	**95,858**	**100%**

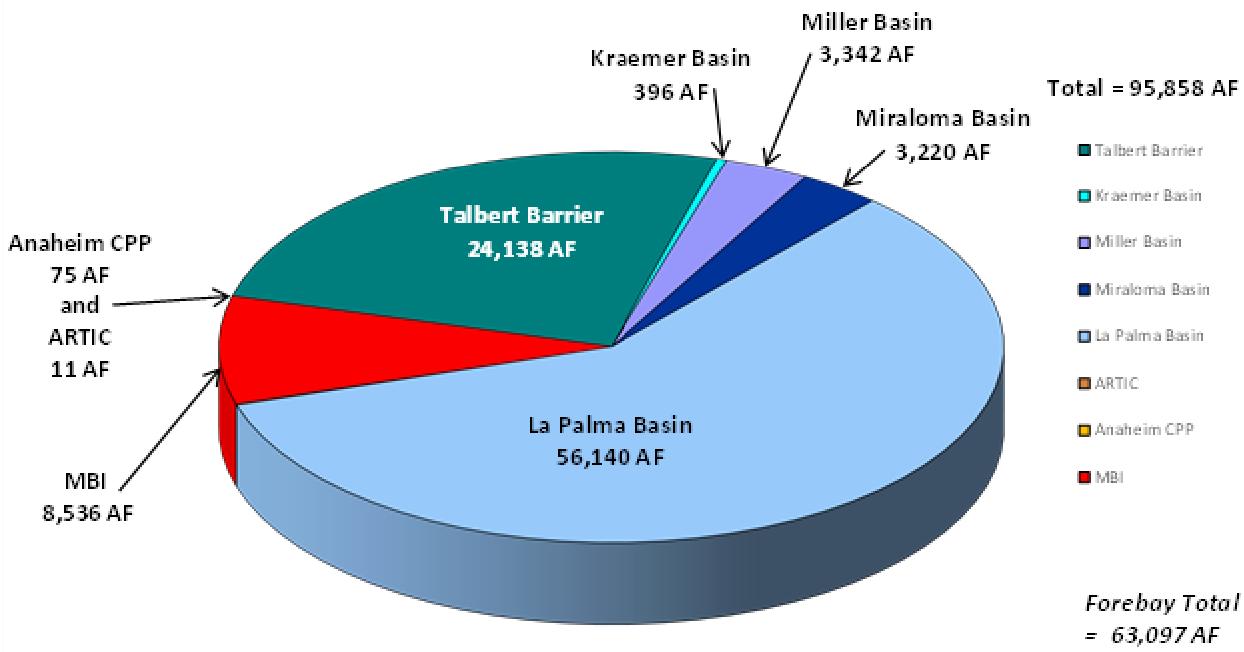


Figure ES-2. 2020 Purified Recycled Water Volume

In terms of average daily flows, the AWPF produced approximately 85.3 MGD (323,000 m^3/day) of purified recycled water in 2020. Overall, the AWPF was on-line approximately 346 days in 2020 (about 94.7% of the year). Figure ES-3 illustrates the average daily AWPF production by month with the reuse location.

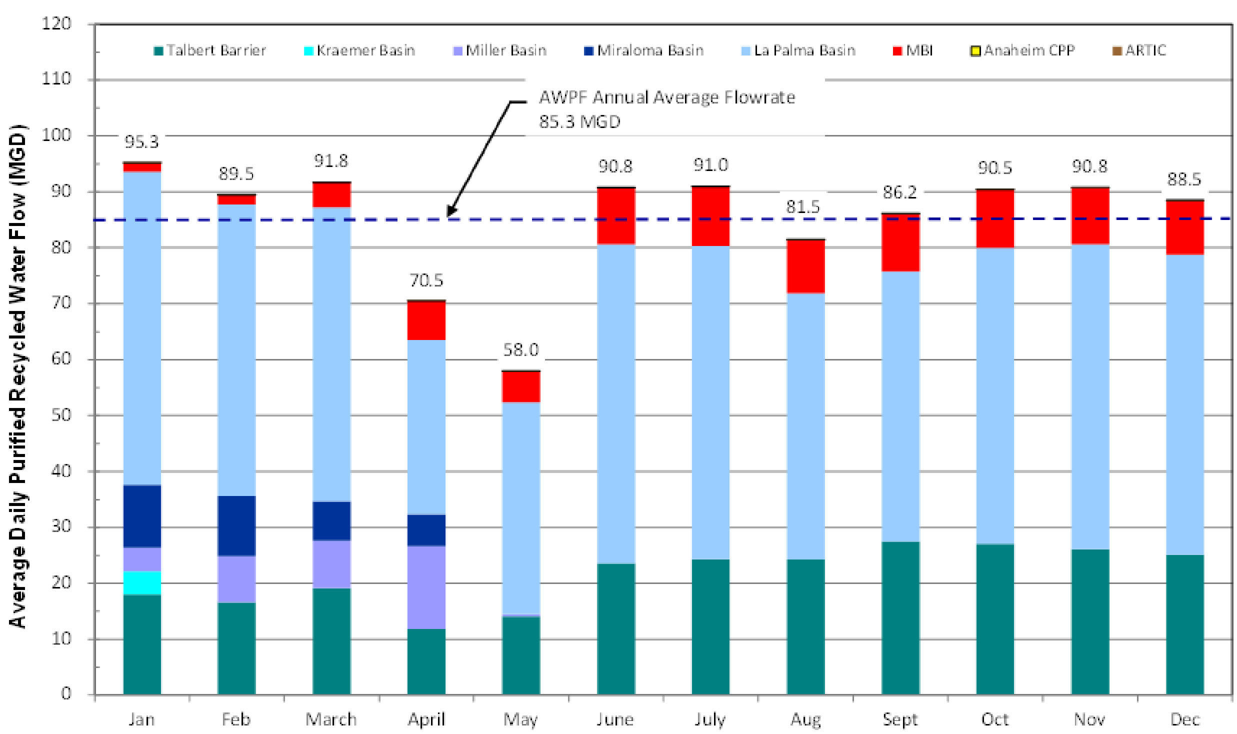


Figure ES-3. 2020 Average Daily Purified Recycled Water Flow By Month

In comparison with prior years, the 2020 purified recycled water production (31,235 MG (95,858 AF or 118,249,000 m^3) was nearly 7% lower than the 2019 production primarily due to AWPF shutdowns for the GWRS Final Expansion (GWRSFE) construction and inspection of the interior of Segment 1 of the GWRS Pipeline. Planned and unplanned power outages from time to time during 2020 also caused brief AWPF production restrictions or complete shutdowns. As illustrated on Figure ES-4, the 2020 GWRS total purified recycled water production was on par with 2018 when the GWRS Pipeline Rehabilitation Project restricted production.

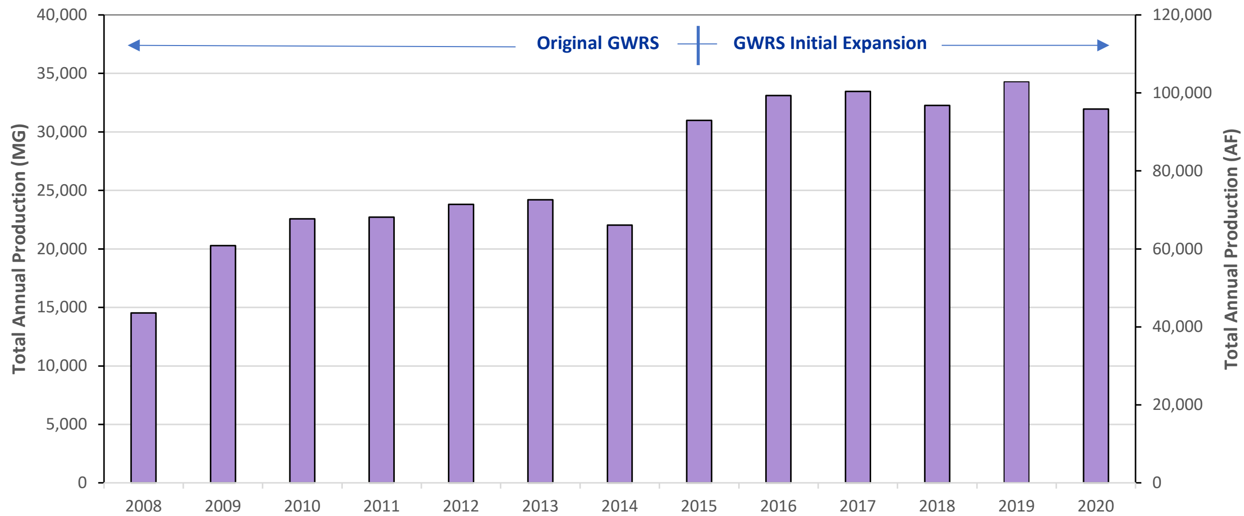


Figure ES-4. Historical GWRS Purified Recycled Water Production Since 2008

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 2020 the GWRS 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 2020 in comparison to the requirements.

Table ES-2. 2020 Average Purified Recycled Water Quality

Parameter Name	Units [1]	FPW [2,3]	Permit Limit
Electrical Conductivity	µmhos/cm	101 [4]	900 [5]
Total Dissolved Solids	mg/L	55	500 [5]
pH	units	8.5 [4]	6 – 9
Chloride	mg/L	5.6	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	1.1	N/A [7]
1,4-Dioxane	µg/L	<0.5 - <1 [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	0.09	0.5 [8]
Total Coliform	MPN/100 mL	0.1	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 2020. 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." The RDL for 1,4-dioxane changed midway through 2020 from 1 to 0.5 µg/L.

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.

Table ES-3. Summary of GWRS Minimum Pathogen Log Reduction Credits Achieved in 2020

Pathogen	Minimum Log Reduction Requirements[1]	Minimum Daily Pathogen Log Reduction Value Achieved in 2020[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	3.89	1.89	6.00	0	12.1
Cryptosporidium oocysts	10	0	3.89	1.89	6.00	0	12.1
Viruses	12	0	0	1.89	6.00	4 (5)	12.0

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

2 Minimum daily log reduction value achieved by each process in 2020. 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 (3.89-log) occurred on 2/10/2020. RO LRV was 1.89-log on 8/12/2020.) 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 2/10/2020. No virus reduction credit taken for MF with chlorination. See Appendix F for details.

5 Minimum daily pathogen LRVs achieved by RO occurred on 8/12/2020. See Appendix F for details.

6 Minimum daily pathogen LRVs achieved by UV/AOP occurred on 1/1-12/31/2020. See Appendix F for details.

7 Minimum daily virus LRV credit of 4-log for underground retention time from 1/1-8/11/2020 and 8/13/2020-12/31/2020. Minimum daily virus LRV credit of 5-log for underground retention time on 8/12/2020. See Appendix F for details.

8 Total daily minimum LRV for all processes in 2020. Totals are not additive per footnote 2. See Appendix F for details

Talbert Barrier Operations

The Talbert Barrier injection supply in 2020 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 7,871 MG (24,155 AF; 29,795,000 m^3) of injection water, the vast majority (99.93%), approximately 7,865 MG (24,138 AF; 29,774,000 m^3), was GWRS purified recycled water. Only about 5.6 MG (17.1 AF; 21,100 m^3) of potable water were injected at the barrier during 2020. 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 2020 was 21.5 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 2020 due to a relatively constant purified recycled water supply and on-going rehabilitation and backwashing of the injection wells. On an annual basis, large injection volumes were directed to the west and east ends of the barrier. Several injection wells were kept off-line on standby for much of 2020 as they were not all needed to maintain groundwater elevations protective for seawater intrusion control due to relatively high Basin conditions.

Table ES-4. 2020 GWRS Injection at the Talbert Barrier

Water Source	Flow Rate	Volume (rounded)			Description
	(Avg. MGD)	(MG)	(AF)	(m^3)	
Purified recycled water	21.5	7,865	24,138	29,774,000	GWRS finished product water (FPW)
OC-44 Potable water	<0.1	5.1	15.7	19,400	Imported water from MWD OC-44 turnout
FV Potable water	<0.1	0.5	1.4	1,700	Blend of imported water and groundwater from City of Fountain
Total	**21.5**	**7,871**	**24,155**	**29,795,000**	

Groundwater Monitoring at the Talbert Barrier

The GWRS permit requires quarterly groundwater monitoring near the Talbert Barrier at five OCWD 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 2020 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 2020, 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 2020 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 2020. 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 2020. 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. In contrast, NDMA was only detected 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 2020: (1) GWRS purified recycled water (only at K-M-M-L Basins); (2) SAR water; and (3) a minimal amount of 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 2020. A total volume of approximately 33,141 MG (101,706 AF; 125,453,000 m^3) of purified recycled water and other water (SAR water and imported water) was recharged at these seven basins.

During 2020, the GWRS purified recycled water discharge was divided between the four spreading basins as follows:

- Kraemer Basin: 129 MG (396 AF; 488,000 m^3), or 0.4 MGD on average;
- Miller Basin: 1,089 MG (3,342 AF; 4,123,000 m^3), or 3.0 MGD on average;
- Miraloma Basin: 1,049 MG (3,220 AF; 3,971,000 m^3), or 2.9 MGD on average; and
- La Palma Basin: 18,293 MG (56,140 AF; 69,248,000 m^3), or 50.0 MGD on average.

Table ES-5. 2020 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]	56.2	20,560	63,097	77,829,000	GWRS finished product water (FPW) delivered
Other water[3]	34.1	12,499	38,357	47,313,000	SAR water and/or imported water percolated
Spreading basin storage[4]		(82)	(251)	(310,000)	Water in recharge basin storage at the end of calendar year
Total	**90.3**	**33,141**	**101,706**	**125,453,000**	

[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.

La Palma Basin has been dedicated solely to recharge of GWRS purified recycled water since its inception in November 2016. In 2020, La Palma and Miraloma Basins received only GWRS purified recycled water. 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: AMD-10, AM-7, AMD-12, AM-8, and AM-10. In addition to these required monitoring wells, OCWD continued to periodically sample monitoring well site 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 2020 at these monitoring well sites in compliance with the permit.

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 2020, groundwater quality at all the Forebay compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards. No detections of 1,4-dioxane or NDMA were found in groundwater at any of the Forebay monitoring wells in 2020. Groundwater quality testing during 2020 at two compliance monitoring well sites, AM-8 and AMD-10, revealed some results above the Federal and State Secondary Drinking Water Standards for apparent color, odor, and iron. Corrosion of the mild steel well casings at those two sites was likely the contributing factor causing the Secondary MCL exceedances for total iron. All the other Secondary MCL exceedances at AM-8 and AMD-10 during 2020 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 2020 approximately 2,782 MG (8,536 AF; 10,530,000 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 2020. Frequent backwash pumping of the five MBI wells totaled approximately 8.5 MG (26 AF; 32,000 m^3) during 2020, representing 0.3% of the total injection.

The total monthly injection volume at the MBI Project significantly increased when the MBI Centennial Park wells (MBI-2, MBI-3, MBI-4, and MBI-5) were placed on-line in March 2020. From January until mid-March, only the DMBI Project (MBI-1) was in operation. The average daily injection rate ranged from 1.61 MGD in January to 10.58 MGD in July. On an annual basis, the 2020 MBI Project injection rate averaged 7.6 MGD with the five injection wells in operation; in comparison with the prior year when only one injection well (MBI-1) was in operation, the 2020 annual average injection rate was a significant increase.

Groundwater Monitoring at the MBI Project

Groundwater monitoring for the MBI Project began in 2012 and continued through 2020. 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 have been instrumental in determining groundwater flow patterns and velocities emanating from 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 2020, 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. Two instances of Secondary MCL exceedance for Aluminum occurred at SAR-10/1 in 2020.

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 2020. The 1,4-dioxane results in 2020 continued to be non-detect at all zones at the four MBI Project monitoring wells. During 2020, NDMA concentrations in all zones of SAR-10 ranged from below the RDL (2 ng/L) to 7.6 ng/L, remaining below the NL (10 ng/L). The higher NDMA concentrations at SAR-10 during 2020 likely resulted from the return of older GWRS purified recycled water to that well with similar NDMA concentrations as injected during 2015 at MBI-1. This return was likely caused by a localized shift or reversal in the groundwater flow direction due to mounding from the four MBI wells in Centennial Park. The NDMA concentrations in all zones at SAR-11 were consistently lower than those at SAR-10 due to mixing via dispersive transport for the longer flow path to SAR-11 and possible biodegradation. NDMA concentrations in all zones of SAR-11 ranged from non-detect to 4.5 ng/L. The NDMA concentrations in all zones of SAR-12 and SAR-13 were consistently non-detect during 2020 due to: (1) no GWRS arrival during 2020 in some of the aquifer zones, and (2) dispersive transport for these longer travel distances for the zones that did show GWRS arrival during 2020.

The tracer test for the MBI Project began in March 2020 with full-scale operation of all five MBI wells. OCWD continues to refine the Talbert Model in the MBI Project area based on available information from the on-going MBI tracer test. The refined Talbert Model will be used along with the observed tracer test results to determine the required buffer areas at the MBI Project.

Conclusions

The GWRS operated during 2020 in compliance with its permit, producing a total of 31,235 MG, or 95,858 AF (118,240,000 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 and ARTIC for non-potable use. Of the purified recycled water produced, approximately 25% was injected at the barrier and nearly 66% 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 85.3 MGD (323,000 m^3/day) of purified recycled water and was on-line approximately 94.7% of the time in 2020. Purified recycled water production was limited due to GWRSFE construction activities as well as planned and unplanned power outages.

During 2020 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 and ARTIC. 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 2020 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 (Demonstration [DMBI] and Centennial Park sites);
- 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 2020 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, 2020), 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. It is anticipated that the 2021 Annual Report for the GWRS will be written to fulfill the requirements of both Order Nos. R8-2004-0002 and R8-2021-0003; however, the 2020 Annual Report is intended only to address the requirements of Order No. R8-2004-0002 and amendments.

This Annual Report serves two overall purposes by providing: (1) an in-depth review and evaluation of the operation of the entire GWRS during 2020 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 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 2020:

- 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
- Two non-potable customers: Anaheim Canyon Power Plant (Anaheim CPP) and Anaheim Regional Transportation Intermodal Center (ARTIC), both of which are supplied by the GWRS Pipeline.

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. A third non-potable water user, Anaheim Adventure Park, is tentatively anticipated to begin operations at Miraloma Basin in 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.

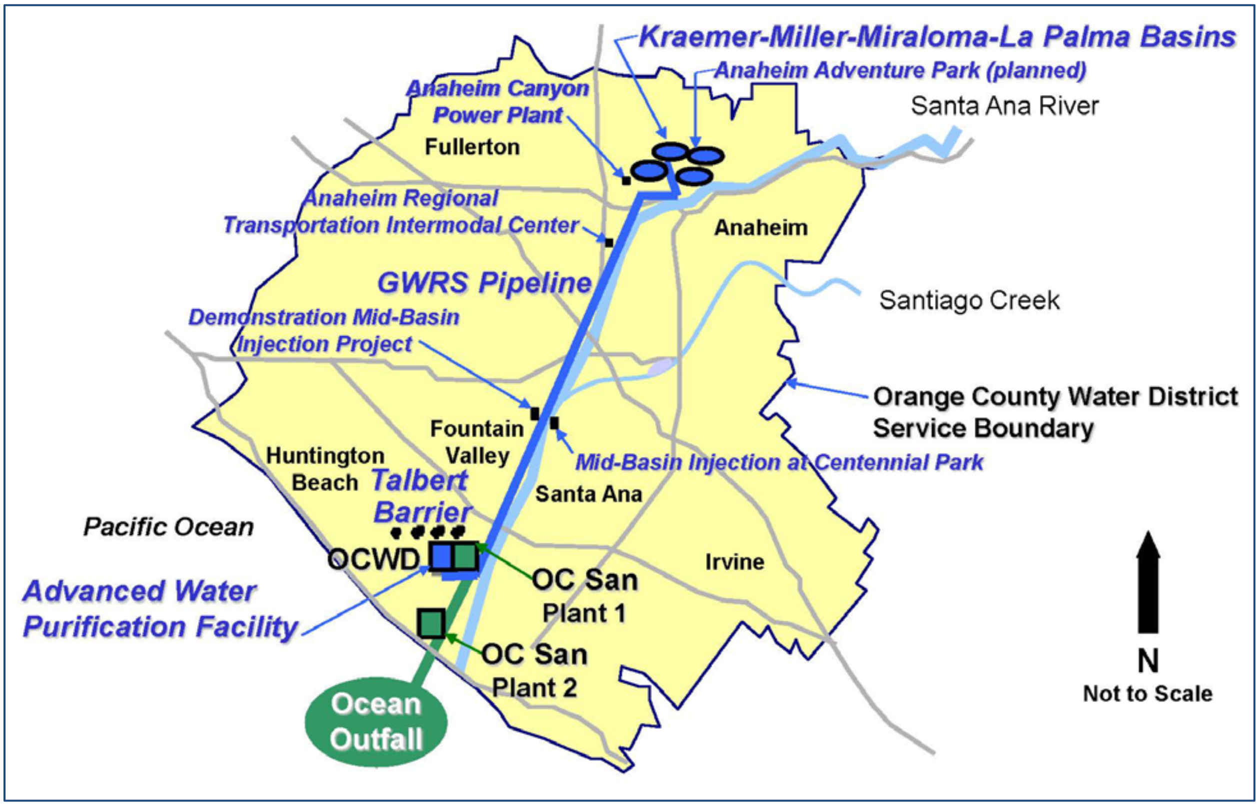


Figure 1-1. Groundwater Replenishment System Location Map

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 2020 the AWPF produced high-quality, purified recycled water averaging a finished water production rate of 85.3 MGD with daily flow rates ranging from 0.0 to 99.3 MGD. As listed in Table 1-1, the purified recycled water flow production in 2020 was discharged to multiple locations, with approximately 25% injected at the Talbert Barrier, 66% pumped to K-M-M-L

Basins, nearly 9% injected at the MBI area, and less than 1% used for non-potable purposes. Over half of the purified recycled water produced by the AWPF in 2020 was recharged at La Palma Basin. Purified recycled water flow rates to the barrier and spreading basins vary seasonally.

Table 1-1. 2020 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	21.5	7,865	24,138	25.2%
Kraemer Basin	0.35	129	396	0.4%
Miller Basin	3.0	1,089	3,342	3.5%
Miraloma Basin	2.9	1,049	3,220	3.4%
La Palma Basin	50.0	18,293	56,140	58.6%
MBI Project	7.6	2,782	8,536	8.9%
Anaheim CPP	<0.1	24	75	<0.1%
ARTIC	<0.1	4	11	<0.1%
Total	**85.3**	**31,235**	**95,858**	**100%**

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 microfiltered, 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 but is in the process of being renewed. 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.

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 two non-potable water customers. Figure 1-2 shows the entrance to the AWPF.

Figure 1-2. Groundwater Replenishment System

The AWPF process flow diagram is shown on Figure 1-3, and the site layout is shown on Figure 1-4.

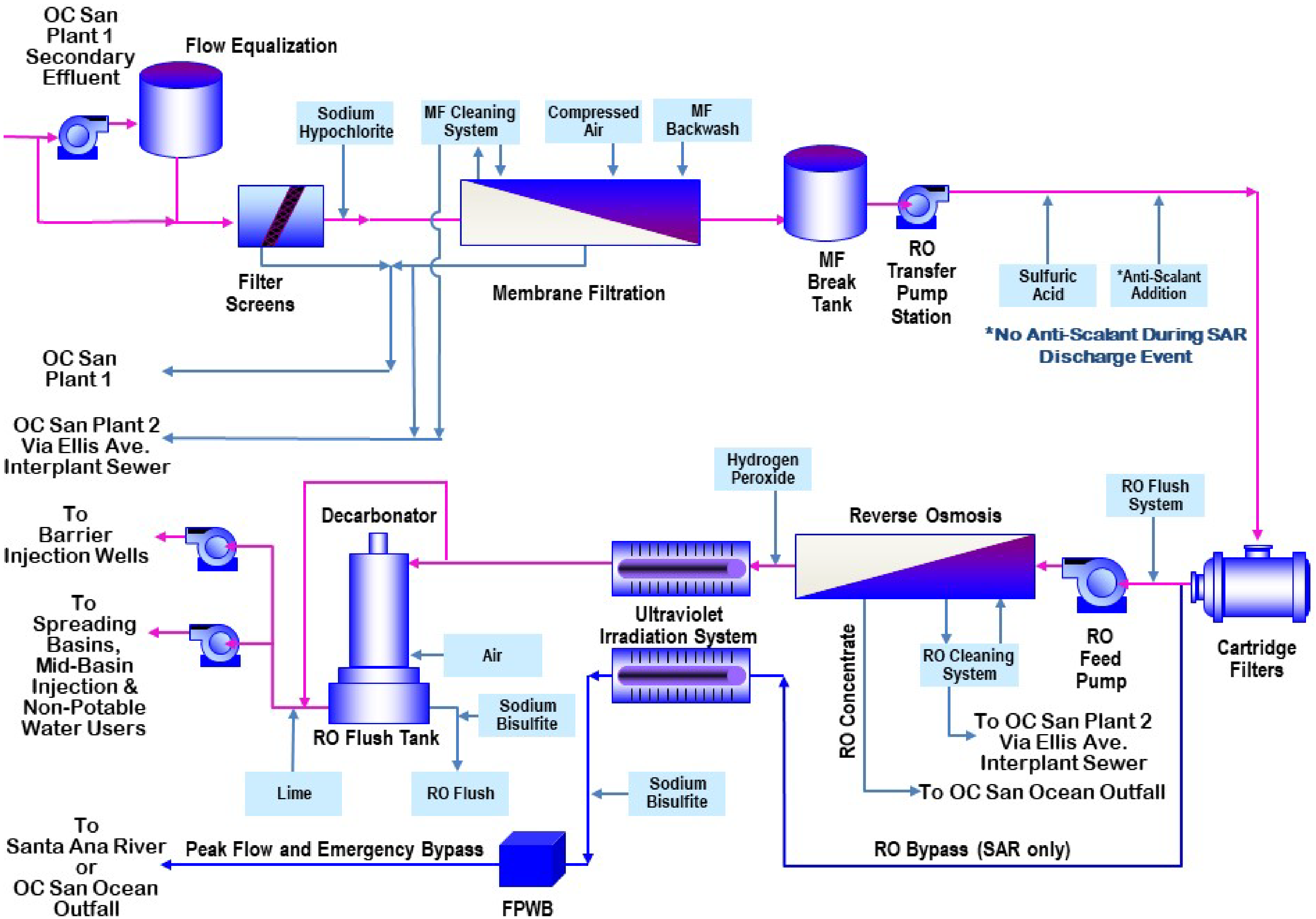


Figure 1-3. GWRS AWPF Process Flow Diagram

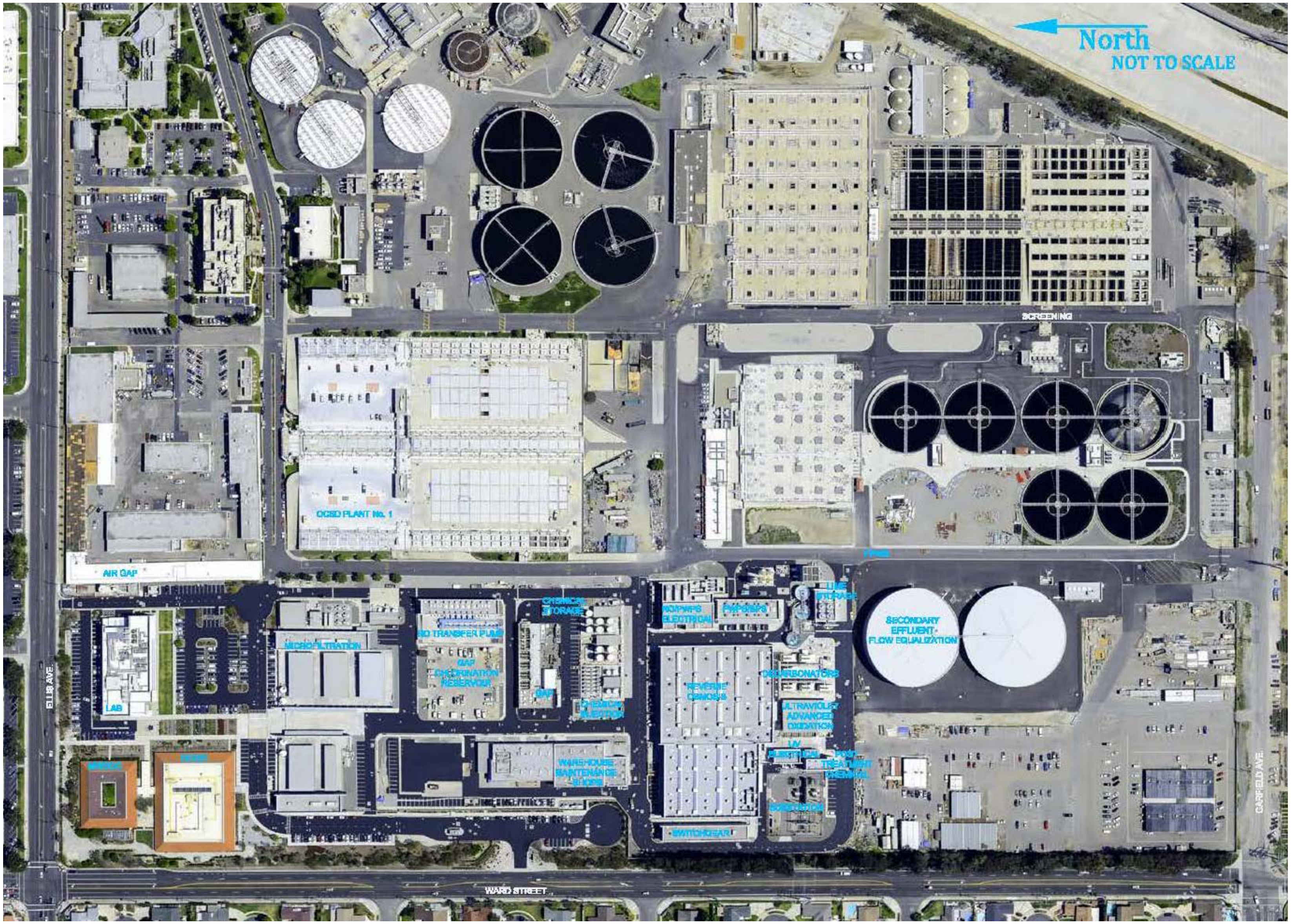


Figure 1-4. AWPF Site Layout

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

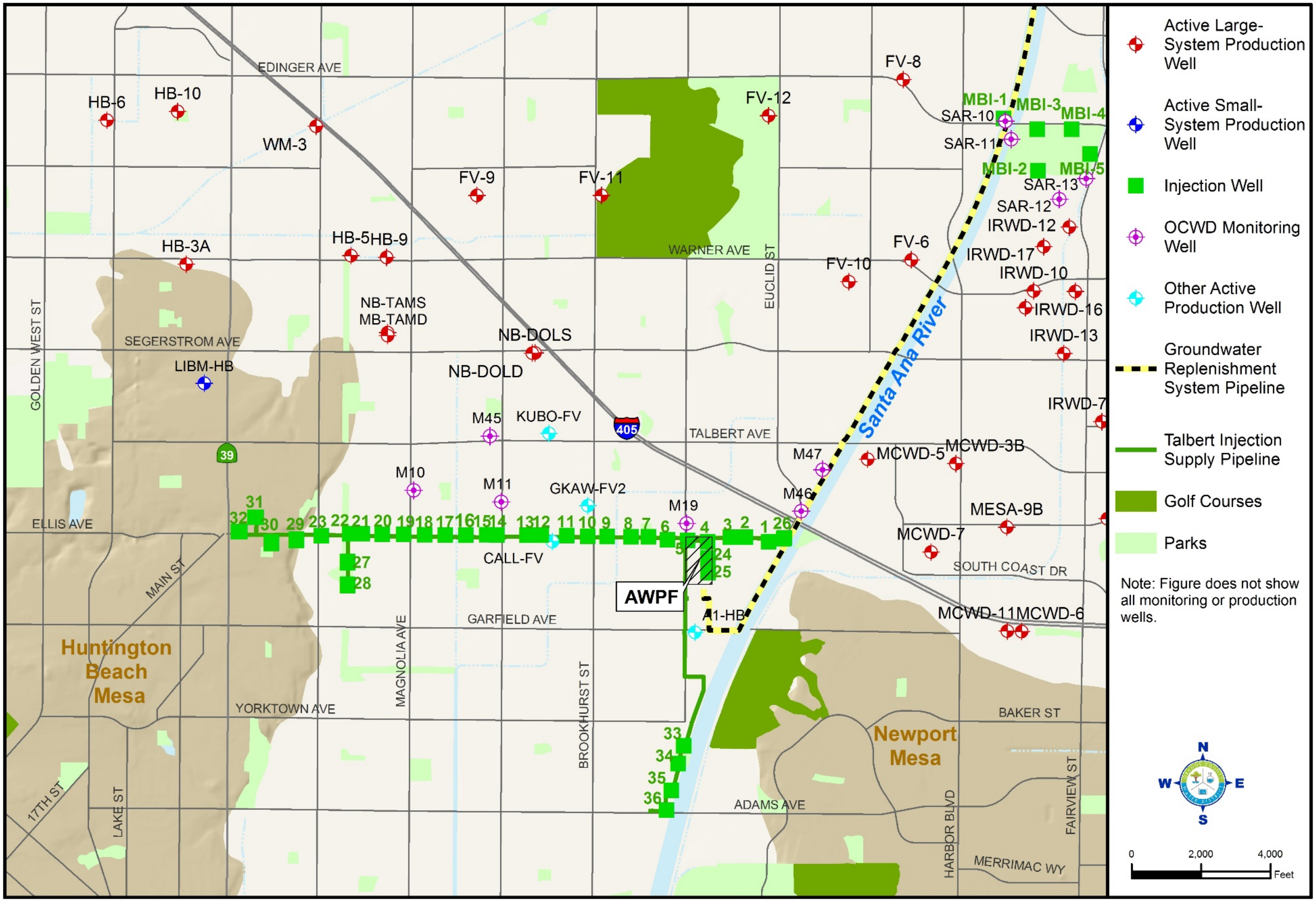


Figure 1-5. GWRS AWPF, Talbert Barrier and MBI Project Location Map

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), Orange County Well Standards Advisory Board, and the City of Fountain Valley, which are the well permitting agencies in this area, of this buffer zone requirement. 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.

Three historic monitoring well sites, M10, M11, and M19, and three newer monitoring well sites, M45, M46, and M47, are monitored for various water quality parameters specified in the permit (RWQCB, 2004). 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 (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, 2020). 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.

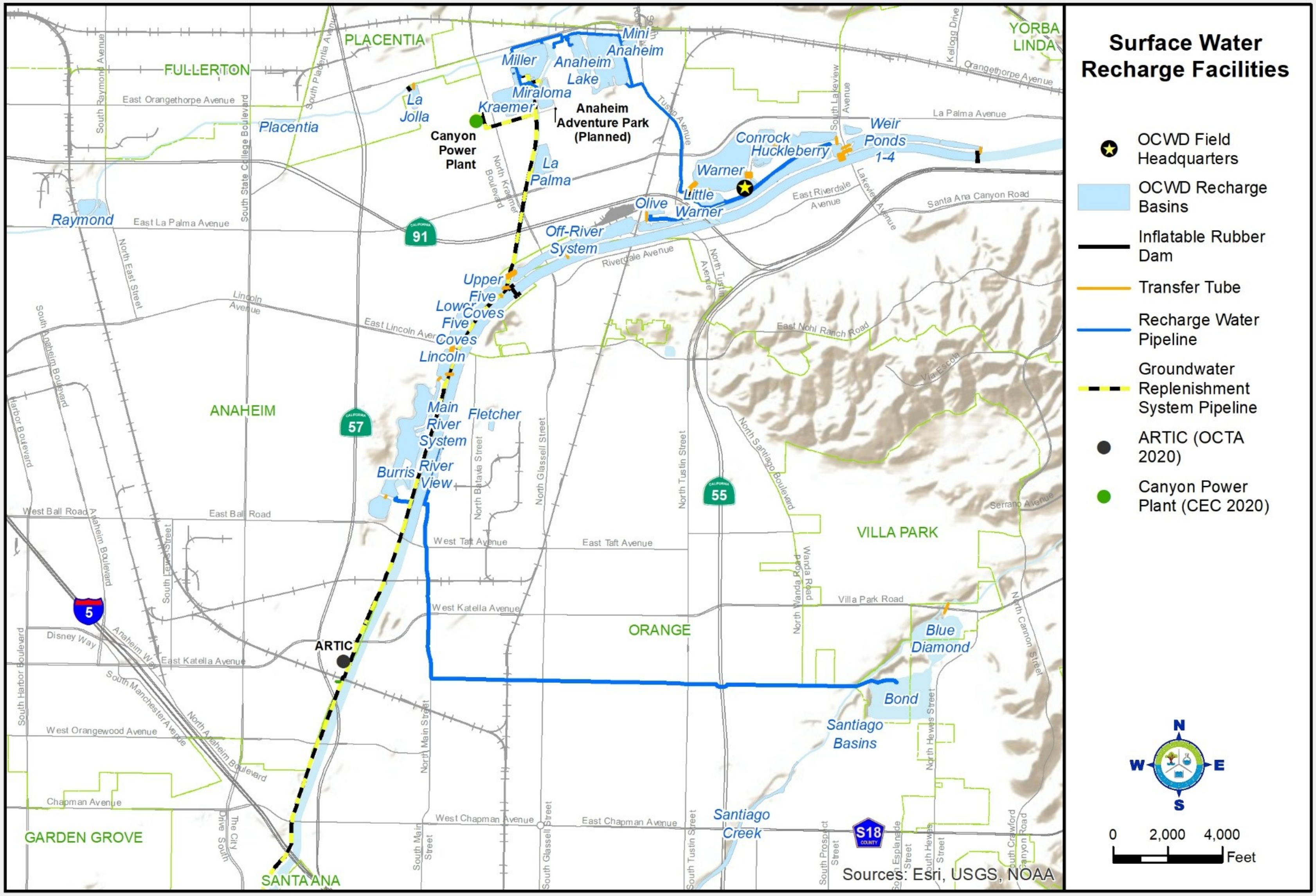


Figure 1-6. Surface Water Recharge Facilities

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 as well as the Orange County Well Standards Advisory Board and the City of Anaheim, which are the well permitting agencies in this area, of this boundary requirement.

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.

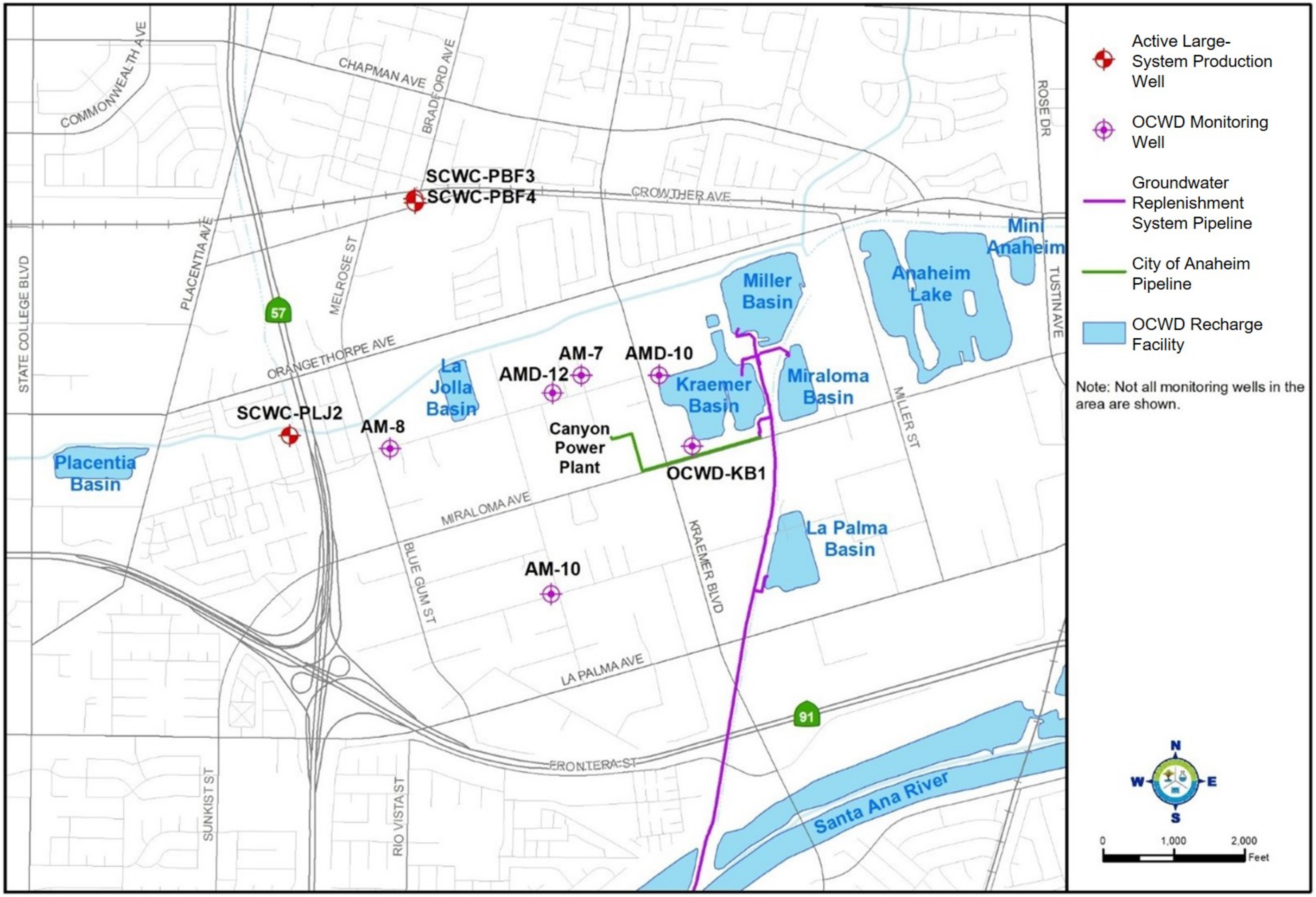


Figure 1-7. Selected Forebay Monitoring and Production Well Locations

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 test 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.

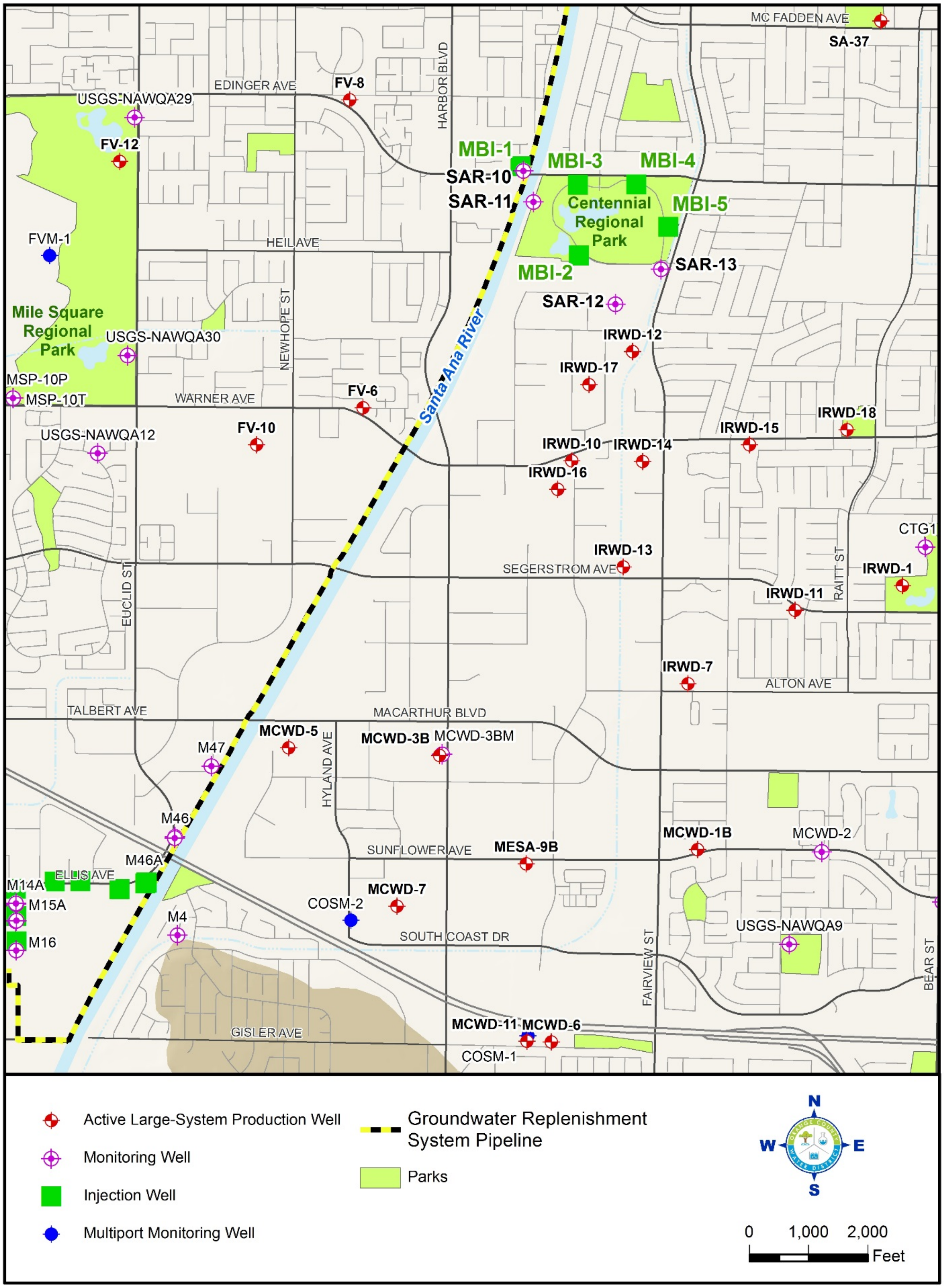


Figure 1-8. MBI Project Location Map

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, each of the four MBI Centennial Park wells were maintained near their operational target of 2.25 MGD for most of 2020, except for the last two months of the year when they were each lowered to approximately 1.75 MGD due to high groundwater levels. Collectively, the five MBI Project wells (including MBI-1) averaged approximately 10 MGD during the second half of 2020.

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).

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 2020 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, 2020). Collectively, these RWQCB Orders comprise the permit for the GWRS. The permit incorporates groundwater recharge criteria, findings and conditions, and recommendations from DDW.

The original 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, 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. R8-20004-0002, incorporating the Recycled Water Policy CEC monitoring requirements for the AWPF. The requirement to initiate this monitoring is pending State Board acceptance of a Quality Assurance Project Plan (QAPP) and validation of analytical methods.

In summary, the permit includes:

- Purified recycled water quality specifications;
- Compliance determinations;
- Allowance for 100% RWC (at Talbert Barrier, DMBI 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, Maintenance and Monitoring Plan (OMMP) (now called an Operation Optimization Plan [OOP]), various prohibitions, and other obligations.

Water quality sampling, analyses, and reporting requirements are specified in the *Revised Monitoring and Reporting Program* (RWQCB, 2020), 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 2020 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	Sample Location	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 - 9
Electrical Conductivity	GWRS-FPW	Final Product	900 µmhos/cm [7]
INORGANIC CHEMICALS			
Aluminum	GWRS-FPW	Final Product	200 ug/L [8]
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 [9]
Nitrate + Nitrite (as Nitrogen)	GWRS-FPW	Final Product	10 mg/L [9]
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
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

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

Parameter	Sample Flow Stream	Sample Location	Permit Requirement [1]
ACTION LEVELS			
Copper	GWRS-FPW	Final Product	1,000 ug/L [10]
Lead	GWRS-FPW	Final Product	15 ug/L
UNREGULATED CHEMICALS			
Boron	GWRS-FPW	Final Product	N/A
Vanadium	GWRS-FPW	Final Product	N/A
Dichlorodifluoromethane	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
Tert-butyl alcohol	GWRS-FPW	Final Product	N/A
1,2,3-Trichloropropane	GWRS-FPW	Final Product	N/A
n-Nitrosodimethylamine (NDMA)	GWRS-FPW	Final Product	N/A
1,4-Dioxane	GWRS-FPW	Final Product	N/A
Perfluorooctane Sulfonate (PFOS)	GWRS-FPW	Final Product	N/A
Perfluorooctanoic Acid (PFOA)	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
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 [8]
Color	GWRS-FPW	Final Product	15 Units
Copper	GWRS-FPW	Final Product	1,000 ug/L [10]
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 [11]
Methyl-tert-butyl ether (MTBE)	GWRS-FPW	Final Product	5 ug/L [12]
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 [13]
Zinc	GWRS-FPW	Final Product	5,000 ug/L

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

Parameter	Sample Flow Stream	Sample Location	Permit Requirement [1]
PERMIT TABLE III [14]			
Total Dissolved Solids	GWRS-FPW	Final Product	500 mg/L
Nitrate nitrogen	GWRS-FPW	Final Product	3 mg/L [9]
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 [15]			
17β-estradiol	GWRS-ROF, ROP, UVP, and FPW		N/A
Caffeine	GWRS-ROF, ROP, UVP, and FPW		N/A
NDMA	GWRS-ROF, ROP, UVP, and FPW		N/A
Triclosan	GWRS-ROF, ROP, UVP, and FPW		N/A
N,N-diethyl-m-toluamide (DEET)	GWRS-ROF, ROP, UVP, and FPW		N/A
Sucralose	GWRS-ROF, ROP, UVP, and FPW		N/A
Electrial Conductivity	GWRS-ROF, ROP, UVP, and FPW		See FPW limit above
Total Organic Carbon	GWRS-ROF, ROP, UVP, and FPW		See FPW limit above

[1] Maximum concentration per RWQCB Order Nos. R8-2004-0002, R8-2008-0058, R8-2014-0054, R8-2016-0051, and R8-2019-0007 requirements and revised monitoring and reporting program requirements in RWQCB Order No. R8-2004-0002. See Appendix A for a complete itemized 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 the final purified 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] The permit requirement for aluminum is the lesser of the primary MCL (1,000 ug/L) and the secondary MCL (200 ug/L).

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

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

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

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

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

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

[15] Monitoring during 2020 was based on the 2013 SWRCB Recycled Water Policy pending SWRCB acceptance of OCWD's Quality Assurance Project Plan per the 2018 SWRCB Recycled Water Policy, which is anticipated to commence in 2021.

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 October 29-30, 2020. 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 October 2020.

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 will be updated in the future 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 thirteenth year of operation. This section summarizes the performance of the AWPF during 2020:

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

2.1 Purified Recycled Water Volume and Flows

During 2020 the AWPF produced a total of approximately 31,235 MG, or 95,858 AF, of purified recycled water to help prevent seawater intrusion and replenish the Basin. On an annual average basis, the AWPF produced approximately 85.3 MGD of purified recycled water for injection, recharge, and non-potable uses in 2020. As shown on Figure 2-1, more than half of the GWRS purified recycled water was pumped to the Anaheim Forebay and recharged at La Palma Basin. Approximately 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.

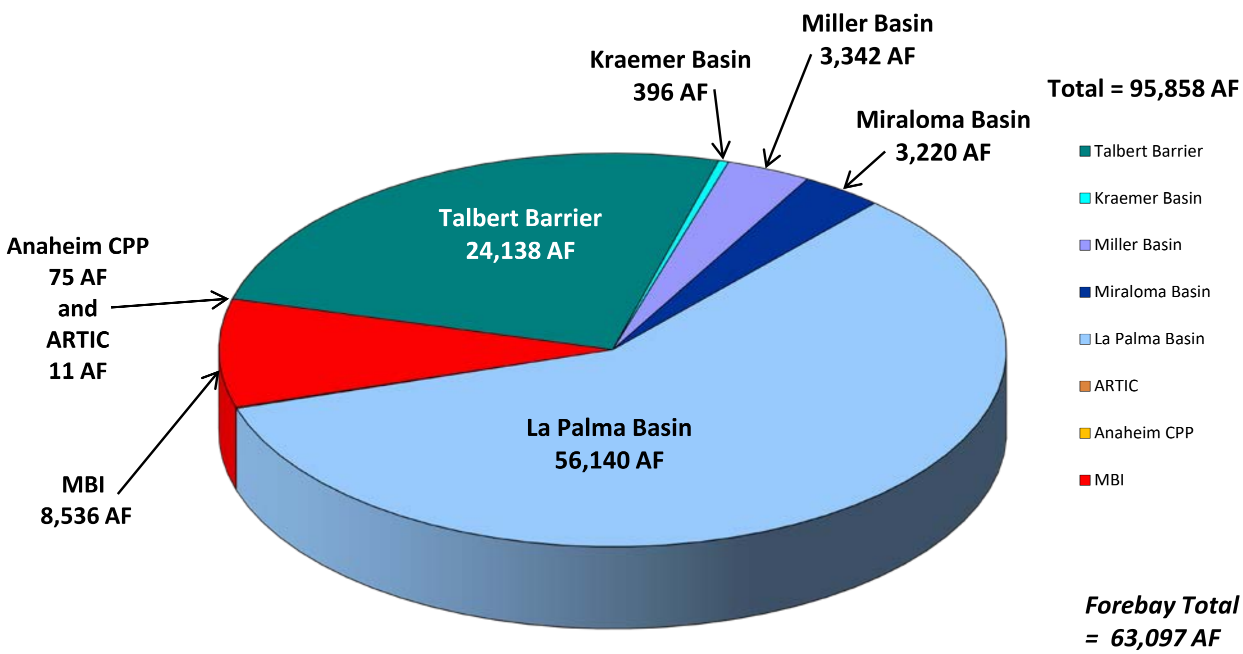


Figure 2-1. 2020 Purified Recycled Water Volume

Figure 2-2 illustrates the average daily AWPF deliveries by month with the reuse location. At times in 2020, the AWPF operated at reduced production rates or was off-line primarily due to GWRSFE construction work and power interruptions. AWPF operations are discussed in more detail in Section 2.3.1.

Overall during 2020, the AWPF was on-line 94.7% of the time with daily average purified recycled water production ranging from 0.0 MGD (April 27-May 10 and August 31 for planned shutdowns) up to 99.3 MGD (on February 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 in order to measure and optimize process performance. The AWPF process schematic and sampling 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 2020.

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 to the barrier, recharge basins, MBI, and/or non-potable customers. Turbidity is monitored continuously on the ROP flow stream.

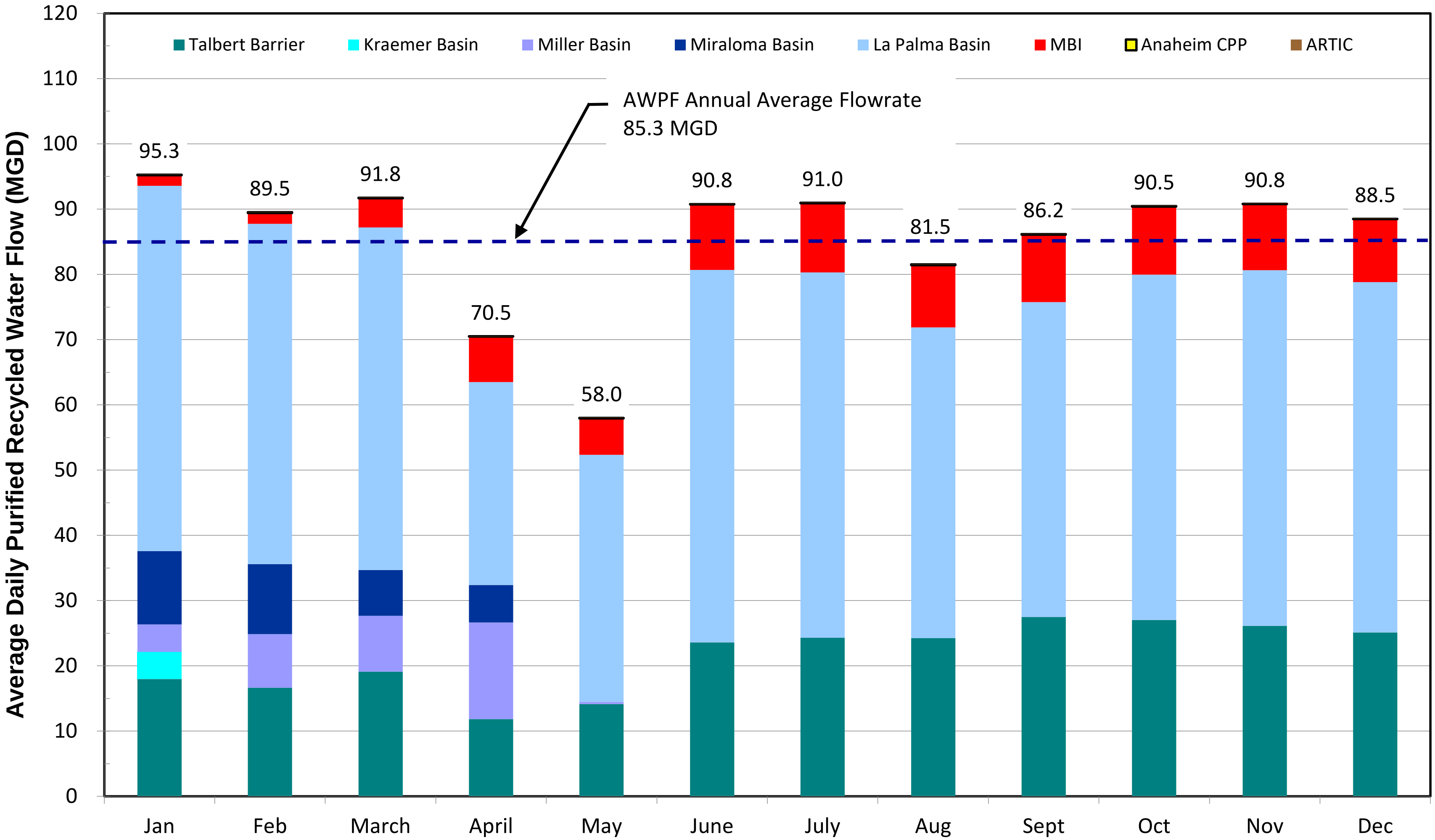


Figure 2-2. 2020 Average Daily Purified Recycled Water Flow by Month

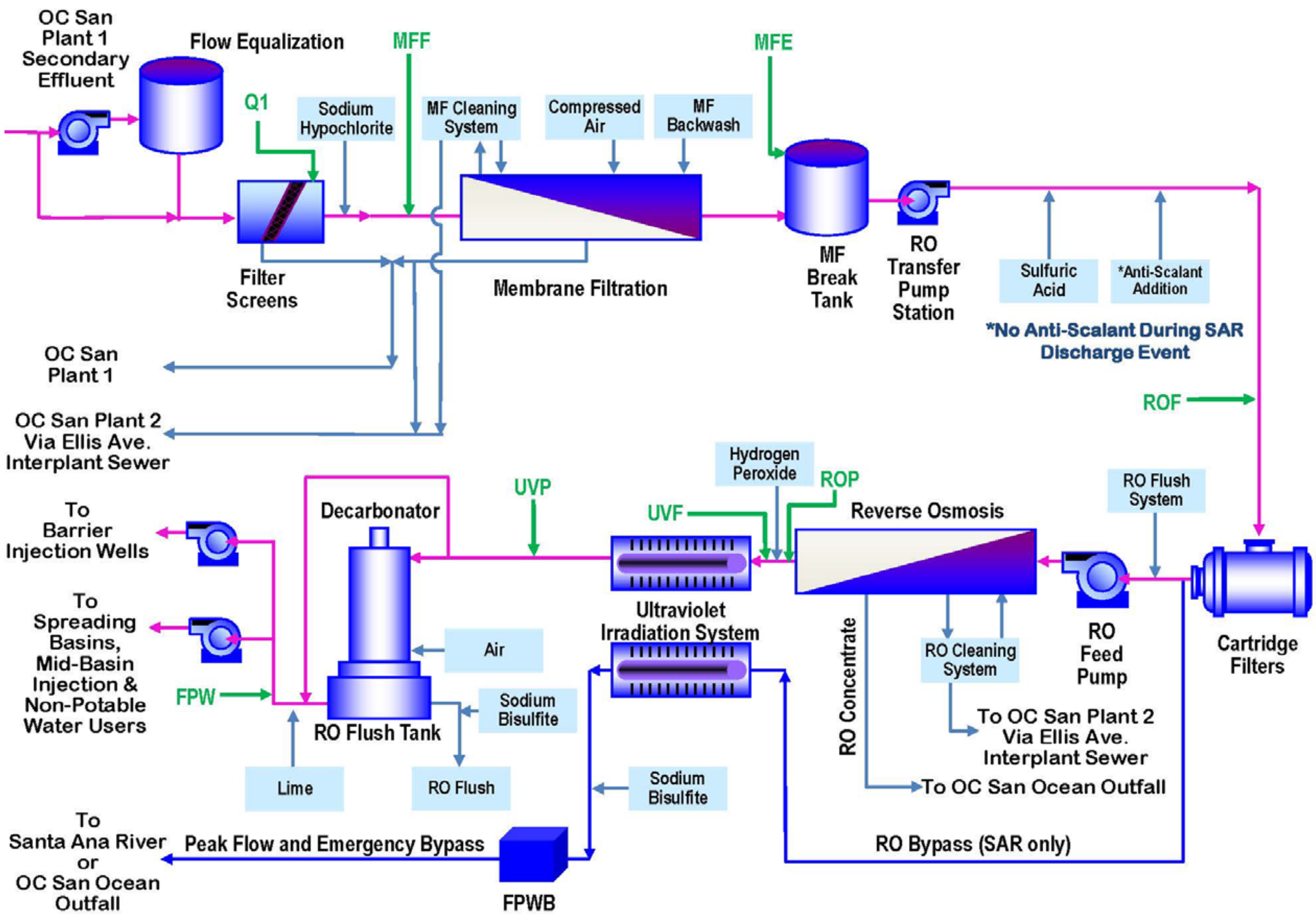


Figure 2-3. AWPF Process Sampling Locations Diagram

Transmittance is measured continuously on the UVF flow stream (UVF is immediately downstream of the hydrogen peroxide addition to the ROP). As a backup for the on-line analyzer, 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 2020 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 2020. The performance of individual treatment processes measured by water quality is discussed later in this section.

One notable observation in 2020 is an elevated average MFF suspended solids concentration (50 mg/L) compared to the concentration at Q1 (5.4 mg/L). Because the Q1 sample is collected as a 24-hour composite and the MFF sample is collected as a weekly grab sample, it is possible that suspended solids concentrations vary throughout the day and tend to be elevated at the time of MFF sample collection which is generally 6:00 AM. Alternatively, there may be sloughing or corrosion between the Q1 and MFF or at the MFF sample point itself. It is unlikely that the MFF contains 50 mg/L of suspended solids throughout the day, as this would be associated with elevated MFF turbidity and high rates of MF membrane fouling, neither of which have been observed. OCWD is currently performing an investigation into the sampling procedure, variability of suspended solids at MFF across the day, and the source of the elevated solids.

It is interesting to compare 2020 average Q1 and FPW quality for selected constituents with average values in 2019 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 2020 as compared to the previous year.

The average Q1 total dissolved solids (TDS) concentration increased from 2019 (986 mg/L) to 2020 (1,017 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 decreased from 2019 (298 mg/L) to 2020 (279 mg/L). For the FPW quality, average TDS levels increased somewhat from 2019 (49 mg/L) to 2020 (55 mg/L). Average FPW chloride concentrations also slightly increased from 2019 (5.2 mg/L) to 2020 (5.6 mg/L).

Average Q1 total suspended solids levels declined from 2019 (6.5 mg/L) to 2020 (5.4 mg/L). Likewise, average Q1 turbidity slightly decreased from 2019 (1.6 Nephlometric Turbidity Units (NTU)) to 2020 (1.1 NTU).

The average Q1 total nitrogen concentration declined somewhat from 2019 (12.0 mg/L) to 2020 (11.2 mg/L). The average FPW total nitrogen concentration remained about the same from 2019 (0.8 mg/L) to 2020 (0.9 mg/L).

Table 2-1. 2020 Average Water Quality[1]

Parameter Name	Units	Q1	MFF	MFE	ROF	ROP	UVP	FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,675	1,687[2]	1,670	1,694[2]	34[2]	46	101[2]	900[3]
Total Dissolved Solids	mg/L	1,017	na	na	1,034	22	na	55	500[3]
Total Suspended Solids	mg/L	5.4	50.0[4]	<2.5	na	na	na	na	N/A
Turbidity	NTU	1.1	3.08[2]	0.04[2]	0.06[2]	0.03[5]	na	0.05[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	68.7	na	96.95[5]	na	na	>90
pH	UNITS	7.14	7.14[2]	7.25	6.88[2]	5.48[2]	5.49	8.47[2]	6 - 9
Total Hardness (as CaCO3)	mg/L	332	na	na	325	<1	na	34.2	240[3]
Calcium	mg/L	81.9	na	na	80.7	<0.5	na	13.8	N/A
Magnesium	mg/L	30.9	na	na	29.8	<0.5	na	<0.5	N/A
Sodium	mg/L	228	na	na	219	6.5	na	6.1	45
Potassium	mg/L	19.1	na	na	18.7	0.2	na	0.2	N/A
Bromide	mg/L	na	na	na	na	na	na	0.01	N/A
Chloride	mg/L	279	na	na	271	5.1	na	5.6	55
Sulfate	mg/L	205	na	na	213	0.3	na	0.3	100
Hydrogen Peroxide	mg/L	na	na	na	na	na	2.4	2.3	N/A
Bicarbonate (as CaCO3)	mg/L	na	na	na	180	9.4	na	36.9	N/A
Nitrate Nitrogen	mg/L	8.26	na	na	na	0.71	na	0.69	3[3]
Nitrite Nitrogen	mg/L	0.540	na	na	na	<0.002	na	0.034	1[3]
Ammonia Nitrogen	mg/L	0.9	na	na	na	0.3	na	0.2	N/A
Organic Nitrogen	mg/L	1.5	na	na	na	0.04	na	0.02	N/A
Total Nitrogen	mg/L	11.2	na	na	na	na	na	0.9	5
Phosphate Phosphorus	mg/L	0.54	na	na	na	na	na	<0.01	N/A
Iron	ug/L	351	na	na	104	<5	na	<5	300
Manganese	ug/L	48.4	na	na	53.9	0.3	na	<1	50
Aluminum	ug/L	7.5	na	na	2.7	0.4	na	0.3	200[3]
Arsenic	ug/L	0.3	na	na	0.3	<1	na	<1	10
Barium	ug/L	53.2	na	na	52.3	<1	na	<1	1,000
Boron	mg/L	0.42	na	na	0.41	0.25	na	0.23	N/A
Cadmium	ug/L	<1	na	na	<1	<1	na	<1	5
Chromium	ug/L	0.2	na	na	0.2	<1	na	<1	50
Copper	ug/L	6.9	na	na	7.7	<1	na	<1	1,000[3]
Cyanide	ug/L	<5	na	na	0.9	<5	na	<5	150
Fluoride	mg/L	0.91	na	na	na	na	na	<0.1	2
Lead	ug/L	<1	na	na	1.2	<1	na	<1	15
Mercury	ug/L	<1	na	na	<1	<1	na	<1	2
Nickel	ug/L	5.1	na	na	5.1	<1	na	<1	100
Perchlorate	ug/L	na	na	na	na	na	na	<2 - 2.5[6]	6
Selenium	ug/L	1.4	na	na	1.6	<1	na	<1	50
Silica	mg/L	20.2	na	na	20.1	<1	na	0.6	N/A
Silver	ug/L	<1	na	na	<1	<1	na	<1	100
Zinc	ug/L	16.8	na	na	21.7	0.2	na	<1	5,000
1,2,3-Trichloropropane	ug/L	<0.005	na	na	<0.005	<0.005	<0.005	<0.005	0.005
N-nitrosodimethylamine	ng/L	45.9	na	na	13.0	6.5	<2	1.1	N/A
1,4-Dioxane	ug/L	1.2	na	na	1.1	<0.5 - 1[7]	<0.5 - 1[7]	<0.5 - 1[7]	N/A
Perfluorooctanoic Acid	ng/L	12.9	na	na	11.7	<2	na	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	16.5	na	na	13.3	<2	na	<2	N/A
Total Trihalomethanes	ug/L	0.5	na	na	16.6	6.5	5.3	3.9	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	33	<3	na	<3	15
Total Organic Carbon (unfiltered)	mg/L	9.69	9.94	na	7.72	0.10	0.19	0.09	0.5[3]
Surfactants (MBAS)	mg/L	0.24	na	na	0.23	<0.02	na	<0.02	0.5
Total Coliform	MPN/100 mL	211,065	9,570	0.14	na	<1	na	0.1	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	60,792	1,079	<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 Elevated value relative to Q1 is unexpected. MFF value based on weekly grab sampling, Q1 based on quarterly 24-hour composites. Lab QC has been confirmed, plant investigation underway to determine source.

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

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

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

Table 2-2. Comparison Between 2019 and 2020 Average Water Quality[1]

Parameter Name	Units	2019 Q1	2020 Q1	2019 FPW	2020 FPW	Permit Limit
Electrical Conductivity	umhos/cm	1,699	1,675	98[2]	101[2]	900[3]
Total Dissolved Solids	mg/L	986	1,017	49	55	500[3]
Total Suspended Solids	mg/L	6.5	5.4	na	na	N/A
Turbidity	NTU	1.6	1.1	0.07[2]	0.05[2]	≤0.2 / ≤0.5[3]
Ultraviolet percent transmittance (%UVT) @254nm	%	na	na	na	na	≥90
pH	UNITS	7.3	7.1	8.50[2]	8	6 - 9
Total Hardness (as CaCO3)	mg/L	312	332	33.9	34.2	240[3]
Calcium	mg/L	80.5	81.9	13.7	13.8	N/A
Magnesium	mg/L	27.0	30.9	<0.5	<0.5	N/A
Sodium	mg/L	232	228	5.7	6.1	45
Potassium	mg/L	19.0	19.1	0.1	0.2	N/A
Bromide	mg/L	na	na	0.01	0.01	N/A
Chloride	mg/L	298	279	5.2	5.6	55
Sulfate	mg/L	188	205	0.5	0.3	100
Hydrogen Peroxide	mg/L	na	na	2.1	2.3	N/A
Bicarbonate (as CaCO3)	mg/L	na	na	38.0	36.9	N/A
Nitrate Nitrogen	mg/L	8.64	8.26	0.67	0.69	3[3]
Nitrite Nitrogen	mg/L	0.691	0.540	0.033	0.034	1[3]
Ammonia Nitrogen	mg/L	1.3	0.9	0.1	0.2	N/A
Organic Nitrogen	mg/L	1.4	1.5	0.02	0.02	N/A
Total Nitrogen	mg/L	12.0	11.2	0.8	0.9	5
Phosphate Phosphorus	mg/L	0.52	0.54	<0.01	<0.01	N/A
Iron	ug/L	302	351	<5	<5	300
Manganese	ug/L	52.6	48.4	<1	<1	50
Aluminum	ug/L	6.2	7.5	1.0	0.3	200[3]
Arsenic	ug/L	0.6	0.3	<1	<1	10
Barium	ug/L	45.3	53.2	<1	<1	1,000
Boron	mg/L	0.40	0.42	0.24	0.23	N/A
Cadmium	ug/L	<1	<1	<1	<1	5
Chromium	ug/L	0.3	0.2	<1	<1	50
Copper	ug/L	7.9	6.9	<1	<1	1,000[3]
Cyanide	ug/L	3.1	<5	<5	<5	150
Fluoride	mg/L	0.97	0.91	<0.1	<0.1	2
Lead	ug/L	<1	<1	<1	<1	15
Mercury	ug/L	<1	<1	<1	<1	2
Nickel	ug/L	4.7	5.1	<1	<1	100
Perchlorate	ug/L	na	na	<2.5	<2 - 2.5[4]	6
Selenium	ug/L	1.1	1.4	<1	<1	50
Silica	mg/L	21.0	20.2	0.3	0.6	N/A
Silver	ug/L	<1	<1	<1	<1	100
Zinc	ug/L	15.3	16.8	<1	<1	5,000
1,2,3-Trichloropropane	ug/L	<0.005	<0.005	<0.005	<0.005	0.005
N-nitrosodimethylamine	ng/L	47.1	45.9	1.9	1.1	N/A
1,4-Dioxane	ug/L	1.4	1.2	<1	<0.5 - 1[5]	N/A
Perfluorooctanoic Acid	ng/L	na	12.9	<4	<2	N/A
Perfluorooctane Sulfonic Acid	ng/L	na	16.5	<4	<2	N/A
Total Trihalomethanes	ug/L	0.3	0.5	3.4	3.9	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	9.53	9.69	0.11	0.09	0.5[3]
Surfactants (MBAS)	mg/L	0.20	0.24	<0.02	<0.02	0.5
Total Coliform	MPN/100 mL	294,196	211,065	<1	0.10	2.2 / 23 / 240[3]
Escherichia coli (E. coli)	MPN/100 mL	65,460	60,792	<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 and April and 2 ug/L for July and October.

[5] RDL for 1,4-Dioxane 1 ug/L from January through June and 0.5 ug/L from July through December.

As determined by laboratory analysis, the average Q1 TOC concentration remained about the same in 2019 (9.5 mg/L) as in 2020 (9.7 mg/L), while the average FPW TOC concentration decreased slightly from 2019 (0.11 mg/L) to 2020 (0.09 mg/L).

The annual average concentration of N-nitrosodimethylamine (NDMA) in the Q1 source water was relatively unchanged from 2019 (47.1 nanograms per liter (ng/L)) to 2020 (45.9 ng/L). The FPW average NDMA concentration decreased from 2019 (1.9 ng/L) to 2020 (1.1 ng/L); it should be noted that the reportable laboratory detection limit for NDMA is 2 ng/L and non-detect values are set at 10% of this reporting limit (0.2 ng/L) for the purposes of averaging. Like the 56 FPW samples analyzed for NDMA in 2019, none of the 55 FPW samples analyzed for NDMA in 2020 exceeded the DDW Notification Level (NL) of 10 ng/L.

A comparison of the annual average Q1 concentrations of 1,4-dioxane revealed a slight decrease from 2019 (1.4 µg/L) to 2020 (1.2 µg/L), although this may be related to the mid-year decrease in the 1,4-dioxane RDL (<1 µg/L from January through June and <0.5 µg/L from July through December). The FPW average 1,4-dioxane concentrations in both2019 and 2020 were below the reportable detection level (RDL) of either 1 µg/L or 0.5 µg/L used since mid-2020; furthermore, all individual FPW sample results during 2019 and 2020 were below the RDL and DDW NL of 1 µg/L for 1,4-dioxane or the more recent RDL of 0.5 µg/L.

2.2.1 Source Water in 2020

The AWPF feedwater (Q1) was a variable blend of AS and TF effluents from OC San Plant 1. In 2020, 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 2020, the Q1 source water to the AWPF consisted of 35,491 MG of AS effluent and 9,065 MG of TF effluent, as illustrated on Figure 2-5, for a total annual influent flow of 46,953 MG. On an annual average daily flow basis, the AWPF had available approximately 97.0 MGD of AS effluent and 23.8 MGD of TF effluent, for a total of 128.3 MGD of available source water. The volume of TF effluent made up just over 20% of the total influent during 2020; however, the day-to-day operation varied with TF effluent making up from 16.6% (January 12) to 25.0% (February 4, immediately before a scheduled shutdown) of the AWPF source water.

Figure 2-6 shows the average daily flow rate of AS effluent and TF effluent for each month during 2020. Of the influent flow stream, about 2,396 MG, or 6.5 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 2020 was higher than in 2019 (1,484 MG or 4.1 MGD on average), primarily due to the AWPF's reduced production during shutdowns for the GWRSFE construction. The net total MFF flow during 2020 was approximately 42,160 MG or an annual average daily flow of 115.2 MGD.

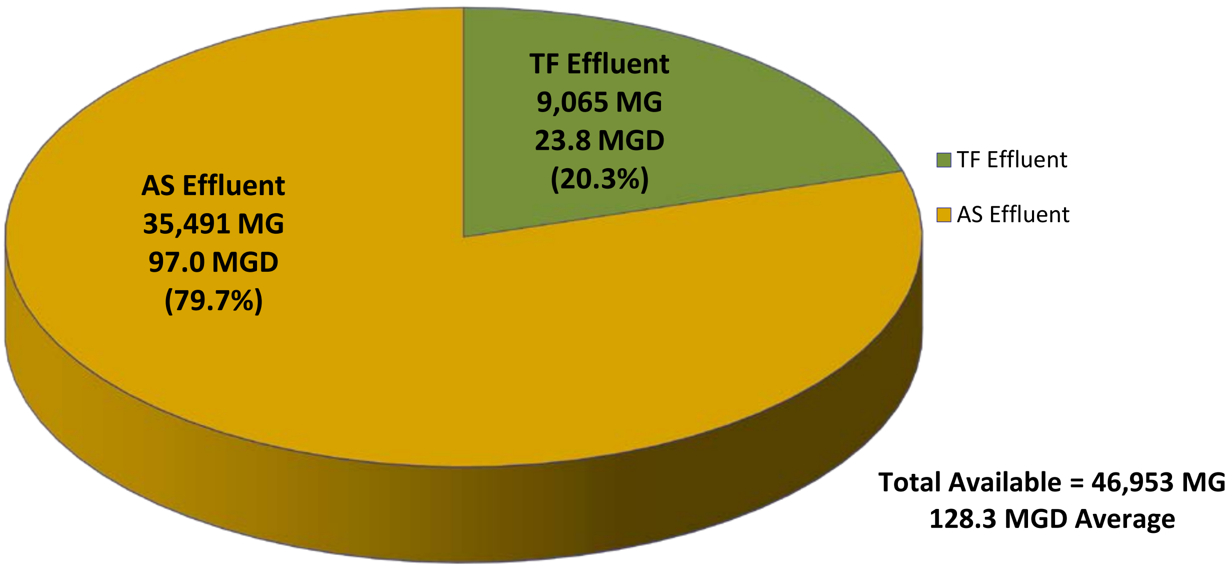


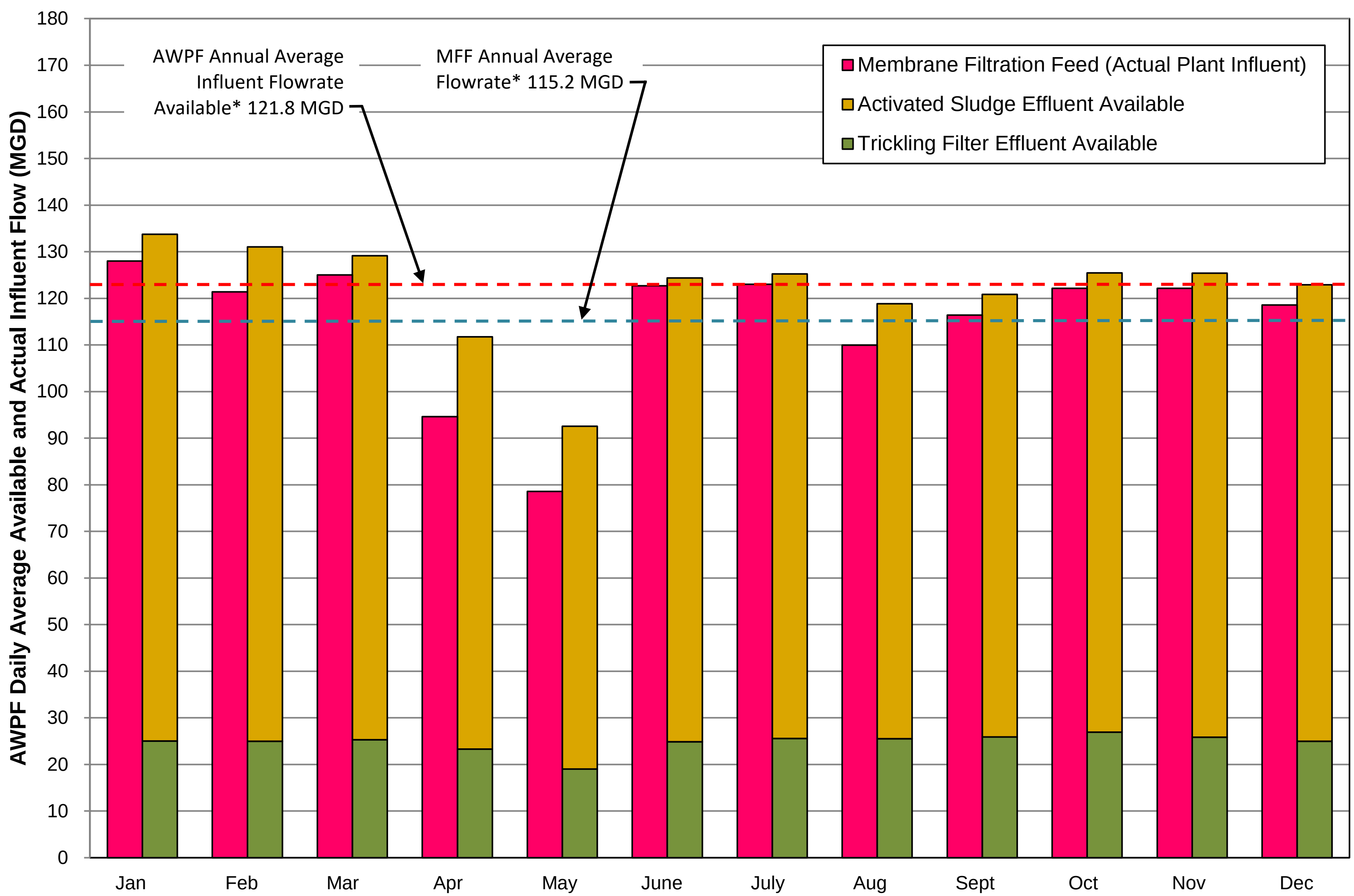
Figure 2-5. 2020 AWPF Average Influent Flow Sources and Volumes

2.2.1.3 Source Water Turbidity and Ammonia-Nitrogen

In 2020 the AWPF feedwater (Q1) turbidity ranged between 0.5 and 1.8 NTU (based on grab samples), averaging 1.1 NTU, indicating consistent Plant 1 operations. Similarly, total suspended solids concentrations in the AWPF feedwater (Q1) ranged from 2.9 to 6.8 mg/L, which is exceptional for secondary effluent.

The average Q1 total nitrogen level remained relatively low (9.7 mg/L) and the corresponding ammonia-nitrogen concentration was 0.9 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. Low ammonia levels increase the potential for free chlorine to be formed, which can damage the MF and RO membranes.

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 0.2 to 2.5 mg/L during 2020. 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 at 9 mg/L in 2020; 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. 2020 AWPF Influent Sources and Average Flows by Month

2.2.2 MF System Performance in 2020

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 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 Break Tank and an air scour. The MF polypropylene membranes are periodically cleaned-in-place 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.

Figure 2-7. MF System

2.2.2.2 MF System Performance

Table 2-3 summarizes the monthly MF system performance for 2020 in terms of turbidity reduction. The daily average MFF turbidity ranged from 1.71 to 4.42 NTU based on daily averages of on-line turbidimeter readings taken upstream of the MF process. The annual average on-line MFF turbidity was 3.09 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.

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 2020 ranged from 0.02 to 0.16 NTU, with an annual average turbidity of 0.04 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 98.6% during 2020.

Table 2-3. 2020 MF Performance

Month	Turbidity			
	MF Feed MFF[1]		MF Effluent MFE[1]	
	Avg. (NTU)	Max (NTU)	Avg. (NTU)	Max (NTU)
January	3.33	4.14	0.08	0.09
February	3.27	3.75	0.09	0.11
March	3.17	3.83	0.07	0.09
April	3.10	3.46	0.05	0.07
May	3.37	4.16	0.06	0.16
June	2.92	3.50	0.04	0.05
July	3.10	3.96	0.02	0.02
August	2.88	3.65	0.02	0.02
September	3.00	4.08	0.02	0.07
October	2.88	3.81	0.02	0.02
November	2.89	3.55	0.02	0.03
December	3.25	4.42	0.03	0.03
Annual Average	3.09	---	0.04	---
Maximum	---	4.42	---	0.16
Average % Removal	98.6%			

[1] Based on daily average turbidity readings from MFF and MFE on-line turbidimeters. Daily average MFE turbidity readings from nine individual MF banks (4 cells/bank) are used for determining compliance with pathogen reduction requirements and can be found in Appendix F.

Between March and June 2020, the original MFE incandescent turbidimeters on the nine banks of four MF cells were sequentially replaced with higher resolution laser turbidimeters. The new laser turbidimeters yielded more precise and accurate MFE turbidity readings than the older units; comparison of the pre- and post-replacement results also revealed that the laser turbidimeters consistently yielded lower MFE turbidity readings in the latter half of 2020 (Table 2-3). Continuous readings from nine MFE turbidimeters (one per bank of four MF cells) were also collected and averaged 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 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 2020 and compares it with the MF system performance during 2019. Overall, the average turbidity removal rate of 98.6% in 2020 was greater than the 97.5% removal rate in 2019. Replacement of the original incandescent turbidimeters with new laser turbidimeters between March and June 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 2020. 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 narrower in 2020 (1.71 to 4.42 NTU) as compared with that in 2019 (2.00 to 5.74 NTU).

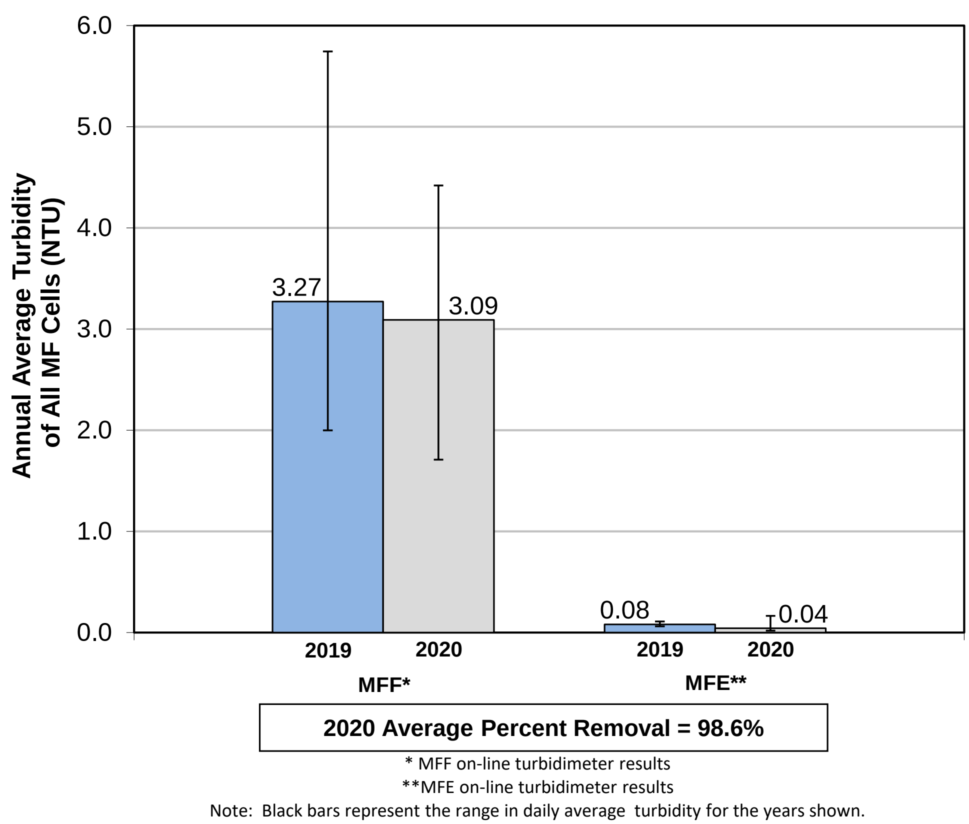


Figure 2-8. 2020 MF Turbidity Removal Performance

2.2.3 RO System Performance in 2020

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 from the RO process is sent to the OC San ocean outfall for disposal. The RO system can 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 2020 for key constituents, EC and TOC, are summarized in Table 2-4. Regarding salinity removal in 2020, the bulk ROF EC averaged 1,692 µmhos/cm, and the bulk ROP EC averaged 40 µmhos/cm based on semi-weekly grab samples. This represents an average salinity removal rate for the RO process of 97.6% during 2020.

Table 2-4. 2020 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	1708	1730	37	39	7.56	8.33	0.10	0.15
February	1687	1710	39	40	8.20	10.70	0.10	0.22
March	1745	1820	40	41	8.05	8.97	0.07	0.10
April	1718	1820	38	41	7.82	8.23	0.09	0.24
May	1733	1790	44	46	7.96	8.46	0.09	0.14
June	1713	1790	42	43	7.53	8.02	0.09	0.15
July	1722	1730	45	48	7.67	8.14	0.12	0.24
August	1695	1720	45	49	7.58	8.74	0.10	0.15
September	1636	1680	43	45	7.57	8.76	0.11	0.18
October	1650	1690	40	42	7.51	7.97	0.09	0.17
November	1678	1690	35	39	7.71	10.60	0.08	0.19
December	1650	1740	33	37	7.66	8.47	0.10	0.24
Annual Average	1692	---	40	---	7.72	---	0.10	---
Maximum	---	1820	---	49	---	10.70	---	0.24
Average % Removal	97.6%				98.8%			

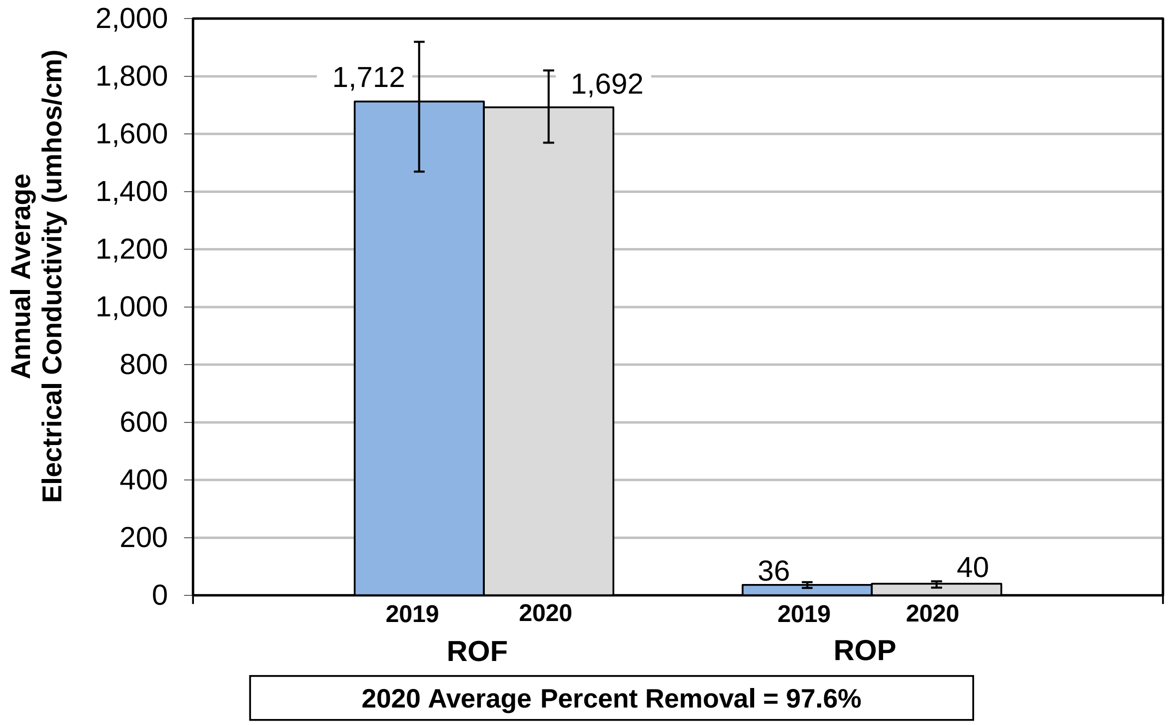
[1] Electrical Conductivity (EC) data for RO are not normalized with respect to ROF pressure or temperature

[2] EC semi-weekly grab sample results

[3] TOC daily grab sample results

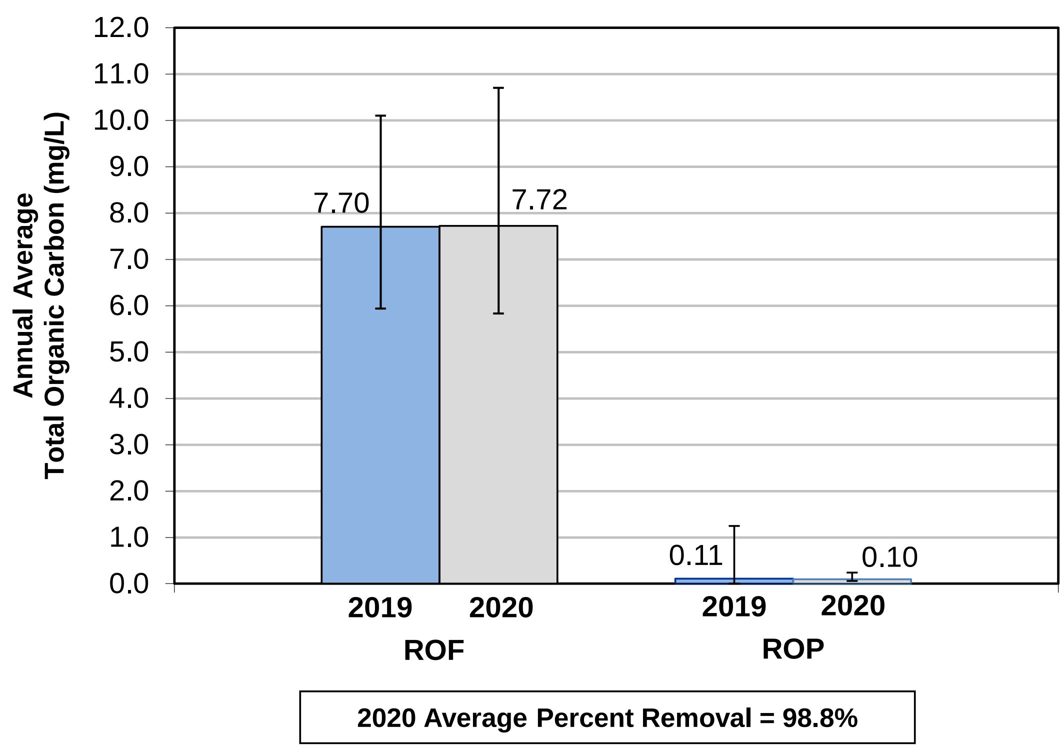
Figure 2-10 presents the 2020 annual average EC reduction performance of the RO system and compares it with the RO system's average EC reduction the previous year. The EC reduction was effectively the same in 2020 and 2019 at 97.6% and 97.9%, respectively.

Figure 2-11 presents the annual average TOC removal performance of the RO system, comparing 2019 and 2020 laboratory-analyzed grab sample results. The average TOC removal of 98.8% in 2020 was essentially identical to the 98.5% average TOC removal rate achieved in 2019. In general, this TOC removal performance indicates rejection rates remained fairly constant over this period.



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

Figure 2-10. 2020 RO Electrical Conductivity Removal Performance



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

Figure 2-11. 2020 RO Total Organic Carbon Removal Performance

The TOC concentration in the ROF based on daily grab samples averaged 7.72 mg/L in 2020, which is virtually the same as the 7.70 mg/L average observed in 2019. The ROF TOC concentration range in 2020 was slightly wider than in the prior year, from 5.83 to 10.70 mg/L as shown by the vertical black bars on Figure 2-11. Throughout 2020, 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 0.10 mg/L during 2020, ranging from 0.06 to 0.24 mg/L. As shown on Figure 2-11, this is a tighter ROP TOC range than observed in 2019, indicating the consistent high performance of the RO system in 2020.

2.2.4 UV / AOP Performance in 2020

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 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 in 2020, total coliform levels in the Q1 averaged approximately 211,100 MPN/100 mL. (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 9,570 MPN/100 mL, representing an average total coliform removal of 2.0-log. MF treatment further reduced the average total coliform levels to less than 1 MPN/100 mL in the MFE, with only two detections at 1 MPN/100 mL (January 29 and June 3). 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 less than 1 MPN/100 mL with the exception of one day when the result was equal to the RDL of 1 MPN/100 mL (April 25).

Figure 2-12. UV/AOP System

Concentrations of *E. coli* were diminished by adding sodium hypochlorite upstream of the MF process in 2020. (See Table 2-1 presented earlier.) The Q1 *E. coli* level averaged approximately 60,790 MPN/100 mL, and the MFF *E. coli* levels averaged approximately 1,079 MPN/100 mL following disinfection. The average MFE results for *E. coli* further declined to less than 1 MPN/100 mL consistently in 2020.

2.2.4.3 NDMA Removal

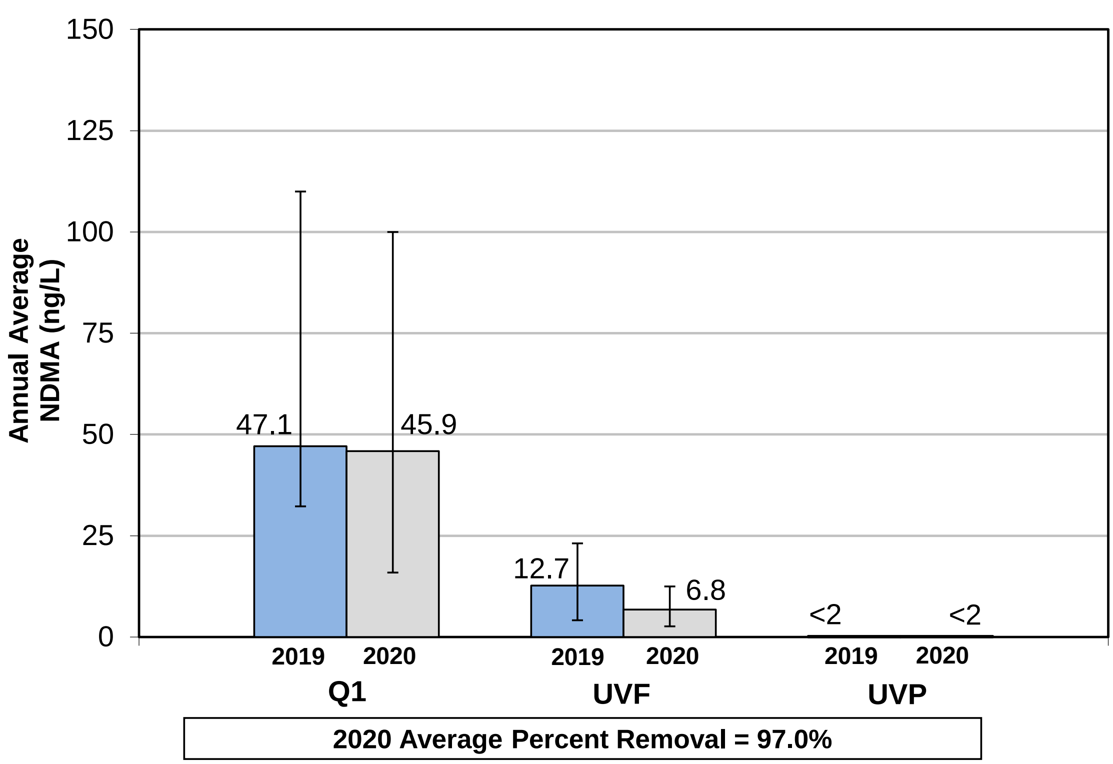
Besides disinfection, a key performance criterion for the UV/AOP system relates to destruction of NDMA as shown in Table 2-5 and illustrated on Figure 2-13. The 2020 average concentration of NDMA in the UVF was approximately 6.8 ng/L, based on weekly grab samples ranging from 2.6 to 12.5 ng/L (using a laboratory method with an RDL of 2 ng/L). For comparison purposes, the average concentration of NDMA in the Q1 stream during 2020 was approximately 45.9 ng/L, ranging from 15.9 to 100 ng/L (using a laboratory method with an RDL of 10 ng/L); this difference is the result of both formation of additional NDMA via sodium hypochlorite addition ahead of the MF process and then partial removal via the RO process.

Table 2-5. 2020 UV/AOP NDMA Removal Performance

Month	NDMA Secondary Effluent Q1 Avg. [2] (ng/L)	Secondary Effluent Q1 Max. (ng/L)	UV Influent UVF [1] Avg. [2] (ng/L)	UV Influent UVF [1] Max. (ng/L)	UV Effluent UVP Avg. [2] (ng/L)	UV Effluent UVP Max. (ng/L)
January	47.6	64.2	6.7	7.6	<2	<2
February	84.7	100.0	10.0	11.7	<2	<2
March	57.2	79.4	8.0	12.5	<2	<2
April	52.2	74.4	6.0	9.3	<2	<2
May	40.4	45.8	7.2	8.2	<2	<2
June	46.2	71.2	5.7	7.1	<2	<2
July	35.9	40.1	5.5	6.0	<2	<2
August	41.3	56.6	8.4	10.5	<2	<2
September	40.1	48.2	7.5	9.3	<2	<2
October	47.5	63.7	7.3	8.7	<2	<2
November	29.3	34.4	4.7	5.9	<2	<2
December	29.1	42.3	4.4	5.3	<2	<2
Annual Average	45.9	---	6.8	---	<2	---
Maximum	---	100.0	---	12.5	---	<2
Average % Removal (by UV/AOP)	97.0%					
Average Log Removal (by UV/AOP)	1.5					

[1] Average hydrogen peroxide dose was 3 mg/L.

[2] 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. 2020 UV/AOP NDMA Removal Performance

All UVP NDMA results in 2020 were non-detect (using a laboratory method with an RDL of 2 ng/L). Overall, comparison of the average UVF and UVP NDMA concentrations in 2020, the UV/AOP system attained an average NDMA removal rate of 97.0%, or a 1.5 log reduction if 10% of the detection limit is assigned to the non-detect values.

In 2020, all FPW NDMA results were below the DDW notification level for NDMA (10 ng/L). The highest NDMA concentration in the Q1 influent, 100 ng/L, occurred on February 14, 2020. The NDMA concentration in the FPW on that date was 2.5 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 (3.4 ng/L) occurred on March 27, 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 2020, 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 (<1 µg/L from January through June and <0.5 µg/L from July through December. The UVF 1,4-dioxane concentrations were also non-detect. The Q1 concentrations of 1,4-dioxane averaged 1.2 µg/L, ranging from non-detect to 2.2 µg/L.

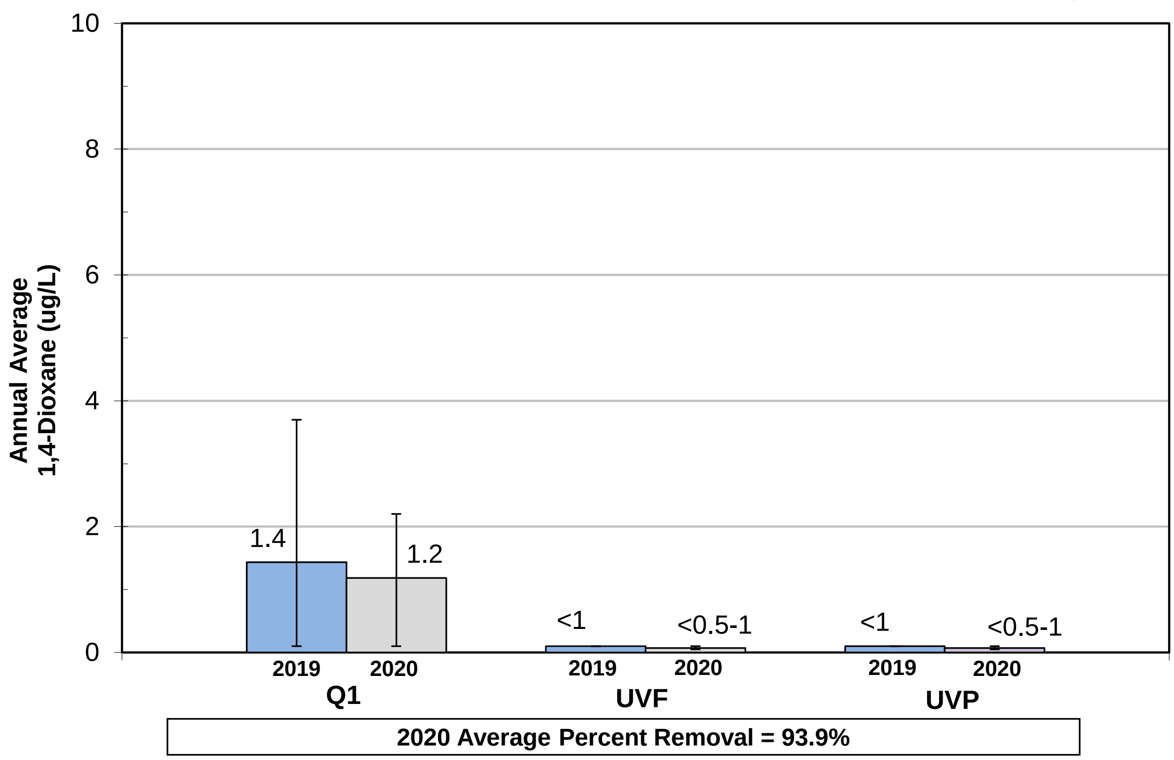
Table 2-6. 2020 RO/UV/AOP 1,4-Dioxane Removal Performance

Month	1,4 Dioxane					
	Secondary Effluent Q1		UV Influent UVF		UV Effluent UVP	
	Avg. [1] (µg/L)	Max. (µg/L)	Avg. [1,2] (µg/L)	Max. [1,2] (µg/L)	Avg. [1,2] (µg/L)	Max. [1,2] (µg/L)
January	1.4	1.8	<1	<1	<1	<1
February	1.4	1.4	<1	<1	<1	<1
March	1.3	1.4	<1	<1	<1	<1
April	1.0	1.6	<1	<1	<1	<1
May	1.1	1.2	<1	<1	<1	<1
June	1.2	1.2	<1	<1	<1	<1
July	1.1	1.2	<0.5	<0.5	<0.5	<0.5
August	1.0	1.2	<0.5	<0.5	<0.5	<0.5
September	1.1	1.2	<0.5	<0.5	<0.5	<0.5
October	1.1	1.3	<0.5	<0.5	<0.5	<0.5
November	1.1	1.7	<0.5	<0.5	<0.5	<0.5
December	1.4	2.2	<0.5	<0.5	<0.5	<0.5
Annual Average	1.2	---	<0.5 - 1	---	<0.5 - 1	---
Maximum	---	2.2	---	<0.5 - 1	---	<0.5 - 1
Average % Removal (RO/UV/AOP System) [3]	93.9%					
Average Log Removal (RO/UV/AOP System) [3]	1.2					

[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] RDL changed in 2020: 1 µg/L from January through June and 0.5 µg/L from July through December.

[3] 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. 2020 RO/UV/AOP 1,4-Dioxane Removal Performance

As illustrated by the black vertical bars on Figure 2-14, the 2020 maximum of 2.2 µg/L from all weekly Q1 grab samples was less than the corresponding maximum of 3.7 µg/L in 2019. The FPW 1,4-dioxane concentrations during 2019 and 2020 were consistently non-detect (<1 µg/L from January through June and <0.5 µg/L from July through December). Overall, the combined RO + UV/AOP processes achieved an average 93.9% removal of 1,4-dioxane during 2020 (Q1 through UVP streams) when assigning 10% of the RDL to the non-detect values (using the average RDL of the two lab methods used during 2020). Given that all UVF 1,4-dioxane concentrations were also non-detect, it appears that the RO process effectively removed 1,4-dioxane in 2020. The overall percent removal was slightly higher in 2020 (93.9%) in comparison with that in 2019 (93.0%); the Q1 average 1,4-dioxane concentration in 2020 (1.2 µg/L) was essentially the same as that that in 2019 (1.4 µg/L), and the UVP 1,4-dioxane concentrations were non-detect. Accounting for the updated lab method in the latter half of 2020 which supports a lower 10% substitute value for ND results in the calculation, this percent removal for 2020 demonstrated the continuing effectiveness of the treatment processes. The RO/UV/AOP processes achieved a 1.3 log removal of 1,4-dioxane during 2020.

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 finished product water (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, Anaheim CPP, and ARTIC; service to the Anaheim Adventure Park at Miraloma Basin is planned in 2021 for non-potable use. 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, and non-potable users are metered, totalized, and recorded.

Figure 2-17. Barrier and Product Water Pump Stations

2.2.7 Total Nitrogen Removal in 2020

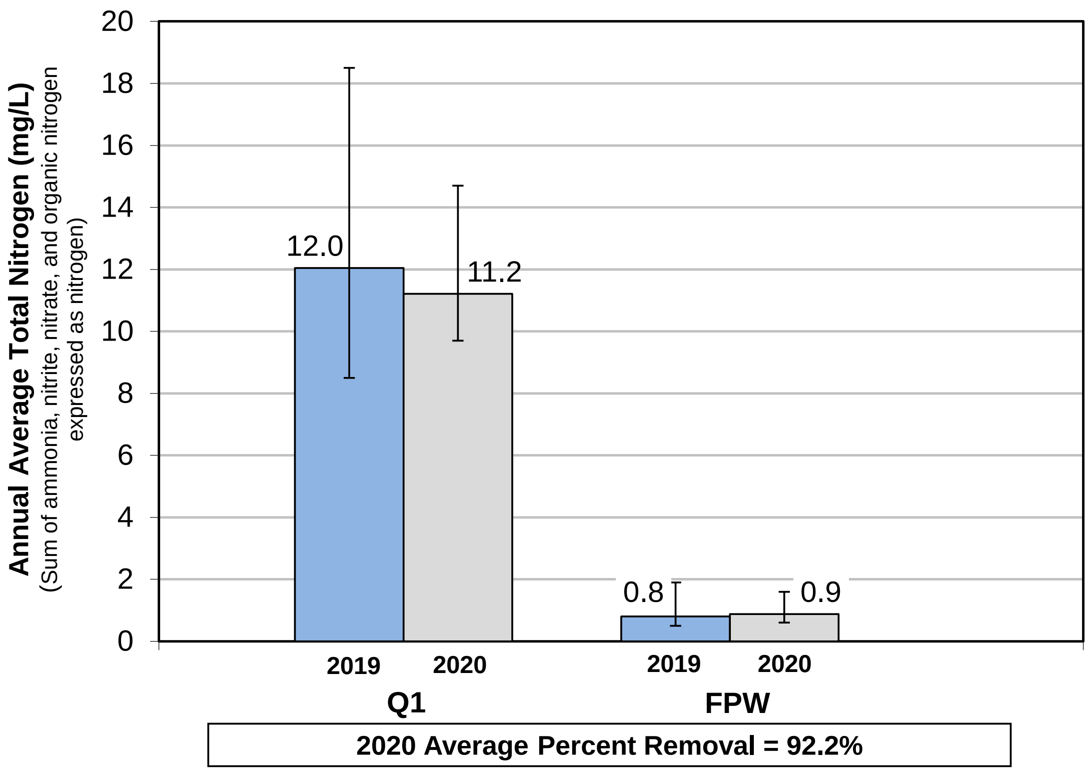
Monthly performance data for AWPF total nitrogen removal are summarized in Table 2-7 and Figure 2-18. On an annual basis, the Q1 total nitrogen concentration (sum of ammonia, nitrite, nitrate, and organic nitrogen, all expressed as nitrogen) averaged approximately 11.2 mg/L during 2020, which was nearly the same as the 2019 average (12.0 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 2020, this lower influent total nitrogen concentration helped the AWPF to achieve consistently low concentrations of total nitrogen levels in the FPW, ranging from approximately 0.6 to 1.6 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

Table 2-7. 2020 AWPF Total Nitrogen Removal Performance

Month	Total Nitrogen [1,2] Secondary Effluent Q1 Avg. (mg/L)	Secondary Effluent Q1 Max. (mg/L)	AWPF Effluent FPW Avg. (mg/L)	AWPF Effluent FPW Max. (mg/L)
January	11.1	11.5	0.8	1.0
February	11.8	14.7	0.8	1.0
March	11.8	12.1	0.7	0.8
April	12.1	12.5	0.9	1.0
May	10.2	10.8	0.9	1.3
June	11.3	12.9	1.0	1.4
July	10.6	11.0	0.9	1.0
August	10.8	11.9	1.1	1.6
September	10.3	10.9	0.9	1.3
October	11.0	11.4	0.8	1.0
November	11.3	11.8	0.8	1.1
December	12.2	14.1	0.9	1.2
Annual Average	11.2	---	0.9	---
Maximum	---	14.7	---	1.6
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. 2020 AWPF Total Nitrogen Removal Performance

nitrogen concentration remained consistently low over the past two years, 0.8 mg/L in 2019 and 0.9 mg/L in 2020. 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 2020 annual average total nitrogen reduction performance of the AWPF and compares it with that achieved in the previous year.

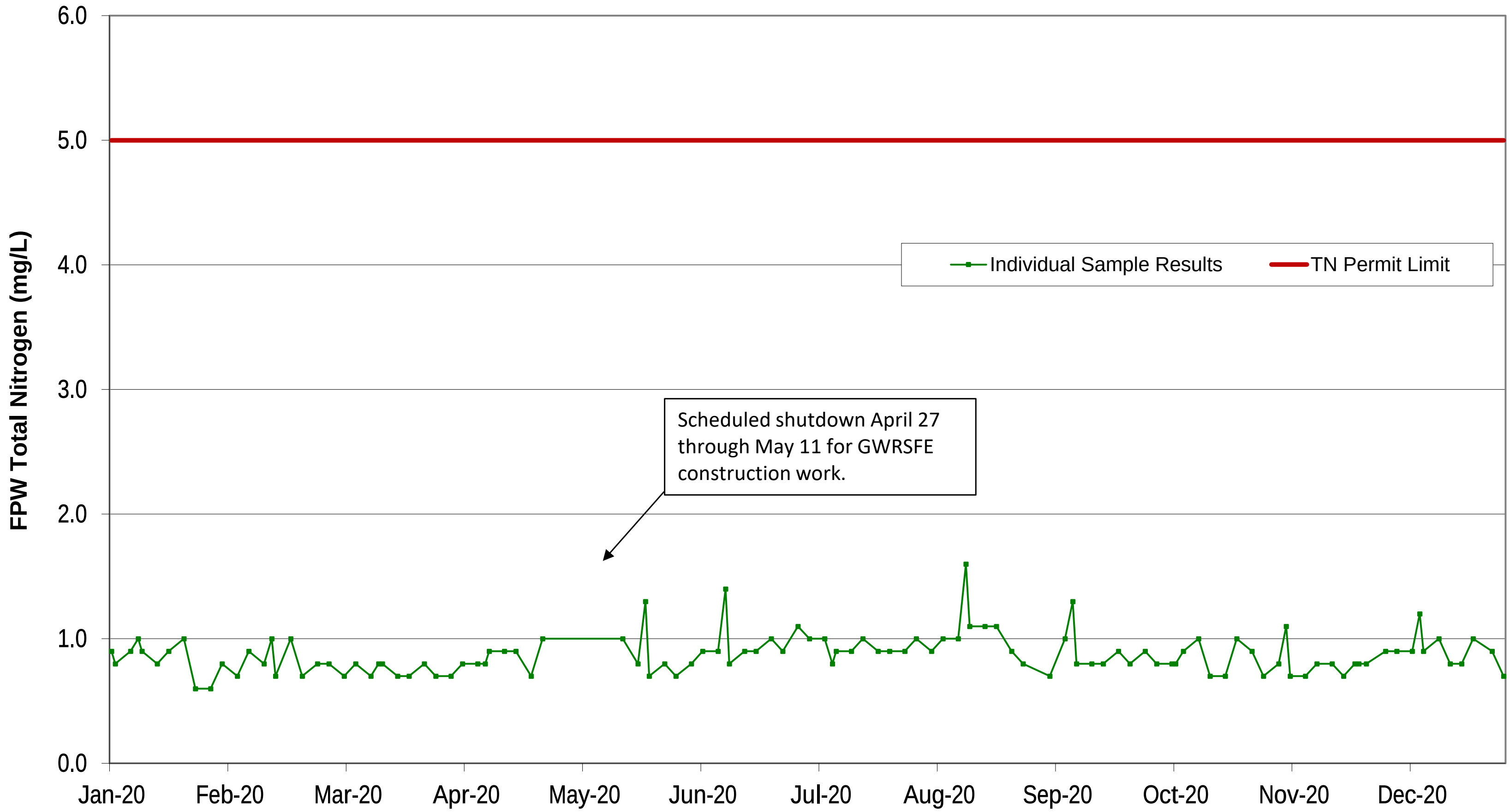
Figure 2-19 illustrates the FPW total nitrogen concentration during 2020, showing it was typically less than 1.0 mg/L, which was well below the total nitrogen GWRS permit limit of 5 mg/L. Ten samples yielded higher results, total nitrogen concentrations of 1.1 to 1.6 mg/L, that were still well below 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 2020

Figure 2-20 shows the TOC concentration in the FPW during 2020 based on daily 24-hour composite samples. The maximum individual daily composite FPW TOC result in 2020 was 0.37 mg/L. The running 20-sample average TOC concentration in the FPW was generally about 0.09 mg/L. The running 4-sample average TOC concentration in the FPW was also approximately 0.09 mg/L. Only the occasional sample greater than these values caused the overall FPW average TOC to be 0.1 mg/L (Table 2-4, Figure 2-11).

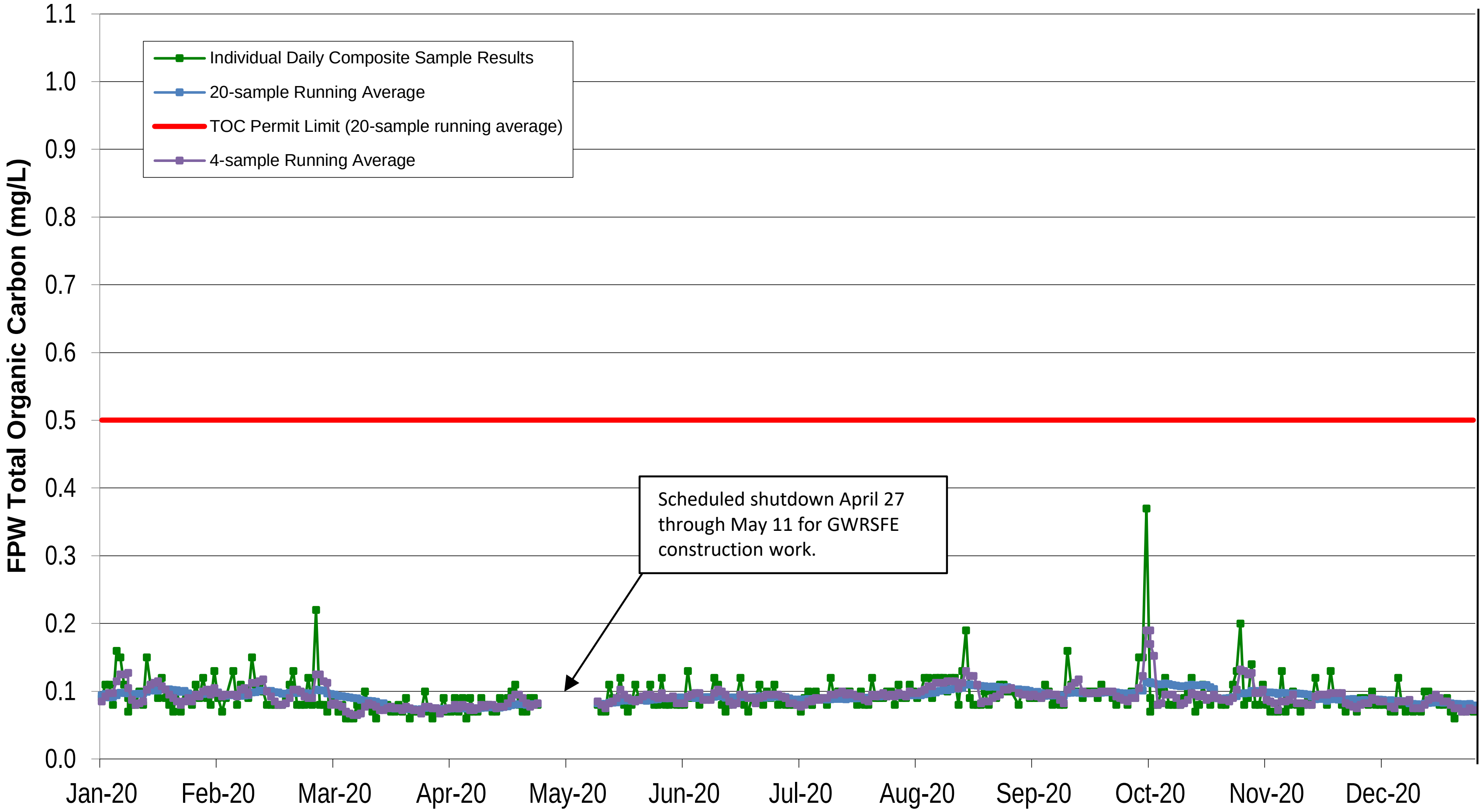
Compliance with the permit TOC limit is determined monthly based on the running average TOC concentration in the most recent 20 composite samples of FPW. The TOC limit is calculated based on the DDW-specified maximum RWC at each recharge location. The TOC limit for all recharge sites (Talbert Barrier, 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 2020, the running 20-sample average FPW TOC was consistently well below 0.5 mg/L and in compliance with the permit requirements.



Note: Reportable Detection Limit is 0.3 mg/L using Method X1-351.2

Figure 2-19. 2020 Purified Recycled Water Total Nitrogen



Note: Reportable Detection Limit is 0.05 mg/L using Method 5310C

Figure 2-20. 2020 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 2020. 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 nearly 346 days in 2020 (94.7% 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 April and May due to a planned two-week shutdown of the AWPF from April 27 to May 11 for GWRSFE construction work and inspection of the interior of Segment 1 of the GWRS Pipeline . The average daily purified recycled water production was below average in August due to a planned shutdown for GWRSFE pipeline tie-ins (August 30-September 1). The AWPF experienced other brief shutdowns due to GWRSFE construction work on the MF electrical processes (November 2 and December 8). The AWPF experienced three unexpected Southern California Edison (SCE) power interruptions, each of which lasted between 1.5 and 10.9 hours (July 24, August 15, and December 9). It is suspected that the unplanned outages were caused by maintenance activities by SCE, the regional electric power utility.

The AWPF operated at reduced production capacity (approximately 15 MGD) for periods up to five hours per day in response to calls from Enel X to reduce power demands on seven occasions (August 14-18 and September 5-6). 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 11 Megawatts based on the original AWPF production capacity of 70 MGD. After completion of the GWRS Initial Expansion, the Enel X program now calls for a load reduction such that total power demand is 5 Megawatts or less during a curtailment event. After completion of the GWRS Initial Expansion, 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.

Lastly, in December, the AWPF was shut down for a MF backwash supply valve actuator replacement (December 17).

Appendix D includes a list of OCWD operators with their grades of certification as well as summaries of equipment calibration records for 2020. OCWD had approximately 60 water production staff in 2020, 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 comments 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 2020. 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	< 0.15 NTU optimum > 0.20 NTU for no more than 4 hours ≤ 0.5 NTU at all times
6.	Transmembrane Pressure (TMP)	MF	3 to 12.5 psi
7.	Pressure Decay Test (PDT) based on daily testing	MF	> 0.25 psi/min triggers work order < 0.5 psi/minute 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.	Average 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 2020 AWPF operations with respect to critical control points yields the following observations:

1. **MFF chlorine residual** (as chloramine) averaged 4.0 mg/L during 2020 (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. Numerous MFF daily average chlorine residual readings below the 3 mg/L target (lowest was 2.1 mg/L) or above the 5 mg/L upper target (highest was 5.7 mg/L) were observed. The sodium hypochlorite dose was adjusted from time to time to control MF membrane fouling.

2. **ROF chlorine residual** (as chloramine) was consistently less than the 5 mg/L maximum target throughout 2020 (See Appendix E, Figure E-2). The 2020 average chlorine residual was 3.4 mg/L (average of the daily averages of continuous on-line results). The maximum daily average ROF chlorine residual was approximately 4.4 mg/L in mid-June. The minimum daily average ROF chlorine residual was 1.6 mg/L in early February when the AWPF was shut down for GWRSFE construction. In general, the ROF chlorine residual trended slightly upwards during 2020.

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 always less than 5 NTU (based on daily averages of continuous on-line results) (See Appendix E, Figure E-3). The MFF turbidity averaged 3.1 NTU and ranged from 1.7 to 4.4 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 2020.

4. **MFE turbidity** was below the target of 0.15 NTU with one exception during 2020 (See Appendix E, Figure E-4). The maximum MFE turbidity (daily average of the nine turbidimeters on the 4-cell banks) was 0.16 NTU in mid-May when the AWPF was restarted following a two-week shutdown. 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 0.16 NTU and averaged 0.04 NTU in 2020 (based on daily averages of continuous on-line results). As discussed in Section 2.2.2.2, the original incandescent turbidimeters were replaced with new laser turbidimeters between March and June 2020 that provided more accurate MFE turbidity readings. The new laser turbidimeters consistently yielded lower MFE turbidity readings between July and December 2020 than prior to the upgrades (Figure E-4).

5. **ROP turbidity** was consistently in the target optimum operating range of less than 0.15 NTU in 2020 (based on daily averages of continuous on-line results) (See Appendix E, Figure E-5). The ROP turbidity averaged 0.03 NTU and ranged between 0.01 and 0.10 NTU during 2020. In May 2020 the original incandescent turbidimeter on the bulk ROP stream was replaced with a new higher resolution laser turbidimeter that provided more precise

readings; beginning in June, the ROP turbidity was lower than prior to the turbidimeter replacement (Figure E-5).

6. **MF TMP** readings were generally within the target operating range of 3 to 12.5 pounds per square inch (psi) in 2020, except for readings that fell below the minimum range due to the two-week AWPF shutdown from late April to mid-May (See Appendix E, Figure E-6). Before and after the two-week shutdown period, the lowest daily average TMP reading (average for all operational MF cells) was approximately 2.4 psi in mid-May when the AWPF was restarted. The highest daily average TMP reading (average for all operational MF cells) was approximately 8.2 psi in early April. The annual average TMP for all operational MF cells in 2020 was 5.9 psi (average of daily averages of continuous on-line results). In 2020 the daily average TMP readings of individual operating MF cells ranged from a minimum of 0.24 psi to a maximum of 11.3 psi.

7. **Daily average MF PDT** results across all cells were below the targeted optimum level of 0.25 psi/minute from January through late February and again in early March and mid-May (See Appendix E, Figure E-7). Daily average MF PDT results (average of all MF cells) ranged from 0.00 to 0.31 psi/minute during 2020. A steady gradual increasing trend was observed during 2020. 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 pathogen log reduction value (LRV) calculations.

8. **ROP electrical conductivity** (EC) exhibited only minor seasonal changes during 2020 with all readings well below the maximum 95 µmhos/cm target (See Appendix E, Figure E-8). During 2020 the daily average ROP EC typically varied from lows of 26 µmhos/cm in early April to highs of 45 µmhos/cm in June, and then decreased to 23 µmhos/cm in late December. The variation in 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. Two ROP EC readings of 52 and 58 µmhos/cm occurred when the AWPF was shut down and restarted in early February. On an annual average basis, the ROP EC was 34 µmhos/cm in 2020.

9. **ROP TOC** daily average levels were below the maximum target of 0.1 mg/L with one exception (See Appendix E, Figure E-9) during 2020. The daily average ROP TOC concentration ranged from 0.03 to 0.13 mg/L based on on-line readings. The annual average ROP TOC concentration was 0.05 mg/L in 2020. 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 2020 (See Appendix E, Figure E-10). On-line %UVT values in 2020 ranged between 96.0% and 99.4%. The overall average %UVT in 2020 was 97.2%.

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 2020 the UV system EED varied from a low of 0.247 kWh/kgal to a high of 0.389 kWh/kgal (based on daily averages of continuous on-line readings). Elevated EED levels (0.313 to 0.389 kWh/kgal) occurred in late April as the AWPF prepared for a scheduled two-week shutdown. The overall annual average EED was 0.261 kWh/kgal in 2020.

12. **Average UV train power levels** were above the minimum 74 kW consumption level for all trains (A through M) throughout 2020 (See Appendix E, Figure E-12). The individual UV trains generally operated at average power levels between 81 and 86 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 225 mJ/cm^2 occurred in mid-August; the highest calculated UV dose of 426 mJ/cm^2 occurred mid-May as the AWPF was restarting following a two-week shutdown for GWRSFE construction. The average calculated UV dose during 2020 was 278 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 8.8; the annual average FPW pH was 8.5.

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.

During nearly all of 2020, 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 operated with three of the four pumps in service with only minor interruptions to increase raw wastewater flows to Plant 1. Beginning in 2016, OC San systematically modified off-line pumps to correct vibration issues; repairs on the fourth SALS pump were completed in April 2020. In response to SCE and statewide energy load reduction events in 2020, the SALS reduced pumping or shut down for brief periods in August and September and OC San diverted the wastewater to Plant 2. The SALS flow reductions typically had minimal impact because the AWPF was contemporaneously responding to load reduction calls from the Enel X Demand Response system. On one occasion in August, however, the AWPF source water flow was limited because Plant 1 operated at a reduced rate with fewer SALS pumps in response to an energy load reduction call; the Enel X Demand Response system had contacted OC San, but not OCWD.

Beginning in December 2020, operation of the SEFE was modified in an effort to better optimize source water availability. Previously, the SEFE storage tanks were filled as quickly as possible during the daytime and secondary effluent was stored until starting the drain sequence to supplement low nighttime flows. At times, the rapid SEFE tank fill approach diverted excessive secondary effluent flows and restricted the source water supply to the AWPF; the SEFE storage tanks would sometimes sit full for up to three hours before the Plant 1 diurnal low flow period began, resulting in secondary effluent flows being discharged to the ocean outfall. A modified SEFE management approach was implemented on December 4 that more closely matched the SEFE operation to the diurnal flow curve. The modified plan filled the SEFE storage tanks slower with the goal of reaching a full level just prior to the Plant 1 diurnal flow curve decline. This modified plan offers the ability to provide adequate daytime source water flows to the AWPF, limit excess flow discharges to the outfall, and have sufficient secondary effluent stored in the SEFE tanks to supplement nighttime deliveries to the AWPF.

OC San projects in the collection system and at Plant 1 temporarily reduced source water availability for the AWPF. Between February and May, approximately 1.7 MGD of raw wastewater flows normally tributary to Plant 1 were diverted to Plant 2 due to construction on OC San's Newhope-Placentia trunkline sewer collection system rehabilitation project.

From July until November, Plant 1 operated at reduced daily peak flow rates to accommodate an extensive repair project at AS1. A new, but temporary bypass pumping system for AS1 was installed to prepared for a scheduled replacement of a 42" RAS header. The RAS header replacement required Plant 1 to divert up to 2.5 MGD of their CENGEN cooling water process flows to Plant 2, which limited flow availability for the AWPF until mid-September. Multiple AS1 aeration basins were also taken out of service for air diffuser repairs. After repairs were completed in November, aeration basins were returned to service and OC San increased the Plant 1 peak daily flow set point, thereby producing more source water for the AWPF.

2.3.4 Source Water Quality

Source water quality was outstanding in 2020. The Plant 1 AS process generally produces secondary effluent with low nitrogen and turbidity levels because of the NdN operation. Brief operational issues were periodically discovered when the AWPF source water quality monitoring observed excursions. For example, in January 2020, high MFF turbidity (19 NTU) alarms were investigated, and the cause was found to be an inadvertently closed RAS valve for a Plant 1 clarifier. The elevated source water turbidity lasted for about 1.5 hours and cleared up soon after OC San opened the RAS valve.

In June, elevated chlorine residuals in the AWPF Q1 source water were observed. It was discovered that OC San had dosed their secondary process effluent channels with a slug of sodium hypochlorite. Normally Plant 1 sodium hypochlorite pumps are set to deliver a steady low dose for algae control; however, the chemical feed pumps were out-of-service and the sodium hypochlorite storage totes drained too rapidly. OC San adjusted the tote delivery rates and repaired the sodium hypochlorite feed pumps.

OC San increased the daily peak flow rate to the two trickling filters to accommodate piping replacements and diffuser repairs in the AS1 facility (from 30 to 35 MGD in January and from 35 to 36 MGD in July). During nighttime low flow periods, one trickling filter received only 5 MGD while the other trickling filter recirculated flows. In March, the AWPF influent screens experienced unusually high fouling and plugging rates attributed to the increased TF peak flow rates. OC San adjusted the daily peak flow rate, which controlled sloughing issues that were affecting the AWPF screening facility.

OC San continued conducting TF clarifier cleanings at night up to three times per month throughout 2020. 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, and with one exception, the corresponding ROP TOC concentration was essentially unaffected by the TF clarifier cleaning events. On October 29 following a TF clarifier cleaning, the ROP on-line TOC analyzers registered gradually rising TOC concentrations, from a stable 0.06 mg/L to 0.10 mg/L; the ROP TOC concentration remained at the 0.10 mg/L peak for about three hours before declining to normal values. While unrelated to TF clarifier cleanings, an elevated ROP TOC event occurred on November 24 after OC San's scheduled caustic dump to the wastewater collection system; the caustic slug arrived at and passed through Plant 1 to the AWPF, causing the ROP TOC to increase from 0.06 mg/L to 0.10 mg/L for about two hours before declining to normal levels.

2.3.5 MF System Operation and Performance

2.3.5.1 MF System Operation

The MF system operated well during 2020 with notable activities that included sodium hypochlorite dosage adjustments, corrective actions for elevated PDTs, valve actuator repairs, and performance tests comparing operating parameters for polypropylene membranes and PVDF membranes.

Adjustments in the sodium hypochlorite dosage to the MFF stream were made from time to time to maintain chloramination in response to seasonal membrane fouling trends and manage the ROF free chlorine residual concentration at or below 0.1 mg/L to protect the RO membranes from damage. The sodium hypochlorite dosage was adjusted to control MF membrane fouling while maintaining the %UVT above 95%. During 2020 the sodium hypochlorite dosage was 9.0 mg/L with brief intermittent reductions ranging from 7.0 to 8.5 to help control the %UVT.

Elevated PDTs were experienced periodically in some MF cells and investigations led to corrective actions and repairs. Most of the elevated PDT issues were investigated (mapping and pinning) and corrected so the cell could be returned to service. A few elevated PDTs were more challenging. Train C cells experienced elevated PDTs that remained fairly high (0.34 psi/min) after investigations. During the April-May two-week shutdown, a new air compressor and control air receiver tank was installed to increase redundancy and improve control air delivery to Train C's compressed air actuated valves and instruments. Elevated PDTs were observed in a Train D cell (greater than 0.40 psi/min); extensive investigations, corrective actions, and maintenance sessions eventually returned the Train D cell's PDT to within the high, but acceptable range (0.35 psi/min). Similarly, Train B cells experienced elevated PDT that required investigations and pinning.

During 2020, Train C membranes were the oldest of the MF system, having been installed with the GWRSIE in April 2015. By the end of the year, three Train C cells had received complete membrane replacements (C02, C03, and C04). Replacement of the remaining five Train C cells' filter membranes is planned in 2021.

Starting in December, Operations staff began performing up to two additional PDT tests on any cell that showed a value of 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.

At no time during 2020 was a cell allowed to remain in service if the PDT value resulted in an LRV calculation of less than 4.0 log for *Giardia* cysts or *Cryptosporidium* oocysts.

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 *Standard Practice for Integrity Testing of Water Filtration Membrane Systems* (ASTM D6908-06) (ASTM, 2017). 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. A PDT value of 0.5 psi/minute or less will ensure that the pathogen reduction achieved is at least 4-log. OCWD's critical limit for the PDT critical control point is 0.25 psi/minute for each MF cell, i.e., any daily PDT result above 0.25 psi/minute triggers a work order to investigate the issue at the affected cell. Any daily PDT result above 0.40

psi/minute requires retesting of that cell (up to two retests as of December 2020 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 2020 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. The MFE turbidity must be 0.2 NTU or less in order to receive pathogen log reduction credits. If the MFE turbidity remains above 0.2 NTU for more than four hours, an investigation is triggered, possibly taking the affected cells out of service. 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 3.09 NTU was consistently reduced through the MF process to an MFE turbidity of 0.04 NTU, which is equivalent to a 98.6% reduction (See Table 2-3, Figure 2-8, and Appendix F). Upgrades of the turbidimeters with high-resolution laser units occurred between March and June 2020, which improved the accuracy of MFE turbidity readings during the latter half of 2020. The maximum MFE turbidity reading was 0.16 NTU in mid-May when the AWPF was restarted following a two-week shutdown, which demonstrated membrane integrity, i.e., the MFE turbidity was consistently less than 0.2 NTU throughout 2020.

Corresponding daily average PDT results for all cells confirm MF membrane integrity based on pressure decay results at or below the target minimums throughout 2020 (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 daily average log reduction values for *Giardia* cysts and *Cryptosporidium* oocysts achieved by the MF process (all 36 MF cells) in 2020. (See Appendix F for monthly reports). The lowest minimum daily average log reduction value achieved in 2020 for these pathogens by the MF process (all 36 MF cells) was 3.9-log (February 10). The average daily minimum log reduction value achieved in 2020 for these pathogens was 4.2-log (based on the minimum daily average 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 2020; the slight 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.

2.3.6 RO System Operation and Performance

The RO system performed well during 2020. Beginning in mid-2015 and continuing through 2020, the three-stage RO system operated at an ROF pH of 6.9 and recovery rate of 85%. RO membranes were replaced in RO units B01, C01 and D01 in October 2020. All three units had their Hydranautics ESPA2LD membranes replaced with new Filmtec BW30XFRLE membranes due to membrane age. In addition, the ESPA2LD first stage membranes removed from these three units were reinstalled in the third stage of RO units B02, B03, C02, C03, D02, D03, E01, E02, and E03. (See Table 2-9 for a list of RO membrane types and dates installed in each of the 21 RO units.) This was done to improve the third stage fouling issues experienced in most units as highlighted further in this report. In May-June 2020, the original incandescent turbidimeters on the bulk ROF and ROP streams were replaced with new laser turbidimeters, which improved the accuracy of the ROF and ROP turbidity readings. Highlights of the RO system operation in 2020 are discussed below.

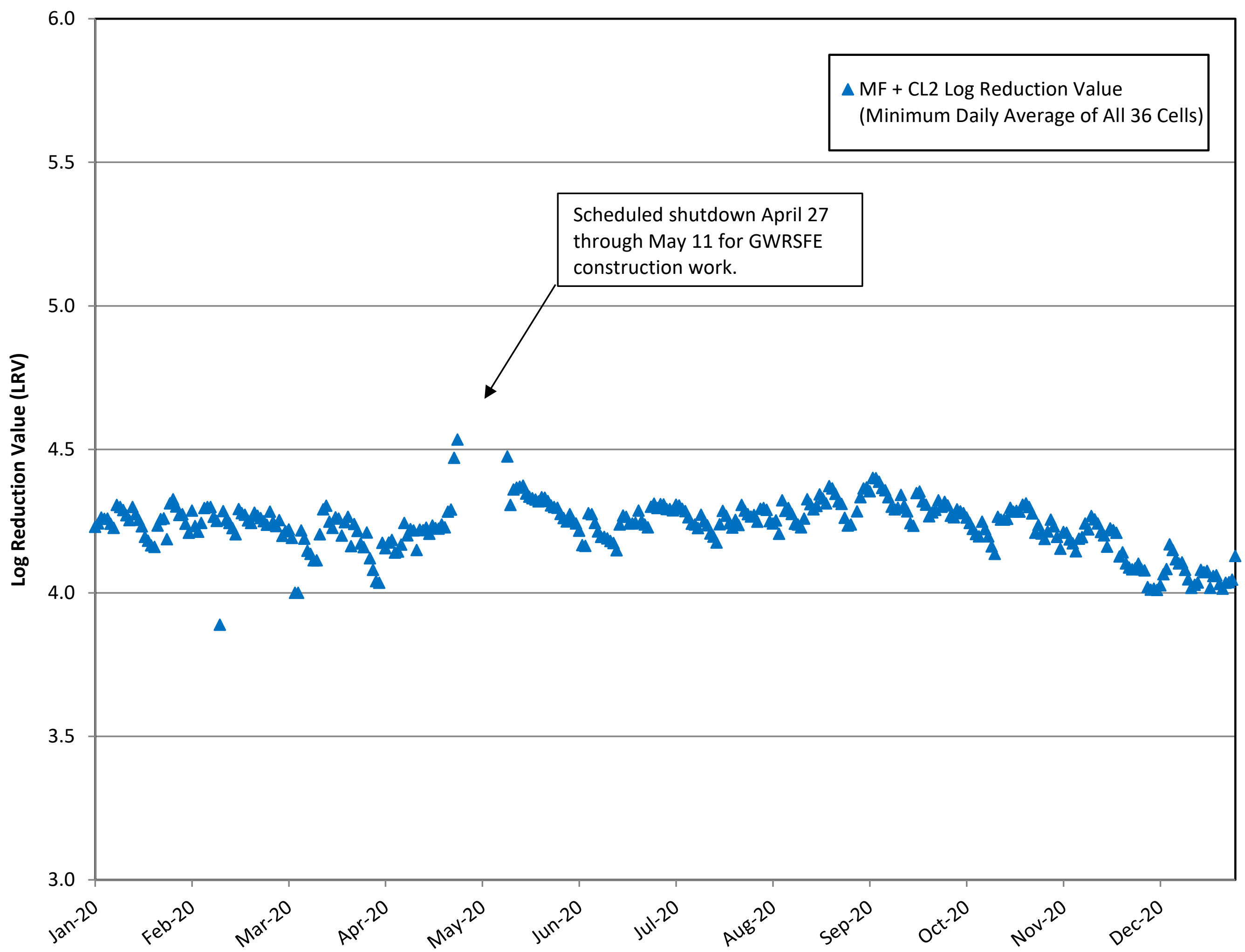
2.3.6.1 RO System Cartridge Filters

The 10-micron cartridge filters on the ROF stream that had been installed in August 2019 experienced increasing differential pressures apparently caused by biofouling. To alleviate the pressure increases in late March 2020, the cartridge filters were systematically soaked with sodium hypochlorite solution for approximately four hours and then flushed to control biofouling. The cartridge filters were again soaked in sodium hypochlorite solution during the April-May two-week AWPF shutdown. This cleaning regime successfully reduced the differential pressures in the cartridge filters until July when it was repeated and yielded minimal improvement. All 14 cartridge filters were replaced in late July. No unusual accumulations of foulant, debris, of filter degradation was observed on the old cartridge filters.

2.3.6.2 RO System TOC Analyzers

The redundant ROF and ROP on-line TOC analyzers installed in early 2018 continued to exhibit instability issues through 2020. All four analyzers showed intermittent spikes of false high and low TOC readings that generally lasted five to ten minutes each and were commonly associated with TOC analyzer reagent dosing syringe flush sequences. Following the analyzer supplier’s recommendations, I&E staff began weekly and later semi-weekly hydrogen peroxide flushes of the ROF TOC analyzers to reduce the frequency of the intermittent spikes. The hydrogen peroxide flushes seemed to improve the ROF TOC analyzers’ operation; however, periodic brief ROP TOC spikes were still observed from time to time.

The intermittent ROP TOC spikes exceeded the CCP (0.1 mg/L) with each event varying in duration from two to 534 minutes. Many of the short ROP TOC spikes appeared to be related to bringing RO units on-line immediately after CIPs that may have had incomplete flushes. Samples were collected, only on occasions where spike duration met criteria of OCWD TOC Response Matrix



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 2020: *Giardia* Cysts and *Cryptosporidium* Oocysts (Minimum Daily Average of All 36 MF Cells)

criteria as shown in the OOP, with inconclusive results to identify the constituent causing the ROP TOC spikes. OC San Plant 1 operations and source control staff were notified of the longer ROP TOC spikes exceeding the CCP, but they were also unable to definitively identify the source. In one instance, a scheduled OC San collection system sodium hydroxide release may have been the source of the ROP TOC spike above the CCP. Interestingly, during these ROP TOC spike events, the ROF TOC analyzers remained within the normal ranges.

Several brief ROP TOC spikes exceeded t0.5 mg/L for up to eight minutes. These ROP TOC spikes were related to bringing RO units on-line immediately after CIPs and acid washes. Fortunately, the intermittent ROP TOC spike events during 2020 were brief and none resulted in a GWRS permit exceedance.

2.3.6.3 RO System Third-Stage Fouling

Third-stage fouling was observed and studied to compare membrane types, ages, and cleaning regimes. OCWD Research and Development Department conducted autopsies on pre- and post-CIP third-stage tail-end membranes from RO Unit G01 (Dow XFLRE membranes) to compare with the autopsy results of RO Unit C01 (Hydranautics ESPA2-LD) that had been completed in late 2019. The January 2020 study concluded that the Unit C01 membranes showed delamination and a granular material that could not be definitively identified was found coating the membranes and feed spacers. The cleaning had not removed all of the accumulated foulant, and analysis indicated signs of aluminum silicate scale. The Unit G01 autopsy found similar but less amounts of granular foulant, but no delamination. The analysis indicated that a portion of the foulant was aluminum silicate.

Autopsies on other third-stage membranes of different ages, pre- and post CIP, continued to compare their physical and fouling conditions, particularly silica scale deposits. Further studies of pre- and post-CIP third-stage tail-end membranes from RO Unit E01 (Hydranautics ESPA2-LD) in February 2020 found that cleaning appeared to remove most of the foulant from the feed spacer/membrane surface interfacing areas, but the feed spacer itself was found to still be significantly fouled. Although signs of biofouling were present, aluminum silicate scale was also present. Based on these results, Operations staff increased the CIP chemical solution contact time from six to ten hours during future sub-stage CIPs.

RO Unit F02 experienced an unexpected rapid loss of third-stage permeability in September 2020. In November sets of pre- and post-CIP third-stage tail-end membranes from Unit F02 were sent to the antiscalant suppliers (Avista and American Water Chemicals [AWC]) for autopsies. New replacement membranes were installed in Unit F02 to replace the few sent out for autopsy. While results of the AWC autopsy point to presence of organics with clays, discussions seemed to indicate that silicate scaling might be a concern if proper pH levels were not maintained during the CIP. Trials of another AWC antiscalant as well as one from Avista are under consideration. Results of the Avista autopsy were pending as of the end of 2020. OCWD continues to evaluate other antiscalants at the AWPF Engineering/Research Center's pilot testing facility.

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	Filmtec BW30XFRLE	October 2020
	B02	Hydranautics ESPA2-LD	February 2016[3]
	B03	Hydranautics ESPA2-LD	January 2017[3]
C	C01	Filmtec BW30XFRLE	October 2020
	C02	Hydranautics ESPA2-LD	February 2016[3]
	C03	Hydranautics ESPA2-LD	January 2017[3]
D	D01	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	DOW/Filmtec XFRLE-400	April 2015
	F02	DOW/Filmtec XFRLE-400	April 2015
	F03	DOW/Filmtec XFRLE-400	April 2015
G	G01	DOW/Filmtec XFRLE-400	May 2015
	G02	DOW/Filmtec XFRLE-400	May 2015
	G03	DOW/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.

2.3.6.4 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 late August 2020. RO Unit G02's ERD developed a mechanical seal leak and had to be taken off-line, and on that same August day, RO Unit G02's concentrate flow control valve failed, resulting in RO Unit G02 being taken out of service. Five of the six ERDs operated until the end of November when repairs were completed and RO Unit G02 and its ERD were returned to service.

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 on-line TOC analyzers (one duty and one standby) continuously monitor the bulk (common header) ROF flow stream, providing full redundancy; likewise, two 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 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 2020.

Figure 2-23 illustrates the minimum daily average pathogen log reduction values achieved by the RO process based on TOC monitoring in 2020 as reported to DDW and the RWQCB; Appendix F includes monthly pathogen reduction reports in 2020.

The pathogen log reduction values demonstrated by the RO process in 2020 were greater than 2.00-log based on on-line TOC readings with one exception. On August 12, the pathogen log reduction values dipped to 1.89-log using on-line TOC readings. A review of the on-line TOC values on that date revealed that the daily average ROF TOC and ROP TOC concentrations were somewhat above average. (See Appendix F, p. F-65 and p. F-71 for details.) Slightly higher TOC values are common when water temperatures increase. The highest feed water temperatures typically occur in August of each year. Operations records show no remarkable RO process or TOC analyzer issues. It is suspected that the elevated ROP TOC concentration was caused by a Q1 TOC spike on August 12. Investigations revealed no apparent source(s) for the one-day TOC spike.

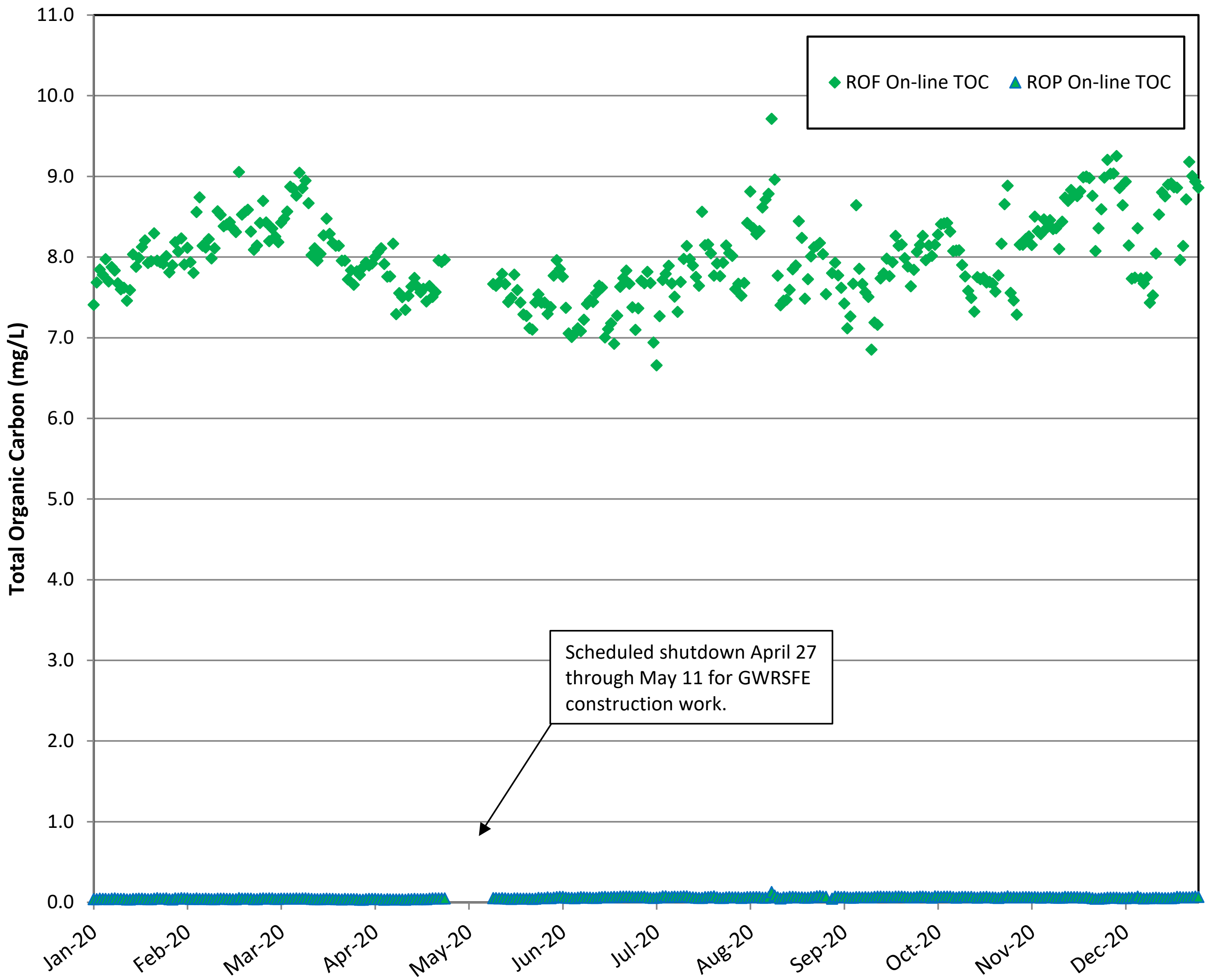


Figure 2-22. TOC Reduction Achieved by the RO Process in 2020

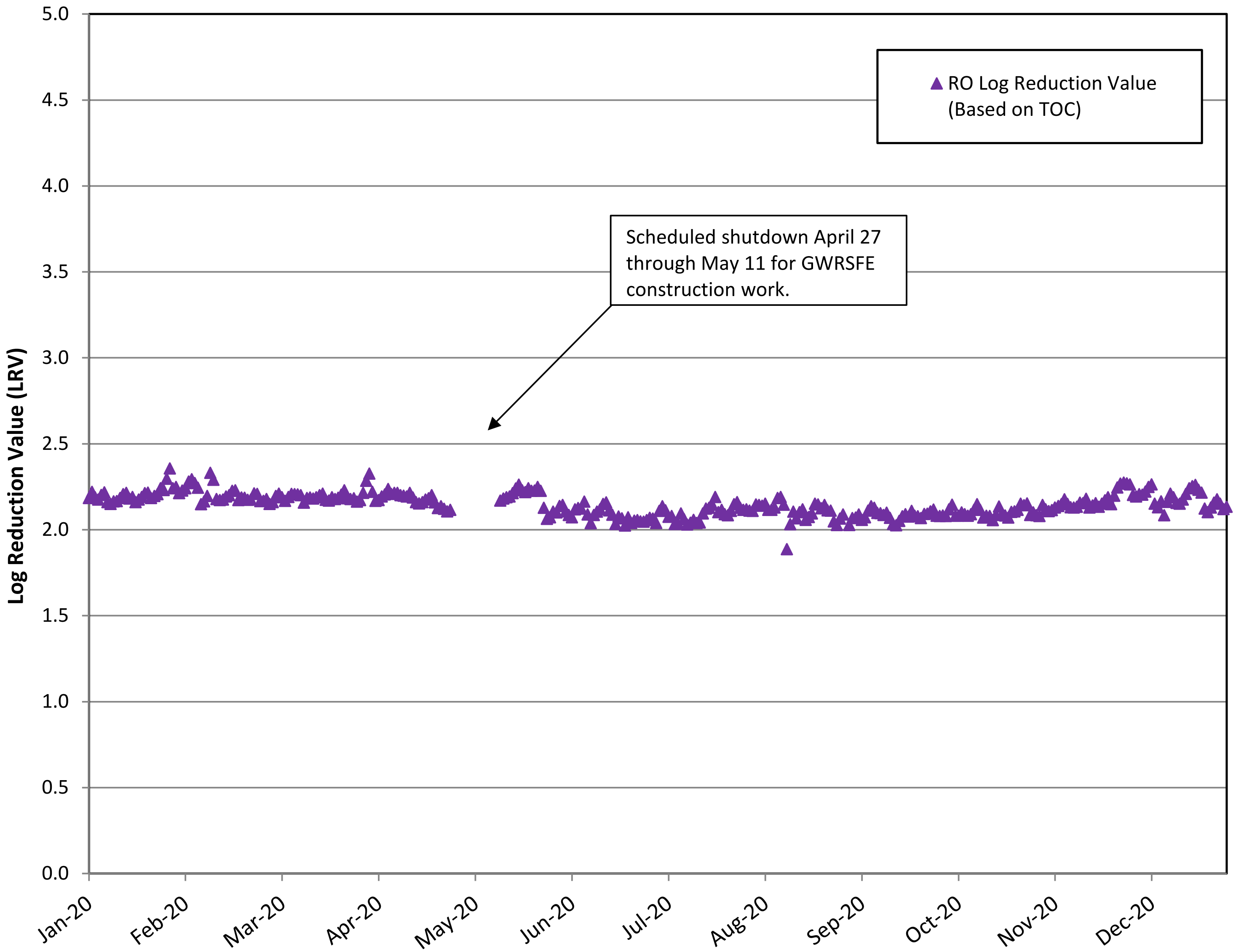


Figure 2-23. RO Log Reduction Values in 2020: *Giardia* Cysts, *Cryptosporidium* Oocysts, and Virus

2.3.7 Ultraviolet/Advanced Oxidation Process Operation and Performance

2.3.7.1 UV/AOP System Operation

The UV/AOP system operated well and few operational challenges were experienced in 2020. The AWPF typically operated with 12 to 13 UV trains and with five to six reactors each on-line during 2020. The targeted hydrogen peroxide dose was 3 mg/L, and the UVF and UVP hydrogen peroxide residual concentrations were monitored. OCWD maintenance staff continued to replace lamps approaching the end of their 12,000-hour guaranteed life, which complied with DDW's mandated limit for each lamp's operational life.

Low UV intensity readings with no lamps or ballasts out of service were occasionally observed in the UV Trains and reactors. The UV intensity issues were typically corrected by (1) replacing the sensors' viewing windows, (2) replacing UV lamps, (3) replacing faulty control components for specific UV lamps, or (4) replacing intensity transmitters.

The UV transmittance analyzer reading suddenly dropped twice during 2020 to less than the target 95% and 90% permit limit for a few minutes, which caused all UV trains and reactors to come on-line in the "safe mode" at 100% power. The first event in July occurred when the hydrogen peroxide dilution water flow rate fluctuated; the less diluted hydrogen peroxide caused ROP/UVF stream transmittance to decline to 83% momentarily before returning to the target level. The brief UV transmittance drop was believed to have been caused by entrained air in the dilution water supply line following an AWPF shutdown due to an unexpected SCE power outage. The second event in November was apparently caused when a slug of concentrated hydrogen peroxide entered the ROP/UVF stream after a dilution water switchover; the UV transmittance declined below the 95% CCP for two minutes and below the 90% permit limit for one minute. After addressing these issues and the UV transmittance returning to greater than 95%, the UV trains were sequentially restarted and reset to the normal operating mode.

In November 2020 GWRSFE construction caused UV Train K to accidentally shut down while installing the new UV Trains N, O, and P. Power was quickly restored, and UV Train K was returned 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 2020 show that the monthly average calculated EED ranged from 0.255 to 0.263 kWh/kgal, which is greater than the minimum EED of 0.23 kWh/kgal approved by DDW for the UV system.

The on-line UV transmittance during 2020 was above the minimum 95% target, except for two brief excursions noted in Section 2.3.7.1.

The on-line UV train power was greater than the minimum critical limits for each UV train; 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 2020. Figure 2-24 illustrates the daily LRV credits achieved by the UV/AOP system in 2020.

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 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.

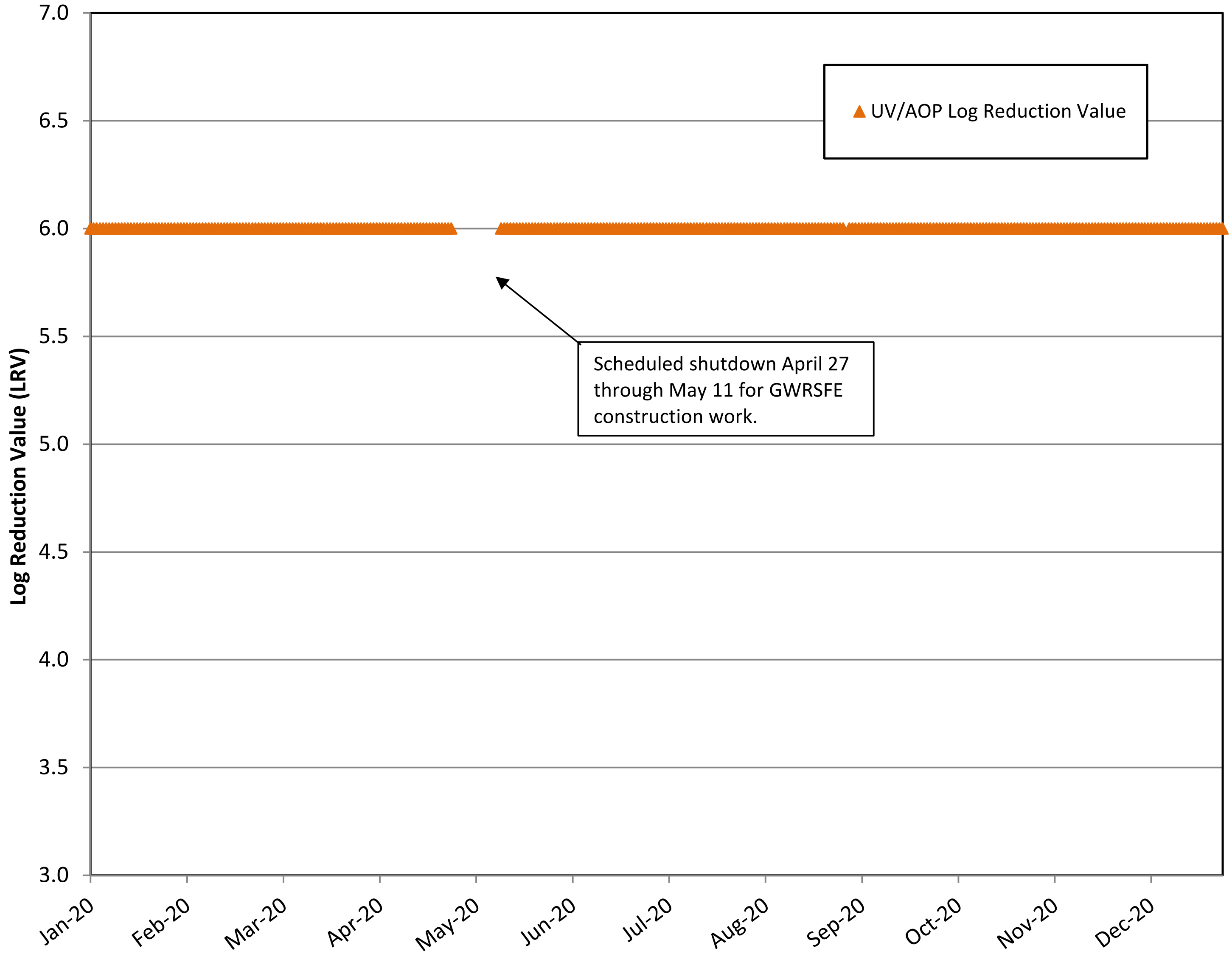


Figure 2-24. UV/AOP Log Reduction Values in 2020: *Giardia* Cysts, *Cryptosporidium* Oocysts and Virus

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; 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 2020 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 2020.

The lime dose averaged 26 mg/L, with brief intermittent reductions to as low as 23 mg/L for FPW pH control. The FPW pH was maintained between 7.7 and 8.9, with an average of 8.5 based on grab samples in 2020. In March, all three DPW pumps failed while replacing the system's process controller in preparation for the GWRSFE. The event caused two brief FPW pH excursions due to dilution water surges with the lime saturators; the total duration of FPW pH levels above 9 was nine minutes.

2.3.9 Summary of GWRS Pathogen Log Reduction Monitoring in 2020

Table 2-10 summarizes the minimum daily total pathogen log reduction credits achieved by GWRS in 2020, 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 taken for secondary treatment.

Table 2-10. Summary of GWRS Minimum Pathogen Log Reduction Credits Achieved in 2020

Pathogen	Minimum Log Reduction Requirements[1]	Minimum Daily Pathogen Log Reduction Value Achieved in 2020[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	3.89	1.89	6.00	0	12.1
Cryptosporidium oocysts	10	0	3.89	1.89	6.00	0	12.1
Viruses	12	0	0	1.89	6.00	4 (5)	12.0

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

[2] Minimum daily log reduction value achieved by each process in 2020. 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 (3.89-log) occurred on 2/10/2020. RO LRV was 1.89-log on 8/12/2020.) 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 2/10/2020. No virus reduction credit taken for MF with chlorination. See Appendix F for details.

[5] Minimum daily pathogen LRVs achieved by RO occurred on 8/12/2020. See Appendix F for details.

[6] Minimum daily pathogen LRVs achieved by UV/AOP occurred on 1/1-12/31/2020. See Appendix F for details.

[7] Minimum daily virus LRV credit of 4-log for underground retention time from 1/1-8/11/2020 and 8/13/2020-12/31/2020. Minimum daily virus LRV credit of 5-log for underground retention time on 8/12/2020. See Appendix F for details.

[8] Total daily minimum LRV for all processes in 2020. 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 also being verified via an intrinsic tracer test in 2020. 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 month of underground retention time allowed by the Title 22 Water Recycling Criteria for

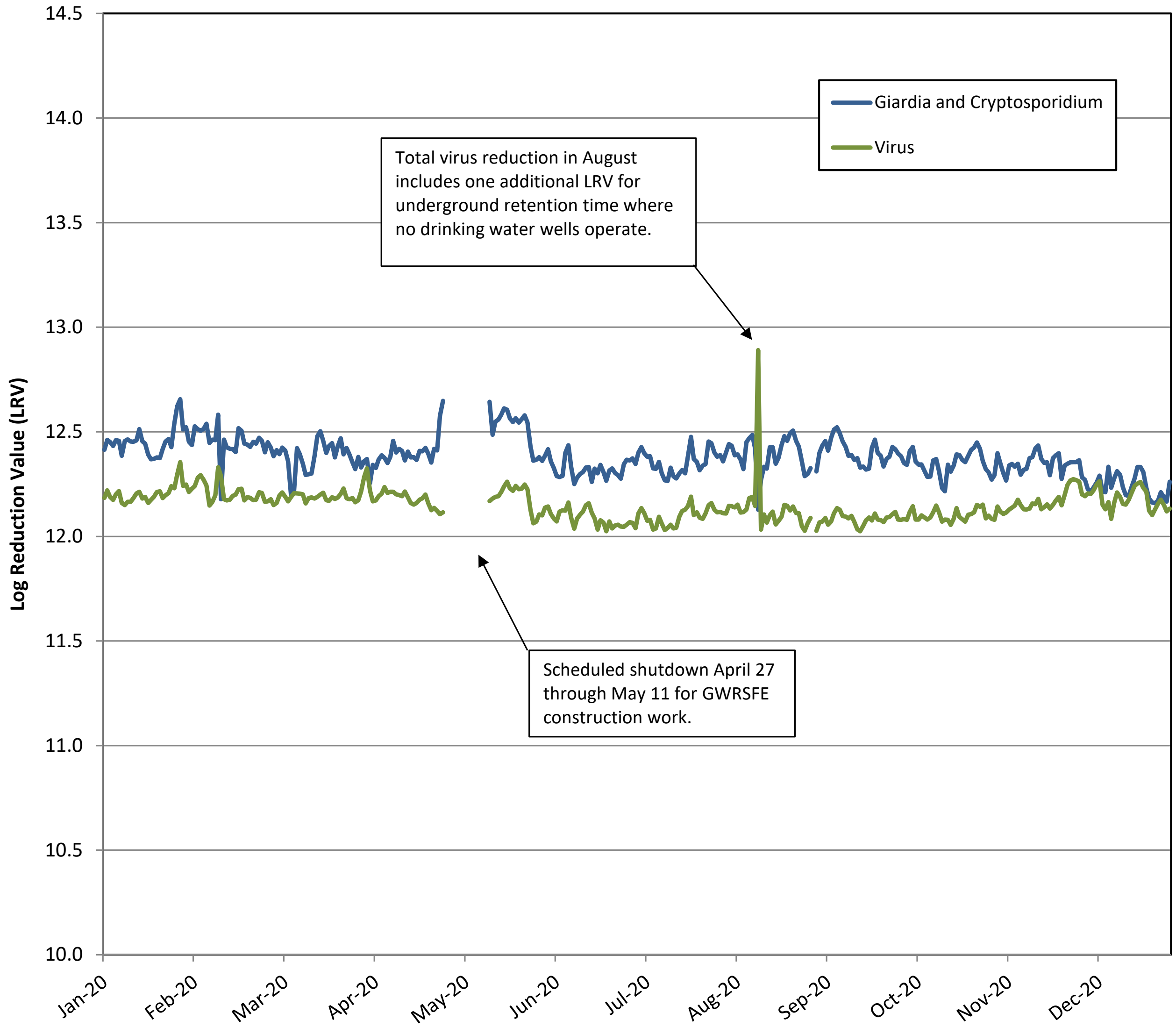


Figure 2-25. Summary of Minimum Daily GWRS Pathogen Log Reduction Credits Achieved in 2020

groundwater recharge (CCR, 2018), GWRS therefore provides at least 4-log reduction of viruses after surface spreading and direct injection. As noted in Table 2-10, 4-log virus reduction credits for underground retention time were taken during 2020, except on August 12 when 5-log virus reduction credits were taken. The additional 1-log virus reduction credit for underground retention time was achieved because no drinking water wells are located beyond the primary and secondary buffer areas. The 5-log virus reduction credit for underground retention time enabled GWRS to make up for the lower virus reduction credits achieved by the RO process on August 12. (See Section 2.3.6.5)

2.3.10 CEC Monitoring and Compliance with SWRCB Recycled Water Policy

OCWD continued its CEC and surrogate monitoring program during 2020 in compliance with the SWRCB amended Recycled Water Policy (SWRCB, 2013) per the GWRS monitoring and reporting requirements. The SWRCB adopted an updated Water Quality Control Policy for Recycled Water in 2018 (SWRCB, 2018). The RWQCB issued modified monitoring and reporting requirements in November 2020 to comply with the latest SWRCB provisions (RWQCB, 2020). During 2020, the GWRS CEC and surrogate monitoring and reporting was conducted following the 2013 SWRCB requirements; no results of this monitoring exceeded the Monitoring Trigger Levels associated with these requirements. Pending the SWRCB and RWQCB's approval of OCWD's Quality Assurance Project Plan (QAPP), future CEC and surrogate monitoring will follow the modified monitoring and reporting program for GWRS and 2018 Recycled Water Policy requirements. Table 2-11 summarizes the monitoring requirements for groundwater recharge projects and presents the results for GWRS in 2020. Monitoring of CECs and surrogates were conducted as follows:

- Health-Based CECs: Monitor at least annually following treatment and prior to release to the aquifer;
- Performance-Indicator CECs: Monitor at least annually prior to RO and following treatment prior to release to the aquifer;
- Surrogates: Monitor both EC and TOC continuously before and after the RO process.

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 2020. The emergency peak flow/rain event system was tested on May 11-12, 2020, when the AWPF discharged membrane filtered, disinfected effluent (bypassing RO) to the OC San 66-inch diameter Interplant Line, which conveyed the treated wastewater 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. R8-2014-0069 NPDES No. CA8000408, entitled *"Waste Discharge Requirements for the Orange County*

Table 2-11. Summary of CEC and Surrogate Monitoring for GWRS in 2020

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																		
17β-estradiol	Steroid hormones	✓		1	2	ng/L	1	2.3	1	<2	na	na	5	<2	91.3%	91.3%	91.3%	N/A
Caffeine	Stimulant	✓	✓	50	3[4]	ng/L	2	685	4	2.5	na	na	5	0.3	100.0%	99.9%	100.0%	>90%
NDMA	Disinfection byproduct	✓	✓	2	2[5]	ng/L	54	13.0	56	6.3	50	0.2	55	1.1	91.4%	0.0%	99.2%	>80%
Triclosan	Antimicrobial	✓		50	1	ng/L	4	6.9	4	1.4	na	na	5	<1	98.5%	0.0%	99.2%	N/A
DEET	Personal care product		✓	50	1	ng/L	4	320	3	<1	na	na	5	<1	100.0%	99.9%	100.0%	>90%
Sucralose	Food additive		✓	100	100	ng/L	4	52,675	4	<100	na	na	5	<100	100.0%	100.0%	100.0%	>90%
Surrogates to be monitored[3]																		
Groundwater Recharge Reuse - Subsurface Applications																		
Electrical Conductivity[6]				N/A	1	µm/cm	49	1,692	50	40	2	46	347	98	94.2%	89.1%	96.4%	>90%
TOC[6]				N/A	0.05	mg/L	351	8	350	0.10	4	0.19	353	0.09	98.8%	93.7%	99.4%	>90%

[1] Performance-indicator CECs are shown for the initial assessment monitoring phase and may be refined for subsequent monitoring phases.

[2] Average of all available 2020 data based on using 10% of the RDL for non-detectable readings unless noted otherwise.

[3] Compliance per GWRS monitoring and reporting program from the 2013 Recycled Water Policy based on CEC and surrogate monitoring for subsurface application of RO + AOP treated recycled water. Targets are from Amended Recycled Water Policy, SWRCB Resolution No. 2013-0003, Table 6 (SRWCB, 2013). Changes to the GWRS monitoring and reporting program for the 2018 Water Quality Control Pollicy for Recycled Water (SWRCB, 2018) requirements are pending.

[4] All results shown for caffeine analyses used OCWD's CEC Method with an RDL of 3 ng/L.

[5] NDMA RDL for ROF stream =10 ng/L. NDMA RDL for ROP and FPW streams = 2 ng/L.

[6] Based on grab sample results. On-line measurements are also taken and available results are reported in Appendix E.

na = Not analyzed

N/A = Not applicable

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 December 12, 2014 (RWQCB, 2014b). This permit is in the process of renewal with the RWQCB.

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. Confirming that capability, the maximum daily purified recycled water production by the AWPF exceeded 99 MGD on two occasions in January and February of 2020.

2.5 Anticipated Changes

A new non-potable water customer, Anaheim Adventure Park, is tentatively anticipated to begin operations at Miraloma Basin in 2021. The RWQCB adopted a Master Water Recycling Permit for current and future non-potable water users that will be served purified recycled water produced by the AWPF (RWQCB, 2021).

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 2020. The project schedule calls for construction of facilities to be completed by early 2023.

In order to produce 130 MGD of purified recycled water, the AWPF will require more source water (secondary effluent) from OC San. The GWRSFE AWPF will require approximately 173 MGD of source water; in comparison, the existing AWPF requires approximately 131 MGD of source water. Currently, the AWPF effectively receives all available secondary effluent from Plant 1. To supplement the existing Plant 1 source water supply, reclaimable secondary effluent from OC San's Plant 2 in Huntington Beach will be conveyed to the AWPF. Plant 2 currently treats raw wastewater as well as flows from the Santa Ana Regional Interceptor (SARI). The SARI flows are comprised of comingled raw wastewater, desalter brines, concentrated waste streams, and effluent from the Stringfellow Hazardous Waste Treatment Facility in Riverside County. Because the GWRS permit precludes flows from the SARI from being used as source water for the AWPF, SARI flows will be segregated. Plant 2 treatment systems will be split into two trains: reclaimable and non-reclaimable. Only reclaimable treated wastewater (non-SARI) will be used as source water for the GWRSFE. This flow will receive secondary treatment via the existing Plant 2 trickling filter/solids contact (TF/SC) process. Plant 2 reclaimable secondary effluent will be flow-equalized and pumped to the expanded AWPF via a slip-lined existing pipeline.

The GWRSFE consists of the following components:

- AWPF expansion of existing treatment processes;
- Plant 2 effluent pump station;

- Plant 2 flow equalization tank;
- Rehabilitated conveyance pipeline between Plant 2 and Plant 1; and
- Plant 2 headworks modification to segregate reclaimable wastewater.

3. TALBERT BARRIER OPERATIONS

In 2020, Talbert Barrier operations 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 2020:

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

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

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

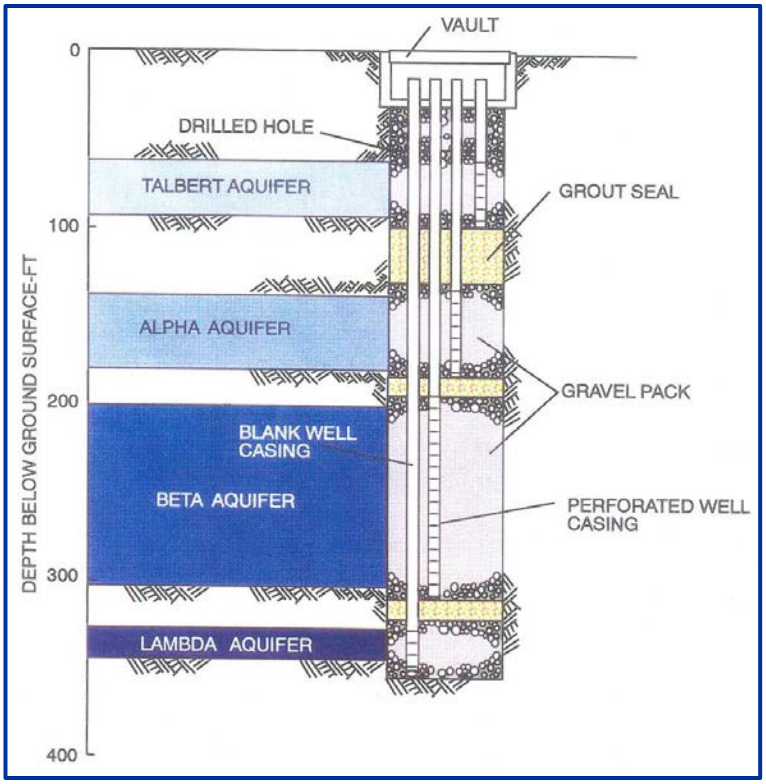


Figure 3-1. Typical Legacy Injection Well

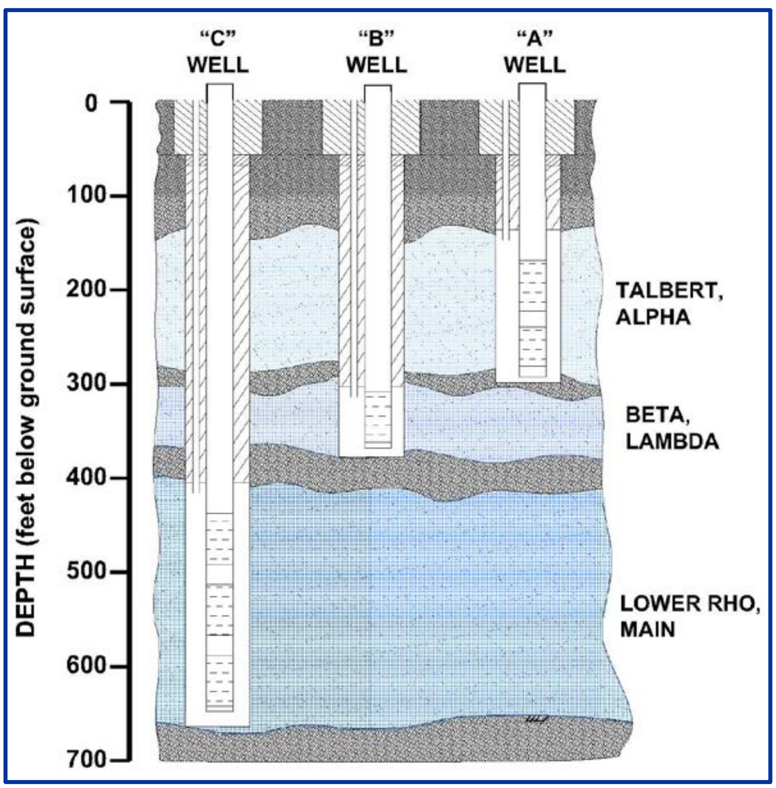


Figure 3-2. Typical Modern Cluster-Type Injection Well

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 12 days in 2020, primarily to keep the barrier pipeline pressurized and to maintain small injection flow into selected wells for operational purposes. OC-44 potable water was used as summarized below:

May	2 days	GWRSFE construction and GWRS Pipeline inspection
July	2 days	Power outage and subsequent AWPF instrumentation issues
August	3 days	Power outage, AWPF instrumentation issues and GWRSFE construction
September	1 day	GWRSFE construction
November	1 day	GWRSFE construction and OCWD Operations coordination
December	3 days	GWRSFE construction, power outage, OC San maintenance, and AWPF maintenance

The highest daily usage of OC-44 potable water was 0.99 MG on August 15 when the AWPF experienced an unscheduled power interruption.

A limited volume of FV potable water was utilized to pressurize the barrier pipeline on three days in February 2020 when OC-44 potable water was unavailable and the AWPF was shut down for GWRSFE construction. The highest daily usage of FV potable water was 0.18 MG on February 4.

3.3 Injection Water Volumes and Flow Rates

The volume of water injected at the Talbert Barrier in 2020 is presented below and compared with historical barrier injection.

3.3.1 2020 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 2020 was 21.5 MGD (including periods of low or no injection during AWPF outages). On a volumetric basis, a total volume of approximately 7,871 MG (24,155 AF) of purified recycled water, OC-44 potable water, and FV potable water was injected at the Talbert Barrier during 2020.

Figure 3-4 illustrates the volumes and average daily flow rates of each of the water sources injected at the Talbert Barrier during 2020. As noted above, essentially all of barrier injection, approximately 21.49 MGD on average (rounded to 7,865 MG or 24,138 AF), was GWRS purified recycled water. Less than 0.01 MGD on average (rounded to 5.12 MG or 15.72 AF) of OC-44 potable water was injected at the barrier during 2020. Less than 0.01 MGD on average (rounded to 0.45 MG or 1.4 AF) of FV potable water was injected at the barrier during 2020.

Table 3-2 summarizes the 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 2020 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.

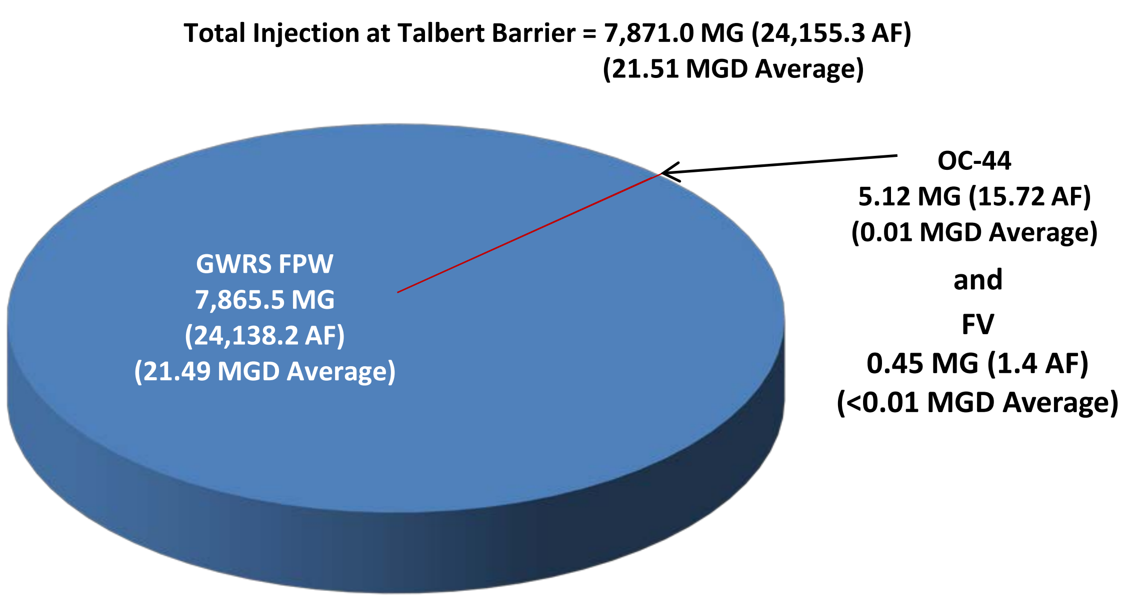


Figure 3-4. 2020 Talbert Barrier Injection Water Sources: Volumes and Flow Rates

Table 3-2. 2020 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	17.99	557.70	0.00	0.00	0.00	0.00	17.99	557.70	1,711.53	2,111,145
February	16.66	483.08	0.00	0.00	0.02	0.45	16.67	483.53	1,483.90	1,830,369
March	19.10	592.13	0.00	0.00	0.00	0.00	19.10	592.13	1,817.18	2,241,466
April	11.85	355.36	0.00	0.00	0.00	0.00	11.85	355.36	1,090.56	1,345,195
May	14.13	438.15	0.02	0.68	0.00	0.00	14.16	438.83	1,346.72	1,661,160
June	23.58	707.27	0.00	0.00	0.00	0.00	23.58	707.27	2,170.54	2,677,327
July	24.33	754.10	0.01	0.42	0.00	0.00	24.34	754.52	2,315.53	2,856,173
August	24.28	752.63	0.08	2.47	0.00	0.00	24.36	755.09	2,317.29	2,858,338
September	27.48	824.48	0.01	0.40	0.00	0.00	27.50	824.88	2,531.45	3,122,507
October	27.01	837.38	0.00	0.00	0.00	0.00	27.01	837.38	2,569.82	3,169,829
November	26.14	784.18	0.00	0.13	0.00	0.00	26.14	784.31	2,406.97	2,968,955
December	25.13	779.02	0.03	1.02	0.00	0.00	25.16	780.04	2,393.85	2,952,777
Total	**21.49**	**7,865.47**	**0.01**	**5.12**	**0.00**	**0.45**	**21.51**	**7,871.05**	**24,155.33**	**29,795,239**

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

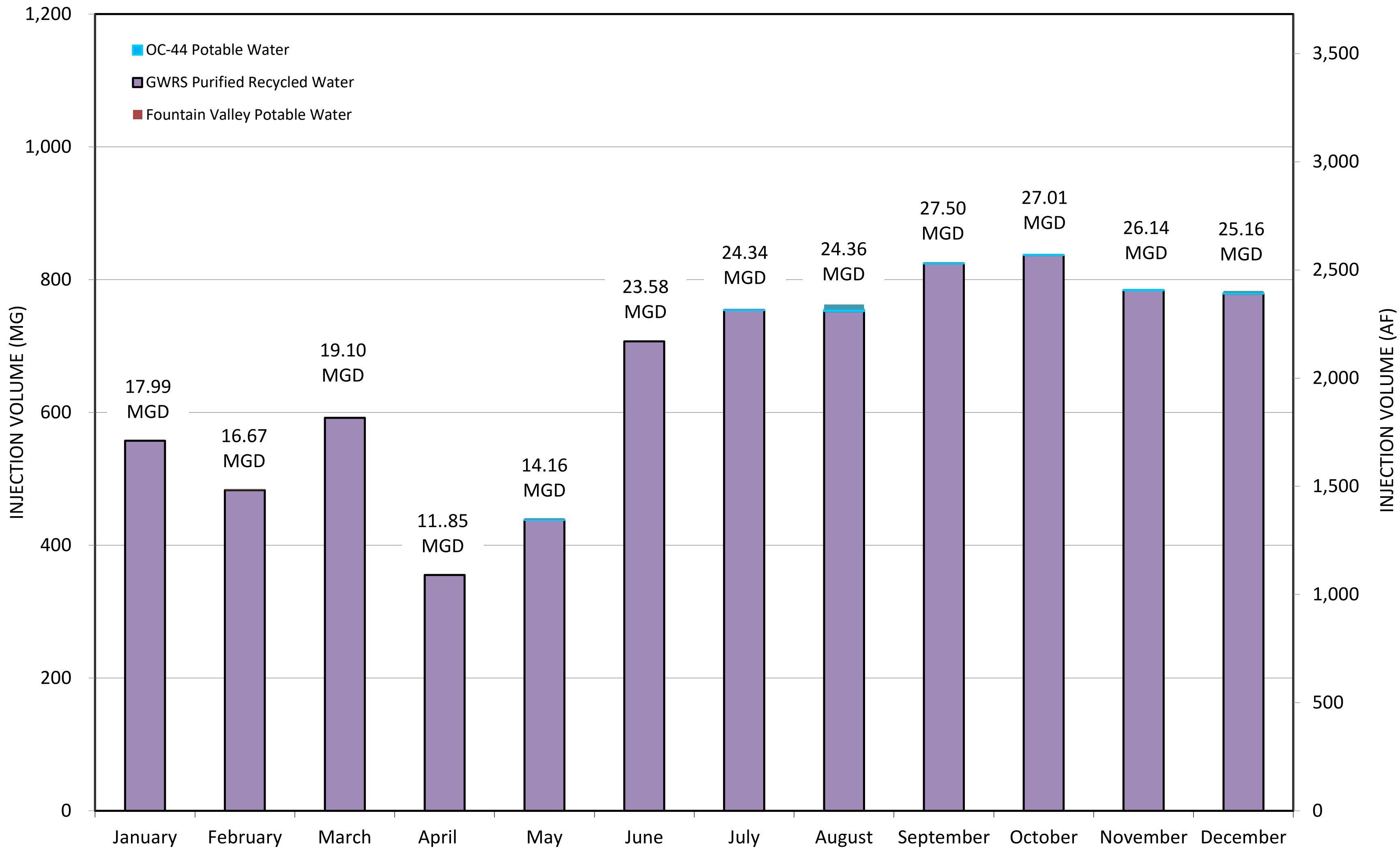


Figure 3-5. 2020 Monthly Injection Water Quantity at Talbert Barrier

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 3-3 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 13 years since GWRS has been in operation, the average total injection at the Talbert Barrier has been approximately 29,701 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 2020 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 3-3. Historical Injection Water Quantity at Talbert Barrier

	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)	
Year	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
TOTALS	**14,040.99**	**29,483.01**	**123,864.14**	**36,782.01**	**7,346.93**	**11,047.79**	**222,564.86**	**682,981.72**								

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.

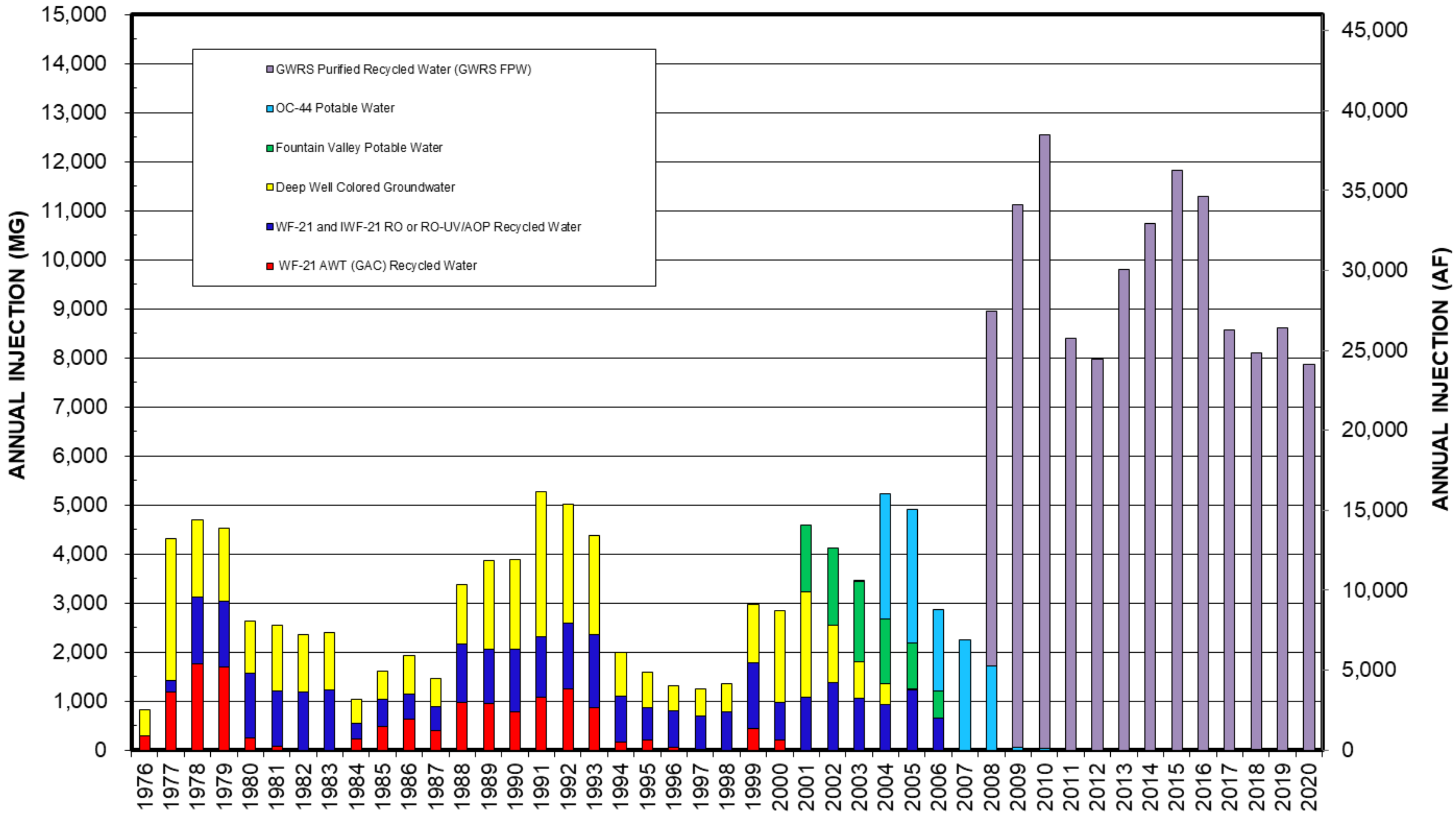


Figure 3-6. Historical Injection Water Quantity at Talbert Barrier

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 were used during 2011, 2012, 2016, 2019, and 2020.

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 2020. As shown in Table 3-2, 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. In general, this supplemental source has been preferred over the City of Fountain Valley potable connection.

3.4 Barrier Operations

Injection of purified recycled water produced by the AWPF began on January 10, 2008. During 2020, 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 2020, the MWD OC-44 connection was used for brief periods on 12 days and the FV connection was briefly used on three days during or immediately following AWPF shutdowns, which were primarily related to GWRSFE construction, GWRS Pipeline inspection, SCE power interruptions, and preventive maintenance activities. 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.

Since the GWRS came on-line in 2008, barrier injection was at its lowest in 2020 (Figure 3-6) 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 the year. Annual barrier injection during 2020 was further reduced due to being off-line for 17 days (April 25 to May 11) due to a planned AWPF shutdown for GWRSFE construction activities. Therefore, annual barrier injection in 2020 was just slightly lower than in 2012 even though Basin storage conditions were slightly higher in 2012. Annual barrier injection was steadily increased from 2012 through 2015 because of decreasing Basin groundwater levels and storage conditions (increasing accumulated overdraft) largely due to the extended drought during that period. Annual barrier injection was reduced once again and remained relatively low and stable from 2016 through 2020 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 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.

Annual barrier injection in 2020 was 24,155 AF, representing a decrease of 8.6% from the prior year primarily because of lower injection from January through May of 2020 due to higher winter/spring groundwater levels and also due to the aforementioned 17-day barrier shutdown April 25 – May 11, 2020. Barrier injection was slightly greater in October through December of 2020 than those same months in 2019.

The 8.6% decrease in annual barrier injection from 2019 to 2020 was largely a result of increased Basin storage conditions which led to higher groundwater elevations in the coastal area. From June 2019 to June 2020, groundwater storage increased by 36,000 AF throughout the Basin largely because of reduced Basin pumping due to PFAS even though rainfall was approximately average during that period. The Basin accumulated overdraft was 200,000 AF as of June 30, 2020; it had not been this small since reaching 179,000 AF in June 2012. Therefore, groundwater elevations were able to be maintained slightly above mean sea level seaward of the barrier throughout 2020 with relatively less injection required to protect against seawater intrusion, as discussed in more detail in Section 4.

Operation of the barrier was consistent and stable during 2020 due to a constant, reliable AWPF water supply and on-going rehabilitation and backwashing of the injection wells. As discussed in the previous section, an insignificant volume of potable water was used on 12 days from the MWD OC-44 connection and 3 days from the FV connection due to brief AWPF shutdowns. During 2020, there was only one AWPF shutdown that lasted longer than one day: a planned 15-day shutdown April 27 – May 11 (barrier off-line April 25 – May 11) related to GWRSFE construction activities. Potable OC-44 water was used to pressurize the barrier pipeline during AWPF restart activities on May 11-12.

As shown in Table 3-2 and on Figure 3-5, monthly injection flow rates during 2020 ranged from a low daily average flow rate of 11.85 MGD in April to a high daily average flow rate of 27.01 MGD in October (annual monthly high October volume of 837.38 MG or 2,569.82 AF). Typically, the volume of injection required to achieve and maintain protective groundwater elevations is greater in the summer months and lesser in the winter months when municipal pumping is considerably less. This was generally the case in 2020 although monthly injection remained relatively high from October through December.

Operationally, injection was intermittently maintained at relatively high rates at the injection wells that were on-line during 2020. However, many of the injection wells were off-line on stand-by for several months or the entire year during 2020 because those wells were not needed to maintain protective elevations for seawater intrusion control and to prevent shallow groundwater issues in low-lying areas seaward of the barrier, including the Huntington Beach Central Park area west of the barrier where ground surface elevations are slightly below mean sea level. 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 2020, but several legacy wells remained off-line on stand-by all year since water levels did not decline as much as usual during the summer of 2020.

In some years when injection requirements are greater due to lower groundwater levels, a few injection wells must be taken off-line during the peak injection summer months because of hydraulic restrictions or bottlenecks in the barrier pipeline. During 2020 however, no injection wells were taken off-line due to hydraulic restrictions or pipeline bottlenecks. When Talbert Barrier injection is reduced due to high groundwater elevations as during 2020, the surplus GWRS water can generally be pumped up to K-M-M-L Basins for surface recharge and starting in March 2020 also up to the five Mid-Basin Injection (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 considered to be 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.

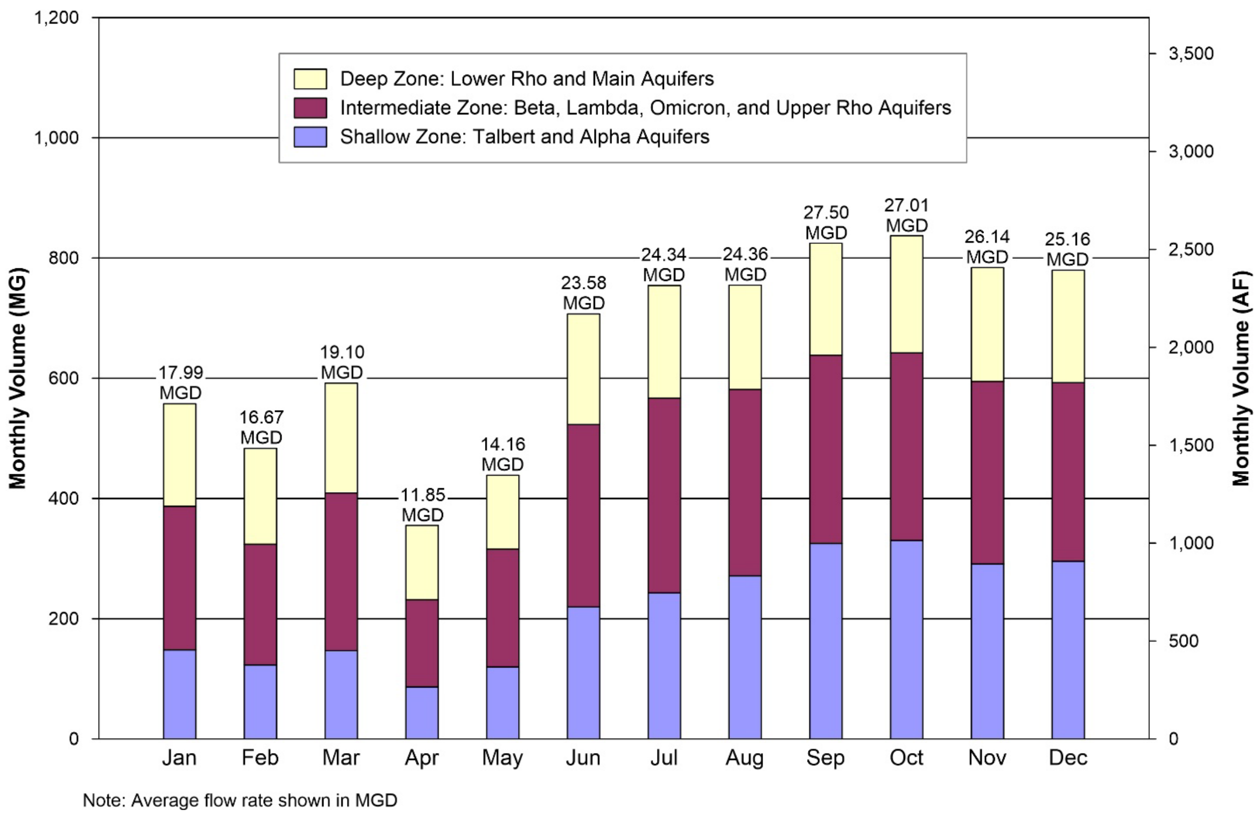


Figure 3-7. 2020 Talbert Barrier Monthly Injection Quantity by Aquifer Zone

As shown on Figure 3-7, 2020 monthly injection into the combined shallow and intermediate zones remained relatively low throughout the winter and spring months from January through May and declined to an annual low of approximately 250 MG (700 AF) in April due to the planned 17-day barrier shutdown April 25 – May 11. Monthly injection into the combined shallow and intermediate zones was steadily increased over the summer and early fall months and reached an annual high of approximately 650 MG (2,000 AF) in October, before declining slightly for the remainder of the year as the weather cooled (but remained dry) and coastal area pumping declined slightly. The lower injection volumes during the January through May period were attributable to higher groundwater elevations in the shallow and intermediate zones during those months in which several shallow and intermediate zone modern injection wells and legacy wells were secured off-line to prevent groundwater elevations from becoming too high in low-lying areas historically subject to shallow groundwater conditions. During the June through October 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 June through October injection rates were still relatively low, as several legacy wells were off-line on stand-by all year during 2020 since they were not needed to achieve protective elevations.

As shown on Figure 3-7, injection into the deep zone for Basin replenishment remained relatively constant from month to month during 2020, as ample pipeline capacity existed throughout the year to supply the lower priority deep zone injection wells due to the lower shallow and intermediate zone injection totals. 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 2020, 33% of all injection was into the shallow zone, 41% into the intermediate zone, and 26% into the deep zone, as shown on Figure 3-8. Therefore, 74% of barrier injection during 2020 was collectively into the shallow and intermediate zones for the primary purpose of seawater intrusion control, similar to the 75% in 2019. The percentage of both shallow and intermediate zone injection was approximately the same in 2020 as in 2019.

Several shallow and intermediate zone injection wells were off-line on stand-by throughout much or all of 2020 due to the relatively high groundwater conditions, while all deep zone injection wells were on-line throughout 2020 (except I24/2 due to maintenance issues). 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.

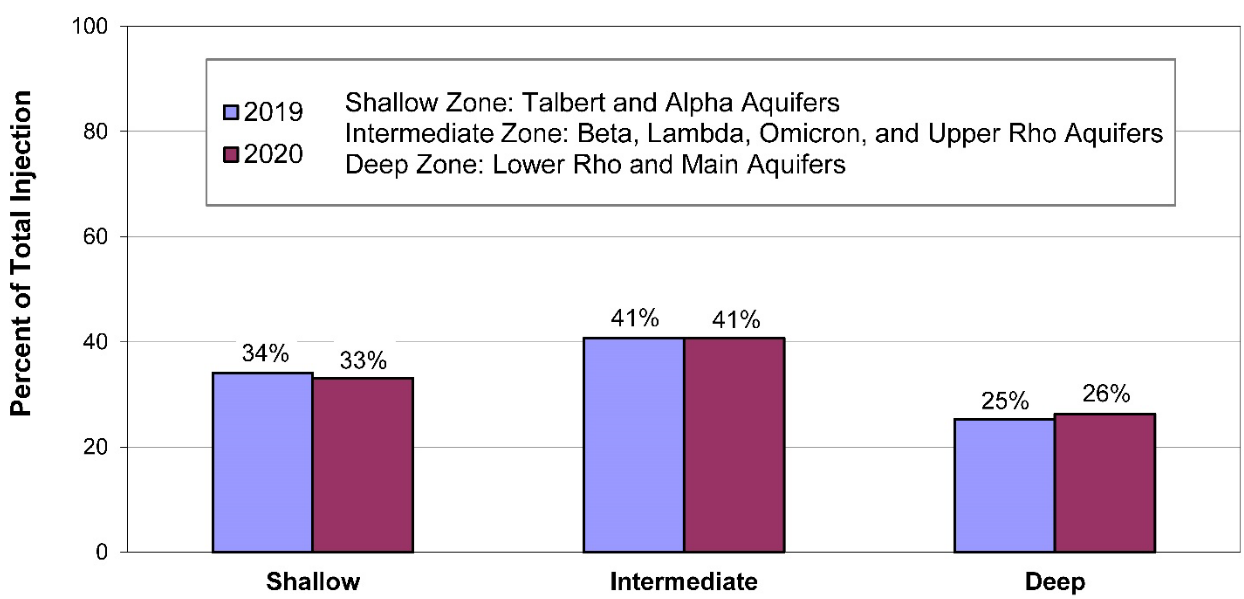


Figure 3-8. 2019 and 2020 Annual Average Injection Percentages for Each Depth Zone

3.4.2 Spatial Distribution of Injection along the Barrier

During 2020, 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 3-4 shows the annual volume injected into each of the 36 injection well sites during 2020. Each well site consists of one to four discretely measured injection casings (installed at different depth zones). Table 3-4 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 3-4 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 3-2 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 3-4. For a given month, all well points were adjusted by the same factor. During 2020, the monthly adjustments ranged from approximately 1.1% to 2.2% 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 2020. 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 wells I24 and I25 had relatively high intermediate zone injection. East-side legacy wells I1 and I5 were good performers with the highest annual injection totals as compared to other legacy wells during 2020.

As shown on Figure 3-9, west-end modern injection well I29 had no shallow zone injection during 2020 because I29A was off-line on stand-by all year since it was not needed to maintain

Table 3-4. 2020 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	1,099.03	563.38	995.92	2,658.33	866.22
	I31	814.09	772.30	1,121.62	2,708.01	882.41
	I30	1,091.55	695.65	1,144.81	2,932.01	955.40
	I29	0.00	992.67	640.00	1,632.67	532.01
	I23	0.00	0.00	–	0.00	0.00
	I28	391.26	806.86	1,014.05	2,212.17	720.84
	I27	366.50	906.04	794.38	2,066.92	673.51
	I22	0.00	0.00	–	0.00	0.00
	I21	–	107.40	–	107.40	35.00
	I20	0.18	0.29	–	0.47	0.15
	I19	–	0.02	–	0.02	0.01
	I18	0.00	0.00	–	0.00	0.00
	I17	269.09	341.29	–	610.37	198.89
	I16	0.00	0.00	–	0.00	0.00
	I15	0.00	0.00	–	0.00	0.00
	I14	0.00	0.00	–	0.00	0.00
	I13	224.11	239.05	–	463.17	150.92
	I12	316.63	192.26	–	508.89	165.82
	I11	520.14	183.36	–	703.50	229.23
	I10	1.09	0.00	–	1.09	0.35
	I9	0.00	0.00	–	0.00	0.00
	I8	0.00	0.00	–	0.00	0.00
	I7	340.02	129.13	–	469.15	152.87
	I6	0.00	0.00	–	0.00	0.00
	I5	305.99	626.00	–	931.99	303.69
	I25	–	1,052.11	–	1,052.11	342.83
	I24	–	723.32	0.00	723.32	235.69
	I4	108.10	163.80	–	271.90	88.60
	I3	0.00	0.00	–	0.00	0.00
	I2	0.00	260.74	–	260.74	84.96
	I1	428.80	458.01	–	886.82	288.97
East	I26	603.75	626.79	618.64	1,849.18	602.56
Southeast Barrier	I33	142.33	–	–	142.33	46.38
	I34	149.10	–	–	149.10	48.59
	I35	347.06	–	–	347.06	113.09
	I36	466.69	–	–	466.69	152.07
	Total:	7,985.51	9,840.46	6,329.42	24,155.40	7,871.05
	Percent:	33.06%	40.74%	26.20%		

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.

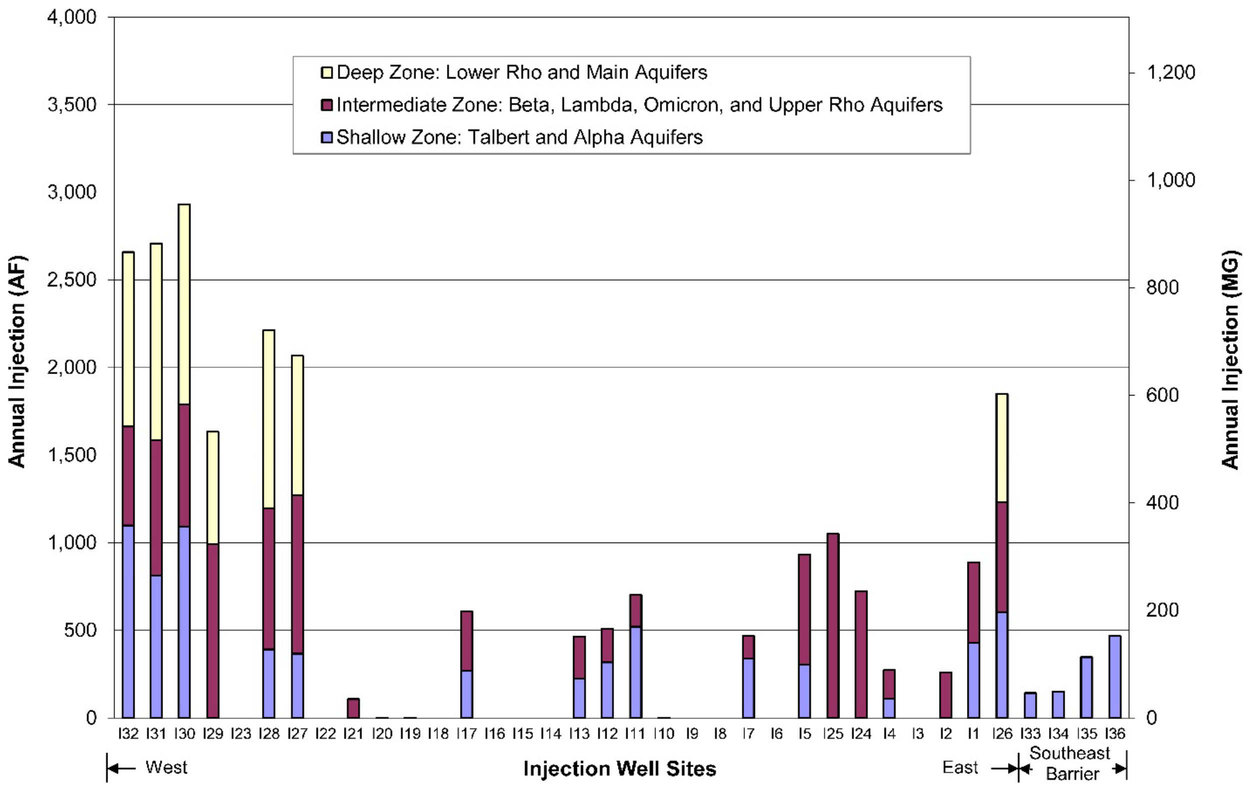


Figure 3-9. 2020 Talbert Barrier Injection Quantity at Each Well Site

groundwater levels above protective elevations and to prevent groundwater levels from becoming too high in the low-lying area farther to the west near Huntington Lake. Southeast barrier modern injection wells I33 and I34 had low annual injection totals during 2020 because they were off-line on stand-by for the first half of the year as they were not needed during that time to maintain protective elevations.

The older legacy well sites (I1 through I23) tend to have lower injection capacities than the modern wells. However, I1 and I5 performed comparably with shallow and intermediate zone injection totals at the modern injection wells during 2020 (Figure 3-9). Of all the active legacy wells during 2020, I5 had the highest combined shallow and intermediate zone annual injection of nearly 1,000 AF, slightly outperforming I1 even though I1 was on-line all year while I5 was only on-line from May through December, equating to a daily average injection at I5 of 1.4 MGD into the combined shallow and intermediate zones. During 2020, many of the other legacy injection wells had relatively low combined shallow and intermediate zone annual injection volumes ranging from zero to approximately 600 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.

During 2020, legacy wells I2 and I21 had very low annual injection of approximately 100 to 300 AF even though they were on-line all year; these two wells, in addition to I3 which was off-line during 2020, 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 13 legacy wells had no or negligible (1 AF or less) injection during 2020 (I3, I6, I8, I9, I10, I14, I15, I16, I18, I19, I20, I22, and I23) because they were off-line on stand-by the entire year (except for brief test starts) 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 2020, 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, 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, many legacy injection wells were off-line for either all or a major portion of 2020 due to relatively high groundwater conditions. In fact, only seven legacy wells were on-line for the majority of 2020: I1, I2, I5, I11, I12, I17, and I21, as indicated in Table 3-5. Protective elevations were maintained throughout the year with the use of these seven 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 2020, all deep zone modern injection wells were on-line throughout 2020, except for I24/2 due to maintenance issues (Table 3-5). 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 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 2020, only 23 of the 36 injection well sites were operated over the course of the year, with 13 of the 23 legacy well sites off-line on stand-by for the entire year since they were not needed to maintain protective elevations. In general, various injection wells

Table 3-5. 2020 Injection Wells Operational Status

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

- ☐ 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).

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 3-5, only I24/1 and I24/2 were off-line for an extended period due to maintenance issues during 2020. These two on-site modern injection wells both have an inoperable down-hole flow control valve. 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. This maintenance work is currently on hold due to access issues related to GWRSFE construction activities.

During 2020, 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 2020, as the flow tube polypropylene linings continued to wear out largely due to FPW aggressivity. The new flow tubes have a Teflon lining. To date, a total of seven modern injection wells have had flow tube replacements.

No legacy wells were redeveloped during 2019 or 2020. 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 both 2019 and 2020, no legacy redevelopment is planned for 2021.

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, 2015), 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 now 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 only 5 to 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 2020, I24/2 was off-line all year and the submersible backwash pumping rate for I24/1 and 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 3-4) 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 2020. Bypass filter monitoring and periodic pipeline inspections will continue.

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 2020:

- 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.

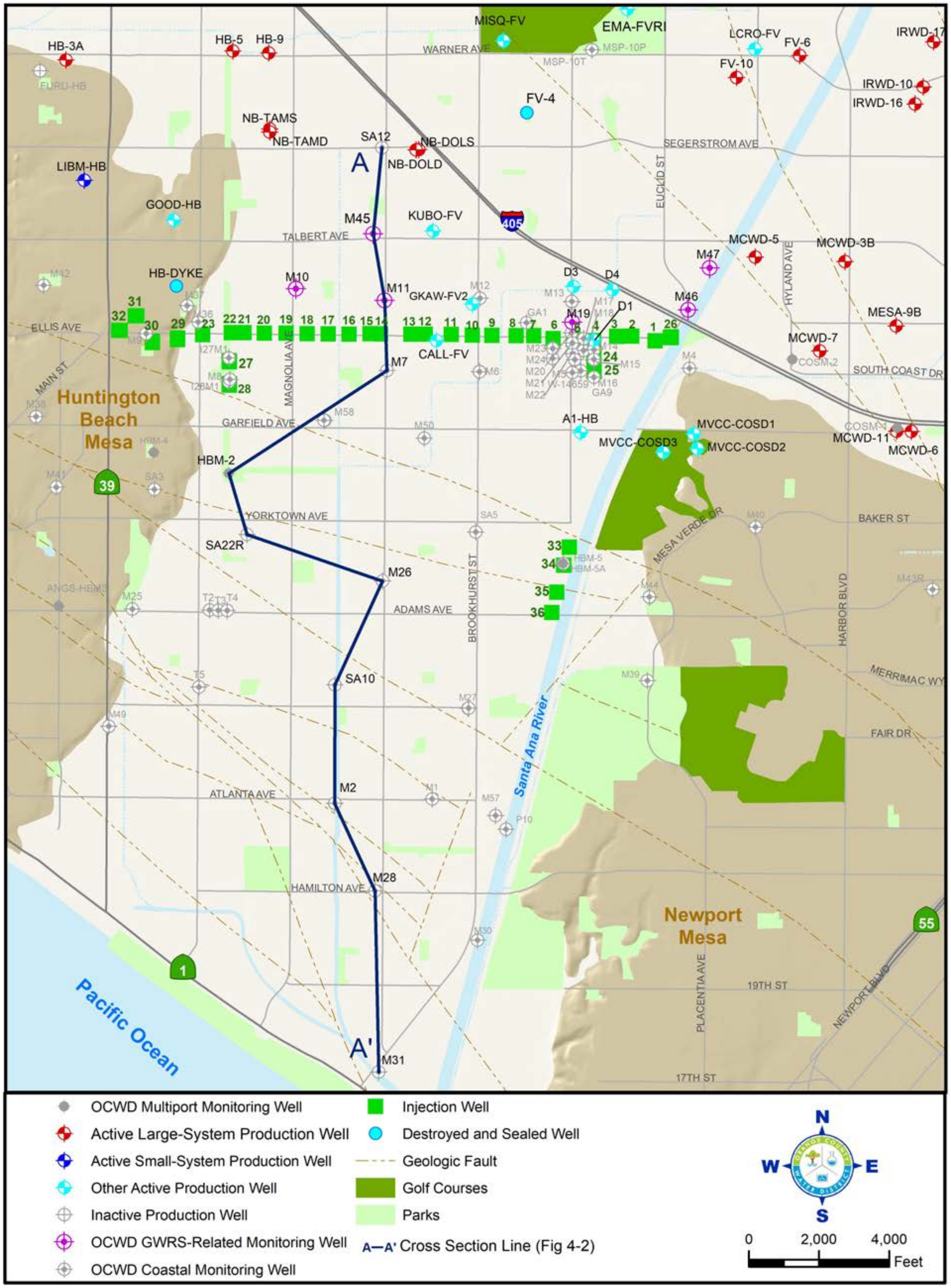


Figure 4-1. Talbert Gap Study Area and Well Location Map

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).

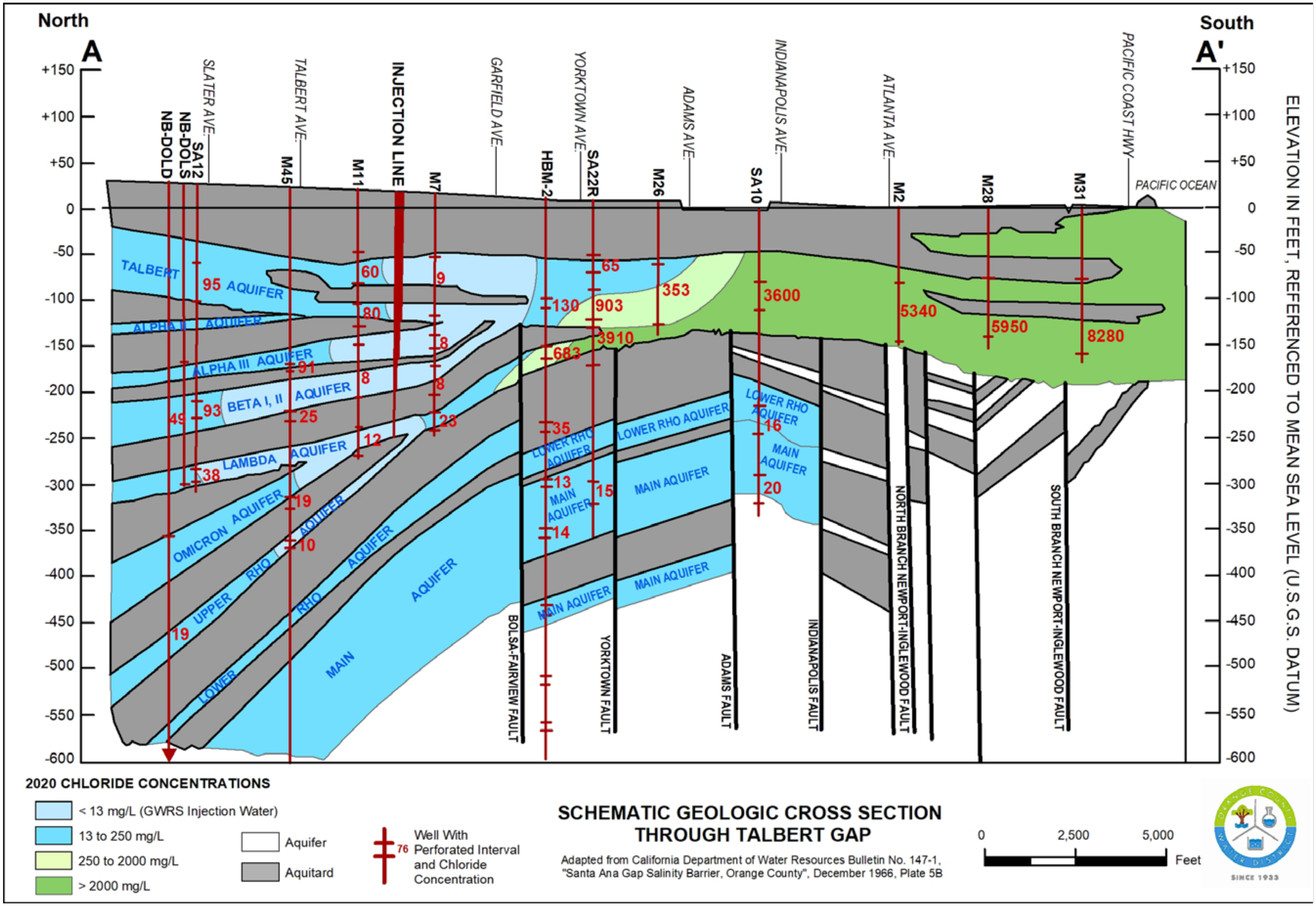


Figure 4-2. Schematic Geological Cross Section Through Talbert Gap

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 2020. 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 2020, 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 flow path.

Table 4-1. Monitoring Wells at the Talbert Barrier

OCWD Well Name	*Date Completed*	*Closest Injection Well* [1]	*Approximate Distance and Direction from Barrier*	*Closest 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, 2020 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 4 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 2 to 3 feet above mean sea level, indicating little or no inland migration of seawater during the June 2020 time frame.

The Shallow aquifer groundwater elevations shown on Figure 4-3 for June 2020 were very similar to the prior year for June 2019, due to similar barrier injection and relatively high coastal groundwater conditions.

During both 2019 and 2020, 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 zones, as was evidenced 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, 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 also shows groundwater flow directions inferred from the groundwater elevation contours for the shallow Talbert and Alpha aquifers for June 2020. The inferred groundwater

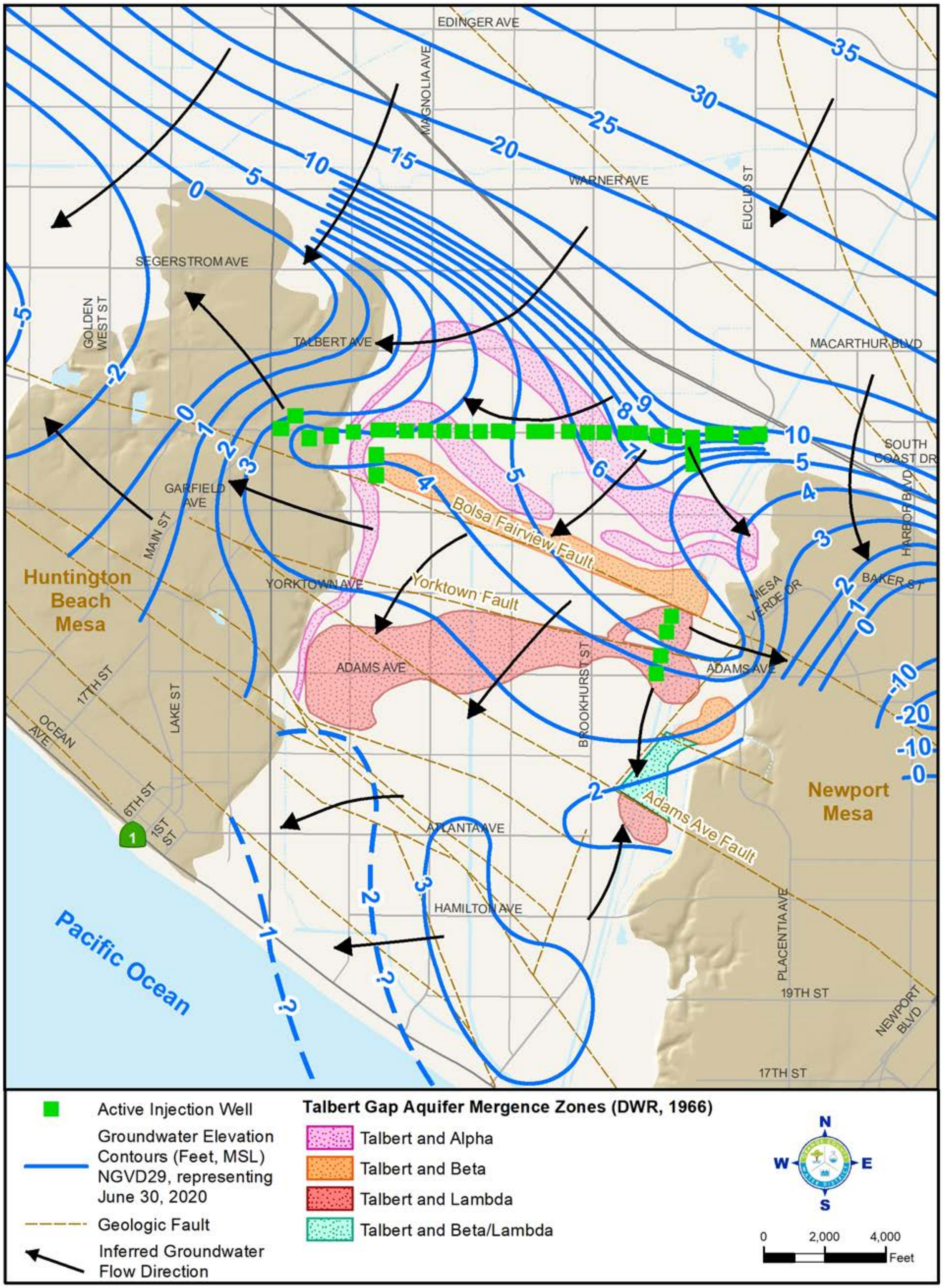


Figure 4-3. Shallow Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area During 2020

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.

In the Huntington Beach Mesa area to the west of the barrier, the Alpha aquifer groundwater flow direction in June 2020 was also west/northwest, indicating a flow path from the Talbert aquifer within the Talbert Gap migrating westerly into the Alpha aquifer via the Talbert/Alpha mergence zone along the eastern margin of the Huntington Beach Mesa (Figure 4-3). As shown on Figure 4-3, the westerly flow pattern beneath the Huntington Beach Mesa was due to lower groundwater elevations of approximately 5 feet below mean sea level in the Bolsa Gap area to the west of the Huntington Beach Mesa. Although not shown on Figure 4-3, the Bolsa Gap also has mergence zones like those in the Talbert Gap where groundwater from the Shallow aquifer can drain down into the Alpha, Beta, and Lambda aquifers, thus causing somewhat lower groundwater levels in that area.

The inferred flow directions shown on Figure 4-3 for the Shallow aquifer during June 2020 were very similar to those the prior year during June 2019 and are representative of normal barrier operating conditions. During June 2014 when the barrier was off-line for approximately one month, the groundwater flow direction in the Huntington Beach Mesa area reversed to eastward from the mesa towards Talbert Gap because of the very low Talbert aquifer groundwater levels in Talbert Gap as was shown in Figure 4-3 of the 2014 Annual Report (DDB Engineering, Inc., 2015). This implies that during periods of no barrier injection, the dominant flow pattern is from the Huntington Beach Mesa towards the Talbert Gap mergence zones. On Figure 4-3, the Shallow (Alpha) aquifer groundwater elevation contours in the southern end of the Huntington Beach Mesa terminate into the North Branch of the Newport-Inglewood Fault system, which is thought to act as an impermeable barrier to flow in the Alpha aquifer on the Huntington Beach Mesa.

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 2020, 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 2020 condition represents just enough 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 13 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 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.

During 2020, Figure 4-4 shows that groundwater elevations at M26 started the year just above 4 ft msl and remained relatively stable at or above protective elevations ranging from approximately 3 to 5 ft msl throughout the year, except for two brief periods in late April/early

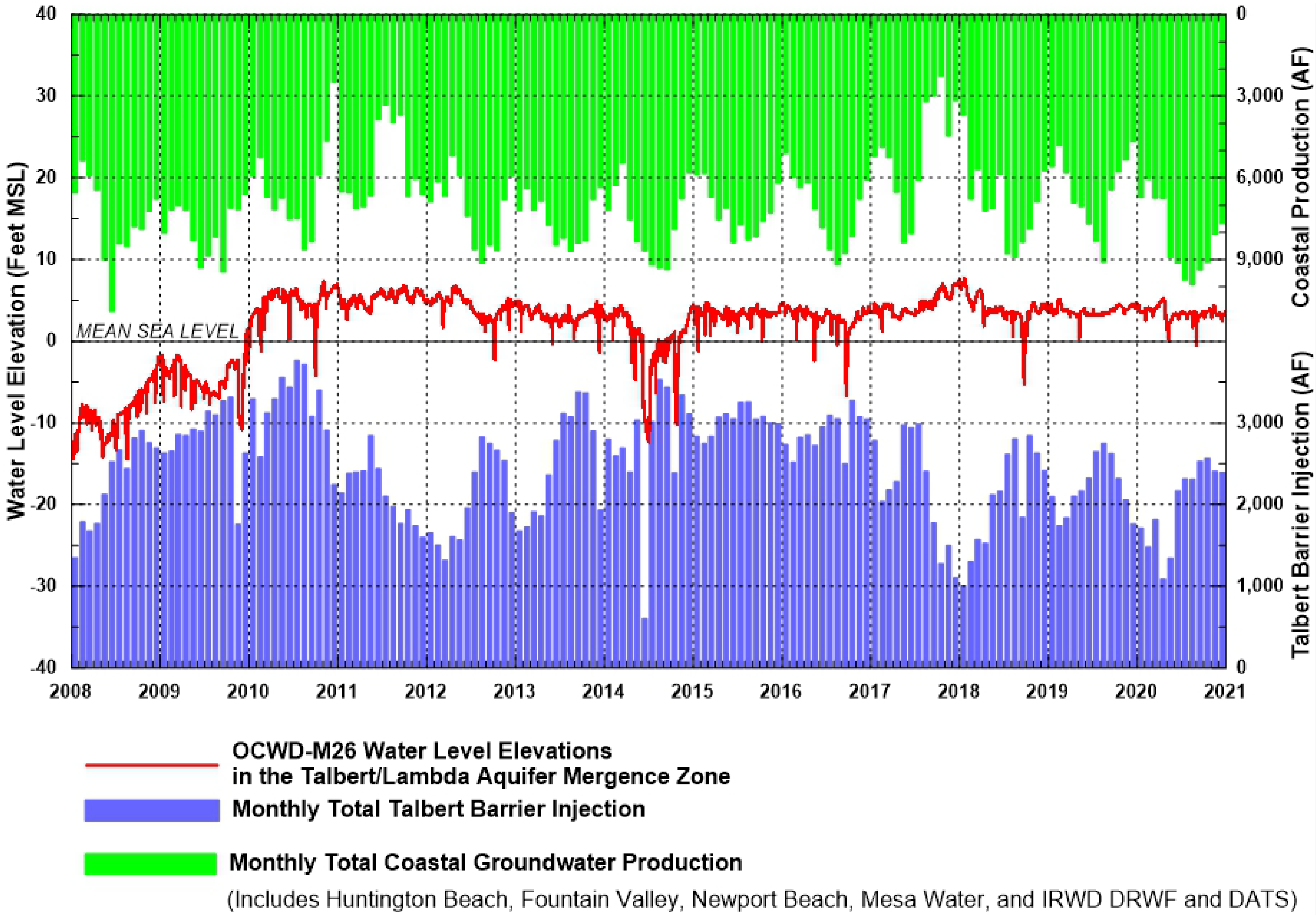


Figure 4-4. Talbert Barrier Injection, Coastal Production, and M26 Groundwater Levels

May and again at the end of August in which M26 groundwater elevations dropped to just barely below mean sea level due to AWPF shutdowns related to GWRSFE construction activities. Although the 17-day barrier shutdown from April 25 to May 11 was much longer than the two-day shutdown at the end of August, the brief August shutdown led to a slightly lower groundwater elevation at M26 due to its occurrence during the peak pumping season. As shown in Figure 4-4, groundwater levels rose rapidly back up to protective elevations once the barrier went back on-line after these two brief shutdowns.

As was discussed in Section 3 and shown in Figure 4-4, barrier injection was increased during the late spring and early summer months to keep pace with increased coastal pumping while maintaining relatively stable protective elevations at M26. Optimally, groundwater elevations at M26 are maintained between 3 and 6 ft msl for seawater intrusion control while avoiding shallow groundwater issues in low lying areas.

Operationally, whenever groundwater elevations at M26 rise above 6 ft msl, barrier injection is reduced at strategic locations to prevent additional groundwater elevation increases. Conversely, when groundwater elevations at M26 drop below 3 ft msl (protective elevation), then barrier injection is increased until groundwater elevations again stabilize within the desired 3 to 6 ft msl range at key well M26. When groundwater levels drop below mean sea level at M26, like after prolonged barrier shutdowns as occurred in June 2014 and to a lesser extent briefly in April/May 2020 and August 2020, subsequent barrier injection is then maximized and prioritized into the shallow and intermediate aquifer zones susceptible to seawater intrusion to quickly raise groundwater levels back up to protective elevations at M26.

As shown on Figure 4-4, coastal groundwater production during 2020 was typically low during the winter/spring months from January through April, unusually high during the summer months, and gradually declining but still unusually high during the late fall months from October through December, based on seasonal water demands as the 2020 summer and fall months were notably hot and dry. Coastal production totaled 98,253 AF during 2020 (includes Huntington Beach, Fountain Valley, IRWD well field in Santa Ana, Mesa Water, and Newport Beach), representing a significant increase of 27% from the prior year primarily because of increased summer and fall water demands relative to the prior wetter year.

Figure 4-4 shows that barrier injection was relatively low during the first four months of the year, but the April and May injection totals were anomalously low due to the 17-day barrier shutdown from April 25 to May 11. Barrier injection was significantly increased in June and was kept high throughout the summer and early fall to keep pace with increased coastal production during those months, with barrier injection peaking over 2,500 AF for September and October (daily average of 27.5 MGD in September). Barrier injection remained unusually high from October through December since coastal production remained unusually high for that time of year due to relatively warm and dry weather.

The annual barrier injection of 24,155 AF for 2020 was nearly 9% less than the prior year and represented the lowest annual injection since GWRS came on-line in 2008. The low amount of injection required to maintain protective elevations during 2020 despite the large amount of coastal pumping that year was primarily due to relatively high Basin storage conditions which increased by 36,000 AF from June 2019 to June 2020 and secondarily due to commencement of the Mid-Basin Injection (MBI) Project in March 2020 approximately 2.5 miles north of the Talbert Barrier. During low injection periods, the surplus AWPF flows were sent to the MBI Project in Santa Ana and the Forebay spreading basins in Anaheim.

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, 2020 during a typical on-line barrier condition. The June 2020 Lambda inferred flow directions shown on Figure 4-5 are very similar to those for June 2019 presented in the prior year's Annual Report.

The June 2020 Lambda groundwater elevations in Figure 4-5 are very similar to those from the prior June, except for the inland northeastern portion of the study area near the MBI Project in Santa Ana just north of the IRWD Dyer Road Well Field (DRWF) and in the northeast portion of Fountain Valley where it was approximately 10 to 20 ft higher than the prior year. The higher groundwater elevations in this area were likely caused by increased groundwater storage conditions throughout the Basin from June 2019 to June 2020 as well as MBI injection which commenced in March 2020.

Groundwater levels in the Lambda aquifer near the Talbert Barrier and in the mergence zones seaward of the barrier during June 2020 (Figure 4-5) were nearly the same as in June 2019, due to similar barrier injection and higher Basin storage conditions being locally offset by increased coastal production.

Revised geologic interpretations of the aquifer stratigraphy completed by OCWD Hydrogeology staff in 2018 were used to determine which wells were screened in the Lambda aquifer for constructing the June 2020 Lambda groundwater elevation contour maps, as was done previously for the June 2017, 2018, and 2019 contour maps. The revised geologic interpretations primarily focused on the Bolsa-Sunset Gap area for groundwater modeling work but were extrapolated westward to the area inland of the Talbert Barrier. The geologic interpretations indicate the Lambda aquifer is penetrated by the upper portion of the screened intervals at the IRWD DRWF wells, whose groundwater elevations were thus interpreted for constructing the Lambda aquifer groundwater contours in that area for Figure 4-5.

When the barrier is on-line as in June 2020, there is typically a localized mound of raised groundwater elevations in the Lambda aquifer, albeit below sea level, in the central portion of

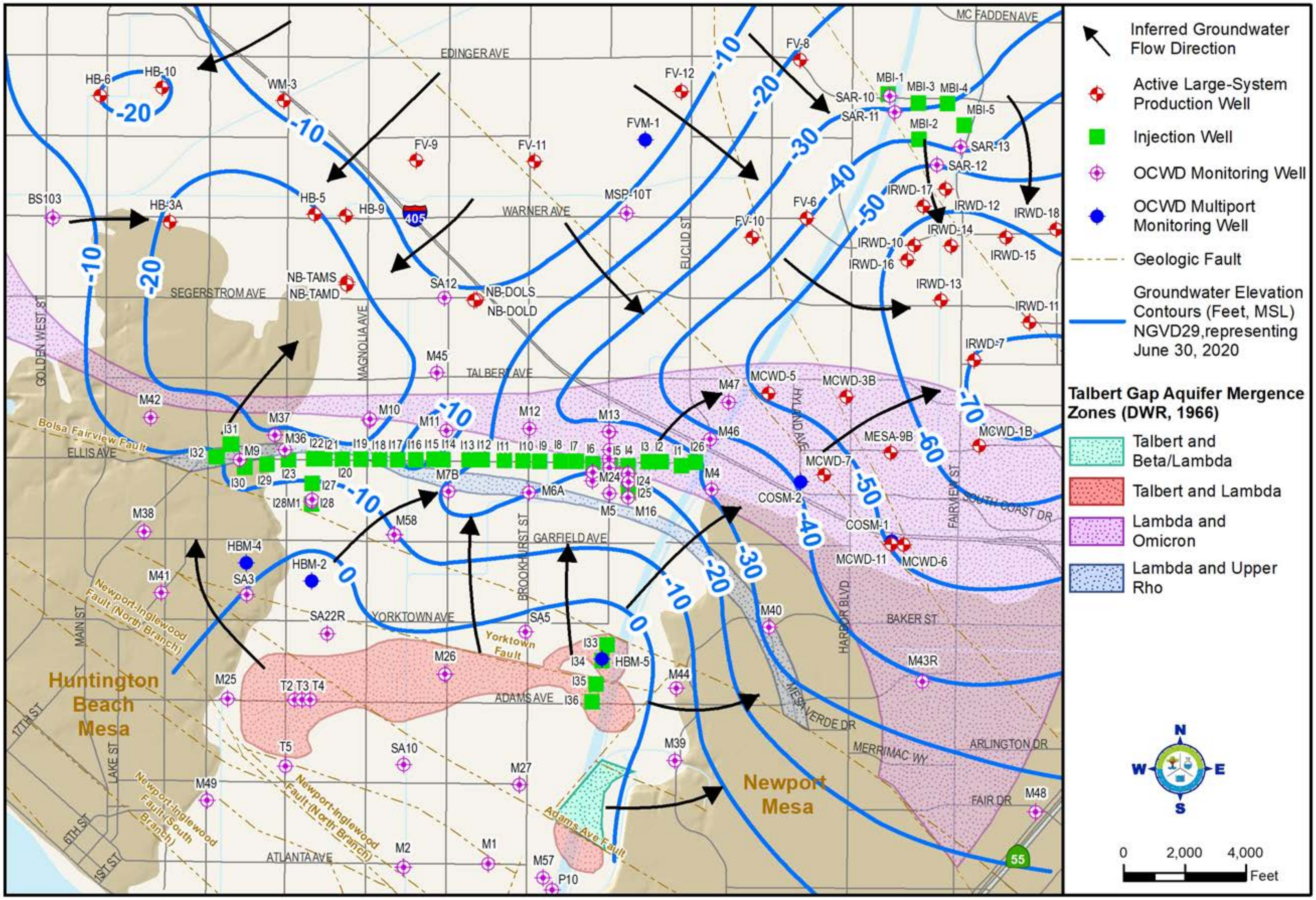


Figure 4-5. Lambda Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area

the Ellis Avenue barrier alignment. The lack of a more pronounced injection mound along Ellis Avenue is likely due to: (1) the limited amount of injection into the legacy well Lambda zones along Ellis Avenue (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 that tap from 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.

Figure 4-5 shows that Lambda aquifer groundwater elevations in 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 -50 to -70 ft msl near the Mesa Water production wells and IRWD DRWF at the end of June 2020. Lambda groundwater elevations were approximately -10 to -20 ft msl to the north/northwest of the Talbert Barrier near Huntington Beach and Newport Beach production wells at the end of June 2020, as groundwater pumping is 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 deeper Principal aquifer system for June 30, 2020. 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 be referred to herein more specifically as Main aquifer groundwater elevations. The Main aquifer typically has the lowest groundwater elevations in the area.

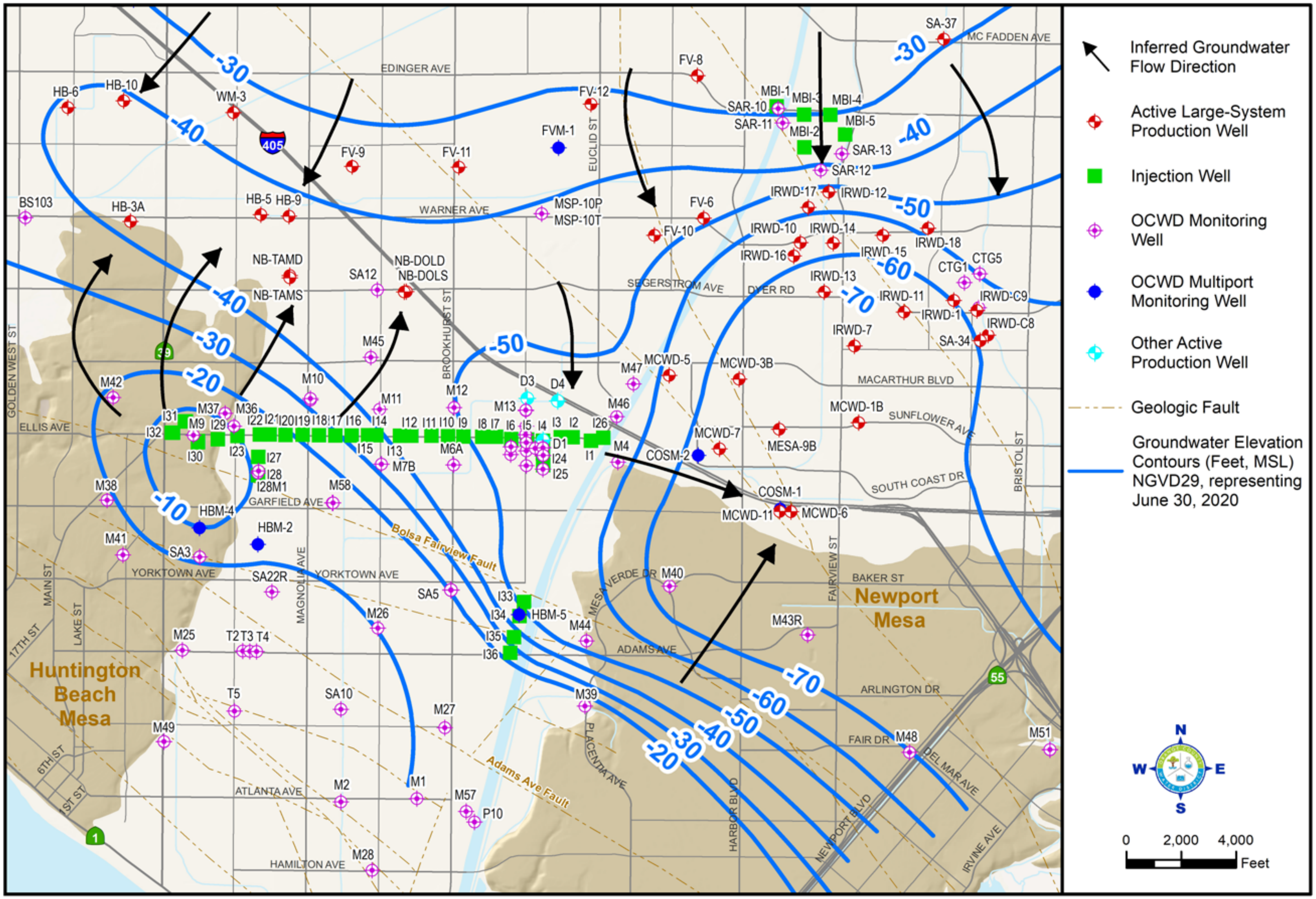


Figure 4-6. Principal (Main) Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the Talbert Gap Area

The June 2020 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. However, the northern extent of this pumping depression was shifted farther south than in previous years, only encompassing the southerly portion of the IRWD DRWF and likely caused by the rise in Main aquifer groundwater elevations from the MBI Project in Santa Ana which commenced March 2020. June 2020 Main aquifer groundwater elevations were approximately the same as in June 2019 in the Mesa Water area (-70 ft msl) but were more than 30 feet higher than June 2019 in the northern portion of the IRWD DRWF near the MBI Project in Santa Ana.

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, with June 2020 Main aquifer groundwater elevations at approximately -40 ft msl (Figure 4-6) and similar to June 2019.

Figure 4-6 shows a localized mound of raised Main aquifer groundwater elevations at approximately -10 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 2020. These June 2020 Main aquifer groundwater elevations were approximately the same as in June 2019 due to similarly sustained injection from the west-end deep injection wells throughout both 2019 and 2020, and although coastal production was greater in 2020 than in 2019, groundwater storage conditions throughout the Basin were higher in 2020. As shown in Figure 4-6, the inferred groundwater flow direction from the west-end of the barrier is 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 during 2020 for maintenance reasons. 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 barrier to inland groundwater flow in the Main aquifer. All eight Main aquifer injection wells (I24/2, I26C, I27C, I28C, I29C, I30C, I31C, and I32C) were constructed and are primarily used for Basin replenishment. Due to the pumping-induced inland gradient in most years, no Main aquifer injection water is expected to be lost to the ocean, especially considering the barrier effect of the Newport-Inglewood Fault Zone.

4.3.4 Compliance Monitoring Well Trends

Groundwater level hydrographs for the 10-year period 2011-2020 for well sites M10, M11, M19, M45, M46, and M47 are shown on Figure 4-7 through Figure 4-12, respectively. These figures also show chloride 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 2020 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 2020 were very similar to their 2019 seasonal counterparts, as increased groundwater storage conditions throughout the Basin in 2020 were locally offset by increased coastal pumping, while barrier injection volume in 2020 was only slightly less than 2019. Groundwater level trends in all barrier compliance monitoring wells in 2020 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 somewhat 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.

During the first quarter of 2020, groundwater levels in all barrier compliance wells remained relatively high and stable, except for a small decline of 5 to 10 feet in the intermediate aquifer zones at M45 and 5 to 10 feet in the deeper Lower Rho and Main aquifer zones.

During the second quarter of 2020, groundwater levels in the compliance wells experienced a negligibly small decline of less than 5 feet in the shallow Talbert and Alpha aquifers and a slightly larger decline in the intermediate and deeper zones of 5 to 15 feet, which is somewhat less than usual for that time of year as coastal pumping increases. Groundwater levels in some of the compliance wells closest to the barrier dropped temporarily in response to the 17-day barrier shutdown from April 25 to May 11, but then quickly recovered.

During the third quarter of 2020, groundwater levels at the compliance wells either remained stable or declined slightly by only 5 to 10 feet. The summertime low occurred in mid-September, as is typical, and was similar in magnitude to the summertime low the prior year. The seasonal amplitude from the winter high to the summertime low in September was only 5 to 10 feet in

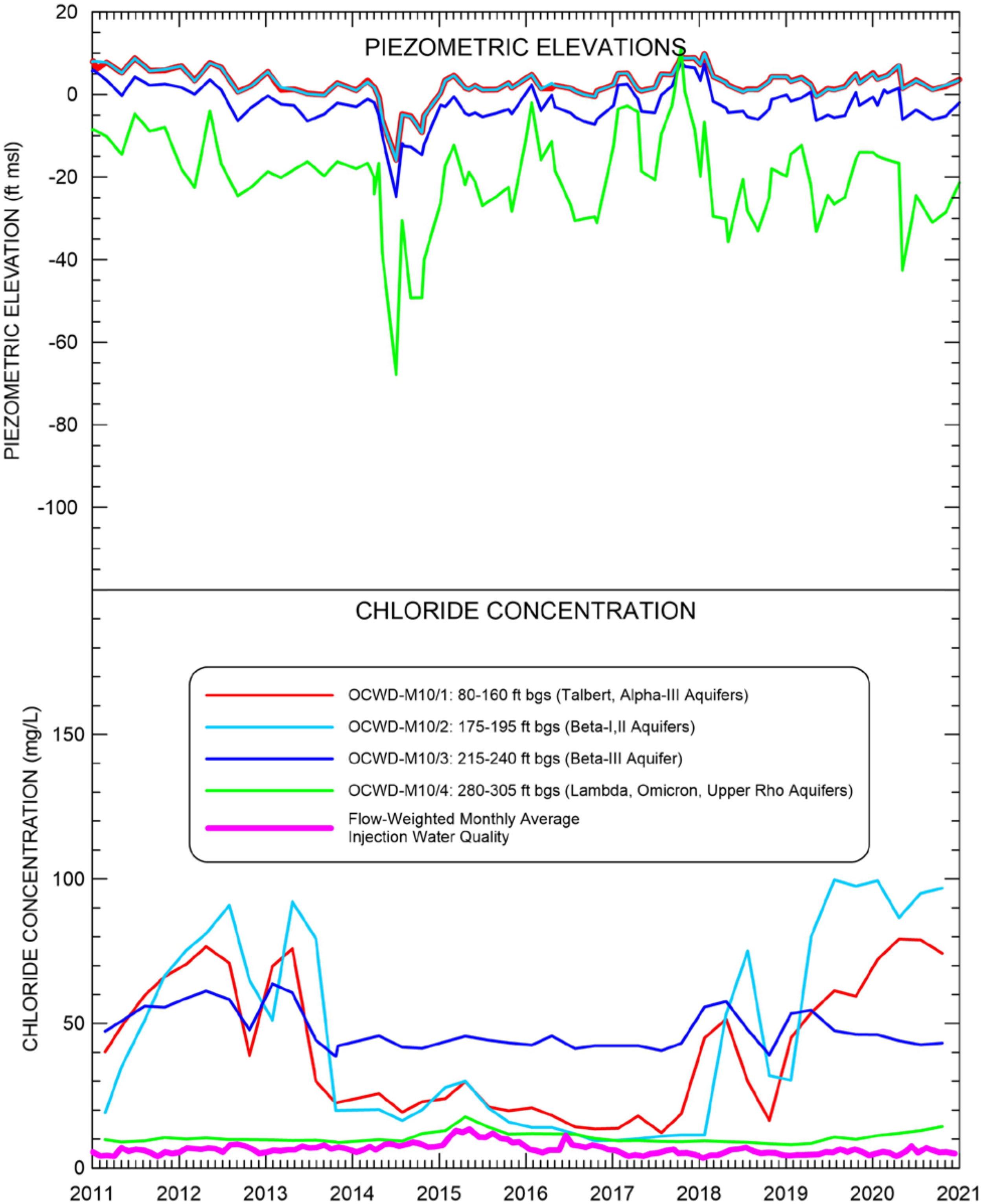


Figure 4-7. Monitoring Well OCWD-M10 Piezometric Elevations and Chloride Concentration

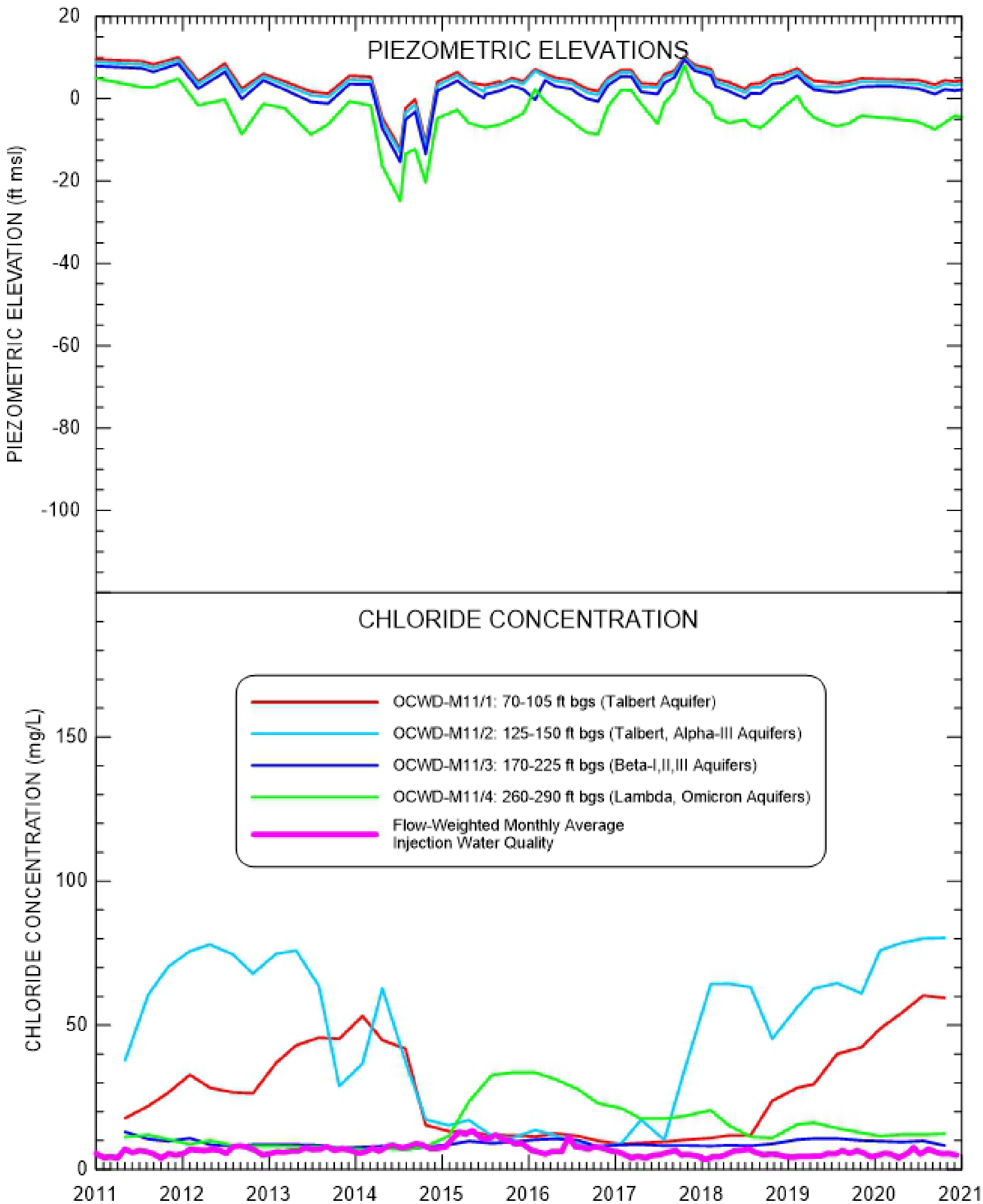


Figure 4-8. Monitoring Well OCWD-M11 Piezometric Elevations and Chloride Concentration

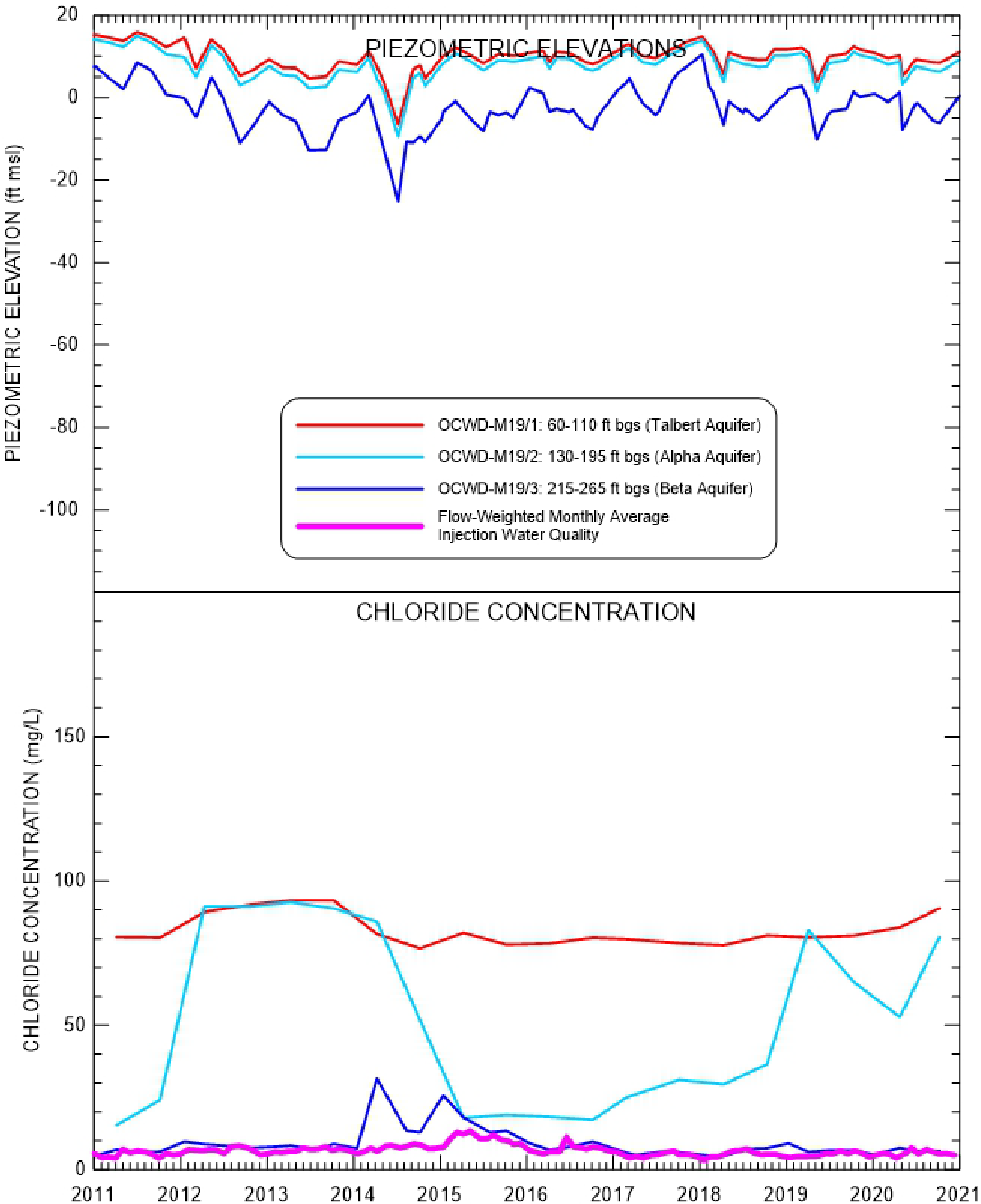


Figure 4-9. Monitoring Well OCWD-M19 Piezometric Elevations and Chloride Concentration

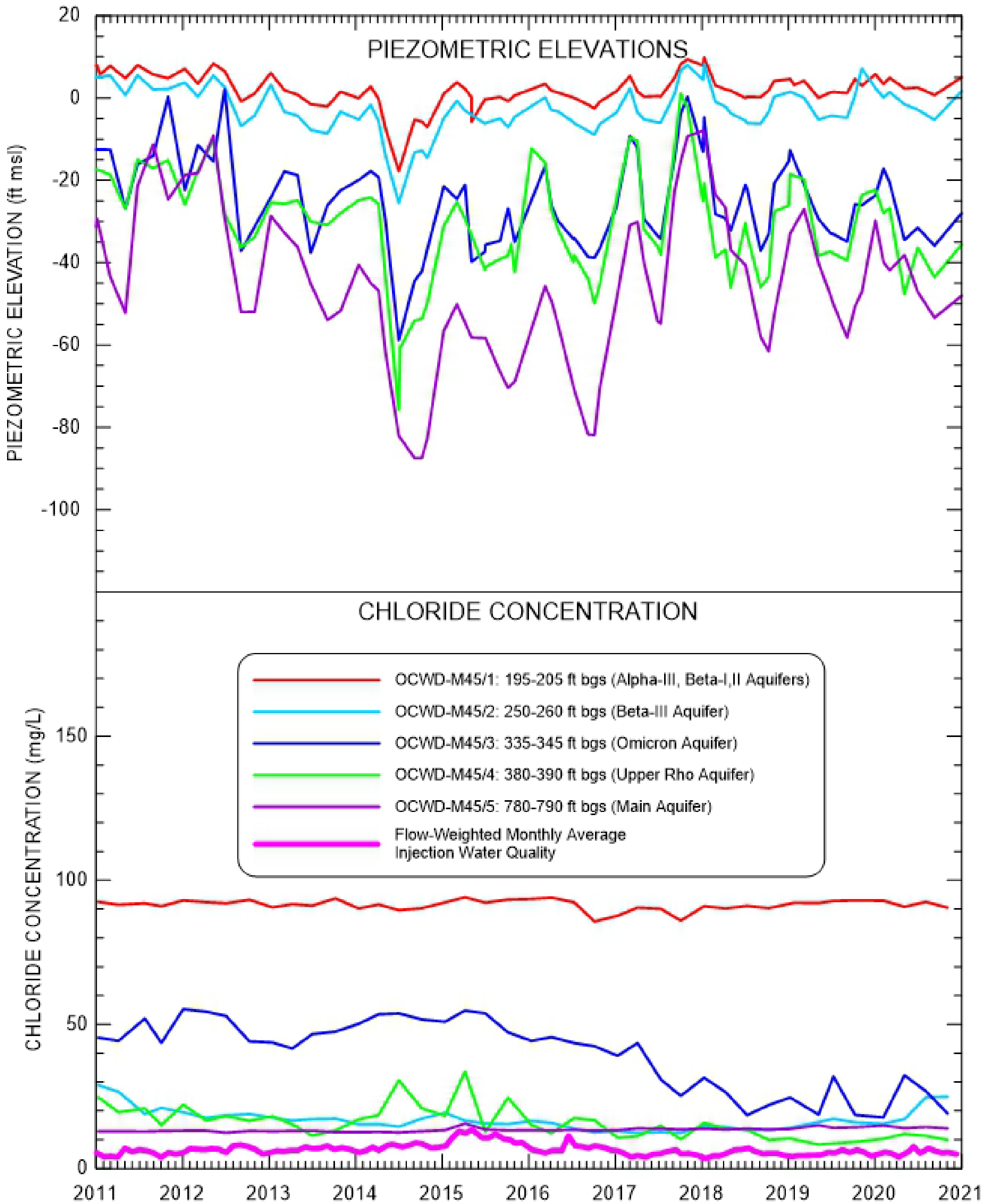


Figure 4-10. Monitoring Well OCWD-M45 Piezometric Elevations and Chloride Concentration

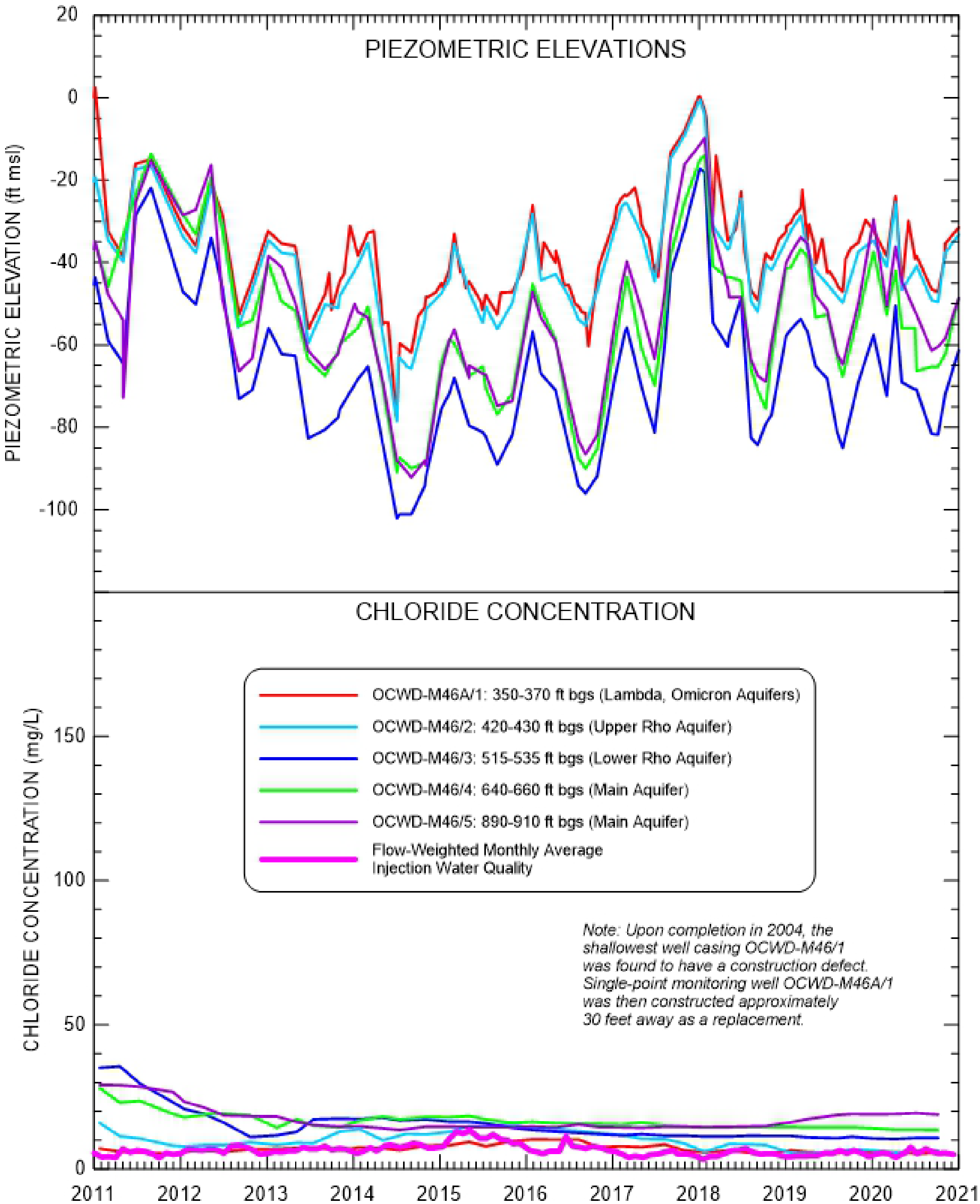


Figure 4-11. Monitoring Well OCWD-M46 and -M46A Piezometric Elevations and Chloride Concentration

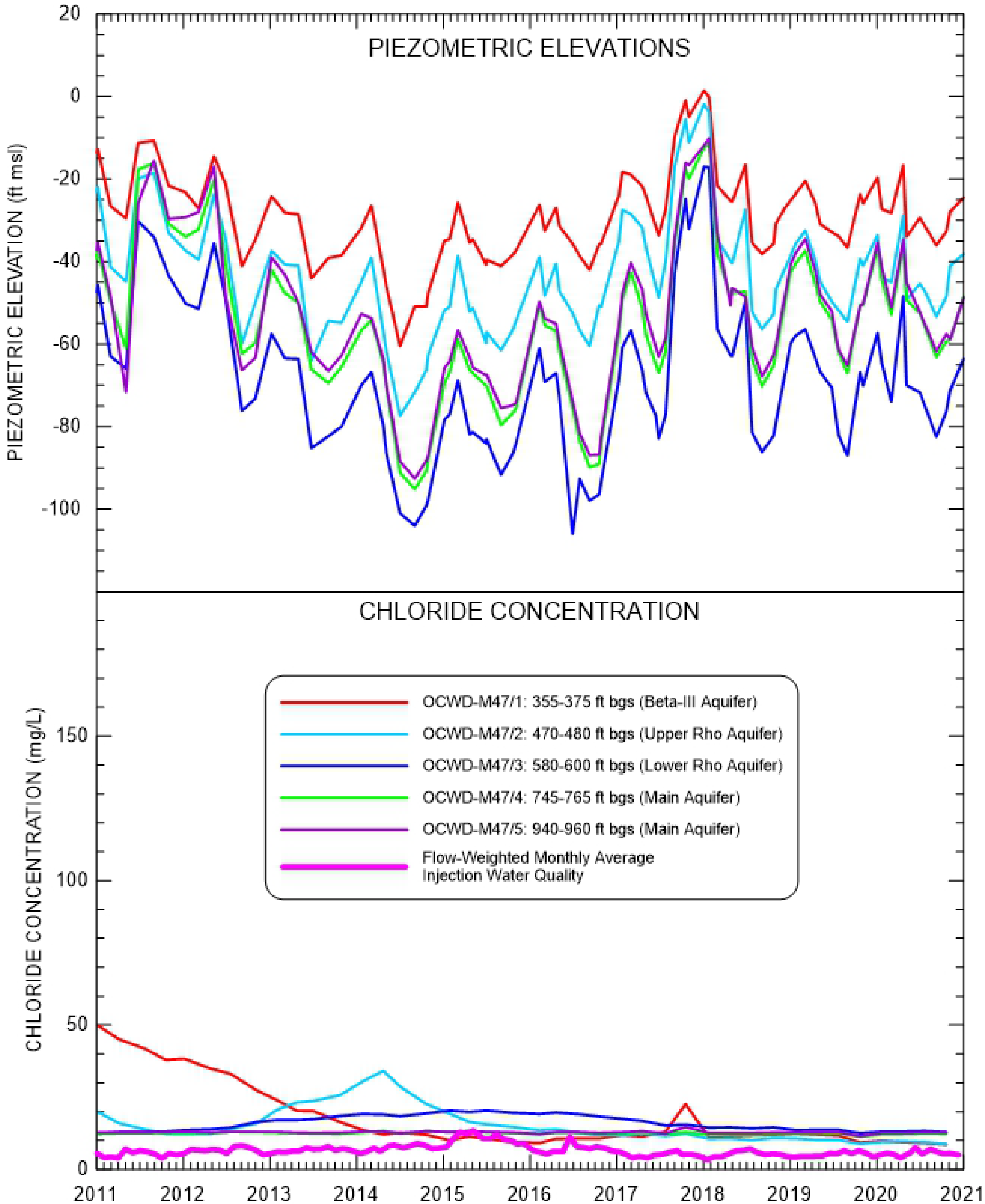


Figure 4-12. Monitoring Well OCWD-M47 Piezometric Elevations and Chloride Concentration

the shallow Talbert and Alpha aquifers as well as in the intermediate depth Beta aquifer, approximately 15 to 25 feet in the other intermediate depth aquifers, and 20 to 30 feet in the deeper aquifers. Overall, these seasonal amplitudes were somewhat less than most years, likely resulting from the continued high Basin storage conditions.

During the fourth quarter of 2020, groundwater levels in the compliance wells rose slightly less than most years due to a less than typical decrease in coastal pumping during those months. The rise was less than 5 ft in the shallow aquifers and 5 to 15 ft in the intermediate and deeper aquifer zones. Compared to the beginning of the year, groundwater levels at the compliance wells ended the year less than 5 feet lower in the shallow aquifer zones, 5 to 10 feet lower in the intermediate depth aquifer zones, and 15 to 20 feet lower in the deeper aquifer zones.

Groundwater elevation hydrographs for compliance monitoring wells M46 and M47 (Figure 4-11 and Figure 4-12, respectively) on the east end of the barrier show the largest summertime declines within the deeper Lower Rho and Main aquifers, declining more than 100 feet below mean sea level during the summers of 2014 and 2016 due to lower Basin conditions stemming from extended drought conditions during those years. During 2020, groundwater elevations in the Lower Rho and Main aquifers declined to a low ranging from approximately 60 to 80 feet below mean sea level in September, approximately 5 feet higher than the prior year's summertime low. Lower Rho and Main aquifer groundwater elevations at M46 and M47 ended the year approximately 5 to 15 feet lower than at the beginning of the year and are primarily influenced by nearby coastal pumping and Basin groundwater storage conditions rather than by barrier injection since the bulk of Main aquifer deep injection occurs on the west end of the barrier.

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 2020 are presented in Appendix G for the Talbert Barrier monitoring wells. General groundwater quality data for the past five years (2016-20) 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 2020, groundwater quality at the compliance monitoring wells complied with all Federal and State Primary Drinking Water Standards. During the fourth quarter of 2018, arsenic was detected slightly above the Primary Maximum Contaminant Level (MCL) at barrier compliance monitoring well M47/1 (10.2 μg/L) but decreased below the MCL shortly thereafter and continued to gradually decrease down to 6.0 μg/L by the fourth quarter of 2020. During 2012 and the first quarter of 2013, arsenic was similarly detected slightly above the MCL at barrier compliance monitoring well M11/4 but steadily declined below the MCL thereafter down to background levels and remained low during 2020. A few other compliance wells have shown small increases in arsenic that appear to be related to the injection of GWRS water, but their concentrations remain well below the MCL. Section 6.4.2 discusses arsenic mobilization resulting from recharge with GWRS purified recycled water at the Anaheim Forebay spreading grounds, as well as OCWD's related studies with Stanford University and recommendations from the NWRI GWRS Independent Advisory Panel.

Some analyses revealed constituents above the EPA Secondary MCL in 2020 (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 2020. A permit requirement for total coliform monitoring at GWRS groundwater compliance monitoring wells was rescinded by the RWQCB in February 2018 (RWQCB, 2018) after review of the historical dataset indicated relatively few total coliform detections have occurred since the initiation of the monitoring program. Those total coliform detections that did occur in the GWRS Talbert Barrier compliance monitoring wells could be traced back to the infiltration of surface water runoff into well vaults, improper well casing welds, or simply random detections due to the sensitivity of the microbial assay, rather than being associated with the injection of GWRS recycled water; 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

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 to 11 mg/L since 2008 and more recently ranging from 5 to 7 mg/L over the last five years, which is considerably lower than older pre-GWRS 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 is typically in the range of older pre-GWRS injection water in the shallow zones, less than pre-GWRS injection water but noticeably greater than GWRS water in the intermediate depth zones, and finally just slightly greater than GWRS water in the deep zones.

Observed chloride concentrations for barrier monitoring wells M10, M11, M19, M45, M46, and M47 are shown on the lower graph of Figure 4-7 through Figure 4-12 for the 10-year period 2011-2020, respectively. For illustrative purposes, these graphs have been kept to a running 10-year history for each successive Annual Report. For comparison, all 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) 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, especially for wells with a discernable travel time of less than three years located relatively close to and downgradient from the barrier.

At M10/1 (Talbert and Alpha 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 at M10/2 as compared to M10/1, likely related to a slightly deeper, slower flow path at M10/2. Chloride concentrations rose sharply at both M10/1 and M10/2 in 2019 and remained high during 2020, except for a small temporary decrease at M10/2 in the second quarter of 2020. The fourth quarter chloride concentration was 74 mg/L at M10/1 and 97 mg/L at M10/2. For both M10/1 and M10/2, the sustained higher chloride concentrations during 2019-20 were very similar to what occurred in 2012-13 and slightly larger than occurred in 2018, all such events resulting from high groundwater conditions causing a temporary shift in the gradient direction or a complete gradient reversal from landward to seaward in which older pre-GWRS injection water inland of M10/1 and M10/2 migrated back to these wells; this gradient reversal phenomenon has previously been observed during other high groundwater periods at other nearby monitoring wells and is also discussed in Section 4.4.3 with regards to temporary increases in 1,4-dioxane.

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. From 2014-2017, chloride concentrations at M10/3 have remained somewhat high and stable at approximately 40 mg/L, likely indicating a much smaller percentage of GWRS water. Contemporaneous with the chloride increase at M10/1, chloride concentrations at M10/3 experienced a short-term subtle rise in late 2017/early 2018 and again in late 2018/early 2019, indicating two short-lived gradient reversals similar to M10/1 but more dampened. Since the second quarter of 2019, chloride concentrations in M10/3 have gradually declined from 55 mg/L down to 43 mg/L by the fourth quarter of 2020, likely indicating the return of an inland gradient, albeit relatively flat, in the Beta aquifer at this location.

At M10/4 (Lambda, Omicron, and Upper Rho aquifers), a travel time of approximately 10 to 12 months was estimated for GWRS injection water to reach M10/4 based on the first arrival of the low-chloride GWRS signal at M10/4 during the last quarter of 2008, as shown in Figure 4-7 of pre-2018 Annual Reports. Since 2010, chloride concentrations at M10/4 have mostly remained stable and low near GWRS levels, indicating a prolonged predominance of GWRS purified recycled water at this well due to a consistently landward gradient in these aquifers. During 2019 and 2020, chloride concentrations at M10/4 experienced a subtle gradual increase but remained relatively low at 14 mg/L by the fourth quarter of 2020 (Figure 4-7), 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 two years because of high Basin conditions.

At monitoring well site M11, arrival of GWRS water has occurred at various times in all four zones, with arrival being the fastest at M11/3 (Beta aquifer) with a previously estimated travel time from the barrier of approximately 10 months. Since this well is 1,000 feet north of the barrier, this would imply an average groundwater velocity of approximately 3 feet/day, which is consistent with groundwater velocity estimates for other flow paths emanating from the barrier. During 2020, chloride concentrations at M11/3 remained low and stable at 10 mg/L during the first three quarters and dipped slightly to 8 mg/L in the fourth quarter (Figure 4-8), indicating nearly 100% GWRS purified recycled water at this well and indicating that the gradient remained predominantly landward in the Beta aquifer at this location.

At M11/4 (Lambda aquifer), chloride concentrations shown on Figure 4-8 indicate that arrival was slowest in this zone, with an estimated travel time from the barrier of approximately 3 years. Possible reasons for the relatively long observed travel time may include: lower permeability in the Lambda aquifer near M11 as compared to the Beta aquifer, little or no injection into the Lambda aquifer legacy injection wells nearest M11, or the injection water flow path to M11 is originating from more distant injection wells. Another complicating factor is that the Lambda-Upper Rho mergence zone is located immediately south of the barrier in this vicinity and could be locally influencing the injection water flow pattern. During 2020, chloride concentrations at M11/4 remained low and stable at approximately 12 mg/L, indicating a continued landward gradient and a predominance of GWRS water at this well.

At M11/1 (Talbert aquifer) and M11/2 (Talbert and Alpha aquifers), Figure 4-8 shows that chloride concentrations increased in both wells during 2019 and 2020, peaking in the fourth quarter of 2020 to 60 mg/L at M11/1 and 80 mg/L at M11/2. At both wells, the sustained chloride concentration increases likely indicated a seaward gradient reversal from late 2018 through 2020 in the Talbert and Alpha aquifers at this location. Inspection of Figure 4-3 shows that the June 2020 inferred groundwater flow direction in the Talbert aquifer near M11 was to the southwest, thus confirming the seaward gradient during this time.

At M19/3 (Beta aquifer), first arrival of the low-chloride GWRS signal in March/April 2008 indicated a three-month travel time to that well from the nearest injection well I5. Given a distance of 500 feet from I5 to M19/3, the three-month travel time represented an average groundwater velocity of over 5 feet/day in this vicinity of the barrier in the Beta aquifer. Figure 4-9 shows that chloride concentrations at M19/3 experienced a temporary increase from low GWRS levels in early 2014 and early 2015, indicating seaward gradient reversal events, before eventually reverting to a landward gradient that has persisted since 2017, with chloride concentrations at M19/3 remaining below 10 mg/L through 2020, indicating 100% GWRS water.

At M19/2 (Alpha aquifer), chloride concentrations also suggest gradient reversals (Figure 4-9). From 2014 through 2016, chloride concentrations declined below 20 mg/L at M19/2, suggesting a landward gradient with predominantly GWRS water at this well due to lower groundwater levels resulting from extended drought conditions during that time. As shown in Figure 4-9, chloride concentrations at M19/2 increased during 2017-18 and reached a peak of 83 mg/L in the second quarter of 2019, again indicating a seaward gradient reversal and higher percentage of pre-GWRS injection water arriving at this well in the Alpha aquifer because of higher groundwater conditions over the last two to three years. Chloride concentrations at M19/2 decreased somewhat during the second half of 2019 and early 2020 before rising again to 81 mg/L in the fourth quarter of 2020, likely indicating a brief landward shift in the gradient before reverting to a more dominant seaward gradient.

At M19/1 (Talbert aquifer), chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L (Figure 4-9), significantly higher than GWRS water and 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.

The results from barrier compliance monitoring well sites M45, M46, and M47 were also consistent with OCWD's hydrogeological understanding of the area. Chloride concentration trends in many of these monitoring well zones also showed the influence of injection water, albeit in a somewhat slower and more dispersive fashion in some of the deeper zones.

At M45/1 (Alpha-III and Beta-I,II aquifers), Figure 4-10 shows that chloride concentrations have remained stable at historical background levels of approximately 80 to 100 mg/L, significantly higher than GWRS water and thus indicating that no GWRS water has reached M45/1, consistent with the observed seaward gradient at this location in the Alpha aquifer.

At M45/2 (Beta-III aquifer) and M45/4 (Upper Rho aquifer), chloride concentrations had already declined down to relatively low levels by 2011 and Figure 4-10 shows that they continued a mild gradual decline and then largely stabilized at relatively low levels since 2017, indicating the sustained arrival of some percentage of GWRS water in these two zones but reliable travel time estimates were not discernable due to the dampened trends. During 2020, chloride concentrations remained low at just over 10 mg/L at M45/4 but increased slightly at M45/2 during the third quarter to approximately 25 mg/L, likely indicating a slight gradient reversal at M45/2 in the Beta aquifer due to the relatively high Basin conditions.

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 19 mg/L in the fourth quarter of 2019. During 2020, chloride concentrations at M45/3 slightly increased in the second quarter before decreasing back down to 19 mg/L in the fourth quarter. These lower chloride concentrations since the beginning of 2017 likely indicate some proportion of GWRS water arriving at this well in the Omicron aquifer.

In the intermediate depth aquifers (Beta-III, Lambda, Omicron, and Upper Rho) landward of the Talbert Barrier near monitoring well site M45 (and also M11) exists a seasonally variable east-west groundwater flow divide 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 2020 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.

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.

At M46A/1 (Lambda aquifer), the decline in chloride concentrations during the fourth quarter of 2008 indicated the first arrival of GWRS water at that well and indicated a travel time of approximately 10 months. Since 2011, chloride concentrations at M46A/1 have remained low and stable at GWRS levels (Figure 4-11), 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 is indicated by the chloride concentration decline in each well (Figure 4-11). However, 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. Therefore, reliable travel times have not been discerned for these deeper zones at the M46 site. At M46/2 (Upper Rho aquifer), chloride concentrations declined slightly down to GWRS levels in 2019 and remained at those low levels in 2020, indicated 100% GWRS water at this well. At the two deeper zones M46/3 (Lower Rho aquifer) and M46/4 (Main aquifer), chloride concentrations during 2020 remained low and stable ranging from 11 to 14 mg/L just slightly higher than GWRS water. Finally, at the deepest zone M46/5 (Main aquifer), chloride concentrations also remained relatively low but experienced a slight increase from 15 mg/L in 2018 to 19 mg/L in the second half of 2019 and remaining stable at 19 mg/L throughout 2020, possibly indicating a very subtle shift in the gradient and/or a weaker Main aquifer injection signal since I24/2 was off-line during 2019-20.

At M47/1 (Beta-III aquifer), chloride concentrations began to gradually decline from background levels in 2011 and finally reached low GWRS levels in 2015 (Figure 4-12). Due to the gradual dampened nature of this chloride decline, a reliable GWRS arrival time could not be calculated but is likely greater than three years. Throughout 2020, chloride concentrations were low and stable at 9 mg/L, indicating nearly 100% GWRS water at this well.

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 but once again was not readily discernable due to the dampened nature of the chloride trends. During 2020, chloride concentrations at M47/2 were low and stable at 9 to 10 mg/L, indicating nearly 100% GWRS water at this well. At the three deeper zones

M47/3, M47/4, and M47/5 screened in the Lower Rho and Main aquifers, GWRS arrival is inconclusive based on the low and stable chloride concentrations since prior to GWRS injection.

4.4.3 Monitoring Wells – 1,4-Dioxane and NDMA

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 2020. In mid-2020, the Reportable Detection Limit (RDL) for 1,4-dioxane was lowered from 1.0 to 0.5 mg/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 AWPF CEC monitoring requirements incorporated into the latest GWRS permit Monitoring and Reporting Program (RWQCB, 2020). Data from the monitoring wells are illustrated on Figure 4-14 through Figure 4-19 and are presented in Appendix H. During 2020, 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 2020 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.

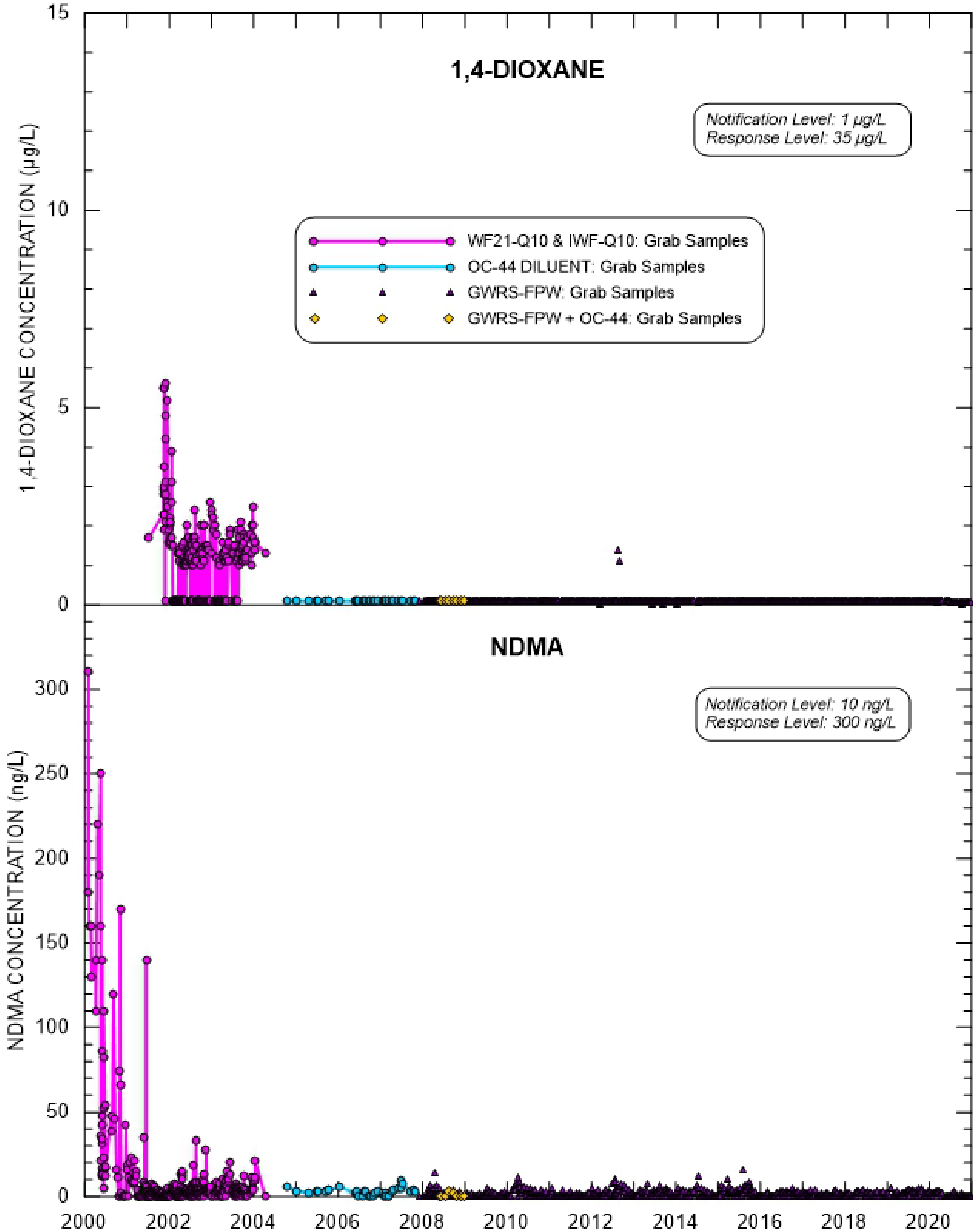


Figure 4-13. Talbert Barrier Injection Water 1,4-Dioxane and NDMA Concentrations

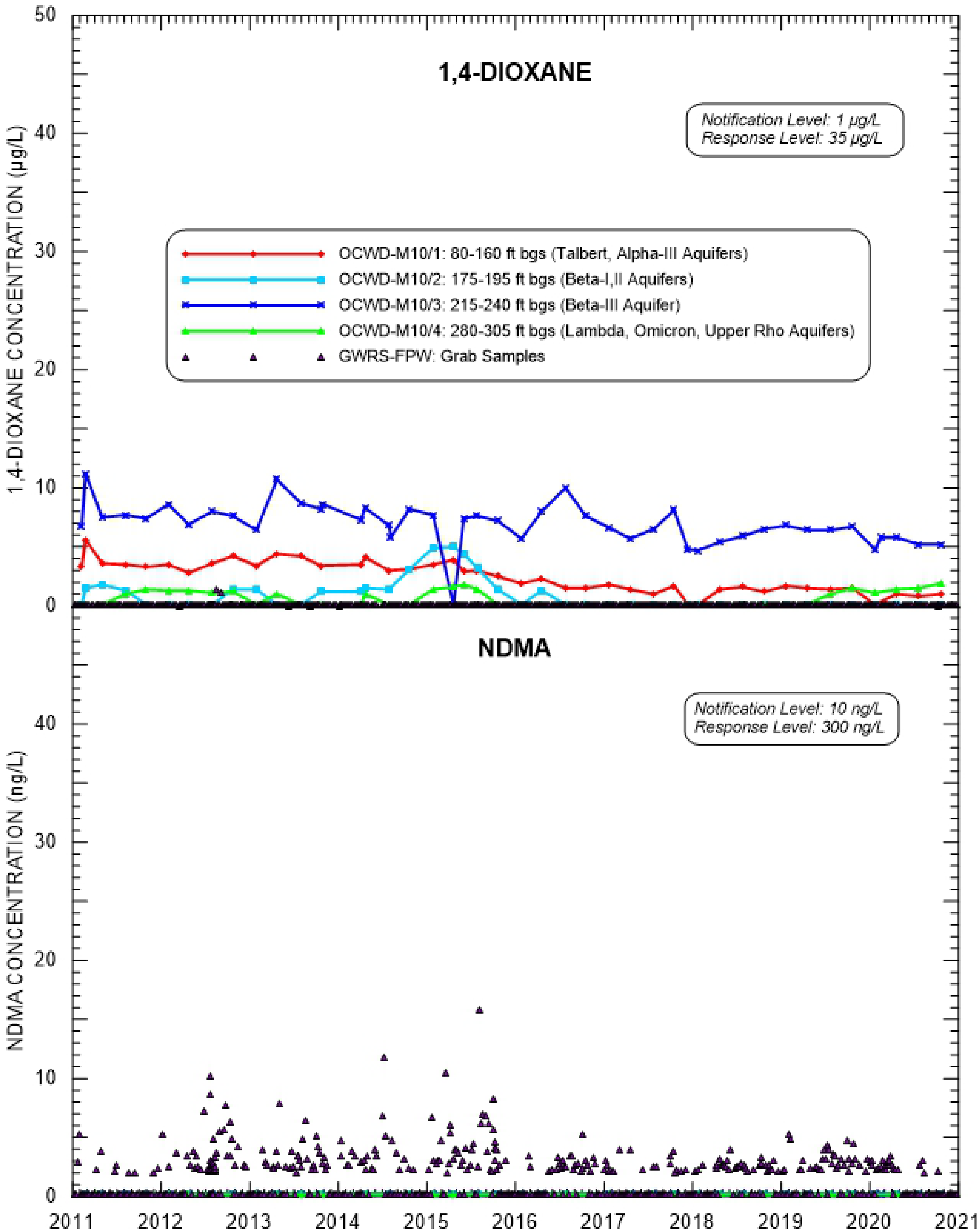


Figure 4-14. Monitoring Well OCWD-M10 1,4-Dioxane and NDMA Concentrations

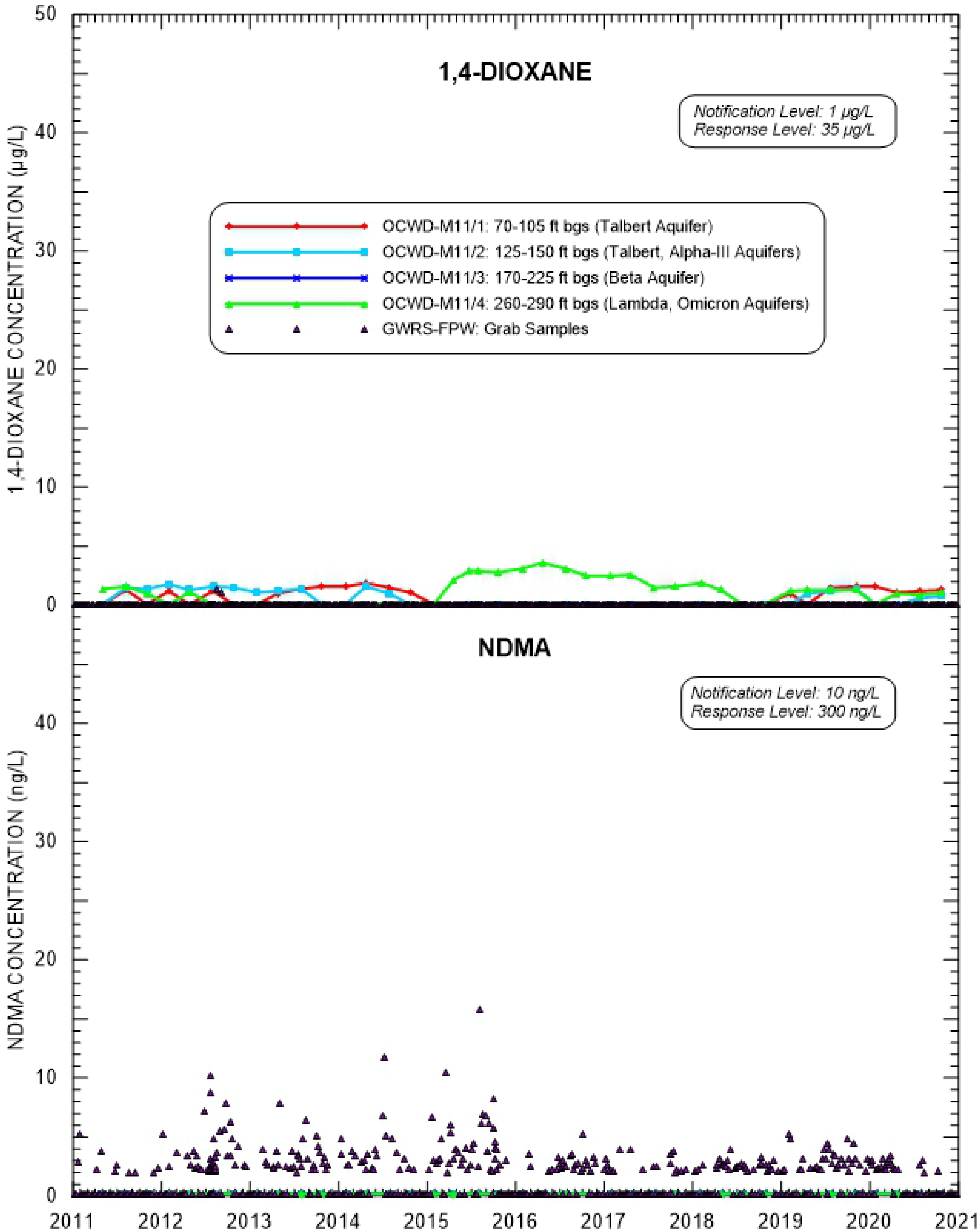


Figure 4-15. Monitoring Well OCWD-M11 1,4-Dioxane and NDMA Concentrations

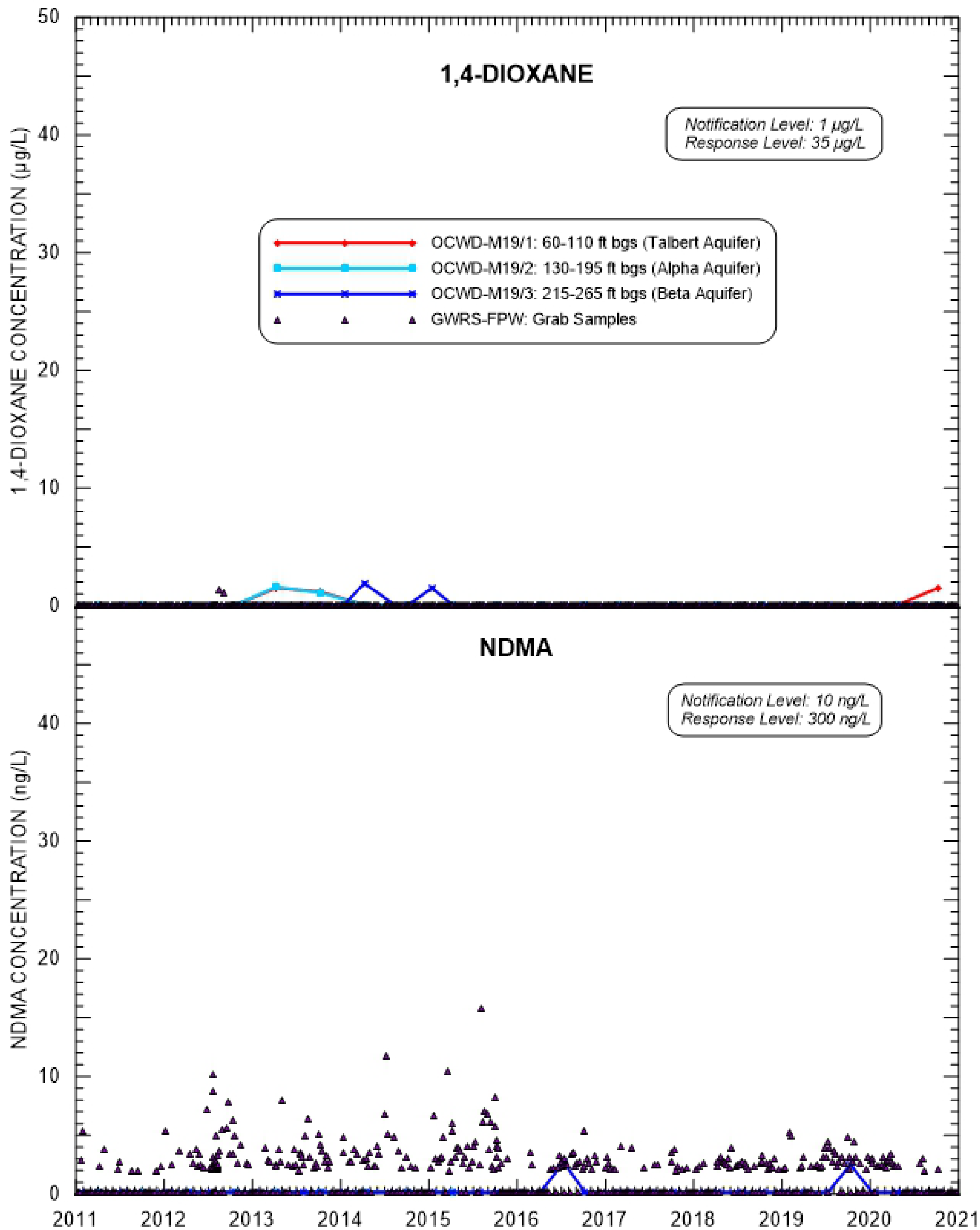


Figure 4-16. Monitoring Well OCWD-M19 1,4- Dioxane and NDMA Concentrations

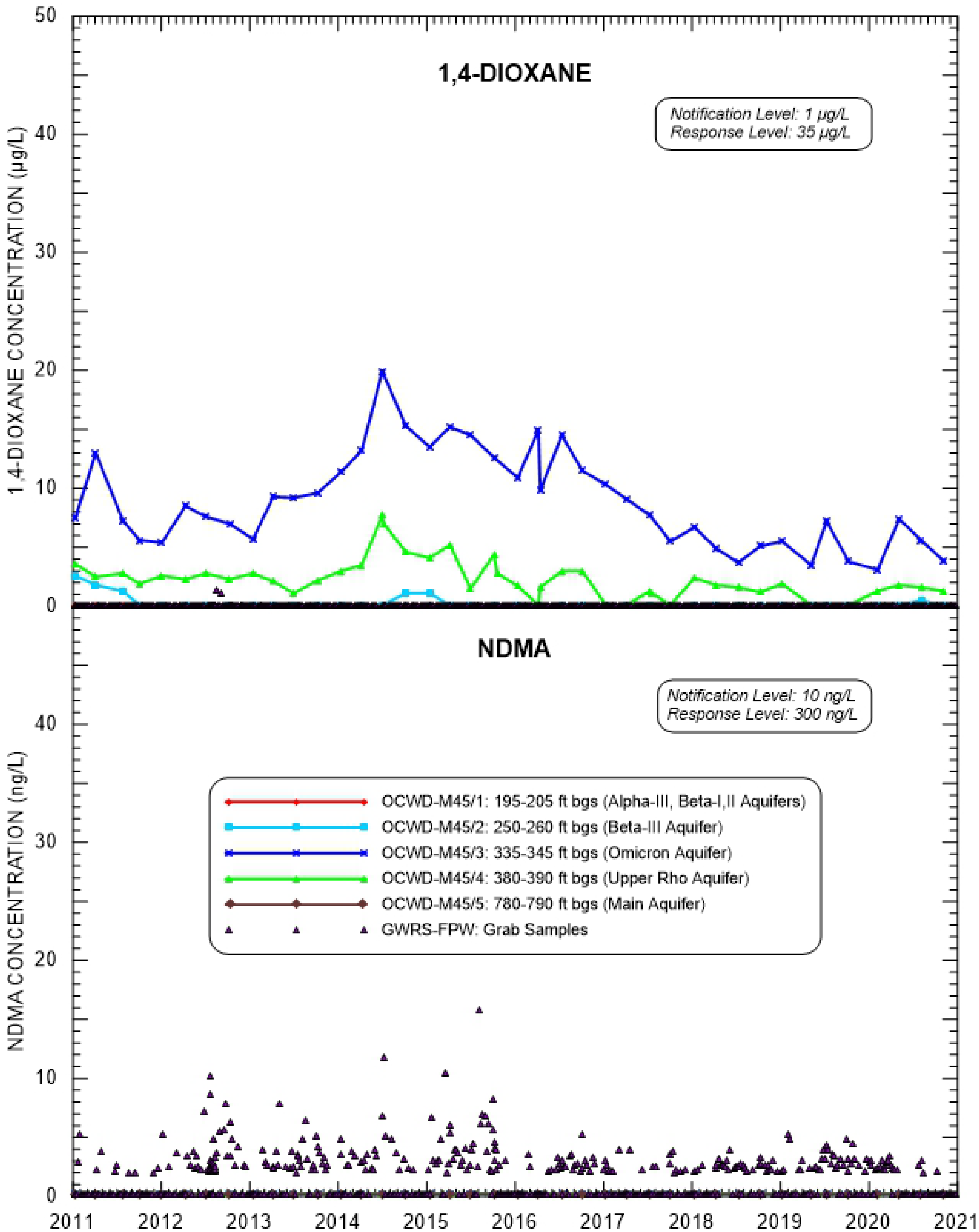


Figure 4-17. Monitoring Well OCWD-M45 1,4-Dioxane and NDMA Concentrations

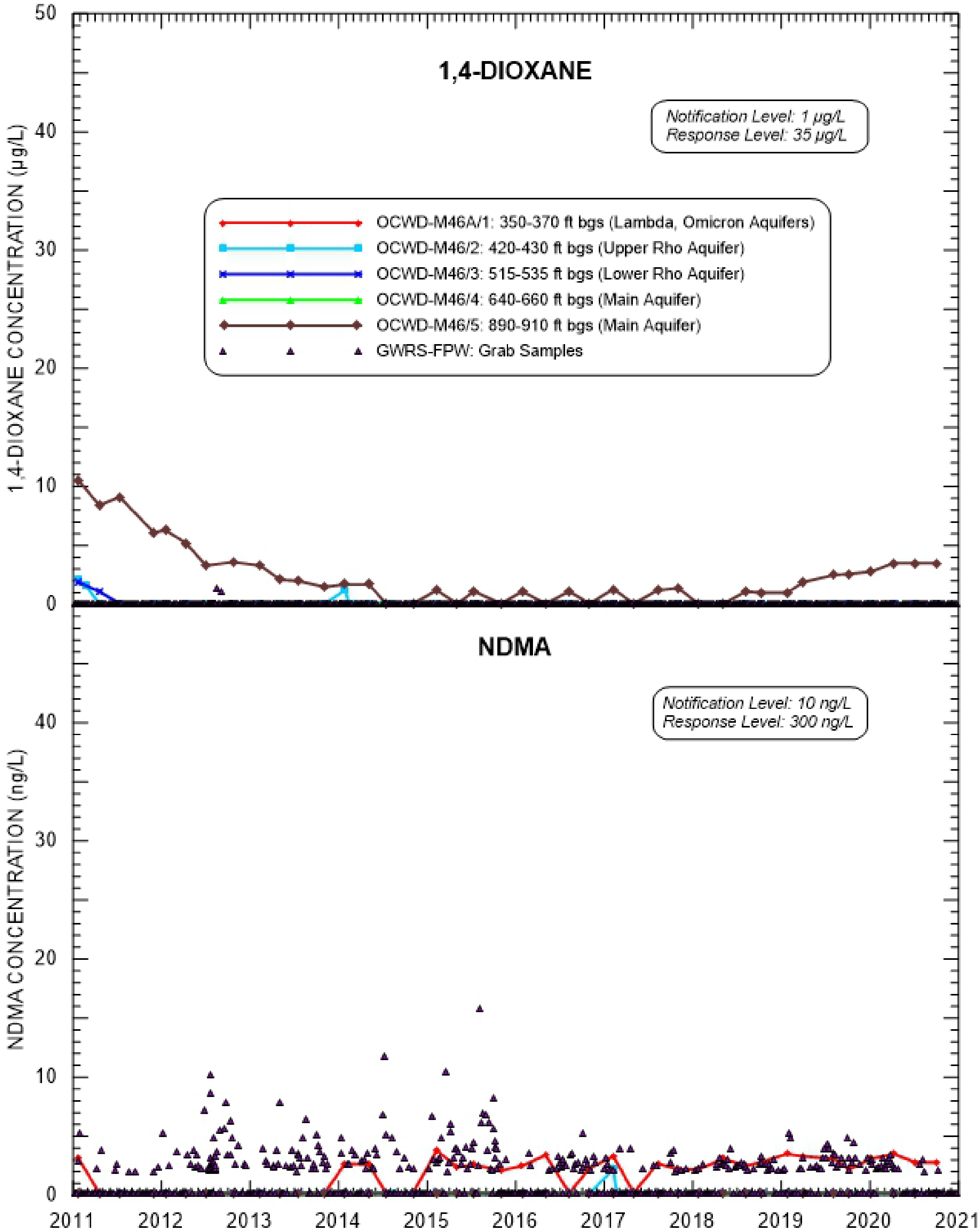


Figure 4-18. Monitoring Well OCWD-M46 1,4-Dioxane and NDMA Concentrations

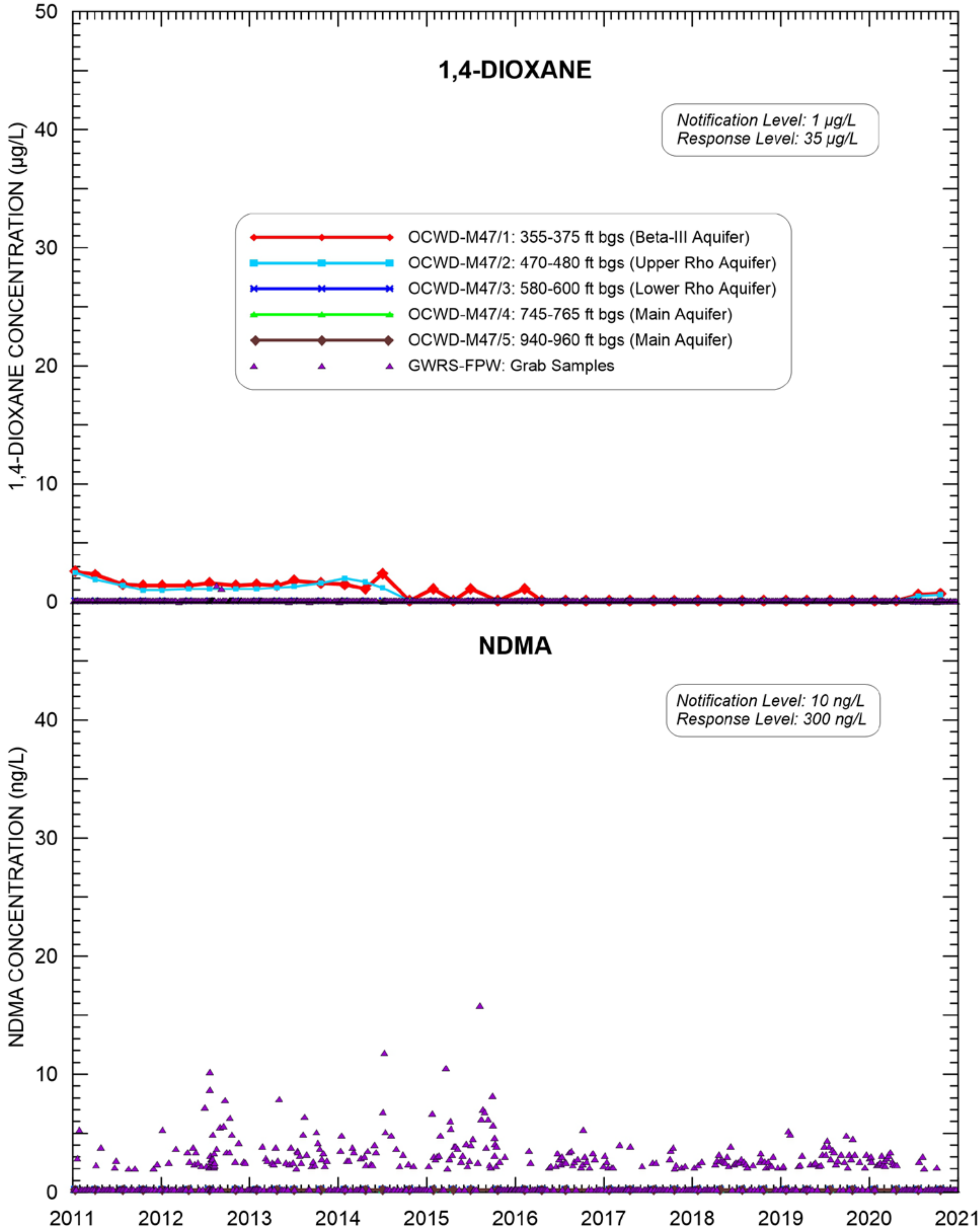


Figure 4-19. Monitoring Well OCWD-M47 1,4-Dioxane and NDMA Concentrations

At monitoring well site M10 (Figure 4-14), the 1,4-dioxane results in 2020 continued to show the highest concentrations in M10/3 (Beta aquifer) and much lower or ND in the other three aquifer zones. Concentrations of 1,4-dioxane at M10/3 remained relatively stable during 2020 at 4.8 to 8.8 μg/L. The continued stable 1,4-dioxane concentrations at M10/3 were consistent with the continued high chloride concentrations at this well during 2020 which indicated a continued seaward gradient, allowing a relatively high percentage of older (pre-GWRS) WF-21 injection water to remain or migrate back to this well.

At M10/4 (Lambda, Omicron, and Upper Rho aquifers), concentrations of 1,4-dioxane increased slightly during the first half of 2015 (Figure 4-14) consistent with the contemporaneous small increase in chloride concentrations at this well (Figure 4-7) that indicated a temporary shift or reversal in the gradient within the Lambda aquifer at this location. The subsequent decline in both chloride concentrations and 1,4-dioxane concentrations below the reportable detection limit (RDL) of 1 μg/L during the second half of 2015 through 2018 indicated the return of a more typical sustained landward gradient from the barrier to this well and a predominance of GWRS water. During the second half of 2019 and throughout 2020, concentrations of 1,4-dioxane at M10/4 experienced a slight gradual increase from below the RDL to 1.9 μg/L by the fourth quarter of 2020, consistent with a contemporaneous slight gradual increase in chloride concentrations, indicating a subtle shift in the gradient and return of a small portion of pre-GWRS injection water to this well in the Lambda aquifer.

At M10/2 (Beta-I and Beta-II aquifers), Figure 4-14 shows that concentrations of 1,4-dioxane increased during the second half of 2014 and first half of 2015, again consistent with the contemporaneous small increase in chloride concentrations at this well (Figure 4-7). Like M10/4, this short-term subtle increase was likely due to a short-term gradient shift or reversal from landward to seaward but was likely due to the barrier being off-line in June 2014 rather than from high groundwater conditions as is typically the case with these gradient reversals. Concentrations of 1,4-dioxane at M10/2 subsequently decreased back down to 1 μg/L by the end of 2015 and have remained below the RDL since 2017 despite seaward gradient reversals during both 2018 and 2019-20 as indicated by chloride concentration increases during that time (Figure 4-7). The 2018 and 2019-20 seaward gradient reversals at M10/2 may have brought higher chloride native groundwater (devoid of 1,4-dioxane) rather than GWRS water back to this well.

At M10/1 (Talbert and Alpha aquifers), Figure 4-14 shows that concentrations of 1,4-dioxane remained low and relatively stable during 2020 from ND to 1 μg/L just slightly above the new RDL of 0.5 μg/L despite the high chloride concentrations in this well during 2020 (Figure 4-7). Like the explanation for M10/2 above, the lack of any increase in 1,4-dioxane concentrations at M10/1 despite the contemporaneous chloride increase likely indicated that the 2019-20 seaward gradient reversal may have caused some native groundwater to migrate back to this well rather than pre-GWRS injection water.

NDMA concentrations at monitoring well site M10 (all zones) remained below the RDL of 2 ng/L throughout 2020.

At monitoring well site M11, Figure 4-15 shows that concentrations of 1,4-dioxane in 2020 were low and stable similar to 2019 and ranged from below the RDL to slightly above the RDL at 1.6 μg/L in all zones except M11/3 (Beta aquifer). At M11/3, 1,4-dioxane concentrations have been below the RDL since 2008, indicating nearly 100% GWRS purified recycled water at this well for several years and confirmed by low chloride concentrations below 15 mg/L since 2010.

At M11/4 (Lambda and Omicron aquifers), concentrations of 1,4-dioxane increased slightly during 2015 and the first half of 2016 (Figure 4-15), consistent with the contemporaneous increase in chloride concentrations at this well (Figure 4-8) and signaling a gradient shift or reversal that likely brought a pulse of older pre-GWRS water back to this well. The low but detectable 1,4-dioxane concentrations just above the RDL during 2020 at M11/4 indicate some remaining small percentage of pre-GWRS injection water at this well due to mixing via dispersive transport or previous shifts in the gradient direction.

At M11/1 (Talbert aquifer) and M11/2 (Talbert and Alpha aquifers), the non-detect 1,4-dioxane concentrations (Figure 4-15) since 2015 were consistent with contemporaneously low chloride concentrations (Figure 4-8) that indicated a predominance of GWRS water. However, during earlier years, non-detect or low 1,4-dioxane concentrations do not necessarily represent a predominance of GWRS water but rather a significant percentage of native groundwater (devoid of 1,4-dioxane) as evidenced by contemporaneous high chloride concentrations. During 2019 and 2020, concentrations of 1,4-dioxane just above the RDL at M11/1 and M11/2 were likely caused by a seaward gradient reversal that began in 2018 and continued through 2020 as evidenced by the increasingly high chloride concentrations during that time in these two wells (Figure 4-8).

NDMA concentrations at monitoring well site M11 (all zones) remained below the RDL of 2 ng/L throughout 2020.

At monitoring well site M19, Figure 4-16 shows that 1,4-dioxane concentrations were below the RDL in all three zones since 2016, albeit for different reasons, except for one detection at M19/1 just above the RDL at 1.5 μg/L in the fourth quarter of 2020. At M19/1 (Talbert aquifer), this 1,4-dioxane detection in 2020 occurred during high Basin conditions like the prior 1,4-dioxane detections during 2013, possibly causing a slight shift in the seaward gradient. High stable chloride concentrations of approximately 80 mg/L indicative of native groundwater (devoid of 1,4-dioxane) experienced a slight increase to 90 mg/L during both the 2013 and 2020 periods (Figure 4-9), possibly indicating some proportion of older pre-GWRS injection water arriving at M19/1. At M19/2 (Alpha aquifer), the decrease in chloride concentrations during late 2019/early 2020 and subsequent increase during late 2020 (Figure 4-9) likely indicated a gradient shift or reversal from landward back to seaward that may have brought a proportionally large blend of native groundwater (devoid of 1,4-dioxane) rather than pre-GWRS injection water back to this well. At M19/3 (Beta aquifer), low chloride concentrations at GWRS levels (Figure 4-9) indicated sustained arrival of 100% GWRS injection water due to a landward gradient at this well since late 2015.

NDMA concentrations at monitoring well site M19 (all zones) remained below the RDL of 2 ng/L throughout 2020.

Monitoring for 1,4-dioxane and NDMA began in 2005 at compliance monitoring well sites M45, M46, and M47, and Figure 4-17 through Figure 4-19, respectively, show their trends over the 10-year period 2011-2020. Their data histories generally confirmed OCWD's hydrogeological understanding of the area and were consistent with previously discussed chloride concentration trends as related to inferred groundwater flow directions and gradient reversals. For example, the 1,4-dioxane concentrations observed at monitoring well site M45 were consistent with those found in previous years at monitoring well sites M10 and M11, indicating the continued long-term landward transport of both pre-GWRS and GWRS injection water in these areas.

At M45/3 (Omicron aquifer), Figure 4-17 shows that 1,4-dioxane concentrations began to decline in 2017 and dropped to a low of 3.7 μg/L by the third quarter of 2018 due to the first evident arrival of GWRS water at this well and confirmed by a contemporaneous chloride decline (Figure 4-10), suggesting a travel time of approximately 9 years. Since M45/3 is approximately 3,000 feet from the nearest barrier injection well, a 9-year mean travel time would equate to an average groundwater velocity of approximately one foot per day, or a somewhat greater groundwater velocity if the flow path is curvilinear from a more distal injection well, as the Lambda groundwater elevation contours on Figure 4-5 suggest. Furthermore, any seasonal shifts in the gradient direction as well as vertical migration from the Lambda aquifer at the legacy injection wells down into the Omicron aquifer to reach M45/3 could lengthen the overall injection water travel path and thus equate to a higher groundwater velocity for the 9-year mean travel time. During 2020, concentrations of 1,4-dioxane temporarily increased from 3.1 μg/L in the first quarter to 7.4 μg/L in the second quarter, before decreasing to 3.9 μg/L in the fourth quarter. This short-term increase in 2020 was consistent with the contemporaneous increase in chloride concentrations at this well (Figure 4-10) and likely indicated a brief seaward shift in the gradient due to the relatively high Basin conditions.

At M45/4 (Upper Rho aquifer), 1,4-dioxane concentrations (Figure 4-17) as well as chloride concentrations (Figure 4-10) have been considerably lower than M45/3 since 2010 due to the gradual decline in both constituents from 2010-12, indicating that some proportion of GWRS water arrived at M45/4 during that time with an estimated travel time of approximately 3 to 4 years. This equates to an average groundwater velocity of approximately 2 to 3 feet per day if originating from the nearest injection wells 3,000 feet away. Since the nearest legacy injection wells are not screened in the Upper Rho aquifer, GWRS arrival at M45/4 required 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). Concentrations of 1,4-dioxane at M45/4 increased slightly from below the RDL in the fourth quarter of 2019 to 1.8 μg/L in the second quarter of 2020 and ended the year at 1.3 μg/L. Once again, this subtle increase during 2020 was consistent with a contemporaneous subtle increase in chloride concentrations (Figure 4-10) and indicated a seaward shift in the gradient with some proportion of older pre-GWRS injection water arriving at this well in the Upper Rho aquifer.

At M45/2 (Beta-III aquifer), Figure 4-17 shows that 1,4-dioxane concentrations prior to 2020 had remained below the RDL since 2015, consistent with contemporaneously low and stable chloride concentrations at this well (Figure 4-10) and indicating a predominance of GWRS water due to a landward gradient from the barrier. Based on both 1,4-dioxane and chloride concentration trends at M45/2, a GWRS arrival time ranging from approximately 4 to 7 years was estimated. During 2020, concentrations of 1,4-dioxane were below the RDL except for one detection at the new RDL of 0.5 μg/L during the third quarter, likely due to a seaward shift in the gradient as supported by the contemporaneous increase in chloride concentrations at this well (Figure 4-10).

At both the shallow M45/1 (Alpha-III and Beta-I,II aquifers) and deep M45/5 (Main aquifer), 1,4-dioxane has never been detected above the RDL (Figure 4-17), likely indicating that barrier injection has never reached these wells and confirmed by stable chloride concentrations trends (Figure 4-10) indicating native groundwater (devoid of 1,4-dioxane).

NDMA concentrations at monitoring well site M45 (all zones) remained below the RDL of 2 ng/L throughout 2020.

At monitoring well site M46, Figure 4-18 shows that concentrations of 1,4-dioxane remained below the RDL in all zones except M46/5 since 2015. At M46A/1 (Lambda aquifer) and M46/2 (Upper Rho aquifer), low chloride concentrations below 15 mg/L since 2012 and even lower at 5 to 6 mg/L during 2020 indicated the long-term sustained predominance of GWRS water at those two wells. At M46/3 (Lower Rho aquifer) and M46/4 (Main aquifer), relatively low chloride concentrations below 20 mg/L since 2013 but with more dampened trends indicated at least some proportion of GWRS water but with less certainty due to lower background chloride concentrations closer to that of GWRS water (Figure 4-11).

At M46/5 (Main aquifer), the decreasing trends from 2012 through 2014 for both 1,4-dioxane (Figure 4-18) and chloride concentrations (Figure 4-11) 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. From 2015-18, concentrations of 1,4-dioxane have oscillated seasonally each year from non-detect to just above the RDL of 1 μg/L, possibly indicating subtle shifts in the seasonal gradient direction causing small pulses of older pre-GWRS water to temporarily migrate back and forth to this well without noticeably increasing chloride concentrations. During 2019-20, a gradual increase in 1,4-dioxane concentrations from the RDL of 1 μg/L in the first quarter of 2019 to 3.5 μg/L in the fourth quarter of 2020 likely indicated a more sustained gradient shift than the previous four years and was consistent with the contemporaneous subtle rise in chloride concentrations at M46/5 in the Main aquifer.

NDMA concentrations at monitoring well site M46 remained below the RDL of 2 ng/L throughout 2020 in all zones except M46A/1, where NDMA concentrations slightly increased to 3.5 ng/L in the second quarter and then decreased slightly to 2.8 ng/L in the second half of the year, remaining well below the NL of 10 ng/L all year. The detections of NDMA at M46A/1 during 2010, 2011, 2014, and 2015-20 all appear to correlate with NDMA concentrations in GWRS-FPW from several months prior, generally consistent with the 10-month mean travel time estimate to this well. Since M46A/1 is 900 feet from the nearest injection well (I26), the 10-month mean travel time equates to an average groundwater velocity of approximately 3 feet per day. The actual travel time likely fluctuates somewhat based on local injection operations on the east end of the barrier along with pumping conditions at nearby Mesa Water production wells.

At monitoring well site M47, Figure 4-19 shows that 1,4-dioxane concentrations remained below the old RDL of 1 μg/L in all zones during 2020, albeit for different reasons. At M47/1 (Beta and Lambda aquifers), historically higher 1,4-dioxane concentrations gradually decreased over time and dropped below the RDL for the first time in late 2014 and remained below the old RDL of 1 μg/L since early 2016. The decline in 1,4-dioxane concentrations was consistent with the contemporaneous decline in chloride concentrations down to nearly GWRS levels (Figure 4-12), indicating a landward gradient from the barrier and nearly 100% GWRS water at this well since 2015. During the second half of 2020, low 1,4-dioxane concentrations just above the new RDL of 0.5 μg/L were detected at 0.6 μg/L and 0.7 μg/L during the third and fourth quarters, respectively. Based on low and stable chloride concentrations at M47/1 of 9 to 10 mg/L during 2020 (Figure 4-12), these 1,4-dioxane detections during 2020 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), Figure 4-19 shows that 1,4-dioxane concentrations historically behaved very similar to M47/1, dropping below the RDL for the first time in late 2014 but then remained below the RDL ever since then rather than experiencing the minor seasonal detections in 2015 and 2016 as at M47/1. Similar to M47/1, low 1,4-dioxane concentrations at M47/2 were detected at 0.5 μg/L and 0.6 μg/L during the third and fourth quarters of 2020, respectively, and were also likely due to the lower RDL of 0.5 μg/L rather than being an actual increase in 1,4-dioxane concentrations from a shift in the gradient direction.

At M47/3, M47/4, and M47/5 (Lower Rho and Main aquifers), 1,4-dioxane has 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 shown on the Main aquifer groundwater elevation contours previously shown on 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 far 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.

NDMA concentrations at monitoring well site M47 (all zones) remained below the RDL of 2 ng/L throughout 2020.

4.4.4 Production Wells

Groundwater quality data for water samples collected during 2020 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 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, Orange County Well Standards Advisory Board, and the City of Fountain Valley, which are the well permitting agencies in this area, of this buffer zone requirement. No new drinking water wells have been installed in the 12-month underground retention area.

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 few years. NDMA and 1,4-dioxane concentrations for MCWD-5 and injection water for the 10-year period 2011-2020 are shown on Figure 4-20. NDMA concentrations at MCWD-5 decreased below the RDL in early 2010 and remained below the RDL through 2020. To reduce final drinking

Table 4-2. 2020 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	2.1 (2.0 - 2.2)	13.1 (12.2 - 13.7)	ND	169 (156 - 178)	1.22 (1.16 - 1.31)	0.001 (ND - 0.003)	0.11 (0.10 - 0.14)	ND	1.2 (1.1 - 1.3)
MCWD-7	793	363 - 753	4,200	1.2 (1.1 - 1.3)	49.6 (48.7 - 50.4)	0.12	321 (312 - 330)	0.64 (0.57 - 0.71)	ND	0.22 (0.19 - 0.24)	ND	2.4 (2.3 - 2.8)
NB-DOLD	739	399 - 729	5,300	2.2 (2.0 - 2.5)	19.0 (18.5 - 19.3)	ND	227 (210 - 248)	0.17 (0.13 - 0.20)	ND	0.15 (0.11 - 0.23)	ND	2.3 (2 - 2.5)
NB-DOLS	366	201 - 356	5,300	ND	50.9 (48.9 - 55.0)	0.15 (0.15 - 0.16)	417 (402 - 440)	2.52 (2.30 - 2.69)	0.001 (ND - 0.002)	0.18 (0.18 - 0.19)	ND	0.6 (ND - 0.9)
MCWD-3B	592	242 - 572	5,400	2.1 (2.0 - 2.2)	27.6 (27.1 - 28.0)	ND	261 (240 - 282)	1.06 (1.01 - 1.12)	ND	0.13 (0.10 - 0.16)	ND	3.8 (3.6 - 4.0)
NB-TAMD	700	395 - 690	5,700	3.4 (3.0 - 4.1)	9.8 (8.6 - 10.6)	ND	134 (104 - 148)	0.67 (0.50 - 0.86)	0.002 (ND - 0.004)	0.10 (0.07 - 0.12)	ND	0.4 (ND - 0.7)
NB-TAMS	370	170 - 360	5,800	1.3 (1.0 - 1.6)	63.7 (61.6 - 68.2)	0.21 (0.19 - 0.23)	528 (498 - 550)	2.71 (2.56 - 2.85)	0.003 (ND - 0.008)	0.27 (0.25 - 0.30)	ND	0.6 (ND - 1.0)
FV-10	990	460 - 980	7,600	ND	27.1	ND	300	1.00 (0.90 - 1.09)	0.005 (0.003 - 0.006)	0.10	ND	1.7 (1.5 - 1.9)
HB-3A	660	370 - 640	7,600	1.8 (1.5 - 2.2)	40.5 (38.0 - 43.7)	0.12 (ND - 0.23)	237 (218 - 254)	0.15 (0.10 - 0.19)	0.003 (ND - 0.005)	0.57 (0.50 - 0.75)	ND	ND
HB-5	820	223 - 800	8,000	2.1 (2.0 - 2.2)	25.4 (24.6 - 26.2)	ND	278 (268 - 288)	0.98 (0.92 - 1.02)	0.001 (ND - 0.003)	0.16 (0.15 - 0.17)	ND	ND
HB-9	996	556 - 996	8,000	0.5 (ND - 1.2)	14.0 (13.5 - 14.5)	ND	220 (216 - 226)	ND	0.001 (ND - 0.002)	0.62 (0.53 - 0.71)	ND	ND
Small System and Private Wells												
GKAW-FV2	125	120 - 125	700	1.2[5]	87.7	0.24	666	3.67	ND	0.23	ND	5.0 (4.2 - 5.7)
KUBO-FV	133	122 - 132	2,900	1.4[5]	81.9	0.23	638	3.98	ND	0.24	ND	ND
LIBM-HB		NA	4,100	1.2 (1.1 - 1.3)	41.4 (33.0 - 48.1)	ND	235 (208 - 256)	2.81 (2.57 - 3.06)	ND	0.13 (0.09 - 0.14)	ND	0.4 (ND - 0.7)
Private Irrigation Wells												
CALL-FV		NA	400	1.7	15.6 (8.9 - 27.6)	ND	139 (96 - 212)	1.53 (1.28 - 1.95)	0.002 (ND - 0.003)	0.12 (0.09 - 0.15)	ND	ND
A1-HB	305	188 - 300	1,800	1.2	30.3 (29.7 - 31.5)	ND	287 (274 - 296)	1.46 (1.38 - 1.51)	0.001 (ND - 0.003)	0.15 (0.14 - 0.16)	ND	1.2 (1.0 - 1.2)

[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

[5] Sample data from 2019

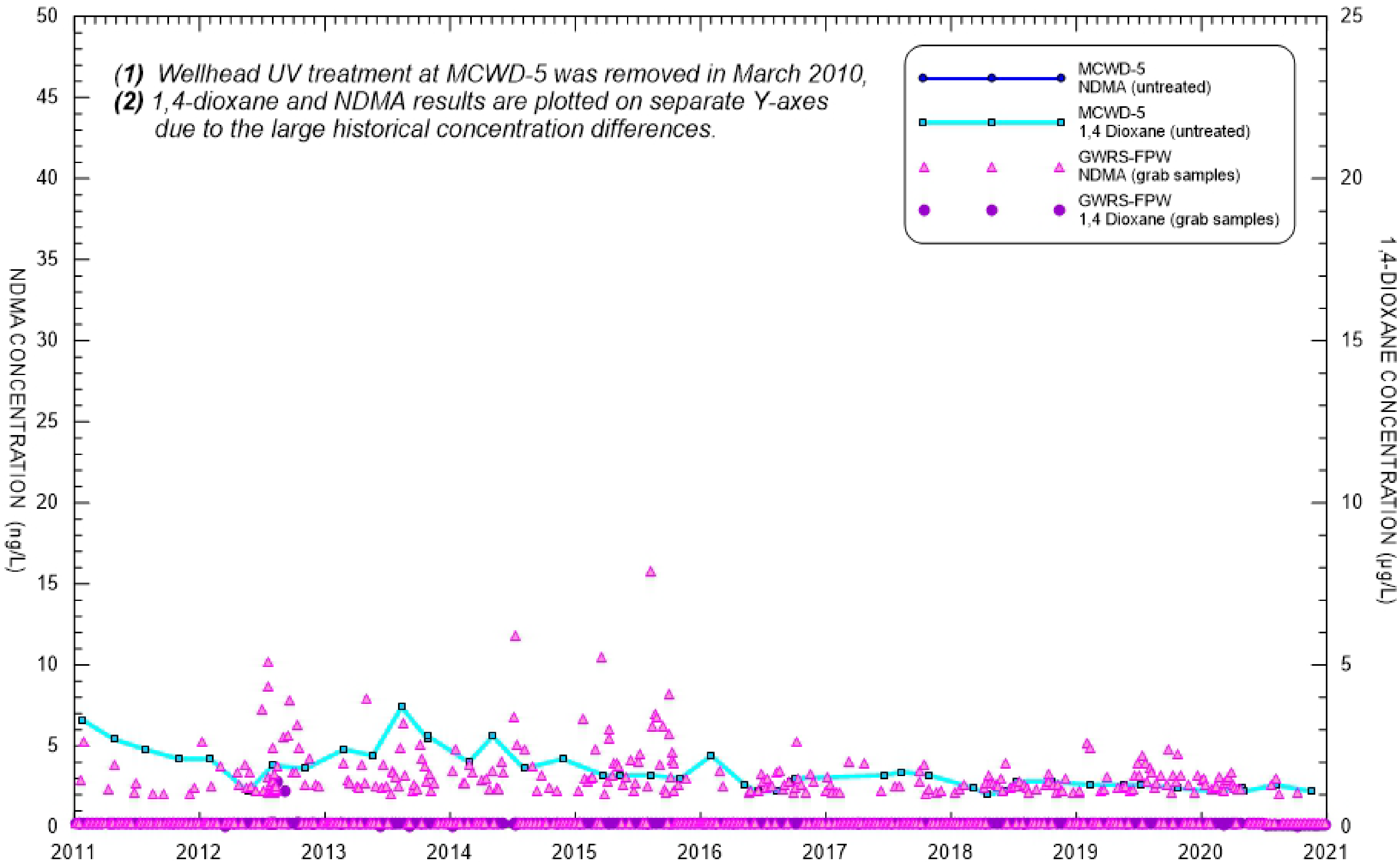


Figure 4-20. MCWD-5 Pre-Treatment and Injection Water 1,4-Dioxane and NDMA Concentrations

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.

As shown in Figure 4-20, 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. 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 2020, concentrations of 1,4-dioxane were low and stable at 1.1 to 1.3 μg/L, just slightly above the DDW NL of 1 μg/L and the new RDL of 0.5 μg/L.

Since 1,4-dioxane concentrations at MCWD-5 did not quite drop below the RDL during 2020, 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 relatively low 1,4-dioxane concentrations at MCWD-5 over the last couple years (Figure 4-20) 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. Although not shown on Figure 4-20, chloride concentrations at MCWD-5 have decreased steadily since 2011 and ranged from 12 to 14 mg/L during 2020. (Table 4-2), indicating the progressive arrival of greater proportions of GWRS water and 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 moderate chloride concentrations ranging from approximately 20 to 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 to 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 to 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.

At HB-5, the chloride concentration range of 25 to 26 mg/L in 2020 (Table 4-2) was approximately the same as in 2019 and still within the lower end of the historical range for that well. Further decline of chloride concentrations at HB-5 down closer to GWRS levels would signal arrival of GWRS injection water. At HB-9, the chloride concentration during 2020 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. Neither NDMA or 1,4-dioxane were detected in either HB-5 or HB-9 during 2020.

In 2012, OCWD became aware of an existing private well near the Talbert Barrier, GKAW-FV2/1, 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 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 Alpha aquifer. The underground retention time prior to extracting GWRS purified recycled water at this private drinking water well has been observed to be greater than ten years; this is based on groundwater samples taken from this well since GWRS began operation in 2008 which indicate that GWRS purified recycled water has not yet reached Well GKAW-FV2/1 despite its proximity to the barrier. During 2020, the chloride concentration at GKAW-FV2/1 was 88 mg/L while 1,4-dioxane concentrations ranged from 4.2 to 5.7 μg/L (Table 4-2), both indicative of pre-GWRS injection water and possibly some proportion of ambient groundwater. Since the inception of GWRS however, the groundwater flow direction in the Alpha aquifer at Well GKAW-FV2/1 is likely seaward towards the barrier.

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

During 2020 OCWD spread GWRS purified recycled water at Kraemer-Miller-Miraloma-La Palma (K-M-M-L) Basins to recharge the Orange County Groundwater Basin. 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 supplemented with a small amount of non-GWRS water in 2017. Non-GWRS water may be recharged at Miraloma Basin in future years.

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 half of all GWRS production during 2020.

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 2020: (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 hydrogeologically part of the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins recharge system. As discussed in Section 1.4, Anaheim Lake and Mini-Anaheim Lake are adjacent to and upgradient of K-M-M-L Basins (Figure 1-6 and Figure 1-7). La Jolla Basin is located downgradient of Kraemer-Miller-Miraloma Basins and downgradient/crossgradient of La Palma Basin that is located further south. SAR water and imported water recharged at Anaheim Lake, Mini-Anaheim Lake, and La Jolla Basin supplement and 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 so as to prevent long-term clogging and maintain their exceptionally high percolation rates.

Prior to 2014, the volume of diluent 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 2020. 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 2020 are presented below and compared with historical spreading amounts in this area.

5.3.1 2020 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 33,141 MG (101,706 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 2020.

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 2020 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 2020, the following volumes and average daily flow rates of GWRS purified recycled water were delivered to the Anaheim Forebay:

- Kraemer Basin received approximately 129 MG (396 AF), or 0.35 MGD on average;
- Miller Basin received approximately 1,089 MG (3,342 AF), or 2.98 MGD on average;
- Miraloma Basin received approximately 1,049 MG (3,220 AF), or 2.87 MGD on average; and
- La Palma Basin received approximately 18,293 MG (56,140 AF), or 49.98 MGD on average.

The total volume of GWRS purified recycled water delivered to the K-M-M-L Basins during 2020 was 20,560 MG (63,097 AF). The annual average daily flow rate of GWRS purified recycled water spread in 2020 was 56.18 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 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 at this time.

Captured flow was diverted from the SAR and recharged at Kraemer-Miller Basins as well as Anaheim Lake, Mini-Anaheim Lake and La Jolla Basin. Imported water was purchased and recharged at these same basins. In 2020, a total of approximately 12,499 MG (38,357 AF) of the two other (non-GWRS) sources was recharged in this area of the Anaheim Forebay. Kraemer and Miller Basins received primarily other water during 2020. Miraloma Basin received only GWRS purified recycled water from January through April and was not used for the remainder of 2020. La Palma Basin received only GWRS purified recycled water during 2020 (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. 2020 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)	(MG)
Jan	396	3,090	449	3,037	400	1,294	-102	1,796	1,070	0	3	1,067	5,326	0	27	5,299	3,722	283	466	15,670	5,106
Feb	0	284	-392	676	728	165	-18	911	954	0	5	949	4,642	0	-3	4,645	1,077	0	250	8,508	2,772
Mar	0	2,324	512	1,812	817	0	22	795	666	0	-40	706	4,995	0	16	4,979	2,512	0	274	11,078	3,610
Apr	0	3,902	214	3,688	1,363	234	13	1,584	530	0	-1	531	2,860	0	-93	2,953	2,599	93	399	11,847	3,860
May	0	2,679	20	2,659	34	2,532	314	2,252	0	0	0	0	3,601	0	7	3,594	2,023	64	498	11,090	3,614
Jun	0	1,113	-8	1,121	0	1,227	-29	1,256	0	0	0	0	5,258	0	2	5,256	1,245	246	402	9,526	3,104
Jul	0	553	-236	789	0	0	-298	298	0	0	0	0	5,327	0	9	5,318	589	57	366	7,417	2,417
Aug	0	-740	-782	42	0	904	-27	931	0	0	0	0	4,526	0	-17	4,543	0	0	193	5,709	1,860
Sep	0	0	0	0	0	0	-1	1	0	0	0	0	4,444	0	30	4,414	0	0	0	4,415	1,439
Oct	0	0	0	0	0	0	0	0	0	0	0	0	5,036	0	4	5,032	0	0	0	5,032	1,640
Nov	0	52	0	52	0	115	0	115	0	0	0	0	5,018	0	12	5,006	640	0	0	5,813	1,894
Dec	0	231	115	116	0	0	0	0	0	0	0	0	5,107	0	22	5,085	397	3	0	5,601	1,825
TOTAL	**396**	**13,488**	**-108**	**13,992**	**3,342**	**6,471**	**-126**	**9,939**	**3,220**	**0**	**-33**	**3,253**	**56,140**	**0**	**16**	**56,124**	**14,804**	**746**	**2,848**	**101,706**	**33,141**

[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 transferred from Kraemer Basin to Miller Basin per Forebay Operations records.

Table 5-3. 2020 Summary of Spreading Water Sources and Quantities [1]

Month	GWRS Purified Recycled Water[2] (Avg. MGD)	GWRS Purified Recycled Water[2] (AF)	Other Water[3] (Avg. MGD)	Other Water[3] (AF)	Total Spreading Water (Avg. MGD)	Total Spreading Water (AF)	Total Change in Storage[4] (AF)	TOTAL PERCOLATION (AF)	TOTAL PERCOLATION (MG)
January	75.6	7,190	93.1	8,856	168.7	16,046	377	15,670	5,106
February	71.1	6,325	20.0	1,776	91.0	8,101	(408)	8,508	2,772
March	68.1	6,478	53.7	5,110	121.8	11,588	510	11,078	3,610
April	51.6	4,753	78.5	7,227	130.1	11,980	133	11,847	3,860
May	38.2	3,635	81.9	7,796	120.2	11,431	341	11,090	3,614
June	57.1	5,258	46.0	4,233	103.1	9,491	(35)	9,526	3,104
July	56.0	5,327	16.5	1,565	72.4	6,892	(525)	7,417	2,417
August	47.6	4,526	3.8	357	51.3	4,883	(826)	5,709	1,860
September	48.3	4,444	0.0	0	48.3	4,444	29	4,415	1,439
October	52.9	5,036	0.0	0	52.9	5,036	4	5,032	1,640
November	54.5	5,018	8.8	807	63.3	5,825	12	5,813	1,894
December	53.7	5,107	6.6	631	60.3	5,738	137	5,601	1,825
TOTAL	**56.2**	**63,097**	**34.1**	**38,357**	**90.3**	**101,454**	**(251)**	**101,706**	**33,141**

[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 2020 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 20,560 MG (63,097 AF) of GWRS purified recycled water was recharged at K-M-M-L Basins. Approximately 89% of the GWRS purified recycled water pumped to the Anaheim Forebay was recharged at La Palma Basin during 2020.

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 2020, ranging from 3,635 AF in May to 7,190 AF in January, with the low volume in May being due to a planned two-week 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 8,856 AF. The monthly volume of GWRS purified recycled water exceeded the monthly volume of other water in nine months during 2020: all except January, April, and May.

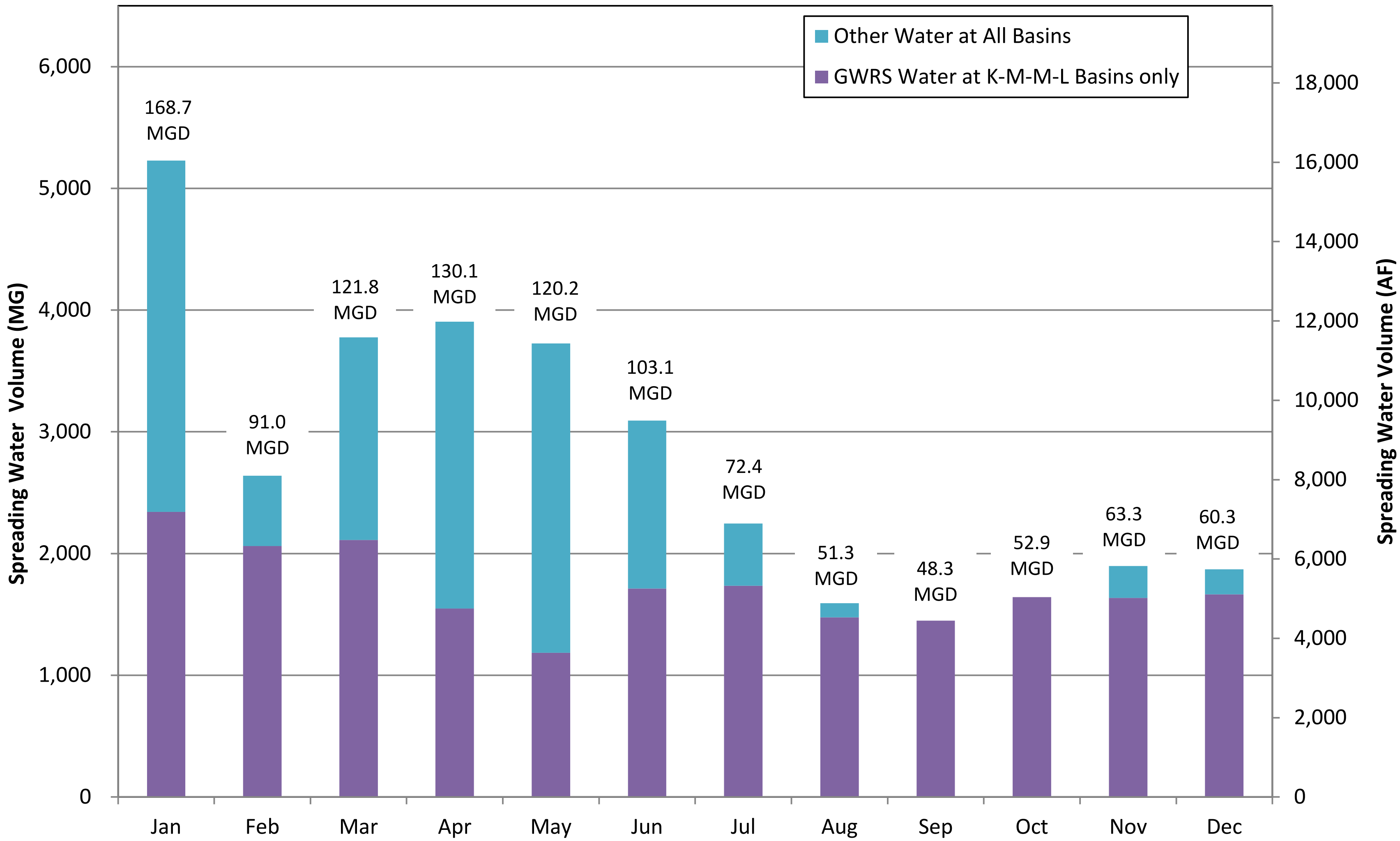
The average daily flow rate of GWRS purified recycled water recharged at K-M-M-L Basins was 56.2 MGD during 2020. The combined average daily flow rate of other water (SAR water and imported water) recharged at Anaheim Lake/Mini-Anaheim Lake/Kraemer-Miller/La Jolla Basins was approximately 34.1 MGD.

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 2020. Purified recycled water spreading began at Miller Basin in January 2008 and continued through 2017, and resumed again in 2020; while allowable, 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. Purified recycled water spreading began at La Palma Basin when this basin first became operational in November 2016 and continued through 2020.

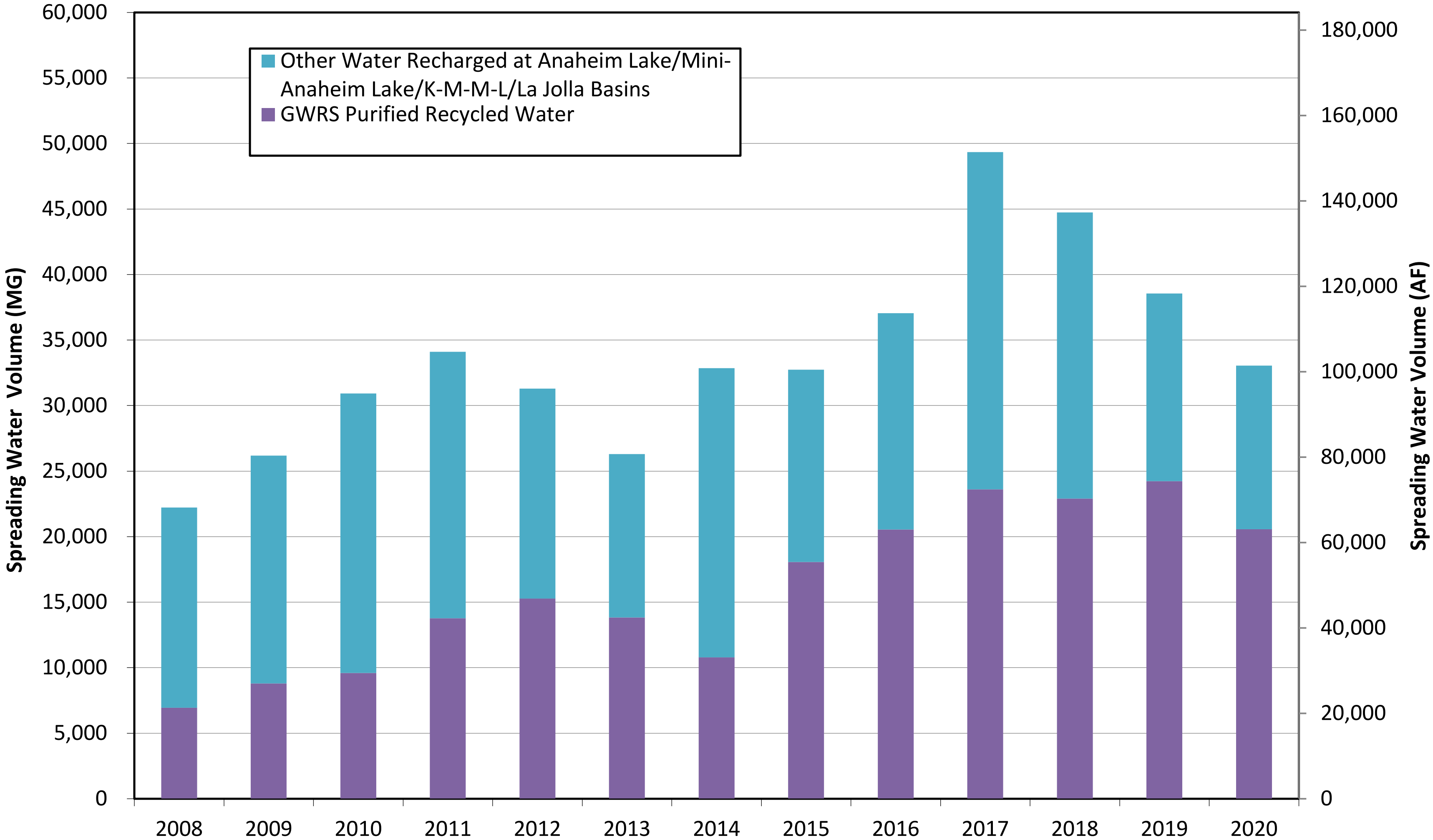
Figure 5-6 compares the volume of purified recycled water and other water recharged at K-M-M-L Basins in 2020 with historical recharge data since the GWRS began operation in January 2008. Since 2008, the highest purified recycled water volume that was delivered to K-M-M-L Basins occurred in 2019 (24,240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

Figure 5-6 also shows that the combined total of 101,706 AF (GWRS and other water) recharged at Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins during 2020 was approximately 14%



Note: Other water consists of SAR water and imported water.
Spreading water average flow rate shown in MGD

Figure 5-5. 2020 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. Spreading Water Sources and Volumes Since 2008

lower than the 2019 volume. Less imported replenishment water was purchased and recharged during 2020 than in 2019 due to reduced Basin pumping in 2020 related to PFAS.

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 13% less non-GWRS water was recharged at the Anaheim Forebay in 2020 (38,357 AF) than in 2019 (43,940 AF) due primarily to reduced purchases of imported water. In fact, 2020 had the second lowest recharge volume of other water since 2008, just marginally more than in 2013. Only a negligible volume of imported water (70 AF) was recharged in the Anaheim Forebay during 2020.

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 2020. Kraemer and Miller Basins have received purified recycled water since January 2008 (except that Miller Basin was not used in 2018-2019). Miraloma Basin has received purified recycled water since July 2012. Miraloma Basin was taken out of service in May 2020 and was not used through December 2020 because of Anaheim Adventure Park construction. It is anticipated that Anaheim Adventure Park will start using GWRS purified recycled water in Miraloma Basin for non-potable purposes in 2021. Spreading of purified recycled water at La Palma Basin began in November 2016 and continued through 2020.

La Palma Basin was the primary site used for recharging purified recycled water throughout 2020, as detailed in Table 5-5 and illustrated on Figure 5-7. La Palma Basin received roughly eight times the volume of purified recycled water as the other three GWRS basins combined. A minimal volume of purified recycled water was recharged at Kraemer Basin. Miller and Miraloma Basins recharged purified recycled water in the first half of 2020. Kraemer and Miller Basins were primarily utilized to recharge other water during 2020.

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 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)	(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
TOTAL	**707,161**	**641,293**	**1,347,844**	**439,197**

[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).

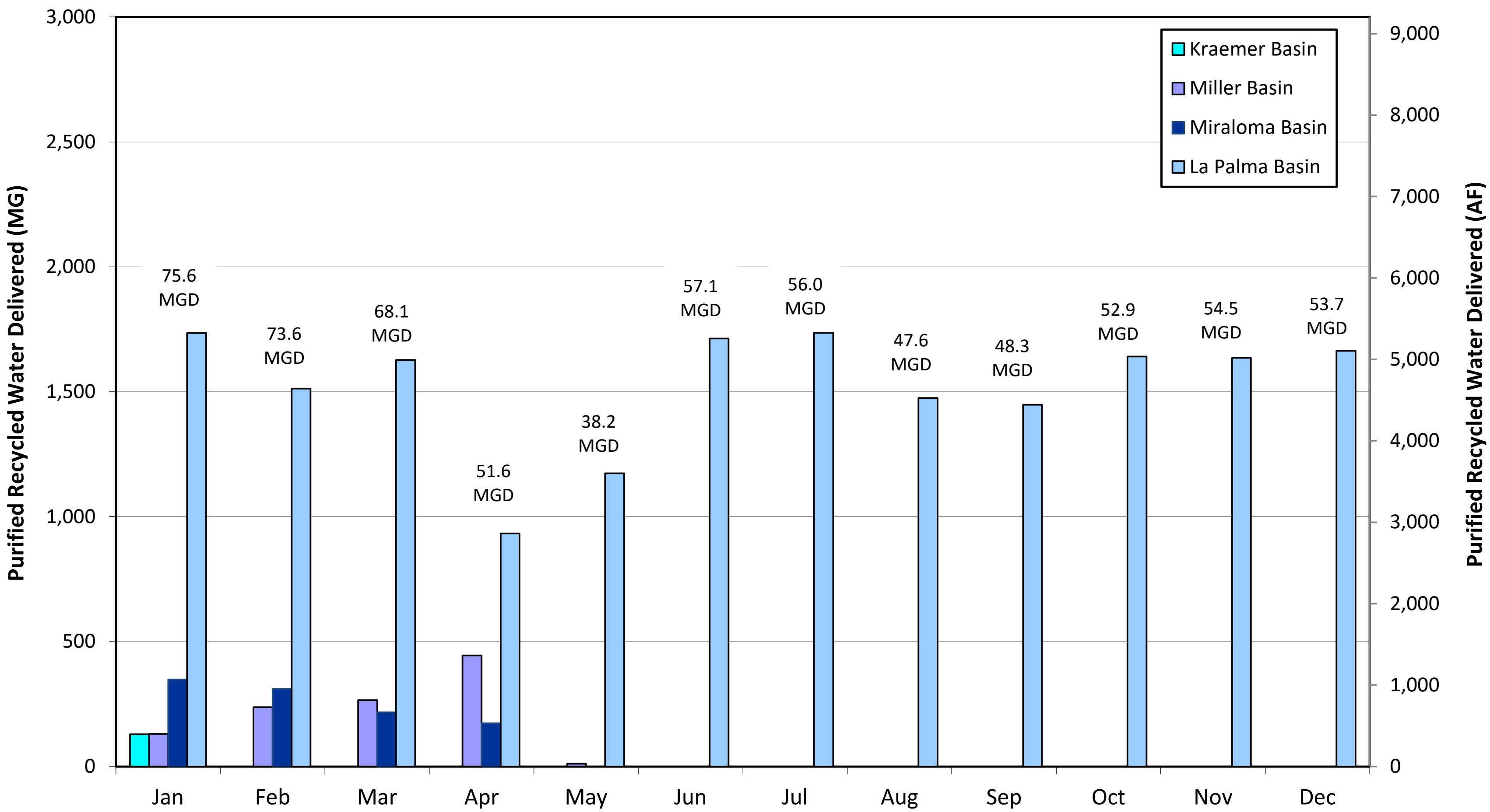
[3] Other water shown for 2015 represents a corrected volume based on OCWD flow records.

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

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

Table 5-5. 2020 Purified Recycled Water Spreading Volumes and Flow Rates

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	396	129	4.2	400	130	4.2	1,070	349	11.2	5,326	1,735	56.0	7,190	2,343	75.6
February	0	0	0.0	728	237	8.5	954	311	11.1	4,642	1,513	54.0	6,325	2,061	73.6
March	0	0	0.0	817	266	8.6	666	217	7.0	4,995	1,628	52.5	6,478	2,111	68.1
April	0	0	0.0	1,363	444	14.8	530	173	5.8	2,860	932	31.1	4,753	1,549	51.6
May	0	0	0.0	34	11	0.4	0	0	0.0	3,601	1,173	37.8	3,635	1,184	38.2
June	0	0	0.0	0	0	0.0	0	0	0.0	5,258	1,713	57.1	5,258	1,713	57.1
July	0	0	0.0	0	0	0.0	0	0	0.0	5,327	1,736	56.0	5,327	1,736	56.0
August	0	0	0.0	0	0	0.0	0	0	0.0	4,526	1,475	47.6	4,526	1,475	47.6
September	0	0	0.0	0	0	0.0	0	0	0.0	4,444	1,448	48.3	4,444	1,448	48.3
October	0	0	0.0	0	0	0.0	0	0	0.0	5,036	1,641	52.9	5,036	1,641	52.9
November	0	0	0.0	0	0	0.0	0	0	0.0	5,018	1,635	54.5	5,018	1,635	54.5
December	0	0	0.0	0	0	0.0	0	0	0.0	5,107	1,664	53.7	5,107	1,664	53.7
TOTAL	**396**	**129**	**0.4**	**3,342**	**1,089**	**3.0**	**3,220**	**1,049**	**2.9**	**56,140**	**18,293**	**50.1**	**63,097**	**20,560**	**56.3**



Note: Average Flow Rate in MGD to All Basins

Figure 5-7. 2020 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 a 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 purpose of the SARWQH Study was to assess the use of SAR water as a recharge source for the Basin because of the treated wastewater component of SAR base 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 2020 marks 13 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 2020:

- 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. With the recent changes to the GWRS Pathogen Log Reduction Requirements (Section 2.3.9, Table 2-9), 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 2020: 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 2020 because of its proximity to the Kraemer Basin recharge site.

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

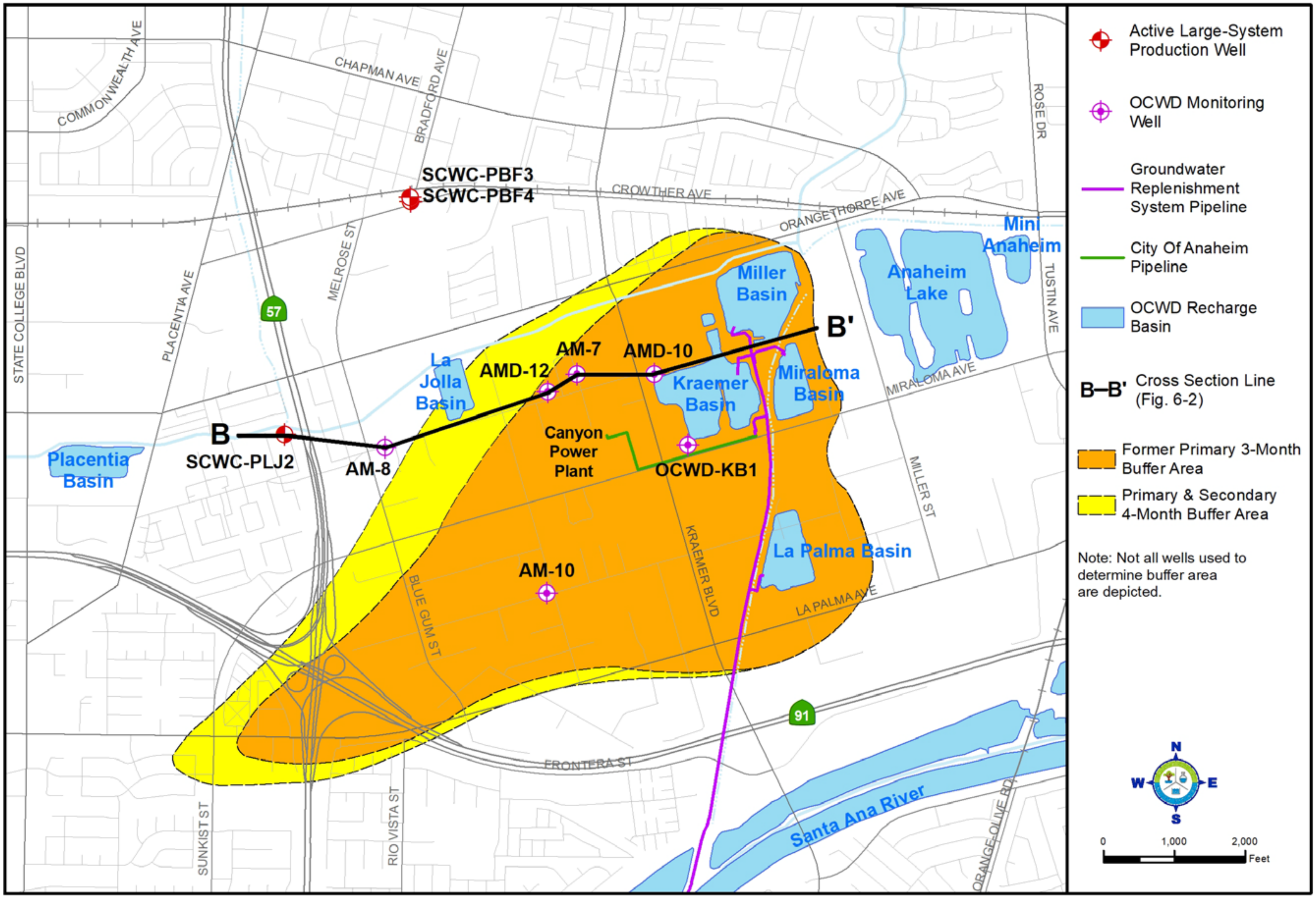


Figure 6-1. Selected Forebay Monitoring Well Locations and Buffer Areas

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, 2020. As shown by the inferred flow arrows on Figure 6-3, the dominant groundwater flow direction was west-southwest away from the recharge basins similar to previous years and also showing the influence of the large recharge volumes at La Palma Basin.

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 2020 contour patterns in Figure 6-3 are fairly similar to those shown for June 2019 presented in last year's Annual Report.

Figure 6-3 shows a prominent mound around La Palma Basin that is more pronounced than around K-M-M Basins because La Palma Basin recharge was significantly greater than the combined recharge from K-M-M Basins in 2020 (Table 5-2). The Shallow aquifer groundwater flow direction was westerly from La Palma Basin towards compliance monitoring well AM-10 in June 2020 for the fourth 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 2020 Shallow aquifer groundwater elevations shown in Figure 6-3 were higher than in June 2019, by approximately 10 feet in the outlying Anaheim Forebay area downgradient of the recharge basins (e.g., at AM-8 and AM-10), by approximately 15 feet surrounding La Palma Basin, and by as much as 20 feet upgradient of K-M-M-L Basins near Anaheim Lake. The June 2020 Shallow aquifer groundwater levels were higher than in June 2019 in the vicinity of the OCWD spreading grounds in Anaheim for the following reasons: (1) increased Basin storage from June 2019 to June 2020, (2) reduced pumping in the Anaheim Forebay during 2020 related to PFAS, and (3) higher recharge from April through June of 2020 as compared to those three months in

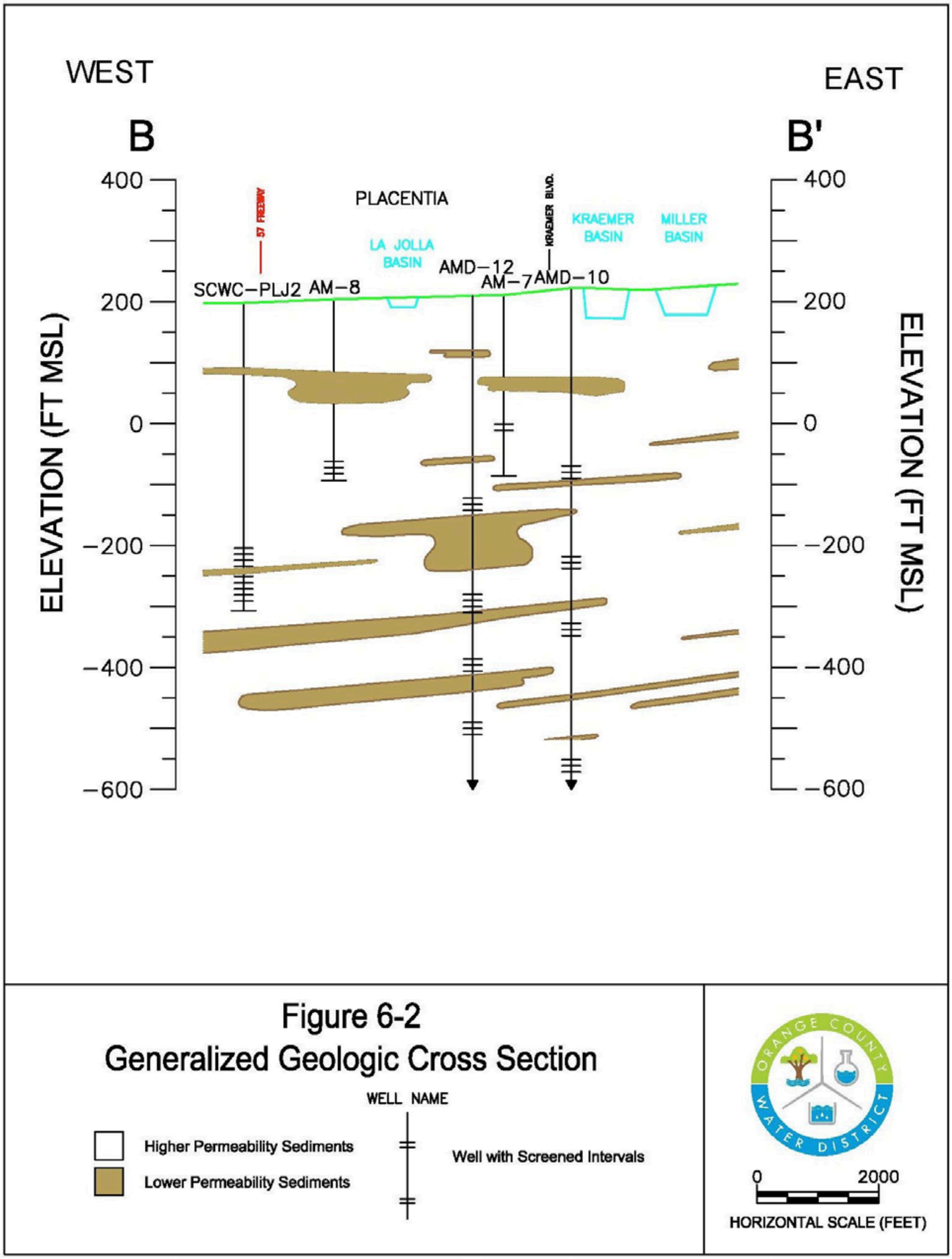


Figure 6-2. Generalized Geologic Cross Section in the Anaheim Forebay

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

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

[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.

2019, even though annual recharge was 14% less in 2020 than in 2019 from the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Table 5-4 and Figure 5-6).

From June 2019 to June 2020, Shallow aquifer groundwater elevations rose by approximately 15 feet near AMD-10 adjacent to Kraemer Basin and by approximately 10 feet farther downgradient near 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 2020 (Figure 6-3) as compared to 25 feet in June 2019, indicating that the gradient in this area steepened by 5 feet. Farther south, the groundwater elevation difference from the northeast corner of La Palma Basin to downgradient compliance well AM-10 was approximately 33 feet in June 2020 (Figure 6-3) as compared to 28 feet in June 2019, indicating that the gradient also steepened by 5 feet along this southerly flow path. The slightly steeper gradients in June 2020 were likely due to higher overall recharge from the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex in April through June of 2020, as well as reduced pumping upgradient of K-M-M-L Basins from the City of Anaheim wells near Anaheim Lake and YLWD related to PFAS.

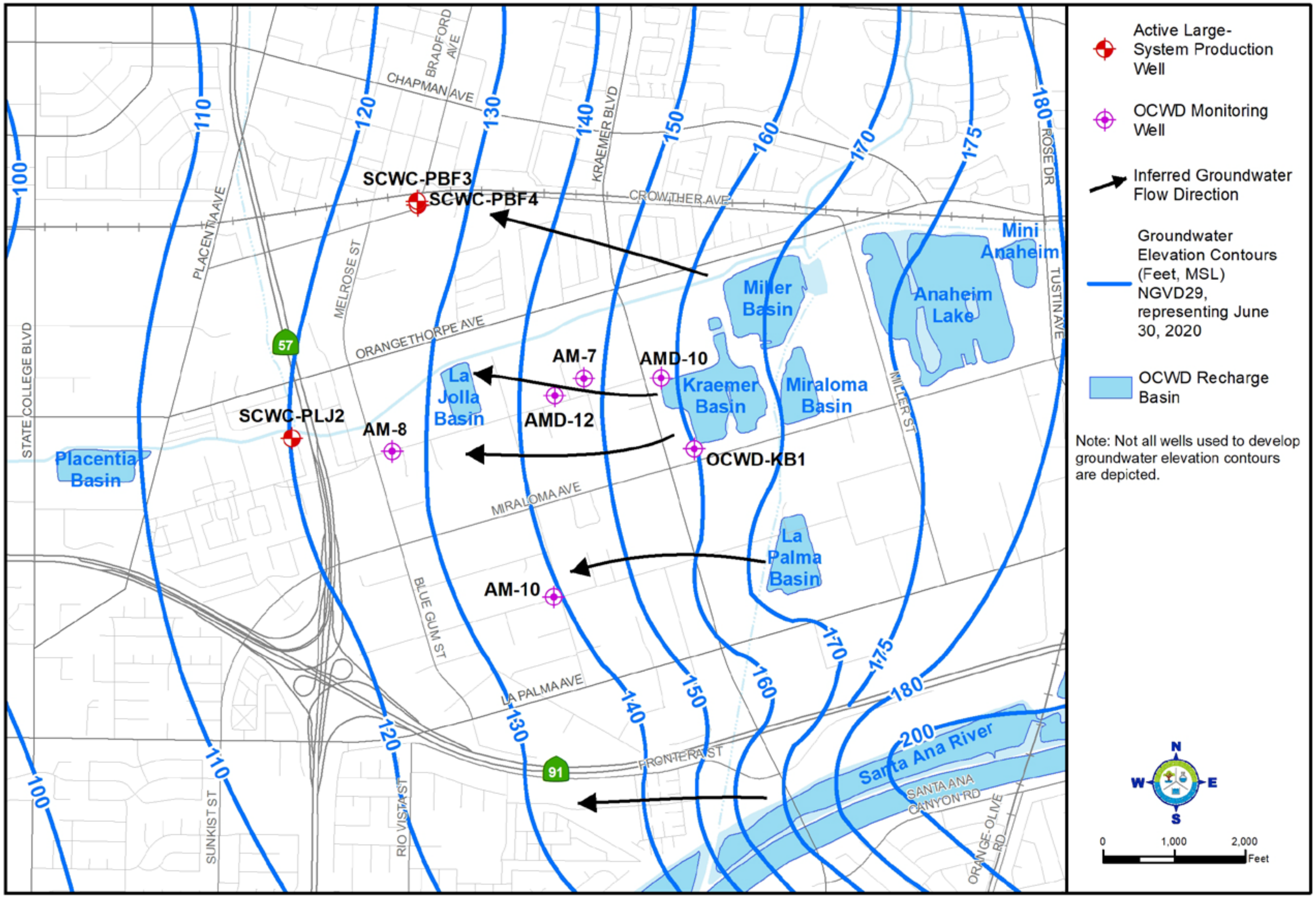


Figure 6-3. Shallow Aquifer Groundwater Elevation Contours and Inferred Groundwater Flow Directions in the Anaheim Forebay Area

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 a 10-year period from 2011-2020. 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 2020, groundwater level trends at all six monitoring wells deviated somewhat from the typical seasonal pattern, continuing to rise throughout the first half of the year later through the spring but then continuing to decline during the second half of the year rather than the typical recovery in the late fall. This continued rise through the first half and continued decline through the second half led to an increase in the seasonal amplitude compared to 2019.

During the first quarter of 2020, groundwater levels rose in January, took a temporary dip in February from relatively low SAR recharge that month (Figure 5-5), associated with lower than normal seasonal rainfall; levels rose again in March due to increased SAR recharge from increased rainfall, with a net first quarter rise of 5 to 10 feet at all six wells.

During the second quarter of 2020, groundwater levels at all six wells rose another 5 to 10 feet overall, with the wells near the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex peaking in late April or May, while the wells farther downgradient (i.e., AM-8 and AM-10) peaked slightly later in June. The continued rise in groundwater levels throughout the second quarter was likely due to late season rainfall in April/May which led to relatively high recharge volumes from April through June (Figure 5-5). The springtime high was approximately 5 to 10 feet higher than the springtime high in 2019 at all six wells.

During the third quarter of 2020, groundwater levels declined sharply by 15 to 20 feet in response to low monthly recharge at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex due to limited SAR flows and no imported MWD replenishment water (Figure 5-5). The decline in groundwater levels was also due to increased basin-wide summertime pumping, even though locally some of the City of Anaheim production wells remained off-line in 2020 related to PFAS.

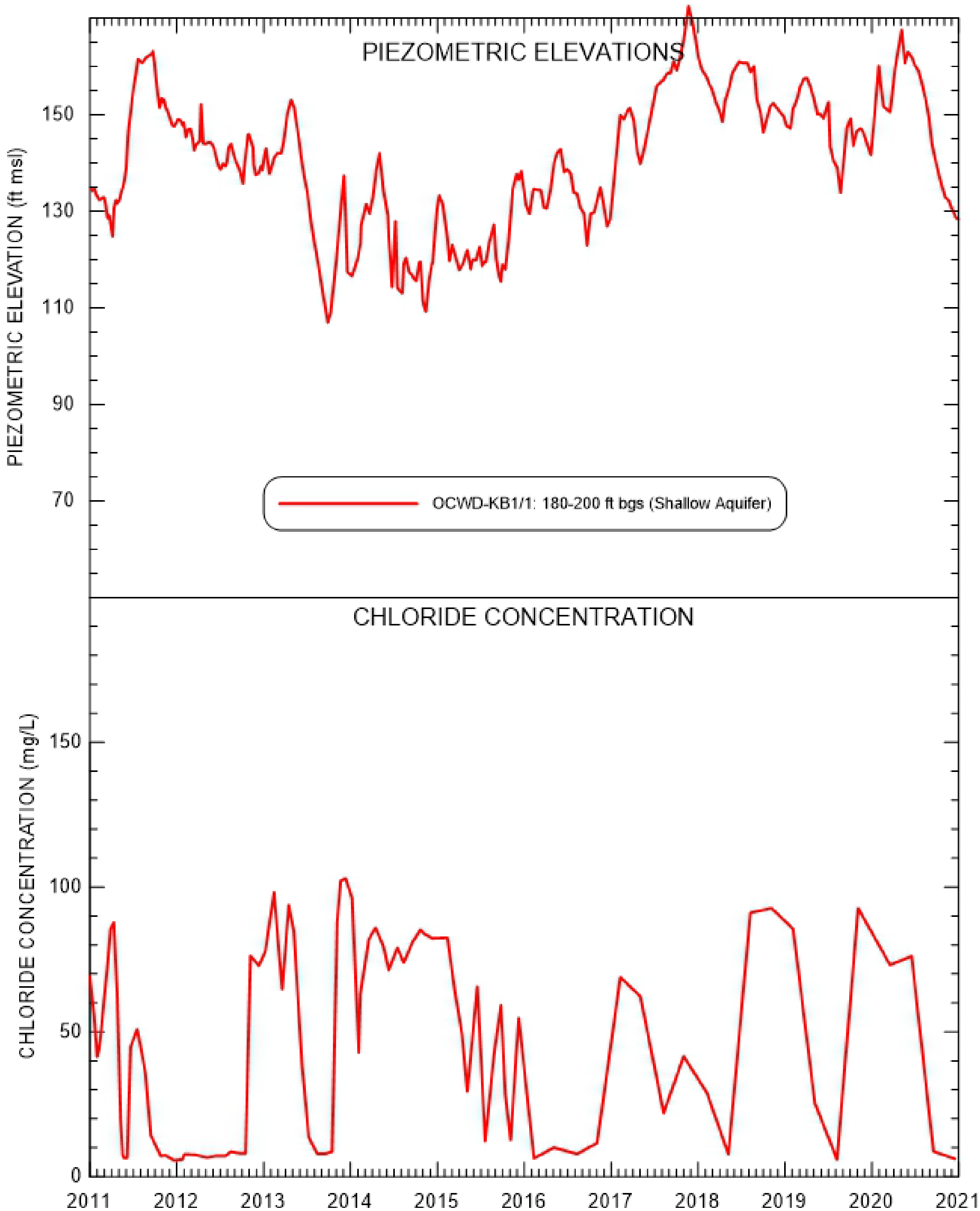


Figure 6-4. Monitoring Well OCWD-KB1 Piezometric Elevations and Chloride Concentration

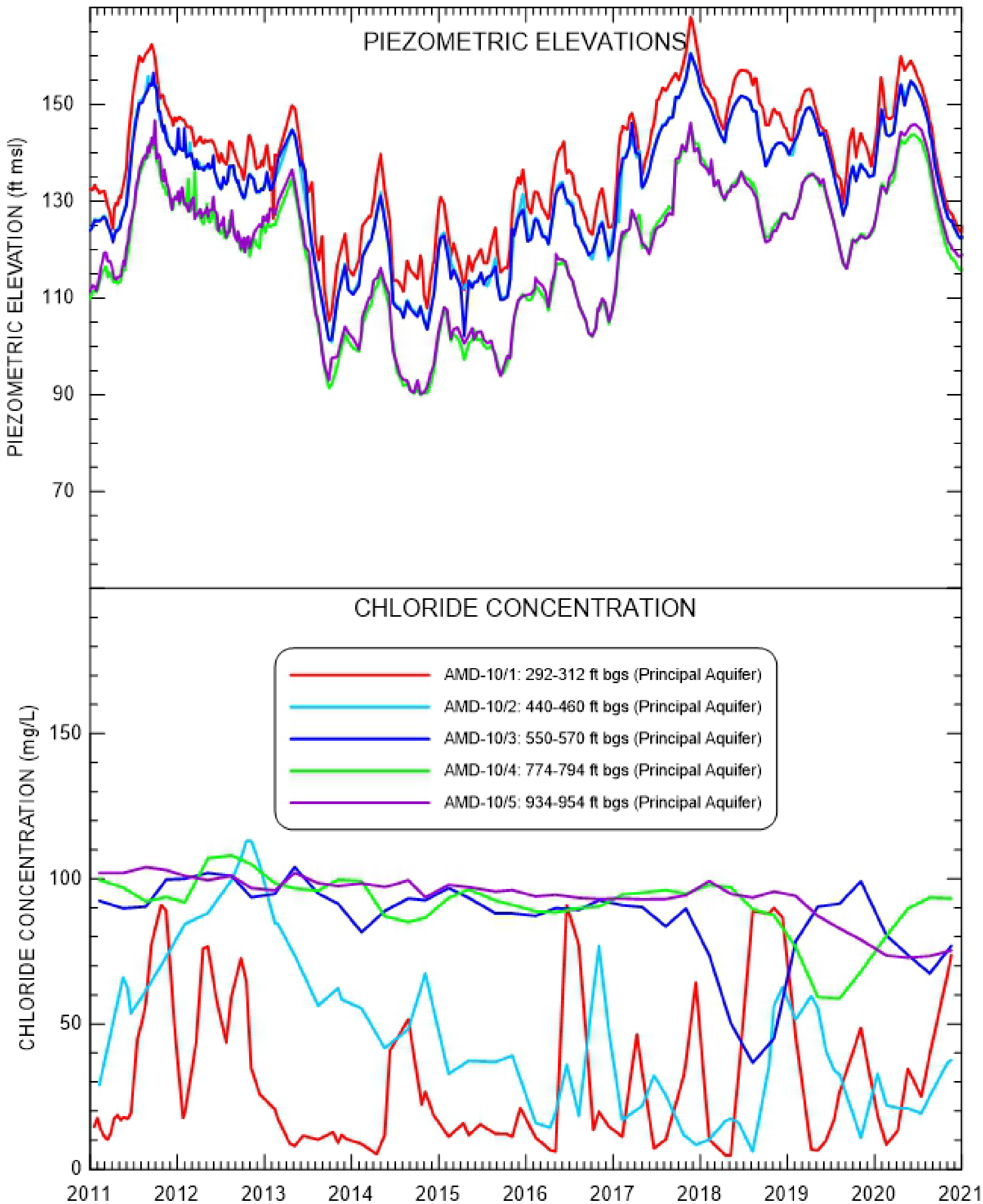


Figure 6-5. Monitoring Well AMD-10 Piezometric Elevations and Chloride Concentration

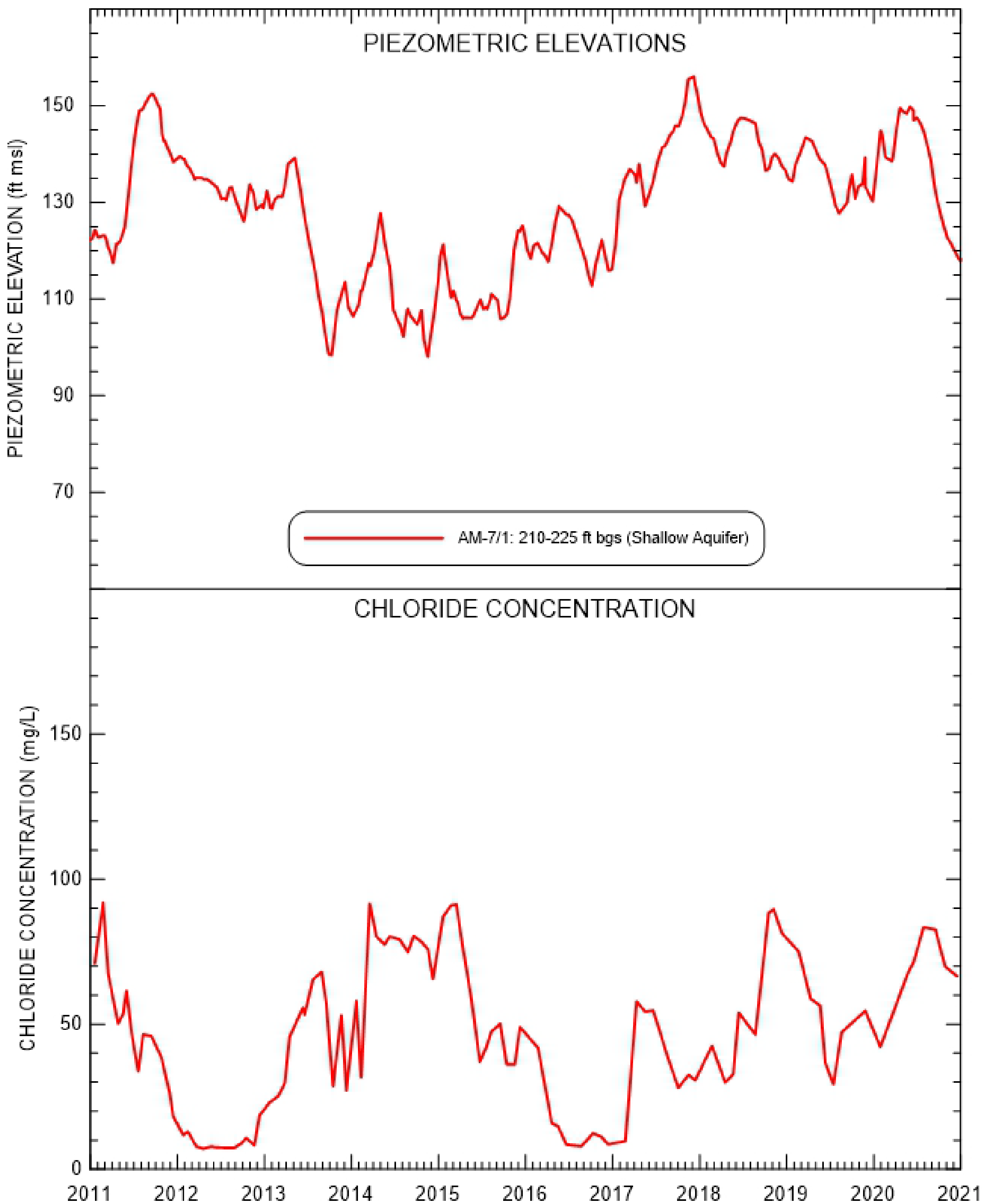


Figure 6-6. Monitoring Well AM-7 Piezometric Elevations and Chloride Concentration

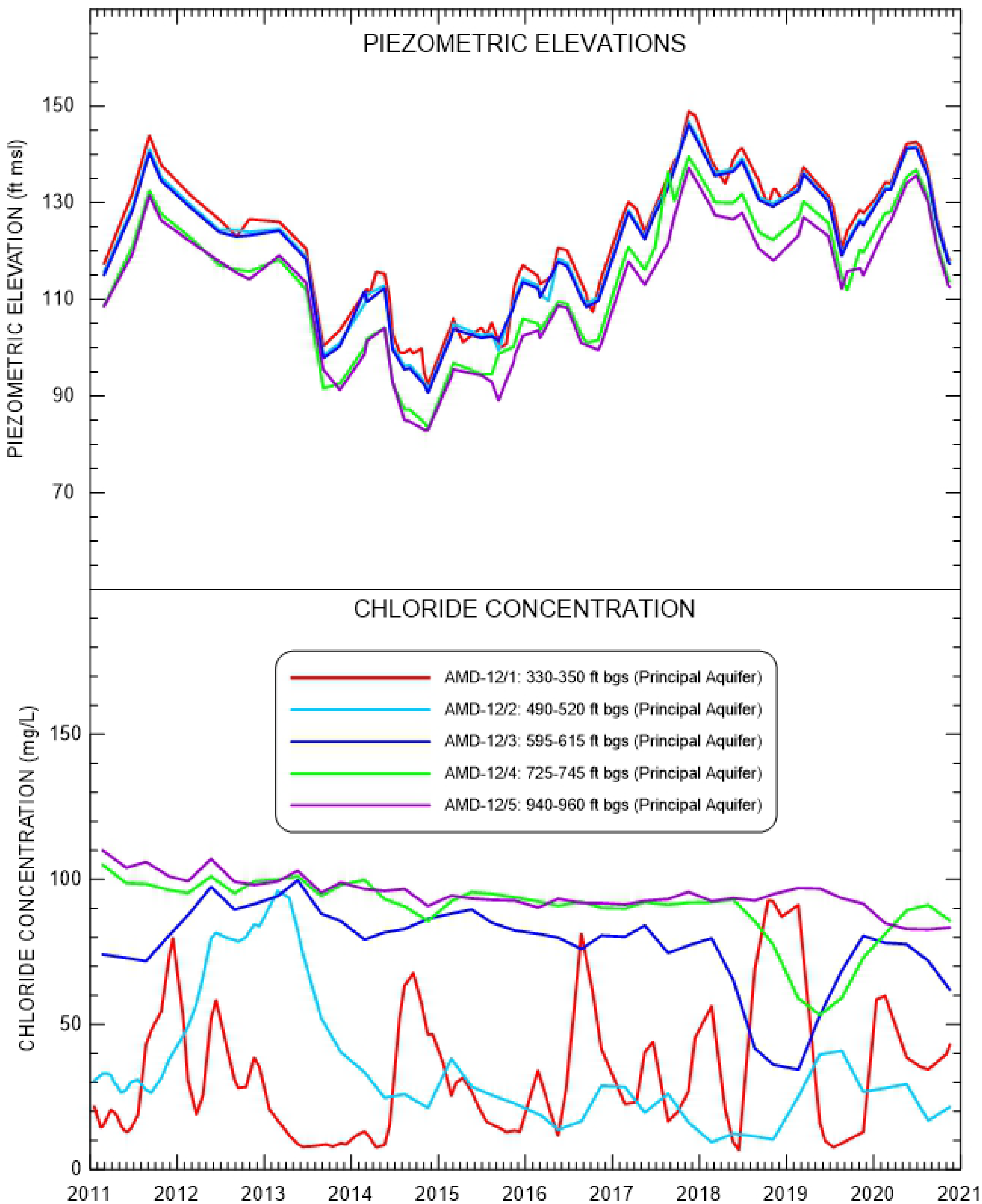


Figure 6-7. Monitoring Well AMD-12 Piezometric Elevations and Chloride Concentration

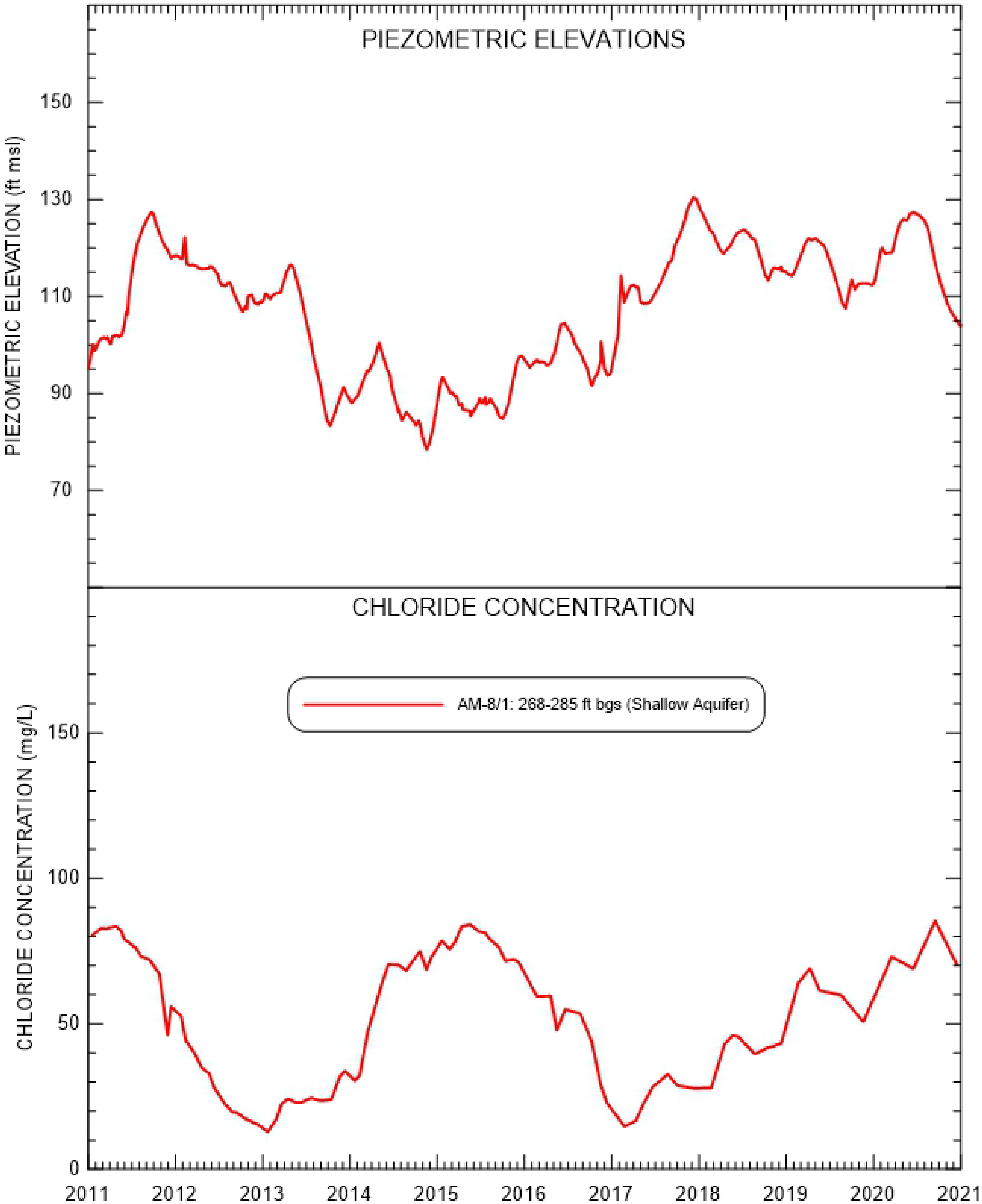


Figure 6-8. Monitoring Well AM-8 Piezometric Elevations and Chloride Concentration

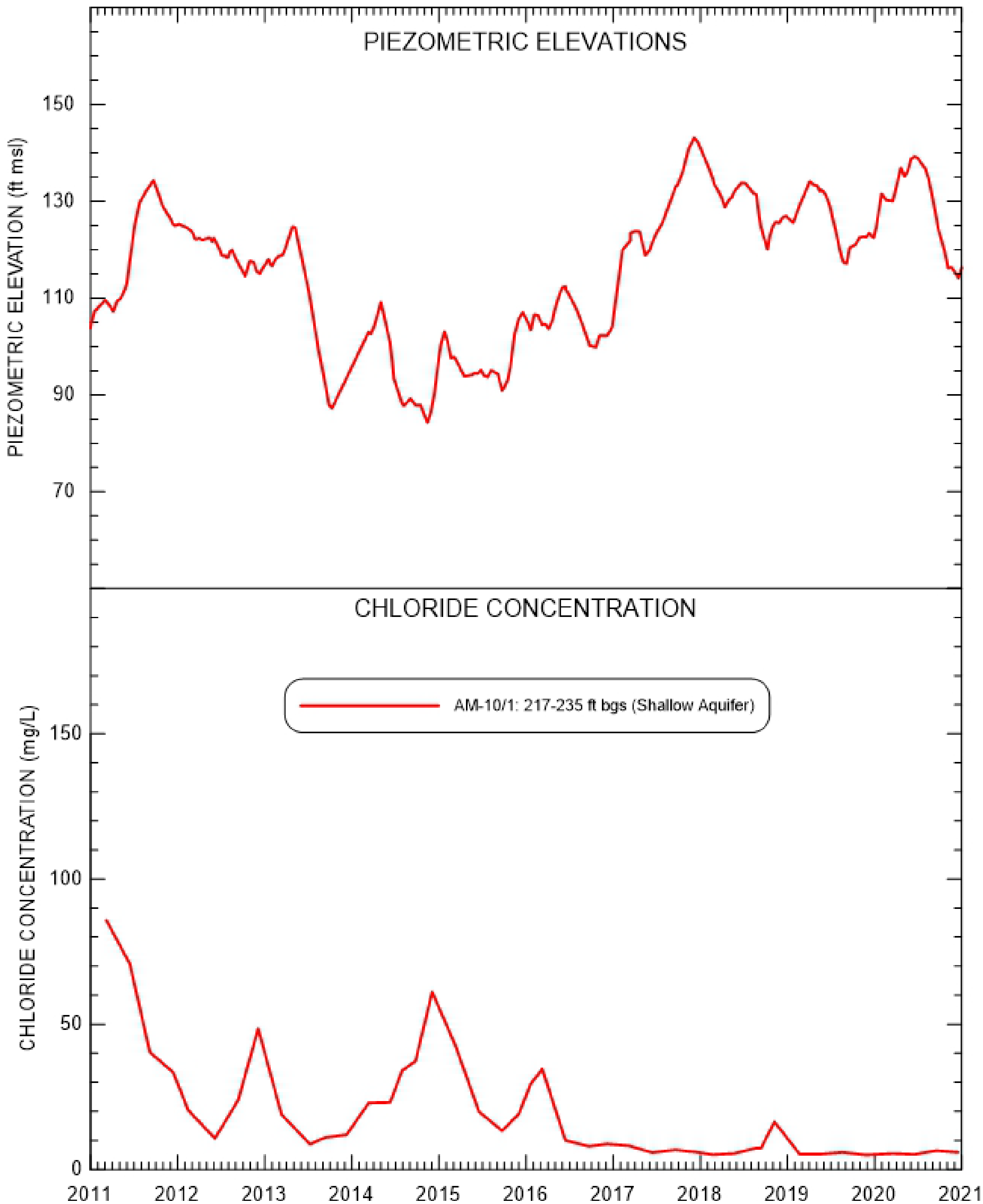


Figure 6-9. Monitoring Well AM-10 Piezometric Elevations and Chloride Concentration

During the fourth quarter of 2020, groundwater levels atypically declined by approximately 10 feet with the annual low occurring at the end of the year rather than in the late summer, as monthly recharge remained relatively low from July through December at the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex (Figure 5-5) due to no purchases of imported MWD replenishment water and limited SAR flows from unusually dry and warm fall conditions. The December 2020 annual low was 5 to 10 feet lower than the summer 2019 annual low.

At all six monitoring wells, groundwater levels at the end of 2020 were approximately 10 to 15 feet lower 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 2020 are presented in Appendix J. General groundwater quality data for the past five years (2016-2020) are 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 2020, 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 2020. During 2020, some of the analyses at monitoring well sites AM-8 and AMD-10 revealed constituents above the EPA Secondary MCL for apparent color, odor, and iron. At monitoring wells AM-8 and AMD-10, iron was detected above the Secondary MCL but dissolved iron concentrations were relatively low and well below the Secondary MCL, confirming that particulate iron from corrosion of the mild steel well casing was likely the primary contributing factor causing the 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 two monitoring well sites. All Secondary MCL exceedances at AM-8 and AMD-10 during 2020 were consistent with the prior monitoring data collected from 2008-2020 and were not associated with the presence of GWRS purified recycled water. Lastly, microbial detections are no longer a reporting requirement as was described in Section 4.4.1.

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 2011-2020 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 2011, 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, especially for wells found to have a discernable travel time of less than three years originating from recharge of GWRS water beginning in January 2008 at Kraemer-Miller Basins.

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 to 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 noticeably 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. 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 to 11 mg/L since 2008 and more recently from 5 to 7 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 2020. 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). Chloride concentrations at OCWD-KB1/1 are dominated by Kraemer Basin recharge with a travel time estimate of approximately three weeks whenever Kraemer Basin recharge volumes are sufficiently large. However, based on past chloride trends discussed in previous Annual Reports, when Kraemer Basin is either empty or operated at a relatively low monthly recharge volume of less than approximately 1,000 AF, GWRS water recharged at Miraloma Basin can migrate laterally downgradient within the Shallow aquifer to OCWD-KB1/1. Figure 6-4 shows that sustained low chloride concentrations of 10 mg/L or less at OCWD-KB1/1 in 2016 indicated the sustained arrival of GWRS water from the large volume of approximately 100% GWRS water recharged in Kraemer Basin that entire year. Chloride concentrations at OCWD-KB1/1 increased 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 in January 2017, thus confirming the approximately one-month travel time from Kraemer Basin.

Figure 6-4 shows that chloride concentrations at OCWD-KB1/1 decreased sharply during the first half of 2019 down to a low of 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 being recharged with low volumes of non-GWRS water averaging less than 1,000 AF per month. This indicates a travel time of approximately four months for Miraloma Basin recharge to arrive at OCWD-KB1/1 in the Shallow aquifer when Kraemer Basin is either off-line or being operated at relatively low monthly recharge volumes of approximately 1,000 AF/month or less. Chloride concentrations at OCWD-KB1/1 subsequently increased to above 90 mg/L by November 2019, once again indicating the shorter approximately one-month arrival time of non-GWRS water recharged in large volumes at adjacent Kraemer Basin from September through November.

Figure 6-4 shows that chloride concentrations remained high at OCWD-KB1/1 during the first half of 2020, due to relatively large non-GWRS recharge volumes in Kraemer Basin from January through June. Chloride concentrations subsequently dropped sharply during the second half of 2020 to a low of 6 mg/L in December, indicating arrival of 100% GWRS water. However, Table 5-2 shows that no GWRS water was recharged at the K-M-M-L Basins during the second half of 2020 except at La Palma Basin. In addition, K-M-M Basins had little or no recharge during that time. Therefore, the GWRS arrival at OCWD-KB1/1 in the Shallow aquifer during the second half of 2020 likely originated from La Palma Basin. A GWRS arrival time of approximately 2 months or less from La Palma Basin to OCWD-KB1/1 was estimated since Kraemer Basin monthly recharge was less than 1,000 AF beginning in July and the low-chloride GWRS signal arrived at OCWD-KB1/1 by September.

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 did not appear to be dominated by Kraemer Basin recharge events since AMD-10/1 is screened in the uppermost zone of the Principal aquifer and therefore deeper than OCWD-KB1/1. During 2017-19 however, chloride concentration trends at AMD-10/1 were very similar to those at the shallower OCWD-KB1/1 discussed above. During the second half of 2020, chloride concentrations at AMD-10/1 increased from low GWRS levels to nearly 50 mg/L, similar to the contemporaneous trend at OCWD-KB1/1 and likely indicating arrival of non-GWRS water from the large volumes recharged at Kraemer Basin from September through November of 2019.

During 2020, Figure 6-5 shows that chloride concentration trends at AMD-10/1 were very different than at OCWD-KB1/1, increasing all year from low GWRS levels to a high of 74 mg/L in November and likely due to Kraemer Basin non-GWRS recharge during the first half of the year. During the second half of 2020, the Anaheim Lake/Mini-Anaheim Lake/K-M-M-L/La Jolla Basins complex had little or no recharge except for La Palma Basin which had a significant amount of 100% GWRS recharge all year. Therefore, under these unusual conditions, Kraemer Basin recharge appeared to arrive at AMD-10/1 in the uppermost Principal aquifer, while GWRS water from La Palma Basin arrived at OCWD-KB1/1 in the Shallow aquifer during the second half of 2020 once Kraemer Basin monthly recharge dropped below 1,000 AF.

In prior years when both Kraemer and Miraloma Basins were fully operational, chloride concentrations at AMD-10/1 typically indicated arrival of GWRS recharge from upgradient Miraloma Basin due to hydraulic interference of Kraemer Basin recharge in the Shallow aquifer forcing Miraloma Basin recharge to migrate vertically into the uppermost Principal aquifer prior to migrating westward beneath Kraemer Basin.

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. Consistent with this pattern, Figure 6-6 shows the sustained arrival of GWRS water at AM-7/1 during the second half of 2016 based on low chloride concentrations remaining at or near GWRS levels during that time, nearly identical to the chloride trend at OCWD-KB1/1 (Figure 6-4) but lagged by 2 to 3 months.

During 2020, chloride concentration trends at AM-7/1 (Figure 6-6) were somewhat different than at OCWD-KB1/1 (Figure 6-4) likely due to the unusually low recharge conditions at the Anaheim Lake/Mini-Anaheim Lake/K-M-M/La Jolla Basins complex during the second half of the year. However, closer inspection of the trends still suggested a lag of 2 to 3 months from OCWD-KB1/1. Chloride concentrations at AM-7/1 increased during the first half of 2020 and remained high above 80 mg/L until September, whereas OCWD-KB1/1 chloride concentrations remained high until June. The subsequent small decline in chloride concentrations at AM-7/1 down to 67 mg/L in the fourth quarter was much more dampened than the large decline down to low GWRS levels at OCWD-KB1/1 during the second half of 2020 but could possibly indicate a small percentage of GWRS arrival from La Palma Basin at AM-7/1 approximately 2 to 3 months later than occurred at OCWD-KB1/1.

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. During 2019, chloride concentrations at AMD-12/1 decreased sharply from May down to low GWRS levels through August, correlative with a similar chloride decline to GWRS levels at AMD-10/1 (Figure 6-5) three months prior. Chloride concentrations at AMD-12/1 subsequently rose from the fourth quarter of 2019 to February 2020, consistent with the same trend at AMD-10/1 but once again lagged by approximately three months. Chloride concentrations at AMD-12/1 decreased to a low of 34 mg/L in August 2020 and thus were lagged by as much as 6 months from the corresponding low at AMD-10/1 in February 2020, suggesting a slower flow path likely due to the unusually low recharge volume from K-M-M Basins from May through August of 2020. Chloride concentrations at AMD-12/1 began to increase slightly in the fourth quarter of 2020, likely correlated to the larger increase at AMD-10/1 several months prior.

At AM-8/1 screened in the Shallow aquifer (screened from 268 to 285 ft bgs) and located the farthest downgradient from K-M-M-L Basins (Figure 6-3), chloride concentration trends are consistent with those at AM-7/1 but lagged by about 2 months and slightly more dampened due to dispersive transport along this more distant flow path. For example, Figure 6-8 shows that chloride concentrations at AM-8/1 declined during late 2016 to a low of 15 mg/L by early 2017, indicating a relatively large proportion of GWRS water but less than 100% and exhibiting a weaker GWRS signal that did not appear to be sustained for as long as the corresponding event at AM-7/1 approximately 2 months prior. Given the estimated travel time of 5 to 6 months for Kraemer Basin recharge to arrive at AM-8/1, the 2016 and early 2017 chloride concentration decline was due to the consistent recharge of nearly 100% GWRS water in Kraemer Basin from the second half of 2015 and throughout most of 2016.

During 2020, chloride concentrations at AM-8/1 rose to a high of 85 mg/L by September, before decreasing slightly during the fourth quarter to 70 mg/L in December, once again similar to but more dampened than the chloride response at AM-7/1 approximately two months prior. Based on the estimated travel time of 3 to 4 months at AM-7/1 and 5 to 6 months at AM-8/1, the analogous chloride increase at both wells during 2020 was consistent with the large volumes of non-GWRS recharge at Kraemer Basin from September to November of 2019 and also during the first five months of 2020. As previously discussed for AM-7/1, the similarly slight decrease in chloride concentrations at AM-8/1 in the fourth quarter of 2020 may possibly indicate a small percentage of GWRS water from La Palma Basin arriving at this well due to the unusually low recharge conditions at the Anaheim Lake/Mini-Anaheim Lake/K-M-M/La Jolla Basins complex during the second half of 2020.

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 have been low and stable below 10 mg/L since the second half of 2016 (except for a brief uptick in November 2018), indicating approximately 100% sustained GWRS water arrival at this well in the Shallow aquifer during that time. The brief uptick in chloride concentrations at AM-10/1 to 16 mg/L in November 2018 denoted the first arrival of some percentage of non-GWRS water at AM-10/1 since the commencement of La Palma Basin and likely resulting from no GWRS recharge at La Palma Basin two months prior during September 2018 (when there were no GWRS flows to K-M-M-L Basins). 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. A two-month first arrival time from either Kraemer Basin or La Palma Basin to AM-10/1 represents a groundwater velocity of 50 feet per day along these two flow paths.

At the slightly deeper 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 were 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.

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 2014-2020 but were somewhat dampened and lagged by approximately 3 to 5 months (Figure 6-5). Chloride concentrations at AMD-10/2 decreased to just below 10 mg/L for the first time in December 2017, signifying the first arrival of near-100% GWRS water at this well; chloride concentrations then decreased further down to GWRS concentrations of 6 mg/L in August 2018. The chloride concentration increase at AMD-10/2 during late 2018 and early 2019 was also consistent with but dampened from the sharp chloride increase at AMD-10/1 approximately 3 to 4 months prior. During the first half of 2020, chloride concentrations at AMD-10/2 decreased slightly down to 19 mg/L by July, before increasing in the second half of 2020 to 38 mg/L in November, once again consistent with but more dampened than the chloride trend at AMD-10/1 about 3 to 5 months prior.

At AMD-10/3 (screened from 550 to 570 ft bgs), Figure 6-5 shows that chloride concentrations had remained relatively stable and high ranging from approximately 90 to 120 mg/L over the last several years and did not appear to be noticeably affected by GWRS recharge until 2018 when chloride concentrations decreased significantly for the first time to a new historical low of 37 mg/L by the third quarter of 2018, indicating the first arrival of a significant percentage of GWRS water at this deeper well. This appears to support that during the high groundwater conditions of 2017 and 2018 (upper graph on Figure 6-5) possibly aided by the addition of La Palma Basin in late 2016, GWRS recharge at Miraloma Basin may vertically migrate deeper 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 2019, chloride concentrations at AMD-10/3 increased all year and reached nearly 100 mg/L in November back up to background levels, possibly due to unusually low recharge volumes in Miraloma Basin from May through September of 2019. During 2020, chloride concentrations at AMD-10/3 decreased slightly during the first three quarters to 67 mg/L, likely indicating a small percentage of GWRS recharge arrival at this well once again due to the larger GWRS recharge volumes in Miraloma Basin from late 2019 through early 2020.

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 2014-2020 but were significantly dampened and delayed by approximately 5 to 6 months. Chloride concentrations at AMD-12/2 dropped just below 10 mg/L in February 2018, representing a new historical low and the first occurrence of near-100% GWRS water at this well as occurred at the analogous AMD-10/2 (Figure 6-5) two months prior. Chloride concentrations at AMD-12/2 remained low and stable for the rest of 2018 at near-GWRS levels but then increased to 41 mg/L during the first three quarters of 2019, once again consistent but dampened from the larger chloride increase at AMD-12/1 approximately 5 to 6 months prior. During 2020, chloride concentrations at AMD-12/2 rose almost imperceptibly during the first half and then had a subtle decrease in the second half, consistent with but much more dampened than the response at AMD-12/1 approximately 5 to 6 months prior.

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. While AMD-12/3 appeared to show some arrival of GWRS recharge from Kraemer-Miller Basins during 2009-2012, chloride concentration trends since 2012 have been too subtle to estimate a reliable groundwater travel time to this well. Similar to the analogous AMD-10/3 but lagged by approximately three months, chloride concentrations at AMD-12/3 declined significantly during 2018 from background levels of approximately 80 mg/L in the first quarter to a new historical low of 36 mg/L in the fourth quarter, thus signaling arrival of the largest percentage of GWRS water to have arrived at this well. As was discussed above for AMD-10/3, this appears to support that GWRS recharge at Miraloma Basin vertically migrated into successively deeper Principal aquifer zones during 2017-18 when groundwater levels were unusually high in the vicinity of the Anaheim Forebay spreading grounds and aided by the addition of large recharge volumes into La Palma Basin since November 2016. The higher groundwater levels likely caused more mounding in the shallower aquifer zones, allowing vertical migration into the deeper Principal aquifer zones to become the path of least resistance. During 2019, chloride concentrations at AMD-12/3 increased all year and reached 80 mg/L in November back up to near-background levels, before declining slightly throughout 2020 down to 62 mg/L in November. This increasing chloride trend in 2019 and milder decline in 2020 was again similar to the chloride trend at the analogous AMD-10/3 approximately three months prior.

At the deep 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 to 110 mg/L until the second half of 2018 when chloride concentrations began to finally decrease enough to signal the arrival of some percentage of GWRS water. At both wells, chloride concentrations decreased significantly down to below 60 mg/L from mid-2018 to mid-2019, before rising again during the second half of 2019 and throughout 2020 back up to near-background levels by the second half of 2020. This chloride decline and subsequent rise at both AMD-10/4 and AMD-12/4 are similar to but more dampened than the analogous chloride trends at their shallower counterparts AMD-10/3 and AMD-12/3 and are lagged by 3 to 6 months, likely indicating arrival of the same GWRS pulse in these deeper zones. Assuming this represents the first notable percentage of GWRS water at both AMD-10/4 and AMD-12/4 leads to an upper-end maximum arrival time of approximately 6 years if originating from Miraloma Basin (which came on-line in July 2012). Based on the flow path discussions above for the somewhat shallower Principal aquifer zones at AMD-10/3 and AMD-12/3, a low-end minimum arrival time could be as fast as 2 years if this deeper vertical flow path from Miraloma Basin did not begin until La Palma Basin came on-line in late 2016, causing hydraulic interference in the shallower aquifer zones and thus driving Miraloma Basin recharge down to these greater depths at AMD-10/4 and AMD-12/4.

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 for several years 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, likely related to but more dampened and lagged by approximately one year than the slightly shallower AMD-10/4 and indicating arrival of a small percentage of GWRS water. At AMD-12/5, Figure 6-7 shows a similar but slightly more dampened chloride decline from mid-2019 down to 83 mg/L by mid-2020, likely indicating some small percentage of GWRS water to this deep well, with the chloride decline also lagged by approximately one year from its shallower counterpart at AMD-12/4. This would lead to an arrival time range of approximately 3 to 7 years to AMD-10/5 and AMD-12/5 assuming a similar flow path from Miraloma Basin but lagged by approximately one year from their slightly shallower counterparts at AMD-10/4 and AMD-12/4 discussed above.

Independent groundwater age estimates developed for this deeper (greater than 900 ft bgs) aquifer zone using tritium/helium age dating indicated average groundwater ages on the order of 10 years or greater (LLNL, 2004). However, these ages were based on the historical recharge operations of that time and thus did not include Miraloma or La Palma Basins, which appear to have reduced the vertical travel time in this area by causing mounding or hydraulic resistance in the shallower aquifer zones and thereby making vertical transport the path of least resistance.

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 2020, either non-detect, low stable concentrations, or decreases in total arsenic were generally observed in all these monitoring wells, with the following exceptions:

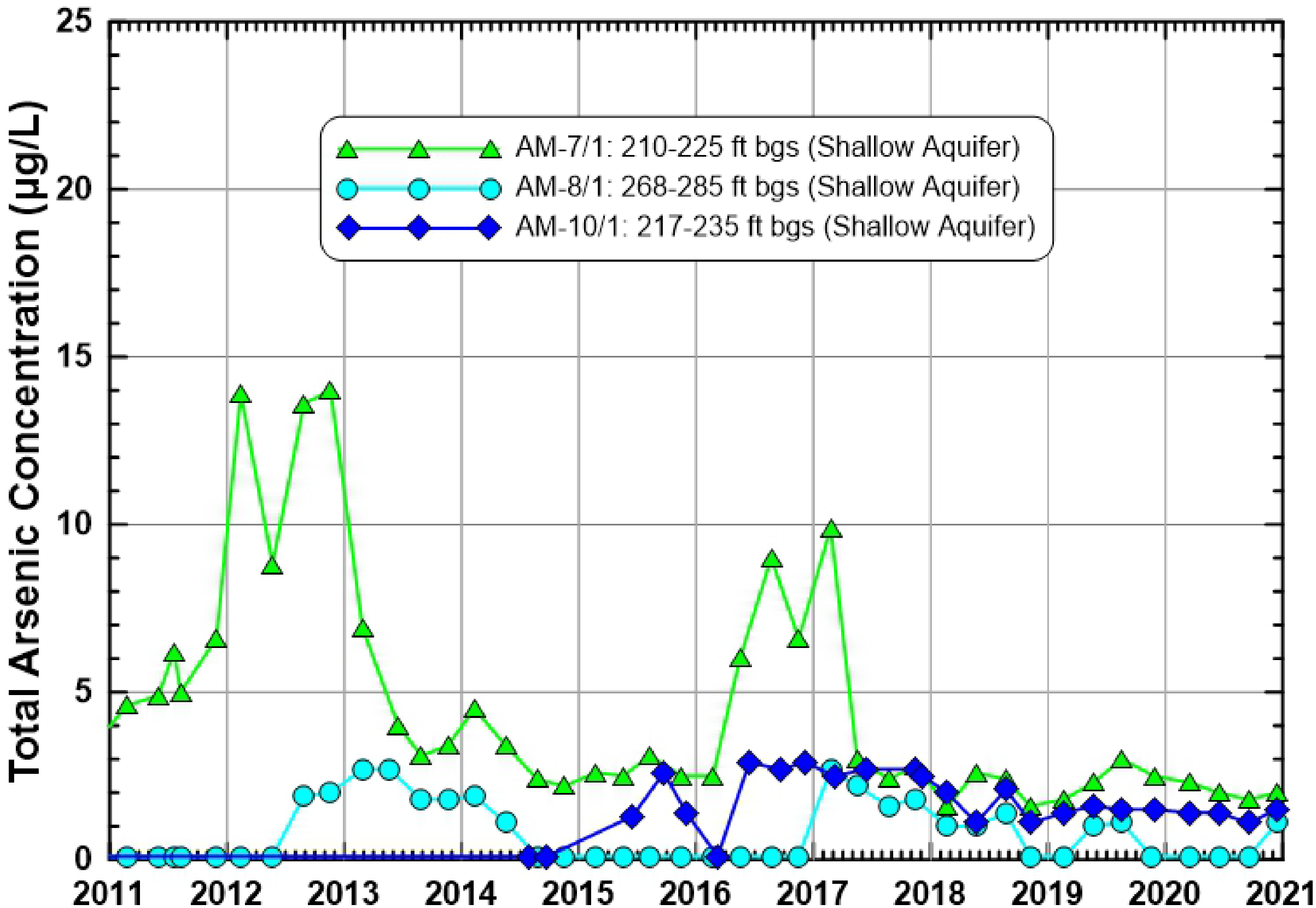


Figure 6-10. Monitoring Wells AM-7 and AM-8 Total Arsenic Concentrations

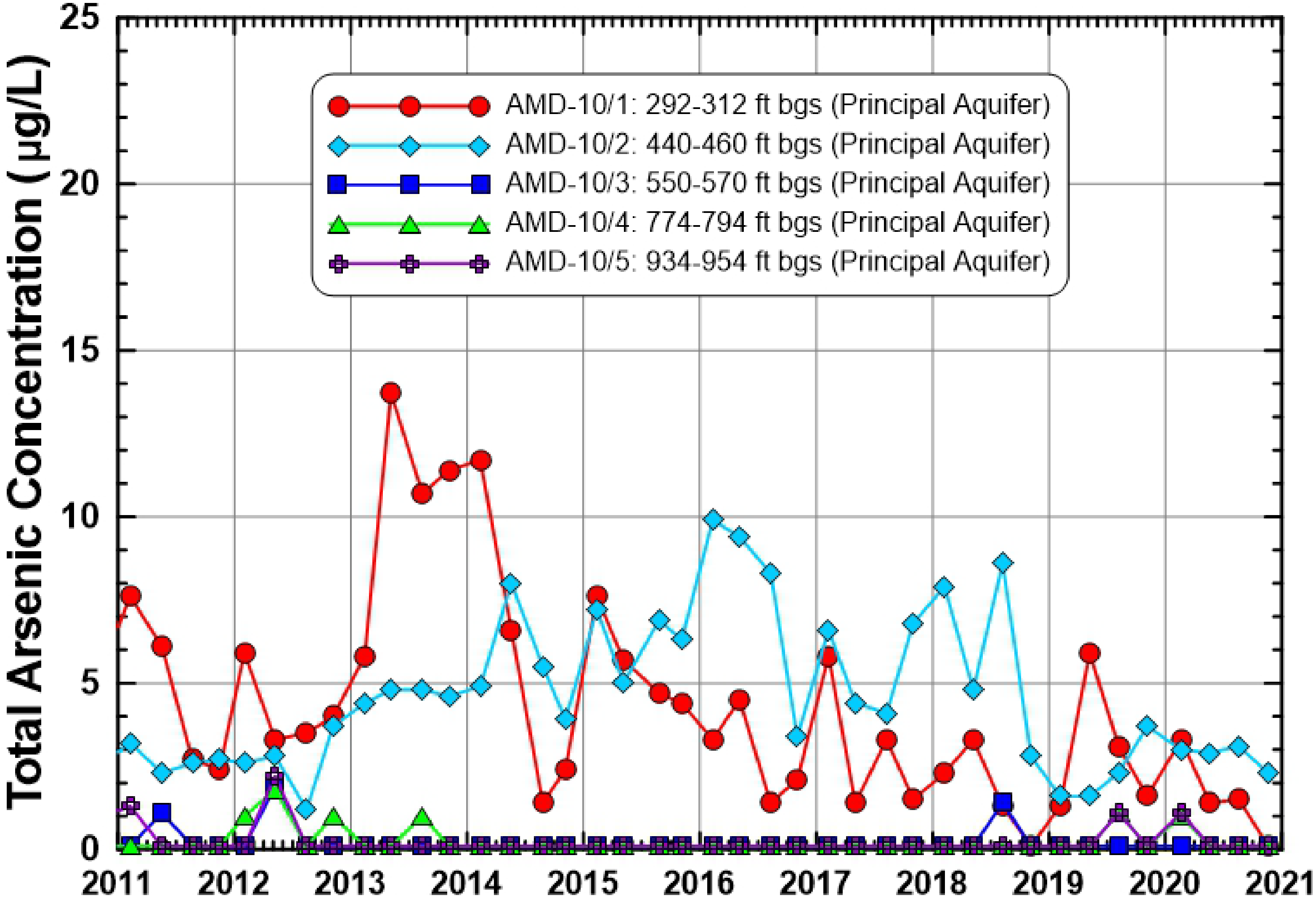


Figure 6-11. Monitoring Well AMD-10 Total Arsenic Concentrations

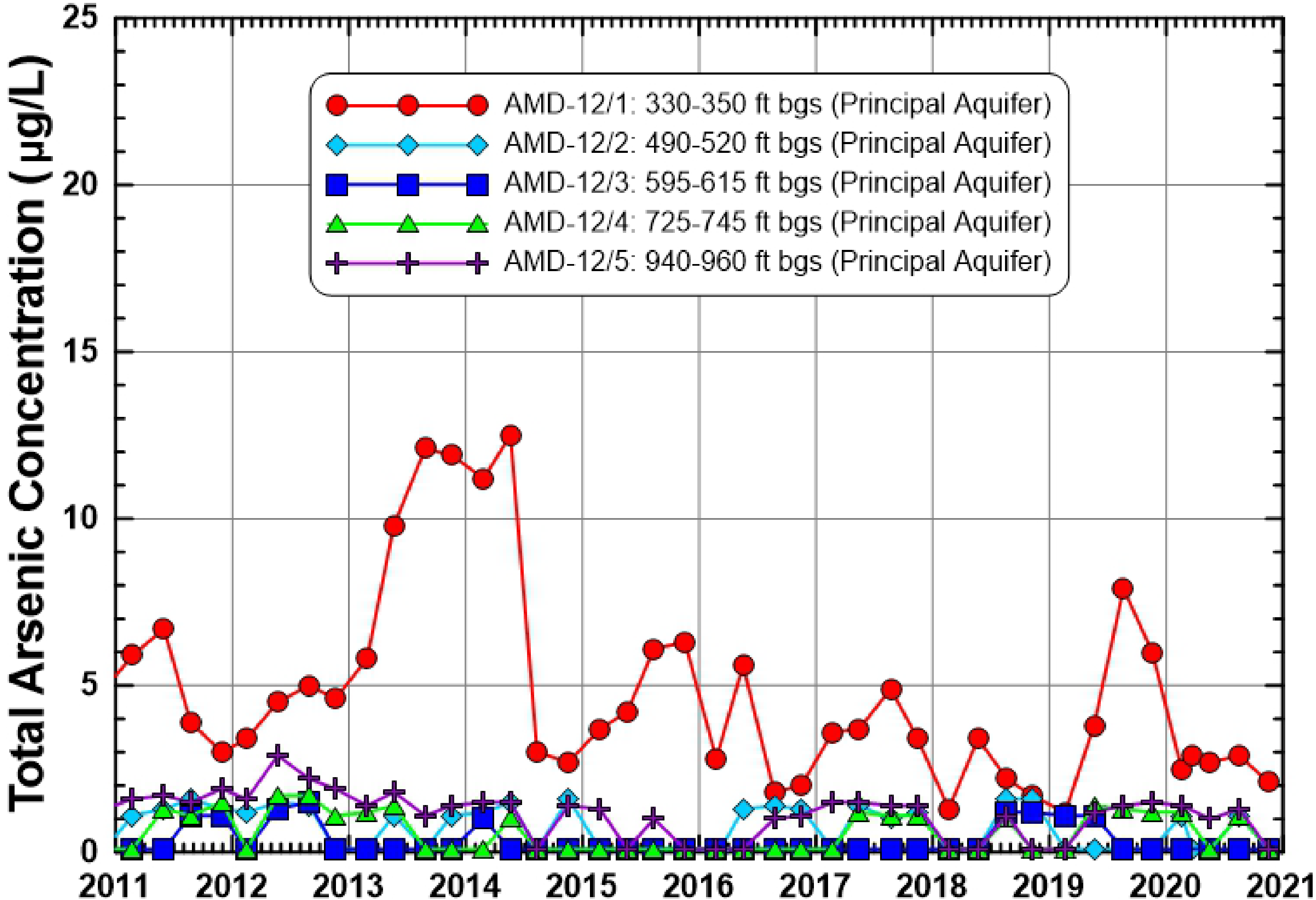


Figure 6-12. Monitoring Well AMD-12 Total Arsenic Concentrations

- AMD-10/1 – increased slightly to 3.3 µg/L in the first quarter of 2020, then decreased the remainder of the year down to below the RDL of 1 µg/L in the fourth quarter;
- AMD-12/1 – decreased sharply from a third quarter 2019 high of 7.9 µg/L down to 2.5 µg/L in the first quarter of 2020, then increased almost imperceptibly to 2.9 µg/L by the third quarter before decreasing slightly to 2.1 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 at least bimonthly, as compared to the quarterly compliance monitoring 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 (e.g., 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).

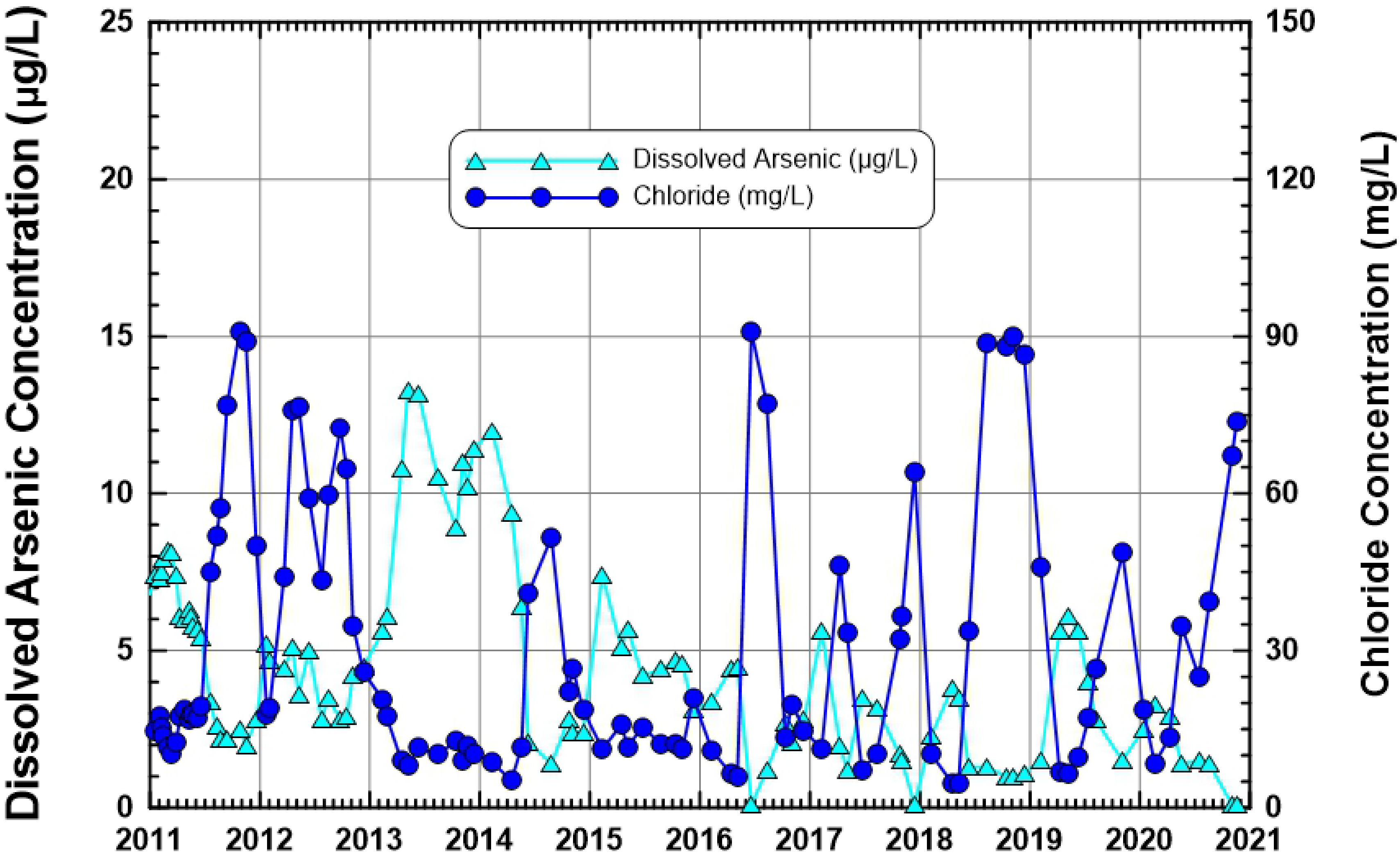


Figure 6-13. Monitoring Well AMD-10/1 Chloride and Dissolved Arsenic Concentrations

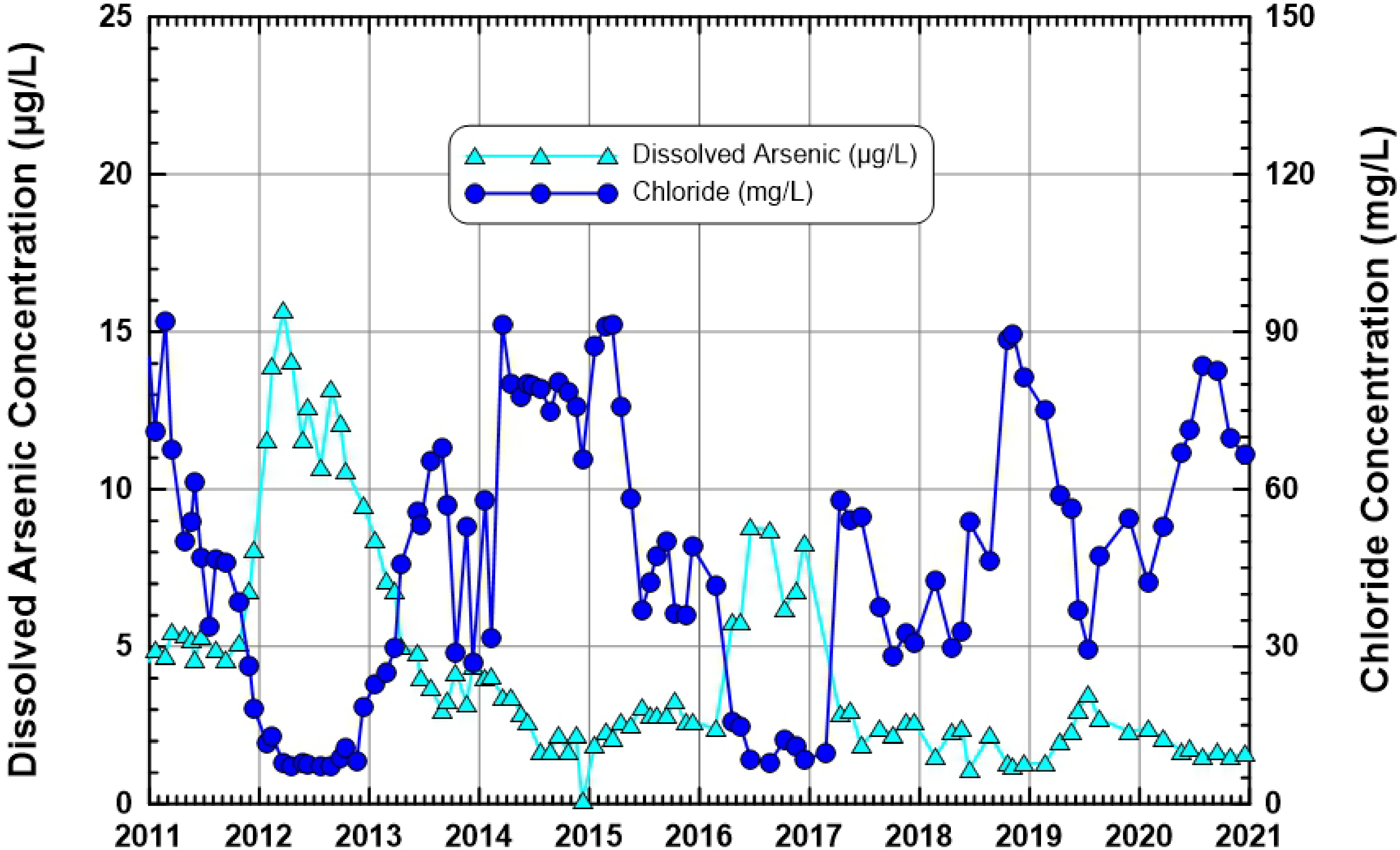


Figure 6-14. Monitoring Well AM-7 Chloride and Dissolved Arsenic Concentrations

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 in November 2020, 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 likely coincided with the arrival of other recharge sources as indicated by the contemporaneous chloride increase in all four cases (Figure 6-13). Similarly, dissolved arsenic concentrations at AM-7/1 (Figure 6-14) 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 previously cleaned 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 down 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 decreased during 2017-18 down to 1.2 µg/L in the fourth quarter of 2018, likely due to the arrival of other recharge sources as indicated by the contemporaneous higher chloride concentrations at this well. Dissolved arsenic concentrations at AM-7/1 peaked at 3.5 µg/L in mid-2019, consistent with a contemporaneous chloride concentration decrease at that well 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 2020, dissolved arsenic concentrations continued to gradually decline down to 1.5 µg/L by the fourth quarter, consistent with the contemporaneous chloride increase in that well indicating the arrival of other recharge sources.

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, as well as the subtle arsenic peak in early 2020 at AMD-10/1, 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.

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 the post-treatment operations.

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 2020 water quality data at large system production well SCWC-PLJ2, which complied with all federal and state drinking water standards in 2020.

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.

Table 6-3. 2020 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	47.2 (32.9 - 56.4)	ND	304 (244 - 362)	0.88 (0.71 - 1.08)	ND	0.23 (0.16 - 0.28)	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

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 2020; 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 2020, there were also no detections of either NDMA or 1,4-dioxane at SCWC-PLJ2 (Table 6-3).

7. MBI PROJECT OPERATIONS

The MBI Project was implemented in two parts: DMBI Project and MBI Centennial Park Project (See Figure 1-1). Operation of these two project facilities is presented in this section:

- MBI Project total injection water source, volumes and flow rates;
- DMBI Project facilities and operations that began on April 15, 2015; and
- MBI Centennial Park Project facilities and operations that began on March 18, 2020.

The DMBI Project was intended to provide operational and groundwater quality data to support the engineering design and 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 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 2020. 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 2,782 MG (8,536 AF) of purified recycled water was injected at the MBI Project wells during 2020. A minor volume of approximately 8.5 MG (26 AF) was pumped from the MBI wells during 2020 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 2020 represented only 0.3% of total MBI injection. Monthly quantities of GWRS purified recycled water injected and backwash water pumped at the MBI Project (all five wells) are summarized in Table 7-1 and illustrated on Figure 7-2. These quantities do not include minor volumes injected or pumped from the four Centennial Park wells (MBI-2, MBI-3, MBI-4, and MBI-5) related to commissioning and start-up testing prior to commencement of full operations on March 18, 2020.

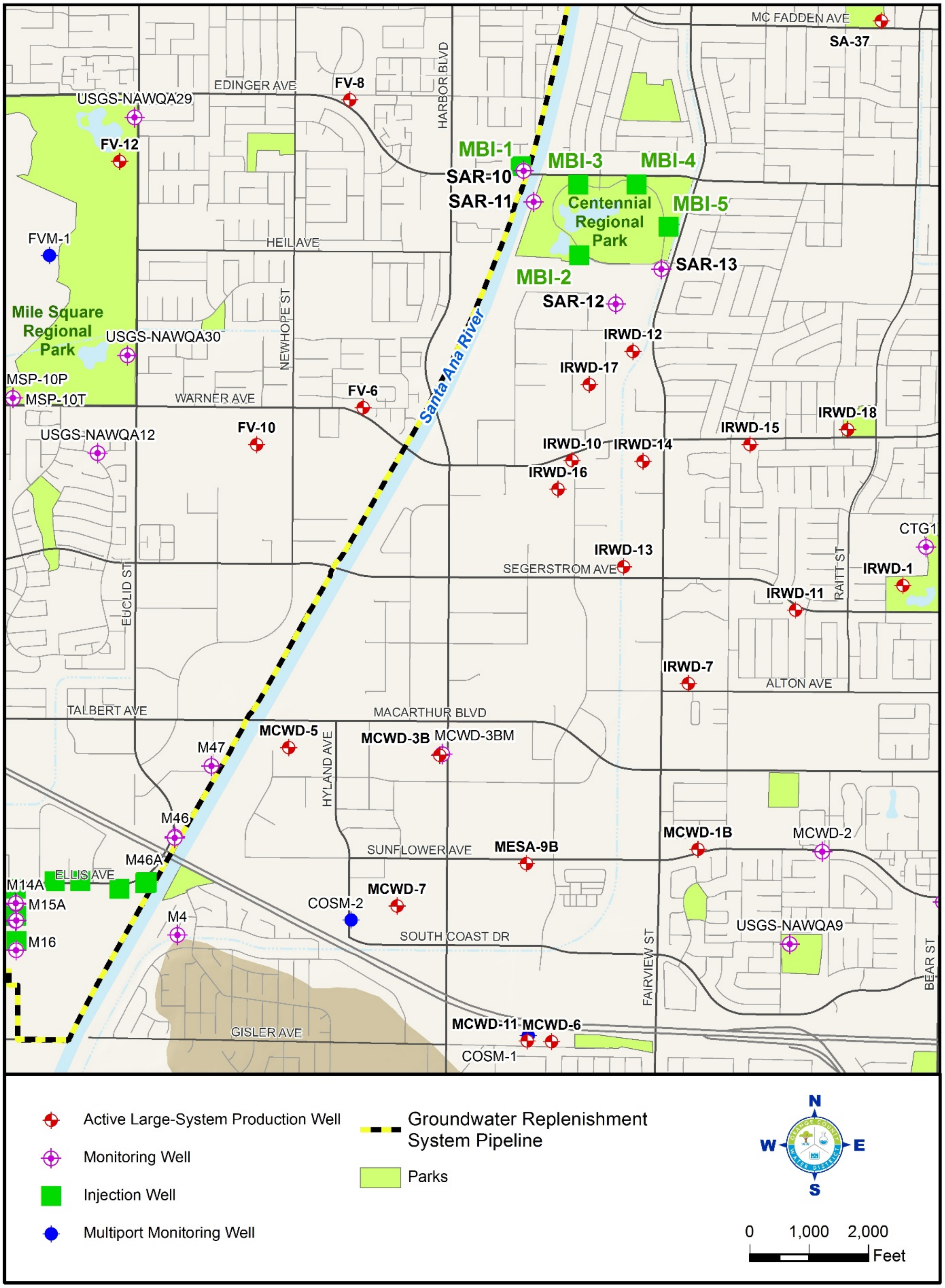


Figure 7-1. MBI Project Location Map

As shown in Table 7-1, the 2020 total monthly injection volume at the MBI Project significantly increased when the MBI Centennial Park wells (MBI-2, MBI-3, MBI-4, and MBI-5) were placed on-line in March. From January until mid-March, only the DMBI Project (MBI-1) was in operation. The average daily injection rate ranged from 1.61 MGD in January to 10.58 MGD in July. The MBI Project injection volume and average daily rate was less in March through May due to less days on-line since MBI Project injection began mid-March and then the project was offline from April 24 through May 13 related to an AWPF shutdown for GWRSFE construction and GWRS Pipeline inspection.

Table 7-1 shows a total MBI backwash volume of 8.54 MG (26.22 AF) in 2020, approximately the same volume as was backwashed the prior year at only MBI-1. The decrease in per-well backwash volume during 2020 was due to reduced backwash frequency at MBI-1 from weekly to biweekly, combined with only monthly backwashing of the four MBI Centennial Park wells.

Table 7-1. 2020 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	1.61	49.79	152.81	0.35	1.06
February	1.67	48.35	148.39	0.50	1.52
March	4.46	138.34	424.55	0.50	1.53
April	6.99	209.56	643.11	1.54	4.72
May	5.60	173.48	532.40	0.13	0.38
June	10.04	301.21	924.38	0.59	1.82
July	10.58	327.85	1,006.12	0.77	2.36
August	9.55	296.00	908.40	0.88	2.71
September	10.35	310.42	952.63	0.14	0.42
October	10.43	323.43	992.56	1.01	3.10
November	10.13	303.84	932.43	0.82	2.50
December	9.66	299.32	918.59	1.33	4.08
Totals	**7.60**	**2,781.59**	**8,536.38**	**8.54**	**26.22**

[1] All MBI wells (MBI-1, MBI-2, MBI-3, MBI-4, and MBI-5); totals do not include minor quantities related to the commissioning and start-up testing from January to March at the MBI Centennial Park wells.

As shown on Figure 7-2, the 2020 total monthly injection volumes were distributed evenly among the four MBI Centennial Park wells, with each well receiving slightly more volume than the DMBI Project well MBI-1, except in March when the MBI Centennial Park wells were only on-line for the second half of the month.

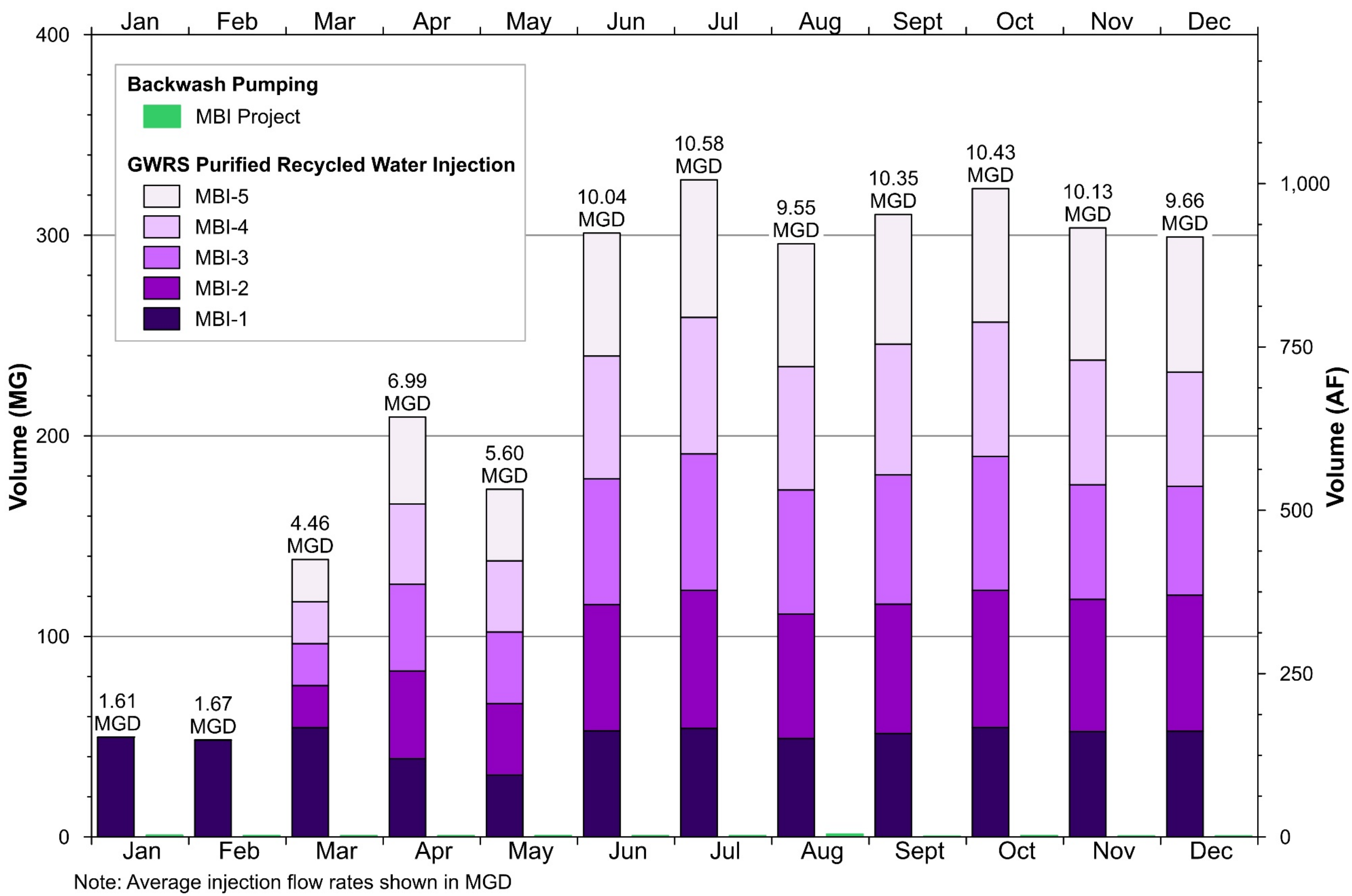


Figure 7-2. 2020 Monthly Injection and Backwash Quantities at MBI Project

7.2 DMBI Project Operations

The DMBI Project consisted of a full-scale injection well (MBI-1) along with two nearby multi-depth nested 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). 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.

The two monitoring wells SAR-10 and SAR-11 were installed during late 2011 and 2012, and injection well MBI-1 was drilled and constructed during 2012. MBI-1 was placed on-line in April 2015 using 100% GWRS purified recycled water and is operated and maintained by OCWD Barrier Operations staff. SAR-10 and SAR-11 were compliance monitoring wells for MBI-1 prior to the full scale MBI Project being placed on-line in March 2020, after which two new monitoring wells, SAR-12 and SAR-13 (see Section 7.3) became the compliance monitoring wells for the entire MBI Project.

Injection well MBI-1 is screened entirely within the Principal aquifer and was constructed very similar to a typical municipal large system production well, with a 20-inch diameter blank well casing in the upper portion of the well to accommodate the vertical turbine pump. The well casing reduces to 16-inch diameter in the lower portion for the well screens, with the topmost screen at 530 ft bgs and bottommost screen at 1,190 ft bgs as illustrated on Figure 7-3. The screened interval at 800-830 ft bgs was swaged off with a stainless steel liner due to excessive sand production during backwash pumping and therefore has a negligible contribution to either injection or pumping.

In 2020, injection well MBI-1 was operated as a demonstration well until the MBI Centennial Park wells came on-line in mid-March, at which time MBI-1 operation was considered part of the MBI Project. No new applicable demonstration findings were observed in 2020 and as such, from the startup of the MBI Project, MBI-1 performance data was simply a portion of the MBI Project performance. However, because MBI-1 was operated continuously throughout 2020 and independently of the MBI Centennial Park wells, MBI-1 performance is discussed individually in Sections 7.2.1 and 7.2.2.

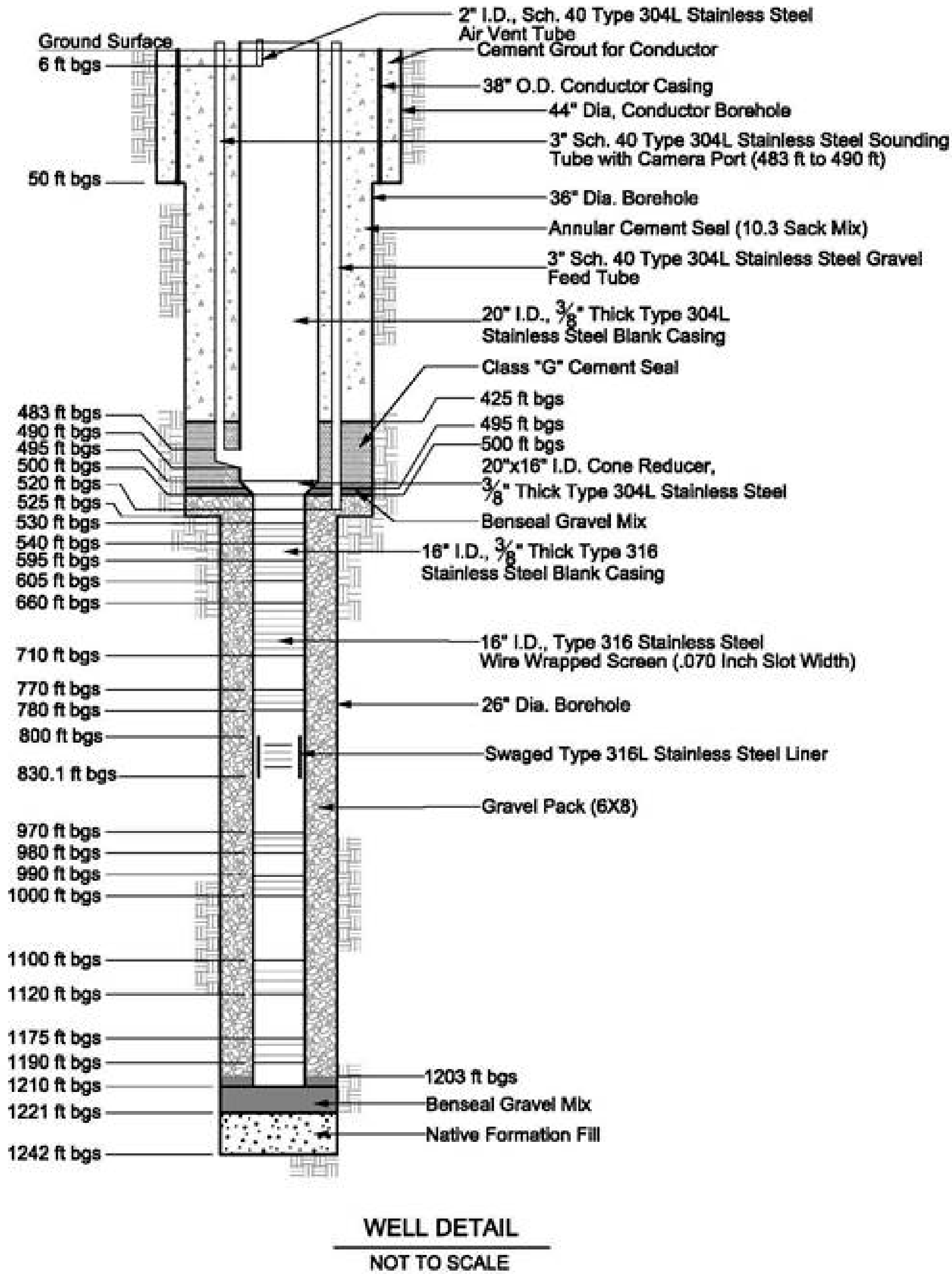


Figure 7-3. Injection Well MBI-1 As-Built Construction Diagram

7.2.1 DMBI Injection Rates and Yields

Study of the operational testing conducted during 2019 after relining of the Unit 1 GWRS Pipeline indicated that an optimal and sustainable condition for MBI-1 was an injection rate ranging from approximately 1,200 to 1,400 gpm (1.7 to 2.0 MGD) with a backwash frequency of one to two weeks. These were the target operating conditions for MBI-1 during 2020.

Figure 7-4 shows MBI-1 injection rates during 2020. The average daily injection at MBI-1 was 1,035 gpm (1.49 MGD), a decrease of approximately 15% from the prior year. The relative decrease is attributed to two AWPF shutdowns for GWRSFE construction, along with a consistent target injection rate of approximately 1,230 GPM (1.8 MGD). This can be compared to the historically high injection rates in 2019 of approximately 1,770 gpm (2.5 MGD) due to injection capacity testing after relining of the Unit 1 GWRS Pipeline.

As shown on Figure 7-4, injection operations at MBI-1 were continuous at the target injection rate throughout 2020 except for the following interruptions: (1) unplanned shutdown on January 18-20, (2) AWPF shutdown on February 4-5 for GWRSFE electrical upgrades, (3) off-line period from April 24 through May 13 related to a planned AWPF shutdown related to a GWRS Pipeline inspection and GWRSFE construction activities, (4) AWPF shutdown on August 30 for GWRSFE construction activities, and (5) automatic injection rate reduction November 30 to December 3 due to injection water levels at MBI-1 rising to the operational threshold of 10 feet below ground surface.

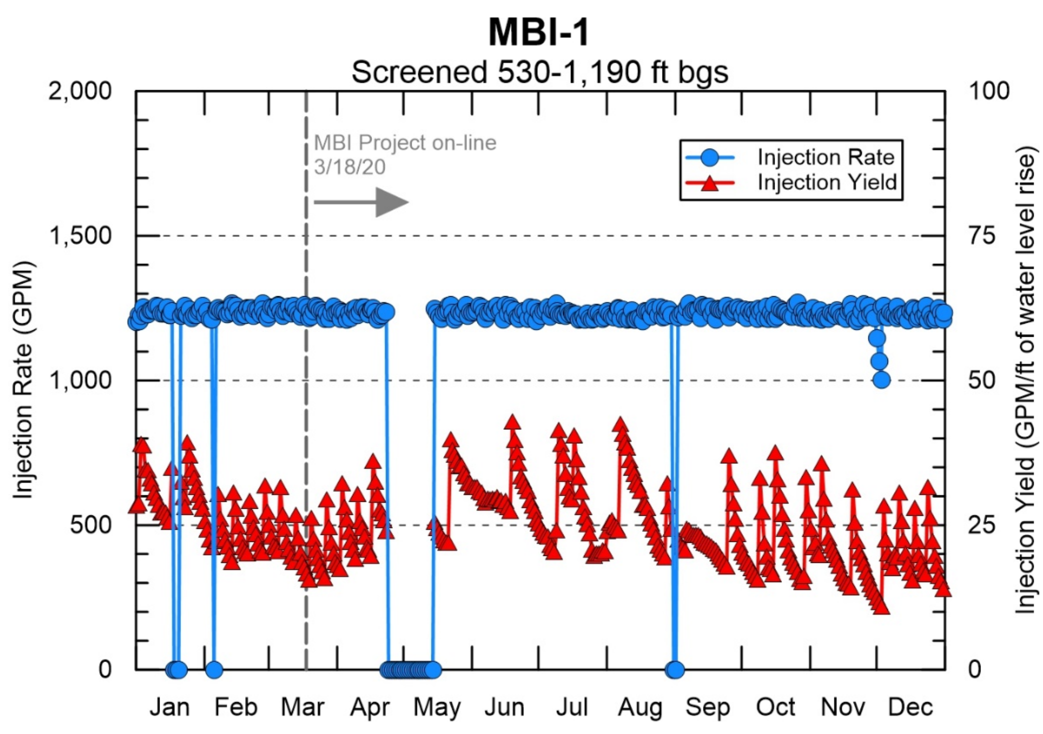


Figure 7-4. 2020 MBI-1 Injection Performance

Figure 7-4 also shows the variation of injection yield at MBI-1 during 2020. 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 MBI-1 was due to the recurring backwash events. During 2020, backwash pumping at MBI-1 typically occurred for approximately 40 minutes for each backwash event, at a frequency that ranged from weekly to biweekly for most of the year, and up to monthly in the period following startup of the MBI Centennial Park wells. Injection at MBI-1 typically resumed at least 30 minutes after each backwash to first allow groundwater levels to recover back to 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.

During 2020, the injection yield at MBI-1 ranged from 11 to 43 gpm/ft, with a daily average of 25 gpm/ft. 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 2020, the backwash frequency at MBI-1 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.

Figure 7-4 shows that during 2020, the injection yields at MBI-1 were relatively stable throughout the year. The low values of each cycle were generally in the 15 to 25 gpm/ft range, though slightly elevated in the middle of the year from May through August, likely due to seasonally lower regional groundwater levels during those months.

7.2.2 DMBI Backflush Pumping Rates and Yields

MBI-1 was backwashed 32 times during 2020. 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 MBI-1 during 2020 ranged from 25 to 45 minutes and averaged approximately 35 minutes. The pumping rate for each backwash event is shown on Figure 7-5. Throughout the year, the backwash process was operated remotely with a target pumping rate set at 3,500 gpm. The average pumping rate of all backwash events during 2020 was approximately 3,490 gpm and was very stable throughout the year, only decreasing less than 5% in the summer months, likely due to seasonally lower regional water levels. The stability of the pumping rate was due to the remote backwash process, and the minor variations in magnitude were largely due to variations in regional groundwater levels.

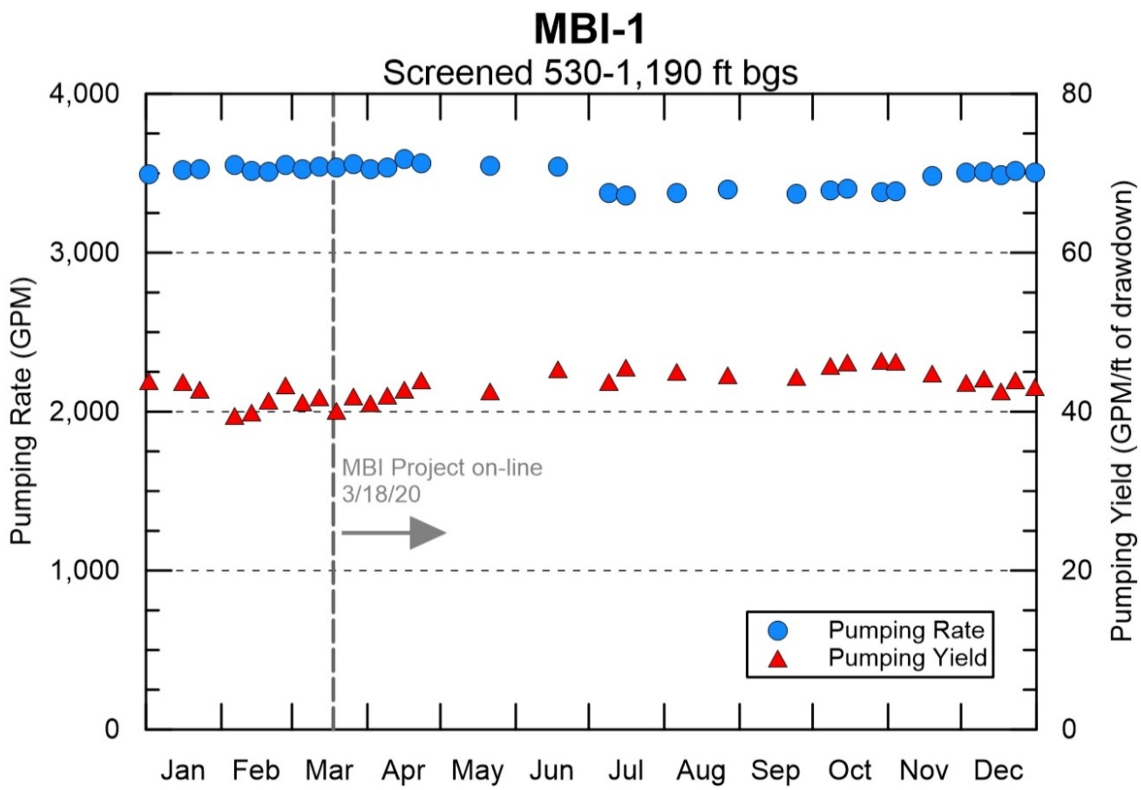


Figure 7-5. 2020 MBI-1 Pumping Performance

Figure 7-5 also shows the MBI-1 pumping yield or specific capacity for all backwash events during 2020. The pumping levels used to determine the pumping yields were measured at the end of each backwash event. During 2020, the pumping yield at MBI-1 ranged from 39 to 46 gpm/ft of drawdown in the well and averaged 43 gpm/ft, slightly above that of the prior year and indicating that the frequency of backwash events has been effective in maintaining the specific capacity of MBI-1. The average backwash pumping yield at MBI-1 was approximately 18 gpm/ft greater than the average injection yield during 2020, resulting in a 0.58 ratio of injection yield to pumping yield.

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 DMBI site versus the Talbert Barrier;
- Higher sustained injection rate; and
- Previously accumulated particulate matter from erosion of the GWRS Pipeline 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.

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 MBI-1. 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 new MBI wells in Centennial Park.

OCWD has put forth efforts to determine a consistent, achievable injection rate for MBI-1 that balances total injection volume with the required frequency and duration of backwash pumping. As discussed above, MBI-1 was operated in 2020 with an injection rate averaging approximately 1.8 MGD with a backwash frequency of one to two weeks, which continued to be optimal and sustainable.

7.3 MBI Centennial Park Project Operations

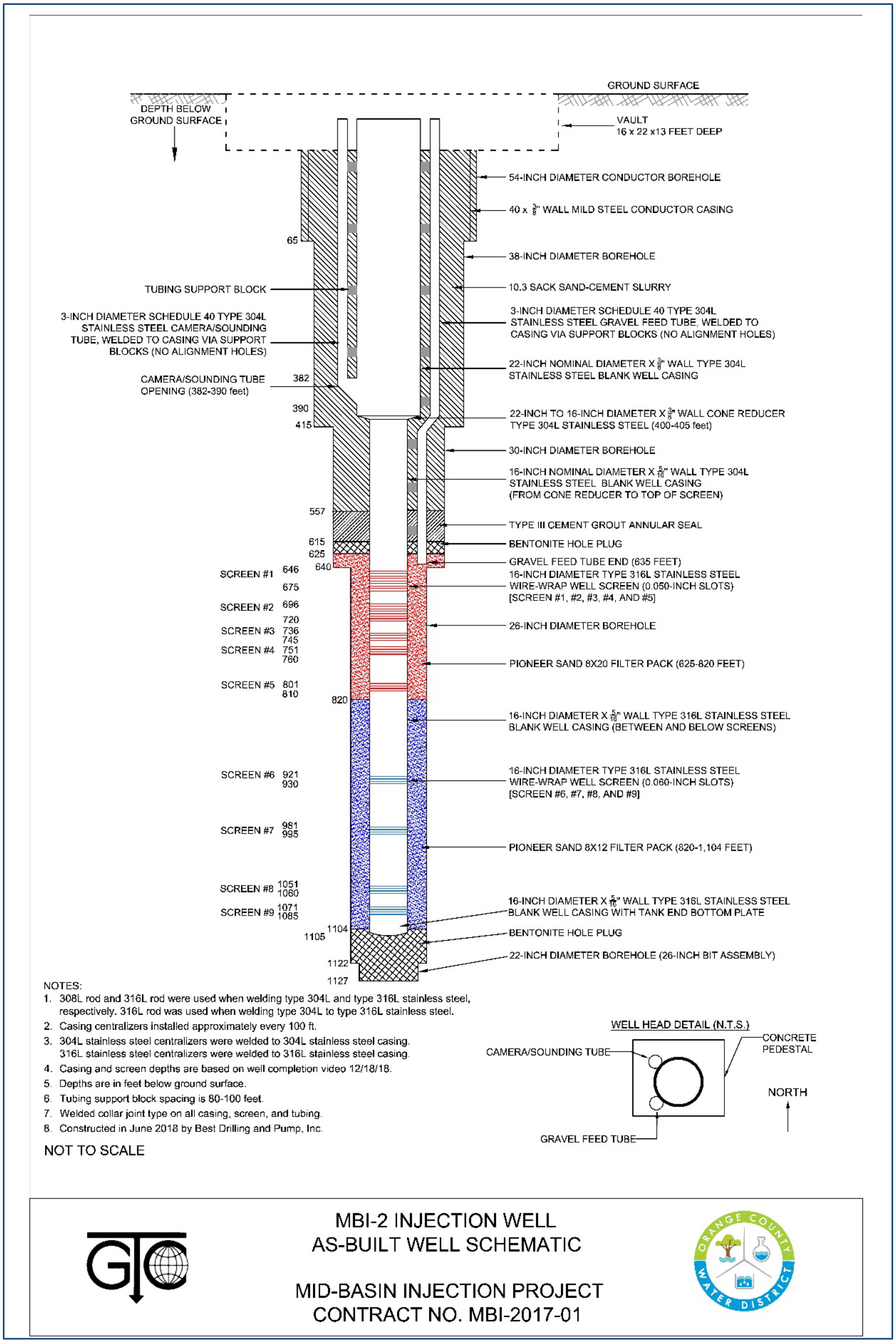
The MBI Centennial Park Project is located on the east side of the Santa Ana River and south of Edinger Avenue, just to the southeast of MBI-1 in the City of Santa Ana (see Figure 7-1). In late 2018, OCWD completed drilling and construction of four injection wells, designated as MBI-2, MBI-3, MBI-4, and MBI-5, that are strategically located to help raise depressed groundwater levels in the Principal aquifer. 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 7-3), but without the uppermost two screens and the lowermost screen. However, additional screened footage was added to the other screened interval depths to the extent possible 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 7-6 through Figure 7-9 show the well construction as-built diagrams for MBI-2 through MBI-5, respectively.

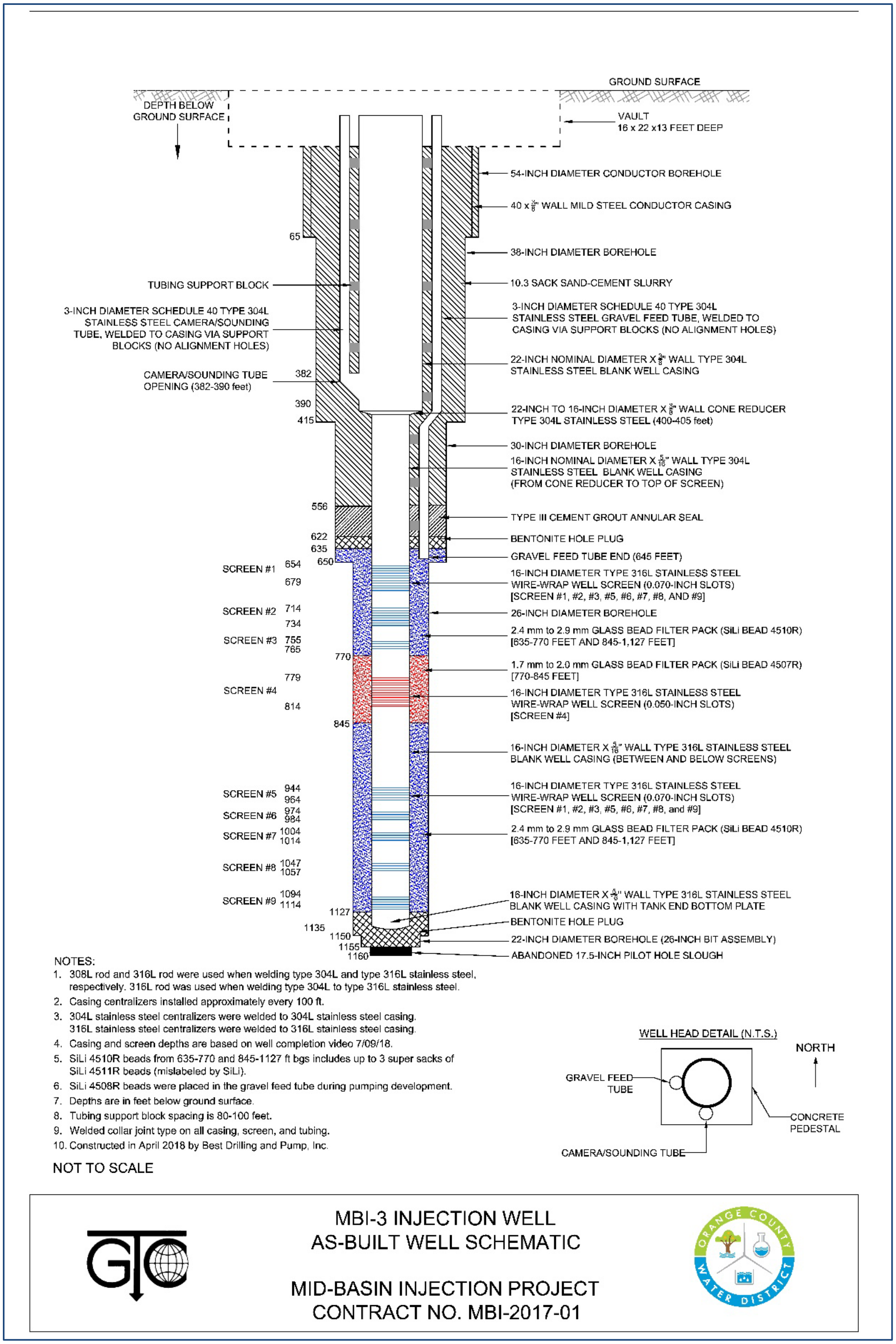
MBI-3 and MBI-5 were constructed using glass beads as the filter pack in the borehole annulus adjacent to the screened interval depths, whereas MBI-2 and MBI-4 were constructed using an industry standard natural gravel pack. Due to the spherical uniformity of the glass beads, they are expected to stack and pack more efficiently with less settlement and therefore have a higher permeability than natural gravel. The glass beads are also chemically inert. The pumping and injection yields for MBI-3 and MBI-5 were compared to MBI-2 and MBI-4 to determine any improvement related to use of the glass beads. Preliminary findings of this operational study are presented in Section 7.3.3.

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). Prior to the onset of injection at the MBI Centennial Park Project, monitoring wells SAR-10 and SAR-11 were the compliance wells for the DMBI Project (see Section 7.2). Groundwater level and quality data at all four MBI Project monitoring wells in 2020 are presented in Section 8.



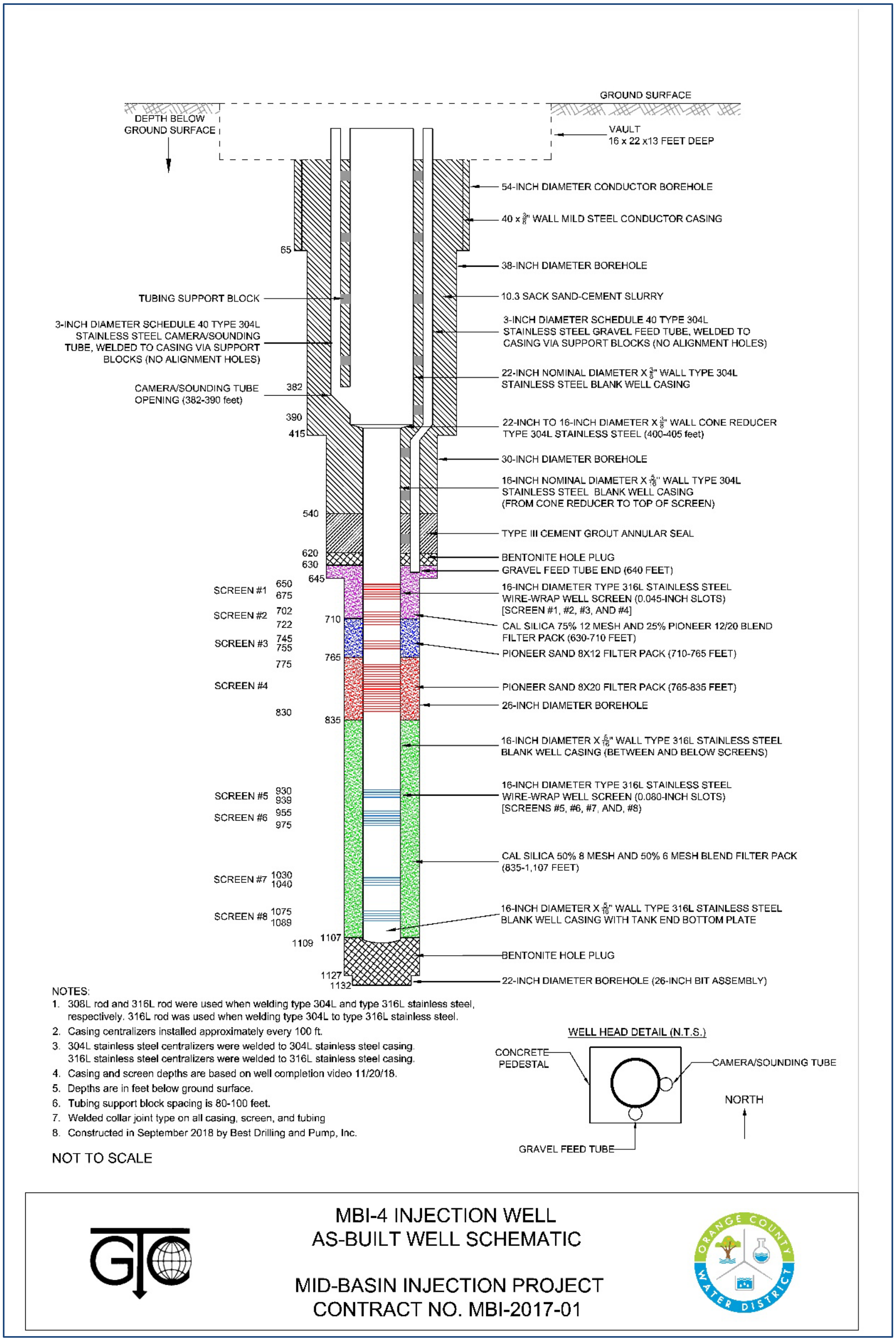
Note: Screened interval depths shown here are based on post-construction downhole video survey and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

Figure 7-6. Injection Well MBI-2 As-Built Construction Diagram



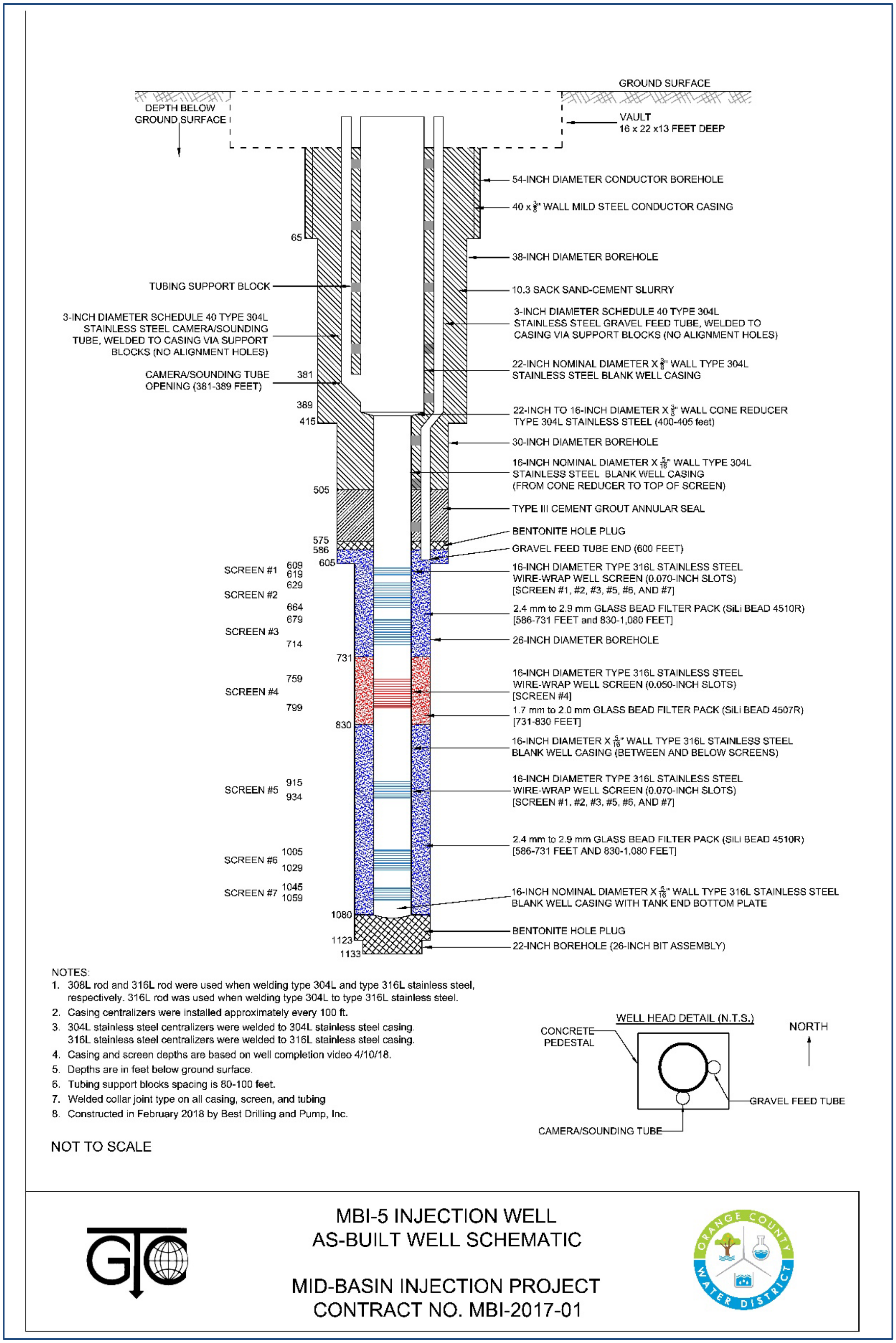
Note: Screened interval depths shown here are based on post-construction downhole video survey and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

Figure 7-7. Injection Well MBI-3 As-Built Construction Diagram



Note: Screened interval depths shown here are based on post-construction downhole video survey and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

Figure 7-8. Injection Well MBI-4 As-Built Construction Diagram



Note: Screened interval depths shown here are based on post-construction downhole video survey and differ from the depths listed in the GWRS Title 22 Engineering Report (OCWD, 2021).

Figure 7-9. Injection Well MBI-5 As-Built Construction Diagram

7.3.1 MBI Centennial Park Injection Rates and Yields

Figure 7-10 shows daily injection rates at the MBI Centennial Park wells during 2020. MBI Project operations began on March 18 when each MBI Centennial Park well began injecting at an initial rate of approximately 695 gpm (1 MGD). The initial injection rate was maintained for two days then increased in steps over the next three weeks up to approximately 1,390 gpm (2 MGD) at each well. Injection ceased at all four wells from April 24 to May 13 due to the AWPF shutdown for GWRS Pipeline inspection and GWRSFE construction activities. After AWPF restart, injection resumed and was maintained at approximately 2 MGD per well until mid-June, when injection was increased to the final target operational rate of 1,565 gpm (2.25 MGD). At MBI-2 and MBI-5, injection rates were maintained near 2.25 MGD for the remainder of the year, aside from an AWPF shutdown for GWRSFE construction activities on August 30. At MBI-3 and MBI-4, injection rates were maintained near 2.25 MGD into the fall, then lowered variably to 1.75 MGD during the last two months of the year in response to diminished injection yields and high injection water levels approaching the operational threshold of 10 feet below ground surface.

As shown on Figure 7-10, injection operations at the MBI Centennial Park wells (and MBI-1) were interrupted by the three-week shutdown in April-May and the one-day shutdown on August 30. Additionally, MBI-4 was offline for a day in April due to well failure and restart; and MBI-4 and MBI-5 were off-line for two days in mid-June for improvements to the flow control section. Average per well daily injection for the four MBI Centennial Park wells for the on-line portion of 2020 (since March 18) was 1,368 gpm (1.97 MGD).

Figure 7-10 also shows the variation of injection yields at the MBI Centennial Park wells during 2020. The repeating cyclical trend seen in the injection yield is expected and similar to MBI-1, though with fewer cycles as each well was only backwashed eight times from mid-March to the end of the year (approximately monthly). The average injection yields were 39 gpm/ft at MBI-2, 34 gpm/ft at MBI-3, 37 gpm/ft at MBI-4, and 47 gpm/ft at MBI-5. Throughout the year, injection yields at each well were relatively stable, with the lowest values of each cycle regularly in the 30-40 gpm/ft range until the end of August, at which time yields at MBI-3 and MBI-4 both began decreasing for the remainder of the year, eventually triggering reductions in injection rates and both reaching lows of around 15 gpm/ft in the month of December. The reduced injection rates and yields at MBI-3 and MBI-4 during the last two months of the year correspond with contemporaneously high Principal aquifer groundwater levels heading into the winter months. MBI-3 and MBI-4 are north of MBI-2 and MBI-5 (Figure 7-1) and are therefore farther upgradient with higher groundwater levels. In November and December, the injection rate was reduced at MBI-3 and MBI-4 as their rising injection levels approached the operational threshold of 10 feet below ground surface, whereas at MBI-2 and MBI-5 injection levels were noticeably lower and did not approach this operational threshold. In addition, the late year high injection levels at

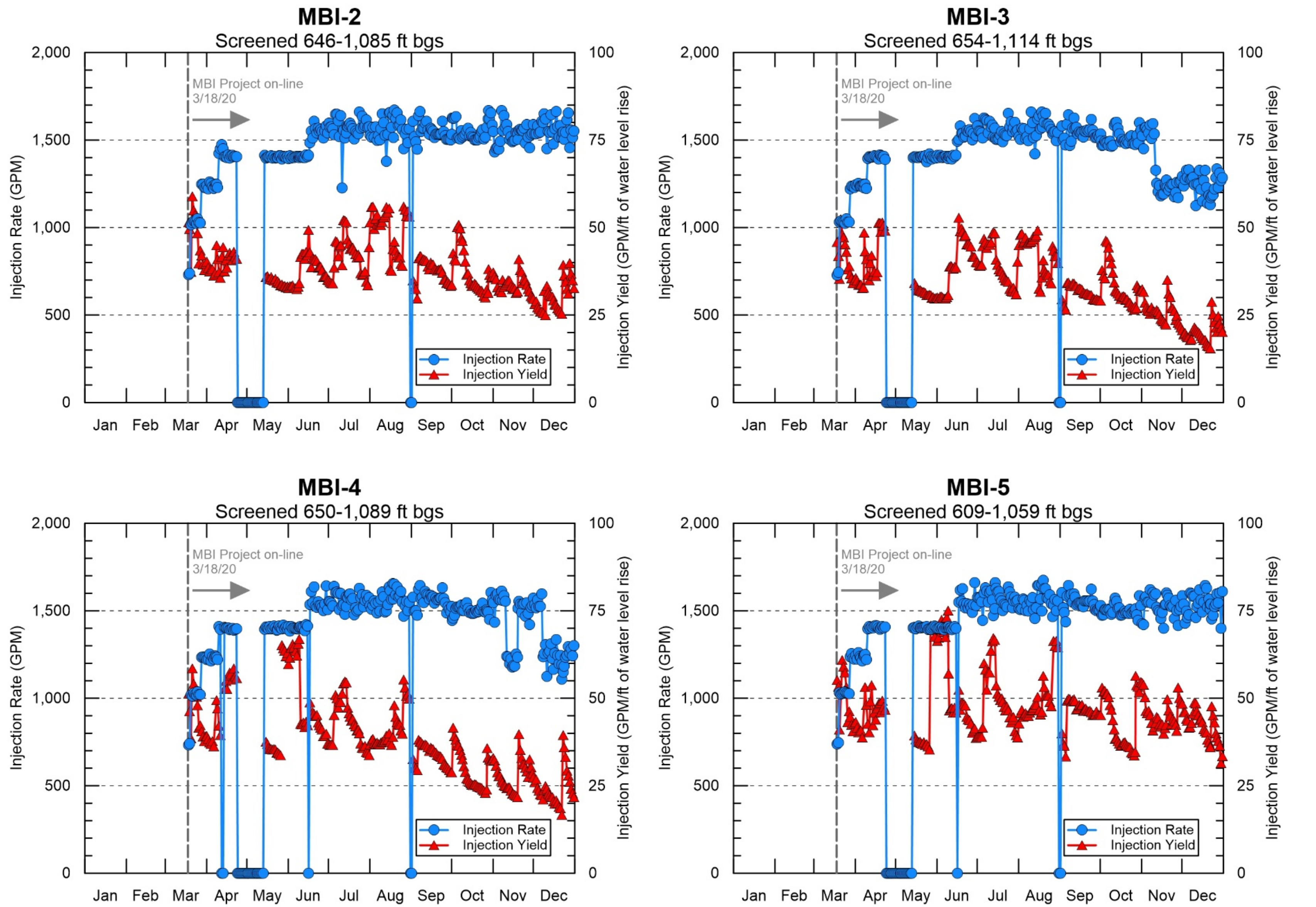


Figure 7-10. 2020 MBI Centennial Park Injection Performance

MBI-3 were exacerbated by reduced injection yields caused by reduced backwash pumping rates related to excessive sand production in that well, as discussed in Section 7.3.2.

Analysis of injection data from 2020 MBI Centennial Park operations indicated that an injection rate of 2.25 MGD and a monthly backwash frequency was optimal and sustainable, except during exceptionally high groundwater periods at upgradient wells MBI-3 and MBI-4; during these times, an injection rate of 1.75 MGD appears more sustainable at those two wells without exceeding the operational injection level threshold. OCWD will continue to determine optimal and sustainable injection rates for each of the MBI wells under various Basin conditions going forward.

7.3.2 MBI Centennial Park Backflush Pumping Rates and Yields

Figure 7-11 shows the pumping rate for backwash events at the MBI Centennial Park injection wells during 2020. Each well was backwashed eight times using the same procedure as at MBI-1 and like at MBI-1, the duration of each backwash event was determined by the rate of sand production decreasing to a target of approximately 1 PPM. The duration of pumping events at the MBI Centennial Park injection wells during 2020 ranged from 30 to 75 minutes and averaged approximately 40 minutes. Backwash pumping was controlled remotely with a target rate set at 3,500 gpm for the first backwash at each well in April. Pumping rates at MBI-2, MBI-4, and MBI-5 were maintained at or slightly below this rate, each averaging approximately 3,300 gpm for the year and showing negligible seasonal variation. At MBI-3, backwash pumping rates greater than 3,000 gpm produced large quantities of fine sand, requiring the pumping rate to be reduced for the rest of the year, down to a low of 1,905 gpm in December.

Figure 7-11 also shows the pumping yield for backwash events at the MBI Centennial Park wells during 2020. At MBI-2 and MBI-4 pumping yields were steady throughout the year with an average of 57 gpm/ft and 58 gpm/ft, respectively. The pumping yield at MBI-5 was also steady over the course of all eight events and was the highest of the four wells with an average of 64 gpm/ft. Pumping yields at MBI-3 were on average the lowest of the group at 55 gpm/ft and decreased throughout the year to a low of 45 gpm/ft in December. The low yields at MBI-3 were attributed to the reduced backwash pumping rate in response to the sand production.

Table 7-2 summarizes the average annual injection yield, pumping yield, and injection to pumping yield ratio at each of the five MBI Project wells. MBI-5 ranked the highest while MBI-1 ranked the lowest in all three categories. The ratio of injection yield to pumping yield ranged from a high of 0.74 at MBI-5 to a low of 0.58 at MBI-1. Due to well hydraulics, injection yields tend to always be less than pumping yields, especially in finer-grained formations. The ranking of all five MBI Project wells in Table 7-2 was primarily based on the injection yield and injection to pumping

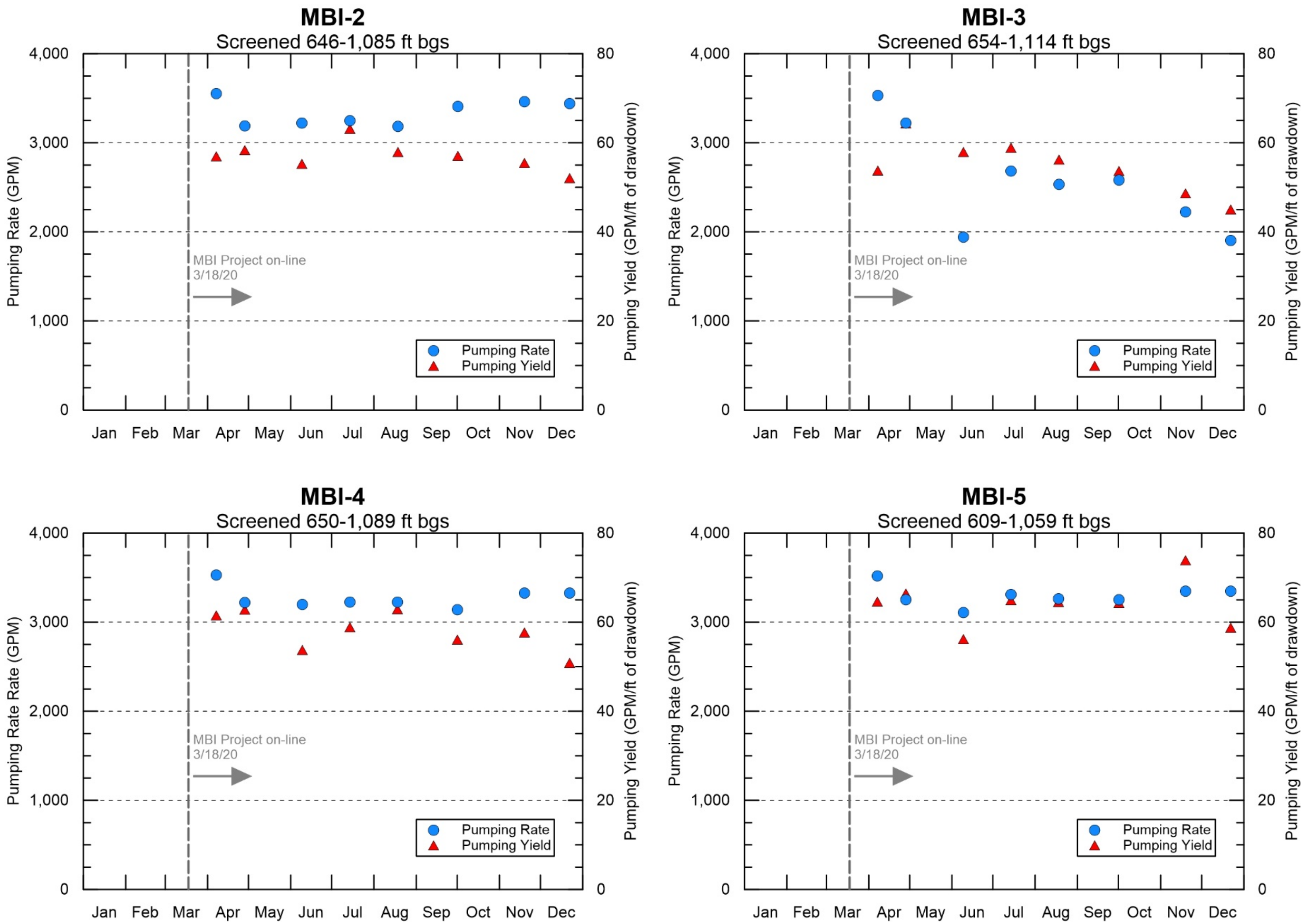


Figure 7-11. 2020 MBI Centennial Park Pumping Performance

yield ratio. The pumping yield generally follows this same ranking except at MBI-2 and MBI-4, which have an insignificant difference in pumping yield that does not follow the ranking.

Table 7-2. 2020 MBI Project Average Injection and Pumping Yields

	MBI-1	MBI-2	MBI-3	MBI-4	MBI-5
Injection Yield (gpm/ft)	25	39	34	37	47
Pumping Yield (gpm/ft)	43	57	55	58	64
Ratio	0.58	0.68	0.62	0.64	0.73
Ranking[1]	5	2	4	3	1

[1] Ranking based on injection yield and injection to pumping yield ratio

7.3.3 MBI Centennial Park Performance Comparison of Filter Pack Materials

Preliminary comparison of well performance between MBI Centennial Park wells constructed with glass beads (MBI-3 and MBI-5) and natural gravel pack (MBI-2 and MBI-4) does not show any indication of a performance benefit gained from the use of glass beads. In ranking the four wells based only on injection and pumping yields during 2020 (Table 7-2), the glass bead wells represent the highest performing well (MBI-5) and the lowest performing well (MBI-3) of the four. Therefore, the performance of these wells is likely controlled more by the permeability of the native lithology than by the type of filter pack. The lithology encountered at each of the four well sites were dominated by fine sands at the screened depths, but the lithology at MBI-5 was observed to have a slightly coarser grain size than the others. The prevalent fine sands alone may account for the low injection yields at MBI-3 and MBI-4 and the sanding during backwashes at MBI-3, just as the coarser lithology alone at MBI-5 may account for the higher yields at that well. Based on the 2020 performance of the MBI Centennial Park wells, the spherical uniformity of the glass beads provides a higher permeability filter pack but only provides a benefit if the grain size of the formation is also extremely uniform throughout the screened interval of the well and only if the glass bead size is perfectly selected to match. In application, it appears that the inherent variation in grain size and sphericity of natural gravel pack provides some advantage in formations with a variable grain size, especially those with a relatively high percentage of finer-grained material as in the Centennial Park area.

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 new 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 2020:

- Aquifers in the MBI Project area;
- Overview of groundwater monitoring program;
- Groundwater elevations and directions of flow;

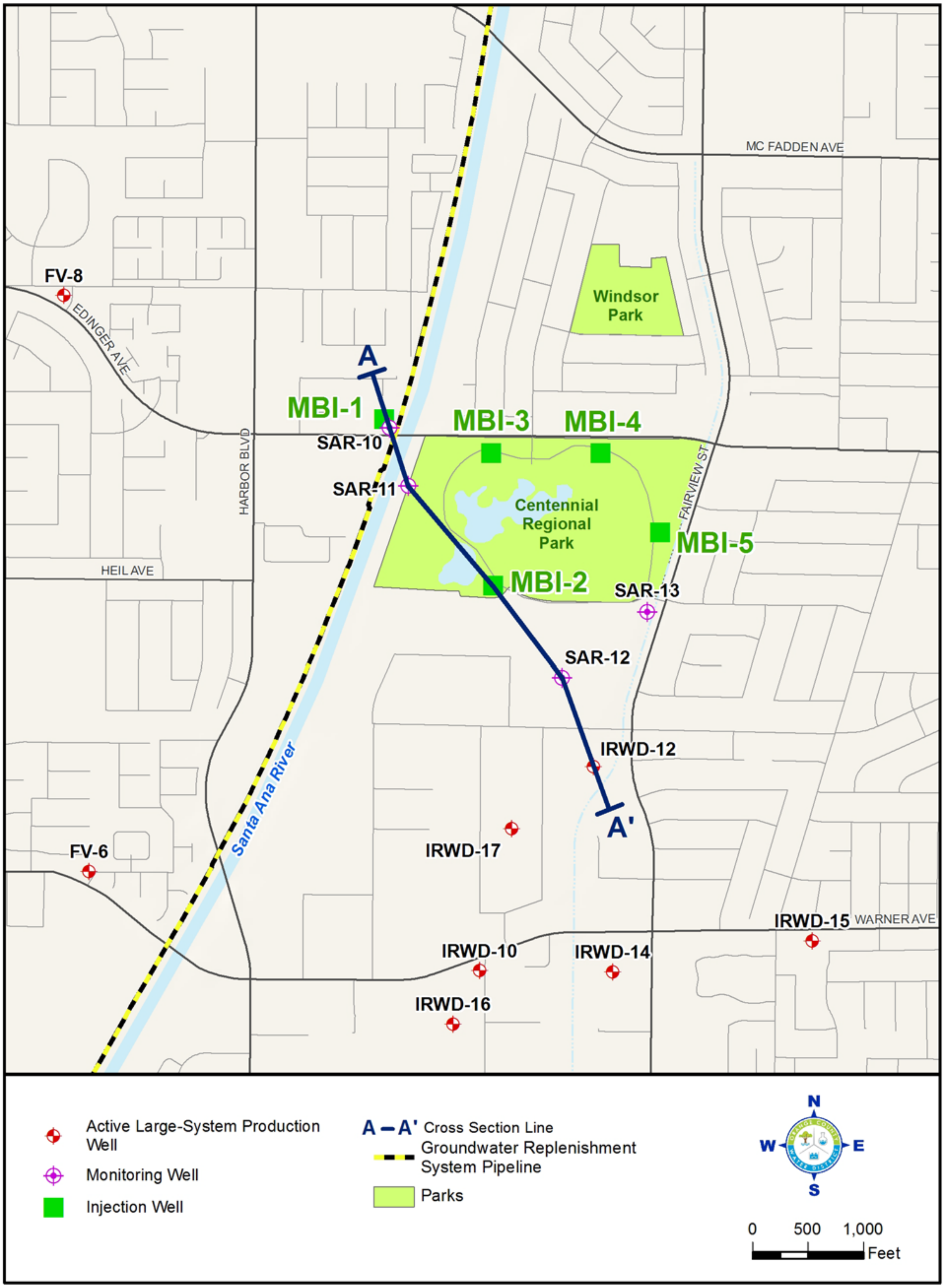


Figure 8-1. MBI Project Area and Well Location Map

- 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').

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.

The Principal aquifer, from shallowest to deepest, consists of the following aquifers:

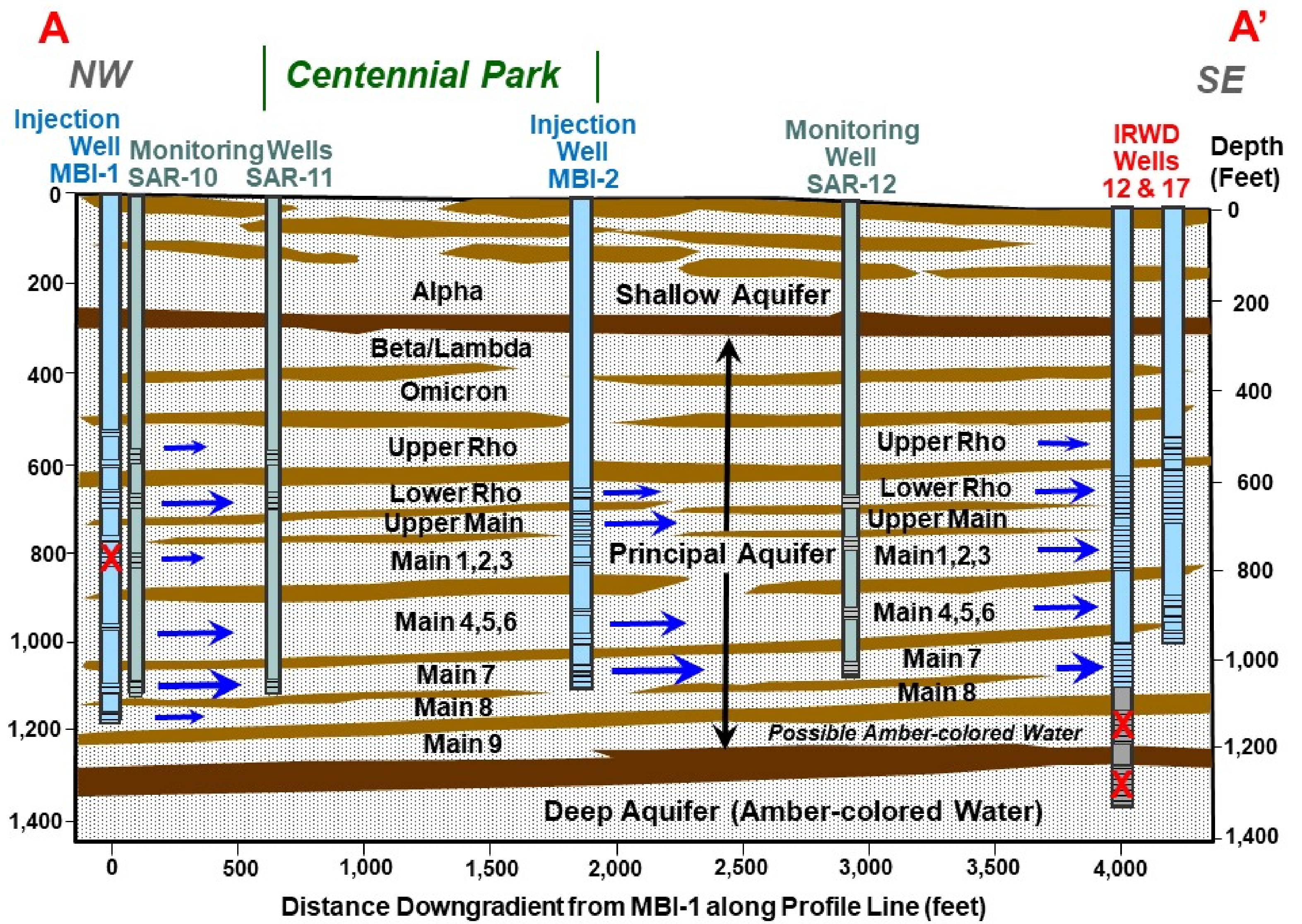


Figure 8-2. Schematic Geological Cross Section Through the MBI Project Area

- 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 injection wells were screened entirely within the Principal aquifer system and were constructed similarly to nearby production wells (Figure 8-2). At MBI-1, the screened interval from 800 to 830 ft bgs in the uppermost Main aquifer unit was swaged off with a blank stainless steel liner to block off this zone due to excessive fine sand entering the well during the pumping development phase of construction. This swaged screened interval is shown schematically with an "X" through the screen in Figure 8-2. The four Centennial Park MBI injection wells were constructed similarly to MBI-1, but without the uppermost two screens and the lowermost screen. However, additional screened footage was added to the other screened interval depths to the extent practicable, based on the local geology encountered during drilling, such that the total screened footage for each of the Centennial Park MBI wells is either the same or greater than MBI-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 as low as 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 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 run 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	5	610-620	1	0
														630-665	12	20
Upper Main	----	----	----	----	695-720	20	15	715-735	9	11	702-722	19	23	680-715	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	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	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	11	6
Main 7	1,100-1,120	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	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.

8.2 Groundwater Monitoring Program

The MBI Project follows a groundwater monitoring program similar to those of 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 quarterly at SAR-10 and SAR-11 from 2012 through 2020 and from 2018 through the first half of 2020 at SAR-12 and SAR-13; during the second half of 2020, these constituents were sampled biweekly at SAR-12 and SAR-13 to track the injected GWRS water from the MBI Project intrinsic tracer test that began March 18, 2020. 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. The metals sampling frequency was increased to biweekly during the second half of 2020 at SAR-12 and SAR-13 for monitoring the GWRS intrinsic tracer test.

Groundwater levels at SAR-10, SAR-11, SAR-12, and SAR-13 were manually measured approximately monthly during 2020. 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 verified 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	Closest Injection Well [1]	Approximate Distance and Direction from MBI	Closest 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 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, 2020. 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 30 feet below mean sea level in the northwest portion of the MBI Project area between SAR-10 and SAR-11, nearly 30 feet higher than in June 2019. In the southeast portion of the MBI Project area between SAR-12 and SAR-13, Principal aquifer groundwater elevations were approximately 40 feet below mean sea level, approximately 35 feet higher than in June 2019. Based on the slight rise in Principal aquifer groundwater elevations of only 5 to 10 feet from June 2019 to June 2020 in the greater Fountain Valley and Santa Ana areas away from the MBI Project, most of the large rise of 30 to 35 feet in the MBI Project area was due to injection from the five MBI wells.

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 prior years. Due to MBI Project injection raising groundwater levels in this area, the lowest groundwater levels that in previous years were centered around the IRWD DRWF were now farther south in June 2020 as depicted by the 70 feet below mean sea level contour in the southernmost portion of Figure 8-3.

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,

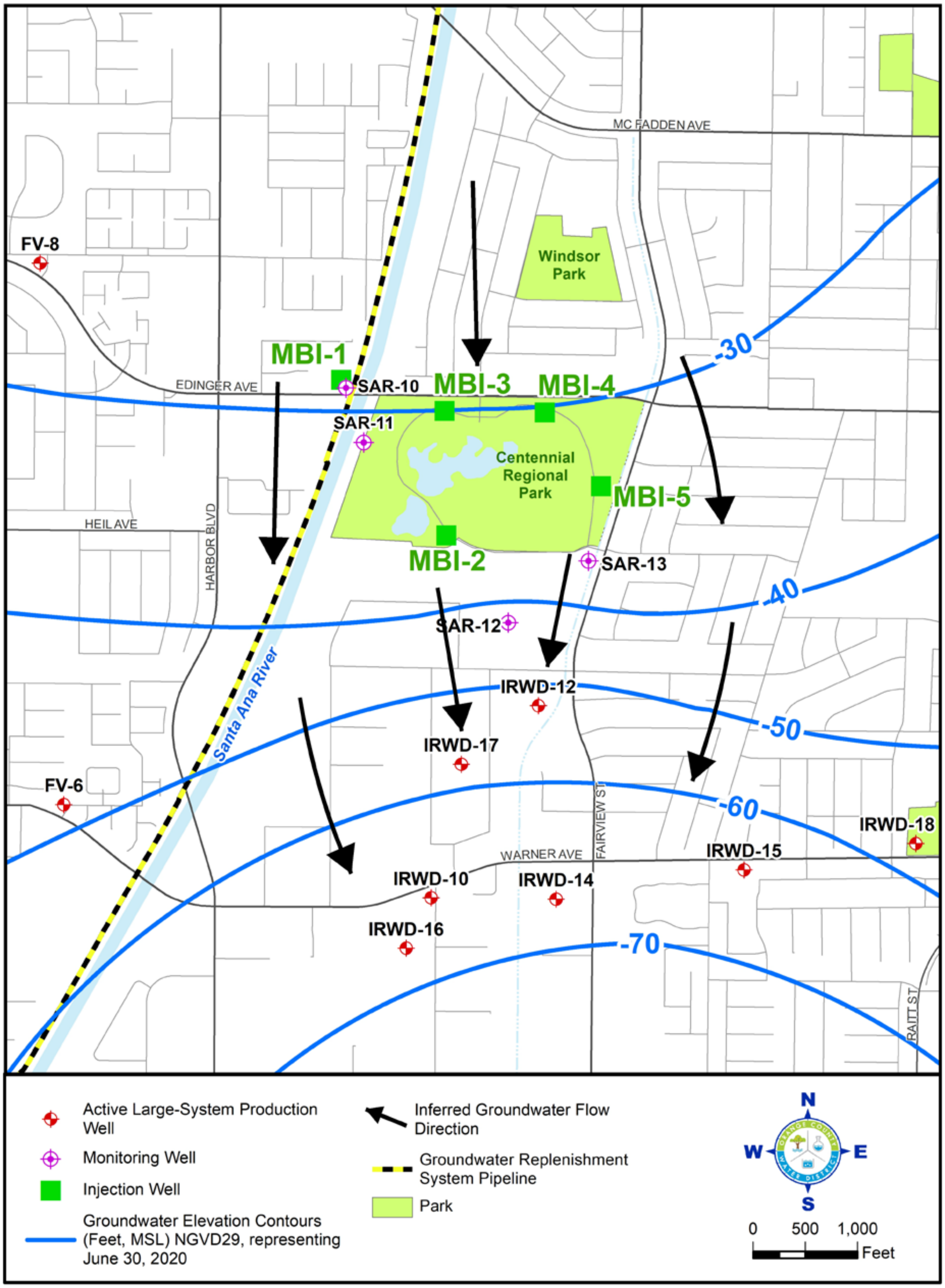


Figure 8-3. Principal Aquifer Potentiometric Surface with Inferred Groundwater Flow Directions in the MBI Project Area

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 2020 were more than 50 feet below mean sea level, approximately 35 feet higher than in June 2019 and consistent with the 35-foot rise in both SAR-12 and SAR-13. Due to MBI Project injection, the hydraulic gradient across the localized Centennial Park injection site was slightly flatter in June 2020 than in June 2019 but was much steeper downgradient or south of Centennial Park towards the IRWD DRWF. Comparison of the groundwater contours in Figure 8-3 with those in Figure 8-3 of last year's Annual Report indicates that the hydraulic gradient from the SAR-12 vicinity to the most southerly IRWD DRWF wells was nearly three times steeper in June 2020 than in June 2019. 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 Compliance Monitoring Well Trends

Groundwater level hydrographs for MBI Project monitoring wells SAR-10, SAR-11, SAR-12, and SAR-13 are shown on Figure 8-4, Figure 8-5, Figure 8-6, and Figure 8-7, respectively. These figures also show chloride concentrations on the lower half of the graphs, which are discussed in Section 8.4.1. Figure 8-4 and Figure 8-5 show groundwater level and chloride data from 2014 through 2020, 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 and chloride data from 2018 through 2020, 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.

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

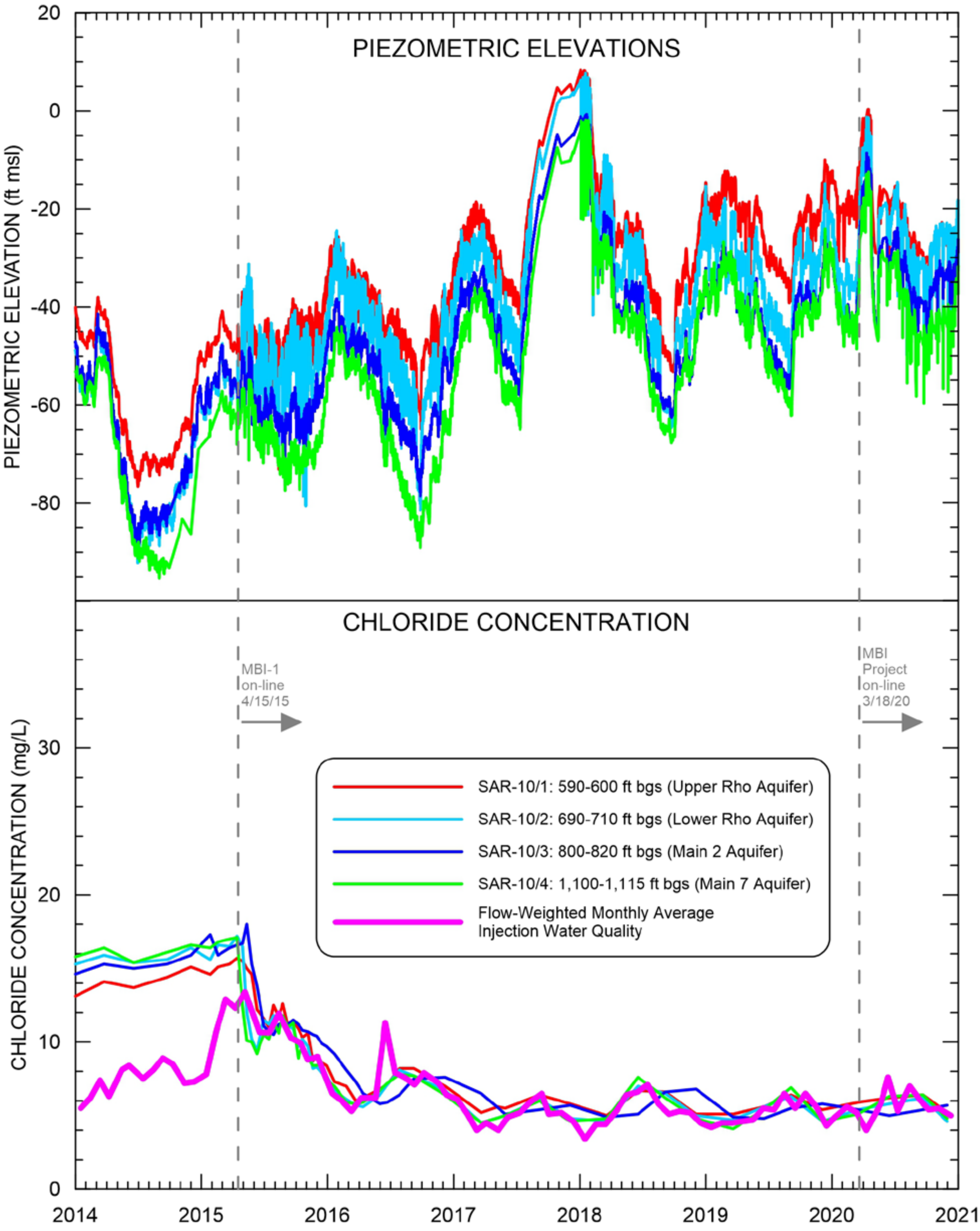


Figure 8-4. Monitoring Well SAR-10 Piezometric Elevations and Chloride Concentration

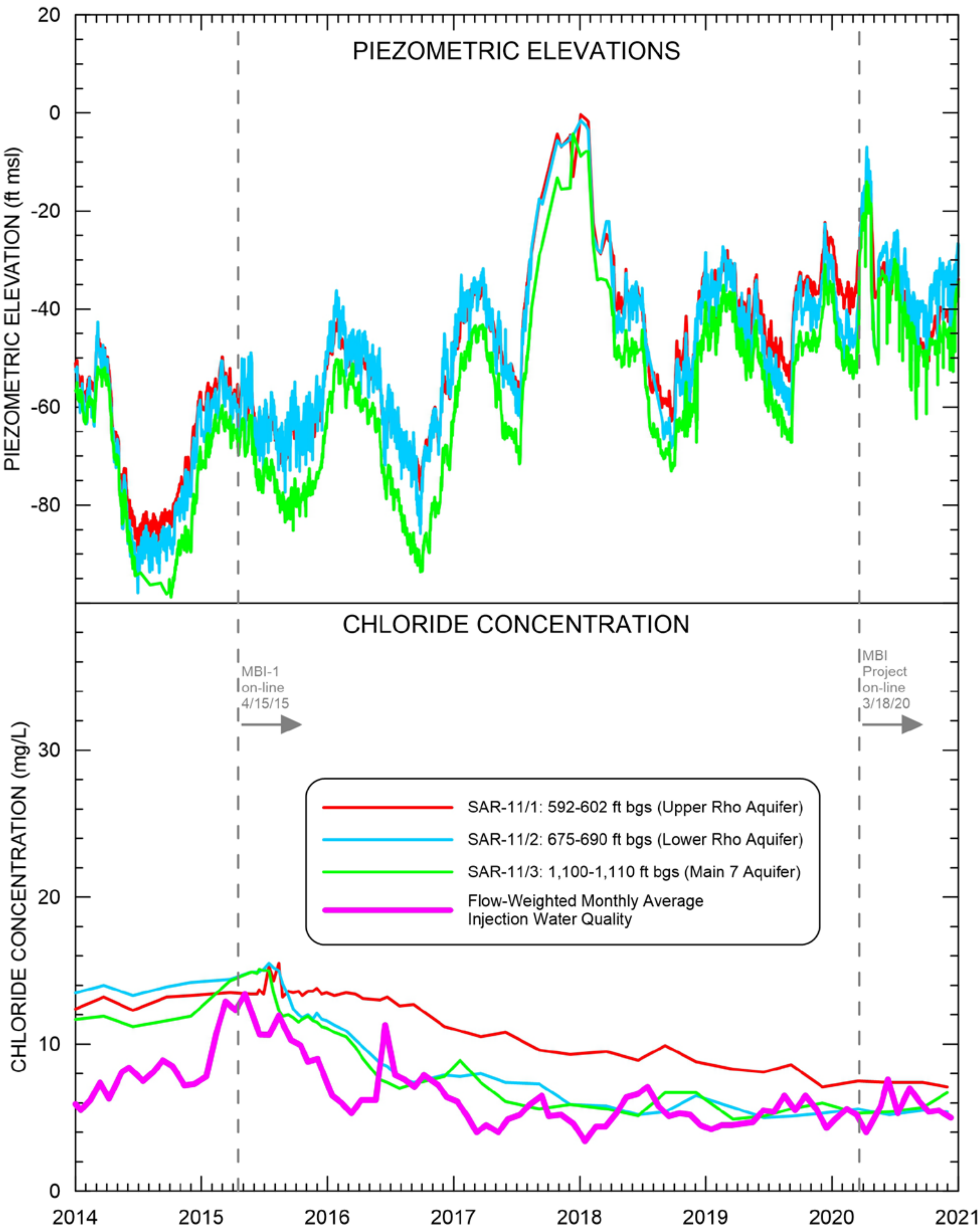


Figure 8-5. Monitoring Well SAR-11 Piezometric Elevations and Chloride Concentration

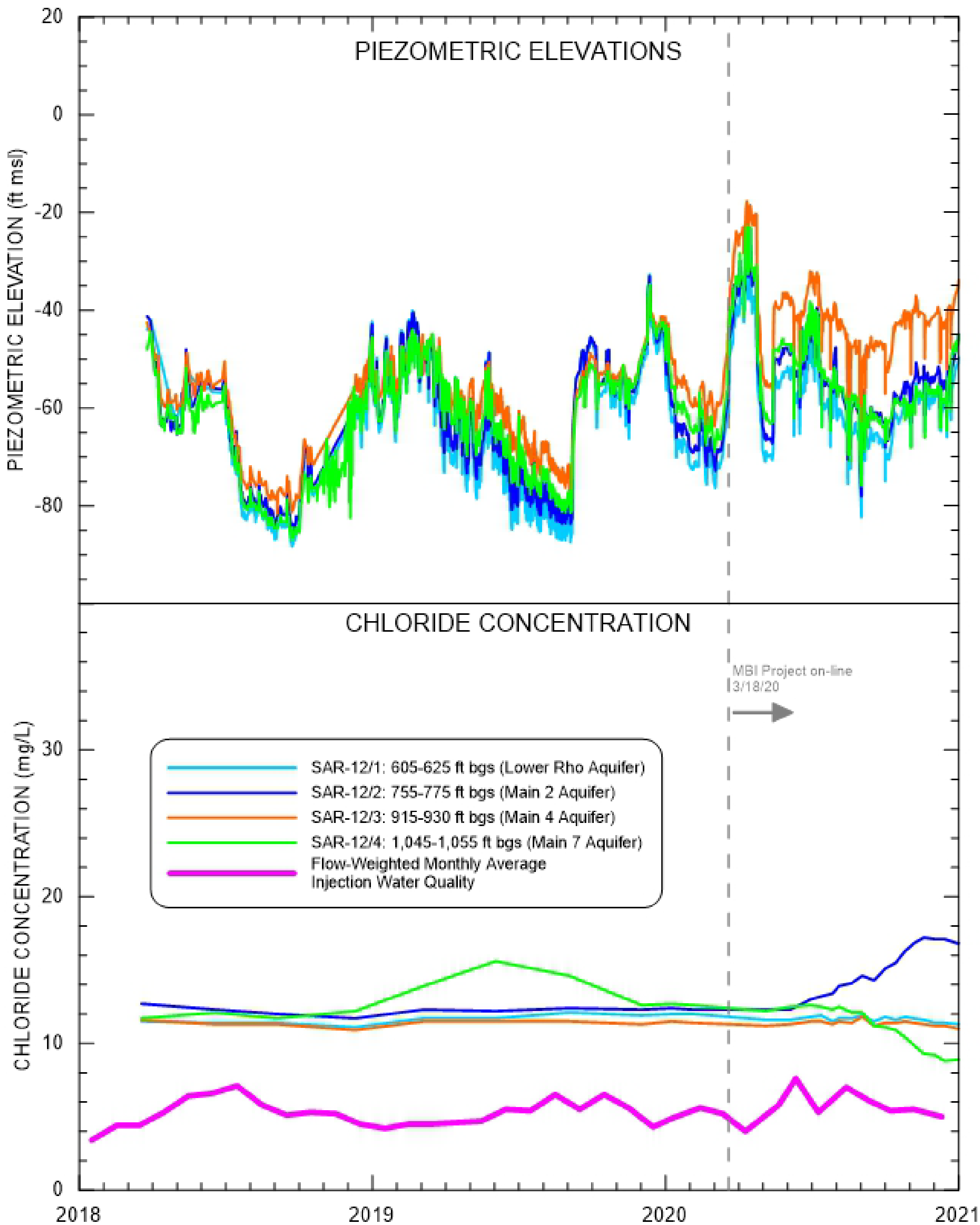


Figure 8-6. Monitoring Well SAR-12 Piezometric Elevations and Chloride Concentration

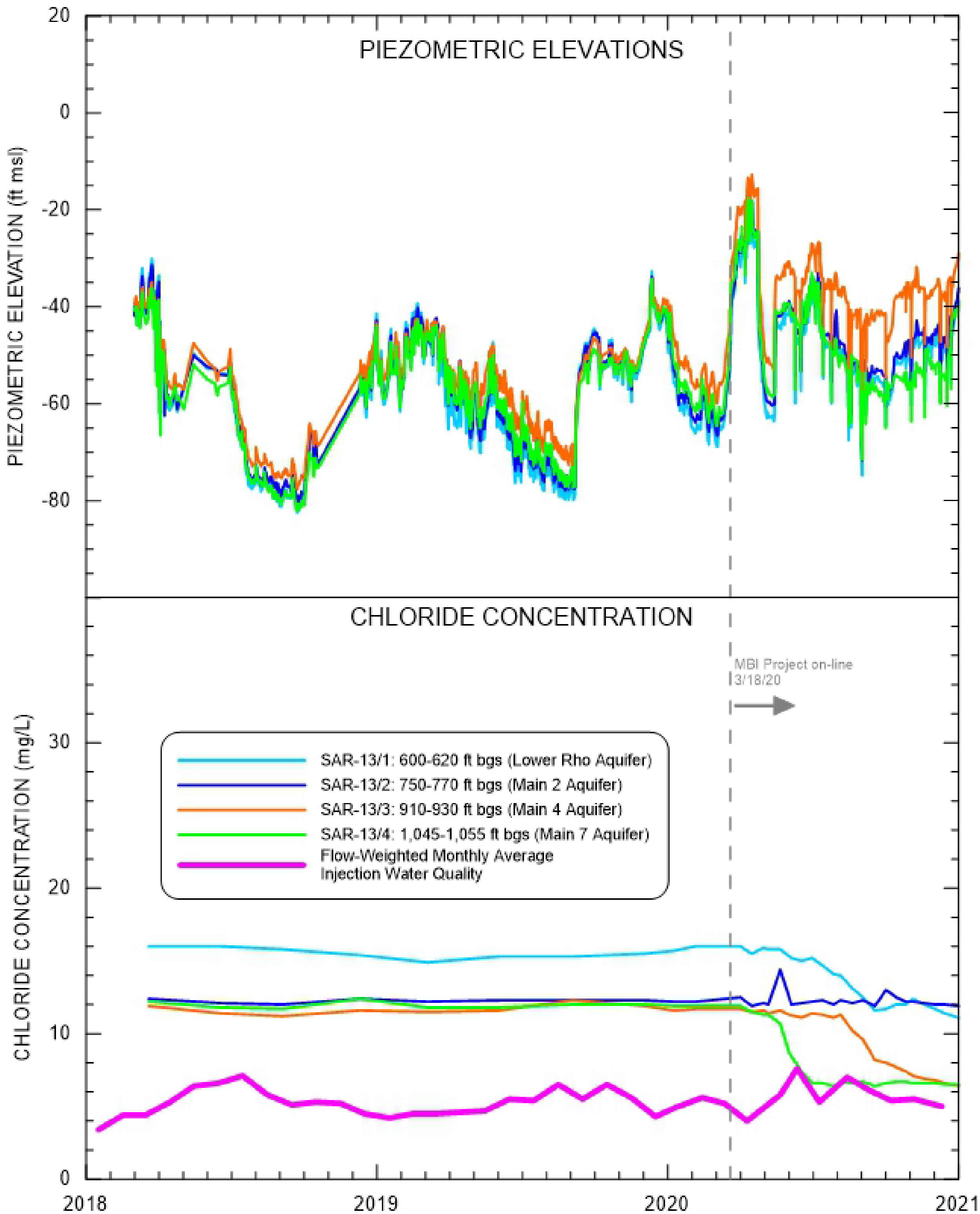


Figure 8-7. Monitoring Well SAR-13 Piezometric Elevations and Chloride Concentration

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.

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 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. The typical downward vertical gradient is not seen at SAR-12 (Figure 8-6) or SAR-13 (Figure 8-7) prior to or during MBI Centennial Park operations 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, causing the upper two zones at SAR-12 and SAR-13 to have lower heads than the lower 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.

During 2020, Principal aquifer groundwater levels at SAR-10 (Figure 8-4) and SAR-11 (Figure 8-5) were similar to one another and loosely followed the typical seasonal pattern described above, albeit dampened in range relative to previous years because of MBI Project injection, reduced Basin pumping due to PFAS, and subsequent reduced purchase and recharge of imported water. 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.

During the first quarter of 2020, Principal aquifer groundwater levels at the MBI Project monitoring wells declined earlier than usual, having seasonally peaked in December 2019. The early winter decline in water levels was attributed to increased Basin pumping in response to unusually dry conditions with less than half an inch of combined rainfall in January and February. The groundwater level decline rebounded slightly in early March in response to a slight reduction in Basin pumping due to significant rainfall that month. Upon startup of the MBI Centennial Park wells in mid-March, water levels rose rapidly at the monitoring wells, increasing from 10 to over 25 feet at SAR-10 and SAR-11 and as much as 35 feet at SAR-12 and SAR-13 through mid-April. However, this increase was not entirely due to MBI Project injection, as Basin pumping (including the nearby IRWD DRWF) contemporaneously decreased in response to continued late-season rainfall in March and April when almost seven inches of rain accumulated (OCWD, 2020).

During the planned AWPF shutdown when the MBI wells were off-line from late April to mid-May, Principal aquifer groundwater levels at the MBI Project monitoring wells declined steeply, falling almost to the lows of late February observed prior to the commissioning of the MBI Centennial Park wells. Upon restart of the AWPF and injection operations at all five MBI wells in mid-May, groundwater levels rebounded significantly in late May and June but remained lower than the annual highs of mid-April, as Basin pumping in the area had since increased. Groundwater levels at all four monitoring wells decreased from July to early October, as is typical due to increased summertime Basin pumping, but remained approximately 10 to 20 feet higher than the 2019 summertime low. Groundwater levels at the four monitoring wells subsequently rebounded gradually through the remainder of the year.

At all four MBI Project monitoring wells, Principal aquifer groundwater levels at the end of 2020 were approximately 5 to 10 feet higher than at the beginning of the year for all zones except the Upper Rho aquifer (SAR-10/1 and SAR-11/1), which ended the year almost ten feet lower than the beginning of the year, primarily because the four new MBI wells do not inject into the Upper Rho aquifer. Therefore, it was apparent that MBI Project injection played a role in the increasing water level trends in the other targeted aquifer zones during 2020.

8.4 Groundwater Quality

Quarterly compliance sampling continued at monitoring wells SAR-10 and SAR-11 during 2020 but became voluntary in March 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. Voluntary quarterly 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. During the second half of 2020, 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 2020 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 2020, groundwater quality at SAR-10, SAR-11, SAR-12, and SAR-13 complied with all Federal and State Primary Drinking Water Standards. Two instances of Secondary MCL exceedance (Aluminum) occurred at SAR-10/1 in 2020 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 to 11 mg/L since 2008 and more recently ranging from 5 to 7 mg/L over the last five years. Monthly chloride concentrations of GWRS purified recycled water during 2020 ranged from approximately 4 to 8 mg/L, with an annual average of approximately 6 mg/L, slightly less than the 7 to 11 mg/L average in 2015-2016 due to replacement of RO membranes at the AWPF. The lower 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 to 17 mg/L prior to the commencement of GWRS injection at MBI-1. Similarly, the lower 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 to 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 ambient 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 throughout 2020. For the other two deeper zones at SAR-11, the fastest arrival of GWRS water occurred in approximately 13 weeks 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 2020, chloride concentrations at both SAR-11/2 and SAR-11/3 (Figure 8-5) remained at GWRS levels, indicating approximately 100% GWRS water in these zones.

At SAR-12, located approximately 1,025 feet downgradient of MBI-2, chloride concentrations during 2020 declined at only SAR-12/4 (Main 7 aquifer), the same zone with the fastest arrival from MBI-1 to SAR-10 and SAR-11 during 2015. Chloride concentrations at SAR-12/4 declined significantly in mid-September (Figure 8-6), signaling arrival of the low-chloride GWRS water but remaining slightly above GWRS levels for the remainder of the year, indicating less than 100% GWRS water at that zone. No other zones at SAR-12 showed a decrease in chloride concentrations in 2020, indicating that SAR-12/4 screened in the Main 7 aquifer zone once again had the fastest arrival time and was the only zone at the SAR-12 site to see GWRS arrival. Chloride concentrations remained stable at ambient levels at SAR-12/1 (Lower Rho aquifer) and at SAR-12/3 (Main 4 aquifer) during 2020. At SAR-12/2 (Main 2 aquifer), chloride concentrations remained at ambient levels of around 12 mg/L for the first half of 2020 then increased steadily from June to November to around 17 mg/L, where they remained for the final months of the year. This 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 SAR-13, located approximately 725 feet downgradient of MBI-5, chloride concentrations during 2020 noticeably declined in three of the four zones (Figure 8-7) signaling GWRS arrival. At SAR-13/1 (Lower Rho aquifer), chloride concentrations began declining significantly in mid-August and continued decreasing steadily for the remainder of the year, though never reaching levels indicative of 100% GWRS water. At SAR-13/2 (Main 2 aquifer), chloride concentrations remained at ambient levels throughout the year indicating no GWRS arrival in this zone. At SAR-13/3 (Main 4 aquifer), chloride concentrations began dropping significantly in mid-August, while at SAR-13/4 (Main 7 aquifer) chloride concentrations decreased significantly in mid-May and once again represented the fastest GWRS arrival at this site, similar to the other three MBI Project monitoring wells. Chloride concentrations at both SAR-13/3 and SAR-13/4 fell to near GWRS levels, where they remained through the end of the year, indicating sustained GWRS arrival at these zones of nearly 100%.

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 quite 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 2015-2020 for all zones at SAR-10 and SAR-11, respectively, and Figure 8-10 and Figure 8-11 show chloride and sulfate concentrations during 2018-2020 for all zones at SAR-12 and SAR-13, respectively. In all cases, the timing of the chloride and sulfate concentration declines signaling GWRS arrival 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 during the 2020 intrinsic tracer test 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 2020 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 2020 GWRS arrival times for SAR-12 and SAR-13 in Table 8-4 were based on biweekly sulfate samples. GWRS arrival was defined as the date of the first sulfate sample whose concentration was 10 to 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.

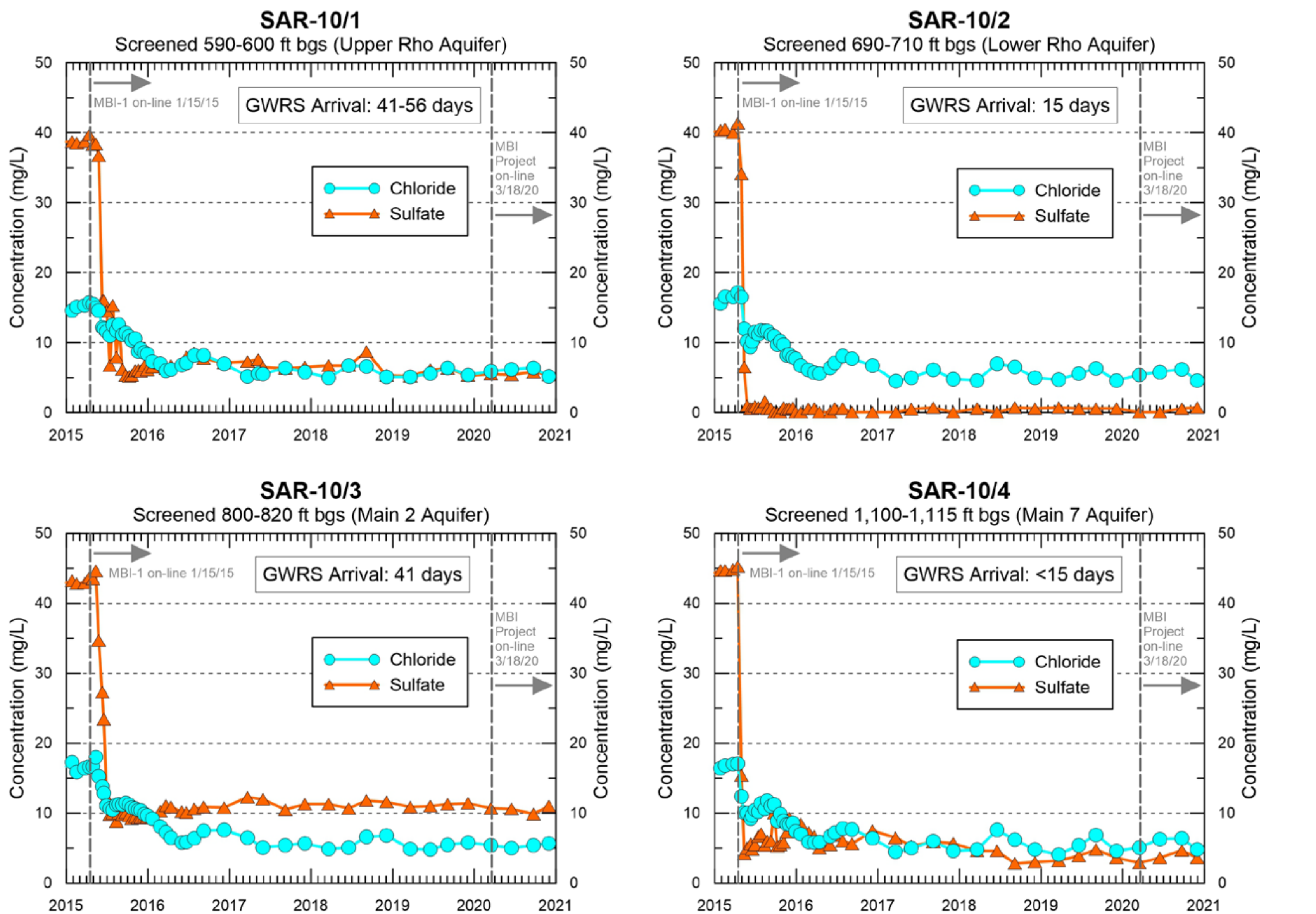


Figure 8-8. Monitoring Well SAR-10 Chloride and Sulfate Concentrations

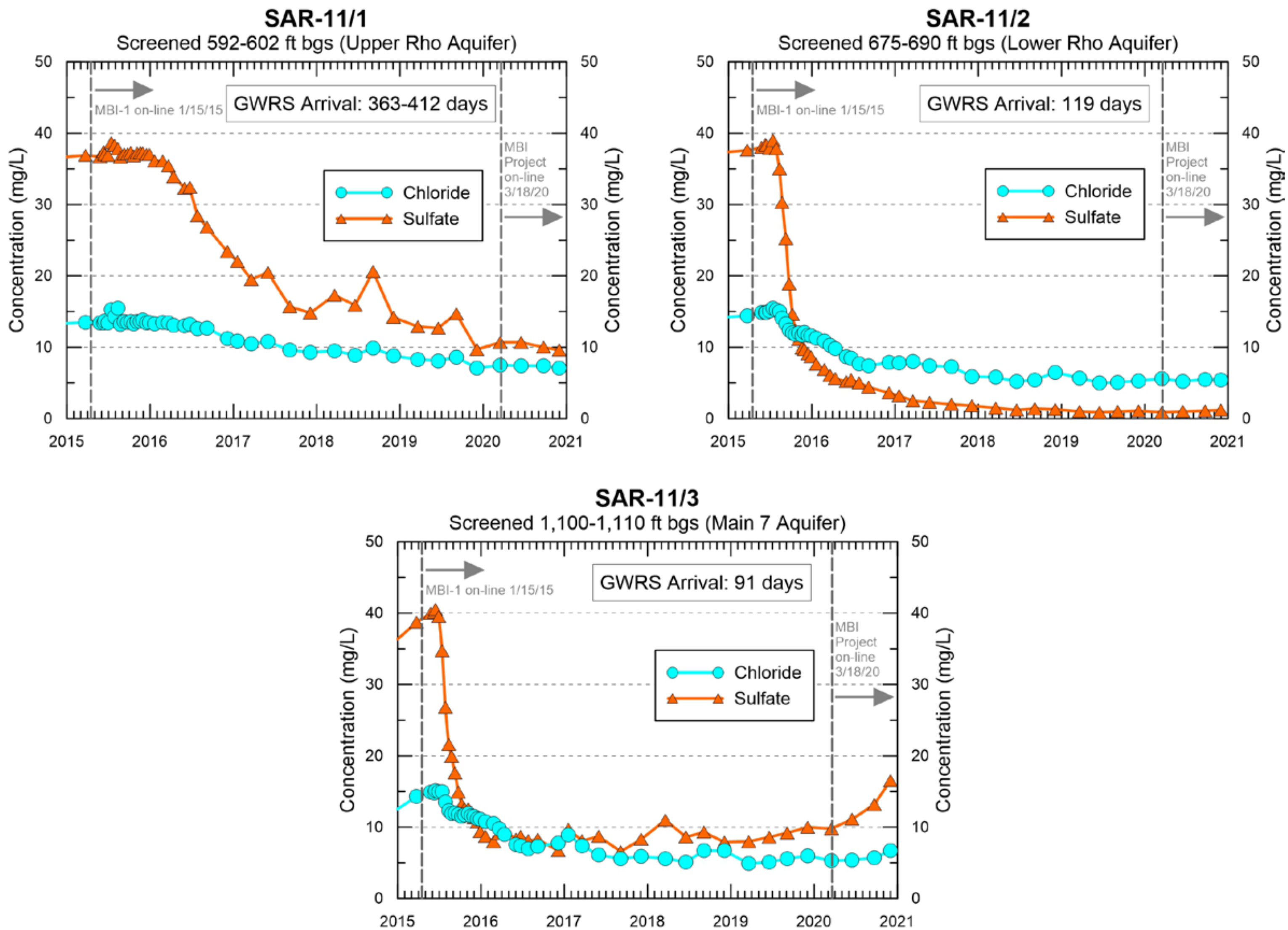


Figure 8-9. Monitoring Well SAR-11 Chloride and Sulfate Concentrations

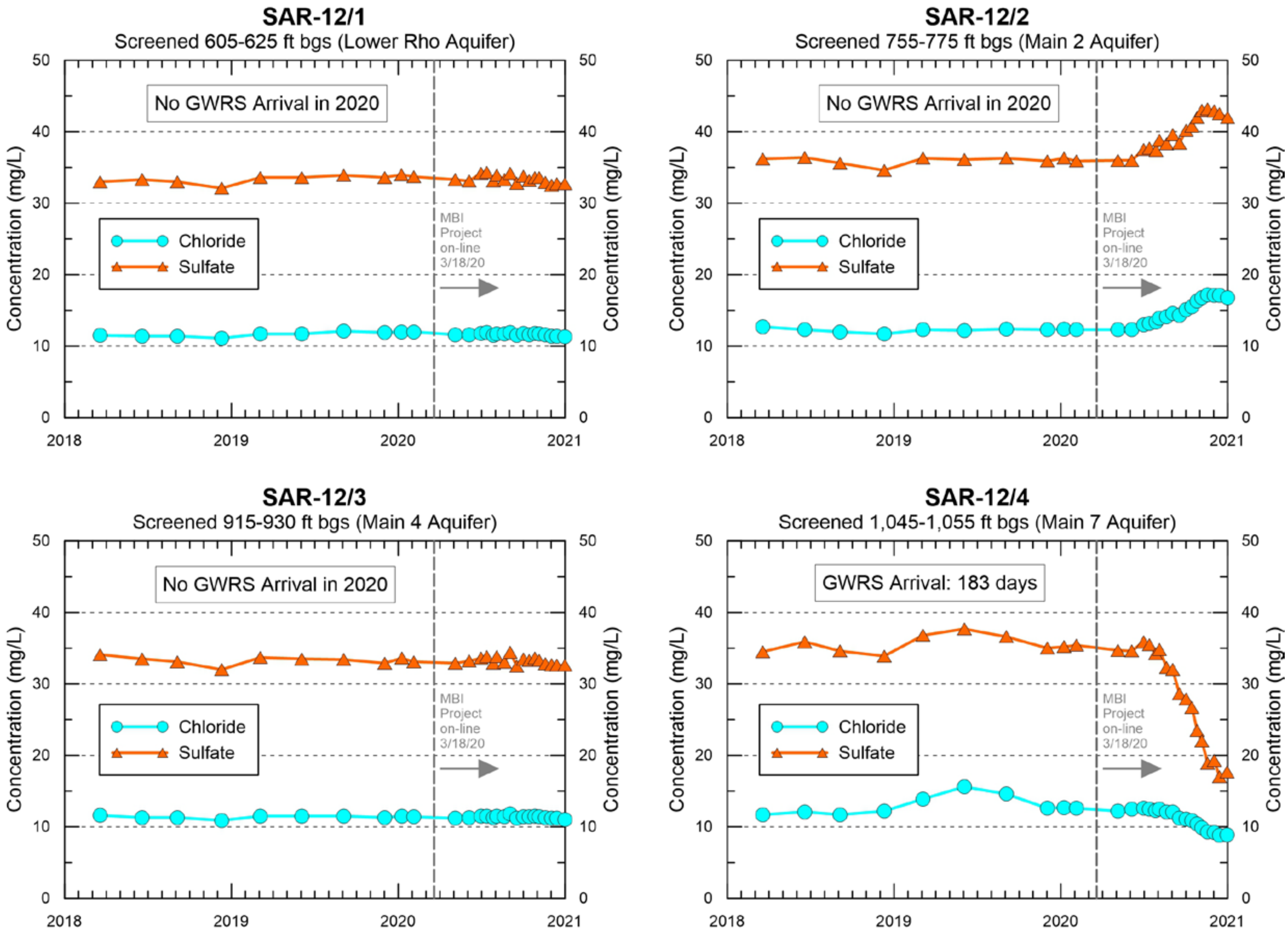


Figure 8-10. Monitoring Well SAR-12 Chloride and Sulfate Concentrations

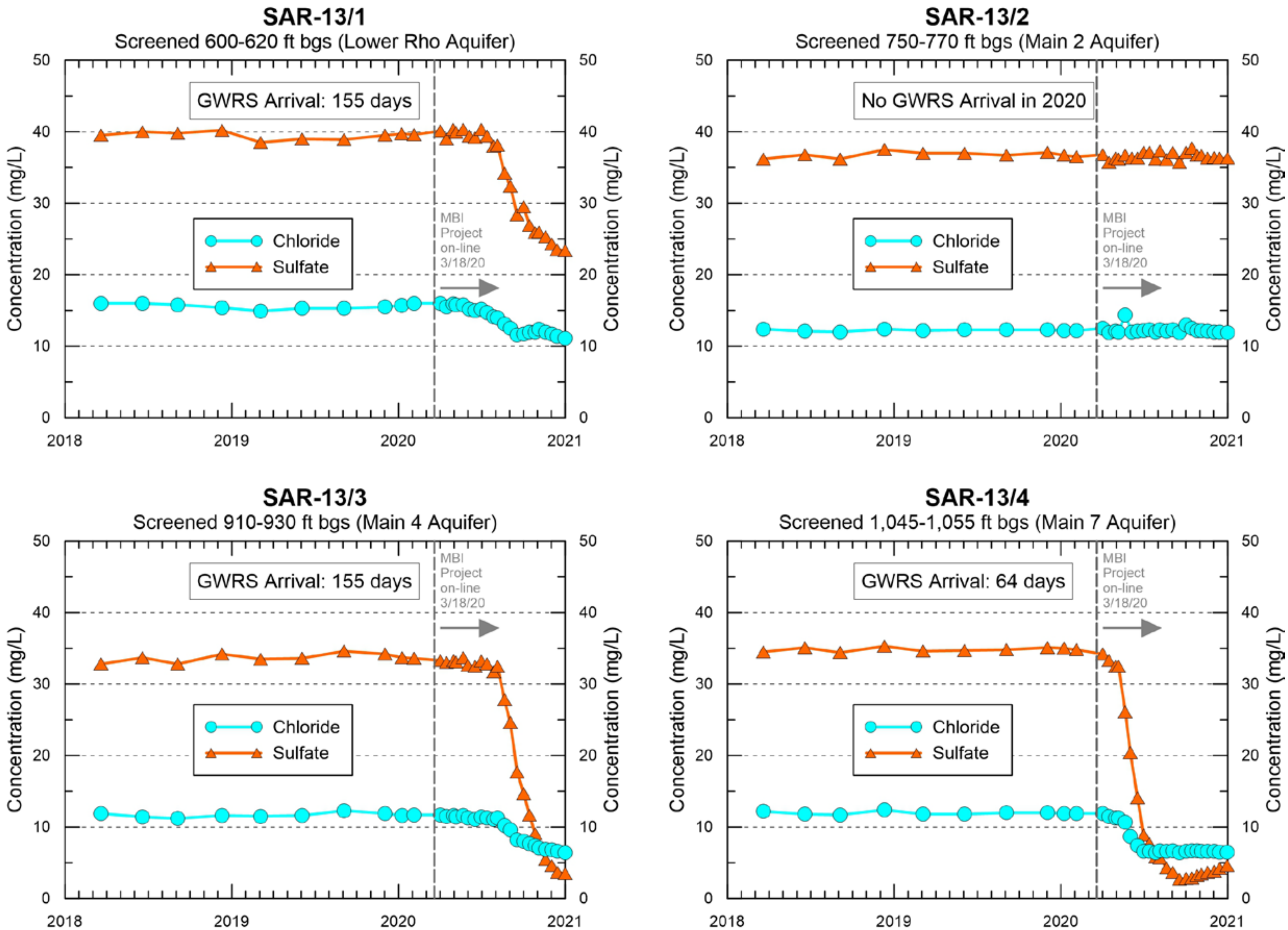


Figure 8-11. Monitoring Well SAR-13 Chloride and Sulfate Concentrations

Table 8-4. 2020 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)	No Arrival	No Arrival
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)	No Arrival	No Arrival
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 2020, 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-12/4, 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, likely due to the oxidation of iron sulfide minerals generating sulfate in these aquifers zones.

8.4.2 Monitoring Wells – 1,4-Dioxane and NDMA

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. 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) in order to comply with the updated Recycled Water Quality AWPF CEC monitoring requirements incorporated as part of the latest GWRS permit Monitoring and Reporting Program (RWQCB, 2020).

Concentrations of 1,4-dioxane at MBI Project monitoring wells SAR-10, SAR-11, SAR-12 and SAR-13 are shown in the upper graph of Figure 8-12 through Figure 8-15, respectively. As expected,

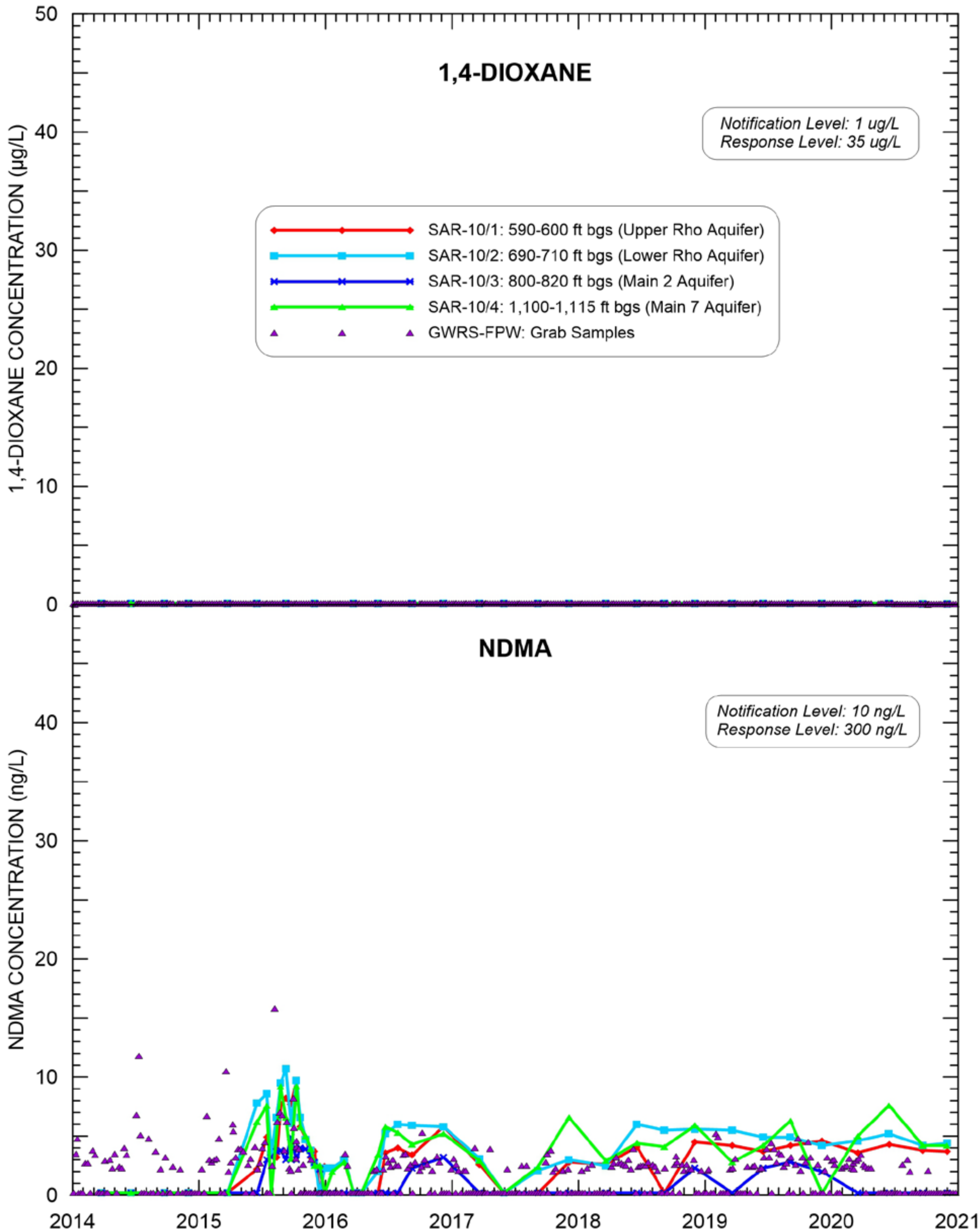


Figure 8-12. Monitoring Well SAR-10 1,4-Dioxane and NDMA Concentrations

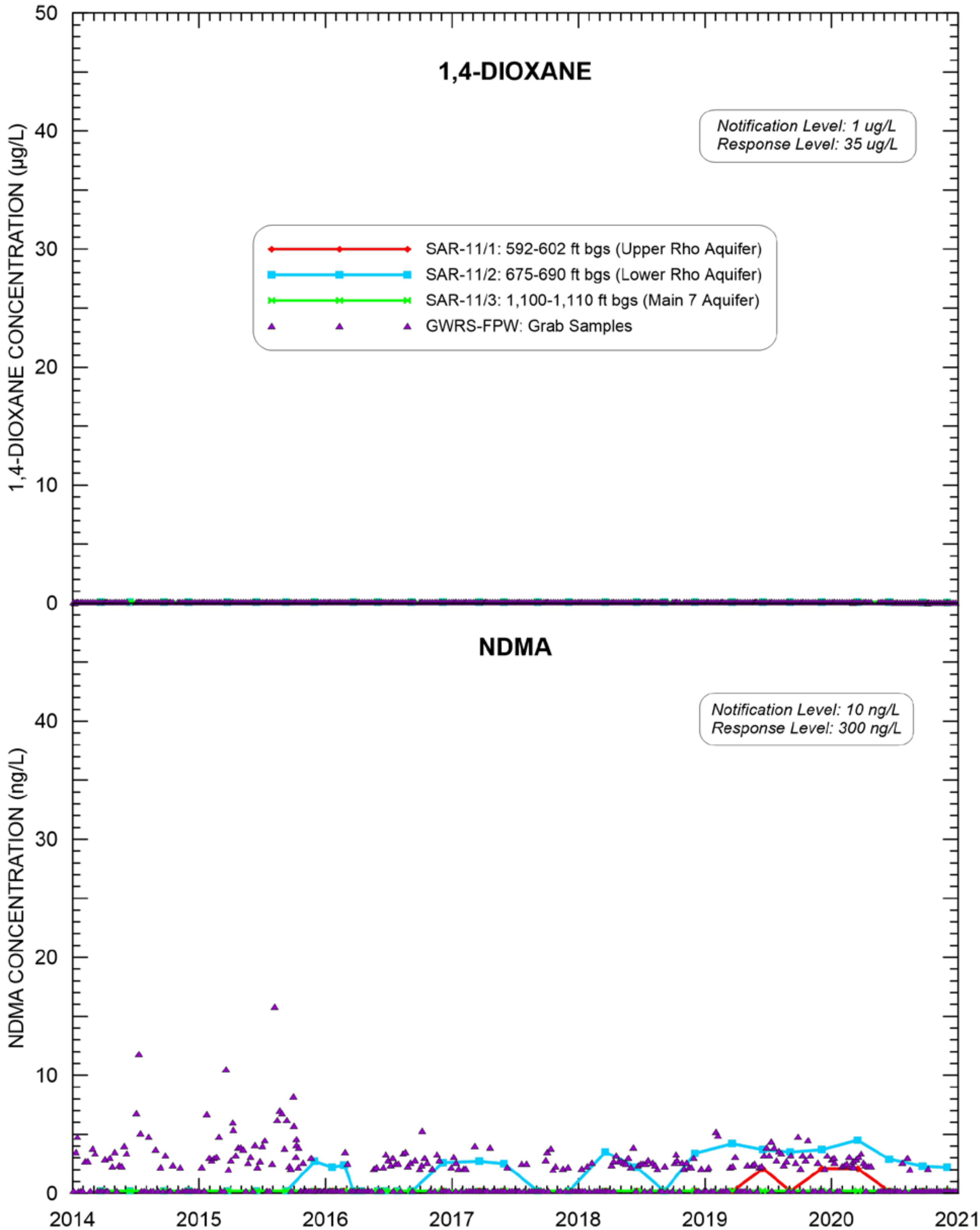


Figure 8-13. Monitoring Well SAR-11 1,4-Dioxane and NDMA Concentrations

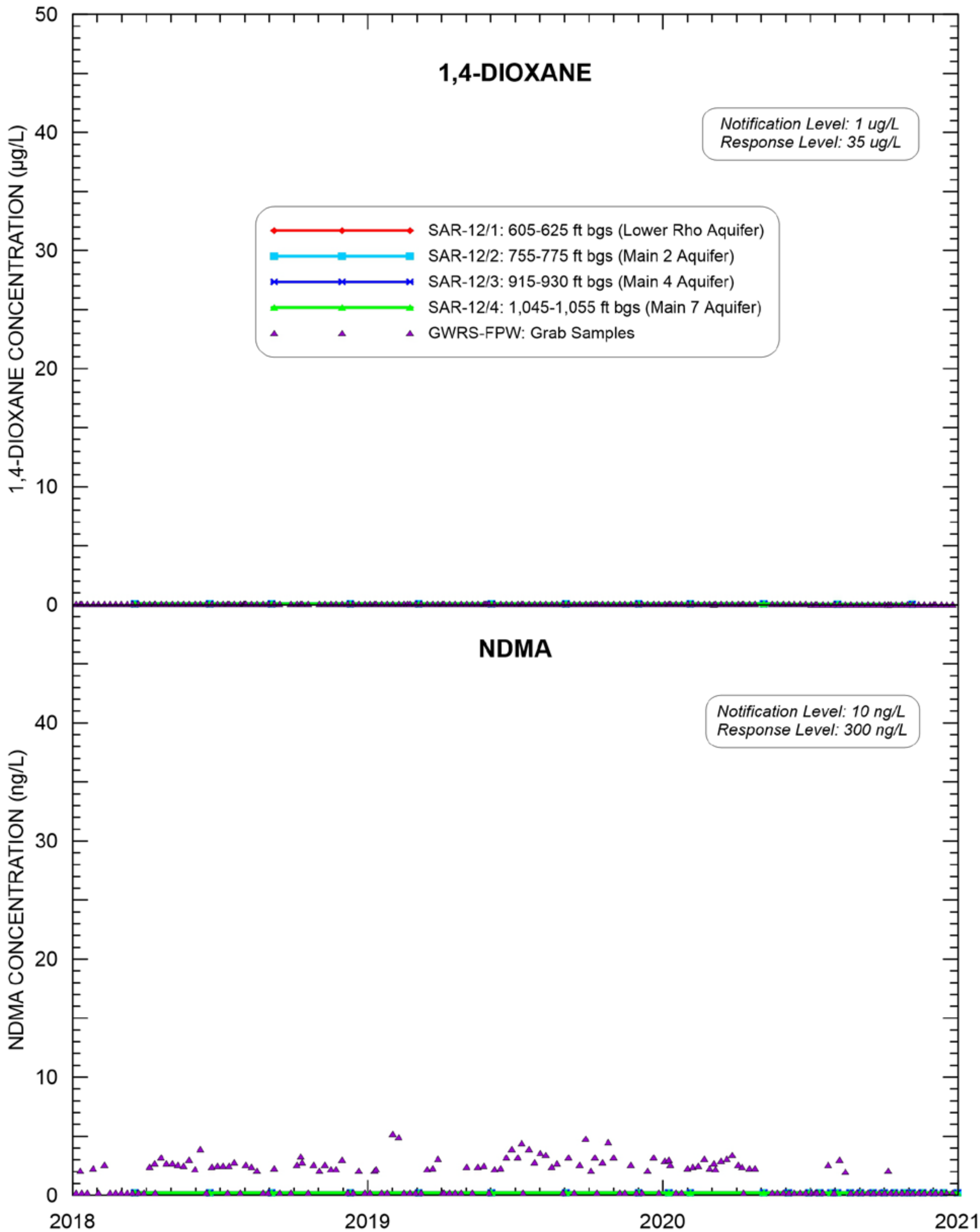


Figure 8-14. Monitoring Well SAR-12 1,4-Dioxane and NDMA Concentrations

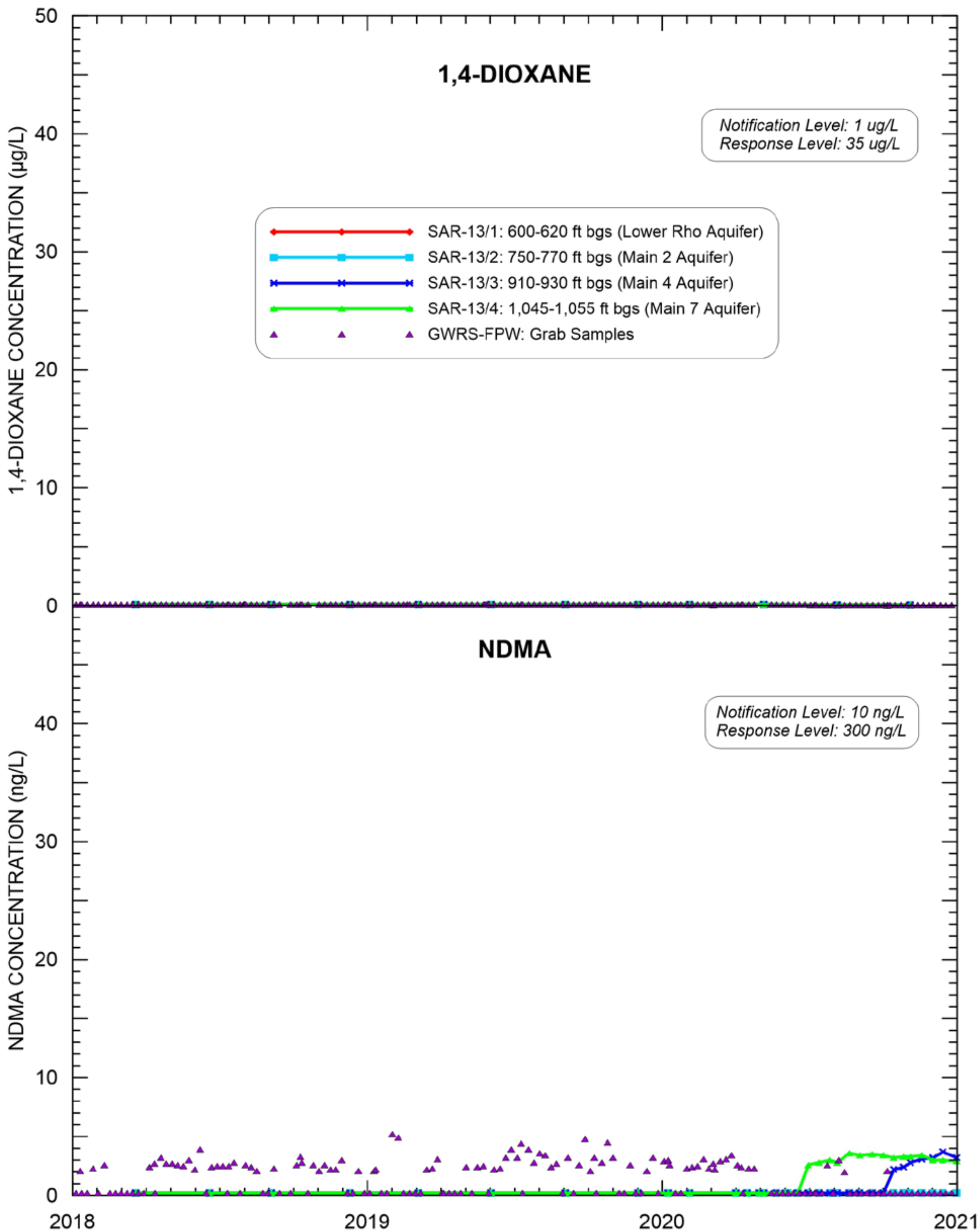


Figure 8-15. Monitoring Well SAR-13 1,4-Dioxane and NDMA Concentrations

all zones at the four MBI Project monitoring wells continued to be non-detect for 1,4-dioxane since historical ambient levels at all four monitoring wells and GWRS water 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 then form NDMA 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 high 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 2019 the average NDMA concentration in GWRS-FPW was reduced to 1.4 ng/L, with only two detections exceeding 5 ng/L (5.2 ng/L and 5.3 ng/L, well below the NL of 10 ng/L). During 2020, NDMA concentrations in GWRS-FPW averaged 1.1 ng/L with a maximum detection of 3.4 ng/L.

NDMA concentrations at SAR-10 for 2014-2020 are shown in the lower graph of Figure 8-12, 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 10 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 2020, NDMA concentrations in all four zones at SAR-10 ranged from below the RDL to 7.6 ng/L (Figure 8-12). At SAR-10/1 and SAR-10/2, NDMA concentrations remained stable during 2020 ranging from approximately 3 to 5 ng/L. This range in NDMA concentrations at SAR-10/1 and SAR-10/2 is slightly higher than the contemporaneous NDMA concentrations in GWRS-FPW and was likely caused by older GWRS water injected during the 2015-2017 period arriving at this well due to a shift in the local hydraulic gradient from injection at the MBI Centennial Park wells from mid-March 2020 to the end of the year. At SAR-10/3, NDMA concentrations were the lowest of all zones at SAR-10, measuring non-detect throughout 2020, likely due to the relatively low fraction 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, at SAR-10/4 NDMA concentrations during 2020 were the highest and most variable of the SAR-10 zones, reaching 7.6 ng/L in June 2020. The June 2020 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 (Figure 8-12) to migrate back to this well.

NDMA concentrations at SAR-11 for 2014-2020 are shown in the lower graph of Figure 8-13 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. Since the start of MBI-1 injection, SAR-11/3 has consistently been non-detect. Prior to 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 detection levels for the remainder of 2020. At SAR-11/2, NDMA concentrations were detected in the 2 to 4 ng/L range intermittently during 2015-2018 and remained slightly higher and more stable at 3.5 to 4.2 ng/L throughout 2019. Concentrations peaked at 4.5 ng/L in March 2020, before falling to the 2 to 3 ng/L range for the remainder of the year which was generally consistent with concurrent NDMA concentrations in GWRS-FPW. 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 2018-2020 are shown in the lower graph of Figure 8-14, along with NDMA concentrations for GWRS-FPW for comparison. All four zones at SAR-12 have been consistently non-detect for NDMA throughout the entire monitoring period of 2018-2020. This is as expected for the zones without any GWRS arrival (SAR-12/1, SAR-12/2, and SAR-12/3). At SAR-12/4, GWRS water has arrived, but as shown in Figure 8-10, at much less than 100% as determined by the slightly elevated sulfate concentrations of approximately 17 mg/L to end the year.

NDMA concentrations at SAR-13 for 2018-2020 are shown in the lower graph of Figure 8-15, 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 2018-2020. This is expected at SAR-13/2 since no GWRS arrival has been observed at this well in 2020, and at SAR-13/1, where similar to SAR-12/4, sulfate concentrations remained elevated in 2020, indicating less than 100% GWRS water (Figure 8-11). SAR-13/3 and SAR-13/4 both had NDMA concentrations above the RDL in the 2 to 4 ng/L range during 2020, beginning in October at SAR-13/3 and in June at SAR-13/4, with concentrations from both remaining steady and within the range of contemporaneous GWRS-FPW concentrations for the remainder of the year.

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 8-16 and Figure 8-17 show dissolved arsenic and chloride concentrations during 2015-2020 for SAR-10 and SAR-11, respectively, and Figure 8-18 and Figure 8-19 show dissolved arsenic and chloride concentrations during 2018-2020 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 quarterly from March 2018 to November 2020, then biweekly thereafter. 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 8-16 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 concentrations similar to what was observed in the Anaheim Forebay (Section 6.4.3). At SAR-10/1, SAR-10/2, and SAR-10/4, Figure 8-16 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, arsenic concentrations at SAR-10/1, SAR-10/2, and SAR-10/4 remained below the RDL of 1 µg/L (Figure 8-16). At SAR-10/3, arsenic concentrations increased after the first arrival of GWRS water in 2015 and continued to remain elevated above pre-injection ambient background levels but well below the MCL of 10 µg/L through 2020 (Figure 8-16). During 2020, arsenic concentrations at SAR-10/3 decreased slightly from approximately 5.0 to 4.5 µg/L, representing the lowest concentration since September 2016. As was discussed in the previous section for SAR-10/3, although chloride concentrations were down at GWRS levels, sulfate concentrations of approximately 10 to 12 mg/L during 2016-2020 (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 8-17 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.

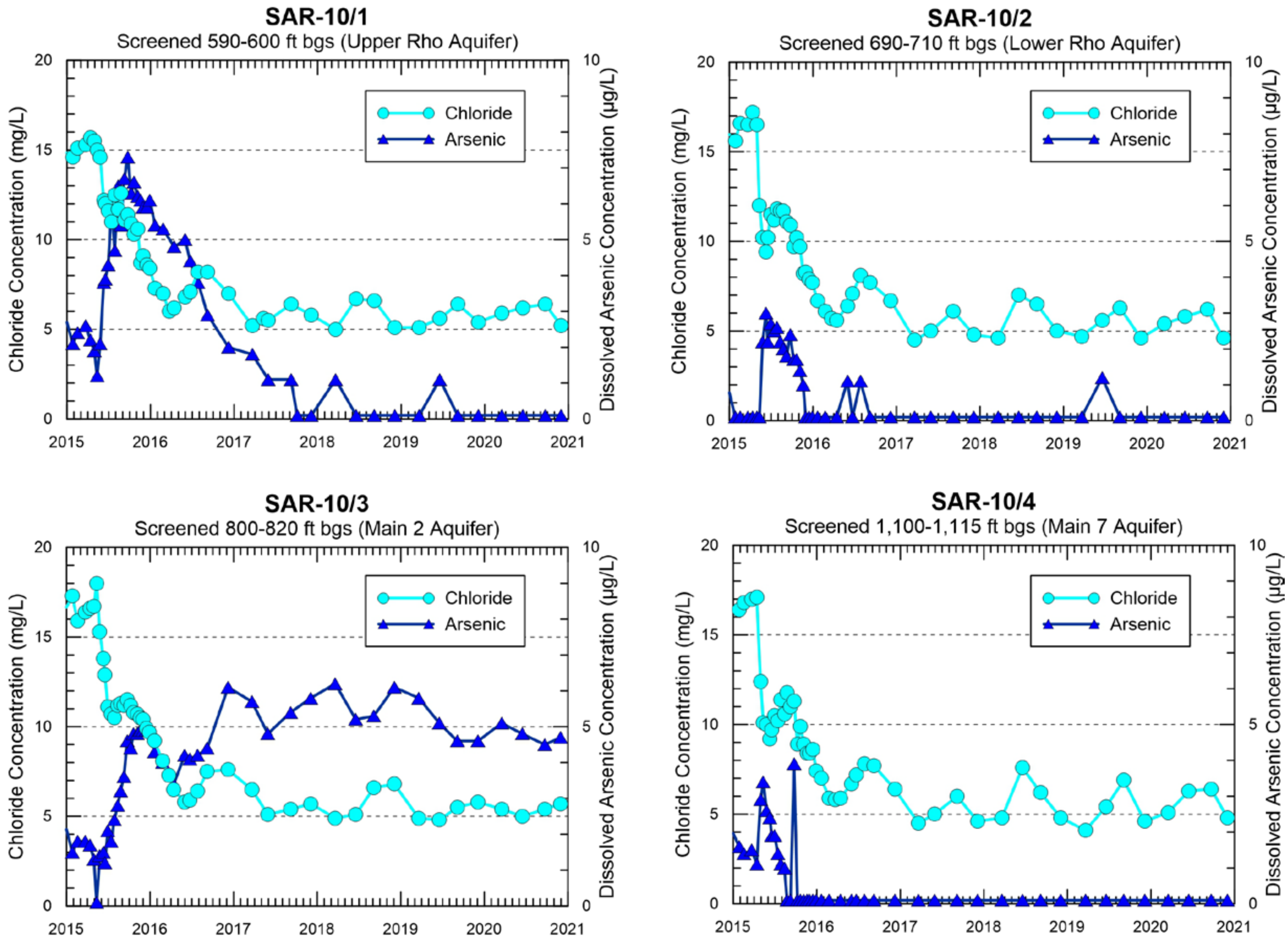


Figure 8-16. Monitoring Well SAR-10 Chloride and Dissolved Arsenic Concentrations

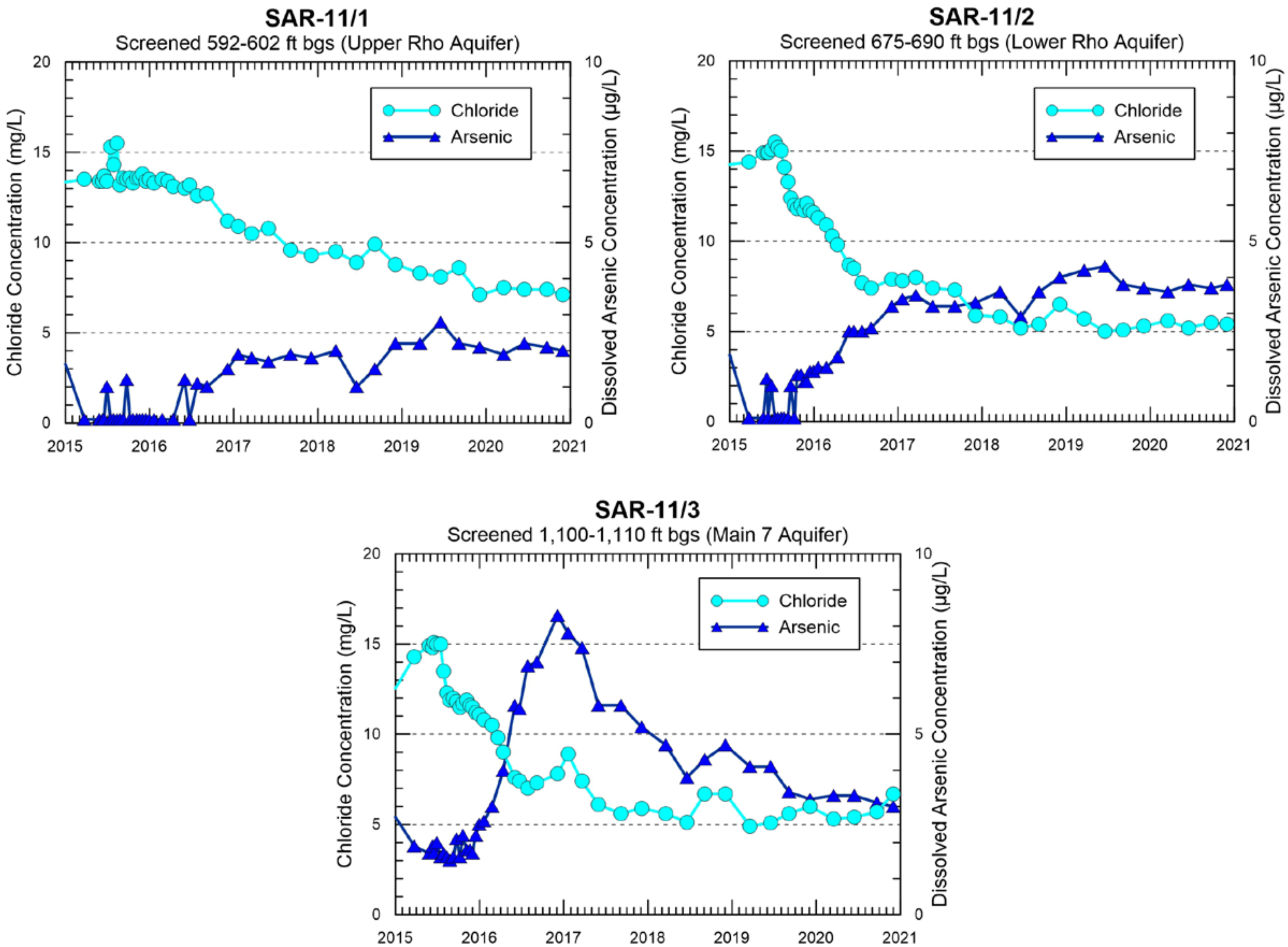


Figure 8-17. Monitoring Well SAR-11 Chloride and Dissolved Arsenic Concentrations

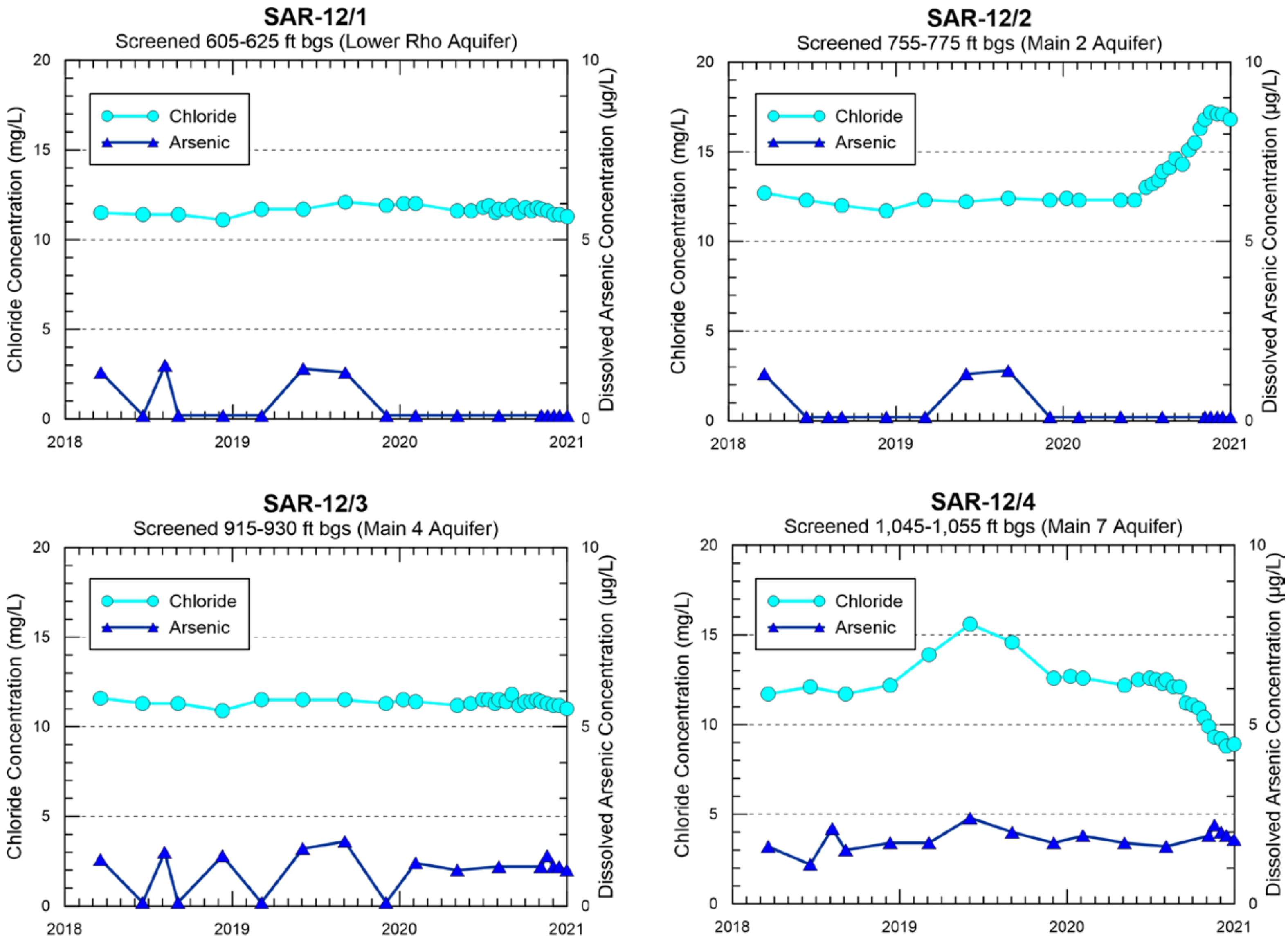


Figure 8-18. Monitoring Well SAR-12 Chloride and Dissolved Arsenic Concentrations

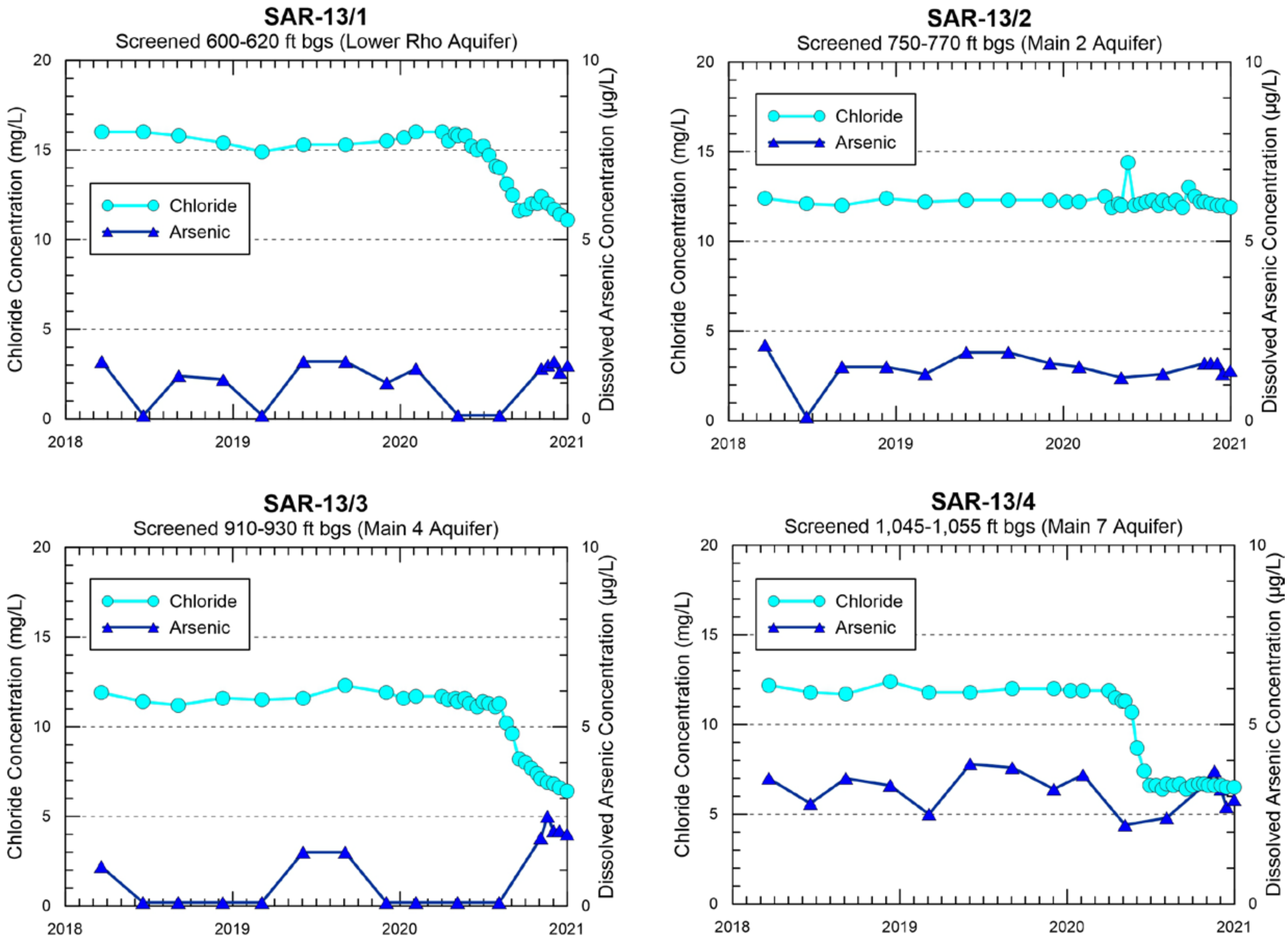


Figure 8-19. Monitoring Well SAR-13 Chloride and Dissolved Arsenic Concentrations

At SAR-11/1 and SAR-11/2, arsenic concentrations have gradually increased since 2016 slightly above ambient levels but well below the MCL of 10 µg/L. At SAR-11/3, arsenic concentrations peaked at approximately 8 µg/L in late 2016 and have since gradually declined. During 2020, arsenic concentrations remained relatively stable at slightly above ambient concentrations in all three zones at SAR-11, ranging from approximately 2 to 4 µg/L. (Figure 8-17).

At SAR-12, Figure 8-18 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. Figure 8-18 shows that arsenic concentrations were not elevated above ambient background concentrations at any SAR-12 zone during 2020. At SAR-12/1, SAR-12/2, and SAR-12/3, no GWRS water arrived during 2020 and, as expected, arsenic concentrations remained within the ambient range throughout the year at each of the three zones, measuring from below the RDL to 1.4 µg/L. At SAR-12/4, where GWRS water is estimated to have arrived in mid-September 2020 as shown by the sulfate concentrations on Figure 8-10, arsenic concentrations remained at ambient background concentrations throughout 2020, ranging from 1.6 to 2.2 µg/L. The low arsenic concentrations at SAR-12/4 during 2020 may be due to GWRS arrival remaining at much less than 100% at this well for the remainder of 2020 or that this zone at this location is less susceptible to mobilization (see SAR-13/4 discussion below)

Figure 8-19 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 8-19 shows that despite GWRS water arrival at three of the four zones, only SAR-13/3 showed a small relative increase in arsenic during 2020 to above ambient background levels. At SAR-13/1 and SAR-13/4, where GWRS water is estimated to have arrived in mid-August 2020 and mid-May 2020, respectively, arsenic concentrations remained at background levels during 2020 ranging from below the RDL to 3.7 µg/L. At SAR-13/2, where no GWRS water arrived based on sulfate concentrations (Figure 8-11), as expected arsenic concentrations remained at background levels throughout 2020, ranging from 1.2 to 1.6 µg/L. At SAR-13/3, where GWRS water is estimated to have arrived in mid-August 2020, a very slight increase in arsenic concentrations above ambient background is seen in late 2020, rising from a background range of below the RDL to 1.5 µg/L up to 2.5 µg/L in November.

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, 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 8-20 and Figure 8-21 show dissolved vanadium and chloride concentrations during 2015-2020 for SAR-10 and SAR-11, respectively and Figure 8-22 and Figure 8-23 show dissolved vanadium and chloride concentrations during 2018-2020 for SAR-12 and SAR-13, respectively. As with arsenic discussed above, dissolved vanadium was used in Figure 8-20, Figure 8-21, Figure 8-22, and Figure 8-23 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 then biweekly for the remainder of 2020. 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 (1 μg/L) to approximately 6 μg/L.

At SAR-10, Figure 8-20 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. 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 Annual Report.

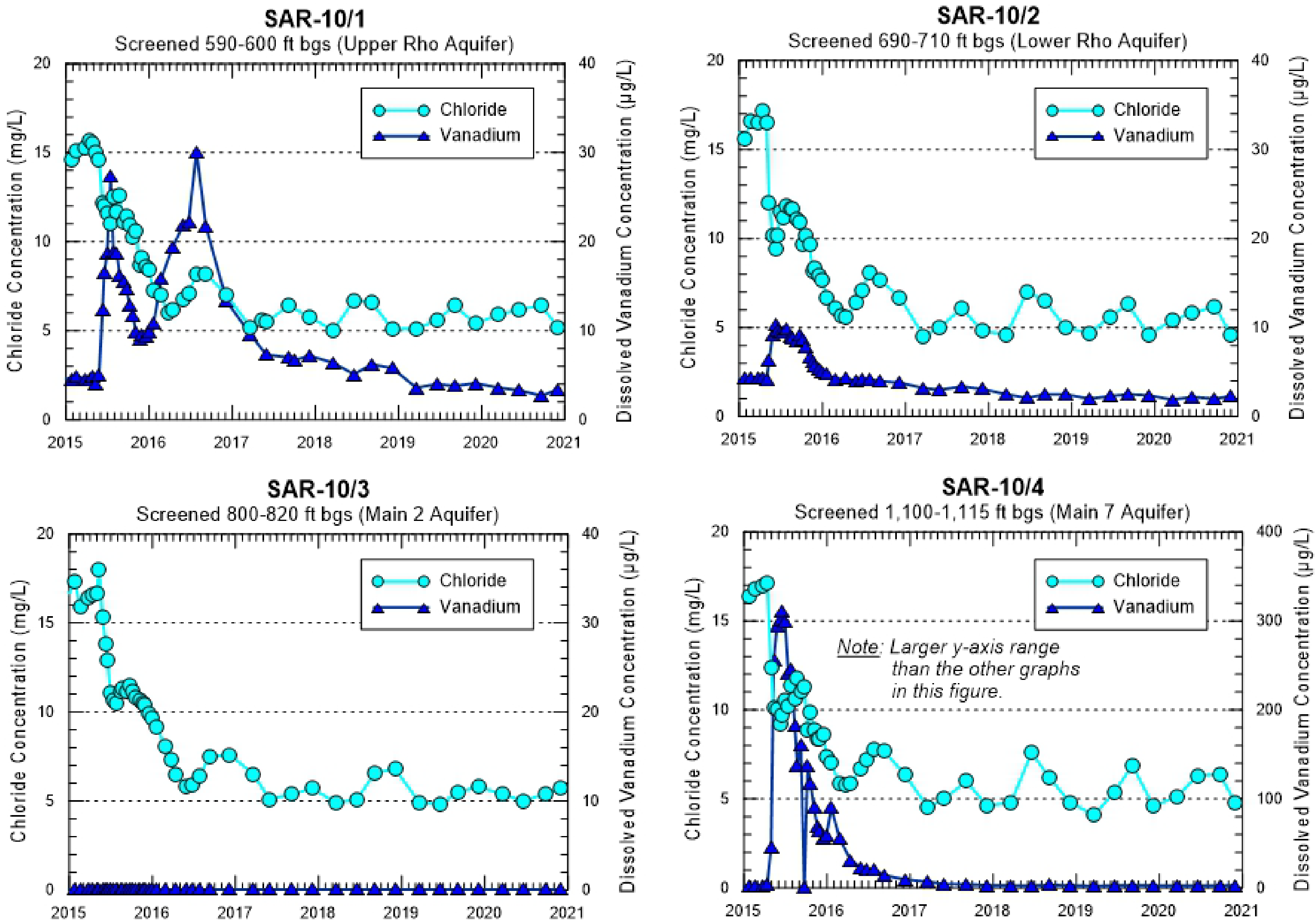


Figure 8-20. Monitoring Well SAR-10 Chloride and Dissolved Vanadium Concentrations

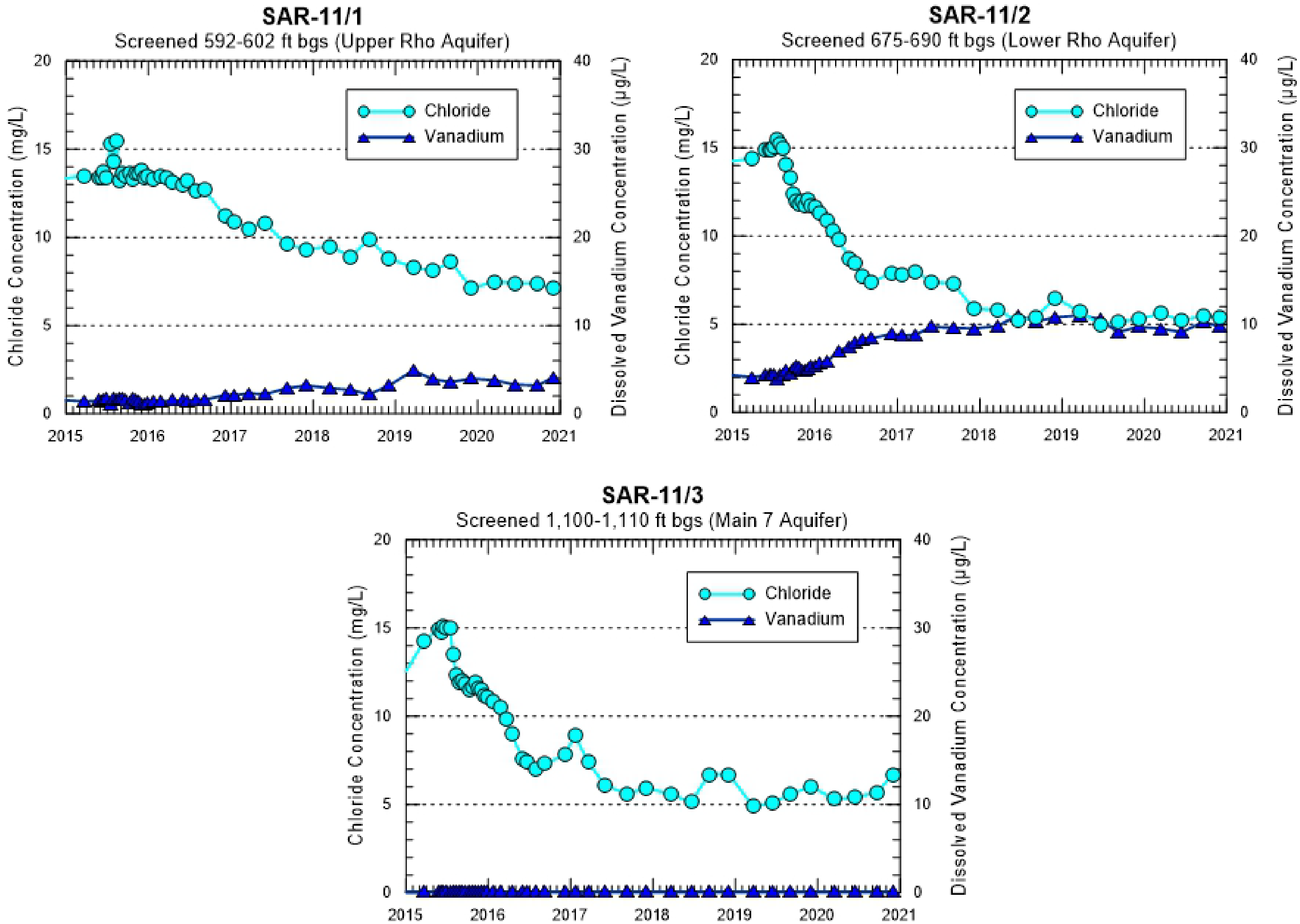


Figure 8-21. Monitoring Well SAR-11 Chloride and Dissolved Vanadium Concentrations

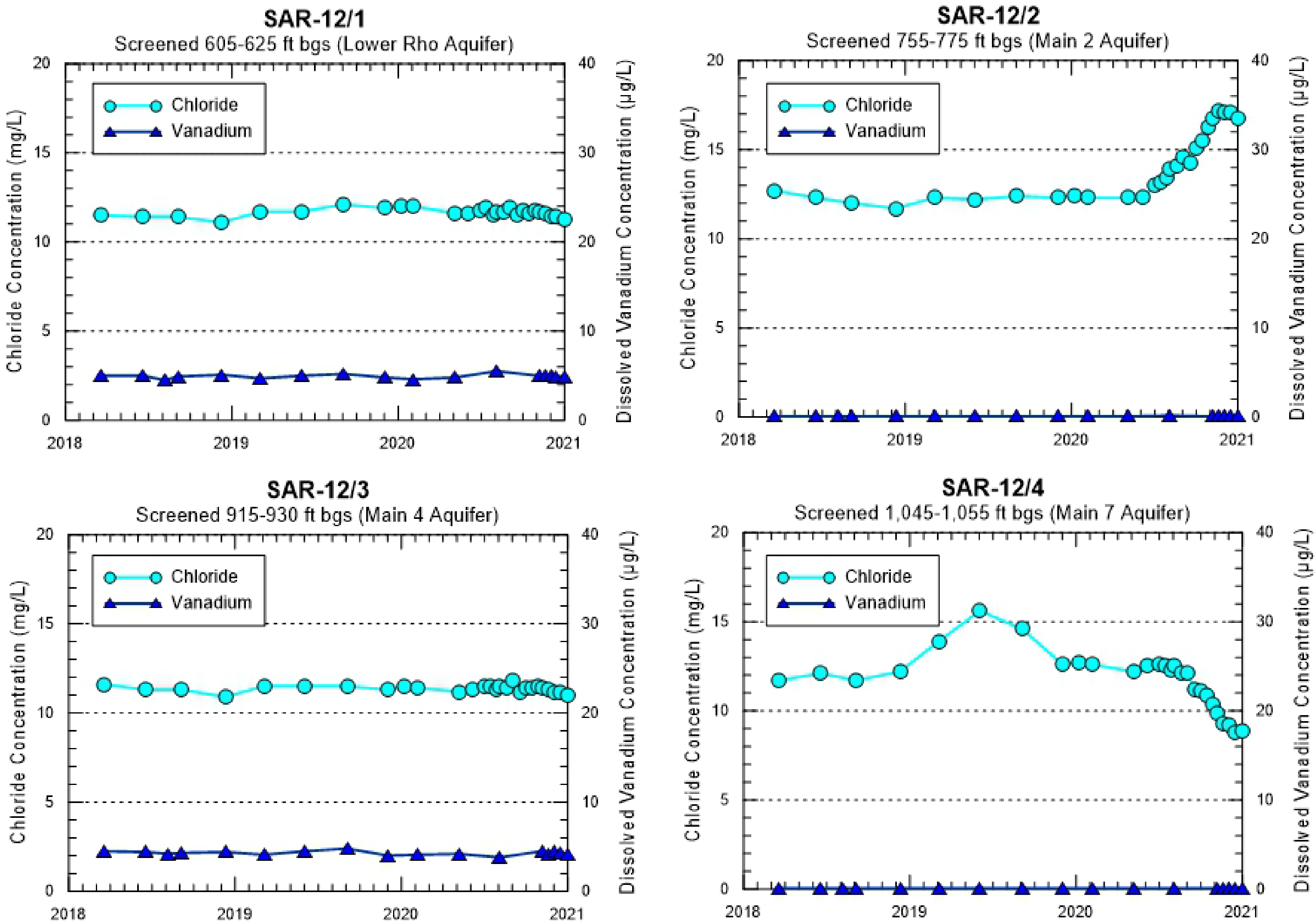


Figure 8-22. Monitoring Well SAR-12 Chloride and Dissolved Vanadium Concentrations

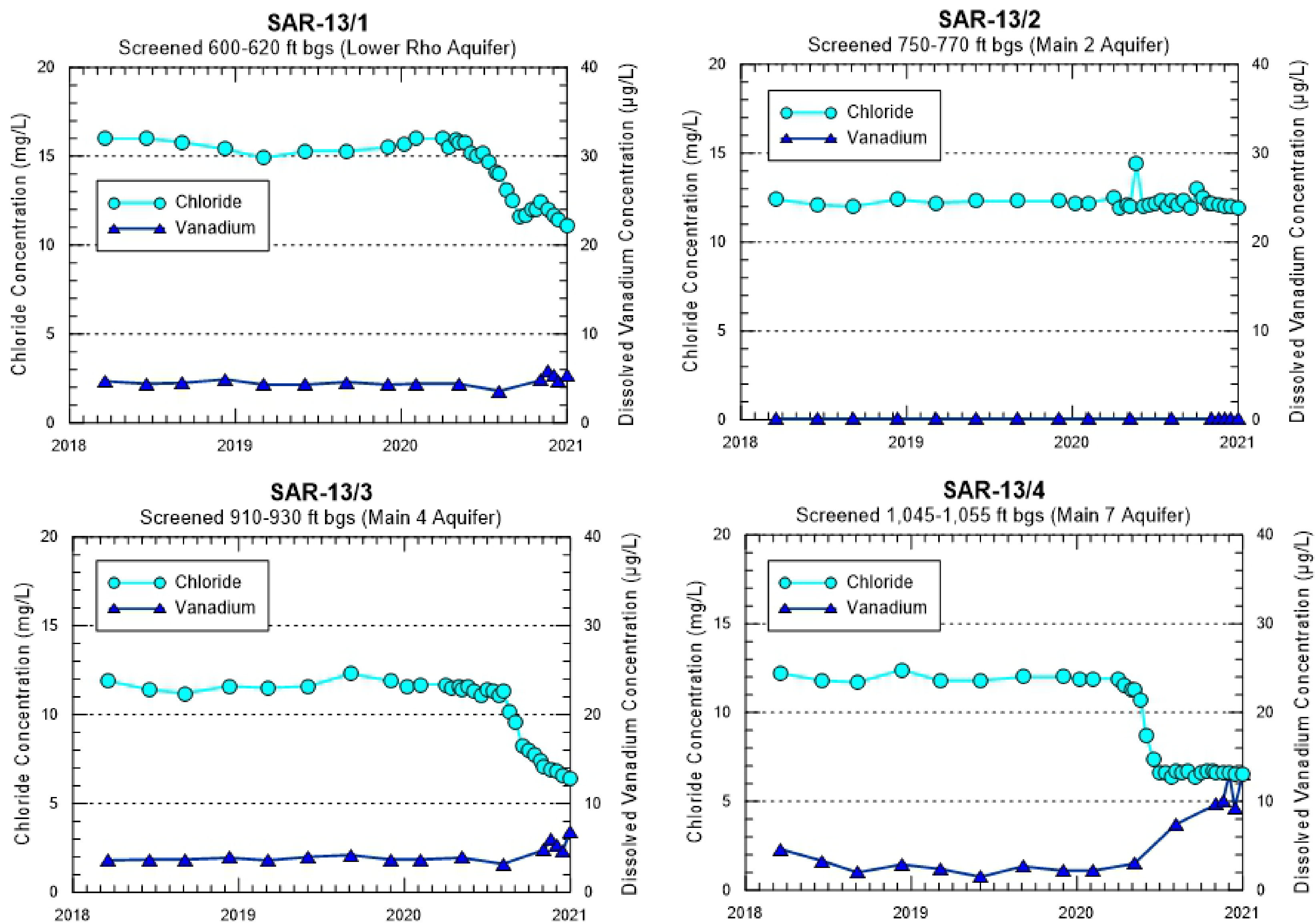


Figure 8-23. Monitoring Well SAR-13 Chloride and Dissolved Vanadium Concentrations

At SAR-10/1, vanadium concentrations have gradually declined from their peak in mid-2016 and during 2020 ranged from 2.7 to 3.6 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 2020, also below ambient concentrations of approximately 4 µg/L. As was discussed previously for arsenic, mass 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 (Figure 8-20). 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 8-20). Since that time, vanadium concentrations have asymptotically declined to pre-injection ambient levels, ranging from 2.4 to 3.1 µg/L during 2020. 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 8-21), 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 through 2020. At SAR-11/2 (Figure 8-21), 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 10 µg/L during 2020 as 100% GWRS water was sustained at this well. At SAR-11/3 (Figure 8-21), vanadium concentrations remained below the RDL of 1 µg/L during 2020.

At SAR-12/1, SAR-12/2, and SAR-12/3 (Figure 8-22), vanadium concentrations have remained at background ambient levels ranging from below the RDL to approximately 6 µg/L during 2020, as expected since no GWRS arrival has been observed at these wells based on chloride and sulfate concentrations (Figure 8-10). At SAR-12/4 (Figure 8-22), vanadium concentrations have also remained at background ambient levels of below the RDL during 2020 both before and after the initial arrival of GWRS water.

Figure 8-23 shows that at SAR-13/1, SAR-13/3, and SAR-13/4, vanadium concentrations increased slightly after arrival of GWRS water, but all remained well below the NL. At SAR-13/1, vanadium concentrations increased in the fourth quarter of 2020 to slightly above background ambient concentrations of below 5 µg/L to a high of 5.9 µg/L. At SAR-13/3, vanadium concentrations remained at background ambient levels of below the RDL during 2020 until the fourth quarter, when concentrations increased to a high of 6.8 µg/L. At SAR-13/4, vanadium concentrations increased during 2020 after GWRS arrival, reaching a maximum of 13.1 µg/L in early December. The increased vanadium concentrations at SAR-13/4 were attributed to the early and sustained 100% GWRS arrival seen at the well based on both chloride and sulfate concentration trends (Figure 8-10). At SAR-13/2 (Figure 8-23), vanadium concentrations remained below the RDL during 2020, as expected since GWRS water has not arrived at this zone based on chloride and sulfate concentrations (Figure 8-10).

Overall, vanadium concentrations at the MBI Project monitoring wells remained well below the NL during 2020 but indicated that mild 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 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 (Table 8-3), total aluminum concentrations at SAR-10/1 increased and were mostly above the Secondary MCL (Figure 8-24). 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 the AWPF shutdown for activities related to the GWRSFE construction. The somewhat extended stop 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 were again below the secondary MCL in November 2020, at 90.0 µg/L.

Figure 8-24 shows no increase in total or dissolved aluminum at any of the zones at SAR-11 with the arrival of GWRS water.

Figure 8-25 shows total and dissolved aluminum concentrations at monitoring wells SAR-12 and SAR-13 for 2018 to 2020. 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 injection at the MBI Centennial Park wells. 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 in 2020.

Figure 8-25 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

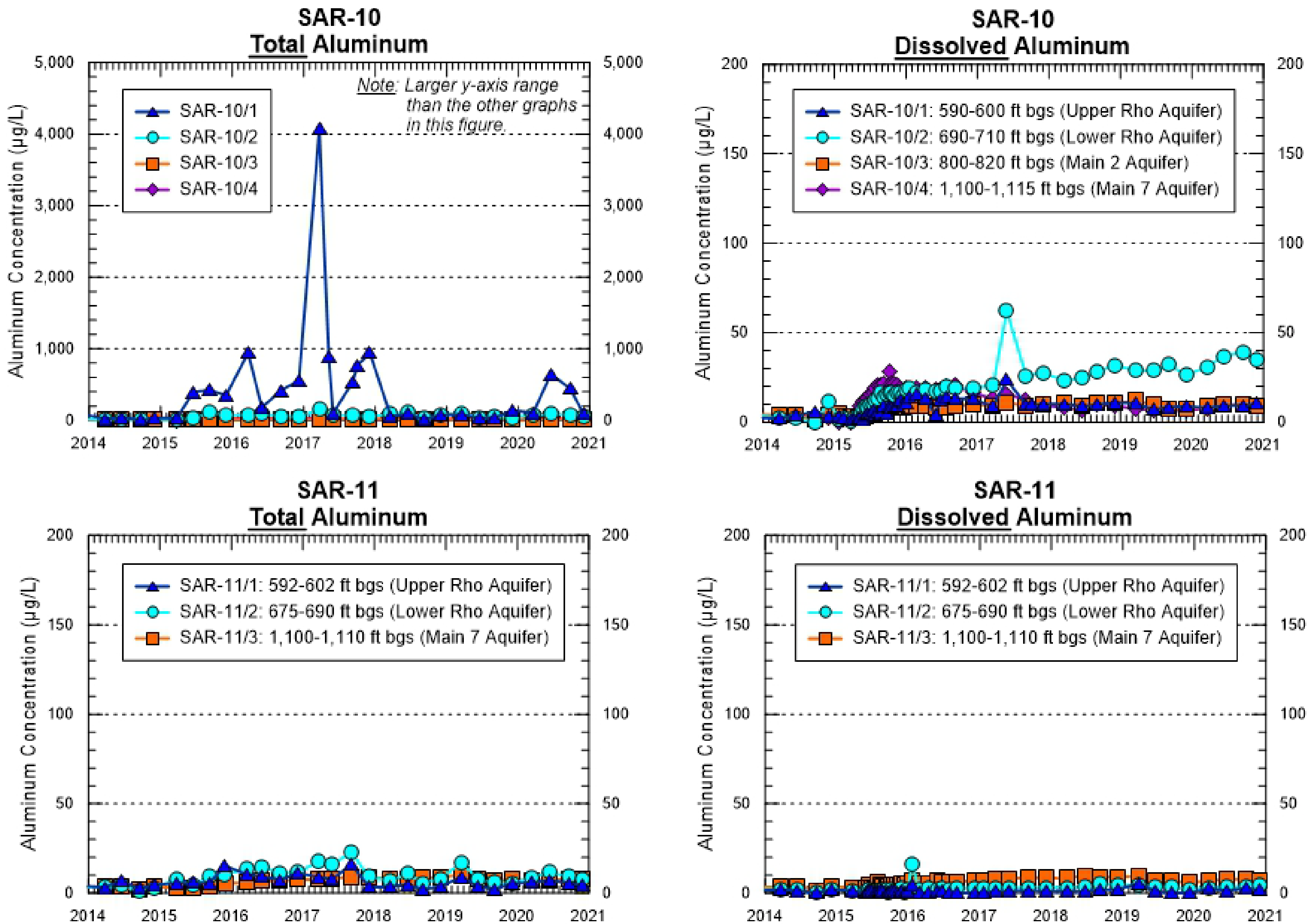


Figure 8-24. Monitoring Wells SAR-10 and SAR-11 Total and Dissolved Aluminum Concentrations

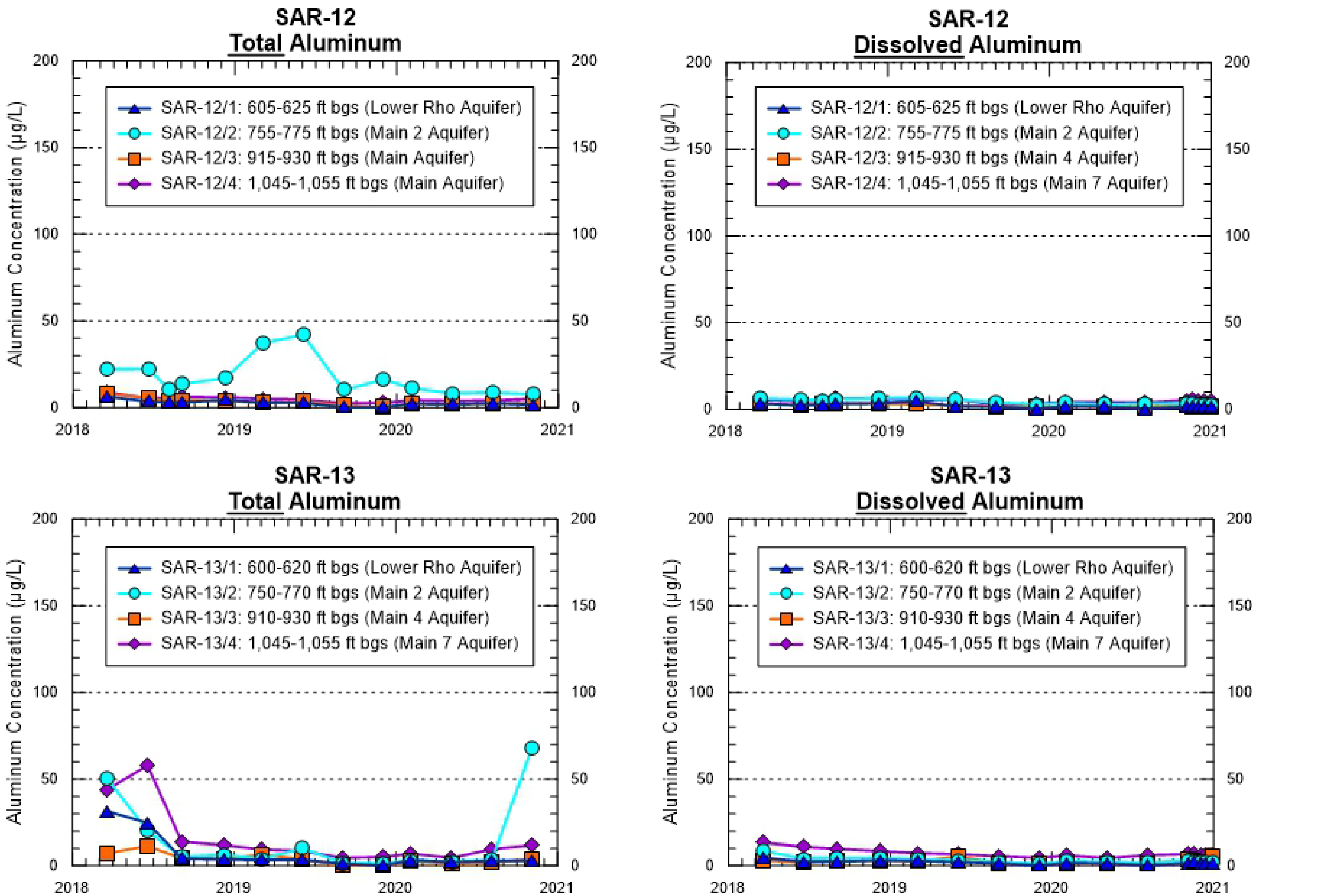


Figure 8-25. Monitoring Wells SAR-12 and SAR 13 Total and Dissolved Aluminum Concentrations

time after GWRS water arrived at both zones in mid-August 2020. At SAR-13/4, a very slight increasing trend of total aluminum is observed beginning in August 2020 and rises to 11.8 µg/L in November 2020, but never approaches the background ambient levels measured in 2018. At SAR-13/2, total aluminum concentrations increased to 68.2 µg/L in November 2020, but with no GWRS arrival observed at this zone, this may be considered an ambient background concentration.

As displayed on Figure 8-24 and Figure 8-25, 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 background conditions (Figure 8-24); the lower dissolved aluminum concentrations indicated 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. 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

Table 8-5. 2020 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												
IRWD-12	1,335	580 - 1,040	2,200	0.6 (ND - 1.1)	13.9 (12.0 - 16.9)	33.8 (27.9 - 39.1)	233 (201 - 258)	0.26 (0.17 - 0.33)	ND	0.07 (ND - 0.19)	ND	ND
IRWD-17	980	504 - 960	2,200	ND	19.8 (19.1 - 21.1)	42.3 (40.6 - 45.0)	260 (199 - 284)	0.38 (0.29 - 0.46)	ND	0.11 (0.05 - 0.48)	ND	0.7 (ND - 1.1)
FV-8[5]	864	312 - 844	3,100	0.6 (ND - 1.0)	28.7 (27.1 - 31.1)	60.8 (58.7 - 62.6)	343 (326 - 360)	1.24 (1.06 - 1.60)	ND	0.08 (0.07 - 0.13)	ND	ND
IRWD-10	960	419 - 940	3,400	1.1	16.3	37.9	228	0.28	ND	0.23	ND[10]	ND
IRWD-14[6]	980	470 - 970	3,700	ND	20	39.8	244	0.21 (0.19 - 0.23)	0.002 (ND - 0.003)	0.44	ND[8]	1.95 (1.5 - 2.4)
IRWD-16[6]	827	406 - 807	4,000	ND[10]	29.4	44	264	0.255 (0.25 - 0.26)	0.014 (0.013-0.014)	ND	ND[9]	4.65 (4.5 - 5)
IRWD-15[7]	1,010	470 - 990	4,300	ND	13.8	37.4	258	0.17	ND	0.29	ND	ND
FV-6	1,120	370 - 1,110	4,500	0.6 (ND - 1.0)	34.3 (31.0 - 38.2)	63.4 (58.9 - 68.5)	338 (314 - 378)	0.83 (0.75 - 0.98)	ND	0.16 (0.13 - 0.25)	ND	1.8 (1.6 - 1.9)
IRWD-18	1,103	390 - 1,080	4,600	4.7 (4.3 - 5.1)	15.2	40.6 (40.5 - 40.7)	262 (252 - 272)	0.27 (0.23 - 0.31)	ND	0.375 (0.35 - 0.4)	ND[8]	ND

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

6 Sampled in 2019

7 Sampled in 2017-2019

8 Sampled in 2007

9 Sampled in 2016

10 Sampled in 2017

downgradient from the nearest injection well MBI-2 (Figure 8-3). All the other IRWD wells in Table 8-4 are also downgradient but farther away from the MBI wells. Municipal production well FV-8 is located upgradient to the northwest of the MBI Project. FV-6 is located to the southwest and somewhat cross-gradient of the MBI Project based on the June 2020 Principal aquifer groundwater elevation contours in Figure 8-3. All the production wells in Table 8-4 and 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

Figure 8-26 shows chloride and sulfate concentrations at IRWD-12 and IRWD-17 for the ten-year period 2011-2020. 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 8-26, both chloride and sulfate concentrations are 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.

During 2020, Figure 8-26 shows that chloride and sulfate concentrations at IRWD-12 declined significantly, indicating the first arrival of a notable percentage of GWRS water to this well. Based on the 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 is consistent with the 64-day GWRS arrival at SAR-13/4 along the most likely flow path from

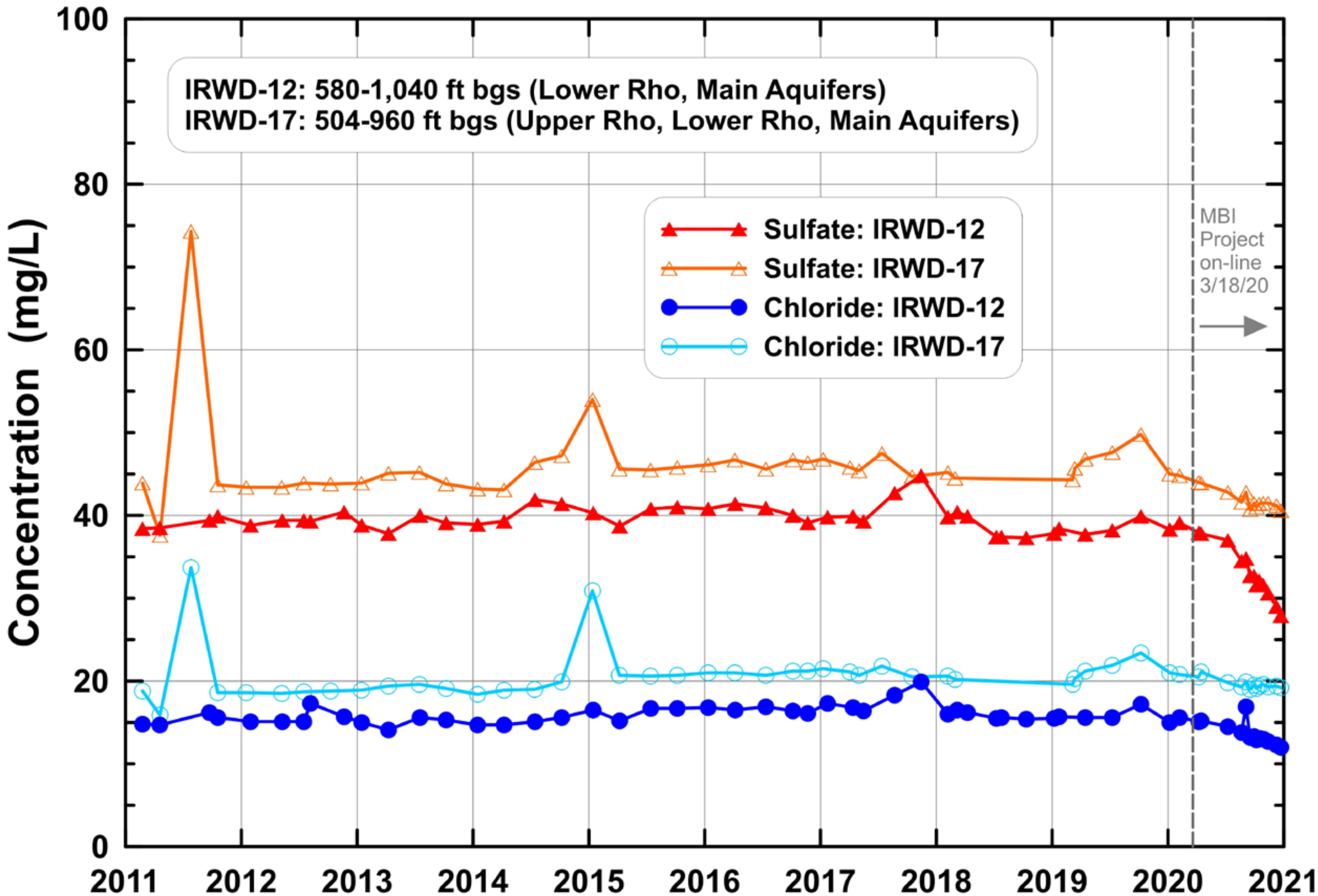


Figure 8-26. Wells IRWD-12 and IRWD-17 Chloride and Sulfate Concentrations

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 8-26 shows that chloride and sulfate concentrations also decreased at IRWD-17 during 2020, but the declining trend was much less pronounced than at IRWD-12. Therefore, GWRS arrival at IRWD-17 from either the MBI Project tracer test or older MBI-1 injection appeared likely but was not statistically conclusive by the end of 2020.

Chloride and sulfate concentrations at both production wells will continue to be monitored during 2021; a continued decline in both chloride and sulfate would indicate a stronger GWRS signal, which would help to reinforce the arrival time estimated above at IRWD-12 and confirm the possible arrival at IRWD-17.

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-13/4, if originating from MBI-5 (Figure 8-3), yields an equivalent groundwater velocity of approximately 12 feet per day. Although GWRS arrival was not statistically conclusive at IRWD-17 by the end of 2020, the possible arrival based on the dampened sulfate decrease would yield a similar groundwater velocity of approximately 12 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 2020, IRWD-12 had two minor detections of 1 µg/L and 1.1 µg/L in the first and second quarters, respectively, based on quarterly samples. At IRWD-17, arsenic concentrations ranged historically from below the RDL to 2.4 µg/L and remained below the RDL during 2020, based on quarterly samples. During 2020, vanadium concentrations at both IRWD-12 and IRWD-17 remained within the historical range of 2.4 to 5.9 µg/L, remaining well below the NL of 50 µg/L.

IRWD-12 and IRWD-17 historically have had no detections of NDMA or 1,4-dioxane. 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 2020, IRWD-17 continued to have minor detections of 1,4-dioxane, ranging from non-detect to 1.1 µg/L. The minor detections of 1,4-dioxane at IRWD-17 in the third and fourth quarters of 0.9 µg/L and 0.8 µg/L, respectively, were just 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 two 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 2020 (Table 8-4), 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 (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.

Refinements to the Talbert Model in the MBI Project area 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

Table 8-6. Simulated and Observed GWRS 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 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.

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.

Additional Talbert Model refinements in the MBI Project area are planned for 2021, including temporally extending the flow and transport model calibration period an additional year through December 2020 based on the most recent data available from the on-going MBI tracer test.

Refinements to aquifer hydraulic and transport parameters will be made as necessary to calibrate to GWRS arrival times observed during the 2020 MBI tracer test in the various zones at SAR-12 and SAR-13.

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.

Table 8-6. 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.

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	OCSD Plant No. 1 P1-82 Activated Sludge Plant
AS2	OCSD Plant No. 2 P1-102 Activated Sludge Plant
ASTM	American Society for Testing and Materials (ASTM International)
AVG	average
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 CDPH)
DHS	California Department of Health Services (now CDPH)
DMBI	Demonstration Mid-Basin Injection
DPW	decarbonated product water
DRWF	Dyer Road Well Field
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
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
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
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

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APPENDICES

Appendix	Title
A	Water Quality Requirements for Groundwater Replenishment System and Final Product Water Quality Data, January 1 through December 31, 2020
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, 2020

Advanced Water Treatment Facility

Orange County Water District
Groundwater Replenishment System
2020 Annual Report

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 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	92.25	72.92	86.23	89.92				≤ 100
REQUIRED REVERSE OSMOSIS PRODUCT MONITORING[5]											
Ultraviolet Transmittance (UV%/T) at 254 (%UVT)	Plant Monitoring	0.10%	%	97.4%	97.3%	97.0%	97.3%				>90%
Turbidity	Plant Monitoring	N/A	NTU	0.06	0.04	0.01	0.02		5		<0.2/0.5[6]
BIOLOGICAL											
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1	MPN	ND	ND	ND	ND				N/A
E. Coli (Colilert - P/A) (ECOLIC)	9223B	1	UNITS	NA	ND	NA	NA				N/A
Total Coliform (Colilert - MPN/100mL) (TCOLIQ)	9223B	1	MPN	ND	0.112	ND	ND				2.2
Total Coliform (Colilert - P/A) (TCOLIC)	9223B	1	MPN	NA	ND	NA	NA				2.2
INORGANIC											
Aggressive Index (AI)	Plant Monitoring		A.I.	11.7	11.8	11.9	11.8				>11.0
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	ND	ND	ND	ND				N/A
Aluminum (Al)	X200.8	1	ug/L	1	ND	ND	ND	1,000	200		200[7]
Ammonia Nitrogen (NH3-N)	350.1	0.1	mg/L	0.17	0.175	0.174	0.159				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	0.18 - 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	34.78	36.49	37.74	38.35				N/A
Bicarbonate (as HCO3) (HCO3)	UNKWQAN	1.2	mg/L	42.39	44.48	46.01	46.75				N/A
Boron (B)	X200.7	0.1	mg/L	0.21	0.19	0.26	0.25			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	0.012	0.01	0.017	0.012				N/A
Cadmium (Cd)	X200.8	1	ug/L	ND	ND	ND	ND	5			5
Calcium (Ca)	X200.7	0.5	mg/L	13.64	13.81	13.59	14.02				N/A
Calcium Hardness (CaHRD)	X200.7	0.25	mg/L	34.05	34.47	33.93	35.02				N/A
Carbonate (as CaCO3) (CO3Ca)	2320B	1	mg/L	ND	ND	ND	ND				N/A
Cation-Anion meq balance (CATANI)	UNKWQAN		RATIO	6.95	5.53	-9.42	3.11				N/A
Chlorate (CLO3)	300.1B	10	ug/L	ND	ND	ND	10.8			800	N/A
Chloride (Cl)	X1-300.0	0.5	mg/L	5.2	5.8	6.13	5.3		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.	-1.20	-1.21	-1.19	-1.57				N/A
Cyanide (CN)	X1-335.4	5	ug/L	ND	ND	ND	ND	150			150
Electrical Conductivity (EC)	2510B	1	uS/cm	95.86	98.71	102.49	94.18		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 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Free Chlorine (FRCL2)	4500CLF	0.1	mg/L	ND	ND	ND	ND				N/A
Free Res. Chlorine - Amperometric Method (FRCL2A)	4500CLD	0.1	mg/L	ND	ND	ND	NR				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			10
Hydrogen Peroxide (H2O2)	H2O2	0.1	mg/L	2.15	2.22	2.39	2.31				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	ND		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	2.74	3.20	3.44	2.93	45			45
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1	mg/L	0.66	0.76	0.81	0.70	10			10[12]
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1	mg/L	0.62	0.72	0.77	0.66	10			3[12]
Nitrite (NO2)	UNKWQAN	0.007	mg/L	0.114	0.107	0.114	0.112				N/A
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002	mg/L	0.035	0.032	0.035	0.034	1			1
Odor Range High (ODORHI)	2150B	0	TON	2	NR	NR	NR				N/A
Odor Range Low (ODORLO)	2150B	0	TON	ND	NR	NR	NR				N/A
Organic Nitrogen (ORG-N)	X1-351.2	0.1	mg/L	0.025	0.018	ND	0.028				N/A
Perchlorate (CLO4)	332.0	2.5	ug/L	ND	ND	ND	ND	6			6
pH (pH)	4500H+B	1	UNITS	7.62	7.56	7.58	7.18				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	0.20	0.38	ND				N/A
Selenium (Se)	X200.8	1	ug/L	ND	ND	ND	ND	50			50
Silica (SIO2)	4500SIOC	1	mg/L	ND	ND	1.1	1.2				N/A
Silver (Ag)	X200.8	1	ug/L	ND	ND	ND	ND		100		100
Sodium (Na)	X200.7	0.5	mg/L	5.5	6.0	7.1	5.97				45[13]
Strontium (Sr)	X200.8	1	ug/L	NR	NR	2.9	2.7				N/A
Sulfate (SO4)	X1-300.0	0.5	mg/L	0.27	0.53	0.27	ND		250		100[14]
Surfactants (MBAS)	5540C	0.02	mg/L	ND	ND	ND	ND		0.5		0.5
Temperature (Laboratory) (TEMP)	4500H+B	1	C	21.19	20.10	21.50	20.56				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	7.17	5.89	-9.09	3.42				N/A
Title 22 Total Anions (T22ANI)	UNKWQAN		meq/L	0.93	0.82	0.89	0.95				N/A
Title 22 Total Cations (T22CAT)	UNKWQAN		meq/L	0.92	0.96	0.97	0.95				N/A
Tot. Res. Chlorine - Amperometric Method (TOTCLA)	4500CLD	0.1	mg/L	ND	ND	ND	NR				N/A
Total Alkalinity (as CaCO3) (TOTALK)	2320B	5	mg/L	34.78	36.49	37.74	38.35				N/A
Total Anions (TOTANI)	UNKWQAN		meq/L	0.93	0.83	0.89	0.95				N/A
Total Cations (TOTCAT)	UNKWQAN		meq/L	1.00	0.87	0.81	0.98				N/A

WATER QUALITY -- GWRS SYSTEM PURIFIED RECYCLED WATER (FINISHED PRODUCT WATER, EXCEPT AS NOTED[1])
AVERAGES FOR ALL AVAILABLE DATA FOR 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Total Chlorine (TOTCL2)	4500CLF	0.1	mg/L	1.35	1.1	0.6	0.9				N/A
Total Dissolved Solids (TDS)	2540C	2.5	mg/L	50.75	57.00	59.89	53.48		500		500[15]
Total Hardness (as CaCO3) (TOTHRD)	X200.7	1	mg/L	34.10	34.80	32.83	34.93				240[16]
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2	mg/L	0.09	0.08	0.09	0.11				N/A
Total Nitrogen (TOT-N)	X1-351.2	0.3	mg/L	0.800	0.904	0.957	0.848				5
Total Organic Carbon (Unfiltered) (TOC)	5310C	0.05	mg/L	0.091	0.087	0.097	0.092				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	0.011	0.008	0.008	0.008				N/A
Uranium (U) (U)	X200.8	1	ug/L	NR	NR	ND	ND				N/A
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	0.136	0.086	0.098	0.110				N/A
Vanadium (V)	X200.8	1	ug/L	ND	ND	ND	ND			50	N/A
Zinc (Zn)	X200.8	1	ug/L	ND	ND	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)	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	0.5 - 9.9	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	0.5 - 9.9	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	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	0.5 - 9.9	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	0.5 - 9.9	ug/L	ND	ND	ND	ND	5			5
1,4-Dioxane (14DIOX)	14DIOX / 522	0.07 - 1	ug/L	ND	ND	ND	ND			1	N/A
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

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17b-Estradiol (bESTRA)	CEC	2	ng/L	ND	ND	ND	ND				N/A
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	pg/L	ND	ND	ND	ND	30			30
2,4,5-Trichlorophenol (245TCP)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
2,4,6-Trichlorophenol (246TCP)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
2,4-Dichlorophenol (24DCPH)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
2,4-Dimethylphenol (24DMP)	625.1	19 - 20	ug/L	ND	ND	ND	ND			100	N/A
2,4-Dinitrophenol (24DNP)	625.1	38 - 40	ug/L	ND	ND	ND	ND				N/A
2,4-Dinitrotoluene (24DNT)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
2,6-Dinitrotoluene (26DNT)	525.2 / 625.1	0.1 - 9.9	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	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
2-Chlorophenol (2ClPNL)	625.1	9.6 - 9.9	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	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
2-Methylphenol (oCRESL)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
2-Nitroaniline (oNTANL)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
2-Nitrophenol (2NPNL)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
3,3'-Dichlorobenzidine (DCBZDE)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
3-Nitroaniline (mNTANL)	625.1	19 - 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-Androstene-3,17-dione (ANDROS)	CEC	2	ng/L	ND	ND	ND	ND				N/A
4-Bromophenyl phenyl ether (4BrPPE)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
4-Chloro-3-methylphenol (43CMP)[22]	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
4-Chloroaniline (pClANL)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.6 - 9.9	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	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
4-Nitroaniline (pNTANL)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
4-Nitrophenol (4NPNL)	625.1	19 - 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
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 - 40	ug/L	ND	1.79	ND	ND				N/A
Aniline (ANLN)	625.1	9.6 - 9.9	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

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AVERAGES FOR ALL AVAILABLE DATA FOR 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Benzidine (BNZDE)	625.1	38 - 40	ug/L	ND	ND	ND	ND				N/A
Benzoic Acid (BNZACD)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
Benzyl Alcohol (BNZALC)	625.1	19 - 20	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.6 - 9.9	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroethyl) ether (B2CLEE)	524.2 / 625.1	5 - 9.9	ug/L	ND	ND	ND	ND				N/A
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.6 - 9.9	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	0.62	ND	1.1	1				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	0.721	1.383	1.837	1.571				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
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	1.49	2.5	2.97	2.6				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	9.6 - 9.9	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	0.064	0.083	0.183	0.182				N/A
Dibromomethane (CH2Br2)	524.2	0.5	ug/L	ND	ND	ND	ND				N/A
Dichloroacetic Acid (DCAA)[28]	552.2	1	ug/L	ND	ND	ND	ND				60, total HAA5
Dichloroacetonitrile (DCAN)	551.1	0.5	ug/L	1.4	ND	1.4	1.1				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	0.085	0.13	0.16	0.1				N/A

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AVERAGES FOR ALL AVAILABLE DATA FOR 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Endosulfan II (ENDOII)[30]	508 / 525.2	0.01 - 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	8.8	17	14			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	0.01 - 0.1	ug/L	ND	ND	ND	ND			0.015	N/A
HCH-beta (Beta-BHC) (BHCb)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND			0.025	N/A
HCH-delta (Delta-BHC) (BHCd)	508 / 525.2	0.01 - 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	0.5 - 9.9	ug/L	ND	ND	ND	ND				N/A
Hexachloroethane (HCE)	625.1	9.6 - 9.9	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	0.1 - 9.9	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	5	ug/L	ND	ND	ND	ND				N/A
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	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	ND	0.06	0.06	5			5
Methylglyoxal (MGLYOX)	556	2	ug/L	ND	ND	ND	ND				N/A
Methylisothiocyanate (MITC)	14DIOX	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
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 / 625.1	0.1 - 9.9	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	19 - 20	ug/L	ND	ND	ND	ND				N/A
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	ND	ND	ND	ND				N/A

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N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodimethylamine (NDMA)	NDMA-LOW	2	ng/L	2.39	0.93	0.7	0.34			10	N/A
n-Nitroso-di-n-propylamine (NDPA)	625.1 / NDMA-LOW	2 - 9900	ng/L	ND	ND	ND	ND			10	N/A
n-Nitrosodiphenylamine (NDPhA)	625.1	9600 - 9900	ng/L	ND	ND	ND	ND				N/A
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2 - 10	ng/L	ND	ND	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	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1221 (PCB21)[33]	508	0.1	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1232 (PCB32)[33]	508	0.1	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1242 (PCB42)[33]	508	0.1	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1248 (PCB48)[33]	508	0.1	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1254 (PCB54)[33]	508	0.1	ug/L	ND	ND	ND	ND	0.5[33]			0.5[33]
PCB-1260 (PCB60)[33]	508	0.1	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				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	N/A
Perfluoro octanoic acid (PFOA)	537.1	2	ng/L	ND	ND	ND	ND			5.1	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
Perfluorohexanoic acid (PFHxA)	537.1	2	ng/L	ND	ND	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	9.6 - 9.9	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
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

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AVERAGES FOR ALL AVAILABLE DATA FOR 2020[2]

Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
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	2.22	3.91	4.98	4.27	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)[36]	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)[37]	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)[38]	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
RADIOLOGICALS											
Gross Alpha Excluding Uranium (TOTa-U)	UNKWQAN	DLR[40] 3, 1.11-1.28	pCi/L	2.914	1.36	1.04	1.04	15			15
Natural Uranium (NTUr)	908.0 / X200.8	DLR[40] 1, 0.13-0.391	pCi/L	0.606	3.045	ND	ND	20			20
Natural Uranium Counting Error (NTUrCE)	908.0	0.391	pCi/L	0.685	1.265	NR	NR				N/A
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	DLR[40] 1, 0.4-0.506	pCi/L	0.342	0.228	0.486	0.889	5			5
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.4 - 0.506	pCi/L	1.069	0.780	0.880	1.091				N/A
Total Alpha (TOTa)	7110C	1.11 - 1.28	pCi/L	3.52	4.400	1.04	1.04				N/A
Total Alpha Counting Error (TOTaCE)	7110C	1.11 - 1.28	pCi/L	1.53	1.815	1.25	1.25				N/A
Total Beta (TOTb)	900.0	DLR[40] 4, 0.49 - 1.6	pCi/L	1.68	1.57	2.86	2.13	50			50
Total Beta Counting Error (TOTbCE)	900.0	0.49 - 1.6	pCi/L	1.33	0.453	1.470	0.486				N/A
Total Radium 226 (TRa226)	903.0	0.326 - 0.407	pCi/L	0.107	0.080	0.172	0.299	5			N/A
Total Radium 226 Counting Error (TRa6CE)	903.0	0.326 - 0.407	pCi/L	0.111	0.104	0.140	0.214				N/A
Total Radium 228 (TRa228)	RA-05	0.4 - 0.506	pCi/L	0.235	0.148	0.314	0.590	5			N/A
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.384 - 0.506	pCi/L	0.96	0.676	0.740	0.877				N/A
Total Strontium-90 (TS90)	905.0	DLR[40] 2, 0.546 - 3	pCi/L	ND	0.159	0.229	0.145	8			8
Total Strontium-90 Counting Error (TS90CE)	905.0	0.546 - 3	pCi/L	ND	0.248	0.361	0.31				N/A
Total Tritium (TTr)	906.0	DLR[40] 1000, 434	pCi/L	109.62	209.75	165.5	225.5	20,000			20,000
Total Tritium Counting Error (TTrCE)	906.0	434	pCi/L	271	269.25	268.5	270.5				N/A
SEMI-ORGANIC											
1-Naphthol (NPTHOL)	531	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

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2,4,6-Trinitrotoluene (246TNT)	8330A	0.1 - 0.43	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	0.7	ND	ND	ND				N/A
3-Hydroxycarbofuran (HYDCFR)	531	2	ug/L	ND	ND	ND	ND				N/A
4,4'-DDD (DDD)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDE (DDE)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
4,4'-DDT (DDT)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Acenaphthene (ACNAPE)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Acenaphthylene (ACENAP)	525.2 / 625.1	0.1 - 9.9	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	1	ug/L	ND	ND	ND	ND			7	N/A
Aldicarb sulfone (ALDISN)	531	2	ug/L	ND	ND	ND	ND				N/A
Aldicarb sulfoxide (ALDISX)	531	2	ug/L	ND	ND	ND	ND				N/A
Aldrin (ALDRIN)	508 / 525.2	0.01 - 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	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
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	ND				N/A
Baygon (BAYGON)	531	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	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Benzo(a)pyrene (BaPYRE)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND	0.2			0.2
Benzo(b)fluoranthene (BbFLUR)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Benzo(g,h,i)perylene (BghiPR)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Benzo[k]fluoranthene (BkFLUR)	525.2 / 625.1	0.1 - 9.9	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	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	2 - 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	2	ug/L	ND	ND	ND	ND			700	N/A
Carbofuran (CARBOF)	531	1	ug/L	ND	ND	ND	ND	18			18
Chlordane (ClDANE)	508	0.1	ug/L	ND	ND	ND	ND	0.1			0.1

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Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Chlordane-alpha (CLDA)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Chlordane-gamma (CLDG)	525.2	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	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Dalapon (DALAPN)	515.4 / 552.2	0.4 - 1	ug/L	0.224	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	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	0.01 - 0.1	ug/L	ND	ND	ND	ND			0.002	N/A
Diethyl phthalate (DEP)	525.2 / 625.1	2 - 9.9	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	2 - 9.9	ug/L	ND	ND	ND	ND				N/A
Di-n-butylphthalate (DnBP)	525.2 / 625.1	2 - 20	ug/L	ND	ND	ND	ND				N/A
Di-n-octyl phthalate (DnOP)	525.2 / 625.1	2 - 20	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	0.01 - 0.1	ug/L	ND	ND	ND	ND				N/A
Endosulfan sulfate (ENDOSL)	508 / 525.2	0.01 - 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	0.01 - 0.1	ug/L	ND	ND	ND	ND	2			2
Endrin Aldehyde (ENDR-A)	508 / 525.2	0.01 - 0.1	ug/L	ND	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				N/A
Etridiazole (ETRDZL)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Fluoranthene (FLANTH)	525.2 / 625.1	0.1 - 9.9	ug/L	ND	ND	ND	ND				N/A
Fluorene (FLUOR)	525.2 / 625.1	0.1 - 9.9	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	0.01 - 0.1	ug/L	ND	ND	ND	ND	0.2			0.2
Heptachlor (HEPTA)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01

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Parameters[3]	Methods	Reportable Detection Limit	Units	2020 Quarter 1	2020 Quarter 2	2020 Quarter 3	2020 Quarter 4	Primary MCL[4]	Secondary MCL[4]	Action or Notification Level[4]	Permit Requirement
Heptachlor epoxide (HEPEPX)	508 / 525.2	0.01 - 0.1	ug/L	ND	ND	ND	ND	0.01			0.01
Hexachlorobenzene (HEXCLB)	508 / 625.1	0.05 - 9.9	ug/L	ND	ND	ND	ND	1			1
Hexachlorocyclopentadiene (HClCPD)	508 / 625.1	0.05 - 20	ug/L	ND	ND	ND	ND	50			50
Hexachlorocyclopentadiene (HClCPD)	508 / 625.1	0.05 - 20	ug/L	ND	ND	ND	ND				N/A
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.1 - 0.32	ug/L	ND	ND	ND	ND				N/A
Hexazinone (HEXZON)	525.2	0.1	ug/L	ND	ND	ND	ND				N/A
Ibuprofen (IBPRFN)	CEC	1 - 100	ng/L	ND	ND	ND	ND				N/A
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2 / 625.1	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	4	ug/L	ND	ND	ND	ND				N/A
Methomyl (MTHOMY)	531	1	ug/L	ND	ND	ND	ND				N/A
Methoxychlor (METHOX)	508 / 525.2	0.01 - 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	0.1 - 0.43	ug/L	ND	ND	ND	ND				N/A
Oxamyl (OXAMYL)	531	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 / CEC	0.2 - 20	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	0.1 - 9.9	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	0.1 - 9.9	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)[39]	525.2	0.1	ug/L	ND	ND	ND	ND	70	1		1[39]
Toxaphene Mixture (TOXA)	508	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, R8-2019-0007 and 2020 revised Monitoring and Reporting Program

[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] Alternate name for trans-1,2-Dichloroethene is trans-1,2-Dichloroethylene.

[37] Alternate name for Trichloroethene is Trichloroethylene.

[38] Alternate name for Trichlorotrifluoroethane (Freon 113) is 1,1,2-Trichloro-1,2,2-Trifluoroethane.

[39] 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.

[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.

GWRS 2020 Quarterly Sampling Dates

OCWD Water Quality Department

GWRS FINAL PRODUCT WATER (FPW)

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
GWRS-FPW	01/08/2020	04/08/2020	07/08/2020	10/06/2020

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 2020 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 2020 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	1	ND	ND	ND
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	ND	ND
Asbestos (ASBESTOS), MFL	Eurofins / EurofCEI	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	10	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	0.55 - 0.74	0.63 - 0.92	0.67 - 0.9	0.47 - 0.87
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	0.023-0.052	0.016-0.047	0.022-0.069	0.025-0.053
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	2.914	1.16 - 1.55	1.04	1.04
Other Radionuclides	FGL / EuroTSTL	Varies	ND < PMCL	< 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	1.8 - 3	2 - 7.6	1.1 - 8.2	2.5 - 8.6
Primary Drinking Water Standards - Biological						
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	2.2	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	N/A	65 - 171	87 - 108	94 - 114	80 - 103
Iron (Fe), ug/L	OCWD	300	ND	ND	ND	ND
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	38 - 55.5	50 - 63.5	55.5 - 68	48 - 58.5
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	0.21	0.19	0.26	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	ND	ND	ND
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD / EurfCalr	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	OCWD / EurfCalr	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	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 2020 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 / EuTalKnx	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD / Weck	ND	ND	ND	ND
508	Chlorinated Pesticides	Weck	ND	ND	ND	ND
515.4	Chlorinated Acids	Weck	ND - Detections	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	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	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	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
625.1	Semi-Volatile Organic Compounds, including Priority Pollutants	EurFCalr	ND	ND	ND	ND
8015B	Nonhalogenated Organics	EurofBuf	ND	ND	ND	ND
8330A	Nitroaromatics and Nitramines	EurDenvr / EuroTSac	ND	ND	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	ND	ND	ND	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND < NL	ND < NL	ND < NL	ND < NL

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 515.4

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/8/2020	10:40	3,5-Dichlorobenzoic Acid (35DBA)	1.9	ug/L	1
1/8/2020	10:40	Dalapon (DALAPN)	0.84	ug/L	0.4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/3/2020	8:25	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
1/3/2020	8:25	Chloroform (CHCl3)	1.7	ug/L	0.5
1/3/2020	8:25	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
1/8/2020	10:40	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
1/8/2020	10:40	Chloroform (CHCl3)	1.7	ug/L	0.5
1/8/2020	10:40	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
1/8/2020	10:40	Total Trihalomethanes (TTHMs)	3.0	ug/L	0.5
1/10/2020	8:15	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
1/10/2020	8:15	Chloroform (CHCl3)	1.3	ug/L	0.5
1/10/2020	8:15	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5
1/17/2020	8:30	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
1/17/2020	8:30	Chloroform (CHCl3)	1.4	ug/L	0.5
1/17/2020	8:30	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5
1/24/2020	7:50	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/24/2020	7:50	Chloroform (CHCl3)	1.7	ug/L	0.5
1/24/2020	7:50	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5
1/31/2020	8:20	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
1/31/2020	8:20	Chloroform (CHCl3)	1.5	ug/L	0.5
1/31/2020	8:20	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
2/7/2020	8:25	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/7/2020	8:25	Chloroform (CHCl3)	1.1	ug/L	0.5
2/7/2020	8:25	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5
2/14/2020	8:30	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
2/14/2020	8:30	Chloroform (CHCl3)	1.2	ug/L	0.5
2/14/2020	8:30	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5
2/21/2020	8:10	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
2/21/2020	8:10	Chloroform (CHCl3)	1.2	ug/L	0.5
2/21/2020	8:10	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5
2/28/2020	8:35	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
2/28/2020	8:35	Chloroform (CHCl3)	1.4	ug/L	0.5
2/28/2020	8:35	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
3/6/2020	8:00	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/6/2020	8:00	Chloroform (CHCl3)	1.7	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
3/6/2020	8:00	Total Trihalomethanes (TTHMs)	2.6	ug/L	0.5
3/13/2020	8:30	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
3/13/2020	8:30	Chloroform (CHCl3)	1.7	ug/L	0.5
3/13/2020	8:30	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5
3/20/2020	8:45	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
3/20/2020	8:45	Chloroform (CHCl3)	2.0	ug/L	0.5
3/20/2020	8:45	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
3/27/2020	9:00	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
3/27/2020	9:00	Chloroform (CHCl3)	1.3	ug/L	0.5
3/27/2020	9:00	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/8/2020	10:40	Bromochloroacetonitrile (BCAN)	0.62	ug/L	0.5
1/8/2020	10:40	Dichloroacetonitrile (DCAN)	1.4	ug/L	0.5

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/8/2020	10:40	Formaldehyde (FORALD)	11	ug/L	2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/3/2020	8:25	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
1/8/2020	10:40	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
1/10/2020	8:15	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2
1/31/2020	8:20	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2
2/7/2020	8:25	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
2/14/2020	8:30	n-Nitrosodimethylamine (NDMA)	2.5	ng/L	2
2/21/2020	8:10	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
2/28/2020	8:35	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2
3/4/2020	10:55	n-Nitrosodimethylamine (NDMA)	2.7	ng/L	2
3/6/2020	8:00	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2
3/13/2020	8:30	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2
3/20/2020	8:45	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
3/27/2020	9:00	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/3/2020	8:00	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
4/3/2020	8:00	Chloroform (CHCl3)	1.6	ug/L	0.5
4/3/2020	8:00	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
4/8/2020	12:40	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
4/8/2020	12:40	Chloroform (CHCl3)	1.5	ug/L	0.5
4/8/2020	12:40	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
4/10/2020	8:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
4/10/2020	8:10	Chloroform (CHCl3)	1.4	ug/L	0.5
4/10/2020	8:10	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5
4/17/2020	8:10	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
4/17/2020	8:10	Chloroform (CHCl3)	1.6	ug/L	0.5
4/17/2020	8:10	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5
4/24/2020	8:20	Bromodichloromethane (CHBrCl)	1.5	ug/L	0.5
4/24/2020	8:20	Chloroform (CHCl3)	2.7	ug/L	0.5
4/24/2020	8:20	Total Trihalomethanes (TTHMs)	4.2	ug/L	0.5
5/15/2020	8:00	Bromodichloromethane (CHBrCl)	1.0	ug/L	0.5
5/15/2020	8:00	Chloroform (CHCl3)	2.0	ug/L	0.5
5/15/2020	8:00	Total Trihalomethanes (TTHMs)	3.0	ug/L	0.5
5/22/2020	8:35	Bromodichloromethane (CHBrCl)	1.5	ug/L	0.5
5/22/2020	8:35	Chloroform (CHCl3)	2.5	ug/L	0.5
5/22/2020	8:35	Total Trihalomethanes (TTHMs)	3.9	ug/L	0.5
5/29/2020	8:45	Bromodichloromethane (CHBrCl)	1.2	ug/L	0.5
5/29/2020	8:45	Chloroform (CHCl3)	2.0	ug/L	0.5
5/29/2020	8:45	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5
6/5/2020	9:00	Bromodichloromethane (CHBrCl)	1.5	ug/L	0.5
6/5/2020	9:00	Chloroform (CHCl3)	2.4	ug/L	0.5
6/5/2020	9:00	Total Trihalomethanes (TTHMs)	3.9	ug/L	0.5
6/12/2020	8:00	Bromodichloromethane (CHBrCl)	2.9	ug/L	0.5
6/12/2020	8:00	Chloroform (CHCl3)	4.7	ug/L	0.5
6/12/2020	8:00	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
6/12/2020	8:00	Total Trihalomethanes (TTHMs)	7.6	ug/L	0.5
6/19/2020	8:00	Bromodichloromethane (CHBrCl)	2.6	ug/L	0.5
6/19/2020	8:00	Chloroform (CHCl3)	4.4	ug/L	0.5
6/19/2020	8:00	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
6/19/2020	8:00	Total Trihalomethanes (TTHMs)	7.0	ug/L	0.5
6/26/2020	8:10	Acetone (ACETNE)	10.5	ug/L	10
6/26/2020	8:10	Bromodichloromethane (CHBrCl)	1.4	ug/L	0.5
6/26/2020	8:10	Chloroform (CHCl3)	3.2	ug/L	0.5
6/26/2020	8:10	Total Trihalomethanes (TTHMs)	4.8	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 556

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/8/2020	12:40	Formaldehyde (FORALD)	8.8	ug/L	2

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/3/2020	8:00	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2
4/8/2020	12:40	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
4/17/2020	8:10	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2
4/24/2020	8:20	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/3/2020	7:50	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
7/3/2020	7:50	Chloroform (CHCl3)	2.7	ug/L	0.5
7/3/2020	7:50	Total Trihalomethanes (TTHMs)	4.0	ug/L	0.5
7/8/2020	9:25	Bromodichloromethane (CHBrCl)	3.3	ug/L	0.5
7/8/2020	9:25	Chloroform (CHCl3)	4.3	ug/L	0.5
7/8/2020	9:25	Dibromochloromethane (CHBr2C)	0.6	ug/L	0.5
7/8/2020	9:25	Total Trihalomethanes (TTHMs)	8.2	ug/L	0.5
7/10/2020	8:20	Bromodichloromethane (CHBrCl)	3.0	ug/L	0.5
7/10/2020	8:20	Chloroform (CHCl3)	4.4	ug/L	0.5
7/10/2020	8:20	Dibromochloromethane (CHBr2C)	0.5	ug/L	0.5
7/10/2020	8:20	Total Trihalomethanes (TTHMs)	7.9	ug/L	0.5
7/17/2020	8:20	Bromodichloromethane (CHBrCl)	1.7	ug/L	0.5
7/17/2020	8:20	Chloroform (CHCl3)	3.1	ug/L	0.5
7/17/2020	8:20	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
7/17/2020	8:20	Total Trihalomethanes (TTHMs)	5.0	ug/L	0.5
7/24/2020	7:50	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
7/24/2020	7:50	Chloroform (CHCl3)	2.2	ug/L	0.5
7/24/2020	7:50	Total Trihalomethanes (TTHMs)	3.7	ug/L	0.5
7/31/2020	8:25	Bromodichloromethane (CHBrCl)	2.3	ug/L	0.5
7/31/2020	8:25	Chloroform (CHCl3)	3.4	ug/L	0.5
7/31/2020	8:25	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
7/31/2020	8:25	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
7/31/2020	8:25	Total Trihalomethanes (TTHMs)	6.0	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/7/2020	7:48	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
8/7/2020	7:48	Chloroform (CHCl3)	2.1	ug/L	0.5
8/7/2020	7:48	Total Trihalomethanes (TTHMs)	2.9	ug/L	0.5
8/12/2020	1:40	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
8/12/2020	1:40	Chloroform (CHCl3)	1.1	ug/L	0.5
8/12/2020	1:40	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5
8/14/2020	8:00	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
8/14/2020	8:00	Chloroform (CHCl3)	2.2	ug/L	0.5
8/14/2020	8:00	Total Trihalomethanes (TTHMs)	3.3	ug/L	0.5
8/21/2020	8:20	Bromodichloromethane (CHBrCl)	1.6	ug/L	0.5
8/21/2020	8:20	Chloroform (CHCl3)	2.4	ug/L	0.5
8/21/2020	8:20	Total Trihalomethanes (TTHMs)	4.0	ug/L	0.5
8/28/2020	8:40	Bromodichloromethane (CHBrCl)	1.4	ug/L	0.5
8/28/2020	8:40	Chloroform (CHCl3)	2.2	ug/L	0.5
8/28/2020	8:40	Total Trihalomethanes (TTHMs)	3.6	ug/L	0.5
9/4/2020	8:00	Bromodichloromethane (CHBrCl)	2.7	ug/L	0.5
9/4/2020	8:00	Chloroform (CHCl3)	3.7	ug/L	0.5
9/4/2020	8:00	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/4/2020	8:00	Total Trihalomethanes (TTHMs)	6.4	ug/L	0.5
9/11/2020	8:10	Bromodichloromethane (CHBrCl)	2.7	ug/L	0.5
9/11/2020	8:10	Chloroform (CHCl3)	3.7	ug/L	0.5
9/11/2020	8:10	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/11/2020	8:10	Total Trihalomethanes (TTHMs)	6.8	ug/L	0.5
9/18/2020	8:00	Bromodichloromethane (CHBrCl)	1.8	ug/L	0.5
9/18/2020	8:00	Chloroform (CHCl3)	3.1	ug/L	0.5
9/18/2020	8:00	Total Trihalomethanes (TTHMs)	4.9	ug/L	0.5
9/25/2020	8:20	Bromodichloromethane (CHBrCl)	2.5	ug/L	0.5
9/25/2020	8:20	Chloroform (CHCl3)	4.0	ug/L	0.5
9/25/2020	8:20	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/25/2020	8:20	Total Trihalomethanes (TTHMs)	6.9	ug/L	0.5

METHOD: 551.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/8/2020	9:25	Bromochloroacetonitrile (BCAN)	1.1	ug/L	0.5
7/8/2020	9:25	Dichloroacetonitrile (DCAN)	1.4	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 3

METHOD: 556

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/8/2020	9:25	Formaldehyde (FORALD)	17	ug/L	2

METHOD: NDMA-LOW

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/24/2020	7:50	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2
8/7/2020	7:48	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
8/14/2020	8:00	n-Nitrosodimethylamine (NDMA)	2.0	ng/L	2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/2/2020	8:00	Bromodichloromethane (CHBrCl)	2.1	ug/L	0.5
10/2/2020	8:00	Chloroform (CHCl3)	3.4	ug/L	0.5
10/2/2020	8:00	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
10/2/2020	8:00	Total Trihalomethanes (TTHMs)	5.9	ug/L	0.5
10/6/2020	10:40	Bromodichloromethane (CHBrCl)	3.7	ug/L	0.5
10/6/2020	10:40	Chloroform (CHCl3)	4.0	ug/L	0.5
10/6/2020	10:40	Dibromochloromethane (CHBr2C)	0.9	ug/L	0.5
10/6/2020	10:40	Total Trihalomethanes (TTHMs)	8.6	ug/L	0.5
10/9/2020	8:20	Bromodichloromethane (CHBrCl)	1.7	ug/L	0.5
10/9/2020	8:20	Chloroform (CHCl3)	3.5	ug/L	0.5
10/9/2020	8:20	Total Trihalomethanes (TTHMs)	5.1	ug/L	0.5
10/16/2020	9:05	Bromodichloromethane (CHBrCl)	2.2	ug/L	0.5
10/16/2020	9:05	Chloroform (CHCl3)	3.3	ug/L	0.5
10/16/2020	9:05	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
10/16/2020	9:05	Total Trihalomethanes (TTHMs)	5.5	ug/L	0.5
10/23/2020	8:30	Bromodichloromethane (CHBrCl)	2.1	ug/L	0.5
10/23/2020	8:30	Chloroform (CHCl3)	3.5	ug/L	0.5
10/23/2020	8:30	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
10/23/2020	8:30	Total Trihalomethanes (TTHMs)	5.7	ug/L	0.5
10/30/2020	8:10	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
10/30/2020	8:10	Chloroform (CHCl3)	2.4	ug/L	0.5
10/30/2020	8:10	Total Trihalomethanes (TTHMs)	3.7	ug/L	0.5
11/6/2020	7:50	Bromodichloromethane (CHBrCl)	1.7	ug/L	0.5
11/6/2020	7:50	Chloroform (CHCl3)	2.7	ug/L	0.5

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/6/2020	7:50	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
11/6/2020	7:50	Total Trihalomethanes (TTHMs)	4.4	ug/L	0.5
11/13/2020	8:25	Bromodichloromethane (CHBrCl)	1.2	ug/L	0.5
11/13/2020	8:25	Chloroform (CHCl3)	2.1	ug/L	0.5
11/13/2020	8:25	Total Trihalomethanes (TTHMs)	3.3	ug/L	0.5
11/20/2020	8:25	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
11/20/2020	8:25	Chloroform (CHCl3)	2.0	ug/L	0.5
11/20/2020	8:25	Total Trihalomethanes (TTHMs)	3.1	ug/L	0.5
11/27/2020	8:00	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
11/27/2020	8:00	Chloroform (CHCl3)	1.9	ug/L	0.5
11/27/2020	8:00	Total Trihalomethanes (TTHMs)	2.8	ug/L	0.5
12/4/2020	8:00	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
12/4/2020	8:00	Chloroform (CHCl3)	2.1	ug/L	0.5
12/4/2020	8:00	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5
12/4/2020	8:00	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5
12/11/2020	8:35	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
12/11/2020	8:35	Chloroform (CHCl3)	1.8	ug/L	0.5
12/11/2020	8:35	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5
12/18/2020	8:15	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
12/18/2020	8:15	Chloroform (CHCl3)	2.1	ug/L	0.5
12/18/2020	8:15	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
12/18/2020	8:15	Total Trihalomethanes (TTHMs)	3.5	ug/L	0.5
12/25/2020	8:35	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
12/25/2020	8:35	Chloroform (CHCl3)	1.6	ug/L	0.5
12/25/2020	8:35	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

METHOD: 551.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/6/2020	10:40	Bromochloroacetonitrile (BCAN)	1.0	ug/L	0.5
10/6/2020	10:40	Dichloroacetonitrile (DCAN)	1.1	ug/L	0.5

METHOD: 556

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/6/2020	10:40	Formaldehyde (FORALD)	14	ug/L	2

GWRS-FPW
Organic Detections by Method

Year 2020, Quarter 4

METHOD: NDMA-LOW

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/6/2020 10:40	n-Nitrosodimethylamine (NDMA)	2.1	ng/L	2

Appendix B

Laboratory Methods of Analysis

Orange County Water District
Groundwater Replenishment System
2020 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 - 0.01	ug/L
1,4-Dioxane (14DIOX)	0.5 - 1	ug/L
2-Chloroethylvinyl ether (2ClEVE)	1	ug/L
Methylisothiocyanate (MITC)	0.1	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: IEH-BIOVIR LABORATORIES

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bacteriophage, Male Specific (BACTMLSP)	1	P/A PERL
Bacteriophage, Somatic (BACTSOMT)	1	P/A PERL

Laboratory Method: 1601

Laboratory: O.C. HEALTH CARE AGENCY

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bacteriophage, Male Specific (BACTMLSP)	1	P/A PERL
Bacteriophage, Somatic (BACTSOMT)	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 TESTAMERICA, KNOXVILLE

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	4.7 - 4.8	pg/L

Laboratory: EUROFINS TESTAMERICA, SACRAMENTO

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	4.8 - 4.9	pg/L

Laboratory Method: 1623

Laboratory: EUROFINS EATON SOUTH BEND

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cryptosporidium (CRYPTO)	0.093 - 0.095	oocyst/L
Giardia (GIARDIA)	0.093 - 0.095	cysts/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
Odor Range High (ODORHI)	0	TON
Odor Range Low (ODORLO)	0	TON
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 - 2.5	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 - 0.3	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: 4500CLD

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Free Res. Chlorine -- Amperometric Method (FRCL2A)	0.1 - 0.13	mg/L
Tot. Res. Chlorine -- Amperometric Method (TOTCLA)	0.1 - 0.4	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 - 0.2	mg/L
Nitrate Nitrogen (NO3-N)	0.1 - 0.2	mg/L
Nitrite Nitrogen (NO2-N)	0.002 - 0.02	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: WECK LABORATORIES, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
1,2-Dibromo-3-chloropropane (DBCP)	0.01	ug/L
1,2-Dibromoethane (EDB)	0.02	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 - 0.5	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 - 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: 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 - 7.5	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: WECK LABORATORIES, INC.

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 - 40	ug/L
Benzene (BENZ)	0.5	ug/L
bis (2-chloroethyl) ether (B2CLEE)	5	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

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Chlorobenzene (CLBENZ)	0.5	ug/L
Chlorodifluoromethane (FREN22)	0.5	ug/L
Chloroethane (ClETHA)	0.5 - 20	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	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)	5	ug/L
Methyl Isobutyl Ketone (MIBK) (MIBK)	5	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
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

Laboratory Method: 524.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
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
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 - 1	ug/L

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
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
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

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
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
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)	1	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

Laboratory Method: 525.2

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
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
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: 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-FRB (B-11CLPF)	2	ng/L
4,8-dioxa-3H-perfluorononanoic acid (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-FRB (B-9CLPF3)	2	ng/L
Hexafluoropropylene oxide dimer acid (GenX) (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(FRB) (B-EtFOSA)	2	ng/L
N-methyl perfluorooctanesulfonamidoacetic acid (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 (FRB) (B-PFBS)	2	ng/L
Perfluoro heptanoic acid (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 (FRB) (B-PFHxS)	2	ng/L
Perfluoro nonanoic acid (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 (FRB) (B-PFOS)	2	ng/L
Perfluoro octanoic acid (PFOA)	2	ng/L
Perfluoro octanoic acid (FRB) (B-PFOA)	2	ng/L
Perfluorodecanoic acid (PFDA)	2	ng/L
Perfluorodecanoic acid (FRB) (B-PFDA)	2	ng/L

Laboratory Method: 537.1

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Perfluorododecanoic acid (PFDoA)	2	ng/L
Perfluorododecanoic acid (FRB) (B-PFDoA)	2	ng/L
Perfluorohexanoic acid (PFHxA)	2	ng/L
Perfluorohexanoic acid (FRB) (B-PFHxA)	2	ng/L
Perfluorotetradecanoic acid (PFTA)	2	ng/L
Perfluorotetradecanoic acid (FRB) (B-PFTA)	2	ng/L
Perfluorotridecanoic acid (PFTrDA)	2	ng/L
Perfluorotridecanoic acid (FRB) (B-PFTrDA)	2	ng/L
Perfluoroundecanoic acid (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
Bromoacetonitrile (BAN)	0.5	ug/L
Bromochloroacetonitrile (BCAN)	0.5	ug/L
Chloroacetonitrile (CAN)	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 - 0.1	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: 625.1

Laboratory: EUROFINS CALSCIENCE IRVINE

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)	19 - 20	ug/L
1,3-Dichlorobenzene (13DCB)	9.6 - 10	ug/L
1,4-Dichlorobenzene (14DCB)	9.6 - 10	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE IRVINE

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,5-Trichlorophenol (245TCP)	19 - 20	ug/L
2,4,6-Trichlorophenol (246TCP)	19 - 20	ug/L
2,4-Dichlorophenol (24DCPH)	9.6 - 10	ug/L
2,4-Dimethylphenol (24DMP)	19 - 20	ug/L
2,4-Dinitrophenol (24DNP)	38 - 40	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)	19 - 20	ug/L
2-Methylphenol (oCRESL)	9.6 - 10	ug/L
2-Nitroaniline (oNTANL)	19 - 20	ug/L
2-Nitrophenol (2NPNL)	9.6 - 10	ug/L
3,3'-Dichlorobenzidine (DCBZDE)	19 - 20	ug/L
3-Nitroaniline (mNTANL)	19 - 20	ug/L
4-Bromophenyl phenyl ether (4BrPPE)	9.6 - 10	ug/L
4-Chloro-3-methylphenol (43CMP)	19 - 20	ug/L
4-Chloroaniline (pClANL)	9.6 - 10	ug/L
4-Chlorophenyl phenyl ether (4ClPPE)	9.6 - 10	ug/L
4-Methylphenol (pCRESL)	9.6 - 10	ug/L
4-Nitroaniline (pNTANL)	19 - 20	ug/L
4-Nitrophenol (4NPNL)	19 - 20	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)	38 - 40	ug/L
Benzo(a)anthracene (BaANTH)	9.6 - 10	ug/L
Benzo(a)pyrene (BaPYRE)	9.6 - 10	ug/L
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)	19 - 20	ug/L

Laboratory Method: 625.1

Laboratory: EUROFINS CALSCIENCE IRVINE

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Benzyl Alcohol (BNZALC)	19 - 20	ug/L
bis (2-chloroethoxy) methane (B2CEM)	9.6 - 10	ug/L
bis (2-chloroethyl) ether (B2CLEE)	9.6 - 10	ug/L
bis (2-chloroisopropyl) ether (B2CIPE)	9.6 - 10	ug/L
bis (2-ethylhexyl) phthalate (DEHP)	19 - 20	ug/L
Butylbenzyl phthalate (BBP)	19 - 20	ug/L
Chrysene (CHRYS)	9.6 - 10	ug/L
Dibenzo(a,h)anthracene (DBahAN)	19 - 20	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)	19 - 20	ug/L
Di-n-octyl phthalate (DnOP)	19 - 20	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)	19 - 20	ug/L
Hexachloroethane (HCE)	9.6 - 10	ug/L
Indeno(1,2,3-cd)pyrene (INDPYR)	19 - 20	ug/L
Isophorone (IPHOR)	9.6 - 10	ug/L
Naphthalene (NAP)	9.6 - 10	ug/L
Nitrobenzene (NBENZ)	19 - 20	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)	19 - 20	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)	1.11 - 1.28	pCi/L
Total Alpha Counting Error (TOTaCE)	1.11 - 1.28	pCi/L

Laboratory Method: 8015D

Laboratory: EUROFINS TESTAMERICA, BUFFALO

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Ethylene Glycol (GLYCOL)	10,000	ug/L

Laboratory Method: 8330A

Laboratory: EUROFINS TESTAMERICA, DENVER

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,6-Trinitrotoluene (246TNT)	0.11 - 0.43	ug/L
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.21 - 0.32	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.21 - 0.43	ug/L

Laboratory: EUROFINS TESTAMERICA, SACRAMENTO

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
2,4,6-Trinitrotoluene (246TNT)	0.1	ug/L
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.1	ug/L
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.1	ug/L

Laboratory Method: 900.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Beta (TOTb)	0.49 - 1.6	pCi/L
Total Beta Counting Error (TOTbCE)	0.49 - 1.6	pCi/L

Laboratory Method: 903.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Radium 226 (TRa226)	0.326 - 0.407	pCi/L
Total Radium 226 Counting Error (TRa6CE)	0.326 - 0.407	pCi/L

Laboratory Method: 905.0

Laboratory: EUROFINS TESTAMERICA, ST LOUIS

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	3	pCi/L
Total Strontium-90 Counting Error (TS90CE)	3	pCi/L

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.546	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.546	pCi/L

Laboratory: PACE ANALYTICAL SERVICES - GREENSBURG

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Total Strontium-90 (TS90)	0.492 - 0.657	pCi/L
Total Strontium-90 Counting Error (TS90CE)	0.492 - 0.657	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: 908.0

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Natural Uranium (NTUr)	0.391	pCi/L
Natural Uranium Counting Error (NTUrCE)	0.391	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: 9223B

Laboratory: ALS - TRUESDAIL LABORATORIES

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
E. Coli (Colilert - P/A) (ECOLIC)	1	UNITS
Total Coliform (Colilert - P/A) (TCOLIC)	1	UNITS

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: 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 - 100	ng/L

Laboratory Method: CEC

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Iohexol (IOHEXL)	20 - 1,000	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 - 10	ng/L
Neotame (NEOTAM)	10	ng/L
Nonylphenol (NONYPH)	0.2	ug/L
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: 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 - 0.506	pCi/L
Total Radium 228 Counting Error (TRa8CE)	0.4 - 0.506	pCi/L

Laboratory Method: UNKWQAN

Laboratory: FRUIT GROWERS LABORATORY, INC.

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Gross Alpha Excluding Uranium (TOTa-U)	1.11 - 1.28	pCi/L
Radium 226 + Radium 228 (Ra6Ra8)	0.4 - 0.506	pCi/L
Radium 226 + Radium 228 Counting Error (Ra68CE)	0.4 - 0.506	pCi/L

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Aggressive Index (AI)	NA	A.I.
Bicarbonate (as HCO3) (HCO3)	1.2	mg/L

Laboratory Method: UNKWQAN

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Cation-Anion meq balance (CATANI)	NA	RATIO
Hydroxide (as CaCO3) (OHCa)	5	mg/L
Nitrate (NO3)	0.4 - 1.8	mg/L
Nitrate + Nitrite Nitrogen (NO3NO2-N)	0.1 - 0.4	mg/L
Nitrite (NO2)	0.007 - 0.066	mg/L
PFOA + PFOS (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)	NA	meq/L
Title 22 Total Anions (T22ANI)	NA	meq/L
Title 22 Total Cations (T22CAT)	NA	meq/L
Total Anions (TOTANI)	NA	meq/L
Total Cations (TOTCAT)	NA	meq/L
Total Nitrogen (TOT-N)	0.2 - 0.6	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 - 0.4	ug/L

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LABORATORY METHODS OF ANALYSES

Laboratory Method: X1-300.0

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	Reportable Detection Limit Range	Units
Bromide (Br)	0.1	mg/L
Chloride (Cl)	0.5 - 2.5	mg/L
Fluoride (F)	0.1 - 0.5	mg/L
Nitrate Nitrogen (NO3-N)	0.1 - 0.4	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	mg/L
Total Kjeldahl Nitrogen (TKN)	0.2 - 0.6	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
Iron (Fe)	5 - 20	ug/L
Iron (dissolved) (Fe-DIS)	5	ug/L

Laboratory Method: X200.7

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
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	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 - 4	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 - 2	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
Chromium (Cr)	1 - 2	ug/L
Chromium (dissolved) (Cr-DIS)	1 - 2	ug/L
Cobalt (Co)	1 - 2	ug/L

Laboratory Method: X200.8

Laboratory: ORANGE COUNTY WATER DISTRICT

Constituent Name & Abbreviation	*Reportable Detection Limit Range*	*Units*
Cobalt (dissolved) (Co-DIS)	1 - 2	ug/L
Copper (Cu)	1 - 2	ug/L
Copper (dissolved) (Cu-DIS)	1 - 2	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 - 10	ug/L
Manganese (dissolved) (Mn-DIS)	1 - 2	ug/L
Mercury (Hg)	1	ug/L
Mercury (dissolved) (Hg-DIS)	1	ug/L
Molybdenum (Mo)	1	ug/L
Nickel (Ni)	1 - 2	ug/L
Nickel (dissolved) (Ni-DIS)	1 - 2	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 - 2	ug/L
Vanadium (V)	1 - 3	ug/L
Vanadium (dissolved) (V-DIS)	1 - 2	ug/L
Zinc (Zn)	1	ug/L
Zinc (dissolved) (Zn-DIS)	1	ug/L

Appendix C

Water Quality Constituents
With Laboratory Methods

Orange County Water District
Groundwater Replenishment System
2020 Annual Report

Constituent Type: BIOLOGICAL

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Bacteriophage, Male Specific (BACTMLSP)	1601	1	P/A PERL	BIOVIR
Bacteriophage, Male Specific (BACTMLSP)	1601	1	P/A PERL	OCHCA
Bacteriophage, Somatic (BACTSOMT)	1601	1	P/A PERL	OCHCA
Bacteriophage, Somatic (BACTSOMT)	1601	1	P/A PERL	BIOVIR
Cryptosporidium (CRYPTO)	1623	0.093 - 0.095	oocyst/L	EUROSBIN
E. Coli (Colilert - MPN/100mL) (ECOLIQ)	9223B	1 - 3,400	MPN	OCWD
E. Coli (Colilert - P/A) (ECOLIC)	9223B	1	UNITS	ALSTL
E. Coli (Membrane Filtration - CFU/100ml) (ECOLI)	M-TEC	1	CFU/100	OCHCA
Enterococcus(Membrane Filtration-CFU/100ml) (ENTRCC)	1600	1	CFU/100	OCHCA
Fecal Coliform (Mult. Tube Fermentation) (FCOLIM)	9221E	1.1	MPN	OCWD
Giardia (GIARDIA)	1623	0.093 - 0.095	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 (Colilert - P/A) (TCOLIC)	9223B	1	UNITS	ALSTL
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	NA	A.I.	OCWD
Alkalinity-Phenolphthalein (ALKPHE)	2320B	1	mg/L	OCWD
Aluminum (Al)	X200.8	1 - 20	ug/L	OCWD

Laboratory Abbreviation Descriptions:

ALSTL: ALS - Truesdail Laboratories; BIOVIR: IEH-Biovir Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; EUROTSTL: Eurofins TestAmerica, St Louis; EUTALKNX: Eurofins TestAmerica, Knoxville; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; 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*
Aluminum (dissolved) (Al-DIS)	X200.8	1 - 4	ug/L	OCWD
Ammonia Nitrogen (NH3-N)	350.1	0.1 - 0.3	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 - 2	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 - 7.5	mg/L	EURFCAIR
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	mg/L	OCWD

Laboratory Abbreviation Descriptions:

ALSTL: ALS - Truesdail Laboratories; BIOVIR: IEH-Biovir Laboratories; EURDENVR: Eurofins TestAmerica, Denver; EURFCAIR: Eurofins Calscience Irvine; EUROFBUF: Eurofins TestAmerica, Buffalo; EUROFCEI: Eurofins CEI, Inc.; EUROFINS: Eurofins Eaton Analytical; EUROSBIN: Eurofins Eaton South Bend; EUROTSAC: Eurofins TestAmerica, Sacramento; EUROTSTL: Eurofins TestAmerica, St Louis; EUTALKNX: Eurofins TestAmerica, Knoxville; FGL: Fruit Growers Laboratory, Inc.; OCHCA: O.C. Health Care Agency; OCWD: Orange County Water District; PACEGRNS: Pace Analytical Services - Greensburg; WECKLAB: Weck Laboratories, Inc.

Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Cadmium (Cd)	X200.8	1	ug/L	OCWD
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	NA	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 - 2	ug/L	OCWD
Cobalt (Co)	X200.8	1 - 2	ug/L	OCWD
Cobalt (dissolved) (Co-DIS)	X200.8	1 - 2	ug/L	OCWD
Copper (Cu)	X200.8	1 - 2	ug/L	OCWD
Copper (dissolved) (Cu-DIS)	X200.8	1 - 2	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 - 0.5	mg/L	OCWD

Laboratory Abbreviation Descriptions:

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Free Chlorine (FRCL2)	4500CLF	0.1	mg/L	OCWD
Free Res. Chlorine -- Amperometric Method (FRCL2A)	4500CLD	0.1 - 0.13	mg/L	OCWD
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 - 0.4	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	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 - 10	ug/L	OCWD
Manganese (dissolved) (Mn-DIS)	X200.8	1 - 2	ug/L	OCWD
Mercury (Hg)	X200.8	1	ug/L	OCWD
Mercury (dissolved) (Hg-DIS)	X200.8	1	ug/L	OCWD
Molybdenum (Mo)	X200.8	1	ug/L	OCWD
Nickel (Ni)	X200.8	1 - 2	ug/L	OCWD

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Nickel (dissolved) (Ni-DIS)	X200.8	1 - 2	ug/L	OCWD
Nitrate (NO3)	4500NO3F	0.4	mg/L	OCWD
Nitrate (NO3)	UNKWQAN	0.4 - 1.8	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	4500NO3F	0.1 - 0.2	mg/L	OCWD
Nitrate + Nitrite Nitrogen (NO3NO2-N)	UNKWQAN	0.1 - 0.4	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	4500NO3F	0.1 - 0.2	mg/L	OCWD
Nitrate Nitrogen (NO3-N)	X1-300.0	0.1 - 0.4	mg/L	OCWD
Nitrite (NO2)	UNKWQAN	0.007 - 0.066	mg/L	OCWD
Nitrite Nitrogen (NO2-N)	4500NO3F	0.002 - 0.02	mg/L	OCWD
Odor Range High (ODORHI)	2150B	0	TON	OCWD
Odor Range Low (ODORLO)	2150B	0	TON	OCWD
Organic Nitrogen (ORG-N)	X1-351.2	0.1	mg/L	OCWD
Perchlorate (CLO4)	332.0	2 - 2.5	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

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
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 - 0.1	mg/L	OCWD
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	NA	meq/L	OCWD
Title 22 Total Anions (T22ANI)	UNKWQAN	NA	meq/L	OCWD
Title 22 Total Cations (T22CAT)	UNKWQAN	NA	meq/L	OCWD
Tot. Res. Chlorine -- Amperometric Method (TOTCLA)	4500CLD	0.1 - 0.4	mg/L	OCWD
Total Alkalinity (as CaCO3) (TOTALK)	2320B	5	mg/L	OCWD
Total Anions (TOTANI)	UNKWQAN	NA	meq/L	OCWD
Total Cations (TOTCAT)	UNKWQAN	NA	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

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Constituent Type: INORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Total Kjeldahl Nitrogen (TKN)	X1-351.2	0.2 - 0.6	mg/L	OCWD
Total Nitrogen (TOT-N)	UNKWQAN	0.2 - 0.6	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
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 - 2	ug/L	OCWD
UV Absorbance/TOC (unfiltered) ratio (UV/TOC)	5910B	0.0001	L/mg-cm	OCWD
Vanadium (V)	X200.8	1 - 3	ug/L	OCWD
Vanadium (dissolved) (V-DIS)	X200.8	1 - 2	ug/L	OCWD
Zinc (Zn)	X200.8	1	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

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
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
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	9.6 - 10	ug/L	EURFCAIR
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)	504.1	0.01	ug/L	WECKLAB
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 - 0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	504.1	0.01	ug/L	OCWD
1,2-Dibromoethane (EDB)	504.1	0.02	ug/L	WECKLAB
1,2-Dibromoethane (EDB)	524.2	0.5	ug/L	OCWD
1,2-Dibromoethane (EDB)	524M-TCP	0.005	ug/L	OCWD

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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-Dichlorobenzene (12DCB)	524.2	0.5	ug/L	OCWD
1,2-Dichlorobenzene (12DCB)	625.1	9.6 - 10	ug/L	EURFCAIR
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	19 - 20	ug/L	EURFCAIR
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	9.6 - 10	ug/L	EURFCAIR
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	EURFCAIR
1,4-Dioxane (14DIOX)	14DIOX	0.5 - 1	ug/L	OCWD
1,4-Dioxane (14DIOX)	522	0.07	ug/L	WECKLAB
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 - 4.9	pg/L	EUROTSAC
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1613B	4.7 - 4.8	pg/L	EUTALKNX
2,4,5-Trichlorophenol (245TCP)	625.1	19 - 20	ug/L	EURFCAIR
2,4,6-Trichlorophenol (246TCP)	625.1	19 - 20	ug/L	EURFCAIR

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
2,4-Dichlorophenol (24DCPH)	625.1	9.6 - 10	ug/L	EURFCAIR
2,4-Dimethylphenol (24DMP)	625.1	19 - 20	ug/L	EURFCAIR
2,4-Dinitrophenol (24DNP)	625.1	38 - 40	ug/L	EURFCAIR
2,4-Dinitrotoluene (24DNT)	525.2	0.1	ug/L	OCWD
2,4-Dinitrotoluene (24DNT)	625.1	9.6 - 10	ug/L	EURFCAIR
2,6-Dinitrotoluene (26DNT)	525.2	0.1	ug/L	OCWD
2,6-Dinitrotoluene (26DNT)	625.1	9.6 - 10	ug/L	EURFCAIR
2-Chloroethylvinyl ether (2ClEVE)	14DIOX	1	ug/L	OCWD
2-Chloronaphthalene (2ClNAP)	625.1	9.6 - 10	ug/L	EURFCAIR
2-Chlorophenol (2ClPNL)	625.1	9.6 - 10	ug/L	EURFCAIR
2-Chlorotoluene (2CLTOL)	524.2	0.5	ug/L	OCWD
2-Methyl naphthalene (2MNAP)	625.1	9.6 - 10	ug/L	EURFCAIR
2-Methyl-4,6-Dinitrophenol (2MDNP)	625.1	19 - 20	ug/L	EURFCAIR
2-Methylphenol (oCRESL)	625.1	9.6 - 10	ug/L	EURFCAIR
2-Nitroaniline (oNTANL)	625.1	19 - 20	ug/L	EURFCAIR
2-Nitrophenol (2NPNL)	625.1	9.6 - 10	ug/L	EURFCAIR
3,3'-Dichlorobenzidine (DCBZDE)	625.1	19 - 20	ug/L	EURFCAIR
3-Nitroaniline (mNTANL)	625.1	19 - 20	ug/L	EURFCAIR
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	537.1	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	EURFCAIR
4-Chloro-3-methylphenol (43CMP)	625.1	19 - 20	ug/L	EURFCAIR

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Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
4-Chloroaniline (pClANL)	625.1	9.6 - 10	ug/L	EURFCAIR
4-Chlorophenyl phenyl ether (4ClPPE)	625.1	9.6 - 10	ug/L	EURFCAIR
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	9.6 - 10	ug/L	EURFCAIR
4-Nitroaniline (pNTANL)	625.1	19 - 20	ug/L	EURFCAIR
4-Nitrophenol (4NPNL)	625.1	19 - 20	ug/L	EURFCAIR
4-n-Octylphenol (4nOCPH)	CEC	0.2	ug/L	OCWD
4-tert-Octylphenol (4tOCPH)	CEC	0.2	ug/L	OCWD
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CLPF3)	537.1	2	ng/L	OCWD
Acetaldehyde (ACEALD)	556	2	ug/L	WECKLAB
Acetone (ACETNE)	524.2	10 - 40	ug/L	OCWD
Aniline (ANLN)	625.1	9.6 - 10	ug/L	EURFCAIR
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
Benzoic Acid (BNZACD)	625.1	19 - 20	ug/L	EURFCAIR
Benzyl Alcohol (BNZALC)	625.1	19 - 20	ug/L	EURFCAIR
bis (2-chloroethoxy) methane (B2CEM)	625.1	9.6 - 10	ug/L	EURFCAIR

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
bis (2-chloroethyl) ether (B2CLEE)	524.2	5	ug/L	OCWD
bis (2-chloroethyl) ether (B2CLEE)	625.1	9.6 - 10	ug/L	EURFCAIR
bis (2-chloroisopropyl) ether (B2CIPE)	625.1	9.6 - 10	ug/L	EURFCAIR
Bisphenol A (BisPHA)	CEC	0.2	ug/L	OCWD
Bromoacetonitrile (BAN)	551.1	0.5	ug/L	WECKLAB
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
Carbon Disulfide (CS2)	524.2	0.5	ug/L	OCWD
Carbon tetrachloride (CCl4)	524.2	0.5	ug/L	OCWD
Chloroacetonitrile (CAN)	551.1	0.5	ug/L	WECKLAB
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 - 20	ug/L	OCWD
Chloroform (CHCl3)	524.2	0.5	ug/L	OCWD
Chloromethane (CH3Cl)	524.2	0.5	ug/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
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	9.6 - 10	ug/L	EURFCAIR
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
Dissolved Organic Carbon (DOC)	5310C	0.05	mg/L	OCWD
Endosulfan II (ENDOII)	508	0.01	ug/L	WECKLAB
Endosulfan II (ENDOII)	525.2	0.1	ug/L	OCWD
Epitestosterone (cis-Testosterone) (EPITES)	CEC	1	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
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	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)	525.2	0.1	ug/L	OCWD
HCH-beta (Beta-BHC) (BHCb)	508	0.01	ug/L	WECKLAB
HCH-beta (Beta-BHC) (BHCb)	525.2	0.1	ug/L	OCWD
HCH-delta (Delta-BHC) (BHCd)	508	0.01	ug/L	WECKLAB
HCH-delta (Delta-BHC) (BHCd)	525.2	0.1	ug/L	OCWD
Heptanal (HEPNAL)	556	2	ug/L	WECKLAB
Hexachlorobutadiene (HClBut)	524.2	0.5	ug/L	OCWD
Hexachlorobutadiene (HClBut)	625.1	9.6 - 10	ug/L	EURFCAIR
Hexachloroethane (HCE)	625.1	9.6 - 10	ug/L	EURFCAIR
Hexafluoropropylene oxide dimer acid (GenX) (HFPODA)	537.1	2	ng/L	OCWD
Hexanal (HEXNAL)	556	2	ug/L	WECKLAB
Iohexol (IOHEXL)	CEC	20 - 1,000	ng/L	OCWD
Iopromide (IOPRMD)	CEC	10	ng/L	OCWD

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Isophorone (IPHOR)	525.2	0.1	ug/L	OCWD
Isophorone (IPHOR)	625.1	9.6 - 10	ug/L	EURFCAIR
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	5	ug/L	OCWD
Methyl Isobutyl Ketone (MIBK) (MIBK)	524.2	5	ug/L	OCWD
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	0.1	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	9.6 - 10	ug/L	EURFCAIR
Naproxen (NAPRXN)	CEC	5 - 10	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

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Nitrobenzene (NBENZ)	625.1	19 - 20	ug/L	EURFCAIR
N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSA)	537.1	2	ng/L	OCWD
N-Nitrosodiethylamine (NDEA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodimethylamine (NDMA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitroso-di-n-propylamine (NDPA)	625.1	9600 - 10,000	ng/L	EURFCAIR
n-Nitroso-di-n-propylamine (NDPA)	NDMA-LOW	2 - 10	ng/L	OCWD
n-Nitrosodiphenylamine (NDPhA)	625.1	9600 - 10,000	ng/L	EURFCAIR
N-Nitrosomorpholine (NMOR)	NDMA-LOW	2 - 10	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-1221 (PCB21)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1232 (PCB32)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1242 (PCB42)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1248 (PCB48)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1254 (PCB54)	508	0.1 - 0.5	ug/L	WECKLAB
PCB-1260 (PCB60)	508	0.1 - 0.5	ug/L	WECKLAB
PCBs, Total (TOTPCB)	508	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

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
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
Perfluorodecanoic acid (PFDA)	537.1	2	ng/L	OCWD
Perfluorododecanoic acid (PFDoA)	537.1	2	ng/L	OCWD
Perfluorohexanoic acid (PFHxA)	537.1	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
PFOA + PFOS (PFOAOS)	UNKWQAN	2	ng/L	OCWD
Phenol (PHENOL)	625.1	9.6 - 10	ug/L	EURFCAIR
PhenylPhenol (PHNYPH)	CEC	0.2	ug/L	OCWD
Progesterone (PRGSTR)	CEC	1	ng/L	OCWD
Propylbenzene (PRPBNZ)	524.2	0.5	ug/L	OCWD
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

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ORANGE COUNTY WATER DISTRICT
Water Quality Constituents With Laboratory Methods

Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
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
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

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Constituent Type: ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Vinyl chloride (VNYLCL)	524.2	0.5	ug/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
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

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Constituent Type: ORGANIC FRB

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
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	1.11 - 1.28	pCi/L	FGL
Natural Uranium (NTUr)	908.0	0.391	pCi/L	FGL
Natural Uranium (NTUr)	X200.8	0.13	pCi/L	FGL
Natural Uranium Counting Error (NTUrCE)	908.0	0.391	pCi/L	FGL
Radium 226 + Radium 228 (Ra6Ra8)	UNKWQAN	0.4 - 0.506	pCi/L	FGL
Radium 226 + Radium 228 Counting Error (Ra68CE)	UNKWQAN	0.4 - 0.506	pCi/L	FGL
Total Alpha (TOTa)	7110C	1.11 - 1.28	pCi/L	FGL
Total Alpha Counting Error (TOTaCE)	7110C	1.11 - 1.28	pCi/L	FGL
Total Beta (TOTb)	900.0	0.49 - 1.6	pCi/L	FGL
Total Beta Counting Error (TOTbCE)	900.0	0.49 - 1.6	pCi/L	FGL
Total Radium 226 (TRa226)	903.0	0.326 - 0.407	pCi/L	FGL
Total Radium 226 Counting Error (TRa6CE)	903.0	0.326 - 0.407	pCi/L	FGL
Total Radium 228 (TRa228)	RA-05	0.4 - 0.506	pCi/L	FGL
Total Radium 228 Counting Error (TRa8CE)	RA-05	0.4 - 0.506	pCi/L	FGL
Total Strontium-90 (TS90)	905.0	0.546	pCi/L	FGL
Total Strontium-90 (TS90)	905.0	3	pCi/L	EUROTSTL
Total Strontium-90 (TS90)	905.0	0.492 - 0.657	pCi/L	PACEGRNS

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Constituent Type: RADIOLOGICALS

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Total Strontium-90 Counting Error (TS90CE)	905.0	3	pCi/L	EUROTSTL
Total Strontium-90 Counting Error (TS90CE)	905.0	0.492 - 0.657	pCi/L	PACEGRNS
Total Strontium-90 Counting Error (TS90CE)	905.0	0.546	pCi/L	FGL
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
2,4,5-T (245T)	515.4	0.2	ug/L	WECKLAB
2,4,5-TP (Silvex) (245TP)	515.4	0.2	ug/L	WECKLAB
2,4,6-Trinitrotoluene (246TNT)	8330A	0.1	ug/L	EUROTSAC
2,4,6-Trinitrotoluene (246TNT)	8330A	0.11 - 0.43	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
4,4'-DDD (DDD)	508	0.01	ug/L	WECKLAB
4,4'-DDD (DDD)	525.2	0.1	ug/L	OCWD
4,4'-DDE (DDE)	508	0.01	ug/L	WECKLAB
4,4'-DDE (DDE)	525.2	0.1	ug/L	OCWD
4,4'-DDT (DDT)	508	0.01	ug/L	WECKLAB
4,4'-DDT (DDT)	525.2	0.1	ug/L	OCWD

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Acenaphthene (ACNAPE)	525.2	0.1	ug/L	OCWD
Acenaphthene (ACNAPE)	625.1	9.6 - 10	ug/L	EURFCAIR
Acenaphthylene (ACENAP)	525.2	0.1	ug/L	OCWD
Acenaphthylene (ACENAP)	625.1	9.6 - 10	ug/L	EURFCAIR
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 sulfone (ALDISN)	531	2	ug/L	OCWD
Aldicarb sulfoxide (ALDISX)	531	2	ug/L	OCWD
Aldrin (ALDRIN)	508	0.01	ug/L	WECKLAB
Aldrin (ALDRIN)	525.2	0.1	ug/L	OCWD
Ametryn (AMERYN)	525.2	0.1	ug/L	OCWD
Anthracene (ANTHRA)	525.2	0.1 - 1	ug/L	OCWD
Anthracene (ANTHRA)	625.1	9.6 - 10	ug/L	EURFCAIR
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
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	9.6 - 10	ug/L	EURFCAIR

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Benzo(a)pyrene (BaPYRE)	525.2	0.1	ug/L	OCWD
Benzo(a)pyrene (BaPYRE)	625.1	9.6 - 10	ug/L	EURFCAIR
Benzo(b)fluoranthene (BbFLUR)	525.2	0.1	ug/L	OCWD
Benzo(b)fluoranthene (BbFLUR)	625.1	9.6 - 10	ug/L	EURFCAIR
Benzo(g,h,i)perylene (BghiPR)	525.2	0.1	ug/L	OCWD
Benzo(g,h,i)perylene (BghiPR)	625.1	9.6 - 10	ug/L	EURFCAIR
Benzo[k]fluoranthene (BkFLUR)	525.2	0.1	ug/L	OCWD
Benzo[k]fluoranthene (BkFLUR)	625.1	9.6 - 10	ug/L	EURFCAIR
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
Bromacil (BROMAC)	525.2	0.1	ug/L	OCWD
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
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
Carbofuran (CARBOF)	531	1	ug/L	OCWD
Chlordane (ClDANE)	508	0.1 - 0.5	ug/L	WECKLAB

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Chlordane-alpha (CLDA)	525.2	0.1	ug/L	OCWD
Chlordane-gamma (CLDG)	525.2	0.1	ug/L	OCWD
Chlorobenzilate (CLBZLA)	525.2	0.1	ug/L	OCWD
Chloroneb (CLNEB)	525.2	0.1	ug/L	OCWD
Chlorothalonil (CLTNIL)	508	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	9.6 - 10	ug/L	EURFCAIR
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
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)	525.2	0.1	ug/L	OCWD
Diethyl phthalate (DEP)	525.2	2	ug/L	OCWD
Diethyl phthalate (DEP)	625.1	9.6 - 10	ug/L	EURFCAIR

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
Dimethoate (DMTH)	525.2	1	ug/L	OCWD
Dimethyl phthalate (DMP)	525.2	2	ug/L	OCWD
Dimethyl phthalate (DMP)	625.1	9.6 - 10	ug/L	EURFCAIR
Di-n-butylphthalate (DnBP)	525.2	2	ug/L	OCWD
Di-n-butylphthalate (DnBP)	625.1	19 - 20	ug/L	EURFCAIR
Di-n-octyl phthalate (DnOP)	525.2	2	ug/L	OCWD
Di-n-octyl phthalate (DnOP)	625.1	19 - 20	ug/L	EURFCAIR
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)	525.2	0.1	ug/L	OCWD
Endosulfan sulfate (ENDOSL)	508	0.01	ug/L	WECKLAB
Endosulfan sulfate (ENDOSL)	525.2	0.1	ug/L	OCWD
Endothall (ENDOTL)	548.1	45	ug/L	WECKLAB
Endrin (ENDRIN)	508	0.01	ug/L	WECKLAB
Endrin (ENDRIN)	525.2	0.1	ug/L	OCWD
Endrin Aldehyde (ENDR-A)	508	0.01	ug/L	WECKLAB
Endrin Aldehyde (ENDR-A)	525.2	0.1	ug/L	OCWD
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

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	Method	Reportable Detection Limit Range	Units	Laboratory
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	9.6 - 10	ug/L	EURFCAIR
Fluorene (FLUOR)	525.2	0.1	ug/L	OCWD
Fluorene (FLUOR)	625.1	9.6 - 10	ug/L	EURFCAIR
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)	525.2	0.1	ug/L	OCWD
Heptachlor (HEPTA)	508	0.01	ug/L	WECKLAB
Heptachlor (HEPTA)	525.2	0.1	ug/L	OCWD
Heptachlor epoxide (HEPEPX)	508	0.01	ug/L	WECKLAB
Heptachlor epoxide (HEPEPX)	525.2	0.1	ug/L	OCWD
Hexachlorobenzene (HEXCLB)	508	0.05	ug/L	WECKLAB
Hexachlorobenzene (HEXCLB)	525.2	0.1	ug/L	OCWD
Hexachlorobenzene (HEXCLB)	625.1	9.6 - 10	ug/L	EURFCAIR
Hexachlorocyclopentadiene (HClCPD)	508	0.05	ug/L	WECKLAB
Hexachlorocyclopentadiene (HClCPD)	525.2	0.1	ug/L	OCWD
Hexachlorocyclopentadiene (HClCPD)	625.1	19 - 20	ug/L	EURFCAIR
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.1	ug/L	EUROTSAC
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330A	0.21 - 0.32	ug/L	EURDENVR
Hexazinone (HEXZON)	525.2	0.1	ug/L	OCWD
Ibuprofen (IBPRFN)	CEC	1 - 100	ng/L	OCWD

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Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Indeno(1,2,3-cd)pyrene (INDPYR)	525.2	0.1	ug/L	OCWD
Indeno(1,2,3-cd)pyrene (INDPYR)	625.1	19 - 20	ug/L	EURFCAIR
Malathion (MALATH)	525.2	2	ug/L	OCWD
Methiocarb (MTHCRB)	531	4	ug/L	OCWD
Methomyl (MTHOMY)	531	1	ug/L	OCWD
Methoxychlor (METHOX)	508	0.01	ug/L	WECKLAB
Methoxychlor (METHOX)	525.2	0.1	ug/L	OCWD
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)	CEC	1 - 10	ng/L	OCWD
Norflurazon (NORFLR)	525.2	1	ug/L	OCWD
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.1	ug/L	EUROTSAC
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330A	0.21 - 0.43	ug/L	EURDENVR
Oxamyl (OXAMYL)	531	2	ug/L	OCWD
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)	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

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Water Quality Constituents With Laboratory Methods

Constituent Type: SEMI-ORGANIC

Constituent Name & Abbreviation	*Method*	*Reportable Detection Limit Range*	*Units*	*Laboratory*
Phenanthrene (PHENAN)	525.2	0.1	ug/L	OCWD
Phenanthrene (PHENAN)	625.1	9.6 - 10	ug/L	EURFCAIR
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)	525.2	0.1	ug/L	OCWD
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	9.6 - 10	ug/L	EURFCAIR
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
Triclosan (TRICLN)	CEC	1	ng/L	OCWD
Trifluralin (TRFLRN)	508	0.01	ug/L	WECKLAB
Trifluralin (TRFLRN)	525.2	0.1	ug/L	OCWD
Trithion (TRTION)	525.2	0.1	ug/L	OCWD

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Appendix D

Operator Certifications,
Operations and Maintenance Summary
and Calibration Records

Orange County Water District
Groundwater Replenishment System
2020 Annual Report

Orange County Water District
Groundwater Replenishment System
Advanced Water Purification Facility

Operations Certification Levels
(As of December 2020)

Listed according to level of WWTP Operator Certification level, high-to-low

Operator	Job Title	Cert. Level	Cert. No.
Tyson Neely	Operations Manager	V	V-27698
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
Craig Liebzeit Jr.	Lead Plant Operator	III	III-43546
Heinz Roehler	Sr. Plant Operator III	III	III-3534
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
Jonathan Mok	Plant Operator I	II	II-43357
Christopher Owens	Plant Operator II	T-4	29560
Anthony Lockhart	Plant Operator II	T-3	38600

Plant Shutdown Summary for Advanced Water Purification Facility
2020 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		32.00						33.30	13.70			2.00	81.00
2	Planned shutdown for GWRSFE construction & GWRS Pipeline inspection				96.20	271.75								367.95
3	Unplanned shutdown due to GWRSFE construction											1.25		1.25
4	Planned shutdown for AWPF MF valve actuator replacement												3.75	3.75
5	Unplanned SCE power interruption							3.50	10.90				1.50	15.90
Total Hours Offline		**0.00**	**32.00**	**0.00**	**96.20**	**271.75**	**0.00**	**3.50**	**44.20**	**13.70**	**0.00**	**1.25**	**7.25**	**469.85**
Total Days Offline		**0.00**	**1.33**	**0.00**	**4.01**	**11.32**	**0.00**	**0.15**	**1.84**	**0.57**	**0.00**	**0.05**	**0.30**	**19.58**

Appendix D
Plant Shutdown Summary

D.1 January 2020

January 1 - 31: Total Downtime 0.0 hours (0.0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of January.

D.2 February 2020

February 1 — 29: Total Downtime 32.0 hours (4.6%)

February 4-5: The GWRS / AWPF was shut down for a total of 32.0 hours for GWRS Final Expansion construction work. During the downtime contractors re-routed plant waste streamlines for the RO Waste pump station and lime slurry lines. The reconfigurations were necessary because they interfered with the downtime to perform high voltage inspections and to take measurements of electrical BUS cabinets to ready them for the addition of new equipment for the Final Expansion.

City of Fountain Valley potable water was used to keep the Talbert Seawater Barrier Injection system pressurized during the GWRS shutdown.

D.3 March 2020

March 1 - 31: Total Downtime 0.0 hours (0.0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of March.

D.4 April 2020

April 1 — 30: Total Downtime 96.2 hours (13.4%)

The AWPF / GWRS experienced one scheduled shutdown in April for GWRSFE construction work and internal inspection of Segment 1 on the GWRS Pipeline for OCWD engineers. OCWD Engineering also had internal repairs on the GWRS Pipeline completed by contractors while the pipeline was empty. The pipeline leak repairs completed the partial repairs that were performed when the pipeline leaks developed on Garfield Ave during December 2019.

GWRSFE construction work during the scheduled 2-week shutdown included replacing all existing Process Control System (PCS) workstations and updating the PCS Emerson Delta V operating programs and software.

Injection to Talbert Seawater Barrier Injection system was taken offline on April 24 to prepare for the 2-week shutdown that began April 26. No Southeast Barrier/OC-44 or Fountain Valley potable water was used to keep the Talbert Seawater Barrier pressurized during the AWPF / GWRS' extended downtime.

D.5 May 2020

May 1 — 31: Total Downtime 271.75 hours (36.5%)

The AWPF / GWRS began May in a shutdown state in continuation of a scheduled 2-week GWRS shutdown for GWRSFE construction work and internal inspections and repairs of Segment 1 on the GWRS Pipeline. The primary purpose of the shutdown's construction work consisted of contractors updating the PCS / Emerson Delta V programming systems and replacing all Master Controllers and PCS workstations plant wide. Also, contractors for the OCWD Engineering group completed internal and external leak repairs on the GWRS Pipeline that could only be partially repaired when the leak occurred during December 2019. During the shutdown period OCWD Water Production staff completed several projects that could only be down while the plant was offline. These work efforts included multiple FPW Channel entries to clean out accumulated lime scale that had formed since the last entries were made during a September 2018 GWRS plant shutdown. The FPWC work also included repairs to DPW sample pump suction lines, repair of the FPWC level indicators (LIT floats). Maintenance staff also made final installations of a new air compressor and receiver tank for the MF East Control Air system. The new Control Air system was installed to increase the system's capacity and improve compressed air supply to MF Train C.

No potable water (OC-44 / City of Fountain Valley) was used keep the Talbert Seawater Barrier Injection system pressurized during the plant's 2-week shutdown. The injection system was allowed to de-pressurize instead, and OC-44 water (0.68 MG / 2.09 AF) was only used to pressurize the injection system prior to being returned to normal service on May 13.

D.6 June 2020

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 2020

July 1 —31: Total Downtime 3.5 hours (0.5%)

During July, the AWPF / GWRS experienced one unexpected shutdown due to a Southern California Edison power interruption. The event occurred on July 24 with the GWRS being offline from 1515-1845 hours. Multiple I&E staff were called in to assist operations with resetting and correcting extensive and various equipment issues that were caused by the power interruptions that was caused by a high voltage surge before the AWPF / GWRS could be safely restarted.

A total of 0.42 MG of OC-44 potable water was used to keep the Talbert Barrier injection well system pressurized until normal FPW distribution could be restored.

D.8 August 2020

August 1 — 31: Total Downtime 44.2 hours (5.9%)

August 15: The GWRS experienced an unexpected shutdown (0515-1610 hours) due to a Southern California Edison (SCE) power interruption. Restarting the plant was delayed due to several device power and communication issues that occurred when the power interruption (surge) occurred. A total of 0.99 MG of MWD OC-44 potable water was used during the shutdown period to maintain barrier system pressures until the plant could be restarted to resume normal FPW injection.

August 30-31: A scheduled GWRS shutdown began on August 30, at 1440 hours, for GWRS Final Expansion construction work. The GWRS remained offline through the end of August resulting in 33.3 hours of downtime during the August operating period.

The GWRS was brought back online September 1 at 1340 hours resulting in a total downtime of 47.0 hours to complete the construction work. The work included making inlet and outlet piping connections for three new UV trains (N, O, P), and for the installation of a new 18" isolation valve for a new surge tank (A05) for the Product Water Pump Station (PWPS). For safety purposes, removing the existing blind flange to install the new PWPS's surge tank's isolation valve required draining the GWRS distribution pipeline to the OCSD ocean outfall system and the OCSD Plant No. 2 headworks to eliminate hydraulic safety concerns during the blind flange's removal and new isolation valve's installation.

During the August operating period the GWRS responded to five Enel X Demand Response power load reduction events. Details follow.

August 14: The GWRS performed a 3.0-hour (1737-2035 hours) Demand Response power load reduction event. During the event, the GWRS production rate was dropped from 90 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 to the spreading basins located in Anaheim was stopped.

August 15: The GWRS performed a 4.25-hour (1530-1946 hours) Demand Response power load reduction event. The event occurred just as the plant had been restarted at 20 mgd following an unexpected shutdown caused by an SCE power interruption. The plant production rate was reduced from 20 mgd to 15 mgd in response to the call for power load reduction.

August 16: The GWRS performed a 1.3-hour (1808-1926 hours) Demand Response power load reduction event. During the event, the GWRS production rate dropped from 90 mgd to 15 mgd.

August 17: The GWRS performed a 4.07-hour (1540-1944 hours) Demand Response power load reduction event. During the event, the GWRS production rate was dropped from 90 mgd to 15 mgd.

August 18: The GWRS performed a 5.25-hour (1410-1925 hours) Demand Response power load reduction event. During the event, the GWRS production rate was dropped from 90 mgd to 15 mgd.

D.9 September 2020

<u>September 1 —30: Total Downtime 13.7 hours (1.9%)</u>

September 1: The AWPF/GWRS began the month offline due to ta GWRS Final Expansion construction work shutdown that began on August 30. The AWPF/GWRS was restarted on September 1. During the August 30-31 portion of the scheduled shutdown the plant was offline for 33.3 hours, and an additional 13.7 hours at the beginning of September resulting in a total shutdown period of 47 hours. No other AWPF/GWRS shutdowns occurred during September.

During the September operating period the GWRS responded to two Enel X Demand Response power load reduction events. Details follow.

September 5: The GWRS performed a 2.5-hour (1758-2034 hours) Demand Response power load reduction event. During the event, the GWRS production rate was dropped from 90 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 to the spreading basins located in Anaheim stopped.

September 6: The GWRS performed a 1.0-hour (1708-1811 hours) Demand Response power load reduction event. During the event, the GWRS production rate was dropped from 80 mgd to 15 mgd.

D.10 October 2020

October 1 – 31: Total Downtime 0.0 hours (0.0%)

The AWPF / GWRS experienced no shutdowns or process interruptions during the month of October.

D.11 November 2020

November 1 — 30: Total Downtime 1.25 hours (0.2%)

During November, the GWRS / AWPF experienced one unexpected shutdown due to a brief power interruption to the MF processes. The 1.25-hour shutdown event occurred on November 2 (0700-0815 hours) while electrical BUS feeds for the MF process were being switched over. The scheduled BUS switchover was being performed by OCWD staff to enable the GWRSFE construction contractor to begin installing wiring upgrades for the MF electrical systems.

A total of 0.13 MG of OC-44 potable water was used to keep the Talbert Seawater Barrier injection well system pressurized until normal FPW distribution could be restored.

D.12 December 2020

December 1 - 31: Total Downtime 7.25 hours (1.0%)

During December, the AWPF / GWRS experienced two scheduled shutdowns and one unexpected shutdown.

On December 8, the GWRS experienced a 2.0-hour shutdown (0940-1140 hours). The shutdown was performed for GWRSFE construction work that required another electrical BUS feed switchover during the continuation of GWRSFE construction work on the MF electrical processes. A total of 0.31 MG of MWD OC-44 potable water was used during the shutdown period to maintain barrier system pressures until the plant could be restarted to resume normal FPW injection.

On December 9, the GWRS experienced an unexpected 1.5-hour shutdown (1550-1750 hours). The shutdown was due to a brief Southern California Edison (SCE) power interruption. A total of 0.23 MG of MWD OC-44 potable water was used during the shutdown period to maintain barrier system pressures until the plant could be restarted to resume normal FPW injection.

On December 17, the GWRS experienced a scheduled 3.75-hour shutdown (0830-1215 hours). The quickly scheduled shutdown was performed to replace a critical valve actuator for the MF processes backwash supply water bypass system. A total of 0.48 MG of MWD OC-44 potable water was used during the shutdown period to maintain barrier system pressures until the plant could be restarted to resume normal FPW 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	1/5/20	21.2	12.9	4.70	4.57
	1/29/20	20.0	13.3	5.63	4.53
February	2/26/20	21.0	10.2	5.52	4.62
March	3/20/20	18.5	12.8	5.17	4.70
April	4/11/20	17.6	12.3	5.81	4.57
	4/24/20	10.2	6.9	4.40	4.21
May	5/27/20	13.0	7.0	3.87	3.50
June	6/23/20	21.0	8.0	3.90	3.68
July	7/19/20	21.0	8.3	4.11	3.72
August	8/16/20	21.5	7.0	6.95	4.16
September	9/13/20	21.0	6.7	3.94	3.37
October	10/9/20	21.0	8.5	4.33	3.60
November	11/5/20	21.0	9.3	4.66	3.91
December	12/1/20	21.0	14.5	5.20	4.10
	12/27/20	21.0	14.5	5.58	4.36
	12/29/20	(See Note 1)			

[1] Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/17/20	18.4	13.4	4.06	3.49
February	2/14/20	21.0	12.5	3.62	3.33
March	3/9/20	19.6	13.2	4.54	3.91
	3/31/20	17.7	12.6	4.32	3.87
April	4/20/20	16.1	11.7	4.67	3.69
May	5/25/20	11.3	6.0	3.27	2.94
June	6/21/20	21.0	6.3	3.00	2.76
July	7/17/20	21.0	6.4	3.33	2.92
August	8/12/20	21.0	6.8	3.25	2.92
September	9/11/20	21.0	5.5	2.75	2.58
October	10/7/20	21.0	7.0	3.52	3.40
November	11/2/20	21.0	8.1	3.46	3.21
	11/29/20	21.0	12.4	4.02	3.33
December	12/24/20	20.3	13.1	4.78	4.32
	12/29/20	(See Note 1)			

[1] Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/18/20	14.6	12.40	(See Note 1)	5.39
February	2/10/20	17.3	12.11	4.81	3.83
	2/29/20	15.4	13.42	4.50	3.72
March	3/18/20	13.9	14.06	4.48	4.09
April	4/6/20	15.3	14.36	4.37	3.74
	4/24/20	13.6	8.83	3.87	3.60
June	6/2/20	17.0	7.31	3.43	3.09
	6/28/20	21.0	7.65	3.22	2.54
July	7/25/20	21.0	7.50	3.65	3.13
August	8/21/20	21.0	6.52	3.21	2.92
September	9/19/20	21.0	8.30	3.27	3.41
October	10/15/20	20.9	9.50	3.53	3.15
November	11/10/20	21.0	12.00	4.56	3.94
December	12/3/20	17.5	14.10	4.62	4.37
	12/24/20	16.7	13.31	5.03	3.98
	12/29/20	(See Note 2)			

1 A citric CIP was started on cell A03, instead of A05.
2 Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/2/20	13.4	12.69	3.98	3.80
	1/16/20	10.6	12.58	4.22	4.01
	1/27/20	9.5	12.37	5.22	4.18
February	2/11/20	11.1	12.81	5.24	4.70
	2/26/20	12.0	14.40	4.71	3.74
March	3/10/20	10.2	12.89	5.19	5.45
	3/24/20	10.5	12.70	5.39	4.37
April	4/7/20	12.1	14.25	5.25	4.84
	4/20/20	10.2	11.33	4.75	4.39
May	5/30/20	14.8	9.62	4.08	3.76
June	6/25/20	21.1	10.30	4.18	3.85
July	7/22/20	21.0	8.65	3.89	3.26
August	8/18/20	21.1	7.35	3.63	3.61
September	9/16/20	21.1	7.45	3.41	3.34
October	10/12/20	21.0	8.86	4.09	3.86
November	11/8/20	21.0	12.00	4.14	3.71
	11/30/20	17.6	14.10	5.07	4.92
December	12/19/20	15.3	13.21	4.55	4.20
	12/29/20	(See Note 1)			

1 Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/18/20	21.0	12.20	3.67	4.52
February	2/14/20	21.0	9.48	4.95	4.56
March	3/11/20	21.2	12.70	5.89	5.27
April	4/6/20	21.0	10.72	5.35	4.76
	4/23/20	14.0	7.34	4.84	4.56
May	5/24/20	10.9	6.10	3.76	3.86
June	6/19/20	21.0	8.23	5.39	4.32
July	7/15/20	21.1	7.44	4.65	4.30
August	8/10/20	21.0	7.00	4.60	4.26
September	9/9/20	21.1	5.82	4.38	3.96
October	10/5/20	21.0	7.90	4.43	4.34
	10/30/20	21.0	10.20	5.04	4.32
November	11/24/20	21.0	12.30	5.90	5.49
December	12/20/20	21.0	13.92	5.69	5.03
	12/29/20	(See Note 1)			

1 Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/3/20	21.0	8.77	3.98	4.26
	1/29/20	21.0	9.22	4.27	4.14
February	2/26/20	21.1	10.05	4.77	4.13
March	3/23/20	21.0	10.60	5.01	4.46
April	4/18/20	21.1	10.33	5.45	3.90
	4/24/20	5.0	5.40	4.59	3.74
June	6/2/20	16.6	6.99	3.98	3.55
	6/27/20	21.0	6.03	3.72	3.36
July	7/23/20	21.0	6.89	3.64	3.52
August	8/20/20	21.0	5.63	3.23	3.31
September	9/17/20	21.0	7.10	3.56	3.69
October	10/13/20	21.0	8.00	3.71	4.13
November	11/8/20	21.0	8.60	4.09	3.86
December	12/3/20	20.5	13.40	5.32	4.64
	12/29/20	(See Note 1)			

1 Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/7/20	21.0	10.94	4.88	4.31
February	2/2/20	21.0	10.51	5.76	4.95
March	3/1/20	21.2	10.53	9.40	5.19
	3/27/20	21.0	12.58	5.53	4.78
April	4/21/20	20.2	10.50	5.66	4.66
May	5/29/20	14.4	7.41	4.50	4.11
June	6/24/20	21.0	6.90	4.16	3.69
July	7/20/20	21.0	7.44	4.60	4.21
August	8/16/20	21.0	6.24	4.03	3.95
September	9/14/20	21.0	6.30	3.26	3.29
October	10/10/20	21.0	7.40	4.29	3.45
November	11/5/20	21.2	8.40	4.72	4.29
December	12/1/20	21.0	12.00	5.60	5.14
	12/27/20	21.2	12.60	5.38	4.28
	12/29/20	(See Note 1)			

[1] Starting 12/29/2020, reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/4/20	21.0	9.55	5.59	5.25
	1/13/20	MW (See Note 1)			
	1/22/20	MW (See Note 1)			
	1/31/20	21.0	11.60	5.45	5.35
February	2/11/20	MW (See Note 1)			
	2/19/20	MW (See Note 1)			
	2/28/20	21.0	10.20	5.16	5.01
March	3/9/20	MW (See Note 1)			
	3/18/20	MW (See Note 1)			
	3/26/20	21.0	12.70	5.15	5.25
April	4/5/20	MW (See Note 1)			
	4/14/20	MW (See Note 1)			
	4/21/20	19.8	11.40	5.55	4.80
May	5/20/20	MW (See Note 1)			
	5/29/20	MW (See Note 1)			
June	6/7/20	21.0	8.80	5.10	4.80
	6/16/20	MW (See Note 1)			
	6/25/20	MW (See Note 1)			
July	7/4/20	21.0	7.70	4.50	4.25
	7/14/20	MW (See Note 1)			
	7/21/20	MW (See Note 1)			
	7/31/20	21.0	7.10	4.56	4.25
August	8/9/20	MW (See Note 1)			
	8/19/20	MW (See Note 1)			
	8/28/20	21.0	7.30	4.50	4.30
September	9/8/20	MW (See Note 1)			
	9/17/20	MW (See Note 1)			
	9/26/20	21.0	8.90	4.60	4.60
October	10/5/20	MW (See Note 1)			
	10/14/20	MW (See Note 1)			
	10/23/20	21.0	8.60	4.59	4.75
November	11/2/20	MW (See Note 1)			
	11/10/20	MW (See Note 1)			
	11/19/20	21.2	10.00	4.50	4.28
	11/28/20	MW (See Note 1)			
December	12/8/20	MW (See Note 1)			
	12/17/20	21.0	6.80	4.80	4.40
	12/26/20	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	1/2/20	18.1	12.12	4.31	3.77
	1/24/20	17.7	12.23	3.97	3.69
February	2/20/20	20.7	13.17	4.82	3.57
March	3/13/20	17.3	12.54	4.02	4.04
April	4/7/20	19.9	14.50	5.25	4.75
	4/23/20	13.0	6.81	3.83	3.54
May	5/13/20	1.5	6.73	3.70	(See Note 1)
June	6/6/20	19.2	7.72	3.90	3.80
July	7/3/20	21.2	7.13	3.97	3.60
	7/29/20	21.0	7.48	3.81	3.25
August	8/26/20	21.0	7.10	3.67	3.11
September	9/24/20	21.2	7.82	4.17	3.70
October	10/24/20	21.0	8.10	4.34	3.56
November	11/20/20	21.3	14.00	5.04	4.00
December	12/11/20	16.8	15.00	4.84	3.95
	12/29/20	(See Note 2)			

[1] Early caustic-only due to air scour issues

[2] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/21/20	17.6	12.11	5.32	5.23
February	2/15/20	18.3	12.60	4.86	4.56
March	3/7/20	17.5	12.72	4.78	5.42
	3/27/20	16.2	12.34	5.28	4.93
April	4/17/20	16.9	14.07	5.48	5.25
	4/25/20	6.2	5.93	4.63	4.24
May	5/13/20	2.5	14.41	6.64	(See Note 1)
June	6/5/20	18.9	9.05	4.79	4.34
July	7/1/20	21.0	7.71	4.72	4.20
	7/28/20	21.1	8.35	4.69	4.21
August	8/26/20	21.0	7.00	4.39	3.55
September	9/24/20	21.0	7.54	5.05	4.40
October	10/21/20	21.0	9.00	4.50	4.09
November	11/20/20	21.2	11.10	6.20	4.23
December	12/11/20	15.2	14.67	5.35	5.01
	12/29/20	(See Note 2)			

[1] Early caustic-only due to air scour issues

[2] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/24/20	20.0	13.10	4.44	3.94
February	2/20/20	21.0	10.74	4.72	4.26
March	3/17/20	21.0	12.00	5.20	4.27
April	4/16/20	18.3	14.18	4.86	4.37
	4/25/20	13.5	7.40	4.15	4.12
May	5/19/20	7.2	6.01	3.90	3.96
June	6/14/20	21.0	7.44	4.23	3.71
July	7/10/20	21.0	6.29	3.66	3.33
August	8/6/20	21.0	6.30	3.77	3.54
September	9/5/20	21.0	5.17	3.43	3.53
October	10/2/20	21.2	6.70	3.64	3.02
	10/28/20	21.0	8.00	3.80	3.51
November	11/24/20	21.0	10.73	4.25	3.60
December	12/20/20	21.0	11.50	4.94	4.14
	12/29/20	(See Note 1)			

1 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/6/20	21.0	11.23	5.08	4.45
	1/30/20	19.4	13.15	4.90	4.61
February	2/26/20	21.0	10.81	4.61	4.68
March	3/18/20	17.7	14.76	4.70	3.92
April	4/10/20	18.0	14.40	4.91	4.71
	4/24/20	11.4	6.94	4.21	3.75
May	5/24/20	9.9	5.98	3.29	4.14
June	6/19/20	21.4	6.80	3.93	3.78
July	7/15/20	21.0	7.09	4.12	3.50
August	8/11/20	21.0	7.50	3.77	3.60
September	9/5/20	21.0	5.60	3.56	3.56
October	10/6/20	21.2	7.10	3.76	2.69
November	11/1/20	21.1	8.70	4.01	2.32
	11/27/20	21.0	12.70	4.40	3.87
December	12/23/20	20.7	13.10	4.95	4.01
	12/29/20	(See Note 1)			

1 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/22/20	17.3	11.44	4.69	4.24
February	2/16/20	18.3	12.20	4.48	4.47
March	3/9/20	18.1	13.64	5.83	4.89
	3/31/20	17.1	13.42	4.70	4.38
April	4/22/20	17.5	10.20	5.18	4.55
June	6/6/20	20.9	10.79	4.94	4.08
July	7/3/20	21.0	7.83	4.56	4.34
August	8/1/20	21.1	7.77	4.02	3.91
September	9/2/20	21.0	7.43	4.08	3.92
October	10/1/20	21.1	7.50	4.03	4.03
	10/27/20	21.0	10.80	5.13	4.55
November	11/19/20	18.4	13.03	5.28	4.30
December	12/10/20	16.6	14.50	5.42	4.37
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/20/20	17.6	12.60	4.94	4.73
February	2/16/20	19.2	13.20	4.38	4.63
March	3/7/20	16.0	14.10	4.52	4.29
	3/26/20	15.3	14.04	4.96	4.99
April	4/15/20	15.8	14.18	6.01	4.73
	4/25/20	8.1	7.15	4.02	3.60
May	5/22/20	9.3	6.73	3.96	3.76
June	6/18/20	21.1	8.34	4.01	3.73
July	7/15/20	21.0	7.75	3.90	3.50
August	8/10/20	21.0	7.75	4.22	3.74
September	9/9/20	21.0	7.10	3.55	3.44
October	10/6/20	21.0	8.20	3.86	3.50
November	11/1/20	21.0	9.90	3.80	3.88
	11/26/20	20.3	14.20	4.65	3.88
December	12/23/20	21.0	13.45	5.18	4.06
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/8/20	21.0	12.22	4.92	4.40
February	2/6/20	21.0	11.10	4.80	4.58
March	3/4/20	21.0	12.02	5.48	4.88
	3/30/20	19.5	13.60	5.75	5.13
April	4/22/20	17.1	9.94	4.91	4.52
June	6/3/20	16.9	6.89	4.44	3.77
July	7/2/20	21.2	7.52	4.05	3.85
	7/31/20	21.0	7.22	4.10	3.74
September	9/2/20	21.0	7.20	4.03	3.61
October	10/2/20	21.2	8.20	4.50	4.02
	10/31/20	21.0	10.10	4.61	3.98
November	11/29/20	21.0	12.90	5.08	0.00
December	12/18/20	13.0	12.90	6.43	4.40
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/7/20	21.2	11.20	5.72	4.55
February	2/1/20	19.5	12.90	4.52	4.30
	2/27/20	20.2	12.60	5.09	4.24
March	3/25/20	20.1	13.20	5.23	4.17
	4/16/20	18.2	12.50	5.34	4.32
April	4/24/20	6.3	5.74	4.44	4.03
May	5/28/20	13.9	6.74	3.74	3.62
June	6/23/20	21.0	7.51	4.07	4.07
July	7/20/20	21.0	5.92	3.50	3.44
August	8/17/20	21.0	6.90	4.02	3.32
September	9/16/20	21.0	7.30	3.86	3.51
October	10/12/20	21.0	8.10	4.27	3.64
November	11/7/20	21.0	9.30	4.49	3.81
December	12/3/20	20.0	14.90	5.18	5.62
	12/29/20	21.0	15.28	6.62	4.94

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/3/20	15.3	13.20	3.89	3.61
	1/18/20	11.9	13.70	4.42	(See Note 1)
	1/30/20	10.1	12.73	4.08	(See Note 1)
February	2/15/20	11.9	13.00	4.53	(See Note 1)
	2/29/20	10.5	13.00	4.21	(See Note 1)
March	3/12/20	10.0	13.60	4.37	(See Note 1)
	3/24/20	9.3	13.10	5.63	(See Note 1)
April	4/6/20	10.4	14.03	5.56	(See Note 1)
	4/15/20	6.8	12.78	5.19	3.92
	4/24/20	6.1	7.87	4.16	(See Note 2)
June	6/4/20	18.8	8.41	3.81	3.16
July	7/2/20	21.1	7.01	3.97	3.05
	7/28/20	21.0	7.18	3.98	3.31
August	8/25/20	21.0	6.28	3.15	3.18
September	9/23/20	21.0	8.30	4.19	3.45
October	10/19/20	21.0	7.90	3.92	3.34
November	11/14/20	21.0	11.70	4.14	3.42
December	12/9/20	19.7	14.30	4.54	3.67
	12/29/20	(See Note 3)			

[1] Early caustic only CIP due to high TMP.

[2] Early caustic-only CIP for 4/27 shutdown.

[3] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/2/20	11.0	13.03	4.37	4.01
	1/15/20	10.6	12.12	4.90	4.32
	1/24/20	6.8	12.90	5.93	(See Note 1)
	1/31/20	5.3	13.00	4.34	(See Note 1)
February	2/12/20	8.7	12.70	5.01	(See Note 1)
	2/24/20	9.6	13.26	4.72	(See Note 1)
March	3/5/20	7.3	13.42	4.88	(See Note 1)
	3/13/20	6.1	13.10	4.40	(See Note 1)
	3/21/20	6.3	13.20	4.89	(See Note 1)
	3/27/20	4.8	13.00	4.65	(See Note 1)
April	4/6/20	8.1	14.96	6.25	(See Note 1)
	4/11/20	3.6	14.00	5.23	4.24
	4/17/20	4.6	13.10	4.66	(See Note 1)
	4/22/20	4.2	10.52	4.75	(See Note 2)
May	5/27/20	12.6	8.20	3.60	3.64
June	6/23/20	21.0	9.73	4.19	3.40
July	7/19/20	21.1	9.36	4.00	3.46
August	8/16/20	21.0	8.60	3.61	3.28
September	9/14/20	21.0	8.90	3.71	3.60
October	10/10/20	21.0	10.40	3.63	3.18
November	11/6/20	21.0	11.30	3.91	3.36
	11/30/20	18.6	14.10	4.52	3.79
December	12/7/20	(See Note 3)			
	12/29/20	(See Note 4)			

1 Early caustic only CIP due to high TMP.

2 Early caustic-only CIP for 4/27 shutdown.

3 MF cell C02 taken offline for new CMF-S filter replacements. The new modules went into service 12/11.

4 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/7/20	9.8	13.56	5.38	4.33
	1/16/20	7.1	12.80	4.55	(See Note 1)
	1/23/20	5.7	12.90	4.94	(See Note 1)
	1/31/20	6.0	13.92	4.95	(See Note 1)
February	2/13/20	8.8	12.16	4.30	(See Note 1)
	2/25/20	9.5	13.60	4.43	(See Note 1)
March	3/6/20	8.1	13.29	4.43	(See Note 1)
	3/14/20	5.9	13.00	4.55	4.55
	3/24/20	7.9	13.20	4.30	3.95
April	4/3/20	8.5	13.24	4.29	(See Note 1)
	4/10/20	5.1	13.26	5.11	4.53
	4/16/20	4.3	13.40	4.83	4.73
	4/21/20	4.1	12.87	5.40	(See Note 2)
May	5/21/20	7.9	8.20	3.61	3.49
June	6/16/20	21.0	10.80	4.80	4.25
July	7/12/20	21.0	9.41	3.81	3.24
August	8/7/20	21.0	8.82	3.95	3.41
September	9/6/20	21.0	5.90	2.62	2.25
October	10/3/20	21.1	8.70	3.23	2.65
	10/29/20	21.1	11.40	3.76	3.66
November	11/20/20	18.2	13.20	4.31	3.92
	11/30/20	(See Note 3)			
December	12/29/20	(See Note 4)			

1 Early caustic only CIP due to high TMP.

2 Early caustic-only CIP for 4/27 shutdown.

3 MF cell C03 taken offline for new CMF-S filter replacements. The new modules went into service 12/4.

4 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/11/20	7.8	12.50	4.47	3.67
	1/18/20	7.8	13.60	4.75	(See Note 1)
	1/25/20	5.3	13.10	4.55	(See Note 1)
	1/31/20	5.0	13.40	4.59	(See Note 1)
February	2/12/20	8.3	12.72	4.54	(See Note 1)
	2/21/20	7.2	13.50	4.51	(See Note 1)
	2/27/20	4.6	13.00	4.42	(See Note 1)
March	3/5/20	6.1	13.10	5.42	(See Note 1)
	3/13/20	5.7	13.50	4.53	(See Note 1)
	3/20/20	5.4	13.90	5.19	(See Note 1)
	3/26/20	5.3	13.80	4.97	(See Note 1)
April	4/3/20	6.2	13.08	4.92	(See Note 1)
	4/8/20	3.9	13.11	5.68	4.93
	4/14/20	4.9	14.14	5.94	4.60
	4/23/20	6.8	10.39	4.42	(See Note 2)
June	6/2/20	17.5	9.85	4.45	3.89
	6/29/20	21.1	5.04	3.76	4.09
July	7/25/20	21.1	8.20	3.48	3.63
August	8/21/20	21.0	7.49	3.34	3.41
September	9/19/20	21.0	10.50	2.97	3.29
October	10/16/20	21.0	10.90	4.05	2.98
November	11/11/20	21.0	12.80	4.38	3.32
	11/15/20	(See Note 3)			
December	12/17/20	21.1	5.20	2.72	2.68
	12/29/20	(See Note 4)			

1 Early caustic only CIP due to high TMP.

2 Early caustic-only CIP for 4/27 shutdown.

3 MF cell C04 taken offline for new CMF-S filter replacements. The new modules went into service 11/20.

4 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/7/20	9.6	12.80	4.26	4.40
	1/16/20	7.2	12.40	4.29	(See Note 1)
	1/23/20	6.0	12.20	4.63	(See Note 1)
February	2/11/20	8.4	13.01	5.07	(See Note 1)
	2/20/20	7.3	13.00	3.89	(See Note 1)
	2/29/20	7.2	12.80	4.75	(See Note 1)
March	3/10/20	7.4	14.56	4.72	(See Note 1)
	3/17/20	6.3	13.40	4.80	(See Note 1)
	3/24/20	5.5	13.34	5.39	(See Note 1)
April	4/1/20	5.8	13.02	4.56	(See Note 1)
	4/7/20	5.3	13.43	5.39	(See Note 1)
	4/11/20	3.2	14.70	4.90	3.79
	4/16/20	3.8	13.10	4.77	3.80
	4/20/20	3.1	9.57	4.44	(See Note 2)
May	5/31/20	16.1	10.50	3.42	3.20
June	6/27/20	21.0	8.95	3.31	2.88
July	7/23/20	21.0	8.59	3.53	2.78
August	8/20/20	21.0	10.20	3.32	2.99
September	9/18/20	21.1	11.00	3.55	2.99
October	10/14/20	21.0	11.60	4.01	3.20
November	11/10/20	21.0	13.80	4.50	3.65
December	12/7/20	21.0	14.59	4.92	3.81
	12/29/20	(See Note 3)			

[1] Early caustic only CIP due to high TMP.
[2] Early caustic-only CIP for 4/27 shutdown.
[3] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/8/20	9.5	12.77	4.98	4.07
	1/17/20	7.6	13.50	4.10	(See Note 1)
	1/27/20	7.6	12.35	4.69	(See Note 1)
February	2/8/20	8.9	10.48	5.06	4.15
	2/24/20	12.7	14.04	5.36	(See Note 1)
March	3/6/20	9.1	14.00	4.48	(See Note 1)
	3/18/20	9.6	13.10	5.41	(See Note 1)
	3/27/20	6.6	13.90	4.25	(See Note 1)
	3/30/20	8.8	13.33	4.85	(See Note 1)
April	4/7/20	8.9	13.40	5.21	(See Note 1)
	4/14/20	5.4	13.45	6.07	4.64
	4/21/20	6.3	11.89	5.91	(See Note 2)
May	5/30/20	15.1	9.27	3.89	3.47
June	6/25/20	21.1	7.85	3.84	3.18
July	7/22/20	21.0	7.58	3.60	3.15
August	8/19/20	21.0	6.70	3.43	2.97
September	9/16/20	21.0	7.80	3.90	3.06
October	10/12/20	21.0	8.80	3.40	3.02
November	11/8/20	21.0	10.10	3.69	3.09
December	12/4/20	21.0	16.21	5.04	3.95
	12/29/20	19.7	14.53	5.74	4.36
	12/29/20	(See Note 3)			

[1] Early caustic only CIP due to high TMP.
[2] Early caustic-only CIP for 4/27 shutdown.
[3] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/6/20	13.5	12.80	4.87	4.16
	1/17/20	8.4	13.60	4.47	(See Note 1)
	1/26/20	7.3	12.94	4.78	(See Note 1)
February	2/10/20	10.9	13.81	5.21	(See Note 1)
	2/21/20	9.1	13.00	4.63	(See Note 1)
March	3/3/20	8.1	12.72	5.41	(See Note 1)
	3/11/20	7.2	13.58	4.77	4.35
	3/23/20	9.5	13.00	4.99	(See Note 1)
April	4/4/20	9.3	13.80	4.82	(See Note 1)
	4/10/20	5.4	13.50	6.05	4.32
	4/18/20	5.6	13.20	4.74	4.16
	4/24/20	4.3	8.26	did	(See Note 2)
May	5/26/20	11.7	7.28	3.82	3.40
June	6/21/20	21.0	8.10	3.87	3.56
July	7/17/20	21.0	8.49	3.88	3.40
August	8/12/20	21.0	8.49	3.66	3.20
September	9/11/20	21.0	7.30	3.61	2.95
October	10/7/20	21.0	9.90	3.79	3.20
November	11/2/20	21.2	11.00	3.58	3.26
	11/28/20	21.1	13.60	5.31	4.19
December	12/24/20	21.0	15.26	5.43	0.00
	12/29/20	(See Note 3)			

1 Early caustic only CIP due to high TMP.

2 Early caustic-only CIP for 4/27 shutdown.

3 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/9/20	10.6	12.30	4.35	3.78
	1/18/20	7.6	12.50	3.67	(See Note 1)
	1/27/20	6.8	8.36	4.11	(See Note 1)
February	2/10/20	10.5	12.97	4.12	(See Note 1)
	2/23/20	10.2	12.20	4.25	(See Note 1)
March	3/4/20	8.4	13.45	3.63	(See Note 1)
	3/12/20	6.1	12.70	3.70	(See Note 1)
	3/19/20	5.5	12.79	4.04	3.89
	3/31/20	8.8	13.33	4.85	(See Note 1)
April	4/9/20	7.6	13.20	4.65	4.15
	4/20/20	7.9	12.70	4.68	(See Note 2)
June	6/3/20	18.4	9.87	4.39	3.83
	6/30/20	21.0	8.73	3.97	3.31
July	7/25/20	21.1	8.92	3.79	3.20
August	8/22/20	21.0	9.10	3.55	3.14
September	9/20/20	21.0	10.50	3.92	3.20
October	10/15/20	20.9	12.90	4.08	3.25
November	11/10/20	21.0	13.60	5.17	4.47
December	12/7/20	21.1	14.80	6.26	4.98
	12/29/20	(See Note 3)			
	12/30/20	17.7	14.68	5.43	4.80

1 Early caustic only CIP due to high TMP.
2 Early caustic-only CIP for 4/27 shutdown.
3 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/2/20	21.0	10.11	4.50	4.14
	1/28/20	21.1	9.41	4.50	3.80
February	2/24/20	21.0	9.53	5.02	3.92
March	3/22/20	21.0	9.90	5.19	4.06
April	4/17/20	21.0	11.65	5.14	4.34
	4/24/20	6.7	5.01	3.25	3.25
May	5/23/20	9.5	5.41	3.73	3.73
June	6/18/20	21.1	7.41	4.17	3.81
July	7/14/20	21.0	7.42	4.23	3.90
August	8/10/20	21.0	7.50	3.89	3.49
September	9/9/20	21.0	5.72	3.75	3.02
October	10/5/20	21.0	7.60	4.11	3.44
	10/31/20	21.1	9.50	4.74	3.56
November	11/26/20	21.0	13.00	5.44	4.08
December	12/23/20	21.0	12.53	5.71	4.59
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/3/20	20.5	12.30	4.28	3.89
	1/28/20	7.1	13.23	5.45	4.62
February	2/25/20	21.0	10.00	4.86	4.62
March	3/19/20	18.5	12.83	5.28	4.20
April	4/13/20	20.1	13.38	5.42	5.49
	4/26/20	10.0	5.79	3.88	3.61
May	5/23/20	9.8	6.04	3.82	3.45
June	6/19/20	21.0	8.09	3.96	3.77
July	7/15/20	21.0	8.00	3.78	3.62
August	8/10/20	21.1	7.85	4.24	4.08
September	9/10/20	21.0	7.09	3.88	3.35
October	10/5/20	21.0	7.74	4.21	3.73
November	11/1/20	21.0	10.40	4.52	3.95
	11/27/20	21.0	14.20	5.53	4.29
December	12/23/20	21.0	14.20	6.44	4.12
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/19/20	20.9	11.54	5.44	4.23
February	2/16/20	21.0	9.70	4.50	4.09
March	3/14/20	21.0	11.22	5.07	4.47
April	4/8/20	20.6	13.91	5.64	4.76
	4/23/20	11.6	6.65	4.20	3.80
May	5/26/20	12.0	6.96	3.80	4.03
June	6/22/20	21.0	7.43	4.11	4.09
July	7/18/20	21.0	8.06	3.95	3.50
August	8/17/20	21.4	7.19	3.29	3.90
September	9/16/20	21.0	6.70	4.03	3.77
October	10/11/20	21.0	7.90	4.09	3.68
November	11/6/20	21.0	9.10	4.26	4.00
December	12/2/20	21.0	13.30	5.57	4.05
	12/28/20	21.0	13.76	6.14	4.83
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/13/20	21.1	11.30	4.25	4.20
February	2/10/20	21.0	9.17	4.26	3.82
March	3/6/20	20.5	12.28	4.43	4.65
April	4/1/20	20.9	14.05	5.61	4.41
	4/20/20	14.9	8.32	4.40	4.26
May	5/24/20	10.4	5.91	4.02	3.59
June	6/20/20	21.0	7.36	3.96	3.89
July	7/18/20	21.0	7.40	3.81	3.72
August	8/13/20	21.0	7.70	3.93	3.58
September	9/12/20	21.0	6.20	3.82	3.66
October	10/8/20	21.0	8.20	4.20	3.34
November	11/3/20	21.0	9.40	4.63	4.08
	11/29/20	21.0	12.80	5.35	4.06
December	12/24/20	19.5	12.70	5.02	4.56
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/22/20	21.0	9.94	4.43	4.04
February	2/19/20	21.0	8.62	4.62	4.22
March	3/17/20	21.0	11.64	4.98	5.09
April	4/10/20	19.2	12.30	4.75	3.90
	4/24/20	10.6	5.79	3.23	3.57
June	6/5/20	18.9	8.34	4.37	3.53
July	7/2/20	21.0	6.57	3.79	3.31
	7/29/20	21.0	7.61	4.05	3.37
August	8/25/20	21.0	5.90	3.58	3.33
September	9/23/20	21.0	7.00	3.72	3.05
October	10/20/20	21.0	7.90	3.67	3.30
November	11/16/20	21.0	10.30	4.19	3.84
December	12/10/20	18.1	13.70	4.78	4.15
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/14/20	21.2	10.25	5.52	4.94
February	2/11/20	21.0	8.82	5.13	4.31
March	3/8/20	21.0	9.34	5.02	4.22
April	4/3/20	21.0	10.48	5.33	4.45
	4/20/20	13.9	7.30	4.78	4.29
May	5/31/20	15.2	6.07	3.90	3.92
June	6/26/20	21.0	6.17	3.94	4.05
July	7/23/20	21.0	6.42	4.11	4.07
August	8/19/20	21.0	6.00	3.41	3.24
September	9/17/20	21.1	6.50	3.74	3.48
October	10/14/20	21.0	7.10	4.23	3.58
November	11/9/20	21.0	8.00	4.59	4.29
December	12/4/20	20.2	14.00	4.62	4.10
	12/29/20	(See Note 1)			
	12/30/20	19.5	11.51	4.75	4.08

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/17/20	21.0	11.79	5.26	4.83
February	2/14/20	21.0	11.68	4.97	4.92
March	3/11/20	21.0	11.32	5.33	4.95
April	4/6/20	21.0	13.02	5.38	4.70
	4/21/20	11.6	7.12	5.12	4.27
May	5/28/20	12.8	6.26	3.90	3.99
June	6/23/20	21.0	7.64	4.41	4.11
July	7/20/20	21.0	7.15	3.88	3.61
August	8/16/20	21.1	6.90	3.96	3.80
September	9/15/20	21.0	6.40	3.78	3.35
October	10/11/20	21.0	8.10	3.80	3.80
November	11/6/20	21.0	9.00	3.96	3.43
December	12/3/20	21.0	13.70	4.40	3.92
	12/29/20	20.7	14.38	5.36	4.60
	12/29/20	(See Note 1)			

1 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/4/20	21.0	9.61	9.61	3.89
	1/29/20	20.3	12.42	4.57	3.96
February	2/25/20	21.0	12.03	4.47	4.00
March	3/20/20	19.6	14.00	4.66	3.84
April	4/14/20	20.1	12.30	4.51	3.95
	4/25/20	8.9	6.20	3.85	3.44
May	5/21/20	8.8	5.33	3.45	3.80
June	6/16/20	21.0	7.94	4.06	3.60
July	7/12/20	21.0	6.19	3.77	3.36
August	8/8/20	21.0	7.40	3.63	3.30
September	9/7/20	21.0	6.10	3.21	3.56
October	10/3/20	21.1	7.80	3.56	3.05
	10/29/20	21.0	9.70	8.54	4.06
November	11/24/20	21.0	13.20	4.40	4.32
December	12/20/20	21.0	13.84	5.02	3.95
	12/29/20	(See Note 1)			

1 Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/7/20	21.0	12.40	6.25	5.45
	1/16/20	MW (See Note 1)			
	1/25/20	MW (See Note 1)			
	2/3/20	21.0	14.30	5.84	5.60
February	2/13/20	MW (See Note 1)			
	2/22/20	MW (See Note 1)			
March	3/2/20	21.0	14.50	6.19	5.95
	3/11/20	MW (See Note 1)			
	3/20/20	MW (See Note 1)			
	3/26/20	19.1	14.60	6.20	5.85
April	4/4/20	MW (See Note 1)			
	4/13/20	MW (See Note 1)			
	4/22/20	20.8	14.40	6.00	5.90
May	5/21/20	MW (See Note 1)			
	5/30/20	MW (See Note 1)			
June	6/7/20	21.1	11.50	6.15	5.15
	6/16/20	MW (See Note 1)			
	6/25/20	MW (See Note 1)			
July	7/4/20	21.0	9.80	4.52	5.20
	7/14/20	MW (See Note 1)			
	7/21/20	MW (See Note 1)			
	7/30/20	21.0	9.15	5.06	5.00
August	8/8/20	MW (See Note 1)			
	8/19/20	MW (See Note 1)			
	8/27/20	21.0	8.70	5.30	4.58
September	9/8/20	MW (See Note 1)			
	9/16/20	MW (See Note 1)			
	9/25/20	21.0	11.80	5.46	5.20
October	10/4/20	MW (See Note 1)			
	10/13/20	MW (See Note 1)			
	10/21/20	21.0	10.80	5.20	4.82
	10/29/20	(See Note 2)	10.80	5.90	0.00
November	11/2/20	MW (See Note 1)			
	11/10/20	MW (See Note 1)			
	11/19/20	21.0	13.20	5.50	5.54
	11/28/20	MW (See Note 1)			
December	12/8/20	MW (See Note 1)			
	12/15/20	21.0	10.10	5.30	5.25
	12/25/20	MW (See Note 1)			

[1] Maintenance Wash using dilute caustic and no citric
[2] 48 hour caustic/Memclean soak.

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	1/24/20	19.9	12.37	4.76	3.99
February	2/21/20	21.0	11.03	4.67	4.65
March	3/18/20	21.0	12.83	5.87	4.14
April	4/11/20	19.1	12.39	4.88	4.22
May	4/26/20	11.5	7.68	3.62	3.88
June	5/25/20	10.9	5.62	3.57	3.26
	6/20/20	21.0	8.05	4.01	3.35
July	7/17/20	21.0	8.09	4.04	3.34
August	8/12/20	21.1	8.40	3.88	3.51
September	9/11/20	21.0	6.25	3.44	3.65
October	10/7/20	21.0	8.50	4.11	3.96
November	11/3/20	21.0	9.90	4.38	4.00
December	11/28/20	20.8	13.80	5.30	4.25
	12/23/20	19.8	13.10	5.42	4.32
	12/29/20	(See Note 1)			

[1] Reduced targeted runtime intervals between CIPs from 21-days to 17-days due to wintertime fouling rates.

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	1/1/20	MW (See Note 1)			
	1/4/20	MW (See Note 1)			
	1/7/20	MW (See Note 1)			
	1/10/20	MW (See Note 1)			
	1/13/20	MW (See Note 1)			
	1/16/20	MW (See Note 1)			
	1/19/20	MW (See Note 1)			
	1/22/20	MW (See Note 1)			
	1/25/20	MW (See Note 1)			
	1/28/20	23.4	10.00	4.17	2.80
	1/31/20	MW (See Note 1)			
February	2/3/20	MW (See Note 1)			
	2/6/20	MW (See Note 1)			
	2/9/20	MW (See Note 1)			
	2/12/20	MW (See Note 1)			
	2/15/20	MW (See Note 1)			
	2/18/20	MW (See Note 1)			
	2/21/20	MW (See Note 1)			
	2/24/20	MW (See Note 1)			
	2/27/20	22.5	9.80	2.90	2.45
March	3/1/20	MW (See Note 1)			
	3/4/20	MW (See Note 1)			
	3/7/20	MW (See Note 1)			
	3/10/20	MW (See Note 1)			
	3/13/20	MW (See Note 1)			
	3/16/20	MW (See Note 1)			
	3/19/20	MW (See Note 1)			
	3/22/20	MW (See Note 1)			
	3/25/20	MW (See Note 1)			
	3/28/20	22.5	10.50	3.72	3.10
	3/31/20	MW (See Note 1)			
April	4/3/20	MW (See Note 1)			
	4/6/20	MW (See Note 1)			
	4/9/20	MW (See Note 1)			
	4/12/20	MW (See Note 1)			
	4/15/20	MW (See Note 1)			
	4/18/20	MW (See Note 1)			
	4/21/20	MW (See Note 1)			
	4/24/20	MW (See Note 1)			
	4/26/20	22.4	6.50	2.62	2.75
May	5/14/20	MW (See Note 1)			
	5/17/20	MW (See Note 1)			
	5/20/20	MW (See Note 1)			
	5/23/20	MW (See Note 1)			
	5/26/20	MW (See Note 1)			
	5/29/20	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

June	6/1/20	MW (See Note 1)			
	6/4/20	MW (See Note 1)			
	6/7/20	MW (See Note 1)			
	6/10/20	22.8	6.20	2.45	2.10
	6/13/20	MW (See Note 1)			
	6/16/20	MW (See Note 1)			
	6/19/20	MW (See Note 1)			
	6/22/20	MW (See Note 1)			
	6/25/20	MW (See Note 1)			
	6/28/20	MW (See Note 1)			
July	7/1/20	MW (See Note 1)			
	7/4/20	MW (See Note 1)			
	7/7/20	MW (See Note 1)			
	7/10/20	23.0	5.70	1.54	1.60
	7/13/20	MW (See Note 1)			
	7/16/20	MW (See Note 1)			
	7/19/20	MW (See Note 1)			
	7/22/20	MW (See Note 1)			
	7/25/20	MW (See Note 1)			
	7/28/20	MW (See Note 1)			
	7/31/20	MW (See Note 1)			
August	8/3/20	MW (See Note 1)			
	8/6/20	MW (See Note 1)			
	8/9/20	22.7	4.50	1.33	1.20
	8/12/20	MW (See Note 1)			
	8/15/20	MW (See Note 1)			
	8/18/20	MW (See Note 1)			
	8/21/20	MW (See Note 1)			
	8/24/20	MW (See Note 1)			
	8/27/20	MW (See Note 1)			
	8/30/20	MW (See Note 1)			
September	9/3/20	MW (See Note 1)			
	9/6/20	MW (See Note 1)			
	9/9/20	20.8	5.10	1.32	1.05
	9/12/20	MW (See Note 1)			
	9/15/20	MW (See Note 1)			
	9/18/20	MW (See Note 1)			
	9/21/20	MW (See Note 1)			
	9/24/20	MW (See Note 1)			
	9/27/20	MW (See Note 1)			
	9/30/20	MW (See Note 1)			
October	10/3/20	MW (See Note 1)			
	10/6/20	MW (See Note 1)			
	10/9/20	23.1	6.00	2.18	1.30
	10/12/20	MW (See Note 1)			
	10/15/20	MW (See Note 1)			
	10/18/20	MW (See Note 1)			
	10/21/20	MW (See Note 1)			
	10/24/20	MW (See Note 1)			
	10/27/20	MW (See Note 1)			
	10/30/20	MW (See Note 1)			

Microfiltration Plant Clean-In-Place (CIP) / Runtime Summary

Unit E03

November	11/2/20	MW (See Note 1)			
	11/5/20	MW (See Note 1)			
	11/8/20	22.7	6.10	2.26	1.90
	11/11/20	MW (See Note 1)			
	11/14/20	MW (See Note 1)			
	11/17/20	MW (See Note 1)			
	11/20/20	MW (See Note 1)			
	11/23/20	MW (See Note 1)			
	11/26/20	MW (See Note 1)			
	11/29/20	MW (See Note 1)			
December	12/2/20	MW (See Note 1)			
	12/5/20	MW (See Note 1)			
	12/7/20	22.7	10.60	4.50	3.15
	12/11/20	MW (See Note 1)			
	12/14/20	MW (See Note 1)			
	12/17/20	MW (See Note 1)			
	12/20/20	MW (See Note 1)			
	12/23/20	MW (See Note 1)			
	12/26/20	MW (See Note 1)			
	12/29/20	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	1/3/20	MW (See Note 1)			
	1/6/20	MW (See Note 1)			
	1/9/20	MW (See Note 1)			
	1/12/20	MW (See Note 1)			
	1/15/20	MW (See Note 1)			
	1/18/20	MW (See Note 1)			
	1/21/20	MW (See Note 1)			
	1/24/20	MW (See Note 1)			
	1/27/20	22.9	14.20	3.07	3.00
	1/30/20	MW (See Note 1)			
February	2/2/20	MW (See Note 1)			
	2/7/20	MW (See Note 1)			
	2/10/20	MW (See Note 1)			
	2/13/20	MW (See Note 1)			
	2/16/20	MW (See Note 1)			
	2/19/20	MW (See Note 1)			
	2/22/20	MW (See Note 1)			
	2/25/20	MW (See Note 1)			
	2/28/20	22.9	12.10	3.02	3.00
March	3/2/20	MW (See Note 1)			
	3/5/20	MW (See Note 1)			
	3/8/20	MW (See Note 1)			
	3/11/20	MW (See Note 1)			
	3/14/20	MW (See Note 1)			
	3/17/20	MW (See Note 1)			
	3/20/20	MW (See Note 1)			
	3/23/20	MW (See Note 1)			
	3/26/20	MW (See Note 1)			
April	4/1/20	21.4	13.20	3.23	3.70
	4/4/20	MW (See Note 1)			
	4/7/20	MW (See Note 1)			
	4/10/20	MW (See Note 1)			
	4/13/020	MW (See Note 1)			
	4/16/20	MW (See Note 1)			
	4/18/20	MW (See Note 1)			
	4/22/20	MW (See Note 1)			
	4/26/20	19.2	9.50	2.77	3.40
May	5/14/20	MW (See Note 1)			
	5/17/20	MW (See Note 1)			
	5/20/20	MW (See Note 1)			
	5/23/20	MW (See Note 1)			
	5/26/20	MW (See Note 1)			
	5/29/20	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)
June	6/1/20	MW (See Note 1)			
	6/4/20	MW (See Note 1)			
	6/7/20	MW (See Note 1)			
	6/10/20	22.6	7.00	2.82	2.50
	6/13/20	MW (See Note 1)			
	6/16/20	MW (See Note 1)			
	6/20/20	MW (See Note 1)			
	6/22/20	MW (See Note 1)			
	6/25/20	MW (See Note 1)			
	6/28/20	MW (See Note 1)			
July	7/1/20	MW (See Note 1)			
	7/4/20	MW (See Note 1)			
	7/7/20	MW (See Note 1)			
	7/10/20	22.5	7.10	2.42	2.55
	7/13/20	MW (See Note 1)			
	7/16/20	MW (See Note 1)			
	7/19/20	MW (See Note 1)			
	7/22/20	MW (See Note 1)			
	7/25/20	MW (See Note 1)			
	7/28/20	MW (See Note 1)			
	7/31/20	MW (See Note 1)			
August	8/3/20	MW (See Note 1)			
	8/6/20	MW (See Note 1)			
	8/9/20	22.1	6.20	2.84	2.60
	8/12/20	MW (See Note 1)			
	8/15/20	MW (See Note 1)			
	8/18/20	MW (See Note 1)			
	8/21/20	MW (See Note 1)			
	8/24/20	MW (See Note 1)			
	8/27/20	MW (See Note 1)			
	8/30/20	MW (See Note 1)			
September	9/3/20	MW (See Note 1)			
	9/6/20	MW (See Note 1)			
	9/9/20	20.4	6.20	2.67	2.40
	9/12/20	MW (See Note 1)			
	9/15/20	MW (See Note 1)			
	9/18/20	MW (See Note 1)			
	9/21/20	MW (See Note 1)			
	9/24/20	MW (See Note 1)			
	9/27/20	MW (See Note 1)			
	9/30/20	MW (See Note 1)			
October	10/3/20	MW (See Note 1)			
	10/6/20	MW (See Note 1)			
	10/9/20	22.3	7.40	2.79	2.70
	10/12/20	MW (See Note 1)			
	10/15/20	MW (See Note 1)			
	10/18/20	MW (See Note 1)			
	10/21/20	MW (See Note 1)			
	10/24/20	MW (See Note 1)			
	10/27/20	MW (See Note 1)			
	10/30/20	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	11/2/20	MW (See Note 1)			
	11/5/20	MW (See Note 1)			
	11/8/20	22.4	7.30	3.03	2.85
	11/11/20	MW (See Note 1)			
	11/14/20	MW (See Note 1)			
	11/17/20	MW (See Note 1)			
	11/20/20	MW (See Note 1)			
	11/23/20	MW (See Note 1)			
	11/26/20	MW (See Note 1)			
	11/29/20	MW (See Note 1)			
December	12/2/20	MW (See Note 1)			
	12/5/20	MW (See Note 1)			
	12/8/20	22.7	13.90	3.25	3.30
	12/11/20	MW (See Note 1)			
	12/14/20	MW (See Note 1)			
	12/17/20	MW (See Note 1)			
	12/20/20	MW (See Note 1)			
	12/23/20	MW (See Note 1)			
	12/26/20	MW (See Note 1)			
	12/29/20	MW (See Note 1)			
	12/29/20	(See Note 2)			

[1] Maintenance Wash using caustic, sodium hypochlorite and citric.

[2] Switched cell E04 from fixed filtration to auto filtration due to wintertime fouling rates.

Reverse Osmosis Plant Cleaning Summary

Unit A01

Date of Cleaning	Treatment Performed
6/7-9/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12-12.2 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 (no pH adjustment needed). All Av-192 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 3.5% citric acid solution at 2.6 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 850 gallons of 50% citric acid was used (appears the A/B CIP skid crossover piping was not properly flushed after completing the high pH CIPs). 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).

Reverse Osmosis Plant Cleaning Summary

Unit A02

Date of Cleaning	Treatment Performed
6/4-6/2020	Full unit CIP using 2% AWC C-227, followed by full unit acid wash (2%-3% citric acid) One batch of 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 began at pH 11 with no heat during the first hour. After one hour the solution pH's were adjusted up pH 12 using caustic soda and the CIP tank heaters were started to bring the solution temperatures up to 35C/95F. A total of 81.5 gals. of 50% caustic soda was used. All 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 500 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).
11/2-3/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12.2-12.3 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 (no pH adjustment needed). All Av-192 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 2.2-2.9 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).

Reverse Osmosis Plant Cleaning Summary

Unit A03

Date of Cleaning	Treatment Performed
6/10-12/2020	Full unit CIP using 2% Avista 192, followed for full unit actid wash (2%-3% citric acid) One batch of Av-192 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 12.1-12.3 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 (no pH adjustment needed). All Av-192 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 500 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).
11/4-6/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of 2.7% Av-192 solution was used to complete sub-stage 1A and 1B, and a new batch of 2.0% solution was used to complete 2nd and 3rd stages. Operator error occurred during 1A/1B mising resulting in a higher concentration solution. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 12.3-12.4 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 (no pH adjustment needed). All Av-192 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 2.3-2.5 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 permeate flush after completing the acid washes (4" PCR open for entire flush period).

Reverse Osmosis Plant Cleaning Summary

Unit B01

Date of Cleaning	Treatment Performed
2/7-8/2020	<u>3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> B01'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 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-onlyacid wash using a 2.3% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
8/4-5/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.5 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 (no pH adjustment needed). All Av-192 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 1.9 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 500 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).

Unit B02

Date of Cleaning	Treatment Performed
2/9-10/2020	<u>3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> B02'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 micronCFs were used during the CIP recirculations. 27.0 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 2.3% citric acid solution at 2.3 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).
8/6-7/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.2-12.4 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 (no pH adjustment needed). All Av-192 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 1.9 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 500 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).

Reverse Osmosis Plant Cleaning Summary

<u>Unit B03</u>

Date of Cleaning	Treatment Performed
2/1-2/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> B03's 3rd stage high pH solution used 2% Avista 192 at 12.0 pH at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. No 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" PCRopen for entire flush period). Followed high pH CIP with a 3rd stag-only acid wash usting a 2.3% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
8/8-9/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.2-12.5 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 (no pH adjustment needed). All Av-192 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 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 500 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).

Reverse Osmosis Plant Cleaning Summary

<u>Unit C01</u>

Date of Cleaning	Treatment Performed
6/13-15/2020	<u>Full unit CIP using 2% AWC C-227, followed by full unit acid wash (2%-3% citric acid)</u> One batch of 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 began at pH 11 with no heat during the first hour. After one hour the solution pHs were adjusted up pH 12 using caustic soda and the CIP tank heaters were started to bring the solution temperatures up to 35C/95F. A total of 94 gals of 50% caustic soda was used. All 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 500 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).
6/24-27/2019	<u>Full unit CIP using 2% C-227 (AWC)</u>: CIPs were performed "stage-by-stage", one at a time, new solution for each. Each CIP was started at a pH of 11, and no heat first hour. After the first hour at pH 11 at ambient temperature, the CIP tank heaters were started to bring the solution's temperature up to 95°F & caustic soda was added to raise the solution's pH. The 1st & 2nd stage solutions were increased to 11.8, while the 3rd stage solution was increased to pH 12. The higher pH levels were maintained during each of the sub-stages remaining 5 hours of CIP, resulting in a total contacttime of 6 hours. Used ROP stored in unused RO CIP tank to flush 1A-1B-and 2nd sub-stages. Ended CIPwith normal full unit 45 min permeate flush (4" PCR open for first 30 minutes). All recirculation flows through 1 micron CFs.

Reverse Osmosis Plant Cleaning Summary

Unit C02

Date of Cleaning	Treatment Performed
1/9-10/2020	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid) CO2's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 35C/95F, for 6-hours of contact time. 1 micron CFs were used during the CIP recirculations. 21.0 gallons of 50% caustic soda was added for 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2.5% citric acid solution at 2.3 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 324 gallongs 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 washees (4" PCR open for entire flush).
5/28-29/2020	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid) CO2'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 was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rd stage DIP (4" PCR open for entire flush period). Followed high pH CIP eith a 3rd stage-only acid wash using a 2.3% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).

Reverse Osmosis Plant Cleaning Summary

Unit C03

Date of Cleaning	Treatment Performed
1/27-28/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> C03's 3rd stage high pH solution used 2% Avista 192 at 12.5 pH, temperature target of 35C/95F, for 6-hours of contact time. 1 micron CFs were used duringthe recirbultions. No caustic soda was used for 3rd stage solution pH adjustments. Performed a normal full unit 60 unit permeate flush after omplting the 3rd stage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage0ibkt acud wasg ysubg a 2.5% citric acid solution at 2.3 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).
6/16-18/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.2-12.5 with no heat during the firist hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F (no pH adjustment needed). All Av-192 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 500 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).

Reverse Osmosis Plant Cleaning Summary

Unit D01

Date of Cleaning	Treatment Performed
1/13-14/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) D01's 3rd stage high pH solution used 2% Avista 192 at 13 pH and ambient water temperature, for 6-hours of contact time. Ambient temperature was used due to the Avista 192 product's naturally high pH. 1 micron CFs were used during the CIP recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 330 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).
5/23-24/2020	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid) D01'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. 22.0 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 2.3% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).

Reverse Osmosis Plant Cleaning Summary

Unit D02

Date of Cleaning	Treatment Performed
1/14-15/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> D02's 3rd stage high pH solution used 2% Avista 192 at 12.5 pH and ambient water temperature, for 6-hours of contact time. Ambient temperature was used due to the Avista 192 product's naturally high pH. 1 micron CFs were used during the CIP recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 330 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).
5/26-27/2020	<u>3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> D02'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. 19.0 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 2.3% citric acid solution at 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 full unit 60 min permeate flush after complting the acid washes (4" PCR open for entire flush period).

Reverse Osmosis Plant Cleaning Summary

Unit D03

Date of Cleaning	Treatment Performed
1/29-30/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) D03's 3rd stage high pH solution used 2% Avista 192 at 12.5 pH, temperature target of 35C/95F, for 6-hours of contact time. 1 micron CFs were used during the recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 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).
6/19-21/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12-12.4 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 (2.0 gals of 50% caustic soda needed for 1A/1B pH adjustment). All Av-192 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 3.3% 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 of 652 gallons of 50% citric acid was used (found pH meter out of calibration, reading high, after adding the additional 152 gals). 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).

Reverse Osmosis Plant Cleaning Summary

Unit E01

Date of Cleaning	Treatment Performed
1/20-21/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> E01's 3rd stage high pH solution used 2% Avista 192 at 13 pH and ambient water temperature, for 6-hours of contact time. Ambient temperature was used due to the Avista 192 product's naturally high pH. 1 micron CFs were used during the CIP recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 400 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).
5/21-22/2020	<u>3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> E01's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 34C/94F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 35.1 gallons of 50% causetic 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 2.3% 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).

Reverse Osmosis Plant Cleaning Summary

Unit E02

Date of Cleaning	Treatment Performed
1/21-22/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) E02's 3rd stage high pH solution used 2% Avista 192 at 12.5 pH and heat was added for the time using Av-192, with a temperature target of 35C/95F, for 6-hours of contact time. 1 micron CFs were used during the CIP recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 pH and ambient temperature (no heat) for 2-hours of contact time. A total of 18.5 gallons of 50% citric acid was added to the itric acid solution used on RO E02's 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).
8/1-3/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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. Both CIPs performed at pH 12.0-12.2 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 (no pH adjustment needed). All Av-192 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). Folled high pH CIPs witha 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 of 500 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).

Reverse Osmosis Plant Cleaning Summary

Unit E03

Date of Cleaning	Treatment Performed
1/25-26/2020	E03 3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) E03's 3rd stage high pH solution used 2% Avista 192 at 12.5 pH temperature target of 35C/95F, for 6-hours of contact time. 1 micron CFs were used during the recirculations. No caustic soda was used for 3rd stage 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 2.5% citric acid solution at 2.3 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).
6/27-29/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 solution was used to complete sub-stage 1A and 1B, and a new batch of solution was used to complete 2nd and 3rd stage. Each CIP targeted 11-12 hours of membrane contact time. Both CIPs performed at pH 12.3-12/7 with no during during the first hour. After one hour the CIP tank heaters were started to bring the solution temperatures up to 35C/95F (no ph adjustment needed). All Av-192 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 500 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).

Reverse Osmosis Plant Cleaning Summary

Unit F01

Date of Cleaning	Treatment Performed
5/30-31/2020	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3% 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. 18.0 gallons of 50% caustic soda was added for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flulsh after completing the 3rd stage CIP (4" PCR open for entire flush period). Folowed high pH CIP with a 3rd stage-only acid wash using a 2.3% 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).
9/9-11/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12.5 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 (no pH adjustment needed). All Av-192 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).

Reverse Osmosis Plant Cleaning Summary

Unit F02

Date of Cleaning	Treatment Performed
2/19-20/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) F02's 3rd stage high pH solution used 2% Avista 192 at 12.2 pH, at 34C/93F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. No 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 3rd stage-only acid wash using a 2.2% citric acid solution aat 2.1 pH and ambient temperature (no heat) for 2-hours of cotact 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).
9/12-14/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12.1-12.2 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 (no pH adjustment needed). All Av-192 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 2.5-2.8 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).
11/12-13/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) F02's 3rd stage high pH solution used 2% Avista 192 at 12.6 pH, at 35C/95F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. No 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 3rd stage-only acid wash using a 2.3% citric acid solution at 2.0-2.3 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).

Reverse Osmosis Plant Cleaning Summary

Unit F03

Date of Cleaning	Treatment Performed
2/21-22/2020	3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid) F03's stage high pH solution used 2% Avista 192 at 12.4 pH, at 34C/93F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. No caustic soda was needed for CIP solution pH adjustments. Performed a normal full unit 60 min permeate flush after completing the 3rdstage CIP (4" PCR open for entire flush period). Followed high pH CIP with a 3rd stage-only acid wash using a 2.2% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
9/15-16/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12.2-12.5 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 (no pH adjustment needed). All Av-192 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).

Reverse Osmosis Plant Cleaning Summary

Unit G01

Date of Cleaning	Treatment Performed
2/23-24/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid)</u> G01's 3rd stage high pH solution used 2% Avista 192 at 12.3 pH at 36C/97F, for 10-hours of contact time. 1 micron CFs were used during the recirculations. No caustic soda was needed for CIP solution pH adjustments. Performed a norma 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-onlyacid wash using a 2.2% citric acid solution at 2.2 pH and ambient temperture (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).
9/17-19/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.4-12.5 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 (no pH adjustment needed). All Av-192 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).

Reverse Osmosis Plant Cleaning Summary

Unit G02

Date of Cleaning	Treatment Performed
6/2-3/2020	3rd stage-only CIP using AWC C-227, followed by 3rd stage-only acid wash (2%-3%) citric acid G02's 3rd stage high pH solution used 2% AWC C-227 at 12.0 pH at 34C/94F, for 10-hours of contact time. 1 micron CFs were used during the CIP recirculations. 18 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 2.3% citric acid solution at 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 full unit 60 min permeate flush after completing the acid washes (4" PCR open for entire flush period).
11/7-9/2020	Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid) One batch of Av-192 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 12.5-12.6 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 (no pH adjustment needed). All Av-192 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 (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).

Reverse Osmosis Plant Cleaning Summary

Unit G03

Date of Cleaning	Treatment Performed
2/26-27/2020	<u>3rd stage-only CIP using Avista 192, followed by 3rd stage-only acid wash (2%-3% citric acid</u> G03's 3rd stage high pH solution used 2% Avista 192 at 12.4 pH at 34C/93F, for 10-hours of contact time. 1 micron CFs were used during the recirculations. No 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 3rd stage-only acid wash using a 2.2% citric acid solution at 2.3 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).
9/20-21/2020	<u>Full unit CIP using 2% Avista 192, followed by full unit acid wash (2%-3% citric acid)</u> One batch of Av-192 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 12.4 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 (no pH adjustment needed). All Av-192 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).

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
2236	Rosemount pH analyzer annual-SAR Bypass: 805-AIT-3580	Transmitter Analyzer Indicating pH	805-CPD-0002	19-May-20	1	YEARS	28-Apr-21
2248	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400D	19-Feb-20	1	YEARS	09-Feb-22
2237	Rosemount pH analyzer annual-DPW 710-AIT-3310	Transmitter Analyzer Indicating pH	710-CPF-0008	18-Aug-20	1	YEARS	19-Aug-21
2238	Rosemount pH analyzer annual- MF Feedwater-B B01-AIT-0305	Transmitter Analyzer Indicating pH - MF Feedwater B	255-PIP-MFF-WQAS	26-Aug-20	1	YEARS	26-Aug-21
2249	Rosemount pH analyzer annual-Element Analyzer pH - MF Train E CIP-E01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400E	19-Feb-20	1	YEARS	23-Feb-21
2079	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	Element Analyzer Conductivity - RO Concentrate Train E Unit 1	510-E01-CPF-5101	25-Nov-20	3	MONTHS	25-Feb-21
2231	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2120	Transmitter Analyzer Indicating pH	450-CPF-0001	12-Nov-20	9	MONTHS	12-Aug-21
2232	Rosemount pH analyzer annual-FPW: 710-AIT-3410	Transmitter Analyzer Indicating pH	710-CPF-0009	05-Aug-20	1	YEARS	05-Aug-21
2293	Block, Bleed and Check Zero -A04- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	09-Jul-20	1	YEARS	07-Jul-21
2083	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	Element Analyzer Conductivity - RO Concentrate Train E Unit 3	510-E03-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
2234	Rosemount pH Analyzer 9 Month RO Feed: 450-AIT-2140	Transmitter Analyzer Indicating pH	450-CPF-0001	12-Nov-20	9	MONTHS	10-Aug-21
2235	Rosemount pH analyzer annual-RO PW: 510-AIT-2241	Transmitter Analyzer Indicating pH	510-CPF-0010	14-Aug-20	1	YEARS	12-Aug-21
2081	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	Element Analyzer Conductivity - RO Concentrate Train E Unit 2	510-E02-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
2116	Transmitter Analyzer Indicating Chlorine	Element Analyzer Chlorine - SAR Bypass	805-CPD-0002	04-Feb-21	1	WEEKS	16-Feb-21
3053	AVFM Enclosure PM on 100-FIT-5530-910 Bldg. North Wall	Transmitter Flow Indicating - north side 910 building	100-PIP-SD-SITE-MAIN	17-Sep-20	6	MONTHS	15-Mar-21
2309	Block, Bleed and Check Zero -D04- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	06-Aug-20	1	YEARS	03-Aug-21
2316	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 1 MFE	Transmitter Level Indicating	210-A01-TNK-0340	25-Jan-21	1	YEARS	18-Jan-22
2317	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 2 MFE	Transmitter Level Indicating	210-A02-TNK-0340	25-Jan-21	1	YEARS	18-Jan-22
2318	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 3 MFE	Transmitter Level Indicating	210-A03-TNK-0340	25-Jan-21	1	YEARS	18-Jan-22
2319	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 4 MFE	Transmitter Level Indicating	210-A04-TNK-0340	25-Jan-21	1	YEARS	18-Jan-22
2290	Block, Bleed and Check Zero - A01-DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	20-Jan-21	6	MONTHS	07-Jul-21
3055	AVFM Enclosure PM 100-FIT-5020-East MF CIP Tank E01	Transmitter Flow Indicating - East MF CIP Tank E01	100-PIP-SW	17-Sep-20	6	MONTHS	14-Mar-21
2310	Block, Bleed and Check Zero -D05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	20-Aug-20	1	YEARS	17-Aug-21
2291	Block, Bleed and Check Zero -A02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	09-Jul-20	1	YEARS	07-Jul-21
2331	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 6 MFE	Transmitter Level Indicating	210-B06-TNK-0340	13-Feb-20	1	YEARS	15-Feb-21
2332	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 7 MFE	Transmitter Level Indicating	210-B07-TNK-0340	13-Feb-20	1	YEARS	15-Feb-21
2333	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 8 MFE	Transmitter Level Indicating	210-B08-TNK-0340	13-Feb-20	1	YEARS	15-Feb-21
2320	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 5 MFE	Transmitter Level Indicating	210-A05-TNK-0340	03-Feb-21	1	YEARS	25-Jan-22
2321	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 6 MFE	Transmitter Level Indicating	210-A06-TNK-0340	03-Feb-21	1	YEARS	25-Jan-22
2322	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 7 MFE	Transmitter Level Indicating	210-A07-TNK-0340	03-Feb-21	1	YEARS	25-Jan-22
2334	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-D01-TNK-0340	13-Feb-20	1	YEARS	15-Feb-21
2335	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-B08-TNK-0340	19-Feb-20	1	YEARS	22-Feb-21
2336	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 2 MFW	Transmitter Level Indicating	210-D02-TNK-0340	19-Feb-20	1	YEARS	22-Feb-21
2337	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 3 MFW	Transmitter Level Indicating	210-D03-TNK-0340	19-Feb-20	1	YEARS	22-Feb-21
2338	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 4 MFW	Transmitter Level Indicating	210-D04-TNK-0340	19-Feb-20	1	YEARS	22-Feb-21
2339	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 5 MFW	Transmitter Level Indicating	210-D05-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2340	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 6 MFW	Transmitter Level Indicating	210-D06-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2324	Flush Feed Tubing Transmitter LIT-0345 Train A Cell 8 MFE	Transmitter Level Indicating	210-A08-TNK-0340	03-Feb-21	1	YEARS	25-Jan-22
2341	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 7 MFW	Transmitter Level Indicating	210-D07-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2326	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 1 MFE	Transmitter Level Indicating	210-B01-TNK-0340	08-Feb-21	1	YEARS	01-Feb-22
2342	Flush Feed Tubing Transmitter LIT-0345 Train D Cell 8 MFW	Transmitter Level Indicating	210-D08-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2327	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 2 MFE	Transmitter Level Indicating	210-B02-TNK-0340	08-Feb-21	1	YEARS	01-Feb-22
2343	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 1 MFW	Transmitter Level Indicating	210-E01-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2294	Block, Bleed and Check Zero -A05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	29-Jul-20	1	YEARS	21-Jul-21
2295	Block, Bleed and Check Zero -A06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	29-Jul-20	1	YEARS	21-Jul-21
2243	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400A	17-Nov-20	1	YEARS	03-Nov-21
2296	Block, Bleed and Check Zero -A07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	29-Jul-20	1	YEARS	21-Jul-21
2244	Rosemount pH analyzer annual-Element Analyzer pH - MF Train A CIP-A02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400A	06-Jan-21	1	YEARS	29-Dec-21
2297	Block, Bleed and Check Zero -A08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	29-Jul-20	1	YEARS	21-Jul-21
2245	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400B	17-Nov-20	1	YEARS	04-Nov-21
2298	Block, Bleed and Check Zero -B01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	07-Aug-20	1	YEARS	03-Aug-21
2246	Rosemount pH analyzer annual-Element Analyzer pH - MF Train B CIP-B02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400B	14-Jan-21	1	YEARS	12-Jan-22
2299	Block, Bleed and Check Zero -B02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	07-Aug-20	1	YEARS	03-Aug-21
2300	Block, Bleed and Check Zero -B03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	07-Aug-20	1	YEARS	03-Aug-21
2247	Rosemount pH analyzer annual-Element Analyzer pH - MF Train D CIP-D01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400D	29-Jan-21	1	YEARS	26-Jan-22
2301	Block, Bleed and Check Zero -B04- DPIT-0405 Every 6 MO	Valve Ball 1/2"	216-PIP-PA-MEMDE	07-Aug-20	1	YEARS	03-Aug-21
2302	Block, Bleed and Check Zero -B05- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	26-Aug-20	1	YEARS	17-Aug-21
2303	Block, Bleed and Check Zero -B06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	26-Aug-20	1	YEARS	17-Aug-21

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
2304	Block, Bleed and Check Zero -B07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	26-Aug-20	1	YEARS	17-Aug-21
2328	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 3 MFE	Transmitter Level Indicating	210-B03-TNK-0340	08-Feb-21	1	YEARS	01-Feb-22
2344	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 2 MFW	Transmitter Level Indicating	210-E02-TNK-0340	27-Feb-20	1	YEARS	01-Mar-21
2305	Block, Bleed and Check Zero -B08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	26-Aug-20	1	YEARS	17-Aug-21
2329	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 4 MFE	Transmitter Level Indicating	210-B04-TNK-0340	08-Feb-21	1	YEARS	01-Feb-22
2866	Calibration of O2 Analyzer 750- AE-4040	Element Analyzer Oxygen - North Building	750-CPF-0030	28-Aug-20	6	MONTHS	22-Feb-21
2306	Block, Bleed and Check Zero -D01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	06-Aug-20	1	YEARS	03-Aug-21
2330	Flush Feed Tubing Transmitter LIT-0345 Train B Cell 5 MFE	Transmitter Level Indicating	210-B05-TNK-0340	13-Feb-20	1	YEARS	15-Feb-21
2867	Calibration of O2 Analyzer 750- AE-4045	Element Analyzer Oxygen - South Building	750-CPF-0030	28-Aug-20	6	MONTHS	22-Feb-21
2307	Block, Bleed and Check Zero -D02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	06-Aug-20	1	YEARS	03-Aug-21
2868	Calibration of O2 Analyzer 750- AE-4050	Element Analyzer Oxygen - North Trench	750-CPF-0030	28-Aug-20	6	MONTHS	22-Feb-21
2869	Calibration of O2 Analyzer 750- AE-4055	Element Analyzer Oxygen - South Trench	750-CPF-0030	28-Aug-20	6	MONTHS	22-Feb-21
2308	Block, Bleed and Check Zero -D03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	06-Aug-20	1	YEARS	03-Aug-21
3516	Check Calibration of TIT-0420 MF Filtrate Train C Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMC2	13-Aug-20	6	MONTHS	10-Aug-21
3579	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 1	Actuator	210-PIP-MFF-MEMC1	06-Jul-20	1	YEARS	01-Jul-21
3517	Check Calibration of TIT-0420 MF Filtrate Train C Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMC3	13-Aug-20	6	MONTHS	10-Aug-21
3017	Surge tank level control functional check - 830-A01-TNK-3410	Tank steel 30430 gal	830-A01-TNK-3410	19-May-20	1	YEARS	29-Apr-21
3580	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 2	Actuator	210-PIP-MFF-MEMC2	06-Jul-20	1	YEARS	01-Jul-21
3135	ROP / UVP CL2 Analyzer Weekly Calibration	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	04-Feb-21	1	WEEKS	16-Feb-21
3518	Check Calibration of TIT-0420 MF Filtrate Train C Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMC4	13-Aug-20	6	MONTHS	10-Aug-21
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	17-Sep-20	6	MONTHS	16-Mar-21
2292	Block, Bleed and Check Zero -A03- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	09-Jul-20	1	YEARS	07-Jul-21
3480	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	Element Analyzer Conductivity - RO Concentrate Train G Unit 2	510-G02-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21
3481	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	Element Analyzer Conductivity - RO Concentrate Train G Unit 3	510-G03-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21
3507	Block, Bleed, and Check Zero - C01-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	08-Sep-20	1	YEARS	01-Sep-21
2311	Block, Bleed and Check Zero -D06- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	20-Aug-20	1	YEARS	17-Aug-21
2312	Block, Bleed and Check Zero -D07- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	20-Aug-20	1	YEARS	17-Aug-21
2313	Block, Bleed and Check Zero -D08- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	20-Aug-20	1	YEARS	17-Aug-21
2314	Block, Bleed and Check Zero -E01- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	24-Aug-20	1	YEARS	17-Aug-21
2315	Block, Bleed and Check Zero -E02- DPIT-0405 Every 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	24-Aug-20	1	YEARS	17-Aug-21
3569	Check Calibration of DPIT-0405 Train C Cell 1	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC1	21-May-20	1	YEARS	02-May-21
3570	Check Calibration of DPIT-0405 Train C Cell 2	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	21-May-20	1	YEARS	02-May-21
3508	Block, Bleed, and Check Zero - C02-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC2	08-Sep-20	1	YEARS	01-Sep-21
3509	Block, Bleed, and Check Zero C03-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	08-Sep-20	1	YEARS	01-Sep-21
3571	Check Calibration of DPIT-0405 Train C Cell 3	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC3	22-May-20	1	YEARS	02-May-21
3510	Block, Bleed, and Check Zero - C04-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	08-Sep-20	1	YEARS	01-Sep-21
3572	Check Calibration of DPIT-0405 Train C Cell 4	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC4	22-May-20	1	YEARS	02-May-21
3573	Check Calibration of DPIT-0405 Train C Cell 5	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	22-May-20	1	YEARS	02-May-21
3511	Block, Bleed, and Check Zero - C05-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC5	24-Sep-20	1	YEARS	01-Sep-21
3512	Block, Bleed, and Check Zero - C06-PDIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	24-Sep-20	1	YEARS	01-Sep-21
3574	Check Calibration of DPIT-0405 Train C Cell 6	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC6	22-May-20	1	YEARS	02-May-21
3513	Block, Bleed, and Check Zero C07-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	24-Sep-20	1	YEARS	01-Sep-21
3575	Check Calibration of DPIT-0405 Train C Cell 7	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC7	22-May-20	1	YEARS	02-May-21
3514	Block, Bleed, and Check Zero C08-DPIT-0405 6 MO	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	24-Sep-20	1	YEARS	01-Sep-21
3576	Check Calibration of DPIT-0405 Train C Cell 8	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMC8	22-May-20	1	YEARS	02-May-21
3515	Check Calibration of TIT-0420 MF Filtrate Train C Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMC1	13-Aug-20	6	MONTHS	10-Aug-21
3577	Check Calibration of Train Feed Valve C02-BFV-0320	Actuator	210-PIP-MFF-MEM	05-Aug-20	1	YEARS	01-Jun-21
3558	Check Calibration of PIT-0454, MF Effluent Train C Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMC7	01-Aug-19	2	YEARS	01-Aug-21
2075	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	Element Analyzer Conductivity - RO Concentrate Train D Unit 2	510-D02-CPF-5101	15-Dec-20	3	MONTHS	15-Mar-21
3643	Check Calibration of BFV-0460 MF Filtrate Train E Cell 4	Actuator	210-PIP-MFE-MEME4	16-Jul-20	1	YEARS	04-Jul-21
3559	Check Calibration of PIT-0454, MF Effluent Train C Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMC8	01-Aug-19	2	YEARS	01-Aug-21
3644	Check Calibration of PIT-0454 MF Effluent Train E Cell 3	Transmitter Pressure Indication	210-PIP-MFE-MEME3	07-Jun-19	2	YEARS	05-Jun-21
7004	Replace pH probe of I&E handheld	pH meter, handheld (s/n C03416)	TOOLS	23-Oct-20	1	YEARS	22-Sep-21
3463	Prominent H2O2 Sensor Standardization Method	UV FEED PROMINENT PEROXIDE ANALYZER	510-CPF-0010	27-Jan-21	2	WEEKS	24-Feb-21
3465	Prominent H2O2 Sensor Standardization Method	UV PRODUCT PROMINET PEROXIDE ANALYZER	805-CPD-0002	27-Jan-21	2	WEEKS	24-Feb-21
3466	Prominent H2O2 Sensor Calibration Method 1 YR	UV PRODUCT PROMINET PEROXIDE ANALYZER	805-CPD-0002	15-May-20	1	YEARS	16-May-21
3467	Prominent H2O2 Sensor Calibration Method 1 YR	UV FEED PROMINENT PEROXIDE ANALYZER	510-CPF-0010	15-May-20	1	YEARS	16-May-21
3471	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	Element Analyzer Conductivity - RO Concentrate Train F Unit 1	510-F01-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21

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3472	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	Element Analyzer Conductivity - RO Concentrate Train F Unit 2	510-F02-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21
3474	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	Element Analyzer Conductivity - RO Concentrate Train F Unit 3	510-F03-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21
3479	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	Element Analyzer Conductivity - RO Concentrate Train G Unit 1	510-G01-CPF-5101	15-Jan-21	3	MONTHS	16-Apr-21
3633	Polymer Blend Controller 730-D01-FDR-7200 6 MO. PM	Polymer Blend and Feed System Train D	730-D01-FDR-7200	10-Aug-20	6	MONTHS	08-Aug-21
2067	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	Element Analyzer Conductivity - RO Concentrate Train C Unit 1	510-C01-CPF-5101	14-Jan-21	3	MONTHS	14-Apr-21
2069	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	Element Analyzer Conductivity - RO Concentrate Train C Unit 2	510-C02-CPF-5101	15-Dec-20	3	MONTHS	15-Mar-21
3552	Check Calibration of PIT-0454, MF Effluent Train C Cell 1	Transmitter Pressure Indication	210-PIP-MFE-MEMC1	02-Aug-19	2	YEARS	01-Aug-21
3553	Check Calibration of PIT-0454, MF Effluent Train C Cell 2	Transmitter Pressure Indication	210-PIP-MFE-MEMC2	02-Aug-19	2	YEARS	01-Aug-21
2071	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	Element Analyzer Conductivity - RO Concentrate Train C Unit 3	510-C03-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
3554	Ckeck Calibration of PIT-0454, MF Effluent Train C Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	02-Aug-19	2	YEARS	01-Aug-21
3555	Check Calibration of PIT-0454, MF Effluent Train C Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMC4	02-Aug-19	2	YEARS	01-Aug-21
3640	Check Calibration of TIT-0420 MF Filtrate Train E Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEME3	03-Dec-20	6	MONTHS	23-May-21
2073	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	Element Analyzer Conductivity - RO Concentrate Train D Unit 1	510-D01-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
3556	Check Calibration of PIT-0454, MF Effluent Train C Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMC5	01-Aug-19	2	YEARS	01-Aug-21
3641	Check Calibration of TIT-0420 MF Flitrate Train E Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEME4	03-Dec-20	6	MONTHS	23-May-21
3557	Check Calibration of PIT-0454, MF Effluent Train C Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMC6	01-Aug-19	2	YEARS	01-Aug-21
3642	Check Calibration of BFV-0460 MF Filtrate Train E Cell 3	Actuator	210-PIP-MFE-MEME3	16-Jul-20	1	YEARS	04-Jul-21
3253	Ammonia Sensor Replacement 1 YR 450-AE-2185	Element Analyzer Ammonia	450-CPF-0001	07-Oct-20	9	MONTHS	01-Jul-21
2065	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	Element Analyzer Conductivity - RO Concentrate Train B Unit 3	510-B03-CPF-5101	17-Nov-20	3	MONTHS	17-Feb-21
3587	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 1	Transmitter Level Indicating	210-C01-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3588	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 2	Transmitter Level Indicating	210-C02-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3589	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 3	Transmitter Level Indicating	210-C03-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3204	Area 450 Ammonia Analyzer Weekly	Transmitter Analyzer Indicating Ammonia	450-CPF-0001	04-Feb-21	1	WEEKS	16-Feb-21
3590	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 4	Transmitter Level Indicating	210-C04-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3591	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 5	Transmitter Level Indicating	210-C05-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3592	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 6	Transmitter Level Indicating	210-C06-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3593	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 7	Transmitter Level Indicating	210-C07-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3581	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 3	Actuator	210-PIP-MFF-MEMC3	06-Jul-20	1	YEARS	01-Jul-21
3519	Check Calibration of TIT-0420 MF Filtrate Train C Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMC5	12-Aug-20	6	MONTHS	10-Aug-21
3520	Check Calibration of TIT-0420 MF Filtrate Train C Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMC6	12-Aug-20	6	MONTHS	10-Aug-21
3583	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell5	Actuator	210-PIP-MFF-MEMC5	20-Jul-20	1	YEARS	01-Jul-21
3521	Check Calibration of TIT-0420 MF Filtrate Train C Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMC7	12-Aug-20	6	MONTHS	10-Aug-21
3584	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 6	Actuator	210-PIP-MFF-MEMC6	20-Jul-20	1	YEARS	01-Jul-21
3522	Check Calibration of TIT-0420 MF Filtrate Train C Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMC8	12-Aug-20	6	MONTHS	10-Aug-21
3585	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 7	Actuator	210-PIP-MFF-MEMC7	20-Jul-20	1	YEARS	01-Jul-21
3586	Check Calibration of Unit Feed Valve BFV-0330 Train C Cell 8	Actuator	210-PIP-MFF-MEMC8	20-Jul-20	1	YEARS	01-Jul-21
3537	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 1 MFE	Transmitter Level Indicating	210-C01-TNK-0340	25-Mar-20	1	YEARS	14-Mar-21
2055	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	Element Analyzer Conductivity - RO Concentrate Train A Unit 1	510-A01-CPF-5101	22-Dec-20	3	MONTHS	22-Mar-21
3538	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 2 MFE	Transmitter Level Indicating	210-C02-TNK-0340	25-Mar-20	1	YEARS	14-Mar-21
2960	Surge tank level control functional check - 830-A02-TNK-3410	Tank steel 30430 gal	830-A02-TNK-3410	19-May-20	1	YEARS	29-Apr-21
2961	Surge tank level control functional check - 830-A03-TNK-3410	Tank steel 30430 gal	830-A03-TNK-3410	19-May-20	1	YEARS	29-Apr-21
2962	Surge tank level control functional check - 830-A04-TNK-3410	Tank steel 30430 gal	830-A04-TNK-3410	19-May-20	1	YEARS	29-Apr-21
2963	Surge tank level control functional check - 830-B01-TNK-3410	Tank steel 5984 gal	830-B01-TNK-3410	19-May-20	1	YEARS	29-Apr-21
3539	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 3 MFE	Transmitter Level Indicating	210-C03-TNK-0340	25-Mar-20	1	YEARS	14-Mar-21
2057	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
3540	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 4 MFE	Transmitter Level Indicating	210-C04-TNK-0340	25-Mar-20	1	YEARS	14-Mar-21
2059	Element Analyzer Conductivity - RO Concentrate Train A Unit 3	Element Analyzer Conductivity - RO Concentrate Train A Unit 2	510-A02-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
3541	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 5 MFE	Transmitter Level Indicating	210-C05-TNK-0340	27-Mar-20	1	YEARS	14-Mar-21
3594	Flush Feed Tubing Transmitter LIT-0345 Train C Cell 8	Transmitter Level Indicating	210-C08-TNK-0340	04-Jun-20	1	YEARS	01-Jun-21
3542	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell6 MFE	Transmitter Level Indicating	210-C06-TNK-0340	27-Mar-20	1	YEARS	14-Mar-21
2980	Polymer Blend Controller 730-C01-FDR-7200 - 6 mo. PM	Polymer Blend and Feed System Train C	730-C01-FDR-7200	26-Oct-20	6	MONTHS	19-Apr-21
3595	Rosemount pH Analyzer Annual Element Analyzer pH MF Train C CIP-C01-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400C	28-Jul-20	1	YEARS	06-Jun-21
2061	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	Element Analyzer Conductivity - RO Concentrate Train B Unit 1	510-B01-CPF-5101	22-Dec-20	3	MONTHS	22-Mar-21
3543	Check Calibration of Cell Level transmitter LIT-0345 Train C Cell 7 MFE	Transmitter Level Indicating	210-C07-TNK-0340	27-Mar-20	1	YEARS	14-Mar-21
2981	Polymer Blend Controller 730-B01-FDR-7200 6 mo. PM	Polymer Blend and Feed System Train B	730-B01-FDR-7200	10-Sep-20	6	MONTHS	13-Mar-21
3596	Rosemount pH analyzer Annual Element Analyzer pH MF Train C02-AIT-0480	Transmitter Analyzer Indicating pH	210-AS-0400C	15-Jun-20	1	YEARS	01-Jun-21
3544	Check Calibration of Cell Level Transmitter LIT-0345 Train C Cell 8 MFE	Transmitter Level Indicating	210-C08-TNK-0340	27-Mar-20	1	YEARS	14-Mar-21
2982	Polymer Blend Controller 730-A01-FDR-7200 6 mo. PM	Polymer Blend and Feed System Train A	730-A01-FDR-7200	24-Aug-20	6	MONTHS	23-Feb-21

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2063	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	Element Analyzer Conductivity - RO Concentrate Train B Unit 2	510-B02-CPF-5101	12-Nov-20	3	MONTHS	14-May-21
7339	UV Transmittance Calibration Check 1 Yr. 610-AE-2220	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	22-May-20	1	YEARS	15-May-21
7342	Rosemount Free Chlorine Maintenance 450-AE-2162	Element Analyzer Free Chlorine and pH- RO Feed	450-CPF-0001	29-Jan-21	3	MONTHS	11-Apr-21
3560	Check Calibration of BFV-0460 MF Filtrate Train C Cell1	Actuator	210-PIP-MFE-MEMC1	18-Jun-20	1	YEARS	01-Jun-21
7343	3 Mo. Rosemount Chlorine Analyzer Maintenance 450-AE-2164	Element Analyzer Total Chlorine - RO Feed	450-CPF-0001	05-Feb-21	3	MONTHS	21-Apr-21
7490	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 5 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD5	14-May-20	12	MONTHS	14-Apr-21
7352	Check calibration of DPIT-0405, Train A Cell 3 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA3	11-Dec-20	1	YEARS	07-Dec-21
7492	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 7 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD7	14-May-20	12	MONTHS	14-Apr-21
7353	Check calibration of DPIT-0405, Train A Cell 4 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA4	16-Dec-20	1	YEARS	07-Dec-21
7493	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 8 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD8	14-May-20	12	MONTHS	14-Apr-21
7484	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 7 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB7	08-Apr-20	12	MONTHS	30-Mar-21
7485	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 8 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB8	08-Apr-20	12	MONTHS	30-Mar-21
7486	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 1 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD1	08-Apr-20	12	MONTHS	07-Apr-21
7487	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 2 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD2	08-Apr-20	12	MONTHS	07-Apr-21
7488	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 3 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD3	08-Apr-20	12	MONTHS	07-Apr-21
7489	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 4 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD4	08-Apr-20	12	MONTHS	07-Apr-21
3645	Check Calibration of PIT-0454 MF Effluent Train E Cell 4	Transmitter Pressure Indication	210-PIP-MFE-MEME4	07-Jun-19	2	YEARS	05-Jun-21
3646	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 3	Actuator	210-PIP-MFF-MEME3	16-Jun-20	1	YEARS	06-Jun-21
3647	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 4	Actuator	210-PIP-MFF-MEME4	16-Jun-20	1	YEARS	06-Jun-21
3648	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 3	Transmitter Level Indicating	210-E03-TNK-0340	17-Jun-20	1	YEARS	06-Jun-21
3649	Check Calibration of Cell Level Transmitter LIT-0345 Train E Cell 4	Transmitter Level Indicating	210-E04-TNK-0340	18-Jun-20	1	YEARS	06-Jun-21
3650	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 3	Transmitter Level Indicating	210-E03-TNK-0340	04-Jun-20	1	YEARS	06-Jun-21
3651	Flush Feed Tubing Transmitter LIT-0345 Train E Cell 4	Transmitter Level Indicating	210-E04-TNK-0340	04-Jun-20	1	YEARS	06-Jun-21
3652	Check Calibration of DPIT-0405 Train E Cell 3	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME3	17-Jun-20	1	YEARS	01-Jun-21
3653	Check Calibration of DPIT-0405 Train E Cell 4	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME4	18-Jun-20	1	YEARS	01-Jun-21
2077	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	Element Analyzer Conductivity - RO Concentrate Train D Unit 3	510-D03-CPF-5101	25-Nov-20	3	MONTHS	25-Feb-21
7615	Check Calibration of TIT-0420, MF Filtrate Train D Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMD5	15-Oct-20	6	MONTHS	14-Apr-21
7616	Check Calibration of TIT-0420, MF Filtrate Train D Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMD6	15-Oct-20	6	MONTHS	14-Apr-21
7344	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0312	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	13-Jan-21	3	MONTHS	14-Apr-21
7345	3 Mo. Rosemount Chlorine Analyzer Maintenance 460-AE-0314	Element Analyzer Total Chlorine - MF Feedwater	460-CPF-0001	13-Jan-21	3	MONTHS	14-Apr-21
7346	3 Mo. Rosemount Chlorine Analyzer Maintenance 710-AE-3425	Element Analyzer Chlorine - Finished Product Water to PWPS	710-CPF-0009	29-Jan-21	3	MONTHS	28-Apr-21
7617	Check Calibration of TIT-0420, MF Filtrate Train D Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMD7	15-Oct-20	6	MONTHS	14-Apr-21
7618	Check Calibration of TIT-0420, MF Filtrate Train D Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMD8	15-Oct-20	6	MONTHS	14-Apr-21
7619	Check Calibration of TIT-0420, MF Filtrate Train E Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEME1	26-Oct-20	6	MONTHS	21-Apr-21
7620	Check Calibration of TIT-0420, MF Filtrate Train E Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEME2	26-Oct-20	6	MONTHS	21-Apr-21
7350	Check calibration of DPIT-0405, Train A Cell 1 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA1	11-Dec-20	1	YEARS	07-Dec-21
7351	Check calibration of DPIT-0405, Train A Cell 2 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA2	11-Dec-20	1	YEARS	07-Dec-21
7491	Check Calibration of Unit Feed Valve BFV-0330 Train D Cell 6 MFW	Valve Butterfly 24"	210-PIP-MFF-MEMD6	14-May-20	12	MONTHS	14-Apr-21
7479	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 2 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB2	26-Mar-20	12	MONTHS	23-Mar-21
7481	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 4 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB4	26-Mar-20	12	MONTHS	23-Mar-21
7482	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 5 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB5	08-Apr-20	12	MONTHS	30-Mar-21
7483	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 6 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB6	08-Apr-20	12	MONTHS	30-Mar-21
3561	Check Calibration of BFV-0460 MF Filtrate Train C Cell 2	Actuator	210-PIP-MFE-MEMC2	18-Jun-20	1	YEARS	01-Jun-21
3562	Check Calibration of BFV-0460 MF Filtrate Train C Cell 3	Actuator	210-PIP-MFE-MEMC3	18-Jun-20	1	YEARS	01-Jun-21
3563	Check Calibration of BFV-0460 MF Filtrate Train C Cell 4	Actuator	210-PIP-MFE-MEMC4	18-Jun-20	1	YEARS	01-Jun-21
3564	Check Calibration of BFV-0460 MF Filtrate Train C Cell 5	Actuator	210-PIP-MFE-MEMC5	02-Jun-20	1	YEARS	01-Jun-21
3565	Check Calibration of BFV-0460 MF Filtrate Train C Cell 6	Actuator	210-PIP-MFE-MEMC6	02-Jun-20	1	YEARS	01-Jun-21
3566	Check Calibration of BFV-0460 MF Filtrate Train C Cell 7	Valve Butterfly 12"	210-PIP-MFE-MEMC7	02-Jun-20	1	YEARS	01-Jun-21
3567	Check Calibration of BFV-0460 MF Filtrate Train C Cell 8	Valve Butterfly 12"	210-PIP-MFE-MEMC8	02-Jun-20	1	YEARS	01-Jun-21
3568	Check Calibration of PIT-0454 MF Effluent Train C Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMC3	02-Aug-19	2	YEARS	01-Aug-21
7480	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 3 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB3	26-Mar-20	12	MONTHS	23-Mar-21
7524	Check Calibration of PIT-0454, MF Effluent Train B Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMB2	27-Nov-19	2	YEARS	18-Nov-21
7354	Check calibration of DPIT-0405, Train A Cell 5 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA5	26-Jan-21	1	YEARS	04-Jan-22
7355	Check calibration of DPIT-0405, Train A Cell 6 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA6	26-Jan-21	1	YEARS	04-Jan-22
7356	Check calibration of DPIT-0405, Train A Cell 7 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA7	26-Jan-21	1	YEARS	04-Jan-22
7357	Check calibration of DPIT-0405, Train A Cell 8 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMA8	26-Jan-21	1	YEARS	04-Jan-22
7358	Check calibration of DPIT-0405, Train B Cell 1 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB1	20-Jan-21	1	YEARS	18-Jan-22
7359	Check calibration of DPIT-0405, Train B Cell 2 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB2	20-Jan-21	1	YEARS	18-Jan-22

PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7360	Check calibration of DPIT-0405, Train B Cell 3 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB3	20-Jan-21	1	YEARS	18-Jan-22
7361	Check calibration of DPIT-0405, Train B Cell 4 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB4	20-Jan-21	1	YEARS	18-Jan-22
7362	Check calibration of DPIT-0405, Train B Cell 5 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB5	05-Feb-20	1	YEARS	08-Feb-22
7363	Check calibration of DPIT-0405, Train B Cell 6 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB6	05-Feb-20	1	YEARS	08-Feb-22
7364	Check calibration of DPIT-0405, Train B Cell 7 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB7	05-Feb-20	1	YEARS	08-Feb-22
7365	Check calibration of DPIT-0405, Train B Cell 8 MFE	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMB8	05-Feb-20	1	YEARS	08-Feb-22
7366	Check calibration of DPIT-0405, Train D Cell 1 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD1	21-Feb-20	1	YEARS	22-Feb-21
7367	Check calibration of DPIT-0405, Train D Cell 2 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD2	21-Feb-20	1	YEARS	22-Feb-21
7368	Check calibration of DPIT-0405, Train D Cell 3 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD3	21-Feb-20	1	YEARS	22-Feb-21
7369	Check calibration of DPIT-0405, Train D Cell 4 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD4	21-Feb-20	1	YEARS	22-Feb-21
7370	Check calibration of DPIT-0405, Train D Cell 5 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD5	10-Mar-20	1	YEARS	08-Mar-21
7525	Check Calibration of PIT-0454, MF Effluent Train B Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMB3	27-Nov-19	2	YEARS	18-Nov-21
7494	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 1 MFW	Valve Butterfly 24"	210-PIP-MFF-MEME1	22-Apr-20	12	MONTHS	21-Apr-21
7495	Check Calibration of Unit Feed Valve BFV-0330 Train E Cell 2 MFW	Valve Butterfly 24"	210-PIP-MFF-MEME2	22-Apr-20	12	MONTHS	21-Apr-21
7510	Check Calibration of Train Feed Valve A02-BFV-0320 MFE	Valve Butterfly 60"	210-PIP-MFF-MEM	20-Jul-20	12	MONTHS	11-Jun-21
7511	Check Calibration of Train Feed Valve B02-BFV-0320 MFE	Valve Butterfly 60"	210-PIP-MFF-MEM	20-Jul-20	12	MONTHS	11-Jun-21
7512	Check Calibration of Train Feed Valve D02-BFV-0320 MFW	Valve Butterfly 60"	210-PIP-MFF-MEM	20-Jul-20	12	MONTHS	11-Jun-21
7513	Check Calibration of Train Feed Valve E01-E02-BFV-0320 MFW	Valve Butterfly 36"	210-PIP-MFF-MEM	20-Jul-20	12	MONTHS	11-Jun-21
7515	Check Calibration of PIT-0454, MF Effluent Train A Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMA1	07-Nov-19	2	YEARS	04-Nov-21
7516	Check Calibration of PIT-0454, MF Effluent Train A Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMA2	07-Nov-19	2	YEARS	04-Nov-21
7517	Check Calibration of PIT-0454, MF Effluent Train A Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMA3	07-Nov-19	2	YEARS	04-Nov-21
7518	Check Calibration of PIT-0454, MF Effluent Train A Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMA4	07-Nov-19	2	YEARS	04-Nov-21
7519	Check Calibration of PIT-0454, MF Effluent Train A Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMA5	13-Nov-19	2	YEARS	11-Nov-21
7520	Check Calibration of PIT-0454, MF Effluent Train A Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMA6	13-Nov-19	2	YEARS	11-Nov-21
7521	Check Calibration of PIT-0454, MF Effluent Train A Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMA7	13-Nov-19	2	YEARS	11-Nov-21
7522	Check Calibration of PIT-0454, MF Effluent Train A Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMA8	13-Nov-19	2	YEARS	11-Nov-21
7523	Check Calibration of PIT-0454, MF Effluent Train B Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMB1	27-Nov-19	2	YEARS	18-Nov-21
7540	Check Calibration of PIT-0454, MF Effluent Train E Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEME2	17-Dec-19	2	YEARS	16-Dec-21
7526	Check Calibration of PIT-0454, MF Effluent Train B Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMB4	27-Nov-19	2	YEARS	18-Nov-21
7527	Check Calibration of PIT-0454, MF Effluent Train B Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMB5	26-Nov-19	2	YEARS	25-Nov-21
7528	Check Calibration of PIT-0454, MF Effluent Train B Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMB6	26-Nov-19	2	YEARS	25-Nov-21
7529	Check Calibration of PIT-0454, MF Effluent Train B Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMB7	26-Nov-19	2	YEARS	25-Nov-21
7530	Check Calibration of PIT-0454, MF Effluent Train D Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEMD1	03-Dec-19	2	YEARS	02-Dec-21
7531	Check Calibration of PIT-0454, MF Effluent Train D Cell 2	Transmitter Pressure Indicating	210-PIP-MFE-MEMD2	03-Dec-19	2	YEARS	02-Dec-21
7532	Check Calibration of PIT-0454, MF Effluent Train D Cell 3	Transmitter Pressure Indicating	210-PIP-MFE-MEMD3	03-Dec-19	2	YEARS	02-Dec-21
7533	Check Calibration of PIT-0454, MF Effluent Train D Cell 4	Transmitter Pressure Indicating	210-PIP-MFE-MEMD4	03-Dec-19	2	YEARS	02-Dec-21
7534	Check Calibration of PIT-0454, MF Effluent Train D Cell 5	Transmitter Pressure Indicating	210-PIP-MFE-MEMD5	11-Dec-19	2	YEARS	09-Dec-21
7535	Check Calibration of PIT-0454, MF Effluent Train D Cell 6	Transmitter Pressure Indicating	210-PIP-MFE-MEMD6	11-Dec-19	2	YEARS	09-Dec-21
7536	Check Calibration of PIT-0454, MF Effluent Train D Cell 7	Transmitter Pressure Indicating	210-PIP-MFE-MEMD7	11-Dec-19	2	YEARS	09-Dec-21
7537	Check Calibration of PIT-0454, MF Effluent Train D Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMD8	11-Dec-19	2	YEARS	09-Dec-21
7538	Check Calibration of PIT-0454, MF Effluent Train B Cell 8	Transmitter Pressure Indicating	210-PIP-MFE-MEMB8	26-Nov-19	2	YEARS	25-Nov-21
7539	Check Calibration of PIT-0454, MF Effluent Train E Cell 1	Transmitter Pressure Indicating	210-PIP-MFE-MEME1	17-Dec-19	2	YEARS	16-Dec-21
7371	Check calibration of DPIT-0405, Train D Cell 6 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD6	10-Mar-20	1	YEARS	08-Mar-21
7372	Check calibration of DPIT-0405, Train D Cell 7 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD7	10-Mar-20	1	YEARS	08-Mar-21
7373	Check calibration of DPIT-0405, Train D Cell 8 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEMD8	10-Mar-20	1	YEARS	08-Mar-21
7374	Check calibration of DPIT-0405, Train E Cell 1 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME1	10-Mar-20	1	YEARS	08-Mar-21
7375	Check calibration of DPIT-0405, Train E Cell 2 MFW	Transmitter Differential Pressure Indicating	210-PIP-MFF-MEME2	10-Mar-20	1	YEARS	08-Mar-21
7003	Replace pH probe of I&E handheld	pH meter, handheld (s/n 003366)	TOOLS	23-Oct-20	1	YEARS	22-Sep-21
7570	Check Calibration of BFV-0460, MF Filtrate Train B Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB3	06-Nov-20	1	YEARS	03-Nov-21
7404	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 7 MFE	Transmitter Level Indicating	210-B07-TNK-0340	14-Apr-20	1	YEARS	30-Mar-21
7571	Check Calibration of BFV-0460, MF Filtrate Train B Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB4	06-Nov-20	1	YEARS	03-Nov-21
7405	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 8 MFE	Transmitter Level Indicating	210-B08-TNK-0340	14-Apr-20	1	YEARS	30-Mar-21
7572	Check Calibration of BFV-0460, MF Filtrate Train B Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB5	09-Dec-20	1	YEARS	19-Nov-21
7406	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 1 MFW	Transmitter Level Indicating	210-D01-TNK-0340	10-Apr-20	1	YEARS	07-Apr-21
7712	Check Calibration of PIT-0750, MF backwash - Do during plant shutdown	Transmitter Pressure Indicating 0 - 60 psi	255-PIP-BW	17-Dec-20	1	YEARS	24-Nov-21
7573	Check Calibration of BFV-0460, MF Filtrate Train B Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB6	09-Dec-20	1	YEARS	19-Nov-21
7407	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 2 MFW	Transmitter Level Indicating	210-D02-TNK-0340	10-Apr-20	1	YEARS	07-Apr-21
7390	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 1 MFE	Transmitter Level Indicating	210-A01-TNK-0340	11-Mar-20	1	YEARS	09-Mar-21

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7391	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 2 MFE	Transmitter Level Indicating	210-A02-TNK-0340	11-Mar-20	1	YEARS	09-Mar-21
7392	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 3 MFE	Transmitter Level Indicating	210-A03-TNK-0340	11-Mar-20	1	YEARS	09-Mar-21
7393	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 4 MFE	Transmitter Level Indicating	210-A04-TNK-0340	11-Mar-20	1	YEARS	09-Mar-21
7394	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 5 MFE	Transmitter Level Indicating	210-A05-TNK-0340	23-Mar-20	1	YEARS	16-Mar-21
7395	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 6 MFE	Transmitter Level Indicating	210-A06-TNK-0340	23-Mar-20	1	YEARS	16-Mar-21
7396	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 7 MFE	Transmitter Level Indicating	210-A07-TNK-0340	23-Mar-20	1	YEARS	16-Mar-21
7397	Check calibration of Cell Level Transmitter LIT-0345 Train A Cell 8 MFE	Transmitter Level Indicating	210-A08-TNK-0340	23-Mar-20	1	YEARS	16-Mar-21
7398	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 1 MFE	Transmitter Level Indicating	210-B01-TNK-0340	24-Mar-20	1	YEARS	23-Mar-21
7399	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 2 MFE	Transmitter Level Indicating	210-B02-TNK-0340	24-Mar-20	1	YEARS	23-Mar-21
7400	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 3 MFE	Transmitter Level Indicating	210-B03-TNK-0340	24-Mar-20	1	YEARS	23-Mar-21
7401	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 4 MFE	Transmitter Level Indicating	210-B04-TNK-0340	24-Mar-20	1	YEARS	23-Mar-21
7402	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 5 MFE	Transmitter Level Indicating	210-B05-TNK-0340	14-Apr-20	1	YEARS	30-Mar-21
7550	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	26-Nov-19	2	YEARS	27-Nov-21
7551	Check Calibration of PIT-0471, MF Filtrate Header Train A Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMA	26-Nov-19	2	YEARS	27-Nov-21
7552	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	04-Dec-19	2	YEARS	27-Nov-21
7553	Check Calibration of PIT-0471, MF Filtrate Header Train B Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMB	04-Dec-19	2	YEARS	27-Nov-21
7554	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	17-Dec-19	2	YEARS	27-Nov-21
7556	Check Calibration of PIT-0471, MF Filtrate Header Train D Cells 5-8	Transmitter Pressure Indicating	210-PIP-MFE-MEMD	17-Dec-19	2	YEARS	27-Nov-21
7557	Check Calibration of PIT-0471, MF Filtrate Header Train E Cells 1-4	Transmitter Pressure Indicating	210-PIP-MFE-MEME	17-Dec-19	2	YEARS	27-Nov-21
7560	Check Calibration of BFV-0460, MF Filtrate Train A Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA1	30-Oct-20	1	YEARS	17-Oct-21
7561	Check Calibration of BFV-0460, MF Filtrate Train A Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA2	30-Oct-20	1	YEARS	17-Oct-21
7562	Check Calibration of BFV-0460, MF Filtrate Train A Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA3	30-Oct-20	1	YEARS	17-Oct-21
7563	Check Calibration of BFV-0460, MF Filtrate Train A Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA4	30-Oct-20	1	YEARS	17-Oct-21
7564	Check Calibration of BFV-0460, MF Filtrate Train A Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA5	29-Oct-20	1	YEARS	23-Oct-21
7565	Check Calibration of BFV-0460, MF Filtrate Train A Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA6	29-Oct-20	1	YEARS	23-Oct-21
7566	Check Calibration of BFV-0460, MF Filtrate Train A Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA7	29-Oct-20	1	YEARS	23-Oct-21
7567	Check Calibration of BFV-0460, MF Filtrate Train A Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMA8	29-Oct-20	1	YEARS	23-Oct-21
7568	Check Calibration of BFV-0460, MF Filtrate Train B Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB1	06-Nov-20	1	YEARS	03-Nov-21
7569	Check Calibration of BFV-0460, MF Filtrate Train B Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB2	06-Nov-20	1	YEARS	03-Nov-21
7403	Check calibration of Cell Level Transmitter LIT-0345 Train B Cell 6 MFE	Transmitter Level Indicating	210-B06-TNK-0340	14-Apr-20	1	YEARS	30-Mar-21
7602	Check Calibration of TIT-0420, MF Filtrate Train A Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMA8	17-Sep-20	6	MONTHS	16-Mar-21
7475	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 6 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA6	23-Mar-20	12	MONTHS	16-Mar-21
7603	Check Calibration of TIT-0420, MF Filtrate Train B Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMB1	22-Sep-20	6	MONTHS	23-Mar-21
7476	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 7 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA7	23-Mar-20	12	MONTHS	16-Mar-21
7604	Check Calibration of TIT-0420, MF Filtrate Train B Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMB2	22-Sep-20	6	MONTHS	23-Mar-21
7477	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 8 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA8	23-Mar-20	12	MONTHS	16-Mar-21
7574	Check Calibration of BFV-0460, MF Filtrate Train B Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB7	09-Dec-20	1	YEARS	19-Nov-21
7575	Check Calibration of BFV-0460, MF Filtrate Train B Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMB8	09-Dec-20	1	YEARS	19-Nov-21
7409	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 4 MFW	Transmitter Level Indicating	210-D04-TNK-0340	10-Apr-20	1	YEARS	07-Apr-21
7576	Check Calibration of BFV-0460, MF Filtrate Train D Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD1	07-Dec-20	1	YEARS	26-Nov-21
7410	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 5 MFW	Transmitter Level Indicating	210-D05-TNK-0340	17-Apr-20	1	YEARS	14-Apr-21
7577	Check Calibration of BFV-0460, MF Filtrate Train D Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD2	07-Dec-20	1	YEARS	26-Nov-21
7411	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 6 MFW	Transmitter Level Indicating	210-D06-TNK-0340	17-Apr-20	1	YEARS	14-Apr-21
7578	Check Calibration of BFV-0460, MF Filtrate Train D Cell 3	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD3	07-Dec-20	1	YEARS	26-Nov-21
7412	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 7 MFW	Transmitter Level Indicating	210-D07-TNK-0340	17-Apr-20	1	YEARS	14-Apr-21
7579	Check Calibration of BFV-0460, MF Filtrate Train D Cell 4	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD4	07-Dec-20	1	YEARS	26-Nov-21
7413	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 8 MFW	Transmitter Level Indicating	210-D08-TNK-0340	17-Apr-20	1	YEARS	14-Apr-21
7580	Check Calibration of BFV-0460, MF Filtrate Train D Cell 5	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD5	14-Dec-20	1	YEARS	09-Dec-21
7414	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 1 MFW	Transmitter Level Indicating	210-E01-TNK-0340	29-Apr-20	1	YEARS	21-Apr-21
7581	Check Calibration of BFV-0460, MF Filtrate Train D Cell 6	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD6	14-Dec-20	1	YEARS	09-Dec-21
7415	Check calibration of Cell Level Transmitter LIT-0345 Train E Cell 2 MFW	Transmitter Level Indicating	210-E02-TNK-0340	29-Apr-20	1	YEARS	21-Apr-21
7582	Check Calibration of BFV-0460, MF Filtrate Train D Cell 7	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD7	21-Dec-20	1	YEARS	09-Dec-21
7583	Check Calibration of BFV-0460, MF Filtrate Train D Cell 8	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEMD8	21-Dec-20	1	YEARS	09-Dec-21
7584	Check Calibration of BFV-0460, MF Filtrate Train E Cell 1	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME1	28-Dec-20	1	YEARS	17-Dec-21
7585	Check Calibration of BFV-0460, MF Filtrate Train E Cell 2	Actuator Pneumatic Operated with Positioner	210-PIP-MFE-MEME2	28-Dec-20	1	YEARS	17-Dec-21
7595	Check Calibration of TIT-0420, MF Filtrate Train A Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMA1	26-Jan-21	6	MONTHS	07-Jul-21
7596	Check Calibration of TIT-0420, MF Filtrate Train A Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMA2	17-Sep-20	6	MONTHS	09-Mar-21
7713	Check Calibration of LIT-1207, MF CIP Tank A01	Transmitter Level Indicating 0 - 12 FT	220-A01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21

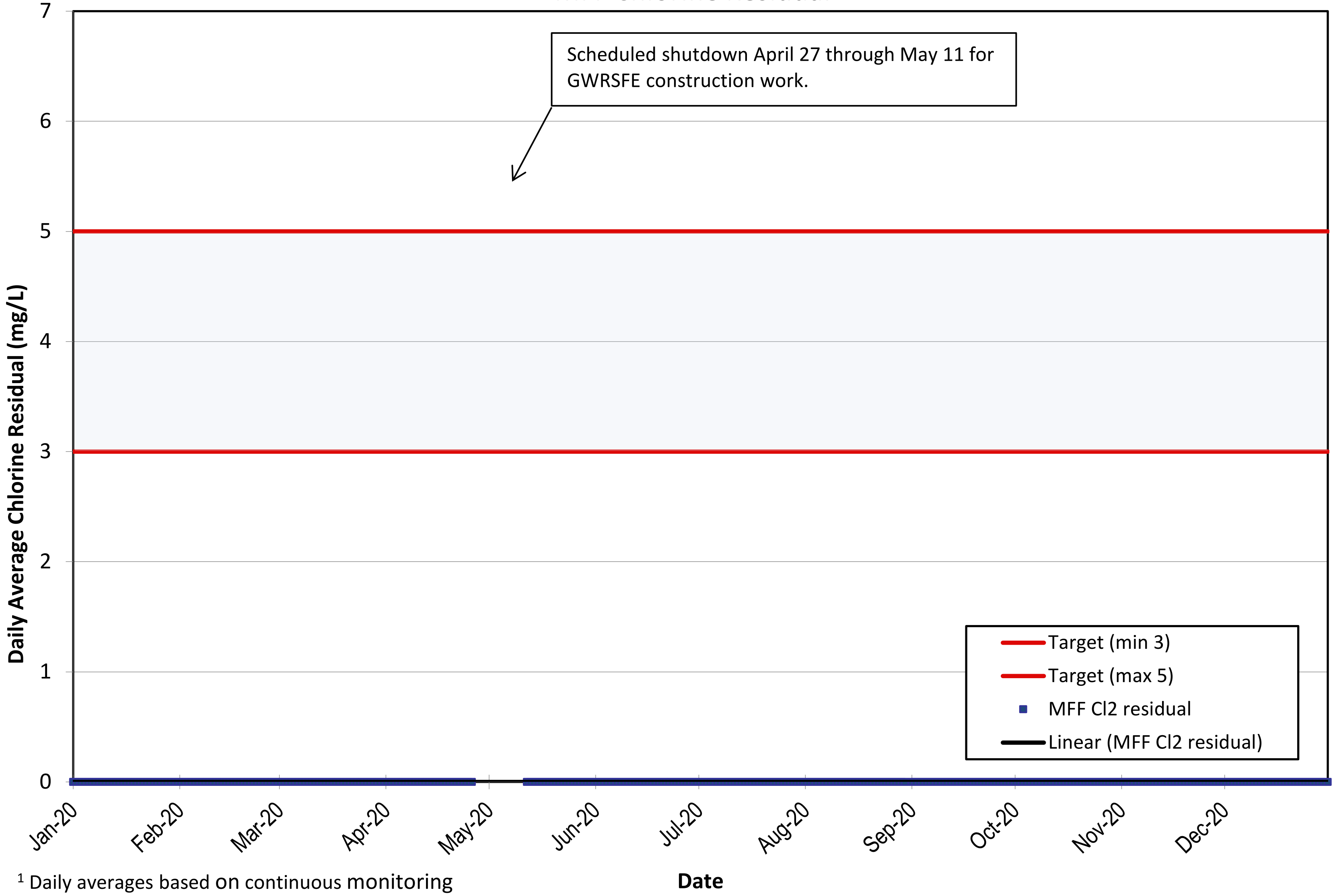
PMNUM	MAXIMO_PM.DESCRIPTION	MAXIMO_ASSET.DESCRIPTION	LOCATION	LASTCOMPDATE	FREQUENCY	FREQUNIT	NEXTDATE
7714	Check Calibration of LIT-1207, MF CIP Tank B01	Transmitter Level Indicating 0 - 12 FT	220-B01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7715	Check Calibration of LIT-1207, MF CIP Tank D01	Transmitter Level Indicating 0 - 12 FT	220-D01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7716	Check Calibration of LIT-1207, MF CIP Tank E01	Transmitter Level Indicating 0 - 12 FT	220-E01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7721	Test Overtemperature Thermocouple, TIT-1226 Train A01	Transmitter Temperature Indicating	220-A01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7722	Test Overtemperature Thermocouple, TIT-1226 Train B01	Transmitter Temperature Indicating	220-B01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7723	Test Overtemperature Thermocouple, TIT-1226 Train D01	Transmitter Temperature Indicating	220-D01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7408	Check calibration of Cell Level Transmitter LIT-0345 Train D Cell 3 MFW	Transmitter Level Indicating	210-D03-TNK-0340	10-Apr-20	1	YEARS	07-Apr-21
7724	Test Overtemperature Thermocouple, TIT-1226 Train E01	Transmitter Temperature Indicating	220-E01-TNK-1200	14-Jul-20	1	YEARS	09-Jul-21
7597	Check Calibration of TIT-0420, MF Filtrate Train A Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMA3	17-Sep-20	6	MONTHS	09-Mar-21
7470	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 1 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA1	25-Mar-20	12	MONTHS	09-Mar-21
7598	Check Calibration of TIT-0420, MF Filtrate Train A Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMA4	17-Sep-20	6	MONTHS	09-Mar-21
7471	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 2 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA2	25-Mar-20	12	MONTHS	09-Mar-21
7599	Check Calibration of TIT-0420, MF Filtrate Train A Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMA5	17-Sep-20	6	MONTHS	16-Mar-21
7472	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 3 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA3	25-Mar-20	12	MONTHS	09-Mar-21
7600	Check Calibration of TIT-0420, MF Filtrate Train A Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMA6	17-Sep-20	6	MONTHS	16-Mar-21
7473	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 4 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA4	25-Mar-20	12	MONTHS	09-Mar-21
7601	Check Calibration of TIT-0420, MF Filtrate Train A Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMA7	17-Sep-20	6	MONTHS	16-Mar-21
7474	Check Calibration of Unit Feed Valve BFV-0330 Train A Cell 5 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMA5	23-Mar-20	12	MONTHS	16-Mar-21
7478	Check Calibration of Unit Feed Valve BFV-0330 Train B Cell 1 MFE	Valve Butterfly 24"	210-PIP-MFF-MEMB1	26-Mar-20	12	MONTHS	23-Mar-21
9044	ROP/UVP CL2 ANALYZER 1 YR	ROP/UVP CL2 510-AIT-2250 Analyzer	510-CPF-0010	31-Mar-20	1	YEARS	04-Apr-21
7605	Check Calibration of TIT-0420, MF Filtrate Train B Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMB3	22-Sep-20	6	MONTHS	23-Mar-21
7606	Check Calibration of TIT-0420, MF Filtrate Train B Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMB4	22-Sep-20	6	MONTHS	23-Mar-21
7607	Check Calibration of TIT-0420, MF Filtrate Train B Cell 5	Transmitter Temperature Indicating	210-PIP-MFE-MEMB5	12-Oct-20	6	MONTHS	30-Mar-21
7608	Check Calibration of TIT-0420, MF Filtrate Train B Cell 6	Transmitter Temperature Indicating	210-PIP-MFE-MEMB6	12-Oct-20	6	MONTHS	30-Mar-21
7609	Check Calibration of TIT-0420, MF Filtrate Train B Cell 7	Transmitter Temperature Indicating	210-PIP-MFE-MEMB7	12-Oct-20	6	MONTHS	30-Mar-21
7610	Check Calibration of TIT-0420, MF Filtrate Train B Cell 8	Transmitter Temperature Indicating	210-PIP-MFE-MEMB8	26-Jan-21	6	MONTHS	07-Jul-21
7611	Check Calibration of TIT-0420, MF Filtrate Train D Cell 1	Transmitter Temperature Indicating	210-PIP-MFE-MEMD1	09-Oct-20	6	MONTHS	07-Apr-21
7612	Check Calibration of TIT-0420, MF Filtrate Train D Cell 2	Transmitter Temperature Indicating	210-PIP-MFE-MEMD2	09-Oct-20	6	MONTHS	07-Apr-21
7613	Check Calibration of TIT-0420, MF Filtrate Train D Cell 3	Transmitter Temperature Indicating	210-PIP-MFE-MEMD3	09-Oct-20	6	MONTHS	07-Apr-21
7614	Check Calibration of TIT-0420, MF Filtrate Train D Cell 4	Transmitter Temperature Indicating	210-PIP-MFE-MEMD4	09-Oct-20	6	MONTHS	07-Apr-21
9239	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	RO Feed TOC Analyzer	450-PIP-ROF	06-Jan-21	3	MONTHS	09-Apr-21
9240	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	RO Permate TOC Analyzer	510-CPF-0010	18-Nov-20	3	MONTHS	15-Feb-21
9242	MF Effluent Trubidity Wet Calibration HACH FT 660SC	MF Process Effluent Turbidity	250-PIP-MFE	14-Jan-21	3	MONTHS	16-Apr-21
9179	Planner Order Trojan UV 100% T Standard Solution	Element Analyzer UV Transmittance - Infeed	610-UVT-2220	11-Jun-20	1	YEARS	04-Jun-21
9241	UV Transmittance Calibration Check 1 Yr. 610-AE-2240	UV Transmittance Analyzer	510-CPF-0010	01-May-20	1	YEARS	22-Apr-21
9149	Replace Consumables ROF TOC M5310 Analyzer 3 MO.	Analyzer Total Organic Compound	450-CPF-0001	06-Jan-21	3	MONTHS	09-Apr-21
9150	Replace Consumables ROP TOC M5310 Analyzer 3 MO.	Analyzer Total Organic Compound	510-CPF-0010	06-Jan-21	3	MONTHS	09-Apr-21
9283	815-SWGR-125VDC Inspect Batteries & Monitor	815 12KV Switchgear 125 VDC Battery System	815-SWG-8001B	09-Jun-20	1	YEARS	03-Jun-21
9303	SEFE Tank A01 Flush & Clean LIT-0130B Transmitter	Transmitter Level Indicating	142-A01-TNK-0130	06-Nov-20	1	YEARS	05-Nov-21
9305	SEFE Tank A02 Flush & Clean LIT-0130B Transmitter	Transmitter Level Indicating	142-A02-TNK-0130	06-Nov-20	1	YEARS	05-Nov-21
9682	M9 Portable TOC No. 2 Replace Consumables 3 MO.	M9 Portable TOC Analyzer No. 2 Permeate	510-PIP-ROP-ROB2	23-Dec-20	3	MONTHS	23-Mar-21
9284	540-SWGR-125VDC Inspect Batteries & Monitor	540 RO Electric 12KV Switchgear 125 VDC Battery Syst	540-SWG12000	09-Jun-20	1	YEARS	04-Jun-21
9681	M9 Portable TOC No. 1 Replace Consumables 3 MO.	Portable M9 TOC Analyzer No.1 RO Feed	510-B02-RO-2200	23-Dec-20	3	MONTHS	23-Mar-21
9296	UVT 2240 Optiview Cleaning & Transmittance Monthly	UV Transmittance Analyzer	510-CPF-0010	08-Feb-21	1	MONTHS	01-Mar-21
9302	SEFE Tank A01 Flush & Clean LIT-0130A Transmitter	Transmitter Level Indicating	142-A01-TNK-0130	18-Nov-20	1	YEARS	05-Nov-21
9304	SEFE Tank A02 Flush & Clean LIT-0130A Transmitter	Transmitter Level Indicating	142-A02-TNK-0130	18-Nov-20	1	YEARS	05-Nov-21

Appendix E

Critical Control Points

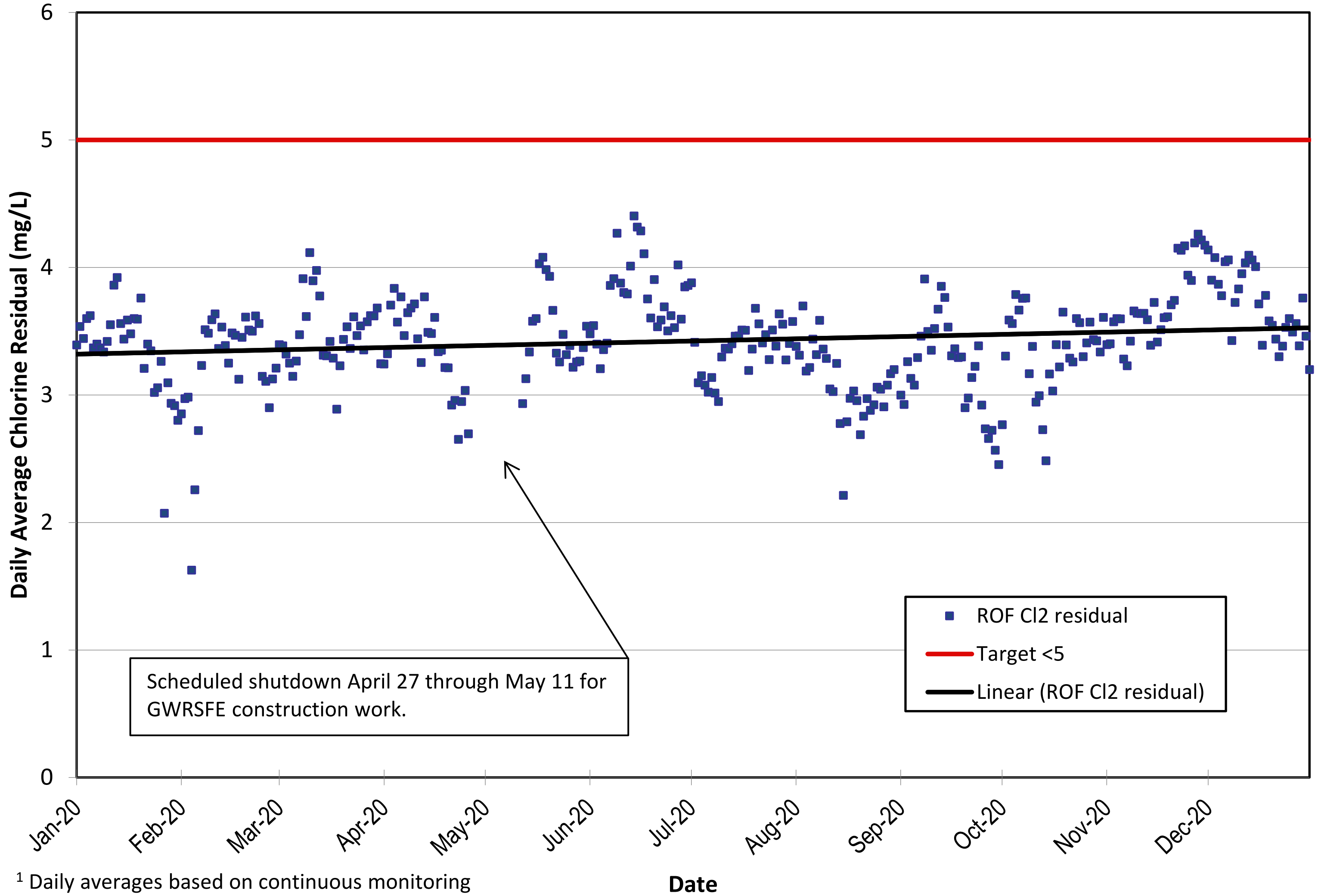
Orange County Water District
Groundwater Replenishment System
2020 Annual Report

Figure E-1
MFF Chlorine Residual[1]



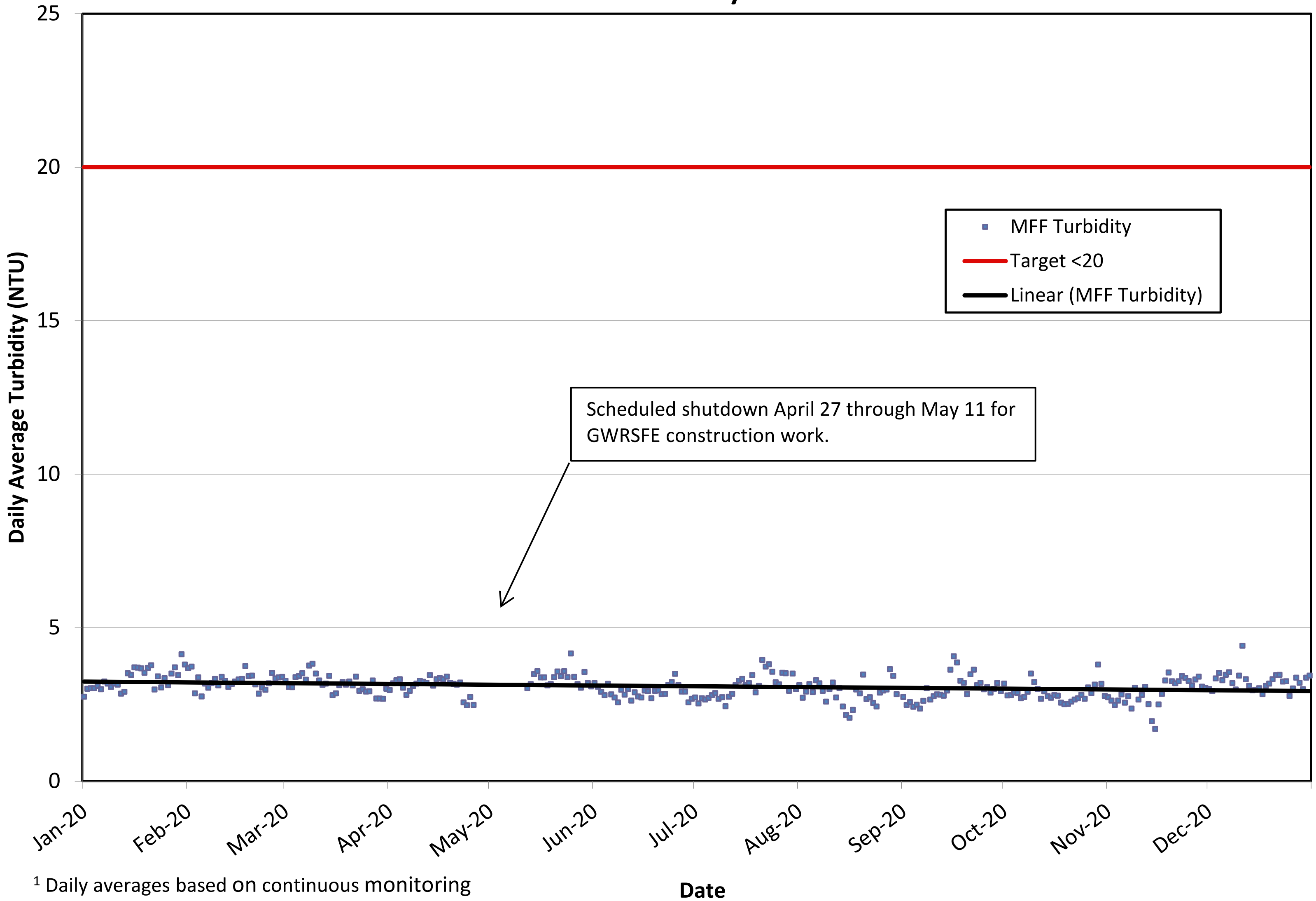
[1] Daily averages based on continuous monitoring

Figure E-2
ROF Chlorine Residual[1]



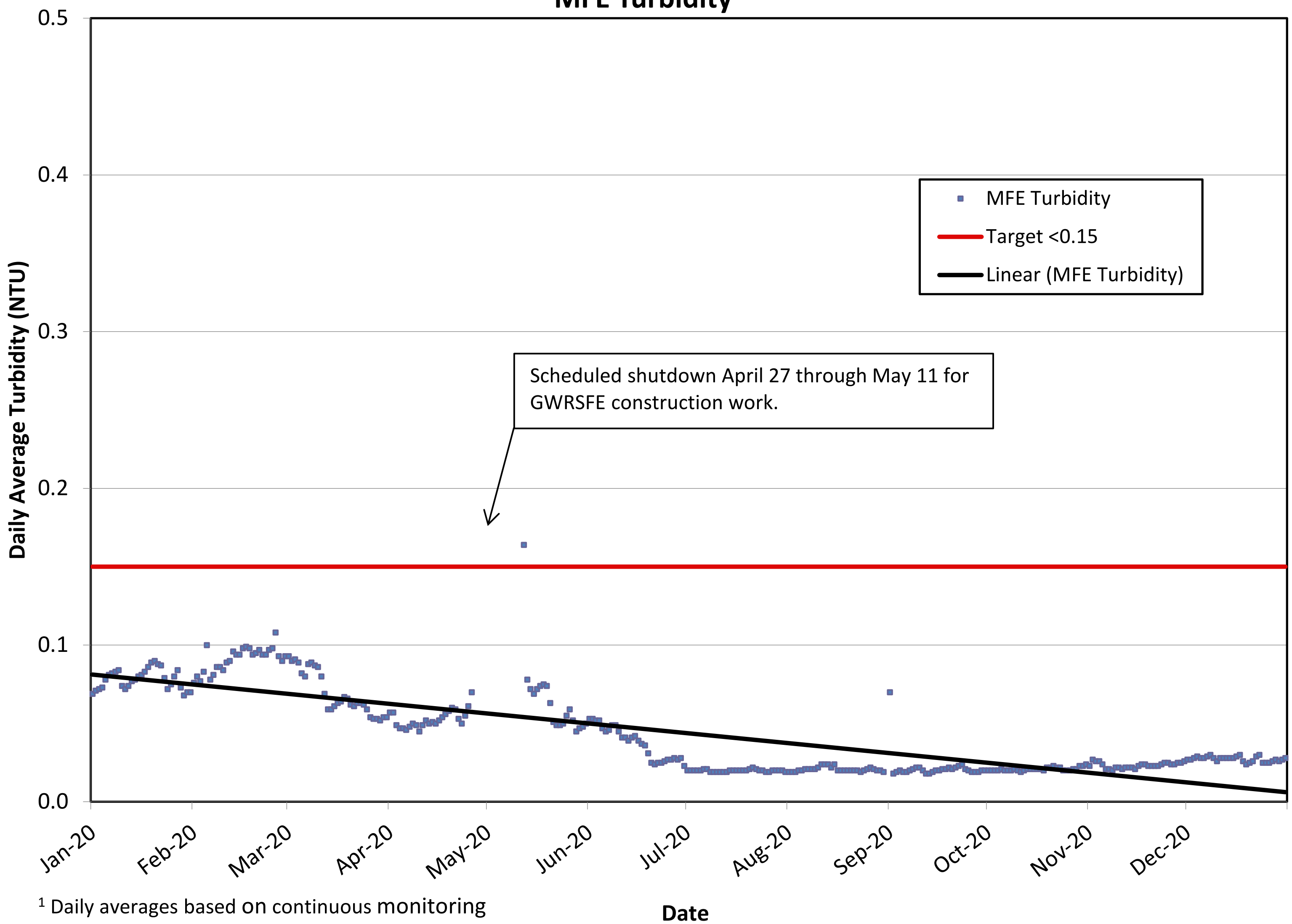
[1] Daily averages based on continuous monitoring

Figure E-3
MFF Turbidity[1]



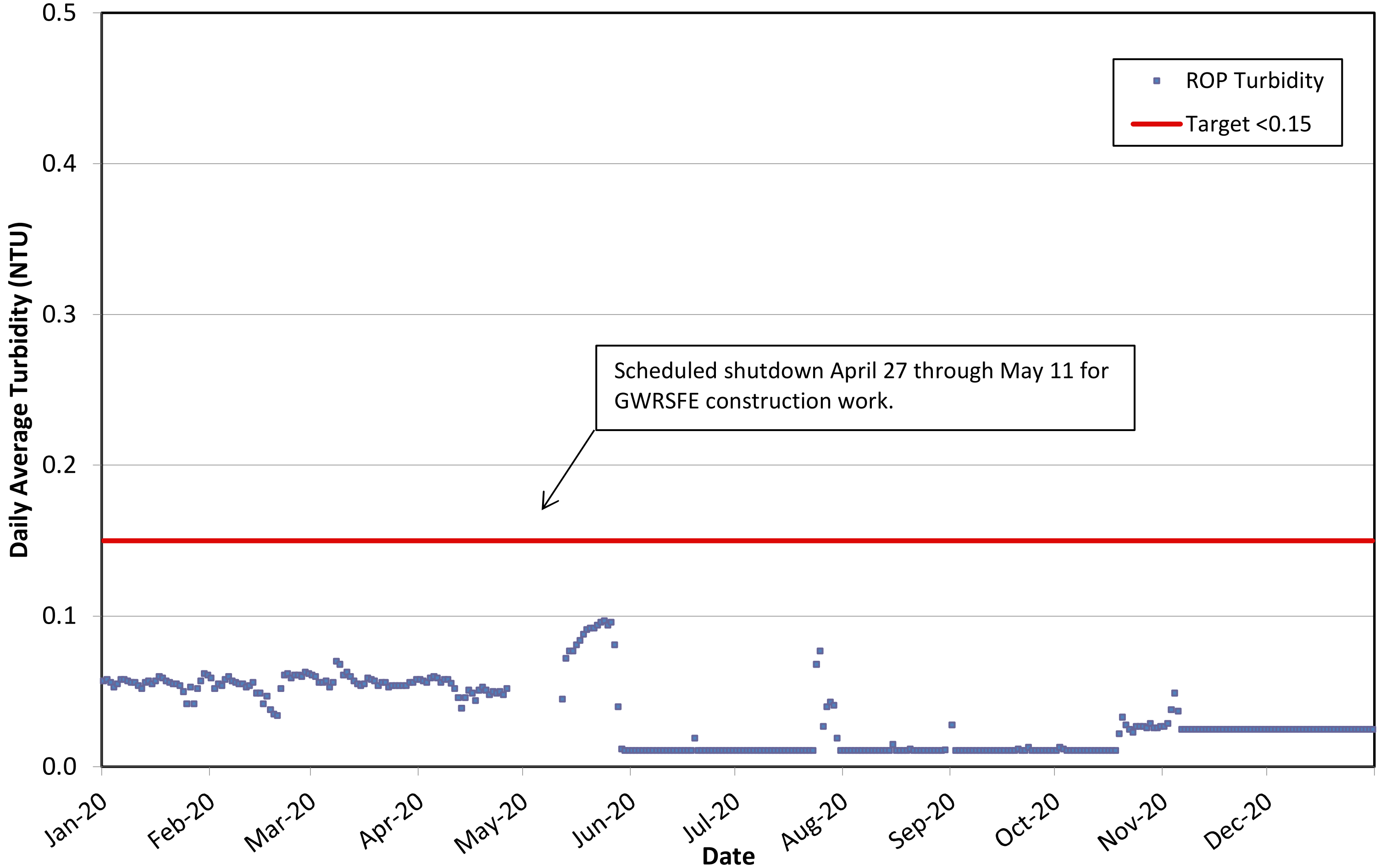
[1] Daily averages based on continuous monitoring

Figure E-4
MFE Turbidity[1]



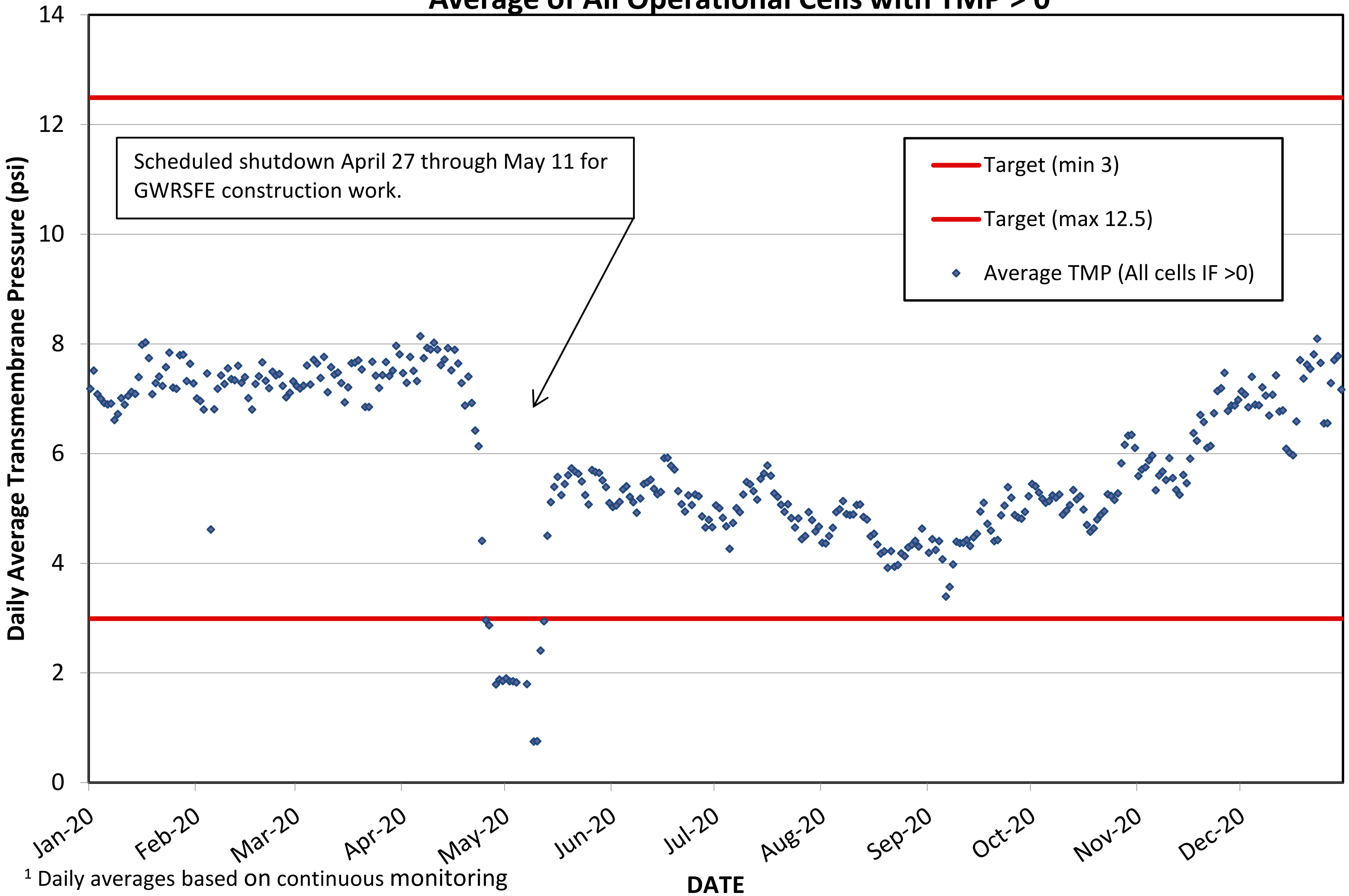
[1] Daily averages based on continuous monitoring

Figure E-5
ROP Turbidity[1]



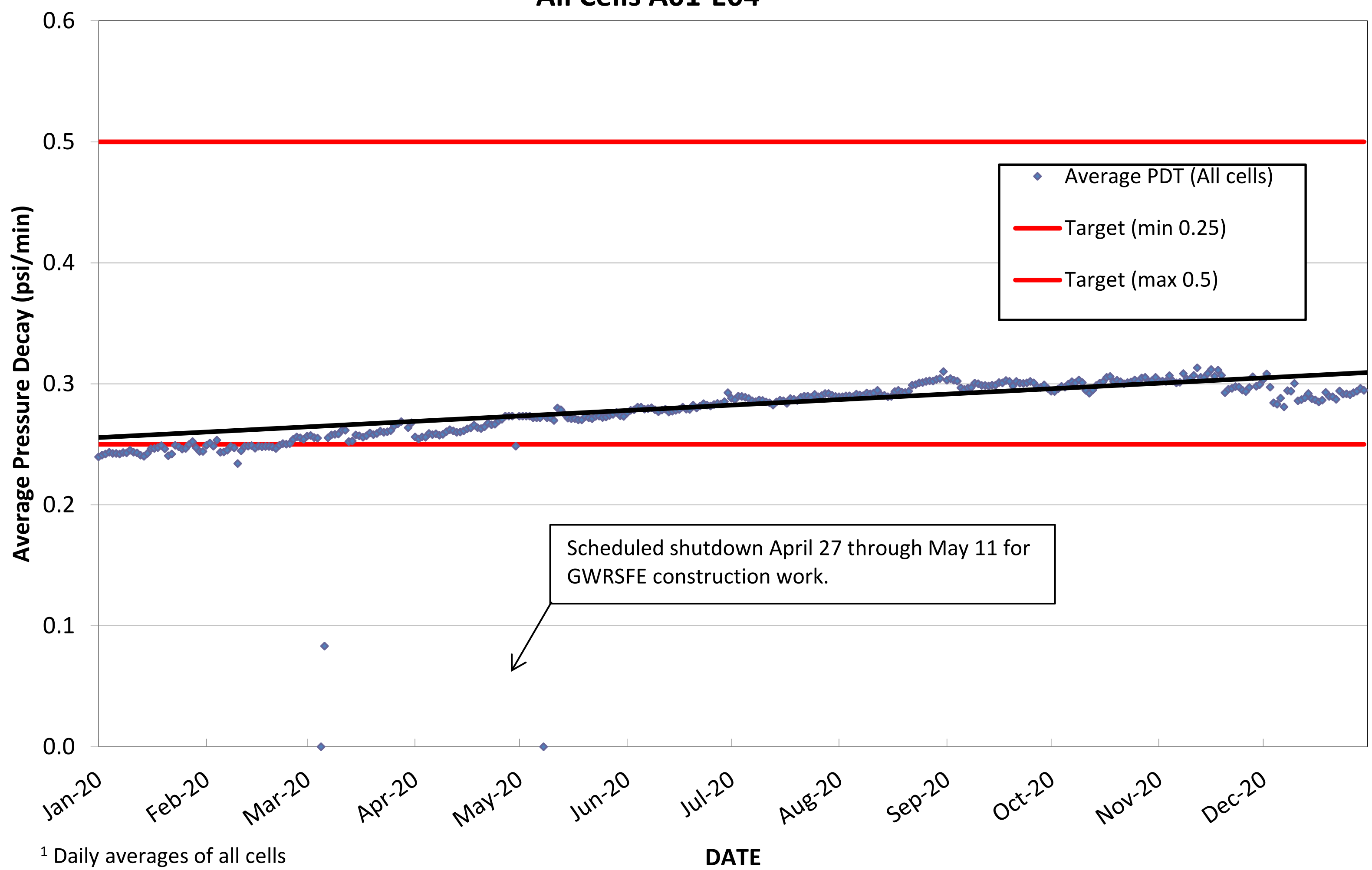
[1] Turbidity shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-6
MF Transmembrane Pressure (TMP)[1]
All Operating Cells A01-E04
Average of All Operational Cells with TMP > 0



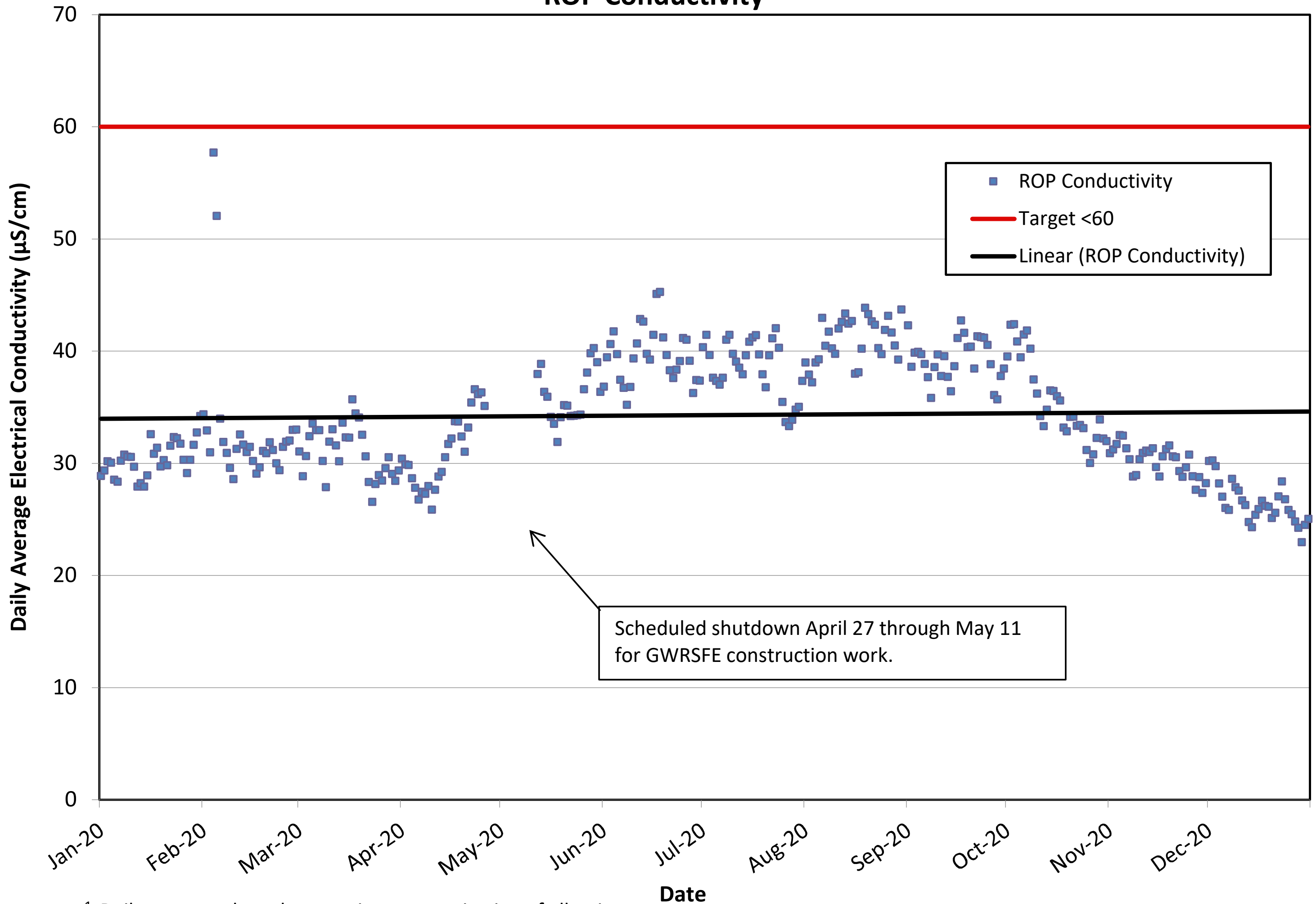
[1] Daily averages based on continuous monitoring

Figure E-7
MF Pressure Decay Test (PDT)
All Cells A01-E04[1]



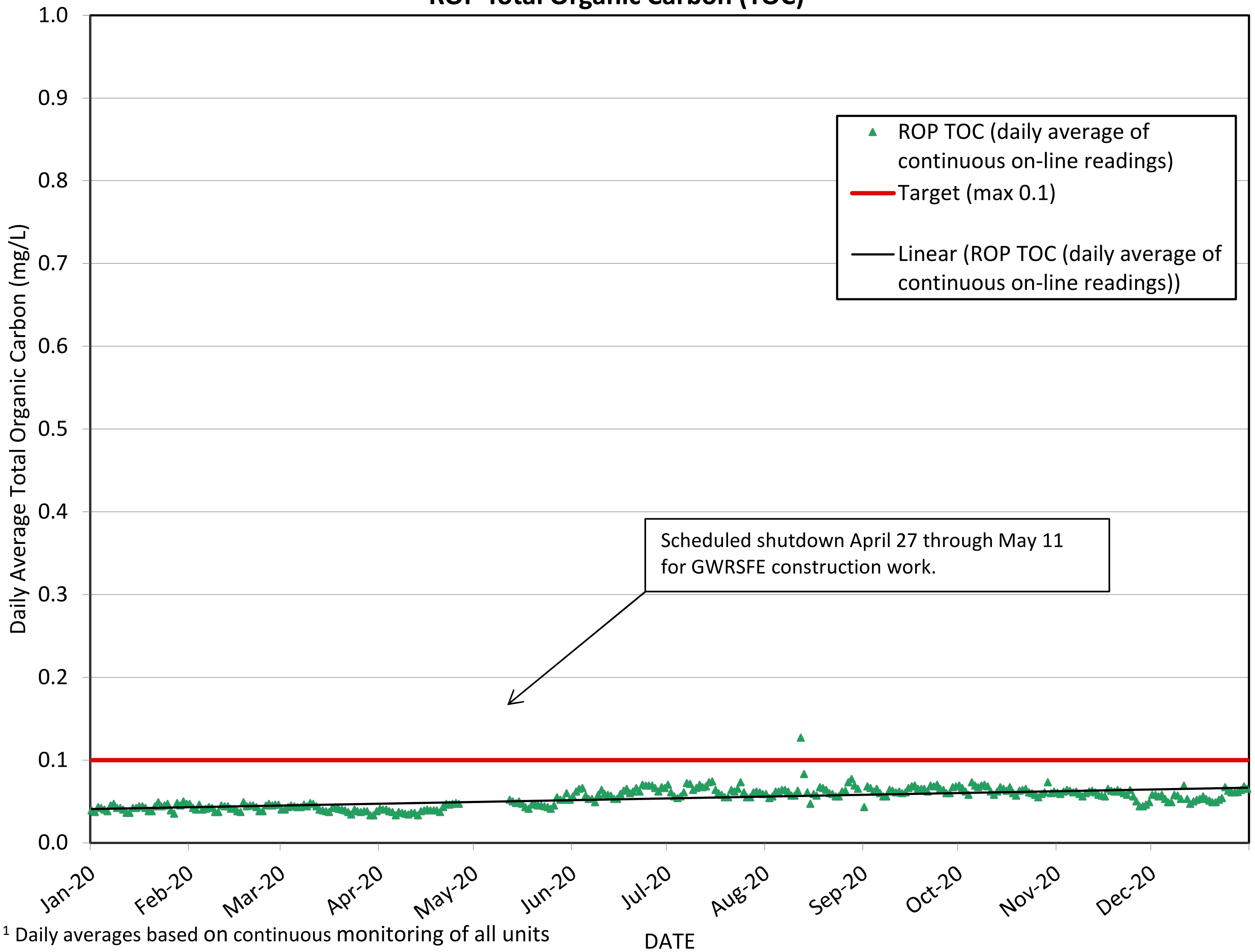
[1] Daily averages of all cells

Figure E-8
ROP Conductivity[1]



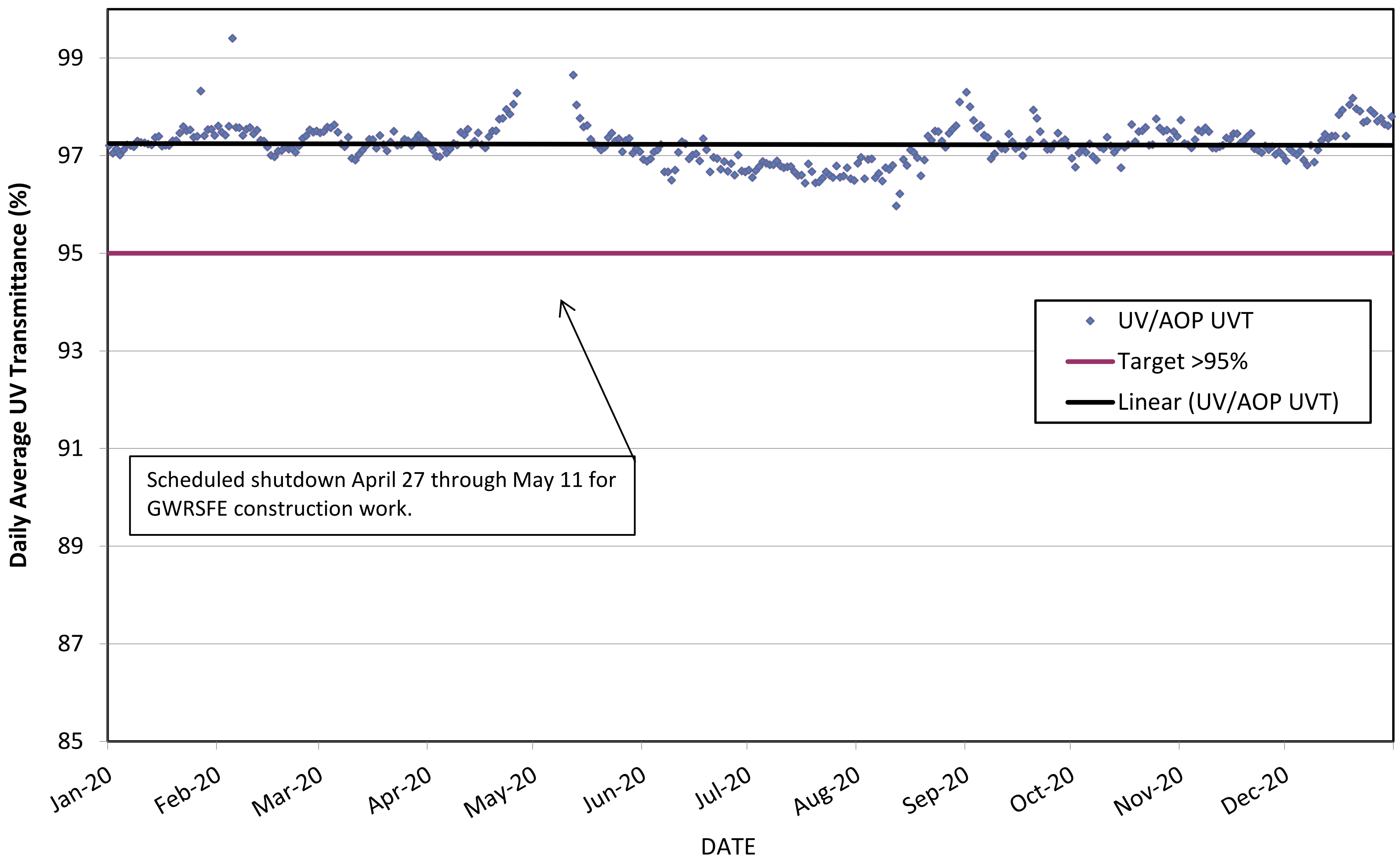
[1] Daily averages based on continuous monitoring of all units.
Electrical conductivity data for ROP are not normalized

Figure E-9
ROP Total Organic Carbon (TOC)[1]



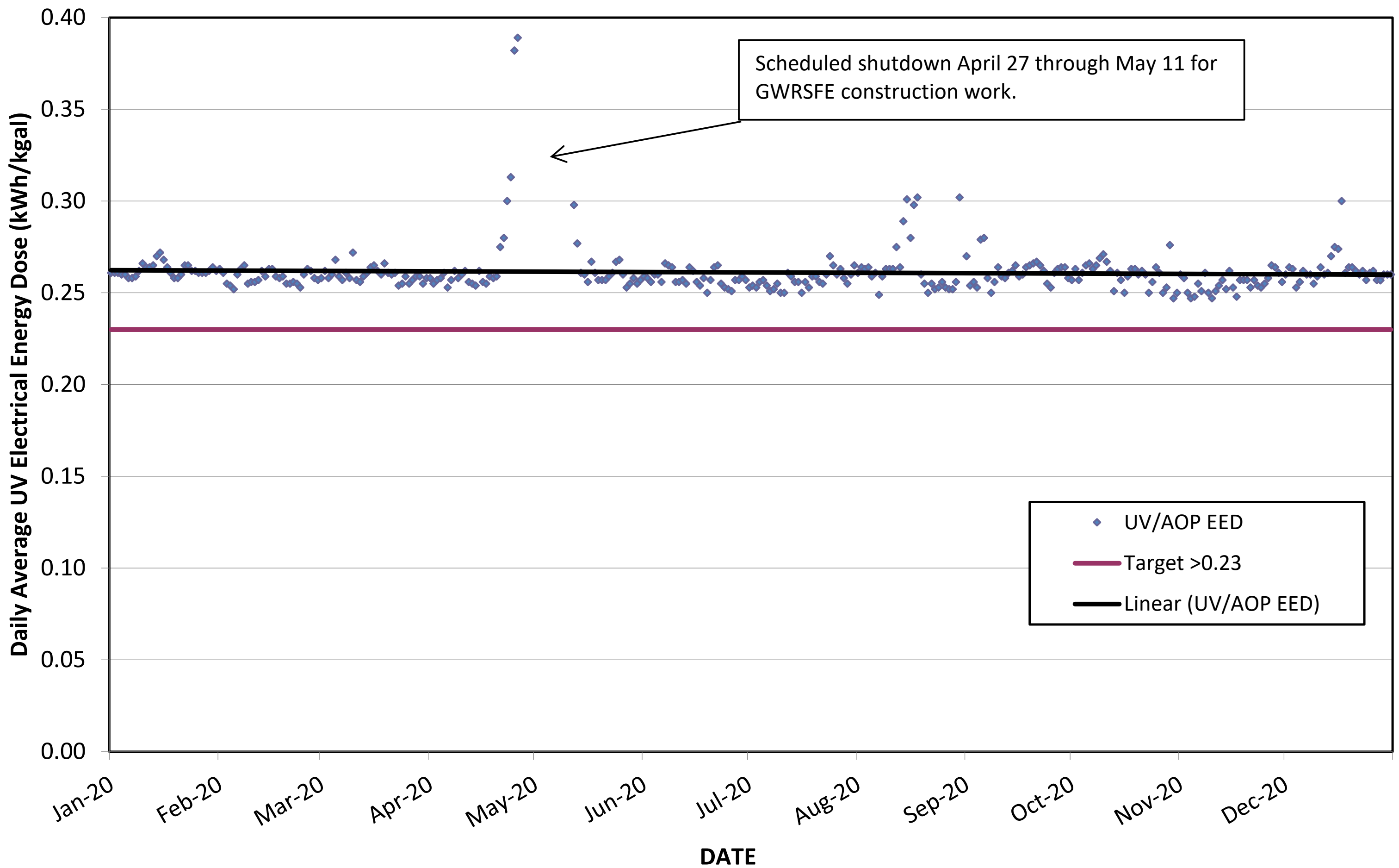
[1] Daily averages based on continuous monitoring of all units

Figure E-10
UV/AOP UV Transmittance [1]



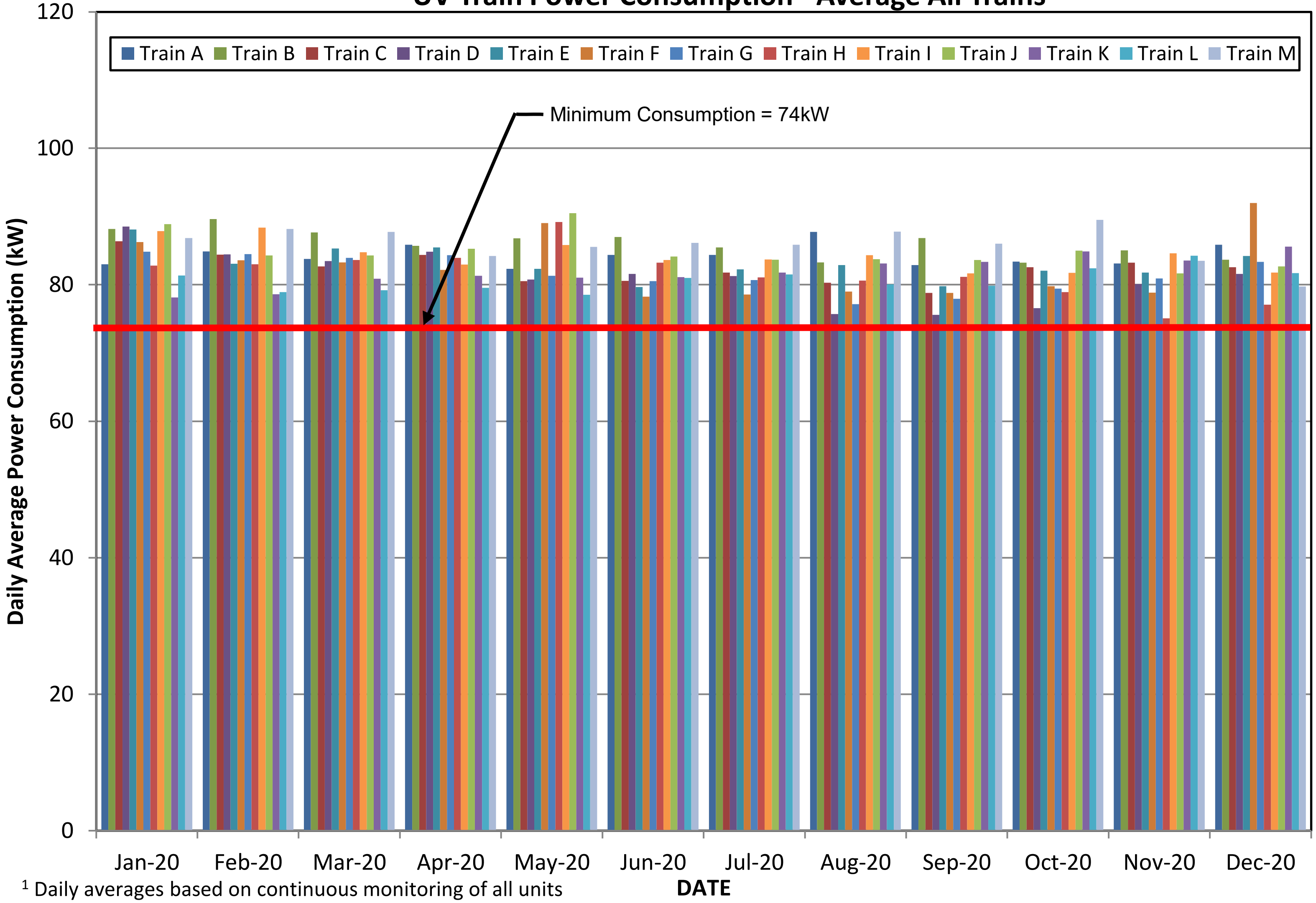
[1] UV Transmittance shown for UVF, which is effectively ROP downstream of hydrogen peroxide addition.
Daily averages based on continuous monitoring

Figure E-11
UV/AOP Electrical Energy Dose (EED)[1]



[1] Daily averages based on continuous monitoring of all units

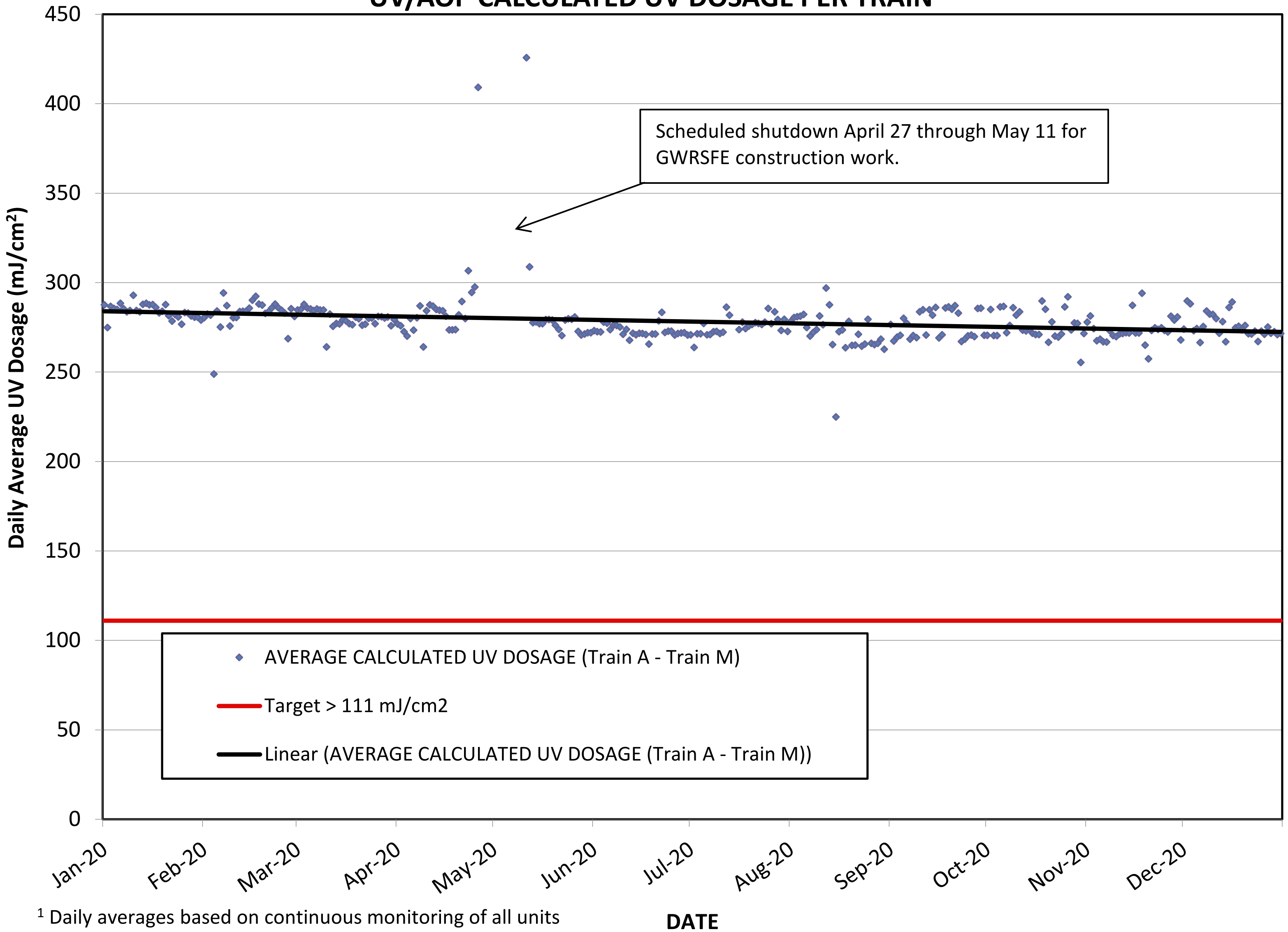
Figure E-12
UV Train Power Consumption - Average All Trains[1]



[1] Daily averages based on continuous monitoring of all units

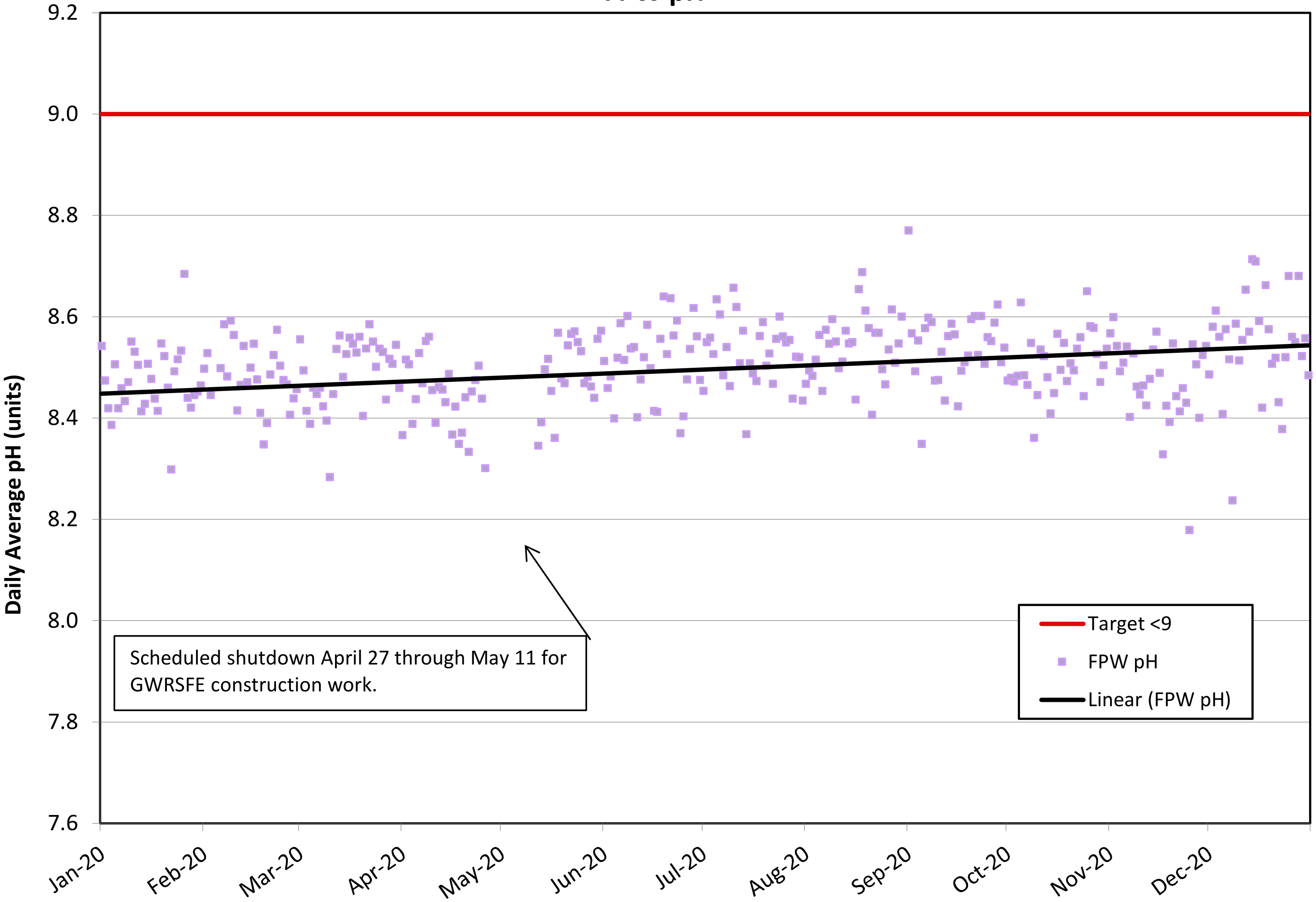
Figure E-13

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
2020 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

	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
01/01/20	12.41	12.41	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/02/20	12.46	12.46	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/03/20	12.45	12.45	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/04/20	12.43	12.43	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/05/20	12.46	12.46	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/06/20	12.46	12.46	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/07/20	12.39	12.39	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/08/20	12.46	12.46	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/09/20	12.46	12.46	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/10/20	12.45	12.45	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/11/20	12.45	12.45	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/12/20	12.46	12.46	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/13/20	12.51	12.51	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/14/20	12.45	12.45	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/15/20	12.44	12.44	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/16/20	12.39	12.39	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/17/20	12.37	12.37	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/18/20	12.37	12.37	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/19/20	12.38	12.38	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/20/20	12.37	12.37	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/21/20	12.42	12.42	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/22/20	12.45	12.45	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/23/20	12.47	12.47	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/24/20	12.43	12.43	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/25/20	12.54	12.54	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/26/20	12.62	12.62	12.30	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/27/20	12.66	12.66	12.36	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/28/20	12.51	12.51	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/29/20	12.52	12.52	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/30/20	12.45	12.45	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
01/31/20	12.44	12.44	12.23	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/20	0.00	4.23	2.18	6.00	0.00	12.41
01/02/20	0.00	4.24	2.22	6.00	0.00	12.46
01/03/20	0.00	4.26	2.19	6.00	0.00	12.45
01/04/20	0.00	4.26	2.17	6.00	0.00	12.43
01/05/20	0.00	4.26	2.20	6.00	0.00	12.46
01/06/20	0.00	4.24	2.22	6.00	0.00	12.46
01/07/20	0.00	4.23	2.16	6.00	0.00	12.39
01/08/20	0.00	4.31	2.15	6.00	0.00	12.46
01/09/20	0.00	4.30	2.17	6.00	0.00	12.46
01/10/20	0.00	4.29	2.17	6.00	0.00	12.45
01/11/20	0.00	4.27	2.18	6.00	0.00	12.45
01/12/20	0.00	4.25	2.21	6.00	0.00	12.46
01/13/20	0.00	4.30	2.21	6.00	0.00	12.51
01/14/20	0.00	4.27	2.18	6.00	0.00	12.45
01/15/20	0.00	4.25	2.19	6.00	0.00	12.44
01/16/20	0.00	4.23	2.16	6.00	0.00	12.39
01/17/20	0.00	4.19	2.17	6.00	0.00	12.37
01/18/20	0.00	4.18	2.19	6.00	0.00	12.37
01/19/20	0.00	4.16	2.21	6.00	0.00	12.38
01/20/20	0.00	4.16	2.22	6.00	0.00	12.37
01/21/20	0.00	4.23	2.18	6.00	0.00	12.42
01/22/20	0.00	4.26	2.20	6.00	0.00	12.45
01/23/20	0.00	4.26	2.21	6.00	0.00	12.47
01/24/20	0.00	4.19	2.24	6.00	0.00	12.43
01/25/20	0.00	4.31	2.23	6.00	0.00	12.54
01/26/20	0.00	4.33	2.30	6.00	0.00	12.62
01/27/20	0.00	4.30	2.36	6.00	0.00	12.66
01/28/20	0.00	4.27	2.24	6.00	0.00	12.51
01/29/20	0.00	4.27	2.25	6.00	0.00	12.52
01/30/20	0.00	4.24	2.21	6.00	0.00	12.45
01/31/20	0.00	4.21	2.23	6.00	0.00	12.44

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
01/01/20	0.00	0.00	2.18	6.00	4.00	12.18
01/02/20	0.00	0.00	2.22	6.00	4.00	12.22
01/03/20	0.00	0.00	2.19	6.00	4.00	12.19
01/04/20	0.00	0.00	2.17	6.00	4.00	12.17
01/05/20	0.00	0.00	2.20	6.00	4.00	12.20
01/06/20	0.00	0.00	2.22	6.00	4.00	12.22
01/07/20	0.00	0.00	2.16	6.00	4.00	12.16
01/08/20	0.00	0.00	2.15	6.00	4.00	12.15
01/09/20	0.00	0.00	2.17	6.00	4.00	12.17
01/10/20	0.00	0.00	2.17	6.00	4.00	12.17
01/11/20	0.00	0.00	2.18	6.00	4.00	12.18
01/12/20	0.00	0.00	2.21	6.00	4.00	12.21
01/13/20	0.00	0.00	2.21	6.00	4.00	12.21
01/14/20	0.00	0.00	2.18	6.00	4.00	12.18
01/15/20	0.00	0.00	2.19	6.00	4.00	12.19
01/16/20	0.00	0.00	2.16	6.00	4.00	12.16
01/17/20	0.00	0.00	2.17	6.00	4.00	12.17
01/18/20	0.00	0.00	2.19	6.00	4.00	12.19
01/19/20	0.00	0.00	2.21	6.00	4.00	12.21
01/20/20	0.00	0.00	2.22	6.00	4.00	12.22
01/21/20	0.00	0.00	2.18	6.00	4.00	12.18
01/22/20	0.00	0.00	2.20	6.00	4.00	12.20
01/23/20	0.00	0.00	2.21	6.00	4.00	12.21
01/24/20	0.00	0.00	2.24	6.00	4.00	12.24
01/25/20	0.00	0.00	2.23	6.00	4.00	12.23
01/26/20	0.00	0.00	2.30	6.00	4.00	12.30
01/27/20	0.00	0.00	2.36	6.00	4.00	12.36
01/28/20	0.00	0.00	2.24	6.00	4.00	12.24
01/29/20	0.00	0.00	2.25	6.00	4.00	12.25
01/30/20	0.00	0.00	2.21	6.00	4.00	12.21
01/31/20	0.00	0.00	2.23	6.00	4.00	12.23

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
01/01/20	4.56	4.83	4.91	4.39	4.63	4.44	4.55	4.46	4.23	4.51	4.72	4.54	4.45	4.50	4.39	4.30
01/02/20	4.54	4.80	4.76	4.34	4.64	4.43	4.53	4.45	4.24	4.54	4.70	4.55	4.53	4.48	4.39	4.28
01/03/20	4.50	4.76	4.83	4.58	4.59	4.64	4.51	4.45	4.46	4.55	4.69	4.51	4.47	4.49	4.38	4.26
01/04/20	4.53	4.76	4.82	4.67	4.58	4.66	4.50	4.43	4.49	4.54	4.70	4.49	4.42	4.47	4.34	4.26
01/05/20	4.50	4.75	4.85	4.60	4.58	4.63	4.47	4.47	4.50	4.53	4.71	4.48	4.43	4.46	4.34	4.26
01/06/20	4.82	4.71	4.81	4.58	4.53	4.65	4.50	4.46	4.46	4.53	4.72	4.49	4.45	4.46	4.34	4.24
01/07/20	4.81	4.71	4.80	4.57	4.52	4.61	4.72	4.46	4.45	4.52	4.72	4.73	4.47	4.41	4.32	4.23
01/08/20	4.76	4.71	4.81	4.55	4.49	4.63	4.74	4.49	4.49	4.45	4.69	4.81	4.47	4.40	4.31	4.44
01/09/20	4.77	4.71	4.75	4.52	4.49	4.61	4.74	4.48	4.43	4.46	4.67	4.80	4.45	4.40	4.49	4.52
01/10/20	4.70	4.67	4.72	4.50	4.48	4.58	4.70	4.42	4.43	4.41	4.68	4.75	4.42	4.39	4.55	4.49
01/11/20	4.75	4.63	4.66	4.45	4.51	4.52	4.70	4.43	4.42	4.43	4.66	4.75	4.40	4.35	4.54	4.47
01/12/20	4.73	4.59	4.63	4.45	4.49	4.58	4.67	4.41	4.42	4.45	4.63	4.78	4.38	4.37	4.52	4.50
01/13/20	4.73	4.60	4.66	4.43	4.48	4.57	4.65	4.42	4.40	4.45	4.65	4.76	4.38	4.35	4.52	4.49
01/14/20	4.72	4.59	4.65	4.43	4.49	4.57	4.61	4.52	4.39	4.39	4.64	4.73	4.38	4.34	4.52	4.46
01/15/20	4.69	4.59	4.61	4.40	4.52	4.52	4.67	4.49	4.37	4.34	4.65	4.76	4.36	4.29	4.51	4.46
01/16/20	4.71	4.47	4.60	4.68	4.49	4.48	4.64	4.45	4.34	4.32	4.60	4.67	4.28	4.23	4.51	4.43
01/17/20	4.67	4.51	4.55	4.50	4.44	4.44	4.62	4.44	4.37	4.34	4.50	4.66	4.27	4.22	4.46	4.42
01/18/20	4.64	4.85	4.45	4.53	4.40	4.49	4.62	4.40	4.29	4.33	4.48	4.68	4.27	4.18	4.46	4.38
01/19/20	4.60	4.78	4.75	4.51	4.67	4.48	4.60	4.36	4.31	4.27	4.48	4.63	4.27	4.16	4.49	4.38
01/20/20	4.59	4.85	4.80	4.51	4.67	4.46	4.62	4.37	4.31	4.31	4.50	4.65	4.26	4.16	4.49	4.38
01/21/20	4.59	4.74	4.74	4.45	4.60	4.48	4.61	4.38	4.28	4.29	4.46	4.68	4.23	4.41	4.48	4.37
01/22/20	4.62	4.79	4.73	4.41	4.65	4.47	4.60	4.39	4.26	4.55	4.45	4.64	4.45	4.50	4.46	4.36
01/23/20	4.62	4.78	4.71	4.50	4.65	4.45	4.58	4.46	4.26	4.50	4.45	4.59	4.50	4.42	4.42	4.33
01/24/20	4.53	4.72	4.73	4.41	4.56	4.41	4.57	4.44	4.19	4.50	4.68	4.56	4.44	4.42	4.41	4.29
01/25/20	4.53	4.74	4.68	4.37	4.60	4.38	4.54	4.41	4.49	4.44	4.76	4.59	4.46	4.46	4.41	4.32
01/26/20	4.48	4.71	4.64	4.33	4.57	4.44	4.53	4.37	4.52	4.50	4.72	4.58	4.45	4.45	4.39	4.34
01/27/20	4.49	4.64	4.59	4.41	4.51	4.38	4.56	4.32	4.48	4.50	4.71	4.54	4.46	4.43	4.38	4.31
01/28/20	4.47	4.71	4.67	4.73	4.57	4.33	4.49	4.40	4.48	4.44	4.72	4.53	4.41	4.37	4.36	4.27
01/29/20	4.47	4.67	4.69	4.60	4.56	4.31	4.53	4.37	4.47	4.46	4.70	4.48	4.36	4.48	4.35	4.27
01/30/20	4.79	4.68	4.64	4.52	4.57	4.51	4.51	4.31	4.41	4.45	4.65	4.48	4.38	4.62	4.33	4.24
01/31/20	4.76	4.61	4.58	4.42	4.55	4.53	4.44	4.31	4.46	4.41	4.62	4.70	4.39	4.51	4.30	4.21

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
01/01/20	4.30	4.32	4.40	4.51	4.49	4.44	4.44	4.50	4.41	4.39	4.45	4.43	4.71	4.46	4.50	4.44
01/02/20	4.28	4.53	4.36	4.55	4.47	4.40	4.39	4.47	4.56	4.35	4.46	4.39	4.72	4.46	4.49	4.44
01/03/20	4.53	4.51	4.32	4.55	4.43	4.34	4.33	4.43	4.67	4.45	4.46	4.35	4.71	4.45	4.46	4.35
01/04/20	4.60	4.39	4.30	4.55	4.37	4.38	4.31	4.43	4.65	4.65	4.45	4.37	4.72	4.45	4.44	4.48
01/05/20	4.54	4.42	4.31	4.52	4.37	4.42	4.35	4.43	4.65	4.64	4.42	4.39	4.69	4.41	4.42	4.73
01/06/20	4.54	4.44	4.32	4.52	4.37	4.39	4.36	4.41	4.62	4.64	4.42	4.37	4.67	4.40	4.42	4.74
01/07/20	4.51	4.43	4.29	4.51	4.56	4.31	4.47	4.40	4.61	4.64	4.41	4.36	4.69	4.37	4.41	4.73
01/08/20	4.46	4.41	4.46	4.50	4.65	4.47	4.58	4.38	4.64	4.62	4.40	4.32	4.64	4.33	4.37	4.68
01/09/20	4.43	4.38	4.54	4.44	4.55	4.60	4.55	4.48	4.67	4.59	4.36	4.30	4.62	4.34	4.35	4.69
01/10/20	4.42	4.34	4.50	4.42	4.49	4.55	4.51	4.59	4.65	4.54	4.35	4.29	4.61	4.35	4.32	4.68
01/11/20	4.41	4.32	4.45	4.59	4.44	4.53	4.47	4.51	4.62	4.52	4.37	4.27	4.61	4.34	4.28	4.65
01/12/20	4.42	4.31	4.41	4.65	4.44	4.48	4.47	4.54	4.62	4.49	4.37	4.25	4.60	4.33	4.29	4.61
01/13/20	4.42	4.30	4.42	4.57	4.46	4.43	4.48	4.50	4.61	4.53	4.37	4.32	4.57	4.30	4.30	4.57
01/14/20	4.42	4.29	4.42	4.52	4.44	4.45	4.46	4.48	4.58	4.67	4.34	4.53	4.53	4.27	4.27	4.56
01/15/20	4.39	4.28	4.38	4.48	4.40	4.47	4.44	4.44	4.57	4.63	4.30	4.52	4.51	4.34	4.25	4.56
01/16/20	4.34	4.37	4.32	4.42	4.52	4.42	4.41	4.38	4.55	4.49	4.25	4.48	4.50	4.48	4.24	4.58
01/17/20	4.27	4.41	4.39	4.40	4.58	4.36	4.49	4.33	4.53	4.45	4.19	4.44	4.46	4.47	4.33	4.52
01/18/20	4.47	4.40	4.40	4.56	4.52	4.42	4.57	4.31	4.53	4.45	4.18	4.46	4.49	4.44	4.56	4.53
01/19/20	4.57	4.38	4.35	4.58	4.48	4.47	4.54	4.45	4.52	4.42	4.18	4.43	4.51	4.43	4.50	4.51
01/20/20	4.53	4.37	4.38	4.50	4.45	4.49	4.49	4.56	4.52	4.43	4.34	4.41	4.50	4.45	4.48	4.50
01/21/20	4.51	4.37	4.41	4.45	4.43	4.50	4.43	4.50	4.49	4.61	4.48	4.41	4.48	4.44	4.48	4.50
01/22/20	4.47	4.35	4.39	4.47	4.40	4.49	4.38	4.47	4.49	4.61	4.42	4.44	4.51	4.40	4.47	4.49
01/23/20	4.41	4.34	4.32	4.46	4.38	4.42	4.37	4.43	4.50	4.32	4.45	4.41	4.73	4.41	4.45	4.47
01/24/20	4.36	4.30	4.38	4.37	4.45	4.36	4.34	4.41	4.44	4.25	4.48	4.35	4.69	4.44	4.43	4.48
01/25/20	4.36	4.39	4.44	4.50	4.51	4.35	4.36	4.38	4.43	4.31	4.44	4.33	4.73	4.44	4.41	4.44
01/26/20	4.38	4.43	4.44	4.56	4.51	4.36	4.38	4.34	4.42	4.33	4.40	4.33	4.78	4.44	4.41	4.37
01/27/20	4.37	4.40	4.41	4.49	4.47	4.46	4.47	4.48	4.39	4.30	4.41	4.31	4.76	4.42	4.38	4.37
01/28/20	4.32	4.34	4.35	4.47	4.40	4.50	4.50	4.59	4.53	4.30	4.36	4.32	4.65	4.37	4.30	4.36
01/29/20	4.30	4.35	4.31	4.43	4.38	4.44	4.43	4.50	4.73	4.42	4.35	4.36	4.65	4.34	4.30	4.44
01/30/20	4.27	4.35	4.32	4.39	4.37	4.39	4.43	4.46	4.67	4.60	4.40	4.34	4.75	4.34	4.37	4.75
01/31/20	4.41	4.50	4.33	4.50	4.44	4.39	4.40	4.41	4.66	4.60	4.40	4.31	4.95	4.34	4.29	4.65

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
01/01/20	4.60	4.62	5.04	4.72
01/02/20	4.53	4.55	5.09	4.88
01/03/20	4.50	4.56	4.97	4.83
01/04/20	4.55	4.57	4.93	4.95
01/05/20	4.51	4.56	4.85	4.97
01/06/20	4.53	4.58	4.88	5.06
01/07/20	4.58	4.58	4.90	5.06
01/08/20	4.72	4.58	4.98	4.91
01/09/20	4.63	4.56	5.03	4.98
01/10/20	4.59	4.56	4.99	5.06
01/11/20	4.55	4.57	4.97	4.91
01/12/20	4.56	4.55	4.98	4.94
01/13/20	4.60	4.52	4.87	5.02
01/14/20	4.56	4.52	4.99	4.90
01/15/20	4.51	4.54	5.05	4.76
01/16/20	4.51	4.50	4.96	4.87
01/17/20	4.65	4.44	4.96	4.79
01/18/20	4.60	4.44	5.01	4.72
01/19/20	4.57	4.38	4.94	4.70
01/20/20	4.54	4.41	4.99	4.64
01/21/20	4.51	4.39	4.83	4.78
01/22/20	4.51	4.39	4.88	4.86
01/23/20	4.50	4.38	4.87	4.78
01/24/20	4.50	4.41	4.95	4.70
01/25/20	4.57	4.60	4.94	4.86
01/26/20	4.68	4.53	5.09	4.79
01/27/20	4.58	4.55	4.89	4.85
01/28/20	4.57	4.55	4.90	5.07
01/29/20	4.56	4.55	5.12	4.78
01/30/20	4.48	4.54	4.91	4.87
01/31/20	4.43	4.52	4.80	4.94

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

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
01/01/20	0.07	0.08	0.05	0.06	0.09	0.09	0.10	0.10	0.06	0.07	0.06	0.06	0.07	0.08	0.07	0.08	0.05	0.06	0.07
01/02/20	0.07	0.08	0.06	0.07	0.09	0.09	0.10	0.10	0.07	0.09	0.06	0.07	0.07	0.08	0.07	0.08	0.05	0.06	0.07
01/03/20	0.07	0.10	0.06	0.07	0.09	0.09	0.09	0.10	0.08	0.08	0.07	0.08	0.07	0.08	0.06	0.07	0.05	0.06	0.07
01/04/20	0.07	0.08	0.06	0.07	0.09	0.09	0.09	0.10	0.08	0.09	0.07	0.08	0.08	0.11	0.07	0.08	0.05	0.07	0.07
01/05/20	0.07	0.09	0.07	0.08	0.09	0.09	0.09	0.10	0.09	0.10	0.08	0.10	0.08	0.13	0.07	0.08	0.06	0.07	0.08
01/06/20	0.07	0.08	0.06	0.07	0.09	0.09	0.09	0.10	0.10	0.83 *	0.08	0.12	0.09	0.11	0.07	0.08	0.06	0.07	0.08
01/07/20	0.07	0.08	0.06	0.07	0.08	0.09	0.09	0.11	0.10	0.10	0.09	0.11	0.10	0.12	0.08	0.08	0.07	0.07	0.08
01/08/20	0.07	0.08	0.06	0.06	0.08	0.09	0.10	0.10	0.10	0.11	0.09	0.11	0.10	0.12	0.08	0.09	0.07	0.07	0.08
01/09/20	0.07	0.08	0.06	0.06	0.08	0.09	0.10	0.11	0.11	0.12	0.09	0.11	0.10	0.13	0.07	0.08	0.07	0.07	0.08
01/10/20	0.07	0.10	0.06	0.07	0.09	0.09	0.10	0.10	0.08	0.11	0.08	0.09	0.07	0.12	0.06	0.07	0.07	0.07	0.07
01/11/20	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.10	0.07	0.08	0.08	0.08	0.04	0.07	0.07	0.07	0.07	0.07	0.07
01/12/20	0.06	0.08	0.07	0.08	0.09	0.10	0.10	0.10	0.08	0.09	0.08	0.09	0.05	0.07	0.07	0.09	0.06	0.07	0.07
01/13/20	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.10	0.08	0.11	0.09	0.10	0.06	0.08	0.07	0.08	0.07	0.07	0.08
01/14/20	0.07	0.08	0.08	0.09	0.08	0.09	0.09	0.12	0.09	0.11	0.09	0.11	0.06	0.08	0.07	0.08	0.07	0.07	0.08
01/15/20	0.07	0.09	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.11	0.10	0.11	0.07	0.08	0.07	0.11	0.07	0.07	0.08
01/16/20	0.07	0.09	0.07	0.09	0.08	0.12	0.09	0.09	0.10	0.11	0.10	0.13	0.07	0.09	0.07	0.08	0.07	0.09	0.08
01/17/20	0.07	0.08	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.12	0.11	0.13	0.08	0.09	0.08	0.11	0.07	0.08	0.08
01/18/20	0.07	0.08	0.08	0.10	0.08	0.10	0.09	0.09	0.10	0.12	0.11	0.14	0.08	0.10	0.08	0.12	0.08	0.09	0.09
01/19/20	0.07	0.11	0.08	0.09	0.09	0.09	0.09	0.10	0.11	0.12	0.11	0.13	0.09	0.14	0.08	0.09	0.08	0.09	0.09
01/20/20	0.07	0.09	0.08	0.09	0.09	0.09	0.09	0.12	0.11	0.12	0.12	0.13	0.09	0.11	0.09	0.12	0.08	0.09	0.09
01/21/20	0.07	0.08	0.07	0.08	0.08	0.13	0.09	0.10	0.11	0.13	0.12	0.13	0.08	0.10	0.08	0.09	0.08	0.09	0.09
01/22/20	0.07	0.08	0.07	0.08	0.08	0.09	0.09	0.09	0.11	0.12	0.12	0.14	0.08	0.10	0.08	0.09	0.08	0.10	0.09
01/23/20	0.06	0.08	0.07	0.08	0.08	0.09	0.09	0.10	0.09	0.13	0.10	0.12	0.08	0.13	0.08	0.12	0.07	0.08	0.08
01/24/20	0.05	0.07	0.07	0.08	0.07	0.09	0.09	0.10	0.07	0.08	0.09	0.12	0.05	0.07	0.08	0.10	0.07	0.09	0.07
01/25/20	0.07	0.08	0.08	0.08	0.07	0.09	0.09	0.09	0.08	0.11	0.09	0.13	0.04	0.05	0.09	0.09	0.07	0.10	0.07
01/26/20	0.08	0.08	0.08	0.10	0.08	0.08	0.09	0.10	0.08	0.10	0.09	0.11	0.04	0.06	0.09	0.10	0.08	0.09	0.08
01/27/20	0.08	0.11	0.08	0.08	0.08	0.08	0.10	0.10	0.09	0.12	0.10	0.15	0.05	0.06	0.09	0.14	0.08	0.10	0.08
01/28/20	0.07	0.10	0.06	0.08	0.07	0.09	0.10	0.11	0.07	0.09	0.07	0.16	0.05	0.09	0.09	0.09	0.07	0.11	0.07
01/29/20	0.06	0.12	0.05	0.11	0.06	0.06	0.10	0.11	0.07	0.10	0.06	0.10	0.05	0.08	0.09	0.10	0.07	0.08	0.07
01/30/20	0.06	0.09	0.05	0.05	0.06	0.07	0.10	0.10	0.07	0.11	0.06	0.10	0.06	0.08	0.09	0.09	0.08	0.09	0.07
01/31/20	0.05	0.07	0.05	0.06	0.06	0.07	0.09	0.10	0.08	0.11	0.06	0.09	0.07	0.08	0.09	0.10	0.08	0.10	0.07

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* The higher than normal turbidity value occurred when diffused air bubbles passed through the turbidity meter due to a mechanical issue following PDT allowing entrained air to enter the filtrate stream.

Cell membrane integrity remained intact.

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
01/01/20	0.057	0.057	7.419	6.827	8.416	0.049	0.041	0.055	1,656	1,606	1,715	29	27	32	99.35	2.18	98.26	1.76
01/02/20	0.057	0.058	7.682	7.033	8.575	0.046	0.043	0.054	1,628	1,548	1,757	29	26	34	99.40	2.22	98.20	1.75
01/03/20	0.056	0.060	7.855	7.209	8.732	0.051	0.046	0.059	1,707	1,634	1,795	30	28	33	99.35	2.19	98.23	1.75
01/04/20	0.053	0.053	7.783	6.985	8.651	0.052	0.046	0.060	1,694	1,626	1,763	30	28	34	99.33	2.17	98.22	1.75
01/05/20	0.055	0.056	7.983	7.163	9.049	0.050	0.046	0.055	1,655	1,593	1,747	29	26	32	99.37	2.20	98.27	1.76
01/06/20	0.057	0.059	7.707	6.892	8.526	0.047	0.036	0.056	1,639	1,526	1,773	28	26	32	99.39	2.22	98.27	1.76
01/07/20	0.058	0.058	7.882	7.070	8.724	0.055	0.050	0.060	1,737	1,631	1,859	30	27	35	99.31	2.16	98.26	1.76
01/08/20	0.057	0.058	7.842	7.124	8.694	0.056	0.051	0.060	1,781	1,716	1,860	31	28	35	99.29	2.15	98.27	1.76
01/09/20	0.056	0.057	7.675	7.013	8.357	0.052	0.046	0.064	1,786	1,716	1,893	31	28	34	99.32	2.17	98.29	1.77
01/10/20	0.056	0.057	7.610	7.064	8.448	0.052	0.047	0.064	1,797	1,728	1,882	31	28	34	99.32	2.17	98.30	1.77
01/11/20	0.053	0.055	7.624	6.894	8.410	0.050	0.045	0.055	1,759	1,696	1,820	30	28	32	99.34	2.18	98.31	1.77
01/12/20	0.051	0.057	7.435	5.117	8.410	0.046	0.042	0.051	1,696	1,629	1,758	28	26	30	99.38	2.21	98.35	1.78
01/13/20	0.056	0.057	7.587	6.951	8.450	0.046	0.043	0.055	1,673	1,580	1,763	28	26	31	99.39	2.21	98.32	1.77
01/14/20	0.056	0.057	8.032	7.447	8.680	0.053	0.047	0.059	1,741	1,655	1,843	28	25	32	99.34	2.18	98.40	1.80
01/15/20	0.055	0.056	7.894	7.349	8.755	0.051	0.045	0.084	1,753	1,692	1,822	29	25	34	99.35	2.19	98.36	1.78
01/16/20	0.056	0.057	7.989	7.408	8.644	0.055	0.051	0.062	1,757	1,705	1,817	33	30	36	99.31	2.16	98.15	1.73
01/17/20	0.060	0.063	8.123	7.489	8.861	0.054	0.050	0.074	1,779	1,718	1,848	31	28	34	99.33	2.17	98.26	1.76
01/18/20	0.059	0.061	8.190	7.467	9.085	0.053	0.046	0.071	1,755	1,691	1,819	31	29	35	99.35	2.19	98.21	1.75
01/19/20	0.057	0.058	7.924	7.367	8.629	0.049	0.045	0.054	1,682	1,613	1,743	30	27	33	99.39	2.21	98.24	1.75
01/20/20	0.056	0.056	7.924	7.265	8.989	0.048	0.043	0.060	1,689	1,600	1,806	30	27	35	99.39	2.22	98.21	1.75
01/21/20	0.054	0.055	8.273	7.635	9.086	0.054	0.050	0.060	1,727	1,652	1,809	30	26	33	99.35	2.18	98.28	1.76
01/22/20	0.055	0.056	7.939	7.374	8.732	0.050	0.041	0.227*	1,795	1,719	1,894	31	27	37	99.36	2.20	98.25	1.76
01/23/20	0.054	0.056	7.939	7.341	8.574	0.049	0.040	0.361**	1,782	1,721	1,863	32	30	36	99.38	2.21	98.18	1.74
01/24/20	0.051	0.060	7.926	7.337	8.624	0.046	0.042	0.107***	1,791	1,720	1,856	32	28	36	99.42	2.24	98.20	1.75
01/25/20	0.041	0.051	8.014	7.289	8.622	0.047	0.042	0.056	1,763	1,702	1,841	32	29	35	99.41	2.23	98.19	1.74
01/26/20	0.048	0.055	7.820	7.215	8.572	0.040	0.034	0.051	1,682	1,640	1,745	30	28	34	99.49	2.30	98.19	1.74
01/27/20	0.041	0.051	7.899	7.107	8.904	0.035	0.030	0.054	1,609	1,552	1,660	29	27	33	99.56	2.36	98.19	1.74
01/28/20	0.052	0.055	8.191	7.450	9.014	0.047	0.042	0.069	1,700	1,619	1,824	30	27	34	99.43	2.24	98.22	1.75
01/29/20	0.056	0.061	8.046	7.495	8.864	0.045	0.041	0.057	1,747	1,678	1,820	32	28	36	99.44	2.25	98.19	1.74
01/30/20	0.062	0.063	8.233	7.635	8.647	0.051	0.047	0.109	1,787	1,713	1,869	33	29	38	99.39	2.21	98.17	1.74
01/31/20	0.061	0.062	7.893	5.310	8.624	0.047	0.044	0.053	1,801	1,719	1,866	34	28	39	99.41	2.23	98.10	1.72

Notes:

* The higher than normal TOC value reflects a temporary spike due to returning RO Unit E01 to service after a cleaning of its 3rd stage membranes.

** Value shown was found to be false after further investigation and issue with TOC analyzer causing a false value was resolved.

*** The higher than normal TOC value reflects a temporary spike due to returning RO Unit E01 to service after single element flow testing membranes from one of its third stage vessels.

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
01/01/20	97.21	96.349	24,601.2	0.26	3.0	6
01/02/20	97.04	96.054	25,148.3	0.26	3.0	6
01/03/20	97.15	95.634	25,018.3	0.26	3.0	6
01/04/20	97.01	97.113	25,138.6	0.26	3.0	6
01/05/20	97.11	96.320	25,216.4	0.26	3.0	6
01/06/20	97.22	94.822	24,678.9	0.26	3.0	6
01/07/20	97.20	94.659	24,437.2	0.26	3.0	6
01/08/20	97.18	95.723	24,946.0	0.26	3.0	6
01/09/20	97.30	96.732	25,241.6	0.26	3.0	6
01/10/20	97.27	99.664	26,158.9	0.26	3.0	6
01/11/20	97.26	97.507	25,976.8	0.26	3.0	6
01/12/20	97.23	96.719	25,593.6	0.26	3.0	6
01/13/20	97.21	94.898	25,567.4	0.26	3.0	6
01/14/20	97.37	94.992	25,126.2	0.27	3.0	6
01/15/20	97.40	94.646	25,698.1	0.27	3.0	6
01/16/20	97.20	96.880	25,504.1	0.27	3.0	6
01/17/20	97.21	97.007	25,778.0	0.27	3.0	6
01/18/20	97.20	95.496	25,201.1	0.26	3.0	6
01/19/20	97.30	94.747	24,890.4	0.26	3.0	6
01/20/20	97.31	94.822	24,493.3	0.26	3.0	6
01/21/20	97.46	94.745	24,506.1	0.26	3.0	6
01/22/20	97.60	93.766	24,687.7	0.26	3.0	6
01/23/20	97.50	98.093	25,629.5	0.27	3.0	6
01/24/20	97.53	96.293	25,446.4	0.26	3.0	6
01/25/20	97.38	96.133	25,261.9	0.26	3.0	6
01/26/20	97.38	95.897	25,146.6	0.26	3.0	6
01/27/20	98.32	94.933	25,072.1	0.26	3.0	6
01/28/20	97.42	94.645	24,769.4	0.26	3.0	6
01/29/20	97.54	95.629	24,618.3	0.26	3.0	6
01/30/20	97.54	95.604	24,843.5	0.26	3.0	6
01/31/20	97.41	97.135	25,156.9	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
02/01/20	12.53	12.53	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/02/20	12.51	12.51	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/03/20	12.51	12.51	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/04/20	12.51	12.51	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/05/20	12.54	12.54	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/06/20	12.45	12.45	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/07/20	12.46	12.46	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/08/20	12.46	12.46	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/09/20	12.58	12.58	12.33	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/10/20	12.18	12.18	12.29	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/11/20	12.46	12.46	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/12/20	12.43	12.43	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/13/20	12.42	12.42	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/14/20	12.42	12.42	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/15/20	12.40	12.40	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/16/20	12.52	12.52	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/17/20	12.51	12.51	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/18/20	12.44	12.44	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/19/20	12.44	12.44	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/20/20	12.43	12.43	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/21/20	12.45	12.45	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/22/20	12.44	12.44	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/23/20	12.47	12.47	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/24/20	12.46	12.46	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/25/20	12.40	12.40	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/26/20	12.45	12.45	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/27/20	12.42	12.42	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/28/20	12.38	12.38	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
02/29/20	12.41	12.41	12.16	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/20	0.00	4.29	2.24	6.00	0.00	12.53
02/02/20	0.00	4.23	2.28	6.00	0.00	12.51
02/03/20	0.00	4.21	2.29	6.00	0.00	12.51
02/04/20	0.00	4.24	2.27	6.00	0.00	12.51
02/05/20	0.00	4.30	2.24	6.00	0.00	12.54
02/06/20	0.00	4.30	2.15	6.00	0.00	12.45
02/07/20	0.00	4.30	2.16	6.00	0.00	12.46
02/08/20	0.00	4.26	2.20	6.00	0.00	12.46
02/09/20	0.00	4.25	2.33	6.00	0.00	12.58
02/10/20	0.00	3.89	2.29	6.00	0.00	12.18
02/11/20	0.00	4.28	2.18	6.00	0.00	12.46
02/12/20	0.00	4.25	2.17	6.00	0.00	12.43
02/13/20	0.00	4.24	2.18	6.00	0.00	12.42
02/14/20	0.00	4.23	2.19	6.00	0.00	12.42
02/15/20	0.00	4.20	2.20	6.00	0.00	12.40
02/16/20	0.00	4.29	2.23	6.00	0.00	12.52
02/17/20	0.00	4.28	2.23	6.00	0.00	12.51
02/18/20	0.00	4.27	2.17	6.00	0.00	12.44
02/19/20	0.00	4.25	2.19	6.00	0.00	12.44
02/20/20	0.00	4.24	2.18	6.00	0.00	12.43
02/21/20	0.00	4.28	2.17	6.00	0.00	12.45
02/22/20	0.00	4.27	2.18	6.00	0.00	12.44
02/23/20	0.00	4.26	2.21	6.00	0.00	12.47
02/24/20	0.00	4.25	2.21	6.00	0.00	12.46
02/25/20	0.00	4.24	2.17	6.00	0.00	12.40
02/26/20	0.00	4.28	2.17	6.00	0.00	12.45
02/27/20	0.00	4.25	2.18	6.00	0.00	12.42
02/28/20	0.00	4.23	2.15	6.00	0.00	12.38
02/29/20	0.00	4.25	2.16	6.00	0.00	12.41

Notes:

Orange County Water District - Ground Water Replenishment System (GWRS)
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	Documented Virus Reduction Achieved					
	OCSD	MF+Cl_2	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
02/01/20	0.00	0.00	2.24	6.00	4.00	12.24
02/02/20	0.00	0.00	2.28	6.00	4.00	12.28
02/03/20	0.00	0.00	2.29	6.00	4.00	12.29
02/04/20	0.00	0.00	2.27	6.00	4.00	12.27
02/05/20	0.00	0.00	2.24	6.00	4.00	12.24
02/06/20	0.00	0.00	2.15	6.00	4.00	12.15
02/07/20	0.00	0.00	2.16	6.00	4.00	12.16
02/08/20	0.00	0.00	2.20	6.00	4.00	12.20
02/09/20	0.00	0.00	2.33	6.00	4.00	12.33
02/10/20	0.00	0.00	2.29	6.00	4.00	12.29
02/11/20	0.00	0.00	2.18	6.00	4.00	12.18
02/12/20	0.00	0.00	2.17	6.00	4.00	12.17
02/13/20	0.00	0.00	2.18	6.00	4.00	12.18
02/14/20	0.00	0.00	2.19	6.00	4.00	12.19
02/15/20	0.00	0.00	2.20	6.00	4.00	12.20
02/16/20	0.00	0.00	2.23	6.00	4.00	12.23
02/17/20	0.00	0.00	2.23	6.00	4.00	12.23
02/18/20	0.00	0.00	2.17	6.00	4.00	12.17
02/19/20	0.00	0.00	2.19	6.00	4.00	12.19
02/20/20	0.00	0.00	2.18	6.00	4.00	12.18
02/21/20	0.00	0.00	2.17	6.00	4.00	12.17
02/22/20	0.00	0.00	2.18	6.00	4.00	12.18
02/23/20	0.00	0.00	2.21	6.00	4.00	12.21
02/24/20	0.00	0.00	2.21	6.00	4.00	12.21
02/25/20	0.00	0.00	2.17	6.00	4.00	12.17
02/26/20	0.00	0.00	2.17	6.00	4.00	12.17
02/27/20	0.00	0.00	2.18	6.00	4.00	12.18
02/28/20	0.00	0.00	2.15	6.00	4.00	12.15
02/29/20	0.00	0.00	2.16	6.00	4.00	12.16

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)
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	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
02/01/20	4.79	4.61	4.62	4.49	4.52	4.51	4.48	4.47	4.43	4.43	4.68	4.75	4.37	4.48	4.29	4.43
02/02/20	4.73	4.55	4.63	4.45	4.51	4.58	4.46	4.45	4.41	4.40	4.64	4.77	4.37	4.47	4.32	4.52
02/03/20	4.78	4.66	4.59	4.47	4.51	4.60	4.70	4.41	4.45	4.38	4.67	4.76	4.36	4.47	4.29	4.51
02/04/20	4.76	4.64	4.54	4.43	4.53	4.61	4.73	4.47	4.45	4.39	4.67	4.76	4.35	4.47	4.27	4.52
02/05/20	4.75	4.64	4.61	4.48	4.54	4.60	4.74	4.50	4.45	4.43	4.68	4.80	4.39	4.49	4.30	4.50
02/06/20	4.72	4.67	4.63	4.53	4.54	4.58	4.73	4.47	4.44	4.46	4.68	4.80	4.38	4.45	4.30	4.48
02/07/20	4.74	4.64	4.53	4.46	4.55	4.54	4.72	4.47	4.45	4.42	4.66	4.78	4.36	4.44	4.44	4.47
02/08/20	4.67	4.59	4.55	4.41	4.51	4.51	4.66	4.42	4.38	4.41	4.62	4.79	4.33	4.42	4.51	4.44
02/09/20	4.72	4.55	4.54	4.39	4.52	4.49	4.66	4.45	4.40	4.40	4.61	4.77	4.32	4.45	4.52	4.42
02/10/20	4.76	4.54	4.50	4.41	4.51	4.52	4.70	4.44	4.40	4.38	4.62	4.75	4.34	4.40	4.55	4.43
02/11/20	4.70	4.53	4.77	4.36	4.52	4.53	4.69	4.52	4.37	4.34	4.62	4.72	4.33	4.37	4.52	4.41
02/12/20	4.59	4.53	4.79	4.66	4.42	4.51	4.67	4.42	4.32	4.34	4.59	4.70	4.28	4.32	4.49	4.41
02/13/20	4.69	4.49	4.78	4.50	4.36	4.48	4.65	4.37	4.34	4.32	4.54	4.72	4.24	4.36	4.49	4.37
02/14/20	4.68	4.45	4.74	4.57	4.33	4.49	4.60	4.44	4.34	4.32	4.54	4.70	4.23	4.34	4.50	4.36
02/15/20	4.60	4.81	4.68	4.53	4.58	4.48	4.58	4.43	4.32	4.56	4.55	4.71	4.20	4.28	4.48	4.35
02/16/20	4.60	4.77	4.71	4.48	4.57	4.50	4.58	4.42	4.29	4.52	4.50	4.68	4.40	4.47	4.44	4.35
02/17/20	4.65	4.80	4.78	4.49	4.65	4.51	4.63	4.41	4.28	4.53	4.50	4.66	4.49	4.61	4.44	4.37
02/18/20	4.66	4.74	4.77	4.45	4.68	4.49	4.64	4.39	4.27	4.54	4.51	4.64	4.49	4.55	4.47	4.37
02/19/20	4.66	4.81	4.65	4.38	4.66	4.50	4.63	4.39	4.25	4.53	4.43	4.64	4.44	4.54	4.42	4.34
02/20/20	4.58	4.80	4.64	4.43	4.62	4.43	4.58	4.52	4.24	4.52	4.39	4.63	4.45	4.58	4.40	4.33
02/21/20	4.60	4.80	4.69	4.43	4.64	4.44	4.59	4.51	4.53	4.50	4.64	4.57	4.47	4.58	4.40	4.30
02/22/20	4.57	4.79	4.69	4.40	4.61	4.48	4.59	4.46	4.54	4.50	4.69	4.58	4.46	4.56	4.40	4.29
02/23/20	4.57	4.79	4.63	4.41	4.55	4.46	4.57	4.47	4.56	4.45	4.70	4.56	4.42	4.53	4.38	4.26
02/24/20	4.52	4.76	4.65	4.38	4.63	4.43	4.59	4.43	4.52	4.47	4.70	4.56	4.43	4.52	4.37	4.28
02/25/20	4.49	4.77	4.64	4.33	4.51	4.41	4.51	4.43	4.47	4.46	4.69	4.56	4.41	4.49	4.38	4.27
02/26/20	4.53	4.70	4.56	4.31	4.51	4.67	4.54	4.39	4.48	4.45	4.65	4.48	4.41	4.44	4.37	4.29
02/27/20	4.71	4.63	4.49	4.68	4.50	4.59	4.52	4.34	4.48	4.44	4.62	4.71	4.35	4.43	4.37	4.29
02/28/20	4.78	4.64	4.54	4.52	4.54	4.58	4.53	4.34	4.48	4.38	4.65	4.75	4.35	4.42	4.32	4.46
02/29/20	4.78	4.59	4.51	4.42	4.56	4.56	4.48	4.51	4.42	4.38	4.65	4.75	4.35	4.38	4.28	4.52

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
02/01/20	4.50	4.53	4.40	4.61	4.51	4.40	4.39	4.42	4.66	4.57	4.40	4.29	4.94	4.35	4.31	4.60
02/02/20	4.50	4.48	4.44	4.52	4.49	4.39	4.41	4.41	4.63	4.53	4.40	4.23	4.68	4.34	4.34	4.63
02/03/20	4.48	4.45	4.41	4.51	4.46	4.35	4.41	4.40	4.65	4.48	4.39	4.21	4.68	4.32	4.34	4.67
02/04/20	4.48	4.44	4.39	4.53	4.46	4.32	4.41	4.40	4.66	4.44	4.41	4.24	4.78	4.32	4.35	4.65
02/05/20	4.48	4.45	4.45	4.56	4.46	4.37	4.42	4.41	4.70	4.58	4.42	4.30	4.77	4.32	4.35	4.69
02/06/20	4.47	4.45	4.49	4.54	4.44	4.42	4.44	4.39	4.69	4.70	4.41	4.36	4.79	4.33	4.36	4.74
02/07/20	4.42	4.41	4.42	4.43	4.40	4.37	4.38	4.34	4.63	4.56	4.38	4.30	4.63	4.36	4.35	4.63
02/08/20	4.41	4.36	4.38	4.43	4.40	4.36	4.34	4.30	4.60	4.44	4.37	4.26	4.47	4.32	4.33	4.62
02/09/20	4.41	4.33	4.37	4.44	4.40	4.47	4.32	4.28	4.58	4.51	4.34	4.25	4.59	4.26	4.32	4.66
02/10/20	4.40	4.33	4.37	4.42	4.37	4.56	4.34	4.30	4.59	4.49	4.33	4.36	4.21 *	4.25	4.31	4.59
02/11/20	4.37	4.28	4.31	4.38	4.33	4.51	4.43	4.44	4.61	4.60	4.33	4.50	4.62	4.35	4.30	4.59
02/12/20	4.34	4.28	4.30	4.51	4.41	4.48	4.53	4.55	4.56	4.56	4.33	4.47	4.73	4.54	4.25	4.56
02/13/20	4.32	4.43	4.30	4.57	4.51	4.47	4.52	4.49	4.48	4.48	4.31	4.44	4.64	4.47	4.25	4.51
02/14/20	4.31	4.46	4.40	4.52	4.48	4.43	4.48	4.43	4.49	4.48	4.30	4.42	4.56	4.46	4.35	4.50
02/15/20	4.29	4.46	4.44	4.52	4.46	4.39	4.47	4.44	4.50	4.51	4.28	4.43	4.56	4.44	4.51	4.52
02/16/20	4.46	4.43	4.39	4.50	4.45	4.35	4.44	4.47	4.51	4.50	4.37	4.42	4.57	4.44	4.48	4.53
02/17/20	4.57	4.40	4.40	4.47	4.41	4.39	4.43	4.44	4.49	4.43	4.51	4.44	4.54	4.46	4.46	4.53
02/18/20	4.54	4.37	4.42	4.42	4.40	4.38	4.43	4.40	4.50	4.38	4.44	4.45	4.47	4.46	4.39	4.52
02/19/20	4.52	4.35	4.40	4.42	4.37	4.36	4.40	4.33	4.53	4.37	4.44	4.40	4.46	4.42	4.40	4.51
02/20/20	4.47	4.35	4.33	4.42	4.32	4.37	4.36	4.33	4.49	4.34	4.42	4.35	4.55	4.39	4.44	4.49
02/21/20	4.44	4.31	4.28	4.57	4.47	4.35	4.33	4.35	4.48	4.34	4.40	4.33	4.75	4.42	4.44	4.43
02/22/20	4.41	4.27	4.30	4.58	4.53	4.29	4.47	4.31	4.45	4.35	4.43	4.33	4.77	4.45	4.40	4.43
02/23/20	4.39	4.28	4.29	4.49	4.46	4.29	4.56	4.28	4.41	4.34	4.43	4.33	4.74	4.43	4.38	4.39
02/24/20	4.37	4.25	4.28	4.45	4.46	4.27	4.50	4.41	4.40	4.32	4.42	4.30	4.72	4.43	4.37	4.39
02/25/20	4.33	4.36	4.24	4.40	4.42	4.34	4.44	4.53	4.50	4.45	4.40	4.31	4.71	4.38	4.38	4.39
02/26/20	4.29	4.45	4.37	4.38	4.35	4.47	4.38	4.47	4.59	4.66	4.38	4.28	4.67	4.35	4.33	4.46
02/27/20	4.26	4.44	4.47	4.54	4.30	4.49	4.38	4.42	4.65	4.56	4.39	4.25	4.67	4.35	4.35	4.71
02/28/20	4.23	4.41	4.43	4.55	4.32	4.44	4.39	4.40	4.68	4.49	4.36	4.27	4.70	4.31	4.38	4.69
02/29/20	4.49	4.40	4.38	4.52	4.30	4.42	4.37	4.39	4.63	4.46	4.35	4.25	4.66	4.33	4.35	4.64

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell D05 failed an initial pressure decay test (PDT) and a subsequent follow up test also failed. The cell was then taken offline to investigate issue. Value shown is from the third the third PDT conducted 2.5 hours later, after which cell was returned to service. Inspection revealed small leak in cell backwash supply valve that was repaired.

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MicroFiltration Process online monitoring results

Log Removal Value

Date	E01 LRV	E02 LRV	E03 LRV	E04 LRV
02/01/20	4.50	4.54	4.87	4.59
02/02/20	4.43	4.52	4.99	4.54
02/03/20	4.47	4.57	4.92	4.69
02/04/20	4.71	4.59	5.11	4.79
02/05/20	4.69	4.61	5.09	4.83
02/06/20	4.66	4.62	5.14	4.88
02/07/20	4.61	4.56	5.37	4.81
02/08/20	4.56	4.54	4.89	4.79
02/09/20	4.59	4.53	4.93	4.72
02/10/20	4.56	4.55	4.92	4.93
02/11/20	4.51	4.48	4.84	4.97
02/12/20	4.53	4.50	4.86	4.77
02/13/20	4.46	4.48	4.84	4.83
02/14/20	4.51	4.45	4.83	4.86
02/15/20	4.60	4.41	4.74	4.76
02/16/20	4.56	4.39	4.79	4.68
02/17/20	4.48	4.37	4.76	4.59
02/18/20	4.50	4.35	4.97	4.51
02/19/20	4.47	4.37	5.34	4.48
02/20/20	4.48	4.33	4.91	4.63
02/21/20	4.50	4.36	4.79	4.40
02/22/20	4.49	4.54	4.82	4.51
02/23/20	4.53	4.55	4.75	4.69
02/24/20	4.53	4.60	4.82	4.44
02/25/20	4.51	4.58	4.97	4.41
02/26/20	4.51	4.53	4.88	4.53
02/27/20	4.45	4.50	4.84	4.35
02/28/20	4.41	4.50	5.05	4.42
02/29/20	4.42	4.52	4.80	4.49

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)
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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
02/01/20	0.07	0.10	0.06	0.07	0.06	0.07	0.09	0.10	0.09	0.14	0.06	0.10	0.07	0.08	0.10	0.10	0.08	0.09	0.08
02/02/20	0.08	0.08	0.06	0.08	0.06	0.07	0.10	0.11	0.10	0.13	0.07	0.12	0.07	0.09	0.10	0.10	0.09	0.09	0.08
02/03/20	0.07	0.10	0.07	0.07	0.06	0.07	0.10	0.11	0.09	0.13	0.07	0.13	0.07	0.09	0.09	0.10	0.09	0.12	0.08
02/04/20	0.07	0.08	0.07	0.08	0.06	0.08	0.10	0.10	0.09	0.09	0.07	0.07	0.06	0.07	0.09	0.09	0.09	0.09	0.08
02/05/20	0.07	0.12	0.07	0.10	0.06	0.10	0.09	0.14	0.09	0.16	0.08	0.29 *	0.07	0.27	0.09	0.15	0.09	0.11	0.08
02/06/20	0.06	0.07	0.07	0.08	0.06	0.07	0.09	0.11	0.10	0.14	0.08	0.13	0.06	0.07	0.09	0.09	0.09	0.10	0.08
02/07/20	0.07	0.08	0.07	0.08	0.06	0.07	0.09	0.10	0.10	0.14	0.09	0.12	0.06	0.08	0.09	0.09	0.09	0.11	0.08
02/08/20	0.08	0.09	0.08	0.08	0.07	0.08	0.10	0.10	0.10	0.16	0.09	0.12	0.07	0.11	0.09	0.11	0.10	0.12	0.09
02/09/20	0.08	0.11	0.07	0.08	0.06	0.08	0.10	0.11	0.10	0.15	0.10	0.15	0.07	0.10	0.09	0.10	0.10	0.14	0.09
02/10/20	0.08	0.08	0.07	0.07	0.06	0.07	0.09	0.10	0.10	0.11	0.10	0.13	0.08	0.14	0.09	0.12	0.09	0.10	0.08
02/11/20	0.08	0.09	0.07	0.12	0.06	0.07	0.09	0.10	0.11	0.14	0.11	0.24 *	0.09	0.11	0.09	0.10	0.10	0.11	0.09
02/12/20	0.08	0.12	0.07	0.08	0.06	0.08	0.09	0.10	0.11	0.19	0.11	0.21 *	0.09	0.12	0.09	0.10	0.10	0.11	0.09
02/13/20	0.10	0.12	0.07	0.08	0.06	0.07	0.09	0.10	0.12	0.24 *	0.12	0.20	0.11	0.15	0.10	0.12	0.10	0.12	0.10
02/14/20	0.09	0.11	0.07	0.11	0.06	0.08	0.09	0.10	0.12	0.24 *	0.12	0.20	0.10	0.13	0.09	0.11	0.10	0.12	0.09
02/15/20	0.09	0.10	0.07	0.08	0.06	0.07	0.09	0.12	0.12	0.24 *	0.12	0.18	0.10	0.13	0.10	0.12	0.10	0.16	0.09
02/16/20	0.09	0.10	0.08	0.08	0.07	0.07	0.09	0.10	0.12	0.23 *	0.12	0.21 *	0.10	0.15	0.10	0.11	0.11	0.11	0.10
02/17/20	0.10	0.11	0.08	0.09	0.07	0.07	0.10	0.10	0.12	0.19	0.12	0.20	0.10	0.12	0.10	0.10	0.11	0.13	0.10
02/18/20	0.09	0.11	0.07	0.08	0.07	0.07	0.09	0.10	0.12	0.22 *	0.12	0.17	0.11	0.15	0.10	0.10	0.11	0.13	0.10
02/19/20	0.09	0.11	0.07	0.09	0.06	0.07	0.09	0.09	0.12	0.18	0.12	0.14	0.10	0.14	0.10	0.11	0.11	0.11	0.09
02/20/20	0.09	0.10	0.08	0.09	0.06	0.07	0.08	0.09	0.12	0.16	0.12	0.17	0.10	0.12	0.10	0.11	0.11	0.12	0.10
02/21/20	0.09	0.10	0.08	0.08	0.07	0.08	0.08	0.09	0.12	0.34 *	0.12	0.15	0.10	0.12	0.10	0.10	0.11	0.13	0.10
02/22/20	0.08	0.10	0.07	0.11	0.06	0.07	0.08	0.09	0.12	0.17	0.12	0.21 *	0.09	0.15	0.10	0.10	0.11	0.13	0.09
02/23/20	0.08	0.09	0.07	0.08	0.06	0.07	0.08	0.09	0.12	0.19	0.12	0.22 *	0.09	0.15	0.10	0.10	0.11	0.12	0.09
02/24/20	0.09	0.09	0.08	0.08	0.07	0.07	0.09	0.09	0.13	0.18	0.12	0.18	0.09	0.16	0.10	0.10	0.11	0.13	0.10
02/25/20	0.09	0.11	0.08	0.10	0.07	0.08	0.09	0.10	0.13	0.22 *	0.13	0.38 *	0.09	0.11	0.10	0.12	0.11	0.13	0.10
02/26/20	0.10	0.12	0.10	0.21	0.08	0.09	0.09	0.11	0.14	0.21 *	0.14	0.19	0.10	0.12	0.11	0.13	0.12	0.14	0.11
02/27/20	0.08	0.10	0.08	0.09	0.07	0.08	0.08	0.10	0.12	0.19	0.11	0.18	0.09	0.12	0.10	0.11	0.10	0.13	0.09
02/28/20	0.08	0.09	0.09	0.11	0.07	0.08	0.08	0.09	0.11	0.21 *	0.11	0.18	0.09	0.10	0.10	0.10	0.09	0.11	0.09
02/29/20	0.08	0.09	0.09	0.10	0.07	0.07	0.09	0.09	0.11	0.20 *	0.11	0.17	0.09	0.10	0.10	0.10	0.10	0.10	0.09

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Higher than normal maximum turbidity values due to mechanical issues and are currently being investigated.

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
02/01/20	0.059	0.060	8.122	7.494	8.791	0.047	0.042	0.053	1,771	1,718	1,845	34	31	39	99.42	2.24	98.06	1.71
02/02/20	0.051	0.055	7.947	7.351	8.824	0.042	0.038	0.045	1,687	1,618	1,774	33	31	37	99.48	2.28	98.04	1.71
02/03/20	0.052	0.055	7.794	7.146	8.712	0.040	0.038	0.045	1,606	1,513	1,712	31	28	35	99.49	2.29	98.07	1.72
02/04/20	0.060	0.061	8.823	8.712	8.947	0.047	0.045	0.050	1,700	1,680	1,717	32	29	35	99.46	2.27	98.11	1.72
02/05/20	0.057	0.058	7.934	7.523	9.107	0.045	0.040	0.062	1,781	1,694	1,833	37	34	40	99.43	2.24	97.91	1.68
02/06/20	0.060	0.062	7.901	7.321	8.616	0.056	0.047	0.062	1,772	1,681	1,886	34	30	38	99.29	2.15	98.08	1.72
02/07/20	0.057	0.058	8.118	7.504	8.800	0.056	0.052	0.060	1,780	1,700	1,860	32	28	36	99.31	2.16	98.20	1.75
02/08/20	0.056	0.056	8.224	7.647	8.967	0.052	0.038	0.065	1,720	1,645	1,794	31	28	35	99.36	2.20	98.20	1.74
02/09/20	0.055	0.057	7.991	7.481	8.751	0.037	0.033	0.044	1,629	1,574	1,678	30	28	33	99.53	2.33	98.18	1.74
02/10/20	0.055	0.056	8.114	7.433	9.308	0.042	0.033	0.062	1,550	1,450	1,673	28	25	33	99.49	2.29	98.16	1.74
02/11/20	0.053	0.054	8.586	7.723	12.785	0.057	0.052	0.062	1,667	1,590	1,785	31	28	36	99.34	2.18	98.12	1.73
02/12/20	0.054	0.055	8.521	7.773	9.162	0.057	0.053	0.066	1,746	1,672	1,815	33	30	36	99.33	2.17	98.13	1.73
02/13/20	0.056	0.057	8.392	7.564	9.137	0.056	0.050	0.062	1,705	1,636	1,780	32	29	35	99.33	2.18	98.14	1.73
02/14/20	0.048	0.055	8.407	7.861	9.061	0.054	0.048	0.061	1,702	1,626	1,789	31	28	34	99.36	2.19	98.18	1.74
02/15/20	0.048	0.050	8.439	7.711	9.329	0.053	0.051	0.057	1,708	1,670	1,753	32	29	35	99.37	2.20	98.15	1.73
02/16/20	0.041	0.049	8.366	7.601	9.368	0.050	0.044	0.055	1,636	1,579	1,696	30	28	34	99.41	2.23	98.15	1.73
02/17/20	0.047	0.053	8.310	7.579	12.294	0.049	0.046	0.061	1,600	1,524	1,692	29	27	33	99.41	2.23	98.18	1.74
02/18/20	0.038	0.045	9.066	8.303	9.799	0.061	0.054	0.071	1,682	1,571	1,835	30	25	35	99.33	2.17	98.24	1.76
02/19/20	0.035	0.035	8.535	7.919	9.391	0.055	0.051	0.062	1,725	1,648	1,792	31	28	34	99.35	2.19	98.19	1.74
02/20/20	0.037	0.047	8.567	7.936	9.500	0.056	0.050	0.063	1,700	1,615	1,789	31	27	41	99.35	2.18	98.16	1.73
02/21/20	0.051	0.063	8.478	7.876	9.322	0.057	0.051	0.066	1,721	1,655	1,788	32	28	35	99.33	2.17	98.14	1.73
02/22/20	0.062	0.066	8.205	7.621	8.983	0.055	0.051	0.065	1,697	1,644	1,762	31	28	35	99.33	2.18	98.16	1.74
02/23/20	0.061	0.062	8.000	7.363	8.749	0.049	0.046	0.055	1,608	1,537	1,681	30	28	34	99.39	2.21	98.13	1.73
02/24/20	0.059	0.061	8.055	7.472	8.878	0.050	0.046	0.062	1,568	1,483	1,657	29	26	34	99.38	2.21	98.13	1.73
02/25/20	0.061	0.062	8.296	7.746	9.041	0.057	0.051	0.063	1,661	1,565	1,768	31	28	36	99.32	2.17	98.11	1.72
02/26/20	0.061	0.062	8.599	6.963	9.242	0.058	0.053	0.062	1,739	1,671	1,807	32	29	35	99.32	2.17	98.16	1.74
02/27/20	0.060	0.062	8.358	7.776	9.234	0.056	0.049	0.061	1,743	1,683	1,798	32	29	36	99.34	2.18	98.17	1.74
02/28/20	0.062	0.064	8.086	7.540	8.750	0.057	0.051	0.062	1,764	1,707	1,822	33	30	35	99.29	2.15	98.13	1.73
02/29/20	0.061	0.062	8.239	7.616	8.906	0.057	0.053	0.062	1,755	1,686	1,830	33	30	36	99.31	2.16	98.13	1.73

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
02/01/20	97.61	96.810	25,441.6	0.26	3.0	6
02/02/20	97.48	96.835	25,433.7	0.26	3.0	6
02/03/20	97.40	95.190	25,234.9	0.26	3.0	6
02/04/20	97.41	16.999	19,398.4	0.25	3.0	6
02/05/20	98.37	28.962	5,462.9	0.28	3.0	6
02/06/20	97.57	97.838	10,384.6	0.28	3.0	6
02/07/20	97.57	99.800	25,400.6	0.26	3.0	6
02/08/20	97.42	96.158	26,576.8	0.26	3.0	6
02/09/20	97.53	95.424	26,480.9	0.26	3.0	6
02/10/20	97.57	95.177	24,287.0	0.26	3.0	6
02/11/20	97.44	94.942	24,277.1	0.26	3.0	6
02/12/20	97.54	95.543	24,277.4	0.26	3.0	6
02/13/20	97.32	98.429	24,573.8	0.26	3.0	6
02/14/20	97.30	96.957	25,781.8	0.26	3.0	6
02/15/20	97.19	97.452	25,291.3	0.26	3.0	6
02/16/20	97.00	96.130	25,334.7	0.26	3.0	6
02/17/20	96.97	95.230	24,944.5	0.26	3.0	6
02/18/20	97.09	95.049	24,630.6	0.26	3.0	6
02/19/20	97.11	93.888	24,401.1	0.26	3.0	6
02/20/20	97.16	94.569	24,214.0	0.26	3.0	6
02/21/20	97.13	96.014	24,084.6	0.25	3.0	6
02/22/20	97.15	96.391	24,437.5	0.25	3.0	6
02/23/20	97.06	95.126	24,465.3	0.26	3.0	6
02/24/20	97.19	94.991	24,164.4	0.25	3.0	6
02/25/20	97.35	92.928	24,095.0	0.26	3.0	6
02/26/20	97.41	91.214	24,074.3	0.26	3.0	6
02/27/20	97.53	90.414	24,022.7	0.26	3.0	6
02/28/20	97.48	92.874	23,627.7	0.26	3.0	6
02/29/20	97.51	92.598	23,930.8	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				
	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
03/01/20	12.39	12.39	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/02/20	12.42	12.42	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/03/20	12.41	12.41	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/04/20	12.36	12.36	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/05/20	12.19 *	12.19 *	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/06/20	12.21 *	12.21 *	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/07/20	12.42	12.42	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/08/20	12.39	12.39	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/09/20	12.35	12.35	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/10/20	12.29	12.29	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/11/20	12.30	12.30	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/12/20	12.30	12.30	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/13/20	12.38	12.38	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/14/20	12.48	12.48	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/15/20	12.50	12.50	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/16/20	12.46	12.46	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/17/20	12.40	12.40	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/18/20	12.43	12.43	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/19/20	12.45	12.45	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/20/20	12.38	12.38	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/21/20	12.43	12.43	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/22/20	12.47	12.47	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/23/20	12.39	12.39	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/24/20	12.42	12.42	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/25/20	12.39	12.39	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/26/20	12.35	12.35	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/27/20	12.32	12.32	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/28/20	12.38	12.38	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/29/20	12.33	12.33	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/30/20	12.36	12.36	12.28	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
03/31/20	12.37	12.37	12.33	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.

* Minimum value substituted due to SCADA upgrade on March 5 and 6 work preventing recording of actual LRV values. All cells were running normally with no integrity issues.

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/20	0.00	4.20	2.20	6.00	0.00	12.39
03/02/20	0.00	4.21	2.21	6.00	0.00	12.42
03/03/20	0.00	4.22	2.19	6.00	0.00	12.41
03/04/20	0.00	4.19	2.17	6.00	0.00	12.36
03/05/20	0.00	4.00 *	2.19	6.00	0.00	12.19
03/06/20	0.00	4.00 *	2.21	6.00	0.00	12.21
03/07/20	0.00	4.22	2.21	6.00	0.00	12.42
03/08/20	0.00	4.19	2.20	6.00	0.00	12.39
03/09/20	0.00	4.15	2.20	6.00	0.00	12.35
03/10/20	0.00	4.14	2.16	6.00	0.00	12.29
03/11/20	0.00	4.11	2.18	6.00	0.00	12.30
03/12/20	0.00	4.11	2.19	6.00	0.00	12.30
03/13/20	0.00	4.20	2.18	6.00	0.00	12.38
03/14/20	0.00	4.29	2.19	6.00	0.00	12.48
03/15/20	0.00	4.30	2.20	6.00	0.00	12.50
03/16/20	0.00	4.25	2.21	6.00	0.00	12.46
03/17/20	0.00	4.23	2.17	6.00	0.00	12.40
03/18/20	0.00	4.26	2.17	6.00	0.00	12.43
03/19/20	0.00	4.26	2.19	6.00	0.00	12.45
03/20/20	0.00	4.20	2.18	6.00	0.00	12.38
03/21/20	0.00	4.25	2.19	6.00	0.00	12.43
03/22/20	0.00	4.26	2.20	6.00	0.00	12.47
03/23/20	0.00	4.16	2.23	6.00	0.00	12.39
03/24/20	0.00	4.24	2.18	6.00	0.00	12.42
03/25/20	0.00	4.21	2.18	6.00	0.00	12.39
03/26/20	0.00	4.17	2.18	6.00	0.00	12.35
03/27/20	0.00	4.16	2.16	6.00	0.00	12.32
03/28/20	0.00	4.21	2.17	6.00	0.00	12.05
03/29/20	0.00	4.12	2.21	6.00	0.00	10.09
03/30/20	0.00	4.08	2.28	6.00	0.00	11.63
03/31/20	0.00	4.04	2.33	6.00	0.00	11.69

Notes:

* Minimum value substituted due to SCADA upgrade on March 5 and 6 work preventing recording of actual LRV values.

All cells were running normally with no integrity issues.

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
03/01/20	0.00	0.00	2.20	6.00	4.00	12.20
03/02/20	0.00	0.00	2.21	6.00	4.00	12.21
03/03/20	0.00	0.00	2.19	6.00	4.00	12.19
03/04/20	0.00	0.00	2.17	6.00	4.00	12.17
03/05/20	0.00	0.00	2.19	6.00	4.00	12.19
03/06/20	0.00	0.00	2.21	6.00	4.00	12.21
03/07/20	0.00	0.00	2.21	6.00	4.00	12.21
03/08/20	0.00	0.00	2.20	6.00	4.00	12.20
03/09/20	0.00	0.00	2.20	6.00	4.00	12.20
03/10/20	0.00	0.00	2.16	6.00	4.00	12.16
03/11/20	0.00	0.00	2.18	6.00	4.00	12.18
03/12/20	0.00	0.00	2.19	6.00	4.00	12.19
03/13/20	0.00	0.00	2.18	6.00	4.00	12.18
03/14/20	0.00	0.00	2.19	6.00	4.00	12.19
03/15/20	0.00	0.00	2.20	6.00	4.00	12.20
03/16/20	0.00	0.00	2.21	6.00	4.00	12.21
03/17/20	0.00	0.00	2.17	6.00	4.00	12.17
03/18/20	0.00	0.00	2.17	6.00	4.00	12.17
03/19/20	0.00	0.00	2.19	6.00	4.00	12.19
03/20/20	0.00	0.00	2.18	6.00	4.00	12.18
03/21/20	0.00	0.00	2.19	6.00	4.00	12.19
03/22/20	0.00	0.00	2.20	6.00	4.00	12.20
03/23/20	0.00	0.00	2.23	6.00	4.00	12.23
03/24/20	0.00	0.00	2.18	6.00	4.00	12.18
03/25/20	0.00	0.00	2.18	6.00	4.00	12.18
03/26/20	0.00	0.00	2.18	6.00	4.00	12.18
03/27/20	0.00	0.00	2.16	6.00	4.00	12.16
03/28/20	0.00	0.00	2.17	6.00	4.00	12.17
03/29/20	0.00	0.00	2.21	6.00	4.00	12.21
03/30/20	0.00	0.00	2.28	6.00	4.00	12.28
03/31/20	0.00	0.00	2.33	6.00	4.00	12.33

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
03/01/20	4.76	4.63	4.84	4.53	4.48	4.61	4.45	4.53	4.45	4.39	4.64	4.78	4.32	4.36	4.29	4.46
03/02/20	4.68	4.57	4.86	4.39	4.55	4.58	4.64	4.40	4.41	4.34	4.60	4.76	4.30	4.34	4.25	4.47
03/03/20	4.68	4.58	4.82	4.39	4.47	4.60	4.68	4.40	4.42	4.33	4.59	4.74	4.29	4.34	4.22	4.48
03/04/20	4.69	4.60	4.83	4.35	4.53	4.59	4.68	4.38	4.42	4.34	4.60	4.74	4.30	4.35	4.22	4.56
03/05/20	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *
03/06/20	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *
03/07/20	4.68	4.54	4.66	4.36	4.42	4.46	4.65	4.36	4.36	4.22	4.46	4.67	4.22	4.57	4.48	4.60
03/08/20	4.69	4.53	4.65	4.40	4.40	4.48	4.66	4.36	4.32	4.45	4.51	4.64	4.19	4.61	4.48	4.57
03/09/20	4.61	4.52	4.67	4.37	4.38	4.54	4.65	4.48	4.29	4.53	4.50	4.68	4.19	4.57	4.50	4.57
03/10/20	4.59	4.92	4.68	4.35	4.34	4.55	4.61	4.47	4.32	4.53	4.44	4.65	4.37	4.55	4.47	4.56
03/11/20	4.59	4.95	4.68	4.35	4.33	4.55	4.60	4.46	4.33	4.53	4.42	4.63	4.40	4.54	4.44	4.55
03/12/20	4.59	4.95	4.68	4.35	4.33	4.55	4.60	4.46	4.33	4.53	4.42	4.63	4.38	4.54	4.44	4.55
03/13/20	4.61	4.86	4.67	4.46	4.54	4.51	4.62	4.38	4.28	4.48	4.46	4.61	4.39	4.48	4.46	4.52
03/14/20	4.60	4.79	4.58	4.48	4.66	4.43	4.62	4.40	4.48	4.47	4.45	4.57	4.40	4.48	4.46	4.49
03/15/20	4.57	4.78	4.49	4.44	4.68	4.43	4.62	4.39	4.47	4.45	4.43	4.54	4.39	4.46	4.42	4.49
03/16/20	4.50	4.82	4.53	4.47	4.61	4.49	4.61	4.37	4.53	4.43	4.45	4.59	4.42	4.43	4.42	4.50
03/17/20	4.54	4.78	4.55	4.44	4.65	4.46	4.59	4.35	4.53	4.44	4.45	4.58	4.43	4.44	4.42	4.50
03/18/20	4.52	4.78	4.46	4.37	4.64	4.43	4.55	4.49	4.48	4.40	4.66	4.57	4.42	4.45	4.39	4.46
03/19/20	4.36	4.76	4.89	4.33	4.52	4.42	4.53	4.41	4.43	4.38	4.71	4.78	4.38	4.45	4.39	4.44
03/20/20	4.42	4.73	4.83	4.34	4.55	4.37	4.54	4.43	4.40	4.36	4.68	4.79	4.32	4.39	4.36	4.44
03/21/20	4.68	4.68	4.81	4.32	4.58	4.35	4.50	4.34	4.43	4.34	4.68	4.75	4.35	4.35	4.36	4.40
03/22/20	4.62	4.55	4.78	4.30	4.57	4.27	4.49	4.34	4.43	4.36	4.72	4.77	4.36	4.32	4.36	4.38
03/23/20	4.66	4.67	4.72	4.29	4.52	4.25	4.46	4.33	4.44	4.34	4.72	4.76	4.33	4.37	4.36	4.38
03/24/20	4.72	4.57	4.69	4.64	4.55	4.51	4.42	4.38	4.38	4.28	4.71	4.75	4.28	4.32	4.35	4.35
03/25/20	4.72	4.57	4.72	4.50	4.51	4.52	4.39	4.34	4.39	4.24	4.71	4.72	4.28	4.29	4.29	4.57
03/26/20	4.69	4.53	4.67	4.40	4.55	4.48	4.41	4.31	4.40	4.22	4.68	4.67	4.28	4.53	4.27	4.61
03/27/20	4.65	4.57	4.61	4.48	4.47	4.53	4.38	4.51	4.33	4.16	4.64	4.70	4.26	4.53	4.24	4.59
03/28/20	4.60	4.51	4.65	4.44	4.51	4.55	4.64	4.42	4.27	4.44	4.64	4.69	4.23	4.48	4.22	4.56
03/29/20	4.67	4.51	4.65	4.43	4.49	4.53	4.71	4.43	4.32	4.46	4.59	4.66	4.21	4.52	4.22	4.58
03/30/20	4.65	4.51	4.63	4.44	4.46	4.51	4.72	4.42	4.28	4.44	4.63	4.66	4.18	4.54	4.21	4.58
03/31/20	4.64	4.45	4.53	4.35	4.40	4.52	4.66	4.37	4.27	4.45	4.58	4.65	4.43	4.48	4.42	4.57

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Minimum value substituted due to SCADA upgrade on March 5 and 6 work preventing recording of actual LRV values. All cells were running normally with no integrity issues.

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
03/01/20	4.55	4.31	4.37	4.45	4.41	4.43	4.33	4.37	4.61	4.51	4.33	4.20	4.64	4.29	4.27	4.62
03/02/20	4.46	4.25	4.34	4.42	4.50	4.39	4.31	4.33	4.60	4.48	4.35	4.21	4.68	4.26	4.25	4.63
03/03/20	4.44	4.28	4.31	4.43	4.44	4.35	4.44	4.30	4.63	4.43	4.31	4.23	4.67	4.28	4.29	4.64
03/04/20	4.42	4.29	4.30	4.39	4.43	4.32	4.54	4.28	4.64	4.48	4.26	4.19	4.67	4.29	4.28	4.62
03/05/20	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *
03/06/20	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *	4.00 *
03/07/20	4.35	4.38	4.39	4.51	4.31	4.40	4.34	4.43	4.62	4.41	4.24	4.27	4.66	4.23	4.23	4.55
03/08/20	4.34	4.32	4.47	4.47	4.34	4.51	4.36	4.41	4.56	4.42	4.21	4.42	4.64	4.21	4.19	4.53
03/09/20	4.33	4.33	4.36	4.47	4.28	4.49	4.37	4.35	4.53	4.36	4.22	4.39	4.59	4.27	4.15	4.55
03/10/20	4.32	4.34	4.34	4.46	4.43	4.48	4.34	4.27	4.56	4.37	4.23	4.43	4.51	4.47	4.14	4.55
03/11/20	4.32	4.34	4.37	4.46	4.54	4.48	4.34	4.27	4.57	4.42	4.23	4.43	4.51	4.47	4.11	4.55
03/12/20	4.32	4.34	4.37	4.46	4.54	4.48	4.34	4.27	4.57	4.42	4.23	4.43	4.51	4.47	4.11	4.55
03/13/20	4.45	4.43	4.29	4.53	4.46	4.35	4.40	4.36	4.52	4.38	4.20	4.40	4.51	4.47	4.22	4.52
03/14/20	4.51	4.45	4.47	4.52	4.38	4.31	4.46	4.46	4.46	4.31	4.29	4.36	4.47	4.44	4.44	4.45
03/15/20	4.49	4.41	4.53	4.50	4.36	4.36	4.44	4.47	4.46	4.34	4.47	4.35	4.44	4.40	4.44	4.42
03/16/20	4.45	4.39	4.45	4.48	4.32	4.31	4.44	4.47	4.47	4.33	4.44	4.34	4.46	4.44	4.41	4.44
03/17/20	4.43	4.37	4.37	4.45	4.32	4.29	4.44	4.43	4.45	4.27	4.43	4.31	4.53	4.45	4.42	4.39
03/18/20	4.42	4.35	4.35	4.44	4.47	4.28	4.40	4.37	4.44	4.26	4.45	4.30	4.73	4.42	4.40	4.41
03/19/20	4.34	4.32	4.29	4.37	4.51	4.42	4.40	4.29	4.43	4.26	4.40	4.31	4.73	4.35	4.35	4.38
03/20/20	4.29	4.25	4.30	4.47	4.41	4.48	4.36	4.36	4.37	4.36	4.38	4.30	4.68	4.32	4.38	4.33
03/21/20	4.32	4.44	4.34	4.55	4.36	4.40	4.34	4.48	4.36	4.52	4.39	4.27	4.67	4.35	4.35	4.43
03/22/20	4.30	4.49	4.34	4.53	4.36	4.44	4.39	4.42	4.53	4.55	4.40	4.26	4.73	4.34	4.38	4.63
03/23/20	4.26	4.36	4.32	4.48	4.36	4.42	4.35	4.30	4.71	4.53	4.38	4.22	4.70	4.34	4.36	4.63
03/24/20	4.25	4.31	4.49	4.41	4.31	4.34	4.36	4.33	4.67	4.52	4.33	4.24	4.68	4.33	4.34	4.65
03/25/20	4.42	4.34	4.52	4.39	4.40	4.32	4.44	4.38	4.65	4.49	4.34	4.22	4.67	4.33	4.33	4.66
03/26/20	4.49	4.33	4.45	4.37	4.47	4.32	4.47	4.35	4.59	4.46	4.37	4.17	4.67	4.30	4.28	4.63
03/27/20	4.44	4.48	4.42	4.44	4.42	4.46	4.46	4.29	4.57	4.48	4.32	4.17	4.69	4.26	4.31	4.60
03/28/20	4.41	4.45	4.37	4.46	4.37	4.52	4.41	4.21	4.61	4.45	4.27	4.16	4.67	4.24	4.30	4.60
03/29/20	4.38	4.33	4.34	4.45	4.34	4.44	4.41	4.22	4.64	4.38	4.31	4.12	4.66	4.23	4.28	4.59
03/30/20	4.37	4.30	4.32	4.45	4.31	4.42	4.39	4.21	4.64	4.37	4.32	4.08	4.65	4.26	4.27	4.57
03/31/20	4.30	4.32	4.27	4.41	4.27	4.36	4.31	4.32	4.63	4.38	4.31	4.04	4.65	4.25	4.25	4.55

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Minimum value substituted due to SCADA upgrade on March 5 and 6 work preventing recording of actual LRV values. All cells were running normally with no integrity issues.

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
03/01/20	4.40	4.53	4.84	4.53
03/02/20	4.53	4.54	4.80	4.46
03/03/20	4.66	4.50	4.76	4.64
03/04/20	4.56	4.52	4.82	4.37
03/05/20	4.00 *	4.00 *	4.00 *	4.00 *
03/06/20	4.00 *	4.00 *	4.00 *	4.00 *
03/07/20	4.44	4.44	4.81	4.29
03/08/20	4.41	4.39	4.85	4.46
03/09/20	4.38	4.38	4.81	4.53
03/10/20	4.39	4.39	4.69	4.23
03/11/20	4.39	4.39	4.69	4.23
03/12/20	4.39	4.39	4.69	4.23
03/13/20	4.45	4.38	4.73	4.27
03/14/20	4.55	4.33	4.85	4.37
03/15/20	4.47	4.30	4.77	4.58
03/16/20	4.48	4.25	4.76	4.46
03/17/20	4.44	4.23	4.83	4.42
03/18/20	4.45	4.30	4.72	4.48
03/19/20	4.38	4.61	4.45	4.35
03/20/20	4.44	4.48	4.58	4.20
03/21/20	4.46	4.55	4.63	4.25
03/22/20	4.43	4.49	4.65	4.38
03/23/20	4.47	4.50	4.70	4.16
03/24/20	4.46	4.51	4.46	4.42
03/25/20	4.38	4.47	4.55	4.21
03/26/20	4.39	4.51	4.72	4.20
03/27/20	4.49	4.52	4.49	4.36
03/28/20	4.56	4.50	4.57	4.00
03/29/20	4.47	4.45	4.65	N/A **
03/30/20	4.50	4.51	4.63	N/A **
03/31/20	4.44	4.49	4.60	N/A **

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Minimum value substituted due to SCADA upgrade on March 5 and 6 work preventing recording of actual LRV values. All cells were running normally with no integrity issues.

** 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	MicroFiltration Process online monitoring results Effluent Turbidity - NTU 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
03/01/20	0.08	0.10	0.09	0.10	0.07	0.08	0.09	0.09	0.11	0.17	0.11	0.18	0.10	0.11	0.10	0.10	0.09	0.12	0.09
03/02/20	0.08	0.08	0.08	0.09	0.07	0.07	0.08	0.08	0.11	0.16	0.11	0.16	0.10	0.16	0.10	0.10	0.10	0.11	0.09
03/03/20	0.08	0.11	0.08	0.09	0.07	0.07	0.08	0.08	0.11	0.15	0.12	0.18	0.10	0.12	0.10	0.10	0.10	0.15	0.09
03/04/20	0.08	0.09	0.08	0.09	0.07	0.07	0.08	0.09	0.09	0.13	0.09	0.12	0.12	0.20	0.10	0.10	0.09	0.10	0.09
03/05/20	0.08	0.12	0.07	0.09	0.07	0.07	0.09	0.11	0.06	0.07	0.06	0.08	0.12	0.13	0.10	0.11	0.08	0.10	0.08
03/06/20	0.08	0.11	0.07	0.08	0.06	0.07	0.10	0.10	0.06	0.11	0.07	0.08	0.12	0.13	0.10	0.10	0.08	0.10	0.08
03/07/20	0.08	0.09	0.08	0.08	0.07	0.08	0.10	0.10	0.07	0.09	0.07	0.09	0.12	0.14	0.10	0.11	0.10	0.12	0.09
03/08/20	0.08	0.10	0.07	0.08	0.07	0.07	0.10	0.10	0.07	0.09	0.08	0.16	0.12	0.20	0.10	0.11	0.10	0.13	0.09
03/09/20	0.08	0.09	0.07	0.08	0.07	0.07	0.10	0.10	0.08	0.10	0.08	0.09	0.11	0.16	0.11	0.11	0.10	0.11	0.09
03/10/20	0.08	0.17	0.07	0.07	0.06	0.07	0.09	0.11	0.08	0.08	0.08	0.09	0.11	0.11	0.10	0.11	0.10	0.10	0.09
03/11/20	0.07	0.09	0.06	0.07	0.06	0.07	0.09	0.10	0.07	0.08	0.08	0.09	0.10	0.12	0.10	0.11	0.09	0.10	0.08
03/12/20	0.06	0.07	0.05	0.05	0.06	0.06	0.09	0.10	0.05	0.06	0.06	0.07	0.07	0.11	0.09	0.11	0.08	0.10	0.07
03/13/20	0.05	0.07	0.04	0.07	0.06	0.07	0.09	0.10	0.06	0.09	0.07	0.30 *	0.04	0.05	0.07	0.08	0.05	0.14	0.06
03/14/20	0.05	0.07	0.04	0.07	0.06	0.06	0.08	0.09	0.05	0.10	0.07	0.18	0.04	0.07	0.07	0.08	0.05	0.09	0.06
03/15/20	0.06	0.07	0.04	0.05	0.06	0.07	0.08	0.09	0.05	0.08	0.07	0.14	0.05	0.07	0.07	0.08	0.05	0.06	0.06
03/16/20	0.06	0.07	0.05	0.05	0.06	0.07	0.09	0.09	0.05	0.06	0.08	0.12	0.06	0.07	0.08	0.08	0.04	0.05	0.06
03/17/20	0.06	0.07	0.05	0.06	0.06	0.07	0.09	0.09	0.05	0.06	0.09	0.15	0.06	0.10	0.08	0.08	0.04	0.05	0.06
03/18/20	0.06	0.07	0.06	0.06	0.06	0.07	0.09	0.09	0.05	0.09	0.09	0.11	0.08	0.09	0.08	0.08	0.04	0.07	0.07
03/19/20	0.07	0.07	0.05	0.07	0.06	0.07	0.10	0.10	0.05	0.06	0.07	0.40 *	0.08	0.09	0.07	0.08	0.04	0.10	0.07
03/20/20	0.07	0.08	0.04	0.04	0.06	0.06	0.10	0.10	0.05	0.07	0.04	0.06	0.08	0.09	0.08	0.09	0.04	0.05	0.06
03/21/20	0.07	0.09	0.04	0.04	0.06	0.06	0.10	0.10	0.05	0.07	0.02	0.03	0.08	0.10	0.08	0.09	0.04	0.07	0.06
03/22/20	0.07	0.08	0.04	0.04	0.06	0.06	0.09	0.10	0.05	0.09	0.02	0.02	0.09	0.11	0.08	0.09	0.05	0.07	0.06
03/23/20	0.07	0.08	0.04	0.05	0.06	0.07	0.09	0.10	0.05	0.19	0.02	0.02	0.09	0.10	0.09	0.09	0.06	0.07	0.06
03/24/20	0.06	0.10	0.04	0.07	0.06	0.06	0.10	0.10	0.06	0.11	0.02	0.02	0.09	0.10	0.08	0.09	0.06	0.07	0.06
03/25/20	0.06	0.08	0.04	0.05	0.06	0.06	0.10	0.11	0.05	0.06	0.02	0.04	0.08	0.11	0.08	0.08	0.05	0.08	0.06
03/26/20	0.06	0.07	0.04	0.05	0.06	0.06	0.05	0.09	0.05	0.12	0.02	0.09	0.07	0.08	0.08	0.08	0.06	0.09	0.05
03/27/20	0.06	0.07	0.05	0.05	0.06	0.07	0.02	0.02	0.05	0.07	0.02	0.03	0.08	0.08	0.08	0.08	0.07	0.19	0.05
03/28/20	0.05	0.07	0.05	0.06	0.06	0.07	0.02	0.02	0.05	0.06	0.02	0.02	0.08	0.09	0.08	0.14	0.06	0.07	0.05
03/29/20	0.05	0.07	0.06	0.06	0.06	0.07	0.02	0.02	0.06	0.11	0.02	0.04	0.06	0.08	0.09	0.09	0.06	0.07	0.05
03/30/20	0.05	0.08	0.06	0.06	0.06	0.07	0.02	0.02	0.05	0.07	0.02	0.07	0.08	0.09	0.09	0.09	0.06	0.07	0.05
03/31/20	0.04	0.05	0.06	0.06	0.06	0.07	0.02	0.09	0.05	0.08	0.02	0.03	0.09	0.10	0.09	0.09	0.06	0.08	0.05

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Elevated value due to turbidity analyzer issue and currently under investigation.

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
03/01/20	0.061	0.061	8.141	7.644	8.949	0.052	0.047	0.057	1,715	1,661	1,790	31	29	34	99.36	2.20	98.19	1.74
03/02/20	0.060	0.061	8.149	7.557	8.973	0.050	0.046	0.059	1,652	1,577	1,741	29	26	31	99.38	2.21	98.25	1.76
03/03/20	0.056	0.057	8.398	7.791	9.169	0.054	0.050	0.062	1,754	1,676	1,859	30	27	35	99.35	2.19	98.26	1.76
03/04/20	0.056	0.057	8.480	7.949	9.204	0.058	0.054	0.062	1,778	1,700	1,845	32	29	36	99.32	2.17	98.18	1.74
03/05/20	0.057	0.057	8.584	7.953	9.977	0.055	0.050	0.061	1,803	1,737	1,901	34	31	37	99.35	2.19	98.14	1.73
03/06/20	0.053	0.060	8.877	8.154	9.756	0.055	0.051	0.060	1,843	1,773	1,929	33	29	37	99.38	2.21	98.22	1.75
03/07/20	0.056	0.063	8.848	8.118	9.582	0.055	0.050	0.062	1,817	1,768	1,899	33	31	36	99.38	2.21	98.18	1.74
03/08/20	0.068	0.073	8.763	8.063	9.727	0.055	0.049	0.060	1,711	1,646	1,768	30	28	33	99.38	2.20	98.23	1.75
03/09/20	0.067	0.069	9.006	8.298	10.301	0.057	0.049	0.068	1,625	1,552	1,737	28	24	32	99.37	2.20	98.29	1.77
03/10/20	0.060	0.062	8.711	8.260	9.584	0.061	0.052	0.075	1,741	1,666	1,862	32	28	34	99.30	2.16	98.19	1.74
03/11/20	0.062	0.063	8.944	8.078	9.854	0.059	0.053	0.069	1,826	1,724	1,914	33	29	37	99.34	2.18	98.19	1.74
03/12/20	0.060	0.061	8.650	7.850	9.476	0.056	0.050	0.068	1,778	1,695	1,872	32	29	35	99.35	2.19	98.21	1.75
03/13/20	0.057	0.060	8.034	7.383	8.821	0.053	0.047	0.060	1,645	1,582	1,705	30	26	35	99.34	2.18	98.17	1.74
03/14/20	0.055	0.055	8.105	7.419	8.994	0.053	0.048	0.057	1,684	1,651	1,738	34	32	37	99.35	2.19	98.01	1.70
03/15/20	0.054	0.054	7.939	7.226	9.007	0.050	0.044	0.055	1,635	1,567	1,715	32	30	36	99.37	2.20	98.02	1.70
03/16/20	0.055	0.059	8.043	7.224	9.184	0.050	0.046	0.060	1,638	1,552	1,769	32	29	37	99.38	2.21	98.03	1.71
03/17/20	0.059	0.060	8.270	7.315	9.467	0.055	0.051	0.072	1,774	1,654	1,944	36	32	41	99.33	2.17	97.99	1.70
03/18/20	0.058	0.059	8.486	7.606	9.505	0.057	0.047	0.072	1,849	1,762	1,947	34	31	38	99.32	2.17	98.13	1.73
03/19/20	0.058	0.058	8.301	7.518	9.505	0.054	0.050	0.060	1,846	1,765	1,918	34	31	38	99.35	2.19	98.15	1.73
03/20/20	0.055	0.060	8.181	7.502	8.985	0.054	0.051	0.060	1,829	1,754	1,932	33	26	37	99.34	2.18	98.22	1.75
03/21/20	0.056	0.057	8.136	7.425	11.497	0.053	0.048	0.059	1,766	1,702	1,866	31	29	34	99.35	2.19	98.26	1.76
03/22/20	0.057	0.057	8.138	7.254	9.287	0.051	0.046	0.058	1,650	1,563	1,718	28	26	32	99.37	2.20	98.28	1.76
03/23/20	0.054	0.055	7.942	7.016	9.061	0.047	0.034	0.051	1,571	1,495	1,648	27	24	29	99.41	2.23	98.31	1.77
03/24/20	0.054	0.055	7.919	7.061	8.763	0.052	0.048	0.061	1,663	1,584	1,797	28	25	32	99.34	2.18	98.31	1.77
03/25/20	0.053	0.055	7.687	6.903	8.675	0.051	0.048	0.064	1,691	1,610	1,787	29	26	32	99.34	2.18	98.28	1.77
03/26/20	0.054	0.054	7.780	7.067	9.460	0.051	0.048	0.057	1,710	1,626	1,808	28	26	32	99.34	2.18	98.34	1.78
03/27/20	0.054	0.057	7.607	6.870	8.595	0.052	0.048	0.058	1,706	1,609	1,795	29	26	35	99.31	2.16	98.27	1.76
03/28/20	0.054	0.055	7.784	6.943	8.939	0.052	0.047	0.056	1,676	1,604	1,742	31	28	34	99.33	2.17	98.18	1.74
03/29/20	0.056	0.057	7.743	6.905	8.821	0.047	0.042	0.051	1,622	1,548	1,715	29	26	33	99.39	2.21	98.21	1.75
03/30/20	0.056	0.057	7.851	6.979	11.909	0.041	0.033	0.048	1,590	1,498	1,722	28	26	33	99.48	2.28	98.21	1.75
03/31/20	0.057	0.059	7.949	7.122	9.170	0.038	0.035	0.047	1,646	1,576	1,744	29	26	34	99.53	2.33	98.22	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
03/01/20	97.45	93.192	23,765.7	0.26	3.0	6
03/02/20	97.48	91.989	24,012.9	0.26	3.0	6
03/03/20	97.57	93.329	24,094.4	0.26	3.0	6
03/04/20	97.56	92.343	24,090.9	0.26	3.0	6
03/05/20	97.63	86.106	23,993.1	0.26	3.0	6
03/06/20	97.49	91.736	23,109.7	0.27	3.0	6
03/07/20	97.24	92.641	23,767.8	0.26	3.0	6
03/08/20	97.18	87.420	23,677.4	0.26	3.0	6
03/09/20	97.37	92.491	22,817.8	0.26	3.0	6
03/10/20	96.95	57.422	23,120.7	0.26	3.0	6
03/11/20	96.91	94.580	23,134.7	0.26	3.0	6
03/12/20	97.02	95.244	24,529.2	0.26	3.0	6
03/13/20	97.10	95.814	24,359.2	0.26	3.0	6
03/14/20	97.19	93.434	24,752.7	0.26	3.0	6
03/15/20	97.34	91.566	24,342.6	0.26	3.0	6
03/16/20	97.33	91.090	24,135.6	0.27	3.0	6
03/17/20	97.13	92.190	24,170.2	0.26	3.0	6
03/18/20	97.42	93.122	24,726.4	0.26	3.0	6
03/19/20	97.22	90.815	24,777.5	0.27	3.0	6
03/20/20	97.10	92.225	24,136.1	0.26	3.0	6
03/21/20	97.28	91.685	24,047.7	0.26	3.0	6
03/22/20	97.49	89.884	23,821.3	0.26	3.0	6
03/23/20	97.20	94.988	23,804.1	0.26	3.0	6
03/24/20	97.23	94.683	24,110.9	0.25	3.0	6
03/25/20	97.32	92.516	24,139.4	0.26	3.0	6
03/26/20	97.30	94.810	23,854.0	0.26	3.0	6
03/27/20	97.20	93.890	24,272.1	0.26	3.0	6
03/28/20	97.32	94.303	24,408.3	0.26	3.0	6
03/29/20	97.42	93.313	24,261.9	0.26	3.0	6
03/30/20	97.32	94.806	24,086.0	0.26	3.0	6
03/31/20	97.29	93.896	24,215.2	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				
							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
04/01/20	12.25	12.25	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/02/20	12.34	12.34	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/03/20	12.33	12.33	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/04/20	12.37	12.37	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/05/20	12.39	12.39	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/06/20	12.38	12.38	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/07/20	12.35	12.35	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/08/20	12.38	12.38	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/09/20	12.46	12.46	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/10/20	12.40	12.40	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/11/20	12.42	12.42	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/12/20	12.41	12.41	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/13/20	12.36	12.36	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/14/20	12.41	12.41	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/15/20	12.38	12.38	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/16/20	12.38	12.38	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/17/20	12.37	12.37	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/18/20	12.41	12.41	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/19/20	12.41	12.41	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/20/20	12.42	12.42	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/21/20	12.40	12.40	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/22/20	12.35	12.35	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/23/20	12.42	12.42	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/24/20	12.41	12.41	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/25/20	12.58	12.58	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/26/20	12.65	12.65	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	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 AWPF offline April 27 to April 30.

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/20	0.00	4.04	2.22	6.00	0.00	12.25
04/02/20	0.00	4.17	2.17	6.00	0.00	12.34
04/03/20	0.00	4.15	2.17	6.00	0.00	12.33
04/04/20	0.00	4.17	2.19	6.00	0.00	12.37
04/05/20	0.00	4.18	2.20	6.00	0.00	12.39
04/06/20	0.00	4.14	2.24	6.00	0.00	12.38
04/07/20	0.00	4.14	2.21	6.00	0.00	12.35
04/08/20	0.00	4.17	2.21	6.00	0.00	12.38
04/09/20	0.00	4.24	2.21	6.00	0.00	12.46
04/10/20	0.00	4.20	2.20	6.00	0.00	12.40
04/11/20	0.00	4.22	2.20	6.00	0.00	12.42
04/12/20	0.00	4.22	2.19	6.00	0.00	12.41
04/13/20	0.00	4.15	2.21	6.00	0.00	12.36
04/14/20	0.00	4.22	2.19	6.00	0.00	12.41
04/15/20	0.00	4.22	2.16	6.00	0.00	12.38
04/16/20	0.00	4.23	2.15	6.00	0.00	12.38
04/17/20	0.00	4.21	2.16	6.00	0.00	12.37
04/18/20	0.00	4.23	2.17	6.00	0.00	12.41
04/19/20	0.00	4.22	2.18	6.00	0.00	12.41
04/20/20	0.00	4.22	2.20	6.00	0.00	12.42
04/21/20	0.00	4.24	2.16	6.00	0.00	12.40
04/22/20	0.00	4.23	2.13	6.00	0.00	12.35
04/23/20	0.00	4.28	2.14	6.00	0.00	12.42
04/24/20	0.00	4.29	2.12	6.00	0.00	12.41
04/25/20	0.00	4.47	2.11	6.00	0.00	12.58
04/26/20	0.00	4.53	2.11	6.00	0.00	12.65
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*

Notes:

* GWRS AWPF offline April 27 to April 30.

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
04/01/20	0.00	0.00	2.22	6.00	4.00	12.22
04/02/20	0.00	0.00	2.17	6.00	4.00	12.17
04/03/20	0.00	0.00	2.17	6.00	4.00	12.17
04/04/20	0.00	0.00	2.19	6.00	4.00	12.19
04/05/20	0.00	0.00	2.20	6.00	4.00	12.20
04/06/20	0.00	0.00	2.24	6.00	4.00	12.24
04/07/20	0.00	0.00	2.21	6.00	4.00	12.21
04/08/20	0.00	0.00	2.21	6.00	4.00	12.21
04/09/20	0.00	0.00	2.21	6.00	4.00	12.21
04/10/20	0.00	0.00	2.20	6.00	4.00	12.20
04/11/20	0.00	0.00	2.20	6.00	4.00	12.20
04/12/20	0.00	0.00	2.19	6.00	4.00	12.19
04/13/20	0.00	0.00	2.21	6.00	4.00	12.21
04/14/20	0.00	0.00	2.19	6.00	4.00	12.19
04/15/20	0.00	0.00	2.16	6.00	4.00	12.16
04/16/20	0.00	0.00	2.15	6.00	4.00	12.15
04/17/20	0.00	0.00	2.16	6.00	4.00	12.16
04/18/20	0.00	0.00	2.17	6.00	4.00	12.17
04/19/20	0.00	0.00	2.18	6.00	4.00	12.18
04/20/20	0.00	0.00	2.20	6.00	4.00	12.20
04/21/20	0.00	0.00	2.16	6.00	4.00	12.16
04/22/20	0.00	0.00	2.13	6.00	4.00	12.13
04/23/20	0.00	0.00	2.14	6.00	4.00	12.14
04/24/20	0.00	0.00	2.12	6.00	4.00	12.12
04/25/20	0.00	0.00	2.11	6.00	4.00	12.11
04/26/20	0.00	0.00	2.11	6.00	4.00	12.11
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	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 AWPF offline April 27 to April 30.

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
04/01/20	4.58	4.88	4.59	4.36	4.40	4.48	4.61	4.41	4.28	4.47	4.59	4.65	4.50	4.51	4.53	4.56
04/02/20	4.65	4.78	4.57	4.35	4.36	4.53	4.66	4.38	4.27	4.47	4.62	4.64	4.48	4.46	4.53	4.57
04/03/20	4.63	4.74	4.58	4.42	4.44	4.49	4.65	4.35	4.26	4.46	4.59	4.59	4.46	4.42	4.53	4.53
04/04/20	4.65	4.71	4.52	4.39	4.38	4.53	4.63	4.32	4.17	4.42	4.55	4.56	4.41	4.39	4.49	4.53
04/05/20	4.58	4.81	4.53	4.36	4.39	4.50	4.66	4.48	4.21	4.42	4.53	4.57	4.41	4.40	4.46	4.53
04/06/20	4.53	4.75	4.52	4.33	4.25	4.48	4.64	4.38	4.21	4.42	4.53	4.57	4.43	4.41	4.46	4.53
04/07/20	4.60	4.77	4.87	4.30	4.58	4.43	4.63	4.42	4.14	4.40	4.49	4.58	4.40	4.40	4.47	4.52
04/08/20	4.54	4.77	4.66	4.64	4.61	4.47	4.57	4.41	4.38	4.40	4.41	4.52	4.39	4.38	4.43	4.48
04/09/20	4.41	4.58	4.65	4.55	4.57	4.39	4.54	4.31	4.40	4.34	4.66	4.47	4.38	4.34	4.42	4.46
04/10/20	4.49	4.72	4.67	4.54	4.54	4.45	4.54	4.35	4.46	4.27	4.73	4.70	4.36	4.31	4.40	4.42
04/11/20	4.47	4.68	4.62	4.49	4.61	4.38	4.56	4.37	4.46	4.28	4.64	4.78	4.34	4.30	4.39	4.43
04/12/20	4.80	4.64	4.64	4.39	4.59	4.32	4.60	4.31	4.45	4.31	4.68	4.74	4.31	4.27	4.40	4.43
04/13/20	4.74	4.60	4.64	4.37	4.56	4.39	4.54	4.28	4.40	4.29	4.64	4.75	4.31	4.29	4.39	4.42
04/14/20	4.68	4.62	4.57	4.31	4.58	4.35	4.55	4.34	4.43	4.30	4.66	4.73	4.32	4.22	4.37	4.41
04/15/20	4.66	4.59	4.55	4.28	4.53	4.32	4.50	4.33	4.38	4.22	4.67	4.66	4.29	4.44	4.35	4.39
04/16/20	4.66	4.55	4.54	4.29	4.54	4.28	4.48	4.39	4.39	4.23	4.66	4.66	4.25	4.54	4.36	4.36
04/17/20	4.66	4.49	4.47	4.36	4.49	4.30	4.49	4.38	4.34	4.21	4.57	4.65	4.23	4.50	4.29	4.51
04/18/20	4.62	4.52	4.58	4.32	4.44	4.32	4.43	4.30	4.36	4.44	4.53	4.60	4.23	4.52	4.30	4.61
04/19/20	4.63	4.52	4.59	4.33	4.48	4.59	4.45	4.33	4.39	4.46	4.56	4.64	4.22	4.49	4.30	4.62
04/20/20	4.59	4.48	4.55	4.26	4.53	4.55	4.46	4.34	4.37	4.45	4.61	4.65	4.22	4.50	4.31	4.63
04/21/20	4.64	4.91	4.46	N/A**	4.48	4.50	4.45	4.26	4.35	4.45	4.57	4.64	4.24	4.44	4.30	4.57
04/22/20	4.69	N/A**	4.48	N/A**	4.50	4.53	4.44	N/A**	4.33	4.41	4.53	4.61	4.45	4.41	4.29	4.52
04/23/20	4.68	N/A**	4.47	N/A**	4.50	4.58	N/A**	N/A**	4.30	4.46	4.57	4.61	N/A**	4.48	4.28	4.54
04/24/20	4.62	N/A**	4.84	N/A**	N/A	4.55	N/A**	N/A**	4.29	4.44	4.59	4.74	N/A**	4.47	N/A**	4.55
04/25/20	N/A**	N/A**	N/A**	N/A**	N/A**	4.69	N/A**	N/A**	N/A**	4.47	4.61	N/A**	N/A**	4.55	N/A**	4.55
04/26/20	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	4.53	N/A**	N/A**
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	N/A*	N/A*	N/A*	N/A*	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.

* GWRS AWPF offline April 27 to April 30.

** Cell Offline

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
04/01/20	4.28	4.30	4.28	4.36	4.46	4.36	4.30	4.43	4.63	4.38	4.29	4.04	4.64	4.24	4.25	4.55
04/02/20	4.30	4.29	4.30	4.33	4.53	4.39	4.31	4.42	4.59	4.38	4.25	4.17	4.63	4.20	4.23	4.55
04/03/20	4.30	4.25	4.26	4.34	4.41	4.35	4.30	4.42	4.55	4.40	4.18	4.39	4.56	4.15	4.19	4.54
04/04/20	4.27	4.21	4.36	4.42	4.37	4.32	4.42	4.39	4.58	4.38	4.20	4.37	4.55	4.27	4.19	4.48
04/05/20	4.24	4.22	4.44	4.47	4.37	4.33	4.56	4.35	4.61	4.37	4.24	4.33	4.52	4.43	4.18	4.48
04/06/20	4.22	4.22	4.42	4.40	4.37	4.29	4.51	4.31	4.57	4.33	4.20	4.38	4.49	4.44	4.14	4.45
04/07/20	4.40	4.37	4.35	4.35	4.35	4.39	4.47	4.23	4.53	4.29	4.16	4.40	4.47	4.44	4.26	4.47
04/08/20	4.44	4.35	4.30	4.37	4.41	4.47	4.41	4.23	4.54	4.29	4.17	4.38	4.47	4.41	4.45	4.47
04/09/20	4.39	4.31	4.31	4.42	4.44	4.41	4.37	4.28	4.54	4.25	4.24	4.36	4.47	4.38	4.43	4.43
04/10/20	4.36	4.30	4.28	4.38	4.39	4.34	4.37	4.27	4.50	4.20	4.40	4.32	4.58	4.38	4.45	4.37
04/11/20	4.33	4.42	4.32	4.32	4.36	4.27	4.45	4.31	4.48	4.22	4.40	4.26	4.70	4.39	4.43	4.34
04/12/20	4.32	4.45	4.38	4.33	4.44	4.26	4.52	4.33	4.44	4.22	4.41	4.28	4.68	4.41	4.41	4.33
04/13/20	4.30	4.37	4.36	4.37	4.48	4.29	4.47	4.32	4.43	4.15	4.43	4.33	4.68	4.41	4.34	4.36
04/14/20	4.28	4.29	4.32	4.38	4.41	4.43	4.40	4.32	4.42	4.28	4.40	4.34	4.67	4.35	4.33	4.45
04/15/20	4.42	4.30	4.28	4.48	4.34	4.49	4.39	4.32	4.40	4.45	4.38	4.30	4.65	4.32	4.34	4.64
04/16/20	4.49	4.29	4.42	4.50	4.32	4.41	4.34	4.35	4.39	4.47	4.39	4.25	4.61	4.35	4.34	4.61
04/17/20	4.44	4.40	4.48	4.45	4.41	4.36	4.27	4.31	4.47	4.45	4.34	4.25	4.63	4.30	4.35	4.61
04/18/20	4.42	4.39	4.39	4.42	4.40	4.34	4.38	4.29	4.64	4.45	4.35	4.26	4.67	4.29	4.38	4.55
04/19/20	4.37	4.36	4.38	4.42	4.37	4.36	4.47	4.27	4.63	4.47	4.35	4.28	4.68	4.32	4.34	4.60
04/20/20	4.33	4.34	4.36	4.41	4.35	4.34	4.42	4.26	4.64	4.45	4.33	4.33	4.70	4.33	4.29	4.61
04/21/20	4.33	4.33	4.28	4.32	4.33	4.27	4.36	N/A**	4.67	4.47	4.32	4.50	4.71	4.32	4.38	4.61
04/22/20	4.35	4.31	N/A**	4.27	N/A**	4.23	4.35	N/A**	4.64	4.46	4.30	N/A**	4.66	N/A**	N/A**	4.61
04/23/20	4.31	N/A**	N/A**	4.31	N/A**	N/A**	4.35	N/A**	4.64	4.46	4.31	N/A**	4.61	N/A**	N/A**	4.57
04/24/20	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	4.66	4.51	N/A**	N/A**	4.65	N/A**	N/A**	4.59
04/25/20	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	4.66	4.49	N/A**	N/A**	N/A**	N/A**	N/A**	4.64
04/26/20	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	4.66	4.54	N/A**	N/A**	N/A**	N/A**	N/A**	4.68
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	N/A*	N/A*	N/A*	N/A*	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.

* GWRS AWPF offline April 27 to April 30.

** Cell Offline

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
04/01/20	4.48	4.48	4.75	5.23
04/02/20	4.46	4.49	4.88	5.11
04/03/20	4.45	4.41	4.76	4.80
04/04/20	4.43	4.39	4.81	4.93
04/05/20	4.40	4.44	4.89	4.96
04/06/20	4.46	4.40	4.86	4.89
04/07/20	4.48	4.34	4.90	4.75
04/08/20	4.47	4.30	4.70	4.94
04/09/20	4.44	4.30	4.85	4.74
04/10/20	4.39	4.22	4.95	4.76
04/11/20	4.42	4.30	4.68	4.94
04/12/20	4.34	4.60	4.71	4.73
04/13/20	4.40	4.51	4.85	4.82
04/14/20	4.40	4.52	4.75	4.98
04/15/20	4.45	4.48	4.66	4.69
04/16/20	4.47	4.47	4.85	4.73
04/17/20	4.43	4.48	4.63	4.85
04/18/20	4.42	4.50	4.62	4.69
04/19/20	4.39	4.52	4.71	4.67
04/20/20	4.34	4.46	4.73	4.69
04/21/20	4.33	4.46	4.73	4.80
04/22/20	4.44	4.48	4.80	4.80
04/23/20	N/A**	4.48	4.83	5.03
04/24/20	N/A**	4.53	4.81	4.82
04/25/20	N/A**	N/A**	4.97	4.74
04/26/20	N/A**	N/A**	4.92	4.78
04/27/20	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*
04/30/20	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.

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** Cell Offline

Orange County Water District - Ground Water Replenishment System (GWRS)
State Water Resources Control Board - Div. of Drinking Water - Title 22 Groundwater Recharge Report
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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
04/01/20	0.04	0.06	0.06	0.07	0.06	0.07	0.02	0.02	0.05	0.06	0.02	0.02	0.10	0.11	0.09	0.09	0.06	0.07	0.06
04/02/20	0.04	0.07	0.05	0.06	0.06	0.07	0.02	0.09	0.05	0.08	0.02	0.05	0.11	0.12	0.09	0.09	0.06	0.07	0.06
04/03/20	0.04	0.06	0.05	0.06	0.06	0.06	0.02	0.02	0.05	0.05	0.02	0.02	0.06	0.08	0.08	0.09	0.06	0.07	0.05
04/04/20	0.03	0.05	0.06	0.07	0.06	0.07	0.02	0.02	0.05	0.06	0.02	0.02	0.04	0.05	0.08	0.09	0.06	0.07	0.05
04/05/20	0.03	0.05	0.05	0.10	0.06	0.07	0.02	0.02	0.05	0.06	0.02	0.02	0.04	0.05	0.08	0.09	0.07	0.07	0.05
04/06/20	0.03	0.04	0.05	0.05	0.06	0.06	0.02	0.02	0.05	0.08	0.02	0.10	0.04	0.05	0.08	0.08	0.07	0.07	0.05
04/07/20	0.04	0.05	0.05	0.05	0.06	0.07	0.02	0.02	0.06	0.10	0.02	0.02	0.04	0.07	0.08	0.09	0.07	0.07	0.05
04/08/20	0.03	0.05	0.04	0.05	0.06	0.06	0.02	0.02	0.05	0.06	0.02	0.04	0.08	0.09	0.08	0.09	0.07	0.07	0.05
04/09/20	0.03	0.06	0.04	0.05	0.06	0.06	0.02	0.09	0.05	0.06	0.02	0.02	0.09	0.15	0.08	0.09	0.06	0.07	0.05
04/10/20	0.03	0.04	0.04	0.04	0.05	0.06	0.02	0.02	0.05	0.07	0.02	0.03	0.06	0.09	0.07	0.08	0.06	0.08	0.04
04/11/20	0.03	0.05	0.04	0.04	0.06	0.06	0.02	0.02	0.05	0.09	0.02	0.02	0.09	0.10	0.07	0.08	0.05	0.06	0.05
04/12/20	0.03	0.04	0.05	0.05	0.06	0.06	0.02	0.02	0.06	0.09	0.02	0.07	0.10	0.11	0.08	0.08	0.06	0.07	0.05
04/13/20	0.04	0.06	0.04	0.05	0.06	0.06	0.02	0.02	0.06	0.22	0.02	0.03	0.07	0.11	0.08	0.09	0.06	0.09	0.05
04/14/20	0.03	0.05	0.04	0.05	0.06	0.06	0.02	0.03	0.06	0.09	0.02	0.06	0.09	0.11	0.08	0.08	0.06	0.07	0.05
04/15/20	0.03	0.05	0.04	0.04	0.06	0.06	0.02	0.02	0.06	0.07	0.02	0.05	0.08	0.12	0.08	0.08	0.07	0.48	0.05
04/16/20	0.04	0.06	0.05	0.05	0.06	0.06	0.02	0.03	0.07	0.37	0.02	0.03	0.08	0.09	0.08	0.08	0.06	0.09	0.05
04/17/20	0.04	0.06	0.05	0.06	0.06	0.06	0.02	0.02	0.07	0.42	0.02	0.02	0.09	0.10	0.08	0.08	0.06	0.07	0.05
04/18/20	0.04	0.06	0.04	0.05	0.06	0.06	0.02	0.04	0.07	0.23	0.02	0.02	0.11	0.12	0.08	0.09	0.06	0.07	0.06
04/19/20	0.04	0.06	0.05	0.05	0.06	0.07	0.02	0.02	0.07	0.10	0.02	0.13	0.12	0.13	0.08	0.09	0.06	0.13	0.06
04/20/20	0.04	0.07	0.05	0.05	0.06	0.07	0.02	0.02	0.07	0.10	0.02	0.02	0.12	0.13	0.09	0.09	0.06	0.08	0.06
04/21/20	0.04	0.06	0.04	0.05	0.06	0.07	0.02	0.02	0.07	0.12	0.02	0.03	0.13	0.15	0.08	0.09	0.06	0.07	0.06
04/22/20	0.05	0.16	0.04	0.05	0.06	0.06	0.02	0.02	0.06	0.23	0.02	0.04	0.10	0.14	0.07	0.08	0.06	0.06	0.05
04/23/20	0.04	0.06	0.05	0.06	0.06	0.06	0.02	0.02	0.06	0.16	0.02	0.06	0.08	0.08	0.07	0.08	0.05	0.06	0.05
04/24/20	0.05	0.07	0.05	0.06	0.06	0.06	0.02	0.03	N/A**	N/A**	N/A**	N/A**	0.08	0.10	0.08	0.10	0.05	0.06	0.06
04/25/20	0.04	0.05	0.06	0.07	0.06	0.08	0.02	0.05	N/A**	N/A**	N/A**	N/A**	0.10	0.10	0.08	0.10	0.06	0.06	0.06
04/26/20	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**	0.02	0.02	N/A**	N/A**	N/A**	N/A**	0.13	1.69	0.09	0.09	0.06	0.07	0.08
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	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.

* GWRS AWPF offline April 27 to April 30.

** Cell Offline

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
04/01/20	0.058	0.058	7.903	7.115	8.924	0.048	0.038	0.058	1,666	1,589	1,783	30	28	34	99.40	2.22	98.17	1.74
04/02/20	0.057	0.058	7.908	7.103	9.086	0.054	0.047	0.063	1,656	1,573	1,758	30	27	35	99.32	2.17	98.19	1.74
04/03/20	0.056	0.061	8.009	7.133	9.217	0.054	0.050	0.065	1,658	1,582	1,741	30	27	33	99.33	2.17	98.20	1.74
04/04/20	0.059	0.060	8.069	7.173	9.302	0.052	0.047	0.062	1,637	1,563	1,720	29	26	32	99.36	2.19	98.25	1.76
04/05/20	0.060	0.060	8.129	7.309	9.473	0.051	0.045	0.064	1,594	1,545	1,660	28	25	31	99.38	2.20	98.25	1.76
04/06/20	0.059	0.059	8.115	7.379	9.621	0.047	0.043	0.051	1,561	1,508	1,614	27	25	29	99.42	2.24	98.28	1.77
04/07/20	0.056	0.057	8.140	7.361	8.925	0.050	0.047	0.059	1,598	1,521	1,721	27	25	31	99.38	2.21	98.28	1.77
04/08/20	0.058	0.058	8.151	7.363	11.678**	0.050	0.046	0.055	1,644	1,556	1,770	27	25	33	99.39	2.21	98.34	1.78
04/09/20	0.058	0.058	8.073	7.394	8.857	0.049	0.044	0.055	1,679	1,607	1,774	28	26	31	99.39	2.21	98.34	1.78
04/10/20	0.055	0.060	7.675	6.843	8.587	0.048	0.043	0.051	1,628	1,531	1,725	26	23	30	99.37	2.20	98.41	1.80
04/11/20	0.052	0.053	7.941	7.147	11.376**	0.050	0.044	0.055	1,711	1,631	1,846	28	25	36	99.37	2.20	98.39	1.79
04/12/20	0.046	0.050	7.895	7.161	8.725	0.051	0.045	0.062	1,715	1,646	1,824	29	26	33	99.36	2.19	98.32	1.77
04/13/20	0.039	0.045	7.761	7.063	8.632	0.047	0.043	0.053	1,689	1,599	1,809	29	27	33	99.39	2.21	98.27	1.76
04/14/20	0.045	0.049	7.951	7.191	8.672	0.052	0.047	0.057	1,787	1,694	1,914	31	27	35	99.35	2.19	98.28	1.76
04/15/20	0.050	0.051	7.764	5.637	8.595	0.054	0.047	0.060	1,833	1,736	1,962	32	29	36	99.31	2.16	98.27	1.76
04/16/20	0.049	0.050	7.754	6.976	8.454	0.055	0.050	0.060	1,876	1,777	2,012	32	28	38	99.30	2.15	98.29	1.77
04/17/20	0.043	0.060	7.837	6.996	8.524	0.054	0.049	0.060	1,901	1,827	2,007	34	30	39	99.31	2.16	98.23	1.75
04/18/20	0.051	0.053	7.989	5.678	8.727	0.053	0.047	0.060	1,895	1,822	1,971	34	31	37	99.33	2.17	98.22	1.75
04/19/20	0.053	0.053	8.064	7.324	8.742	0.053	0.045	0.062	1,832	1,757	1,923	32	30	36	99.34	2.18	98.23	1.75
04/20/20	0.051	0.051	7.891	6.826	8.759	0.050	0.035	0.056	1,738	1,638	1,817	31	28	35	99.37	2.20	98.22	1.75
04/21/20	0.047	0.050	8.098	7.388	8.848	0.056	0.053	0.072	1,815	1,727	1,951	33	29	38	99.31	2.16	98.18	1.74
04/22/20	0.049	0.049	7.954	7.383	8.782	0.060	0.050	0.074	1,844	1,755	1,955	35	32	40	99.25	2.13	98.10	1.72
04/23/20	0.048	0.051	7.979	6.134	8.689	0.058	0.053	0.067	1,853	1,772	1,959	36	32	42	99.27	2.14	98.03	1.71
04/24/20	0.049	0.050	7.974	6.921	8.842	0.060	0.056	0.067	1,866	1,776	1,971	36	31	41	99.24	2.12	98.06	1.71
04/25/20	0.049	0.050	7.952	7.292	12.274**	0.062	0.056	0.111	1,859	1,797	1,942	36	34	40	99.22	2.11	98.05	1.71
04/26/20	0.052	0.053	7.968	7.353	8.620	0.061	0.056	0.069	1,777	1,706	1,886	35	32	39	99.23	2.11	98.02	1.70
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	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 AWPF offline April 27 to April 30.

** Higher than normal value due to analyzer issue and issue is under investigation.

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
04/01/20	97.22	92.309	24,192.9	0.26	3.0	6
04/02/20	97.12	94.876	23,768.6	0.26	3.0	6
04/03/20	96.98	95.234	24,312.7	0.26	3.0	6
04/04/20	96.97	94.357	24,434.8	0.26	3.0	6
04/05/20	97.17	91.973	24,193.7	0.26	3.0	6
04/06/20	97.05	94.846	23,928.8	0.26	3.0	6
04/07/20	97.11	94.331	23,958.9	0.25	3.0	6
04/08/20	97.26	95.761	24,243.5	0.26	3.0	6
04/09/20	97.21	95.157	24,507.7	0.26	3.0	6
04/10/20	97.46	93.736	24,397.8	0.26	3.0	6
04/11/20	97.43	92.580	24,417.4	0.26	3.0	6
04/12/20	97.55	94.814	24,170.2	0.26	3.0	6
04/13/20	97.23	93.618	24,264.2	0.26	3.0	6
04/14/20	97.29	94.788	24,122.7	0.25	3.0	6
04/15/20	97.47	93.616	24,381.1	0.26	3.0	6
04/16/20	97.22	95.360	24,277.1	0.26	3.0	6
04/17/20	97.15	93.872	24,309.4	0.26	3.0	6
04/18/20	97.38	92.459	23,950.0	0.26	3.0	6
04/19/20	97.51	92.798	23,929.2	0.26	3.0	6
04/20/20	97.50	91.910	23,930.6	0.26	3.0	6
04/21/20	97.74	73.147	23,688.6	0.26	3.0	6
04/22/20	97.76	60.181	19,926.8	0.27	3.0	6
04/23/20	97.94	47.405	16,784.7	0.28	3.0	6
04/24/20	97.84	28.304	14,073.2	0.30	3.0	6
04/25/20	98.05	20.739	8,757.0	0.31	3.0	6
04/26/20	98.30	17.173	7,839.4	0.38	3.0	6
04/27/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/28/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/29/20	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
04/30/20	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 AWPF offline April 27 to April 30.

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	12.64	12.64	12.17	Y	Y	Y	0.4	0.0	0.0	0.0	0.0
05/13/20	12.49	12.49	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/14/20	12.55	12.55	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/15/20	12.56	12.56	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/16/20	12.58	12.58	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/17/20	12.61	12.61	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/18/20	12.61	12.61	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/19/20	12.56	12.56	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/20/20	12.55	12.55	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/21/20	12.57	12.57	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/22/20	12.54	12.54	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/23/20	12.56	12.56	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/24/20	12.58	12.58	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/25/20	12.55	12.55	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/26/20	12.43	12.43	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/27/20	12.36	12.36	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/28/20	12.37	12.37	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/29/20	12.38	12.38	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/30/20	12.36	12.36	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
05/31/20	12.39	12.39	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.

* GWRS AWPF offline May 1 to May 11, 2020

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					
	OCSD	MF+Cl_2	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	0.00	4.47	2.17	6.00	0.00	12.64
05/13/20	0.00	4.31	2.18	6.00	0.00	12.49
05/14/20	0.00	4.36	2.19	6.00	0.00	12.55
05/15/20	0.00	4.37	2.19	6.00	0.00	12.56
05/16/20	0.00	4.37	2.21	6.00	0.00	12.58
05/17/20	0.00	4.37	2.24	6.00	0.00	12.61
05/18/20	0.00	4.35	2.26	6.00	0.00	12.61
05/19/20	0.00	4.33	2.23	6.00	0.00	12.56
05/20/20	0.00	4.33	2.22	6.00	0.00	12.55
05/21/20	0.00	4.32	2.24	6.00	0.00	12.57
05/22/20	0.00	4.32	2.23	6.00	0.00	12.54
05/23/20	0.00	4.33	2.23	6.00	0.00	12.56
05/24/20	0.00	4.33	2.25	6.00	0.00	12.58
05/25/20	0.00	4.32	2.23	6.00	0.00	12.55
05/26/20	0.00	4.30	2.13	6.00	0.00	12.43
05/27/20	0.00	4.30	2.06	6.00	0.00	12.36
05/28/20	0.00	4.30	2.07	6.00	0.00	12.37
05/29/20	0.00	4.27	2.10	6.00	0.00	12.38
05/30/20	0.00	4.26	2.10	6.00	0.00	12.36
05/31/20	0.00	4.25	2.14	6.00	0.00	12.39

Notes:

* GWRS AWPF offline May 1 to May 11, 2020

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	0.00	0.00	2.17	6.00	4.00	12.17
05/13/20	0.00	0.00	2.18	6.00	4.00	12.18
05/14/20	0.00	0.00	2.19	6.00	4.00	12.19
05/15/20	0.00	0.00	2.19	6.00	4.00	12.19
05/16/20	0.00	0.00	2.21	6.00	4.00	12.21
05/17/20	0.00	0.00	2.24	6.00	4.00	12.24
05/18/20	0.00	0.00	2.26	6.00	4.00	12.26
05/19/20	0.00	0.00	2.23	6.00	4.00	12.23
05/20/20	0.00	0.00	2.22	6.00	4.00	12.22
05/21/20	0.00	0.00	2.24	6.00	4.00	12.24
05/22/20	0.00	0.00	2.23	6.00	4.00	12.23
05/23/20	0.00	0.00	2.23	6.00	4.00	12.23
05/24/20	0.00	0.00	2.25	6.00	4.00	12.25
05/25/20	0.00	0.00	2.23	6.00	4.00	12.23
05/26/20	0.00	0.00	2.13	6.00	4.00	12.13
05/27/20	0.00	0.00	2.06	6.00	4.00	12.06
05/28/20	0.00	0.00	2.07	6.00	4.00	12.07
05/29/20	0.00	0.00	2.10	6.00	4.00	12.10
05/30/20	0.00	0.00	2.10	6.00	4.00	12.10
05/31/20	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.

* GWRS AWPF offline May 1 to May 11, 2020

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	4.84	4.96	4.97	4.65	4.69	4.70	4.79	4.50	4.49	4.48	4.68	4.74	4.47	4.47	4.50	4.54
05/13/20	4.83	4.98	4.96	4.64	4.65	4.67	4.73	4.46	4.33	4.31	4.55	4.58	4.31	4.39	4.35	4.39
05/14/20	4.74	4.87	4.77	4.55	4.57	4.54	4.70	4.43	4.47	4.41	4.63	4.70	4.36	4.39	4.41	4.45
05/15/20	4.71	4.78	4.71	4.51	4.56	4.50	4.68	4.39	4.48	4.44	4.69	4.74	4.39	4.39	4.49	4.52
05/16/20	4.71	4.77	4.69	4.45	4.53	4.49	4.63	4.38	4.48	4.47	4.71	4.68	4.42	4.38	4.51	4.52
05/17/20	4.67	4.77	4.73	4.48	4.53	4.51	4.67	4.39	4.46	4.48	4.69	4.69	4.39	4.41	4.51	4.51
05/18/20	4.67	4.77	4.77	4.40	4.55	4.52	4.63	4.35	4.48	4.51	4.69	4.71	4.40	4.43	4.50	4.55
05/19/20	4.66	4.75	4.73	4.50	4.50	4.53	4.61	4.36	4.44	4.46	4.65	4.69	4.37	4.42	4.51	4.55
05/20/20	4.65	4.77	4.69	4.47	4.48	4.51	4.63	4.38	4.41	4.46	4.69	4.68	4.38	4.39	4.48	4.51
05/21/20	4.63	4.74	4.68	4.44	4.53	4.49	4.61	4.49	4.45	4.47	4.73	4.67	4.37	4.36	4.48	4.50
05/22/20	4.63	4.78	4.71	4.40	4.51	4.47	4.63	4.46	4.45	4.43	4.73	4.67	4.35	4.37	4.47	4.50
05/23/20	4.59	4.74	4.66	4.39	4.53	4.48	4.62	4.42	4.46	4.44	4.71	4.66	4.33	4.46	4.48	4.51
05/24/20	4.63	4.73	4.67	4.38	4.48	4.51	4.60	4.42	4.46	4.46	4.73	4.81	4.36	4.49	4.46	4.52
05/25/20	4.59	4.70	4.64	4.43	4.64	4.51	4.63	4.38	4.42	4.45	4.74	4.81	4.38	4.49	4.46	4.51
05/26/20	4.56	4.98	4.61	4.42	4.57	4.50	4.58	4.38	4.41	4.40	4.72	4.76	4.34	4.49	4.47	4.50
05/27/20	4.55	4.84	4.63	4.37	4.55	4.43	4.57	4.40	4.40	4.42	4.68	4.76	4.30	4.51	4.46	4.49
05/28/20	4.83	4.86	4.58	4.39	4.54	4.50	4.57	4.39	4.41	4.45	4.69	4.75	4.30	4.47	4.43	4.48
05/29/20	4.79	4.84	4.61	4.38	4.56	4.50	4.60	4.38	4.38	4.39	4.66	4.75	4.27	4.47	4.42	4.58
05/30/20	4.75	4.80	4.61	4.33	4.53	4.48	4.82	4.46	4.36	4.40	4.70	4.75	4.28	4.48	4.42	4.63
05/31/20	4.75	4.81	4.60	4.56	4.56	4.46	4.71	4.43	4.32	4.42	4.68	4.74	4.27	4.48	4.41	4.62

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline May 1 to May 11, 2020

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	4.68	4.65	4.60	4.74	4.60	4.62	4.65	4.59	4.69	4.63	4.55	4.51	4.84	4.51	4.65	4.85
05/13/20	4.65	4.64	4.56	4.69	4.50	4.58	4.63	4.51	4.65	4.55	4.46	4.41	4.87	4.42	4.51	4.75
05/14/20	4.54	4.54	4.49	4.60	4.50	4.55	4.55	4.47	4.61	4.51	4.40	4.39	4.83	4.40	4.43	4.69
05/15/20	4.47	4.43	4.43	4.51	4.42	4.50	4.49	4.45	4.62	4.52	4.37	4.39	4.77	4.37	4.43	4.64
05/16/20	4.47	4.40	4.41	4.48	4.39	4.47	4.49	4.43	4.60	4.48	4.37	4.38	4.73	4.39	4.43	4.59
05/17/20	4.48	4.39	4.42	4.48	4.43	4.49	4.51	4.44	4.59	4.48	4.39	4.37	4.75	4.42	4.42	4.62
05/18/20	4.49	4.38	4.42	4.49	4.44	4.47	4.51	4.40	4.61	4.50	4.37	4.35	4.80	4.41	4.42	4.61
05/19/20	4.49	4.41	4.41	4.50	4.42	4.41	4.47	4.41	4.58	4.47	4.36	4.33	4.88	4.43	4.40	4.58
05/20/20	4.45	4.40	4.39	4.48	4.37	4.44	4.45	4.41	4.56	4.46	4.35	4.33	4.78	4.42	4.41	4.55
05/21/20	4.45	4.40	4.35	4.48	4.38	4.48	4.43	4.37	4.57	4.45	4.35	4.32	4.78	4.44	4.43	4.59
05/22/20	4.45	4.39	4.39	4.48	4.39	4.47	4.42	4.37	4.59	4.45	4.34	4.32	4.74	4.42	4.39	4.65
05/23/20	4.43	4.36	4.42	4.46	4.37	4.45	4.45	4.38	4.62	4.51	4.34	4.34	4.72	4.40	4.39	4.68
05/24/20	4.43	4.36	4.44	4.48	4.36	4.45	4.47	4.36	4.65	4.62	4.34	4.33	4.71	4.38	4.37	4.68
05/25/20	4.42	4.38	4.45	4.46	4.34	4.44	4.47	4.35	4.66	4.55	4.32	4.37	4.72	4.40	4.40	4.67
05/26/20	4.40	4.36	4.42	4.43	4.36	4.41	4.57	4.35	4.65	4.51	4.30	4.42	4.69	4.39	4.39	4.64
05/27/20	4.40	4.34	4.42	4.42	4.36	4.39	4.59	4.35	4.62	4.50	4.34	4.41	4.70	4.39	4.37	4.64
05/28/20	4.40	4.42	4.42	4.40	4.33	4.35	4.52	4.33	4.60	4.51	4.41	4.39	4.70	4.38	4.44	4.64
05/29/20	4.38	4.44	4.40	4.36	4.29	4.34	4.55	4.30	4.60	4.51	4.38	4.39	4.67	4.37	4.54	4.64
05/30/20	4.35	4.46	4.41	4.38	4.26	4.36	4.54	4.29	4.64	4.51	4.42	4.39	4.65	4.39	4.47	4.63
05/31/20	4.34	4.50	4.42	4.40	4.25	4.49	4.53	4.30	4.63	4.51	4.43	4.38	4.69	4.44	4.47	4.60

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline May 1 to May 11, 2020

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												
05/01/20	NA*	NA*	NA*	NA*												
05/02/20	NA*	NA*	NA*	NA*												
05/03/20	NA*	NA*	NA*	NA*												
05/04/20	NA*	NA*	NA*	NA*												
05/05/20	NA*	NA*	NA*	NA*												
05/06/20	NA*	NA*	NA*	NA*												
05/07/20	NA*	NA*	NA*	NA*												
05/08/20	NA*	NA*	NA*	NA*												
05/09/20	NA*	NA*	NA*	NA*												
05/10/20	NA*	NA*	NA*	NA*												
05/11/20	NA*	NA*	NA*	NA*												
05/12/20	4.74	5.00	5.23	5.21												
05/13/20	4.54	4.75	4.99	5.09												
05/14/20	4.52	4.61	4.94	5.00												
05/15/20	4.50	4.55	4.93	4.90												
05/16/20	4.48	4.56	4.88	4.96												
05/17/20	4.44	4.56	4.76	4.99												
05/18/20	4.47	4.56	4.98	5.07												
05/19/20	4.49	4.55	4.83	4.88												
05/20/20	4.47	4.53	4.77	5.00												
05/21/20	4.46	4.54	4.84	5.16												
05/22/20	4.56	4.50	4.81	5.01												
05/23/20	4.54	4.50	4.86	4.86												
05/24/20	4.50	4.48	4.89	4.93												
05/25/20	4.50	4.52	4.87	4.98												
05/26/20	4.50	4.70	4.94	4.99												
05/27/20	4.46	4.64	4.98	5.01												
05/28/20	4.48	4.60	4.82	4.94												
05/29/20	4.45	4.56	4.88	4.96												
05/30/20	4.44	4.59	5.03	4.96												
05/31/20	4.49	4.56	4.94	5.13												

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* GWRS AWPF offline May 1 to May 11, 2020

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	0.08	0.83**	0.13	0.26	0.10	1.03**	0.08	2.16**	0.10	0.26	0.57	1.04	0.17	0.32	0.14	0.24	0.08	0.13	0.16
05/13/20	0.05	0.32	0.11	0.23	0.09	1.57**	0.05	0.41	0.07	0.22	0.02	0.04	0.11	0.24	0.12	0.27	0.07	0.08	0.08
05/14/20	0.04	0.27	0.13	2.82**	0.07	0.36	0.05	0.06	0.07	0.21	0.02	0.12	0.09	0.11	0.11	0.14	0.07	0.08	0.07
05/15/20	0.03	0.06	0.10	0.12	0.07	0.07	0.06	0.06	0.07	0.08	0.02	0.03	0.11	0.26	0.11	0.17	0.05	0.07	0.07
05/16/20	0.03	0.05	0.10	0.11	0.07	0.08	0.06	0.07	0.08	0.08	0.02	0.10	0.12	0.16	0.11	0.15	0.06	0.12	0.07
05/17/20	0.03	0.04	0.10	0.12	0.07	0.09	0.07	0.07	0.08	0.12	0.02	0.08	0.12	0.17	0.11	0.14	0.06	0.06	0.07
05/18/20	0.03	0.22	0.11	0.13	0.07	0.09	0.07	0.07	0.07	0.12	0.02	0.03	0.13	0.16	0.11	0.14	0.06	0.07	0.07
05/19/20	0.03	0.06	0.11	0.13	0.06	0.07	0.07	0.07	0.08	0.21	0.02	0.03	0.12	0.16	0.11	0.13	0.05	0.10	0.07
05/20/20	0.03	0.04	0.06	0.14	0.06	0.08	0.04	0.07	0.08	0.10	0.02	0.04	0.13	0.19	0.07	0.12	0.05	0.07	0.06
05/21/20	0.03	0.04	0.04	0.06	0.07	0.07	0.02	0.02	0.07	0.21	0.02	0.03	0.12	0.18	0.02	0.18	0.06	0.07	0.05
05/22/20	0.03	0.04	0.04	0.13	0.07	0.08	0.02	0.07	0.07	0.26	0.03	0.16	0.09	0.21	0.02	0.11	0.06	0.07	0.05
05/23/20	0.04	0.12	0.04	0.10	0.07	0.09	0.02	0.15	0.06	0.07	0.03	0.03	0.09	0.21	0.02	0.03	0.07	0.07	0.05
05/24/20	0.04	0.06	0.05	0.09	0.07	0.08	0.02	0.03	0.06	0.11	0.03	0.10	0.10	0.15	0.02	0.03	0.07	0.07	0.05
05/25/20	0.04	0.05	0.06	0.15	0.08	0.09	0.02	0.03	0.06	0.07	0.03	0.04	0.11	0.13	0.03	0.28	0.07	0.11	0.05
05/26/20	0.04	0.07	0.06	0.14	0.07	0.10	0.02	0.10	0.07	0.12	0.03	0.11	0.13	0.20	0.03	0.11	0.07	0.08	0.06
05/27/20	0.03	0.09	0.05	0.09	0.07	0.08	0.02	0.03	0.07	0.14	0.03	0.03	0.13	0.18	0.02	0.03	0.04	0.18	0.05
05/28/20	0.03	0.04	0.05	0.11	0.07	0.20	0.03	0.31	0.06	0.08	0.02	0.03	0.11	0.13	0.02	0.03	0.02	0.03	0.04
05/29/20	0.03	0.05	0.06	0.11	0.07	0.08	0.03	0.06	0.06	0.10	0.02	0.03	0.11	0.15	0.02	0.03	0.02	0.02	0.05
05/30/20	0.03	0.04	0.07	0.18	0.07	0.08	0.03	0.04	0.06	0.08	0.02	0.04	0.11	0.21	0.02	0.03	0.02	0.02	0.05
05/31/20	0.03	0.14	0.07	0.13	0.07	0.08	0.03	0.05	0.06	0.08	0.02	0.03	0.12	0.26	0.02	0.04	0.02	0.02	0.05

Notes: Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* GWRS AWPF offline May 1 to May 11, 2020

** Higher than normal maximum values occurred briefly (5 – 6 minutes) immediately following the affected cells' daily PDT. Preliminarily, the events appear to be due to air entrainment or other related mechanical issue and currently being investigated by OCWD staff.

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	0.043	0.069	7.675	6.950	8.519	0.052	0.043	0.064	1,778	1,709	1,913	38	31	46	99.32	2.17	97.89	1.68
05/13/20	0.072	0.075	7.662	7.092	8.289	0.051	0.044	0.059	1,840	1,767	1,919	39	34	45	99.34	2.18	97.88	1.67
05/14/20	0.076	0.078	7.690	6.772	8.659	0.060	0.053	0.071	1,839	1,740	1,981	36	32	42	99.35	2.19	98.03	1.70
05/15/20	0.077	0.078	7.785	6.520	8.725	0.050	0.045	0.060	1,824	1,741	1,907	36	32	43	99.36	2.19	98.02	1.70
05/16/20	0.080	0.082	7.679	6.825	8.794	0.047	0.043	0.060	1,764	1,705	1,828	34	32	38	99.39	2.21	98.06	1.71
05/17/20	0.084	0.086	7.423	5.636	8.616	0.043	0.038	0.048	1,685	1,615	1,764	34	31	37	99.42	2.24	98.01	1.70
05/18/20	0.088	0.089	7.493	6.592	8.893	0.041	0.037	0.052	1,622	1,530	1,764	32	28	36	99.45	2.26	98.03	1.71
05/19/20	0.091	0.093	7.777	5.875	9.006	0.046	0.043	0.060	1,778	1,679	1,894	34	30	38	99.41	2.23	98.08	1.72
05/20/20	0.094	0.098	7.703	5.670	10.290	0.047	0.042	0.060	1,817	1,748	1,908	35	31	40	99.39	2.22	98.06	1.71
05/21/20	0.092	0.094	7.931	7.089	9.142	0.046	0.041	0.058	1,821	1,749	1,904	35	32	39	99.43	2.24	98.07	1.71
05/22/20	0.093	0.094	7.653	5.641	8.838	0.046	0.038	0.059	1,788	1,727	1,857	35	31	42	99.41	2.23	98.07	1.71
05/23/20	0.095	0.096	7.388	5.561	8.682	0.044	0.041	0.067	1,741	1,681	1,834	34	31	39	99.41	2.23	98.03	1.71
05/24/20	0.097	0.098	7.623	6.867	8.888	0.043	0.038	0.050	1,653	1,587	1,724	34	31	39	99.44	2.25	97.92	1.68
05/25/20	0.093	0.095	7.567	5.913	8.771	0.045	0.036	0.066	1,624	1,572	1,696	34	29	43	99.41	2.23	97.89	1.68
05/26/20	0.097	0.101	7.927	6.372	9.177	0.059	0.051	0.074	1,621	1,550	1,729	36	32	43	99.25	2.13	97.75	1.65
05/27/20	0.083	0.102	8.056	6.330	9.233	0.070	0.062	0.111	1,759	1,649	1,927	38	33	44	99.14	2.06	97.84	1.67
05/28/20	0.043	0.071	7.943	6.682	10.470	0.067	0.060	0.079	1,818	1,726	1,948	40	36	45	99.15	2.07	97.81	1.66
05/29/20	0.013	0.070	7.920	7.195	8.859	0.062	0.040	0.103	1,830	1,771	1,894	40	36	45	99.21	2.10	97.80	1.66
05/30/20	0.011	0.011	7.795	5.833	8.802	0.062	0.053	0.077	1,754	1,701	1,846	39	37	44	99.21	2.10	97.76	1.65
05/31/20	0.011	0.011	7.912	7.120	13.869	0.058	0.051	0.068	1,649	1,591	1,701	36	33	41	99.27	2.14	97.80	1.66

Notes:

* GWRS AWPF offline May 1 to May 11, 2020

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
05/01/20	NA*	NA*	NA*	NA*	NA*	NA*
05/02/20	NA*	NA*	NA*	NA*	NA*	NA*
05/03/20	NA*	NA*	NA*	NA*	NA*	NA*
05/04/20	NA*	NA*	NA*	NA*	NA*	NA*
05/05/20	NA*	NA*	NA*	NA*	NA*	NA*
05/06/20	NA*	NA*	NA*	NA*	NA*	NA*
05/07/20	NA*	NA*	NA*	NA*	NA*	NA*
05/08/20	NA*	NA*	NA*	NA*	NA*	NA*
05/09/20	NA*	NA*	NA*	NA*	NA*	NA*
05/10/20	NA*	NA*	NA*	NA*	NA*	NA*
05/11/20	NA*	NA*	NA*	NA*	NA*	NA*
05/12/20	98.63	53.930	10,986.7	0.42	3.0	6
05/13/20	98.03	76.585	15,968.0	0.30	3.0	6
05/14/20	97.77	96.224	20,856.4	0.27	3.0	6
05/15/20	97.58	95.414	25,070.3	0.26	3.0	6
05/16/20	97.62	94.864	24,797.4	0.26	3.0	6
05/17/20	97.33	89.992	24,324.7	0.26	3.0	6
05/18/20	97.22	93.283	25,873.5	0.26	3.0	6
05/19/20	97.19	94.958	24,367.1	0.26	3.0	6
05/20/20	97.10	93.866	24,400.5	0.26	3.0	6
05/21/20	97.18	96.399	24,324.2	0.26	3.0	6
05/22/20	97.36	94.948	24,971.8	0.26	3.0	6
05/23/20	97.44	92.544	24,558.7	0.26	3.0	6
05/24/20	97.29	90.306	24,106.7	0.26	3.0	6
05/25/20	97.34	90.235	24,088.6	0.27	3.0	6
05/26/20	97.08	91.652	22,685.9	0.26	3.0	6
05/27/20	97.28	93.376	24,169.3	0.26	3.0	6
05/28/20	97.34	93.897	24,280.3	0.25	3.0	6
05/29/20	97.04	92.120	23,819.8	0.26	3.0	6
05/30/20	97.13	90.942	23,830.7	0.26	3.0	6
05/31/20	97.07	90.028	22,999.5	0.25	3.0	6

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95% — * GWRS AWPF offline May 1 to May 11, 2020

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
06/01/20	12.42	12.42	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/02/20	12.36	12.36	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/03/20	12.33	12.33	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/04/20	12.29	12.29	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/05/20	12.28	12.28	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/06/20	12.29	12.29	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/07/20	12.40	12.40	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/08/20	12.44	12.44	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/09/20	12.33	12.33	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/10/20	12.25	12.25	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/11/20	12.28	12.28	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/12/20	12.30	12.30	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/13/20	12.31	12.31	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/14/20	12.33	12.33	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/15/20	12.33	12.33	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/16/20	12.26	12.26	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/17/20	12.32	12.32	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/18/20	12.30	12.30	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/19/20	12.34	12.34	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/20/20	12.31	12.31	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/21/20	12.27	12.27	12.02	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/22/20	12.31	12.31	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/23/20	12.33	12.33	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/24/20	12.30	12.30	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/25/20	12.29	12.29	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/26/20	12.28	12.28	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/27/20	12.34	12.34	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/28/20	12.37	12.37	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/29/20	12.36	12.36	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
06/30/20	12.37	12.37	12.06	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/20	0.00	4.27	2.14	6.00	0.00	12.42
06/02/20	0.00	4.25	2.11	6.00	0.00	12.36
06/03/20	0.00	4.24	2.08	6.00	0.00	12.33
06/04/20	0.00	4.22	2.07	6.00	0.00	12.29
06/05/20	0.00	4.17	2.12	6.00	0.00	12.28
06/06/20	0.00	4.16	2.13	6.00	0.00	12.29
06/07/20	0.00	4.28	2.12	6.00	0.00	12.40
06/08/20	0.00	4.27	2.16	6.00	0.00	12.44
06/09/20	0.00	4.24	2.09	6.00	0.00	12.33
06/10/20	0.00	4.21	2.04	6.00	0.00	12.25
06/11/20	0.00	4.19	2.09	6.00	0.00	12.28
06/12/20	0.00	4.19	2.10	6.00	0.00	12.30
06/13/20	0.00	4.19	2.12	6.00	0.00	12.31
06/14/20	0.00	4.18	2.15	6.00	0.00	12.33
06/15/20	0.00	4.17	2.16	6.00	0.00	12.33
06/16/20	0.00	4.15	2.11	6.00	0.00	12.26
06/17/20	0.00	4.24	2.09	6.00	0.00	12.32
06/18/20	0.00	4.27	2.03	6.00	0.00	12.30
06/19/20	0.00	4.26	2.08	6.00	0.00	12.34
06/20/20	0.00	4.24	2.07	6.00	0.00	12.31
06/21/20	0.00	4.24	2.02	6.00	0.00	12.27
06/22/20	0.00	4.24	2.07	6.00	0.00	12.31
06/23/20	0.00	4.29	2.04	6.00	0.00	12.33
06/24/20	0.00	4.25	2.05	6.00	0.00	12.30
06/25/20	0.00	4.24	2.06	6.00	0.00	12.29
06/26/20	0.00	4.23	2.05	6.00	0.00	12.28
06/27/20	0.00	4.30	2.05	6.00	0.00	12.34
06/28/20	0.00	4.31	2.06	6.00	0.00	12.37
06/29/20	0.00	4.30	2.07	6.00	0.00	12.36
06/30/20	0.00	4.31	2.06	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
06/01/20	0.00	0.00	2.14	6.00	4.00	12.14
06/02/20	0.00	0.00	2.11	6.00	4.00	12.11
06/03/20	0.00	0.00	2.08	6.00	4.00	12.08
06/04/20	0.00	0.00	2.07	6.00	4.00	12.07
06/05/20	0.00	0.00	2.12	6.00	4.00	12.12
06/06/20	0.00	0.00	2.13	6.00	4.00	12.13
06/07/20	0.00	0.00	2.12	6.00	4.00	12.12
06/08/20	0.00	0.00	2.16	6.00	4.00	12.16
06/09/20	0.00	0.00	2.09	6.00	4.00	12.09
06/10/20	0.00	0.00	2.04	6.00	4.00	12.04
06/11/20	0.00	0.00	2.09	6.00	4.00	12.09
06/12/20	0.00	0.00	2.10	6.00	4.00	12.10
06/13/20	0.00	0.00	2.12	6.00	4.00	12.12
06/14/20	0.00	0.00	2.15	6.00	4.00	12.15
06/15/20	0.00	0.00	2.16	6.00	4.00	12.16
06/16/20	0.00	0.00	2.11	6.00	4.00	12.11
06/17/20	0.00	0.00	2.09	6.00	4.00	12.09
06/18/20	0.00	0.00	2.03	6.00	4.00	12.03
06/19/20	0.00	0.00	2.08	6.00	4.00	12.08
06/20/20	0.00	0.00	2.07	6.00	4.00	12.07
06/21/20	0.00	0.00	2.02	6.00	4.00	12.02
06/22/20	0.00	0.00	2.07	6.00	4.00	12.07
06/23/20	0.00	0.00	2.04	6.00	4.00	12.04
06/24/20	0.00	0.00	2.05	6.00	4.00	12.05
06/25/20	0.00	0.00	2.06	6.00	4.00	12.06
06/26/20	0.00	0.00	2.05	6.00	4.00	12.05
06/27/20	0.00	0.00	2.05	6.00	4.00	12.05
06/28/20	0.00	0.00	2.06	6.00	4.00	12.06
06/29/20	0.00	0.00	2.07	6.00	4.00	12.07
06/30/20	0.00	0.00	2.06	6.00	4.00	12.06

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
06/01/20	4.69	4.81	4.59	4.58	4.53	4.46	4.70	4.45	4.35	4.39	4.68	4.73	4.27	4.45	4.40	4.59
06/02/20	4.76	4.84	4.59	4.56	4.51	4.67	4.73	4.40	4.36	4.39	4.66	4.71	4.25	4.46	4.39	4.61
06/03/20	4.72	4.83	4.84	4.56	4.53	4.62	4.68	4.40	4.37	4.38	4.67	4.71	4.24	4.44	4.38	4.61
06/04/20	4.65	4.77	4.83	4.54	4.50	4.58	4.68	4.40	4.30	4.34	4.65	4.69	4.22	4.44	4.49	4.58
06/05/20	4.68	4.77	4.82	4.47	4.49	4.57	4.65	4.41	4.24	4.31	4.63	4.70	4.17	4.39	4.52	4.56
06/06/20	4.69	4.77	4.73	4.45	4.49	4.58	4.62	4.35	4.27	4.47	4.61	4.67	4.16	4.40	4.52	4.56
06/07/20	4.67	4.80	4.77	4.50	4.48	4.58	4.66	4.36	4.46	4.54	4.60	4.66	4.43	4.40	4.50	4.55
06/08/20	4.66	4.73	4.73	4.48	4.49	4.58	4.63	4.43	4.49	4.52	4.57	4.65	4.52	4.38	4.51	4.52
06/09/20	4.66	4.74	4.76	4.45	4.50	4.59	4.63	4.47	4.50	4.47	4.58	4.62	4.49	4.36	4.50	4.51
06/10/20	4.66	4.78	4.77	4.46	4.48	4.58	4.64	4.46	4.50	4.51	4.58	4.64	4.46	4.37	4.48	4.52
06/11/20	4.66	4.71	4.74	4.47	4.47	4.55	4.62	4.44	4.43	4.50	4.57	4.64	4.45	4.34	4.47	4.51
06/12/20	4.61	4.66	4.74	4.43	4.46	4.50	4.60	4.43	4.45	4.48	4.58	4.63	4.43	4.33	4.48	4.49
06/13/20	4.63	4.69	4.72	4.42	4.48	4.53	4.63	4.44	4.48	4.48	4.53	4.63	4.47	4.32	4.47	4.50
06/14/20	4.60	4.69	4.74	4.46	4.49	4.55	4.62	4.42	4.46	4.47	4.49	4.61	4.45	4.32	4.47	4.52
06/15/20	4.65	4.67	4.76	4.41	4.49	4.56	4.63	4.43	4.44	4.45	4.69	4.62	4.45	4.32	4.49	4.51
06/16/20	4.58	4.67	4.75	4.44	4.44	4.54	4.60	4.42	4.44	4.48	4.74	4.60	4.43	4.29	4.47	4.47
06/17/20	4.57	4.67	4.69	4.40	4.40	4.53	4.57	4.46	4.44	4.48	4.74	4.57	4.42	4.28	4.46	4.44
06/18/20	4.57	4.66	4.64	4.43	4.42	4.53	4.57	4.44	4.41	4.48	4.74	4.56	4.39	4.27	4.45	4.47
06/19/20	4.57	4.66	4.68	4.36	4.40	4.54	4.60	4.47	4.43	4.47	4.74	4.58	4.39	4.46	4.45	4.45
06/20/20	4.56	4.66	4.63	4.36	4.62	4.52	4.59	4.46	4.44	4.47	4.74	4.73	4.40	4.51	4.45	4.43
06/21/20	4.59	4.66	4.66	4.34	4.60	4.54	4.59	4.46	4.43	4.43	4.73	4.78	4.43	4.50	4.45	4.42
06/22/20	4.58	4.90	4.70	4.40	4.55	4.52	4.58	4.45	4.40	4.44	4.72	4.79	4.42	4.51	4.44	4.43
06/23/20	4.55	4.88	4.62	4.40	4.57	4.49	4.56	4.39	4.42	4.43	4.71	4.76	4.38	4.49	4.42	4.42
06/24/20	4.77	4.89	4.65	4.39	4.56	4.53	4.55	4.42	4.44	4.42	4.67	4.75	4.38	4.48	4.42	4.51
06/25/20	4.77	4.83	4.65	4.34	4.54	4.52	4.76	4.44	4.38	4.40	4.67	4.75	4.34	4.45	4.41	4.59
06/26/20	4.75	4.77	4.56	4.50	4.57	4.46	4.74	4.46	4.38	4.39	4.66	4.71	4.33	4.46	4.38	4.62
06/27/20	4.75	4.87	4.56	4.57	4.60	4.46	4.71	4.46	4.39	4.40	4.65	4.74	4.35	4.48	4.39	4.61
06/28/20	4.77	4.85	4.55	4.49	4.52	4.68	4.72	4.47	4.35	4.41	4.67	4.74	4.37	4.44	4.40	4.57
06/29/20	4.70	4.88	4.68	4.58	4.52	4.66	4.69	4.48	4.33	4.35	4.65	4.72	4.39	4.49	4.39	4.59
06/30/20	4.71	4.84	4.76	4.56	4.50	4.63	4.70	4.43	4.34	4.31	4.64	4.70	4.33	4.44	4.38	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															
	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
06/01/20	4.37	4.47	4.41	4.39	4.44	4.58	4.52	4.29	4.61	4.50	4.43	4.39	4.67	4.53	4.47	4.62
06/02/20	4.38	4.45	4.36	4.39	4.57	4.55	4.52	4.29	4.60	4.48	4.40	4.37	4.63	4.47	4.47	4.59
06/03/20	4.34	4.45	4.36	4.52	4.52	4.54	4.50	4.27	4.59	4.46	4.36	4.36	4.60	4.44	4.45	4.58
06/04/20	4.33	4.44	4.36	4.57	4.48	4.53	4.49	4.40	4.57	4.49	4.37	4.36	4.59	4.45	4.42	4.59
06/05/20	4.47	4.41	4.34	4.53	4.49	4.51	4.47	4.52	4.57	4.48	4.38	4.34	4.60	4.44	4.42	4.56
06/06/20	4.53	4.40	4.31	4.52	4.48	4.49	4.45	4.49	4.54	4.44	4.34	4.32	4.63	4.46	4.39	4.55
06/07/20	4.51	4.39	4.28	4.52	4.45	4.48	4.48	4.48	4.52	4.45	4.34	4.32	4.75	4.45	4.41	4.53
06/08/20	4.53	4.40	4.27	4.53	4.45	4.48	4.47	4.47	4.53	4.44	4.33	4.30	4.75	4.43	4.40	4.53
06/09/20	4.49	4.38	4.24	4.51	4.43	4.47	4.45	4.44	4.53	4.42	4.32	4.32	4.72	4.46	4.40	4.50
06/10/20	4.50	4.36	4.21	4.50	4.40	4.46	4.42	4.45	4.52	4.45	4.34	4.33	4.72	4.45	4.41	4.49
06/11/20	4.50	4.34	4.19	4.48	4.41	4.46	4.41	4.45	4.52	4.43	4.34	4.33	4.71	4.45	4.41	4.48
06/12/20	4.47	4.33	4.19	4.46	4.42	4.45	4.42	4.43	4.50	4.38	4.31	4.30	4.74	4.41	4.40	4.49
06/13/20	4.47	4.32	4.19	4.47	4.38	4.45	4.43	4.43	4.50	4.39	4.30	4.28	4.74	4.44	4.39	4.48
06/14/20	4.47	4.33	4.18	4.49	4.37	4.45	4.42	4.44	4.48	4.38	4.30	4.27	4.71	4.42	4.36	4.46
06/15/20	4.49	4.32	4.17	4.48	4.38	4.43	4.41	4.44	4.45	4.37	4.31	4.26	4.72	4.41	4.37	4.47
06/16/20	4.49	4.28	4.15	4.45	4.37	4.41	4.39	4.43	4.45	4.32	4.29	4.28	4.69	4.43	4.35	4.49
06/17/20	4.46	4.24	4.29	4.44	4.34	4.39	4.34	4.40	4.41	4.28	4.28	4.27	4.68	4.41	4.35	4.54
06/18/20	4.45	4.27	4.43	4.43	4.32	4.39	4.32	4.39	4.40	4.30	4.28	4.27	4.69	4.40	4.33	4.69
06/19/20	4.48	4.28	4.42	4.42	4.32	4.37	4.34	4.38	4.51	4.44	4.26	4.27	4.67	4.38	4.32	4.67
06/20/20	4.48	4.26	4.42	4.43	4.31	4.38	4.35	4.36	4.62	4.58	4.24	4.25	4.67	4.37	4.34	4.64
06/21/20	4.46	4.25	4.43	4.43	4.30	4.41	4.50	4.35	4.64	4.54	4.24	4.33	4.68	4.37	4.33	4.69
06/22/20	4.47	4.27	4.44	4.42	4.29	4.42	4.64	4.35	4.64	4.50	4.24	4.44	4.68	4.38	4.31	4.68
06/23/20	4.44	4.47	4.43	4.40	4.29	4.40	4.55	4.35	4.64	4.51	4.33	4.47	4.67	4.36	4.30	4.69
06/24/20	4.43	4.50	4.40	4.38	4.25	4.37	4.51	4.36	4.63	4.54	4.42	4.49	4.67	4.36	4.33	4.69
06/25/20	4.42	4.48	4.39	4.39	4.24	4.36	4.52	4.32	4.60	4.53	4.38	4.48	4.63	4.35	4.46	4.65
06/26/20	4.41	4.48	4.37	4.37	4.23	4.46	4.54	4.29	4.60	4.50	4.38	4.47	4.59	4.34	4.46	4.61
06/27/20	4.42	4.48	4.39	4.38	4.45	4.55	4.56	4.30	4.61	4.53	4.40	4.47	4.62	4.37	4.48	4.62
06/28/20	4.43	4.47	4.40	4.38	4.60	4.56	4.58	4.31	4.63	4.50	4.39	4.47	4.62	4.46	4.46	4.62
06/29/20	4.39	4.47	4.38	4.52	4.53	4.55	4.55	4.30	4.64	4.49	4.39	4.45	4.62	4.46	4.44	4.65
06/30/20	4.39	4.46	4.38	4.59	4.51	4.54	4.50	4.43	4.59	4.48	4.40	4.44	4.62	4.44	4.45	4.63

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
06/01/20	4.52	4.58	4.87	5.15
06/02/20	4.50	4.58	5.01	5.08
06/03/20	4.51	4.57	4.94	4.92
06/04/20	4.48	4.59	4.98	4.93
06/05/20	4.42	4.55	5.04	4.93
06/06/20	4.43	4.53	4.92	5.08
06/07/20	4.41	4.51	4.89	5.09
06/08/20	4.44	4.49	5.08	4.91
06/09/20	4.56	4.52	4.91	5.03
06/10/20	4.55	4.49	4.91	4.97
06/11/20	4.56	4.49	5.14	4.97
06/12/20	4.52	4.49	4.94	5.02
06/13/20	4.52	4.48	4.86	5.10
06/14/20	4.52	4.46	5.06	5.08
06/15/20	4.49	4.44	4.96	5.07
06/16/20	4.50	4.44	4.91	5.04
06/17/20	4.52	4.38	5.07	5.13
06/18/20	4.53	4.36	4.98	5.15
06/19/20	4.55	4.38	4.95	5.18
06/20/20	4.53	4.38	5.14	5.10
06/21/20	4.56	4.44	5.04	5.06
06/22/20	4.52	4.58	4.92	5.16
06/23/20	4.51	4.56	5.06	5.07
06/24/20	4.52	4.56	4.96	4.91
06/25/20	4.57	4.57	5.06	4.96
06/26/20	4.60	4.57	5.17	4.89
06/27/20	4.52	4.58	5.08	5.15
06/28/20	4.53	4.58	4.98	5.13
06/29/20	4.53	4.59	5.06	5.12
06/30/20	4.53	4.57	4.94	5.12

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)
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	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
06/01/20	0.03	0.04	0.07	0.13	0.07	0.09	0.03	0.06	0.06	0.10	0.02	0.03	0.14	0.22	0.02	0.03	0.02	0.03	0.05
06/02/20	0.03	0.04	0.07	0.10	0.07	0.08	0.03	0.04	0.06	0.14	0.02	0.10	0.14	0.25	0.02	0.03	0.02	0.03	0.05
06/03/20	0.03	0.04	0.07	0.11	0.07	0.16	0.03	0.14	0.06	0.07	0.02	0.03	0.14	0.17	0.02	0.02	0.03	0.03	0.05
06/04/20	0.04	0.05	0.07	0.10	0.07	0.08	0.03	0.09	0.06	0.13	0.03	0.04	0.13	0.20	0.02	0.03	0.03	0.04	0.05
06/05/20	0.03	0.04	0.07	0.12	0.07	0.20	0.03	0.03	0.04	0.14	0.03	0.03	0.09	0.11	0.02	0.04	0.03	0.04	0.05
06/06/20	0.04	0.04	0.07	0.13	0.07	0.09	0.03	0.03	0.02	0.03	0.03	0.04	0.09	0.13	0.02	0.03	0.04	0.04	0.04
06/07/20	0.04	0.04	0.08	0.12	0.07	0.09	0.03	0.04	0.02	0.06	0.03	0.04	0.09	0.11	0.02	0.03	0.04	0.05	0.05
06/08/20	0.04	0.04	0.09	0.14	0.07	0.08	0.03	0.06	0.02	0.04	0.03	0.06	0.10	0.13	0.02	0.03	0.05	0.06	0.05
06/09/20	0.03	0.04	0.09	0.14	0.07	0.09	0.03	0.15	0.02	0.02	0.03	0.03	0.09	0.11	0.02	0.03	0.05	0.06	0.05
06/10/20	0.03	0.04	0.09	0.14	0.07	0.13	0.03	0.03	0.02	0.02	0.03	0.03	0.05	0.15	0.02	0.02	0.06	0.06	0.04
06/11/20	0.03	0.04	0.09	0.14	0.07	0.10	0.03	0.04	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.06	0.07	0.04
06/12/20	0.03	0.04	0.08	0.13	0.06	0.07	0.03	0.05	0.02	0.07	0.03	0.03	0.02	0.10	0.02	0.02	0.07	0.08	0.04
06/13/20	0.03	0.04	0.07	0.08	0.07	0.07	0.03	0.04	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.07	0.07	0.04
06/14/20	0.03	0.04	0.07	0.09	0.07	0.13	0.03	0.07	0.02	0.02	0.03	0.06	0.02	0.02	0.02	0.02	0.07	0.08	0.04
06/15/20	0.04	0.04	0.08	0.14	0.07	0.08	0.03	0.04	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.02	0.08	0.08	0.04
06/16/20	0.04	0.05	0.05	0.12	0.07	0.08	0.03	0.04	0.02	0.03	0.03	0.07	0.02	0.04	0.02	0.02	0.08	0.12	0.04
06/17/20	0.04	0.05	0.02	0.03	0.06	0.08	0.03	0.04	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.04	0.09	0.09	0.04
06/18/20	0.04	0.06	0.02	0.02	0.06	0.09	0.03	0.05	0.02	0.09	0.03	0.03	0.02	0.23	0.02	0.02	0.09	0.09	0.04
06/19/20	0.04	0.04	0.02	0.02	0.04	0.09	0.03	0.04	0.02	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.07	0.09	0.03
06/20/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.04	0.03	0.03	0.02	0.03	0.02	0.05	0.03	0.05	0.02
06/21/20	0.04	0.04	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.03	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.02
06/22/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.07	0.03	0.03	0.02	0.04	0.02	0.17	0.03	0.03	0.02
06/23/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.05	0.02	0.02	0.03	0.06	0.02	0.03	0.02	0.03	0.03	0.03	0.02
06/24/20	0.04	0.07	0.02	0.02	0.02	0.02	0.04	0.05	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03
06/25/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.05	0.03	0.04	0.02	0.03	0.02	0.02	0.04	0.08	0.03
06/26/20	0.04	0.04	0.02	0.03	0.02	0.02	0.04	0.07	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.03	0.04	0.06	0.03
06/27/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.02	0.04	0.06	0.02	0.02	0.02	0.02	0.04	0.04	0.03
06/28/20	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.02	0.04	0.04	0.02	0.02	0.02	0.02	0.04	0.04	0.03
06/29/20	0.04	0.05	0.02	0.05	0.02	0.08	0.04	0.07	0.02	0.03	0.04	0.04	0.02	0.02	0.02	0.17	0.04	0.05	0.03
06/30/20	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.13	0.02	0.03	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.05	0.02

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Turbidity meters replaced with laser-style units for cells A05-A08 on 6/16, B01-B04 on 6/19, C01-C04 on 6/5 and D01-D04 on 6/10.

Orange County Water District - Ground Water Replenishment System (GWRS)
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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
06/01/20	0.011	0.011	7.794	6.180	9.049	0.056	0.050	0.068	1,608	1,526	1,734	37	33	42	99.28	2.14	97.72	1.64
06/02/20	0.011	0.011	7.982	6.440	9.074	0.062	0.056	0.076	1,747	1,633	1,910	39	34	49	99.22	2.11	97.75	1.65
06/03/20	0.011	0.011	7.889	6.120	8.782	0.065	0.057	0.078	1,806	1,735	1,892	41	36	46	99.18	2.08	97.75	1.65
06/04/20	0.011	0.011	7.792	7.078	8.759	0.066	0.056	0.077	1,850	1,752	1,977	42	38	47	99.15	2.07	97.73	1.64
06/05/20	0.011	0.011	7.385	6.664	8.273	0.056	0.000	0.067	1,819	1,760	1,896	40	37	42	99.24	2.12	97.81	1.66
06/06/20	0.011	0.011	7.067	6.337	7.977	0.053	0.049	0.061	1,730	1,673	1,799	37	35	40	99.25	2.13	97.84	1.67
06/07/20	0.011	0.011	7.027	6.368	7.907	0.053	0.047	0.069	1,639	1,574	1,699	37	33	40	99.25	2.12	97.76	1.65
06/08/20	0.011	0.011	7.139	5.908	19.055*	0.049	0.047	0.059	1,624	1,550	1,745	35	31	39	99.31	2.16	97.84	1.66
06/09/20	0.011	0.011	7.133	5.677	10.986*	0.058	0.052	0.070	1,712	1,635	1,822	37	33	43	99.18	2.09	97.86	1.67
06/10/20	0.011	0.011	7.107	5.746	7.936	0.065	0.054	0.309	1,781	1,695	1,906	39	34	45	99.08	2.04	97.79	1.66
06/11/20	0.011	0.011	7.191	5.558	8.068	0.059	0.054	0.069	1,828	1,735	1,947	41	36	47	99.18	2.09	97.78	1.65
06/12/20	0.011	0.011	7.415	5.681	8.384	0.058	0.051	0.069	1,803	1,751	1,868	43	36	49	99.21	2.10	97.63	1.62
06/13/20	0.011	0.011	7.510	5.549	10.787*	0.057	0.049	0.069	1,704	1,640	1,798	43	39	47	99.24	2.12	97.48	1.60
06/14/20	0.011	0.011	7.432	6.151	8.361	0.053	0.048	0.064	1,631	1,558	1,703	40	36	45	99.29	2.15	97.56	1.61
06/15/20	0.011	0.011	7.538	5.976	13.971*	0.052	0.048	0.065	1,612	1,551	1,706	39	36	44	99.31	2.16	97.57	1.61
06/16/20	0.011	0.011	7.638	5.936	8.696	0.059	0.052	0.066	1,678	1,609	1,816	41	37	48	99.23	2.11	97.54	1.61
06/17/20	0.011	0.011	7.643	6.740	9.397	0.063	0.058	0.072	1,750	1,672	1,843	45	39	53	99.18	2.09	97.43	1.59
06/18/20	0.011	0.011	7.010	6.434	7.668	0.065	0.052	0.087	1,785	1,733	1,832	45	42	49	99.07	2.03	97.46	1.60
06/19/20	0.019	0.110	7.113	6.466	7.975	0.060	0.053	0.066	1,774	1,719	1,843	42	36	49	99.16	2.08	97.66	1.63
06/20/20	0.011	0.011	7.188	6.616	8.049	0.062	0.058	0.071	1,750	1,692	1,821	40	36	44	99.14	2.07	97.73	1.64
06/21/20	0.011	0.011	6.937	6.305	7.652	0.066	0.054	0.079	1,660	1,610	1,732	38	36	42	99.05	2.02	97.69	1.64
06/22/20	0.011	0.011	7.261	6.257	8.497	0.062	0.055	0.073	1,609	1,529	1,738	37	33	43	99.15	2.07	97.67	1.63
06/23/20	0.011	0.011	7.652	6.945	8.573	0.070	0.062	0.080	1,672	1,607	1,755	38	35	43	99.08	2.04	97.70	1.64
06/24/20	0.011	0.011	7.729	5.786	8.546	0.069	0.061	0.081	1,729	1,650	1,834	39	35	44	99.11	2.05	97.74	1.65
06/25/20	0.011	0.011	7.843	7.112	8.741	0.069	0.061	0.081	1,808	1,716	1,964	41	36	48	99.12	2.06	97.73	1.64
06/26/20	0.011	0.011	7.674	5.812	9.249	0.069	0.063	0.079	1,799	1,718	1,890	41	36	47	99.10	2.05	97.72	1.64
06/27/20	0.011	0.011	7.386	5.866	8.200	0.066	0.057	0.073	1,715	1,654	1,828	39	36	44	99.10	2.05	97.71	1.64
06/28/20	0.011	0.011	7.113	6.548	7.970	0.063	0.053	0.077	1,607	1,560	1,652	36	33	41	99.12	2.06	97.74	1.65
06/29/20	0.011	0.011	7.368	6.648	8.494	0.063	0.053	0.211**	1,611	1,541	1,744	37	33	43	99.15	2.07	97.70	1.64
06/30/20	0.011	0.011	7.707	5.695	8.575	0.066	0.058	0.099	1,685	1,602	1,811	38	33	42	99.14	2.06	97.77	1.65

Notes:

* Higher than normal values due to primary analyzer issue, uncorroborated by secondary backup analyzer. Issue currently under investigation.

** Higher than normal value due to bringing online an RO unit after a membrane cleaning causing a short term spike in TOC value.

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
06/01/20	96.92	89.243	23,058.7	0.26	3.0	6
06/02/20	96.88	91.141	23,210.3	0.26	3.0	6
06/03/20	96.91	92.774	23,497.4	0.26	3.0	6
06/04/20	97.07	91.315	23,673.9	0.26	3.0	6
06/05/20	96.10	92.752	23,284.0	0.26	3.0	6
06/06/20	97.23	92.361	23,861.5	0.26	3.0	6
06/07/20	96.66	88.439	23,635.3	0.26	3.0	6
06/08/20	96.65	90.227	23,575.7	0.26	3.0	6
06/09/20	96.49	91.657	23,873.5	0.26	3.0	6
06/10/20	96.69	93.148	24,076.4	0.26	3.0	6
06/11/20	97.05	94.389	23,832.6	0.26	3.0	6
06/12/20	97.28	94.625	24,190.3	0.26	3.0	6
06/13/20	97.24	91.309	24,054.7	0.26	3.0	6
06/14/20	96.93	88.752	23,245.8	0.26	3.0	6
06/15/20	97.00	90.659	23,455.6	0.26	3.0	6
06/16/20	97.03	92.846	23,733.5	0.26	3.0	6
06/17/20	96.89	93.409	24,008.5	0.26	3.0	6
06/18/20	97.34	92.369	23,707.6	0.25	3.0	6
06/19/20	97.11	94.537	23,838.8	0.26	3.0	6
06/20/20	96.66	90.781	23,645.7	0.25	3.0	6
06/21/20	96.94	88.613	23,235.8	0.26	3.0	6
06/22/20	96.93	88.507	23,381.4	0.27	3.0	6
06/23/20	96.71	93.198	23,428.4	0.26	3.0	6
06/24/20	96.87	94.007	23,379.3	0.25	3.0	6
06/25/20	96.67	93.457	23,789.7	0.25	3.0	6
06/26/20	96.83	94.297	23,592.1	0.25	3.0	6
06/27/20	96.59	90.883	23,871.9	0.25	3.0	6
06/28/20	97.01	91.300	23,325.5	0.26	3.0	6
06/29/20	96.68	90.979	23,414.8	0.26	3.0	6
06/30/20	96.67	92.051	23,464.2	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				
							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
07/01/20	12.35	12.35	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/02/20	12.40	12.40	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/03/20	12.43	12.43	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/04/20	12.40	12.40	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/05/20	12.38	12.38	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/06/20	12.38	12.38	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/07/20	12.32	12.32	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/08/20	12.32	12.32	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/09/20	12.36	12.36	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/10/20	12.30	12.30	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/11/20	12.27	12.27	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/12/20	12.27	12.27	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/13/20	12.33	12.33	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/14/20	12.29	12.29	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/15/20	12.28	12.28	12.04	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/16/20	12.30	12.30	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/17/20	12.32	12.32	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/18/20	12.30	12.30	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/19/20	12.38	12.38	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/20/20	12.48	12.48	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/21/20	12.37	12.37	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/22/20	12.36	12.36	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/23/20	12.32	12.32	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/24/20	12.34	12.34	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/25/20	12.35	12.35	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/26/20	12.45	12.45	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/27/20	12.45	12.45	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/28/20	12.40	12.40	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/29/20	12.38	12.38	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/30/20	12.39	12.39	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
07/31/20	12.36	12.36	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
07/01/20	0.00	4.31	2.04	6.00	0.00	12.35
07/02/20	0.00	4.29	2.11	6.00	0.00	12.40
07/03/20	0.00	4.29	2.14	6.00	0.00	12.43
07/04/20	0.00	4.29	2.11	6.00	0.00	12.40
07/05/20	0.00	4.31	2.07	6.00	0.00	12.38
07/06/20	0.00	4.30	2.08	6.00	0.00	12.38
07/07/20	0.00	4.29	2.03	6.00	0.00	12.32
07/08/20	0.00	4.28	2.04	6.00	0.00	12.32
07/09/20	0.00	4.26	2.09	6.00	0.00	12.36
07/10/20	0.00	4.24	2.06	6.00	0.00	12.30
07/11/20	0.00	4.24	2.03	6.00	0.00	12.27
07/12/20	0.00	4.23	2.04	6.00	0.00	12.27
07/13/20	0.00	4.27	2.06	6.00	0.00	12.33
07/14/20	0.00	4.25	2.04	6.00	0.00	12.29
07/15/20	0.00	4.23	2.04	6.00	0.00	12.28
07/16/20	0.00	4.21	2.09	6.00	0.00	12.30
07/17/20	0.00	4.20	2.12	6.00	0.00	12.32
07/18/20	0.00	4.17	2.13	6.00	0.00	12.30
07/19/20	0.00	4.24	2.15	6.00	0.00	12.38
07/20/20	0.00	4.29	2.19	6.00	0.00	12.48
07/21/20	0.00	4.27	2.10	6.00	0.00	12.37
07/22/20	0.00	4.24	2.11	6.00	0.00	12.36
07/23/20	0.00	4.23	2.09	6.00	0.00	12.32
07/24/20	0.00	4.25	2.08	6.00	0.00	12.34
07/25/20	0.00	4.24	2.11	6.00	0.00	12.35
07/26/20	0.00	4.31	2.15	6.00	0.00	12.45
07/27/20	0.00	4.29	2.16	6.00	0.00	12.45
07/28/20	0.00	4.27	2.13	6.00	0.00	12.40
07/29/20	0.00	4.27	2.12	6.00	0.00	12.38
07/30/20	0.00	4.27	2.12	6.00	0.00	12.39
07/31/20	0.00	4.25	2.11	6.00	0.00	12.36

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					
	OCSD	MF+Cl_2	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
07/01/20	0.00	0.00	2.04	6.00	4.00	12.04
07/02/20	0.00	0.00	2.11	6.00	4.00	12.11
07/03/20	0.00	0.00	2.14	6.00	4.00	12.14
07/04/20	0.00	0.00	2.11	6.00	4.00	12.11
07/05/20	0.00	0.00	2.07	6.00	4.00	12.07
07/06/20	0.00	0.00	2.08	6.00	4.00	12.08
07/07/20	0.00	0.00	2.03	6.00	4.00	12.03
07/08/20	0.00	0.00	2.04	6.00	4.00	12.04
07/09/20	0.00	0.00	2.09	6.00	4.00	12.09
07/10/20	0.00	0.00	2.06	6.00	4.00	12.06
07/11/20	0.00	0.00	2.03	6.00	4.00	12.03
07/12/20	0.00	0.00	2.04	6.00	4.00	12.04
07/13/20	0.00	0.00	2.06	6.00	4.00	12.06
07/14/20	0.00	0.00	2.04	6.00	4.00	12.04
07/15/20	0.00	0.00	2.04	6.00	4.00	12.04
07/16/20	0.00	0.00	2.09	6.00	4.00	12.09
07/17/20	0.00	0.00	2.12	6.00	4.00	12.12
07/18/20	0.00	0.00	2.13	6.00	4.00	12.13
07/19/20	0.00	0.00	2.15	6.00	4.00	12.15
07/20/20	0.00	0.00	2.19	6.00	4.00	12.19
07/21/20	0.00	0.00	2.10	6.00	4.00	12.10
07/22/20	0.00	0.00	2.11	6.00	4.00	12.11
07/23/20	0.00	0.00	2.09	6.00	4.00	12.09
07/24/20	0.00	0.00	2.08	6.00	4.00	12.08
07/25/20	0.00	0.00	2.11	6.00	4.00	12.11
07/26/20	0.00	0.00	2.15	6.00	4.00	12.15
07/27/20	0.00	0.00	2.16	6.00	4.00	12.16
07/28/20	0.00	0.00	2.13	6.00	4.00	12.13
07/29/20	0.00	0.00	2.12	6.00	4.00	12.12
07/30/20	0.00	0.00	2.12	6.00	4.00	12.12
07/31/20	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
07/01/20	4.76	4.85	4.78	4.56	4.52	4.58	4.70	4.43	4.34	4.35	4.64	4.72	4.31	4.44	4.38	4.58
07/02/20	4.70	4.81	4.75	4.51	4.50	4.54	4.66	4.41	4.30	4.48	4.63	4.66	4.29	4.41	4.35	4.56
07/03/20	4.73	4.78	4.73	4.49	4.48	4.52	4.66	4.38	4.56	4.52	4.58	4.65	4.29	4.41	4.48	4.54
07/04/20	4.69	4.78	4.74	4.51	4.49	4.52	4.68	4.52	4.50	4.50	4.57	4.66	4.44	4.38	4.54	4.53
07/05/20	4.71	4.80	4.79	4.51	4.49	4.56	4.66	4.47	4.49	4.49	4.58	4.66	4.50	4.40	4.54	4.54
07/06/20	4.66	4.79	4.80	4.53	4.50	4.59	4.63	4.45	4.49	4.51	4.57	4.63	4.50	4.36	4.52	4.54
07/07/20	4.64	4.74	4.78	4.53	4.51	4.58	4.64	4.40	4.46	4.48	4.57	4.62	4.48	4.36	4.51	4.51
07/08/20	4.66	4.78	4.74	4.54	4.49	4.58	4.62	4.41	4.44	4.50	4.57	4.61	4.46	4.38	4.51	4.52
07/09/20	4.61	4.70	4.70	4.50	4.47	4.52	4.65	4.42	4.45	4.50	4.55	4.62	4.46	4.35	4.50	4.52
07/10/20	4.62	4.71	4.72	4.51	4.47	4.58	4.63	4.42	4.48	4.46	4.52	4.58	4.45	4.35	4.49	4.50
07/11/20	4.64	4.66	4.71	4.52	4.45	4.57	4.62	4.41	4.43	4.48	4.67	4.59	4.43	4.34	4.47	4.48
07/12/20	4.64	4.72	4.72	4.53	4.45	4.58	4.60	4.41	4.45	4.49	4.74	4.63	4.44	4.31	4.48	4.47
07/13/20	4.60	4.68	4.66	4.47	4.45	4.55	4.61	4.40	4.46	4.48	4.73	4.58	4.44	4.32	4.48	4.49
07/14/20	4.60	4.69	4.68	4.50	4.44	4.56	4.61	4.39	4.45	4.46	4.74	4.56	4.45	4.32	4.47	4.47
07/15/20	4.54	4.66	4.61	4.41	4.41	4.53	4.60	4.40	4.42	4.42	4.70	4.56	4.43	4.48	4.45	4.44
07/16/20	4.53	4.63	4.57	4.36	4.56	4.54	4.57	4.41	4.40	4.43	4.68	4.70	4.44	4.52	4.44	4.43
07/17/20	4.51	4.60	4.61	4.36	4.59	4.49	4.55	4.39	4.41	4.43	4.67	4.72	4.37	4.48	4.43	4.42
07/18/20	4.51	4.85	4.59	4.35	4.57	4.50	4.56	4.41	4.40	4.42	4.66	4.71	4.38	4.48	4.45	4.41
07/19/20	4.50	4.78	4.54	4.34	4.52	4.52	4.57	4.42	4.42	4.42	4.66	4.73	4.38	4.49	4.44	4.42
07/20/20	4.76	4.85	4.60	4.37	4.58	4.52	4.56	4.41	4.39	4.42	4.63	4.71	4.38	4.48	4.43	4.55
07/21/20	4.71	4.82	4.55	4.33	4.54	4.47	4.66	4.38	4.36	4.41	4.63	4.70	4.37	4.48	4.42	4.60
07/22/20	4.71	4.84	4.57	4.43	4.55	4.47	4.67	4.45	4.36	4.38	4.62	4.68	4.37	4.44	4.40	4.59
07/23/20	4.73	4.80	4.55	4.52	4.57	4.46	4.65	4.44	4.36	4.40	4.64	4.67	4.34	4.43	4.39	4.60
07/24/20	4.72	4.77	4.51	4.54	4.57	4.68	4.67	4.44	4.32	4.36	4.64	4.67	4.37	4.42	4.39	4.59
07/25/20	4.74	4.81	4.51	4.61	4.54	4.62	4.70	4.43	4.33	4.35	4.60	4.66	4.34	4.43	4.38	4.57
07/26/20	4.72	4.81	4.64	4.60	4.47	4.60	4.70	4.44	4.32	4.35	4.58	4.66	4.31	4.42	4.37	4.56
07/27/20	4.71	4.79	4.81	4.57	4.51	4.61	4.66	4.42	4.29	4.33	4.58	4.66	4.29	4.43	4.39	4.58
07/28/20	4.72	4.78	4.82	4.59	4.50	4.60	4.70	4.42	4.31	4.33	4.57	4.66	4.27	4.42	4.39	4.58
07/29/20	4.72	4.78	4.80	4.57	4.50	4.58	4.68	4.39	4.29	4.50	4.56	4.63	4.27	4.39	4.35	4.57
07/30/20	4.70	4.73	4.75	4.55	4.49	4.55	4.62	4.39	4.47	4.52	4.54	4.64	4.27	4.39	4.35	4.54
07/31/20	4.71	4.77	4.75	4.55	4.51	4.55	4.66	4.38	4.48	4.51	4.53	4.63	4.25	4.41	4.34	4.55

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															
	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
07/01/20	4.37	4.43	4.36	4.53	4.53	4.52	4.49	4.55	4.58	4.47	4.38	4.45	4.57	4.45	4.41	4.60
07/02/20	4.48	4.42	4.34	4.51	4.51	4.48	4.48	4.51	4.53	4.46	4.37	4.43	4.63	4.43	4.39	4.58
07/03/20	4.53	4.42	4.31	4.53	4.45	4.49	4.50	4.52	4.51	4.44	4.35	4.41	4.78	4.43	4.41	4.58
07/04/20	4.53	4.37	4.29	4.50	4.44	4.51	4.50	4.51	4.56	4.43	4.33	4.40	4.73	4.43	4.43	4.58
07/05/20	4.54	4.39	4.31	4.50	4.45	4.51	4.50	4.51	4.56	4.44	4.31	4.41	4.73	4.43	4.40	4.58
07/06/20	4.52	4.38	4.30	4.52	4.45	4.50	4.48	4.49	4.53	4.43	4.33	4.40	4.75	4.41	4.39	4.56
07/07/20	4.50	4.33	4.29	4.46	4.43	4.47	4.44	4.46	4.50	4.40	4.32	4.38	4.74	4.39	4.38	4.53
07/08/20	4.51	4.31	4.28	4.44	4.43	4.46	4.44	4.45	4.53	4.37	4.31	4.38	4.73	4.41	4.38	4.53
07/09/20	4.50	4.33	4.26	4.44	4.44	4.45	4.42	4.47	4.51	4.39	4.27	4.36	4.72	4.43	4.38	4.53
07/10/20	4.46	4.34	4.24	4.44	4.42	4.42	4.41	4.47	4.47	4.37	4.25	4.35	4.72	4.43	4.39	4.50
07/11/20	4.48	4.33	4.24	4.45	4.41	4.43	4.42	4.45	4.50	4.34	4.24	4.39	4.71	4.41	4.36	4.49
07/12/20	4.49	4.33	4.23	4.48	4.38	4.46	4.41	4.44	4.49	4.34	4.26	4.34	4.70	4.41	4.34	4.50
07/13/20	4.48	4.29	4.34	4.45	4.35	4.43	4.40	4.40	4.47	4.32	4.27	4.33	4.71	4.40	4.36	4.54
07/14/20	4.47	4.27	4.44	4.39	4.36	4.40	4.37	4.39	4.43	4.30	4.25	4.36	4.70	4.37	4.37	4.63
07/15/20	4.45	4.25	4.44	4.40	4.36	4.40	4.35	4.40	4.49	4.44	4.23	4.40	4.69	4.37	4.34	4.63
07/16/20	4.42	4.23	4.42	4.38	4.32	4.39	4.34	4.40	4.59	4.59	4.21	4.48	4.64	4.38	4.34	4.61
07/17/20	4.42	4.20	4.40	4.36	4.32	4.36	4.46	4.38	4.61	4.53	4.20	4.41	4.64	4.35	4.33	4.63
07/18/20	4.42	4.21	4.41	4.36	4.31	4.36	4.58	4.36	4.62	4.51	4.17	4.46	4.66	4.34	4.31	4.63
07/19/20	4.39	4.24	4.43	4.37	4.27	4.35	4.57	4.35	4.65	4.52	4.24	4.54	4.68	4.33	4.32	4.66
07/20/20	4.40	4.40	4.43	4.36	4.29	4.35	4.55	4.34	4.61	4.53	4.39	4.48	4.67	4.32	4.38	4.65
07/21/20	4.42	4.47	4.40	4.35	4.27	4.34	4.53	4.31	4.59	4.48	4.42	4.48	4.62	4.31	4.51	4.62
07/22/20	4.39	4.48	4.40	4.36	4.24	4.47	4.54	4.28	4.60	4.49	4.42	4.48	4.62	4.30	4.50	4.64
07/23/20	4.38	4.48	4.40	4.37	4.23	4.57	4.53	4.26	4.61	4.50	4.40	4.49	4.60	4.36	4.49	4.62
07/24/20	4.38	4.45	4.36	4.32	4.40	4.52	4.51	4.25	4.63	4.46	4.38	4.51	4.60	4.43	4.49	4.61
07/25/20	4.37	4.44	4.35	4.31	4.55	4.50	4.53	4.24	4.59	4.48	4.36	4.50	4.60	4.42	4.48	4.62
07/26/20	4.38	4.44	4.35	4.46	4.55	4.51	4.53	4.39	4.58	4.52	4.35	4.52	4.58	4.44	4.47	4.56
07/27/20	4.36	4.45	4.36	4.56	4.52	4.52	4.51	4.53	4.60	4.49	4.36	4.50	4.53	4.44	4.46	4.58
07/28/20	4.33	4.45	4.35	4.54	4.50	4.51	4.49	4.51	4.57	4.41	4.38	4.50	4.52	4.43	4.43	4.57
07/29/20	4.48	4.41	4.34	4.52	4.50	4.49	4.46	4.53	4.53	4.42	4.38	4.50	4.59	4.42	4.41	4.56
07/30/20	4.56	4.41	4.31	4.53	4.48	4.48	4.48	4.53	4.52	4.48	4.36	4.47	4.76	4.42	4.42	4.56
07/31/20	4.53	4.40	4.30	4.52	4.48	4.48	4.48	4.51	4.51	4.50	4.39	4.49	4.73	4.42	4.42	4.55

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
07/01/20	4.49	4.56	4.95	5.09
07/02/20	4.48	4.54	5.16	5.16
07/03/20	4.49	4.55	5.05	5.11
07/04/20	4.51	4.50	4.93	4.99
07/05/20	4.66	4.52	5.04	4.99
07/06/20	4.57	4.52	5.08	5.08
07/07/20	4.55	4.49	5.00	5.13
07/08/20	4.54	4.46	5.05	5.10
07/09/20	4.54	4.46	4.97	4.97
07/10/20	4.55	4.45	4.90	4.98
07/11/20	4.58	4.44	5.05	5.02
07/12/20	4.54	4.47	4.98	5.03
07/13/20	4.50	4.47	4.98	5.04
07/14/20	4.52	4.42	4.97	5.11
07/15/20	4.56	4.37	4.92	4.93
07/16/20	4.56	4.34	4.95	5.00
07/17/20	4.56	4.40	5.04	4.92
07/18/20	4.54	4.55	4.89	4.93
07/19/20	4.50	4.57	4.92	5.04
07/20/20	4.49	4.59	4.97	5.11
07/21/20	4.52	4.54	4.93	4.98
07/22/20	4.55	4.53	5.05	5.03
07/23/20	4.57	4.53	5.17	4.97
07/24/20	4.51	4.56	5.10	5.08
07/25/20	4.55	4.57	5.04	5.12
07/26/20	4.52	4.52	5.09	5.10
07/27/20	4.50	4.52	5.10	5.17
07/28/20	4.49	4.49	5.08	5.11
07/29/20	4.46	4.51	5.08	5.09
07/30/20	4.48	4.51	4.94	5.14
07/31/20	4.53	4.50	5.02	5.05

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
07/01/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
07/02/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/03/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.03	0.02	0.03	0.02
07/04/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.07	0.02	0.02	0.02	0.02	0.02	0.03	0.02
07/05/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.02
07/06/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
07/07/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.03	0.07	0.02	0.02	0.02	0.02	0.03	0.05	0.02
07/08/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/09/20	0.02	0.02	0.02	0.02	0.02	0.07	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.18	0.02	0.02	0.02
07/10/20	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/11/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.01	0.02	0.02	0.02	0.02	0.02	0.02
07/12/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.06	0.02	0.06	0.03	0.03	0.01	0.02	0.02	0.06	0.02	0.03	0.02
07/13/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.07	0.02	0.02	0.03	0.03	0.02	0.06	0.02	0.02	0.02	0.02	0.02
07/14/20	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.02	0.03	0.09	0.02	0.03	0.02	0.02	0.02	0.02	0.02
07/15/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.05	0.02	0.07	0.02	0.03	0.02
07/16/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.08	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.07	0.02	0.02	0.02
07/17/20	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.09	0.03	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/18/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.08	0.02	0.02	0.02
07/19/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
07/20/20	0.02	0.02	0.02	0.02	0.02	0.10	0.02	0.03	0.02	0.02	0.03	0.10	0.02	0.02	0.02	0.02	0.02	0.03	0.02
07/21/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.02
07/22/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.02
07/23/20	0.02	0.03	0.02	0.03	0.02	0.05	0.02	0.08	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/24/20	0.02	0.03	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.05	0.02
07/25/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
07/26/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.03	0.02
07/27/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02
07/28/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.09	0.02	0.02	0.03	0.03	0.02
07/29/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.04	0.02	0.02	0.03	0.04	0.02
07/30/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.02
07/31/20	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.06	0.02	0.05	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
07/01/20	0.011	0.011	7.682	7.004	8.678	0.070	0.062	0.098	1,611	1,574	1,650	37	34	41	99.09	2.04	97.69	1.64
07/02/20	0.011	0.011	7.826	7.125	8.616	0.061	0.056	0.070	1,617	1,547	1,749	37	33	42	99.22	2.11	97.71	1.64
07/03/20	0.011	0.011	7.679	7.125	8.669	0.056	0.051	0.063	1,689	1,601	1,834	37	33	44	99.27	2.14	97.78	1.65
07/04/20	0.011	0.011	6.954	6.394	7.821	0.054	0.049	0.060	1,794	1,704	1,891	41	36	47	99.23	2.11	97.71	1.64
07/05/20	0.011	0.011	6.667	5.797	7.458	0.056	0.048	0.067	1,816	1,732	1,930	41	37	48	99.16	2.07	97.73	1.64
07/06/20	0.011	0.011	7.259	6.508	8.462	0.061	0.055	0.071	1,787	1,722	1,870	40	36	43	99.17	2.08	97.77	1.65
07/07/20	0.011	0.011	7.724	7.060	8.426	0.072	0.062	0.082	1,737	1,675	1,803	39	36	44	99.07	2.03	97.75	1.65
07/08/20	0.011	0.011	7.791	6.046	8.572	0.071	0.057	0.086	1,683	1,631	1,733	38	35	44	99.08	2.04	97.72	1.64
07/09/20	0.011	0.011	7.926	7.122	11.039	0.064	0.057	0.082	1,648	1,585	1,754	38	35	43	99.19	2.09	97.70	1.64
07/10/20	0.011	0.011	7.688	6.960	8.501	0.067	0.058	0.127	1,732	1,649	1,876	39	35	46	99.13	2.06	97.72	1.64
07/11/20	0.011	0.011	7.505	6.245	8.591	0.070	0.061	0.081	1,773	1,701	1,866	41	36	47	99.07	2.03	97.69	1.64
07/12/20	0.011	0.011	7.335	5.469	8.488	0.067	0.058	0.077	1,792	1,702	1,910	41	37	46	99.09	2.04	97.70	1.64
07/13/20	0.011	0.011	7.695	6.185	8.817	0.068	0.061	0.076	1,649	1,583	1,756	38	34	43	99.12	2.06	97.70	1.64
07/14/20	0.011	0.011	7.957	5.905	9.036	0.073	0.067	0.083	1,733	1,649	1,878	40	35	47	99.08	2.04	97.72	1.64
07/15/20	0.011	0.011	8.148	6.411	9.344	0.074	0.064	0.084	1,773	1,699	1,871	41	36	47	99.09	2.04	97.70	1.64
07/16/20	0.011	0.011	8.000	6.792	9.297	0.064	0.054	0.078	1,792	1,702	1,910	41	37	46	99.19	2.09	97.70	1.64
07/17/20	0.011	0.011	7.929	7.117	8.965	0.060	0.057	0.065	1,789	1,717	1,888	41	38	46	99.24	2.12	97.68	1.64
07/18/20	0.011	0.011	7.753	6.519	8.915	0.058	0.051	0.066	1,737	1,672	1,825	40	36	45	99.25	2.13	97.71	1.64
07/19/20	0.011	0.011	7.649	6.691	8.915	0.055	0.048	0.062	1,647	1,612	1,704	38	35	42	99.28	2.15	97.70	1.64
07/20/20	0.011	0.011	8.569	5.781	19.992*	0.055	0.050	0.066	1,598	1,526	1,718	37	33	42	99.35	2.19	97.70	1.64
07/21/20	0.011	0.011	8.172	7.093	9.397	0.065	0.061	0.077	1,716	1,613	1,862	40	34	47	99.21	2.10	97.69	1.64
07/22/20	0.011	0.011	8.169	6.026	9.432	0.063	0.056	0.077	1,778	1,690	1,885	41	36	47	99.23	2.11	97.69	1.64
07/23/20	0.011	0.011	8.043	6.007	9.195	0.065	0.056	0.360	1,797	1,723	1,902	42	37	48	99.19	2.09	97.66	1.63
07/24/20	0.057**	0.197**	7.830	5.739	9.150	0.065	0.054	0.125	1,784	1,720	1,886	38	30	82***	99.18	2.08	97.84	1.67
07/25/20	0.079**	0.161**	7.951	7.025	9.117	0.062	0.056	0.094	1,772	1,702	1,845	36	33	39	99.22	2.11	97.99	1.70
07/26/20	0.026**	0.044**	7.777	6.646	8.899	0.055	0.048	0.065	1,676	1,613	1,739	34	30	38	99.29	2.15	97.99	1.70
07/27/20	0.040**	0.053**	7.936	5.786	9.353	0.055	0.049	0.067	1,657	1,604	1,745	33	30	37	99.31	2.16	97.99	1.70
07/28/20	0.043**	0.045**	8.149	6.026	9.373	0.061	0.056	0.069	1,732	1,640	1,865	34	30	39	99.25	2.13	98.04	1.71
07/29/20	0.040**	0.041**	8.047	5.826	9.272	0.062	0.057	0.073	1,780	1,700	1,867	35	29	40	99.23	2.12	98.05	1.71
07/30/20	0.020**	0.036**	8.022	6.863	9.295	0.061	0.039	0.074	1,767	1,690	1,850	35	32	41	99.24	2.12	98.01	1.70
07/31/20	0.011**	0.011**	7.627	6.476	10.684	0.059	0.053	0.066	1,756	1,718	1,804	37	32	44	99.23	2.11	97.88	1.67

Notes:

* Higher than normal values due to primary analyzer issue, uncorroborated by secondary backup analyzer. Issue currently under investigation.

** Higher than normal values due to analyzer flow issue which has since been corrected.

*** Higher than normal value due to an improper flush of RO units after a brief power interruption-related plant 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

	UltraViolet / AOP Process online monitoring results					
Date	UVT % avg	FLOW MG	POWER kW	EED kWh/kgal	Peroxide Dose mg/l	Log Removal
07/01/20	96.68	94.446	23,676.8	0.26	3.0	6
07/02/20	96.54	94.499	23,854.1	0.25	3.0	6
07/03/20	96.69	93.411	23,932.1	0.25	3.0	6
07/04/20	96.76	90.986	23,682.3	0.25	3.0	6
07/05/20	96.88	88.900	23,247.5	0.26	3.0	6
07/06/20	96.84	92.857	22,857.6	0.26	3.0	6
07/07/20	96.82	95.594	23,553.6	0.25	3.0	6
07/08/20	96.80	94.104	23,996.3	0.25	3.0	6
07/09/20	96.89	91.689	23,664.6	0.25	3.0	6
07/10/20	96.78	94.905	23,498.4	0.25	3.0	6
07/11/20	96.74	94.814	23,712.9	0.25	3.0	6
07/12/20	96.77	91.481	23,749.1	0.25	3.0	6
07/13/20	96.76	91.040	23,722.1	0.26	3.0	6
07/14/20	96.66	94.483	24,107.4	0.26	3.0	6
07/15/20	96.58	93.548	24,109.6	0.26	3.0	6
07/16/20	96.59	95.863	23,918.4	0.26	3.0	6
07/17/20	96.43	92.434	24,072.0	0.25	3.0	6
07/18/20	96.82	92.138	23,551.1	0.25	3.0	6
07/19/20	96.66	90.298	23,298.3	0.25	3.0	6
07/20/20	96.42	91.904	23,409.4	0.26	3.0	6
07/21/20	96.46	90.939	23,780.3	0.26	3.0	6
07/22/20	96.53	93.409	23,922.3	0.25	3.0	6
07/23/20	96.67	89.376	23,743.1	0.26	3.0	6
07/24/20	96.99	73.733	21,794.5	0.26	3.0	6
07/25/20	96.56	92.183	20,686.0	0.26	3.0	6
07/26/20	96.78	89.044	24,055.4	0.26	3.0	6
07/27/20	96.55	89.004	23,210.3	0.26	3.0	6
07/28/20	96.57	92.649	23,535.0	0.26	3.0	6
07/29/20	96.75	92.407	23,754.5	0.26	3.0	6
07/30/20	96.53	90.695	23,376.3	0.25	3.0	6
07/31/20	96.49	92.039	23,672.0	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
08/01/20	12.40	12.40	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/02/20	12.44	12.44	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/03/20	12.43	12.43	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/04/20	12.39	12.39	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/05/20	12.39	12.39	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/06/20	12.37	12.37	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/07/20	12.32	12.32	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/08/20	12.45	12.45	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/09/20	12.47	12.47	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/10/20	12.48	12.48	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/11/20	12.42	12.42	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/12/20	12.13	12.13	12.89 (2)	Y	Y	Y (2)	0.0	0.0	0.0	0.0	0.0
08/13/20	12.27	12.27	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/14/20	12.33	12.33	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/15/20	12.32	12.32	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/16/20	12.43	12.43	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/17/20	12.43	12.43	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/18/20	12.35	12.35	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/19/20	12.38	12.38	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/20/20	12.44	12.44	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/21/20	12.48	12.48	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/22/20	12.46	12.46	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/23/20	12.50	12.50	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/24/20	12.51	12.51	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/25/20	12.46	12.46	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/26/20	12.43	12.43	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/27/20	12.36	12.36	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/28/20	12.29	12.29	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/29/20	12.30	12.30	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/30/20	12.33	12.33	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
08/31/20 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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.
2. Two additional log-virus credits taken for 1 month between primary and secondary project boundary plus 1 month beyond secondary boundary where no drinking water wells operate.

* Plant offline for planned outage for GWRS Final Expansion construction work.

	Documented Giardia and Cryptosporidium Reduction Achieved					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/20	0.00	4.29	2.11	6.00	0.00	12.40
08/02/20	0.00	4.29	2.15	6.00	0.00	12.44
08/03/20	0.00	4.29	2.14	6.00	0.00	12.43
08/04/20	0.00	4.25	2.14	6.00	0.00	12.39
08/05/20	0.00	4.24	2.15	6.00	0.00	12.39
08/06/20	0.00	4.25	2.11	6.00	0.00	12.37
08/07/20	0.00	4.21	2.12	6.00	0.00	12.32
08/08/20	0.00	4.32	2.13	6.00	0.00	12.45
08/09/20	0.00	4.29	2.18	6.00	0.00	12.47
08/10/20	0.00	4.30	2.19	6.00	0.00	12.48
08/11/20	0.00	4.27	2.15	6.00	0.00	12.42
08/12/20	0.00	4.24	1.89 **	6.00	0.00	12.13
08/13/20	0.00	4.24	2.03	6.00	0.00	12.27
08/14/20	0.00	4.23	2.11	6.00	0.00	12.33
08/15/20	0.00	4.26	2.07	6.00	0.00	12.32
08/16/20	0.00	4.33	2.10	6.00	0.00	12.43
08/17/20	0.00	4.31	2.12	6.00	0.00	12.43
08/18/20	0.00	4.29	2.06	6.00	0.00	12.35
08/19/20	0.00	4.30	2.07	6.00	0.00	12.38
08/20/20	0.00	4.34	2.09	6.00	0.00	12.44
08/21/20	0.00	4.33	2.15	6.00	0.00	12.48
08/22/20	0.00	4.31	2.15	6.00	0.00	12.46
08/23/20	0.00	4.37	2.12	6.00	0.00	12.50
08/24/20	0.00	4.36	2.14	6.00	0.00	12.51
08/25/20	0.00	4.34	2.11	6.00	0.00	12.46
08/26/20	0.00	4.32	2.11	6.00	0.00	12.43
08/27/20	0.00	4.31	2.05	6.00	0.00	12.36
08/28/20	0.00	4.26	2.03	6.00	0.00	12.29
08/29/20	0.00	4.23	2.06	6.00	0.00	12.30
08/30/20	0.00	4.24	2.09	6.00	0.00	12.33
08/31/20 *	NA	NA	NA	NA	NA	NA

Notes:

* Plant offline for planned outage for GWRS Final Expansion construction work.

** RO LRV value below two due to elevated ROP TOC values from suspected spike in GWRS feed water. The origin of the spike is still under investigation by OCWD and OCSD.

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
08/01/20	0.00	0.00	2.11	6.00	4.00	12.11
08/02/20	0.00	0.00	2.15	6.00	4.00	12.15
08/03/20	0.00	0.00	2.14	6.00	4.00	12.14
08/04/20	0.00	0.00	2.14	6.00	4.00	12.14
08/05/20	0.00	0.00	2.15	6.00	4.00	12.15
08/06/20	0.00	0.00	2.11	6.00	4.00	12.11
08/07/20	0.00	0.00	2.12	6.00	4.00	12.12
08/08/20	0.00	0.00	2.13	6.00	4.00	12.13
08/09/20	0.00	0.00	2.18	6.00	4.00	12.18
08/10/20	0.00	0.00	2.19	6.00	4.00	12.19
08/11/20	0.00	0.00	2.15	6.00	4.00	12.15
08/12/20	0.00	0.00	1.89 **	6.00	5.00 (2)	12.89
08/13/20	0.00	0.00	2.03	6.00	4.00	12.03
08/14/20	0.00	0.00	2.11	6.00	4.00	12.11
08/15/20	0.00	0.00	2.07	6.00	4.00	12.07
08/16/20	0.00	0.00	2.10	6.00	4.00	12.10
08/17/20	0.00	0.00	2.12	6.00	4.00	12.12
08/18/20	0.00	0.00	2.06	6.00	4.00	12.06
08/19/20	0.00	0.00	2.07	6.00	4.00	12.07
08/20/20	0.00	0.00	2.09	6.00	4.00	12.09
08/21/20	0.00	0.00	2.15	6.00	4.00	12.15
08/22/20	0.00	0.00	2.15	6.00	4.00	12.15
08/23/20	0.00	0.00	2.12	6.00	4.00	12.12
08/24/20	0.00	0.00	2.14	6.00	4.00	12.14
08/25/20	0.00	0.00	2.11	6.00	4.00	12.11
08/26/20	0.00	0.00	2.11	6.00	4.00	12.11
08/27/20	0.00	0.00	2.05	6.00	4.00	12.05
08/28/20	0.00	0.00	2.03	6.00	4.00	12.03
08/29/20	0.00	0.00	2.06	6.00	4.00	12.06
08/30/20	0.00	0.00	2.09	6.00	4.00	12.09
08/31/20 *	NA	NA	NA	NA	NA	NA

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.
2. Two additional log-virus credits taken for 1 month between primary and secondary project boundary plus 1 month beyond secondary boundary where no drinking water wells operate.

* Plant offline for planned outage for GWRS Final Expansion construction work.

** RO LRV value below two due to elevated ROP TOC values from suspected spike in GWRS feed water. The origin of the spike is still under investigation

	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
08/01/20	4.71	4.80	4.74	4.57	4.50	4.57	4.67	4.42	4.51	4.51	4.55	4.62	4.41	4.41	4.49	4.55
08/02/20	4.68	4.78	4.76	4.64	4.51	4.62	4.66	4.45	4.51	4.54	4.52	4.62	4.50	4.40	4.55	4.52
08/03/20	4.64	4.75	4.77	4.55	4.49	4.60	4.66	4.45	4.49	4.53	4.53	4.61	4.47	4.40	4.53	4.54
08/04/20	4.67	4.80	4.78	4.56	4.46	4.60	4.63	4.43	4.45	4.51	4.53	4.59	4.50	4.38	4.51	4.52
08/05/20	4.67	4.73	4.75	4.57	4.46	4.56	4.65	4.43	4.48	4.52	4.50	4.60	4.47	4.37	4.51	4.49
08/06/20	4.63	4.73	4.74	4.49	4.46	4.54	4.65	4.42	4.48	4.51	4.48	4.59	4.46	4.36	4.49	4.51
08/07/20	4.60	4.74	4.76	4.53	4.42	4.54	4.64	4.40	4.46	4.50	4.60	4.58	4.45	4.32	4.50	4.51
08/08/20	4.60	4.71	4.75	4.52	4.38	4.51	4.64	4.39	4.43	4.49	4.63	4.57	4.43	4.32	4.49	4.49
08/09/20	4.60	4.69	4.73	4.50	4.41	4.51	4.63	4.41	4.42	4.46	4.65	4.56	4.43	4.29	4.46	4.48
08/10/20	4.56	4.68	4.71	4.52	4.38	4.52	4.63	4.44	4.40	4.45	4.62	4.54	4.44	4.30	4.45	4.46
08/11/20	4.55	4.62	4.62	4.42	4.53	4.53	4.58	4.43	4.43	4.43	4.60	4.69	4.41	4.45	4.47	4.44
08/12/20	4.55	4.62	4.70	4.45	4.54	4.48	4.59	4.41	4.39	4.43	4.60	4.73	4.41	4.49	4.47	4.43
08/13/20	4.61	4.87	4.68	4.41	4.53	4.46	4.57	4.39	4.39	4.42	4.61	4.71	4.39	4.49	4.45	4.44
08/14/20	4.51	4.86	4.66	4.42	4.56	4.49	4.60	4.42	4.41	4.42	4.62	4.70	4.40	4.49	4.44	4.42
08/15/20	4.55	4.85	4.68	4.41	4.57	4.49	4.57	4.42	4.39	4.42	4.63	4.71	4.41	4.49	4.45	4.41
08/16/20	4.55	4.88	4.67	4.43	4.57	4.50	4.58	4.43	4.40	4.44	4.65	4.69	4.40	4.46	4.46	4.43
08/17/20	4.76	4.85	4.68	4.44	4.55	4.48	4.71	4.42	4.40	4.44	4.65	4.69	4.37	4.45	4.45	4.58
08/18/20	4.79	4.84	4.68	4.39	4.55	4.49	4.73	4.41	4.41	4.42	4.63	4.70	4.38	4.50	4.45	4.62
08/19/20	4.77	4.82	4.65	4.53	4.58	4.47	4.72	4.42	4.40	4.43	4.63	4.69	4.41	4.49	4.45	4.62
08/20/20	4.77	4.85	4.65	4.64	4.59	4.63	4.74	4.46	4.39	4.43	4.64	4.69	4.37	4.45	4.45	4.61
08/21/20	4.76	4.82	4.59	4.62	4.56	4.63	4.70	4.43	4.38	4.41	4.64	4.68	4.33	4.45	4.43	4.58
08/22/20	4.76	4.77	4.51	4.59	4.56	4.57	4.68	4.40	4.38	4.40	4.63	4.66	4.34	4.45	4.41	4.56
08/23/20	4.75	4.82	4.73	4.62	4.55	4.59	4.71	4.43	4.38	4.40	4.64	4.65	4.37	4.43	4.40	4.59
08/24/20	4.72	4.85	4.80	4.59	4.56	4.63	4.71	4.41	4.37	4.39	4.61	4.63	4.36	4.42	4.43	4.61
08/25/20	4.72	4.78	4.81	4.58	4.56	4.60	4.68	4.41	4.34	4.37	4.62	4.65	4.34	4.44	4.41	4.56
08/26/20	4.68	4.79	4.76	4.57	4.52	4.59	4.67	4.39	4.32	4.49	4.59	4.64	4.32	4.43	4.38	4.56
08/27/20	4.70	4.77	4.79	4.59	4.52	4.57	4.68	4.35	4.48	4.52	4.59	4.63	4.31	4.43	4.36	4.52
08/28/20	4.66	4.76	4.76	4.57	4.51	4.58	4.66	4.35	4.48	4.50	4.57	4.60	4.26	4.43	4.36	4.47
08/29/20	4.69	4.72	4.73	4.56	4.48	4.58	4.62	4.39	4.49	4.51	4.54	4.61	4.23	4.41	4.35	4.47
08/30/20	4.69	4.76	4.73	4.52	4.49	4.56	4.64	4.41	4.48	4.49	4.56	4.59	4.24	4.38	4.33	4.46
08/31/20 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Plant offline for planned outage for GWRS Final Expansion construction work.

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
08/01/20	4.53	4.38	4.29	4.53	4.47	4.49	4.47	4.49	4.52	4.46	4.37	4.50	4.75	4.42	4.43	4.57
08/02/20	4.56	4.39	4.29	4.54	4.47	4.50	4.46	4.50	4.53	4.46	4.38	4.51	4.76	4.40	4.42	4.53
08/03/20	4.55	4.40	4.29	4.55	4.46	4.50	4.45	4.50	4.52	4.42	4.36	4.48	4.75	4.42	4.42	4.53
08/04/20	4.52	4.38	4.25	4.52	4.45	4.46	4.44	4.49	4.49	4.41	4.39	4.43	4.74	4.40	4.40	4.53
08/05/20	4.49	4.33	4.24	4.48	4.44	4.45	4.44	4.48	4.49	4.43	4.39	4.46	4.72	4.39	4.38	4.53
08/06/20	4.48	4.34	4.25	4.48	4.42	4.43	4.42	4.45	4.47	4.42	4.39	4.45	4.71	4.38	4.41	4.50
08/07/20	4.46	4.33	4.21	4.47	4.41	4.41	4.39	4.44	4.41	4.37	4.39	4.38	4.72	4.35	4.39	4.45
08/08/20	4.46	4.32	4.36	4.48	4.41	4.41	4.38	4.45	4.43	4.35	4.41	4.39	4.71	4.38	4.36	4.54
08/09/20	4.50	4.31	4.47	4.48	4.37	4.44	4.40	4.45	4.45	4.32	4.40	4.39	4.70	4.39	4.37	4.70
08/10/20	4.50	4.30	4.45	4.46	4.35	4.43	4.38	4.44	4.55	4.32	4.38	4.38	4.70	4.38	4.38	4.65
08/11/20	4.47	4.27	4.44	4.44	4.36	4.39	4.34	4.42	4.67	4.43	4.35	4.37	4.68	4.36	4.36	4.67
08/12/20	4.44	4.24	4.42	4.42	4.33	4.37	4.46	4.39	4.61	4.56	4.33	4.36	4.67	4.36	4.33	4.66
08/13/20	4.44	4.24	4.40	4.42	4.31	4.35	4.59	4.38	4.58	4.61	4.33	4.33	4.69	4.36	4.33	4.64
08/14/20	4.43	4.23	4.39	4.40	4.31	4.37	4.56	4.38	4.61	4.60	4.29	4.42	4.69	4.35	4.32	4.63
08/15/20	4.45	4.26	4.40	4.39	4.31	4.40	4.57	4.38	4.65	4.59	4.31	4.55	4.67	4.35	4.31	4.65
08/16/20	4.44	4.46	4.43	4.44	4.33	4.39	4.58	4.39	4.65	4.66	4.33	4.57	4.71	4.35	4.38	4.74
08/17/20	4.41	4.48	4.42	4.41	4.31	4.38	4.55	4.36	4.63	4.55	4.38	4.55	4.67	4.35	4.50	4.71
08/18/20	4.44	4.47	4.43	4.39	4.29	4.37	4.55	4.35	4.62	4.58	4.53	4.55	4.68	4.35	4.49	4.76
08/19/20	4.43	4.48	4.42	4.40	4.30	4.49	4.55	4.35	4.62	4.60	4.53	4.53	4.67	4.37	4.49	4.66
08/20/20	4.40	4.47	4.41	4.39	4.50	4.57	4.54	4.34	4.62	4.63	4.56	4.52	4.64	4.45	4.52	4.59
08/21/20	4.40	4.44	4.40	4.33	4.60	4.52	4.53	4.33	4.59	4.61	4.56	4.51	4.66	4.52	4.55	4.57
08/22/20	4.38	4.43	4.38	4.48	4.53	4.53	4.52	4.31	4.59	4.43	4.52	4.52	4.65	4.52	4.56	4.58
08/23/20	4.40	4.43	4.38	4.57	4.50	4.54	4.53	4.44	4.61	4.46	4.51	4.51	4.65	4.51	4.54	4.58
08/24/20	4.38	4.45	4.39	4.56	4.52	4.52	4.49	4.55	4.59	4.46	4.54	4.49	4.63	4.50	4.55	4.58
08/25/20	4.52	4.45	4.37	4.56	4.53	4.50	4.49	4.53	4.56	4.46	4.51	4.49	4.61	4.50	4.53	4.58
08/26/20	4.56	4.43	4.35	4.54	4.51	4.49	4.50	4.51	4.55	4.50	4.50	4.47	4.66	4.48	4.53	4.56
08/27/20	4.52	4.41	4.34	4.52	4.47	4.48	4.48	4.49	4.55	4.52	4.51	4.45	4.75	4.48	4.49	4.55
08/28/20	4.50	4.40	4.33	4.51	4.48	4.45	4.46	4.49	4.53	4.47	4.52	4.44	4.76	4.49	4.48	4.52
08/29/20	4.49	4.40	4.33	4.50	4.46	4.46	4.45	4.49	4.53	4.40	4.54	4.48	4.73	4.48	4.50	4.52
08/30/20	4.50	4.38	4.32	4.48	4.45	4.46	4.45	4.48	4.49	4.37	4.50	4.42	4.67	4.47	4.45	4.52
08/31/20 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Plant offline for planned outage for GWRS Final Expansion construction work.

Date	**MicroFiltration Process online monitoring results** Log Removal Value			
	E01	**E02**	**E03**	**E04**
	LRV	LRV	LRV	LRV
08/01/20	4.60	4.50	5.08	5.08
08/02/20	4.59	4.50	5.09	5.14
08/03/20	4.58	4.47	5.01	5.08
08/04/20	4.61	4.45	5.17	5.13
08/05/20	4.59	4.47	5.10	5.08
08/06/20	4.54	4.42	4.99	5.08
08/07/20	4.54	4.42	5.15	4.94
08/08/20	4.53	4.44	5.06	5.12
08/09/20	4.53	4.44	5.10	5.12
08/10/20	4.62	4.41	5.10	5.07
08/11/20	4.58	4.35	5.07	5.05
08/12/20	4.56	4.34	4.90	5.05
08/13/20	4.54	4.44	5.00	5.09
08/14/20	4.56	4.60	4.98	5.05
08/15/20	4.53	4.60	4.95	5.14
08/16/20	4.55	4.65	5.03	5.00
08/17/20	4.52	4.56	5.06	5.14
08/18/20	4.55	4.58	5.15	5.15
08/19/20	4.52	4.57	5.29	5.26
08/20/20	4.51	4.55	5.13	5.16
08/21/20	4.56	4.56	4.97	5.20
08/22/20	4.56	4.56	5.05	5.26
08/23/20	4.53	4.57	5.02	5.05
08/24/20	4.52	4.56	5.10	5.05
08/25/20	4.52	4.51	5.08	5.08
08/26/20	4.49	4.53	4.95	5.15
08/27/20	4.53	4.53	4.92	5.17
08/28/20	4.63	4.49	5.04	5.02
08/29/20	4.53	4.49	4.92	5.02
08/30/20	4.55	4.46	5.09	5.00
08/31/20 *	NA	NA	NA	NA

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Plant offline for planned outage for GWRS Final Expansion construction work.

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
08/01/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.07	0.02	0.02	0.02	0.03	0.02
08/02/20	0.02	0.05	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
08/03/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02
08/04/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.02
08/05/20	0.02	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02
08/06/20	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.11	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02
08/07/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.04	0.03	0.04	0.02
08/08/20	0.02	0.10	0.02	0.02	0.02	0.02	0.02	0.08	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.04	0.04	0.02
08/09/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.07	0.02	0.02	0.02	0.02	0.04	0.04	0.02
08/10/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.04	0.05	0.02
08/11/20	0.02	0.03	0.02	0.05	0.02	0.03	0.02	0.04	0.02	0.04	0.02	0.03	0.02	0.03	0.02	0.03	0.05	0.05	0.02
08/12/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.05	0.06	0.02
08/13/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.04	0.02	0.02	0.05	0.05	0.02
08/14/20	0.02	0.07	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.05	0.02	0.05	0.02	0.04	0.02	0.02	0.04	0.05	0.02
08/15/20	0.02	0.03	0.02	0.03	0.02	0.04	0.02	0.03	0.02	0.04	0.02	0.04	0.02	0.13	0.02	0.09	0.02	0.03	0.02
08/16/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.19	0.02	0.02	0.02	0.02	0.02
08/17/20	0.02	0.03	0.02	0.06	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.06	0.02	0.04	0.02	0.02	0.02
08/18/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.13	0.02	0.05	0.02
08/19/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02
08/20/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.04	0.02	0.03	0.02	0.03	0.02	0.02	0.02
08/21/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02
08/22/20	0.02	0.03	0.02	0.02	0.02	0.05	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
08/23/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
08/24/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
08/25/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
08/26/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02
08/27/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
08/28/20	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
08/29/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02
08/30/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
08/31/20 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Effluent turbidity ntu limit 0.20 , values of 0.5 ntu require shutdown of cell.

* Plant offline for planned outage for GWRS Final Expansion construction work.

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
08/01/20	0.011	0.011	7.660	6.515	8.760	0.059	0.050	0.069	1,743	1,691	1,798	39	35	43	99.22	2.11	97.76	1.65
08/02/20	0.011	0.011	7.519	6.595	8.536	0.054	0.049	0.062	1,661	1,599	1,724	38	35	42	99.29	2.15	97.72	1.64
08/03/20	0.011	0.011	7.680	6.639	8.851	0.055	0.049	0.062	1,632	1,564	1,724	37	34	42	99.28	2.14	97.72	1.64
08/04/20	0.011	0.011	8.503	6.500	19.972***	0.062	0.057	0.086	1,720	1,632	1,846	39	34	45	99.27	2.14	97.74	1.64
08/05/20	0.011	0.011	8.834	7.644	9.815	0.062	0.057	0.075	1,760	1,667	1,871	39	33	47	99.29	2.15	97.77	1.65
08/06/20	0.011	0.011	8.355	7.192	9.420	0.064	0.054	0.079	1,813	1,742	1,899	43	38	49	99.23	2.11	97.63	1.63
08/07/20	0.011	0.011	8.300	6.676	9.302	0.064	0.053	0.079	1,776	1,704	1,868	40	36	46	99.23	2.12	97.72	1.64
08/08/20	0.011	0.011	8.310	7.455	9.632	0.062	0.054	0.067	1,725	1,671	1,790	42	39	47	99.26	2.13	97.58	1.62
08/09/20	0.011	0.011	8.625	7.375	9.785	0.057	0.050	0.065	1,663	1,609	1,722	40	36	45	99.34	2.18	97.58	1.62
08/10/20	0.011	0.011	8.713	7.744	10.074	0.056	0.051	0.073	1,629	1,537	1,744	40	35	45	99.35	2.19	97.56	1.61
08/11/20	0.011	0.011	8.766	7.305	10.378	0.063	0.056	0.098	1,740	1,624	1,890	42	35	50	99.29	2.15	97.59	1.62
08/12/20	0.011	0.011	9.704	7.669	10.975	0.126**	0.080**	0.194**	1,779	1,698	1,877	43	39	48	98.70	1.89 **	97.60	1.62
08/13/20	0.011	0.011	8.997	7.459	10.876	0.084	0.060	0.136**	1,789	1,694	1,898	43	38	52	99.07	2.03	97.58	1.62
08/14/20	0.011	0.011	7.779	5.752	8.988	0.061	0.052	0.073	1,773	1,736	1,848	42	38	50	99.22	2.11	97.61	1.62
08/15/20	0.011	0.011	7.862	6.943	8.713	0.068	0.057	0.105	1,685	1,640	1,779	41	35	57	99.14	2.07	97.59	1.62
08/16/20	0.011	0.011	7.476	6.144	8.370	0.059	0.051	0.071	1,585	1,507	1,642	38	34	51	99.21	2.10	97.60	1.62
08/17/20	0.011	0.011	7.482	5.731	8.498	0.057	0.051	0.072	1,556	1,493	1,659	38	35	47	99.24	2.12	97.56	1.61
08/18/20	0.011	0.011	7.604	5.602	8.767	0.067	0.061	0.081	1,652	1,566	1,777	40	35	51	99.12	2.06	97.57	1.62
08/19/20	0.011	0.011	7.853	6.264	8.867	0.066	0.058	0.081	1,708	1,627	1,791	44	39	51	99.16	2.07	97.43	1.59
08/20/20	0.012	0.024	7.921	5.935	8.776	0.064	0.059	0.075	1,739	1,667	1,819	43	39	48	99.19	2.09	97.50	1.60
08/21/20	0.011	0.012	8.444	6.949	10.075	0.060	0.056	0.066	1,716	1,639	1,798	43	37	50	99.29	2.15	97.52	1.60
08/22/20	0.011	0.011	8.246	5.545	10.170	0.059	0.053	0.064	1,699	1,655	1,760	42	39	46	99.29	2.15	97.50	1.60
08/23/20	0.011	0.011	7.475	5.828	8.386	0.056	0.051	0.065	1,631	1,570	1,693	40	37	44	99.25	2.12	97.53	1.61
08/24/20	0.011	0.011	7.726	5.654	9.762	0.056	0.051	0.063	1,598	1,516	1,678	40	35	45	99.28	2.14	97.52	1.60
08/25/20	0.011	0.011	8.026	6.360	8.944	0.062	0.060	0.071	1,681	1,602	1,814	42	36	48	99.23	2.11	97.51	1.60
08/26/20	0.011	0.011	8.133	6.050	8.986	0.063	0.058	0.085	1,745	1,669	1,819	43	39	49	99.23	2.11	97.52	1.61
08/27/20	0.011	0.011	8.151	6.522	9.248	0.073	0.062	0.100	1,722	1,641	1,825	42	38	47	99.11	2.05	97.58	1.62
08/28/20	0.011	0.011	8.207	7.382	9.194	0.077	0.066	0.102	1,707	1,611	1,783	41	37	45	99.06	2.03	97.63	1.62
08/29/20	0.011	0.011	8.051	7.307	9.135	0.069	0.062	0.079	1,679	1,626	1,736	39	36	43	99.14	2.06	97.66	1.63
08/30/20	0.011	0.011	7.691	5.525	8.850	0.063	0.059	0.071	1,600	1,555	1,662	35	32	39	99.18	2.09	97.80	1.66
08/31/20 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

* Plant offline for planned outage for GWRS Final Expansion construction work.

** An elevated ROP TOC event occurred from 2300 hours on 8/12/20 to 0430 hours on 8/13/20 due to a suspected spike in GWRS feed water. The origin of the spike is still under investigation by OCWD and OCSD.

*** Higher than normal values due to primary analyzer issue, uncorroborated by secondary backup analyzer. Issue currently under investigation.

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
08/01/20	96.83	91.755	24,321.2	0.26	3.0	6
08/02/20	96.97	89.818	23,922.7	0.26	3.0	6
08/03/20	96.52	89.781	23,693.6	0.26	3.0	6
08/04/20	96.92	91.836	23,675.0	0.26	3.0	6
08/05/20	96.92	93.544	24,224.6	0.26	3.0	6
08/06/20	96.54	88.868	24,205.5	0.26	3.0	6
08/07/20	96.64	93.584	23,126.0	0.26	3.0	6
08/08/20	96.47	89.664	23,286.9	0.25	3.0	6
08/09/20	96.74	87.775	23,197.9	0.26	3.0	6
08/10/20	96.70	88.347	23,068.0	0.26	3.0	6
08/11/20	96.81	90.603	23,575.2	0.26	3.0	6
08/12/20	95.97	90.912	24,022.5	0.26	3.0	6
08/13/20	96.21	91.355	24,951.8	0.27	3.0	6
08/14/20	96.92	76.681	24,104.2	0.26	3.0	6
08/15/20	97.79	32.952	20,440.0	0.27	3.0	6
08/16/20	97.11	79.679	9,185.4	0.28	3.0	6
08/17/20	97.07	71.895	21,031.3	0.26	3.0	6
08/18/20	96.96	64.799	19,470.0	0.27	3.0	6
08/19/20	96.58	84.551	17,743.3	0.27	3.0	6
08/20/20	96.90	86.662	21,917.2	0.26	3.0	6
08/21/20	97.40	90.916	22,115.8	0.26	3.0	6
08/22/20	97.32	89.018	22,654.9	0.25	3.0	6
08/23/20	97.50	90.896	22,659.4	0.25	3.0	6
08/24/20	97.48	90.796	22,874.7	0.25	3.0	6
08/25/20	97.31	90.105	22,881.6	0.25	3.0	6
08/26/20	97.16	91.102	23,052.5	0.25	3.0	6
08/27/20	97.45	91.202	23,074.2	0.25	3.0	6
08/28/20	97.54	89.770	22,963.4	0.25	3.0	6
08/29/20	97.61	90.686	23,122.3	0.25	3.0	6
08/30/20	98.17	44.194	21,033.8	0.26	3.0	6
08/31/20 *	NA	NA	NA	NA	NA	NA

Notes:

Based on August 28, 2009 letter from California Department of Public Health (now DDW).

minimum UVT = 95%

minimum EED = 0.23 kwh/kgal

* Plant offline for planned outage for GWRS Final Expansion construction work.

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
09/01/20	12.31	12.31	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/02/20	12.40	12.40	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/03/20	12.43	12.43	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/04/20	12.46	12.46	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/05/20	12.41	12.41	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/06/20	12.47	12.47	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/07/20	12.51	12.51	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/08/20	12.52	12.52	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/09/20	12.49	12.49	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/10/20	12.45	12.45	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/11/20	12.43	12.43	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/12/20	12.39	12.39	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/13/20	12.39	12.39	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/14/20	12.36	12.36	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/15/20	12.37	12.37	12.03	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/16/20	12.33	12.33	12.02	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/17/20	12.33	12.33	12.05	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/18/20	12.32	12.32	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/19/20	12.32	12.32	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/20/20	12.42	12.42	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/21/20	12.46	12.46	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/22/20	12.40	12.40	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/23/20	12.38	12.38	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/24/20	12.33	12.33	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/25/20	12.37	12.37	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/26/20	12.38	12.38	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/27/20	12.43	12.43	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/28/20	12.42	12.42	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/29/20	12.40	12.40	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
09/30/20	12.38	12.38	12.08	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					
	OCSD	MF+Cl_2	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/20	0.00	4.28	2.03	6.00	0.00	12.31
09/02/20	0.00	4.33	2.07	6.00	0.00	12.40
09/03/20	0.00	4.36	2.07	6.00	0.00	12.43
09/04/20	0.00	4.37	2.09	6.00	0.00	12.46
09/05/20	0.00	4.35	2.06	6.00	0.00	12.41
09/06/20	0.00	4.40	2.07	6.00	0.00	12.47
09/07/20	0.00	4.40	2.11	6.00	0.00	12.51
09/08/20	0.00	4.39	2.14	6.00	0.00	12.52
09/09/20	0.00	4.37	2.13	6.00	0.00	12.49
09/10/20	0.00	4.36	2.10	6.00	0.00	12.45
09/11/20	0.00	4.33	2.10	6.00	0.00	12.43
09/12/20	0.00	4.30	2.09	6.00	0.00	12.39
09/13/20	0.00	4.29	2.10	6.00	0.00	12.39
09/14/20	0.00	4.30	2.07	6.00	0.00	12.36
09/15/20	0.00	4.34	2.03	6.00	0.00	12.37
09/16/20	0.00	4.30	2.02	6.00	0.00	12.33
09/17/20	0.00	4.28	2.05	6.00	0.00	12.33
09/18/20	0.00	4.24	2.08	6.00	0.00	12.32
09/19/20	0.00	4.23	2.09	6.00	0.00	12.32
09/20/20	0.00	4.35	2.08	6.00	0.00	12.42
09/21/20	0.00	4.35	2.11	6.00	0.00	12.46
09/22/20	0.00	4.32	2.08	6.00	0.00	12.40
09/23/20	0.00	4.31	2.08	6.00	0.00	12.38
09/24/20	0.00	4.27	2.07	6.00	0.00	12.33
09/25/20	0.00	4.28	2.09	6.00	0.00	12.37
09/26/20	0.00	4.29	2.09	6.00	0.00	12.38
09/27/20	0.00	4.32	2.11	6.00	0.00	12.43
09/28/20	0.00	4.30	2.12	6.00	0.00	12.42
09/29/20	0.00	4.32	2.08	6.00	0.00	12.40
09/30/20	0.00	4.30	2.08	6.00	0.00	12.38

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
09/01/20	0.00	0.00	2.03	6.00	4.00	12.03
09/02/20	0.00	0.00	2.07	6.00	4.00	12.07
09/03/20	0.00	0.00	2.07	6.00	4.00	12.07
09/04/20	0.00	0.00	2.09	6.00	4.00	12.09
09/05/20	0.00	0.00	2.06	6.00	4.00	12.06
09/06/20	0.00	0.00	2.07	6.00	4.00	12.07
09/07/20	0.00	0.00	2.11	6.00	4.00	12.11
09/08/20	0.00	0.00	2.14	6.00	4.00	12.14
09/09/20	0.00	0.00	2.13	6.00	4.00	12.13
09/10/20	0.00	0.00	2.10	6.00	4.00	12.10
09/11/20	0.00	0.00	2.10	6.00	4.00	12.10
09/12/20	0.00	0.00	2.09	6.00	4.00	12.09
09/13/20	0.00	0.00	2.10	6.00	4.00	12.10
09/14/20	0.00	0.00	2.07	6.00	4.00	12.07
09/15/20	0.00	0.00	2.03	6.00	4.00	12.03
09/16/20	0.00	0.00	2.02	6.00	4.00	12.02
09/17/20	0.00	0.00	2.05	6.00	4.00	12.05
09/18/20	0.00	0.00	2.08	6.00	4.00	12.08
09/19/20	0.00	0.00	2.09	6.00	4.00	12.09
09/20/20	0.00	0.00	2.08	6.00	4.00	12.08
09/21/20	0.00	0.00	2.11	6.00	4.00	12.11
09/22/20	0.00	0.00	2.08	6.00	4.00	12.08
09/23/20	0.00	0.00	2.08	6.00	4.00	12.08
09/24/20	0.00	0.00	2.07	6.00	4.00	12.07
09/25/20	0.00	0.00	2.09	6.00	4.00	12.09
09/26/20	0.00	0.00	2.09	6.00	4.00	12.09
09/27/20	0.00	0.00	2.11	6.00	4.00	12.11
09/28/20	0.00	0.00	2.12	6.00	4.00	12.12
09/29/20	0.00	0.00	2.08	6.00	4.00	12.08
09/30/20	0.00	0.00	2.08	6.00	4.00	12.08

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
09/01/20	4.71	4.80	4.81	4.58	4.52	4.61	4.67	4.45	4.49	4.52	4.59	4.63	4.28	4.41	4.35	4.47
09/02/20	4.70	4.75	4.73	4.59	4.48	4.58	4.63	4.43	4.46	4.48	4.55	4.63	4.41	4.40	4.36	4.48
09/03/20	4.69	4.71	4.71	4.51	4.49	4.52	4.62	4.42	4.47	4.48	4.62	4.61	4.43	4.41	4.45	4.46
09/04/20	4.66	4.77	4.71	4.55	4.47	4.54	4.62	4.40	4.50	4.48	4.65	4.61	4.43	4.40	4.52	4.46
09/05/20	4.68	4.79	4.66	4.55	4.48	4.56	4.63	4.41	4.50	4.46	4.66	4.61	4.43	4.39	4.51	4.48
09/06/20	4.71	4.82	4.77	4.59	4.49	4.59	4.66	4.43	4.52	4.51	4.74	4.61	4.44	4.41	4.53	4.50
09/07/20	4.75	4.82	4.81	4.57	4.50	4.57	4.66	4.44	4.53	4.50	4.81	4.60	4.47	4.40	4.54	4.47
09/08/20	4.71	4.77	4.72	4.58	4.50	4.53	4.65	4.43	4.49	4.49	4.79	4.65	4.43	4.39	4.54	4.46
09/09/20	4.67	4.76	4.73	4.53	4.49	4.51	4.66	4.43	4.46	4.47	4.77	4.60	4.42	4.37	4.51	4.45
09/10/20	4.63	4.73	4.66	4.47	4.54	4.52	4.60	4.42	4.45	4.46	4.77	4.60	4.40	4.52	4.49	4.45
09/11/20	4.62	4.73	4.65	4.51	4.54	4.50	4.62	4.40	4.45	4.46	4.75	4.66	4.41	4.51	4.49	4.42
09/12/20	4.63	4.84	4.66	4.45	4.56	4.49	4.62	4.40	4.44	4.43	4.74	4.66	4.41	4.50	4.47	4.41
09/13/20	4.59	4.86	4.65	4.44	4.54	4.47	4.61	4.41	4.44	4.44	4.74	4.68	4.38	4.49	4.48	4.41
09/14/20	4.78	4.82	4.63	4.46	4.54	4.46	4.76	4.41	4.43	4.41	4.74	4.66	4.40	4.48	4.48	4.40
09/15/20	4.73	4.81	4.59	4.39	4.58	4.44	4.71	4.38	4.43	4.40	4.72	4.68	4.35	4.46	4.47	4.37
09/16/20	4.69	4.83	4.61	4.40	4.52	4.45	4.69	4.36	4.36	4.41	4.73	4.65	4.36	4.46	4.46	4.53
09/17/20	4.72	4.81	4.49	4.43	4.55	4.42	4.65	4.31	4.38	4.38	4.68	4.61	4.40	4.45	4.44	4.55
09/18/20	4.69	4.76	4.55	4.48	4.52	4.54	4.63	4.39	4.38	4.33	4.69	4.63	4.42	4.42	4.42	4.52
09/19/20	4.74	4.82	4.49	4.54	4.53	4.53	4.65	4.36	4.37	4.36	4.68	4.60	4.40	4.43	4.41	4.56
09/20/20	4.73	4.82	4.65	4.56	4.52	4.53	4.66	4.37	4.35	4.36	4.69	4.60	4.40	4.43	4.40	4.53
09/21/20	4.71	4.82	4.75	4.59	4.52	4.56	4.67	4.35	4.36	4.36	4.70	4.58	4.44	4.43	4.41	4.51
09/22/20	4.66	4.76	4.69	4.49	4.49	4.51	4.68	4.34	4.34	4.34	4.66	4.60	4.40	4.38	4.40	4.48
09/23/20	4.65	4.74	4.75	4.50	4.49	4.47	4.66	4.33	4.31	4.31	4.66	4.56	4.37	4.39	4.38	4.51
09/24/20	4.60	4.74	4.68	4.43	4.44	4.51	4.62	4.29	4.27	4.27	4.64	4.55	4.41	4.39	4.38	4.50
09/25/20	4.59	4.69	4.63	4.39	4.43	4.47	4.63	4.28	4.47	4.41	4.60	4.55	4.51	4.36	4.33	4.49
09/26/20	4.64	4.69	4.72	4.45	4.42	4.53	4.58	4.29	4.51	4.47	4.61	4.54	4.50	4.37	4.34	4.48
09/27/20	4.61	4.72	4.67	4.43	4.43	4.48	4.62	4.37	4.48	4.47	4.63	4.53	4.48	4.36	4.33	4.48
09/28/20	4.65	4.68	4.67	4.50	4.43	4.51	4.58	4.39	4.44	4.44	4.63	4.52	4.52	4.34	4.36	4.47
09/29/20	4.61	4.70	4.72	4.45	4.42	4.49	4.60	4.33	4.46	4.45	4.62	4.52	4.51	4.35	4.36	4.45
09/30/20	4.59	4.68	4.68	4.45	4.42	4.48	4.59	4.37	4.45	4.46	4.64	4.50	4.49	4.34	4.35	4.46

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
09/01/20	4.52	4.44	4.35	4.51	4.45	4.48	4.50	4.50	4.53	4.40	4.55	4.44	4.74	4.49	4.47	4.57
09/02/20	4.51	4.44	4.33	4.48	4.44	4.48	4.47	4.49	4.55	4.44	4.57	4.47	4.78	4.51	4.48	4.60
09/03/20	4.50	4.39	4.36	4.47	4.44	4.42	4.42	4.46	4.48	4.40	4.55	4.45	4.74	4.49	4.46	4.52
09/04/20	4.49	4.38	4.38	4.50	4.44	4.43	4.44	4.44	4.45	4.37	4.54	4.43	4.74	4.49	4.43	4.47
09/05/20	4.46	4.37	4.35	4.50	4.41	4.47	4.44	4.43	4.49	4.40	4.51	4.43	4.76	4.48	4.45	4.47
09/06/20	4.48	4.40	4.52	4.52	4.42	4.49	4.46	4.44	4.51	4.41	4.50	4.44	4.78	4.49	4.45	4.50
09/07/20	4.51	4.41	4.69	4.52	4.45	4.48	4.49	4.46	4.50	4.41	4.51	4.45	4.78	4.50	4.46	4.58
09/08/20	4.48	4.39	4.65	4.51	4.42	4.47	4.47	4.46	4.49	4.40	4.53	4.44	4.79	4.48	4.44	4.69
09/09/20	4.46	4.37	4.61	4.48	4.38	4.45	4.44	4.44	4.57	4.37	4.51	4.42	4.74	4.44	4.44	4.62
09/10/20	4.47	4.36	4.62	4.48	4.41	4.45	4.44	4.42	4.62	4.40	4.49	4.40	4.74	4.45	4.41	4.59
09/11/20	4.44	4.33	4.60	4.47	4.43	4.44	4.50	4.43	4.59	4.47	4.48	4.40	4.75	4.45	4.37	4.60
09/12/20	4.41	4.30	4.57	4.43	4.39	4.39	4.57	4.39	4.61	4.55	4.47	4.41	4.71	4.46	4.37	4.62
09/13/20	4.44	4.29	4.59	4.44	4.39	4.40	4.56	4.36	4.62	4.58	4.49	4.45	4.70	4.44	4.38	4.63
09/14/20	4.42	4.30	4.60	4.44	4.38	4.42	4.55	4.36	4.62	4.55	4.46	4.51	4.72	4.40	4.37	4.62
09/15/20	4.39	4.39	4.56	4.39	4.34	4.35	4.52	4.34	4.58	4.52	4.42	4.51	4.69	4.39	4.39	4.60
09/16/20	4.38	4.44	4.52	4.36	4.30	4.32	4.48	4.32	4.59	4.49	4.50	4.51	4.65	4.36	4.48	4.58
09/17/20	4.38	4.40	4.47	4.31	4.28	4.42	4.44	4.29	4.57	4.43	4.58	4.47	4.63	4.32	4.46	4.58
09/18/20	4.33	4.36	4.44	4.29	4.48	4.45	4.45	4.24	4.54	4.42	4.53	4.46	4.60	4.37	4.41	4.55
09/19/20	4.32	4.39	4.44	4.30	4.59	4.43	4.47	4.23	4.54	4.44	4.51	4.50	4.57	4.49	4.48	4.54
09/20/20	4.35	4.43	4.45	4.43	4.52	4.47	4.50	4.41	4.55	4.51	4.53	4.49	4.61	4.47	4.50	4.54
09/21/20	4.36	4.44	4.45	4.52	4.51	4.47	4.50	4.51	4.56	4.53	4.56	4.45	4.62	4.45	4.49	4.55
09/22/20	4.32	4.41	4.41	4.47	4.48	4.45	4.47	4.44	4.53	4.47	4.54	4.44	4.56	4.45	4.46	4.55
09/23/20	4.45	4.40	4.40	4.46	4.47	4.44	4.45	4.41	4.49	4.50	4.50	4.43	4.53	4.44	4.44	4.51
09/24/20	4.47	4.35	4.35	4.45	4.47	4.44	4.41	4.42	4.49	4.41	4.52	4.40	4.62	4.44	4.42	4.50
09/25/20	4.46	4.31	4.33	4.46	4.40	4.48	4.38	4.42	4.47	4.33	4.51	4.39	4.72	4.42	4.42	4.45
09/26/20	4.43	4.33	4.36	4.43	4.37	4.47	4.40	4.42	4.45	4.39	4.52	4.36	4.71	4.43	4.41	4.45
09/27/20	4.42	4.35	4.32	4.44	4.40	4.48	4.41	4.42	4.43	4.50	4.52	4.38	4.71	4.42	4.38	4.46
09/28/20	4.46	4.36	4.30	4.47	4.40	4.51	4.40	4.42	4.44	4.47	4.50	4.39	4.75	4.41	4.38	4.46
09/29/20	4.46	4.34	4.32	4.47	4.38	4.51	4.40	4.40	4.44	4.35	4.49	4.40	4.74	4.42	4.39	4.45
09/30/20	4.45	4.32	4.30	4.45	4.36	4.48	4.40	4.37	4.41	4.39	4.47	4.45	4.69	4.41	4.37	4.45

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												
09/01/20	4.59	4.48	5.19	5.08												
09/02/20	4.59	4.48	5.05	5.09												
09/03/20	4.54	4.45	5.01	4.98												
09/04/20	4.53	4.46	5.08	5.00												
09/05/20	4.57	4.49	4.91	5.08												
09/06/20	4.56	4.49	5.06	5.21												
09/07/20	4.55	4.46	5.12	5.15												
09/08/20	4.55	4.47	4.99	5.17												
09/09/20	4.53	4.45	4.94	5.09												
09/10/20	4.51	4.41	5.06	5.12												
09/11/20	4.53	4.47	5.01	5.00												
09/12/20	4.52	4.66	5.01	5.05												
09/13/20	4.49	4.58	5.03	5.24												
09/14/20	4.48	4.57	4.86	5.05												
09/15/20	4.47	4.52	4.84	4.97												
09/16/20	4.48	4.53	4.83	4.90												
09/17/20	4.47	4.52	4.76	4.83												
09/18/20	4.42	4.53	4.75	4.79												
09/19/20	4.46	4.50	4.86	4.99												
09/20/20	4.49	4.50	4.74	4.90												
09/21/20	4.47	4.49	4.82	4.79												
09/22/20	4.42	4.46	4.92	4.81												
09/23/20	4.43	4.46	4.83	4.85												
09/24/20	4.39	4.43	4.79	4.88												
09/25/20	4.45	4.44	5.04	4.88												
09/26/20	4.61	4.42	4.93	4.94												
09/27/20	4.48	4.42	4.86	5.02												
09/28/20	4.50	4.43	5.05	5.04												
09/29/20	4.49	4.39	4.92	4.87												
09/30/20	4.45	4.38	4.80	4.88												

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
09/01/20 *	0.02	0.06	0.02	0.04	0.02	0.09	0.02	0.09	0.02	0.09	0.03	0.06	0.02	0.08	0.02	0.10	0.03	0.09	0.02
09/02/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
09/03/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
09/04/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02
09/05/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
09/06/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
09/07/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02
09/08/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
09/09/20	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02
09/10/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.13	0.03	0.06	0.02	0.02	0.02	0.02	0.04	0.04	0.02
09/11/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02
09/12/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02
09/13/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
09/14/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02
09/15/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.04	0.03	1.27**	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02
09/16/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02
09/17/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02
09/18/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02
09/19/20	0.02	0.03	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.05	0.03	0.04	0.02
09/20/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.02
09/21/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.02
09/22/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.02	0.05	0.05	0.02
09/23/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.05	0.06	0.02
09/24/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.06	0.02
09/25/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
09/26/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
09/27/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.06	0.02	0.02	0.02
09/28/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
09/29/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
09/30/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	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.

* Plant was restarted on 9/1/20 after a planned outage for the GWRS Final Expansion Construction project.

** A 2.5 minute elevated turbidity event occurred during backwashing sequences of cells C01-C04. The exact cause of the elevated turbidity values is under investigation.

Orange County Water District - Ground Water Replenishment System (GWRS)
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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
09/01/20 *	0.036	0.140	7.731	5.672	8.481	0.073	0.058	0.093	1,680	1,490	1,789	43	41	53	99.06	2.03	97.44	1.59
09/02/20	0.011	0.011	7.938	7.312	8.568	0.068	0.058	0.083	1,710	1,625	1,799	39	35	43	99.14	2.07	97.74	1.65
09/03/20	0.011	0.011	7.774	6.625	8.924	0.066	0.059	0.078	1,712	1,628	1,800	40	35	47	99.15	2.07	97.67	1.63
09/04/20	0.011	0.011	7.636	7.043	8.515	0.062	0.058	0.072	1,718	1,646	1,785	40	36	44	99.18	2.09	97.67	1.63
09/05/20	0.011	0.011	7.440	5.765	8.415	0.065	0.055	0.098	1,704	1,666	1,771	40	37	110**	99.12	2.06	97.64	1.63
09/06/20	0.011	0.011	7.084	5.623	8.163	0.060	0.054	0.069	1,611	1,550	1,669	39	36	47	99.15	2.07	97.58	1.62
09/07/20	0.011	0.011	7.249	5.732	8.657	0.056	0.049	0.064	1,550	1,489	1,600	38	35	42	99.23	2.11	97.57	1.61
09/08/20	0.011	0.011	7.671	6.945	9.027	0.056	0.051	0.072	1,535	1,456	1,635	36	33	40	99.27	2.14	97.67	1.63
09/09/20	0.011	0.011	8.641	7.813	9.483	0.064	0.054	0.075	1,665	1,569	1,803	39	35	42	99.25	2.13	97.69	1.64
09/10/20	0.011	0.011	7.858	5.628	8.716	0.063	0.055	0.077	1,742	1,642	1,835	40	35	44	99.20	2.10	97.72	1.64
09/11/20	0.011	0.011	7.665	6.876	8.490	0.062	0.055	0.071	1,700	1,635	1,770	38	35	42	99.20	2.10	97.78	1.65
09/12/20	0.011	0.011	7.565	5.840	8.564	0.062	0.056	0.072	1,673	1,616	1,725	40	37	43	99.18	2.09	97.64	1.63
09/13/20	0.011	0.011	7.476	6.761	8.328	0.060	0.051	0.073	1,615	1,559	1,675	38	35	41	99.20	2.10	97.66	1.63
09/14/20	0.011	0.011	6.925	5.660	13.289	0.059	0.051	0.103	1,560	1,497	1,627	36	34	41	99.15	2.07	97.67	1.63
09/15/20	0.011	0.011	7.160	5.830	8.871	0.066	0.058	0.075	1,643	1,556	1,766	39	35	44	99.07	2.03	97.65	1.63
09/16/20	0.011	0.023	7.176	5.936	9.003	0.068	0.060	0.077	1,743	1,669	1,844	41	37	47	99.06	2.02	97.64	1.63
09/17/20	0.011	0.012	7.709	5.848	10.301	0.069	0.064	0.080	1,749	1,674	1,863	43	39	49	99.11	2.05	97.56	1.61
09/18/20	0.011	0.011	7.784	5.772	8.667	0.065	0.059	0.073	1,736	1,657	1,818	42	35	46	99.16	2.08	97.60	1.62
09/19/20	0.011	0.014	7.992	7.206	8.925	0.065	0.057	0.072	1,694	1,644	1,752	40	38	52	99.19	2.09	97.62	1.62
09/20/20	0.012	0.014	7.781	7.064	8.954	0.065	0.054	0.079	1,632	1,571	1,694	40	37	44	99.16	2.08	97.52	1.61
09/21/20	0.011	0.011	7.936	6.978	9.297	0.062	0.055	0.070	1,585	1,485	1,717	38	34	43	99.22	2.11	97.58	1.62
09/22/20	0.011	0.011	8.272	7.335	9.383	0.069	0.062	0.076	1,685	1,610	1,769	41	37	46	99.17	2.08	97.55	1.61
09/23/20	0.013	0.015	8.155	7.293	9.330	0.068	0.063	0.098	1,687	1,600	1,794	41	36	48	99.16	2.08	97.56	1.61
09/24/20	0.011	0.012	8.165	7.380	8.985	0.070	0.063	0.089	1,704	1,623	1,780	41	37	46	99.14	2.07	97.58	1.62
09/25/20	0.011	0.011	7.997	7.180	9.030	0.065	0.056	0.074	1,708	1,634	1,780	41	37	47	99.19	2.09	97.63	1.62
09/26/20	0.011	0.011	7.893	7.058	8.959	0.064	0.058	0.072	1,672	1,630	1,733	39	36	43	99.19	2.09	97.67	1.63
09/27/20	0.011	0.011	7.649	6.815	10.290	0.060	0.052	0.071	1,580	1,546	1,627	36	34	38	99.22	2.11	97.71	1.64
09/28/20	0.011	0.011	7.843	6.795	9.262	0.060	0.054	0.074	1,541	1,471	1,648	36	32	40	99.24	2.12	97.69	1.64
09/29/20	0.011	0.011	8.077	7.088	9.262	0.067	0.060	0.077	1,646	1,561	1,778	38	34	43	99.17	2.08	97.71	1.64
09/30/20	0.011	0.011	8.143	7.092	9.365	0.068	0.060	0.084	1,697	1,614	1,797	38	34	43	99.17	2.08	97.73	1.64

Notes:

* Plant was restarted on 9/1/20 after a planned outage for the GWRS Final Expansion Construction project.

** A short term excursion of elevated electrical conductivity occurred as plant was ramping up flow after a demand response event. OCWD participates in a voluntary electrical load reduction event program with SCE known as Demand Response. When events are called plant flow is reduced to 15 mgd to curtail electrical demand at request of SCE and CAISO.

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
09/01/20	98.34	39.400	2,317.4	0.27	3.0	6
09/02/20	98.02	91.127	12,906.0	0.26	3.0	6
09/03/20	97.72	88.198	23,005.9	0.25	3.0	6
09/04/20	97.56	91.052	22,560.9	0.26	3.0	6
09/05/20	97.62	73.767	22,904.3	0.25	3.0	6
09/06/20	97.41	66.143	19,460.1	0.26	3.0	6
09/07/20	97.37	81.302	17,737.8	0.27	3.0	6
09/08/20	96.94	85.439	21,066.6	0.26	3.0	6
09/09/20	97.02	85.665	21,378.3	0.25	3.0	6
09/10/20	97.24	84.030	21,897.3	0.26	3.0	6
09/11/20	97.15	89.671	22,054.2	0.26	3.0	6
09/12/20	97.12	89.702	23,251.5	0.26	3.0	6
09/13/20	97.43	88.415	23,122.0	0.26	3.0	6
09/14/20	97.29	88.003	23,082.7	0.26	3.0	6
09/15/20	97.14	89.368	22,965.1	0.26	3.0	6
09/16/20	97.18	91.146	23,473.5	0.26	3.0	6
09/17/20	96.98	91.166	23,987.6	0.26	3.0	6
09/18/20	97.18	89.536	23,641.1	0.26	3.0	6
09/19/20	97.31	89.403	23,643.1	0.26	3.0	6
09/20/20	97.91	87.927	23,535.3	0.27	3.0	6
09/21/20	97.76	88.116	23,419.9	0.27	3.0	6
09/22/20	97.49	89.701	23,594.4	0.27	3.0	6
09/23/20	97.27	90.427	23,212.9	0.26	3.0	6
09/24/20	97.12	94.457	23,714.2	0.26	3.0	6
09/25/20	97.13	93.627	24,008.9	0.25	3.0	6
09/26/20	97.25	90.666	23,631.8	0.25	3.0	6
09/27/20	97.46	89.550	23,635.2	0.26	3.0	6
09/28/20	97.27	89.589	23,481.9	0.26	3.0	6
09/29/20	97.32	89.599	23,691.6	0.26	3.0	6
09/30/20	97.22	91.802	23,683.8	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				
	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
10/01/20	12.35	12.35	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/02/20	12.34	12.34	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/03/20	12.41	12.41	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/04/20	12.43	12.43	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/05/20	12.36	12.36	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/06/20	12.34	12.34	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/07/20	12.34	12.34	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/08/20	12.31	12.31	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/09/20	12.29	12.29	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/10/20	12.29	12.29	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/11/20	12.36	12.36	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/12/20	12.37	12.37	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/13/20	12.31	12.31	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/14/20	12.23	12.23	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/15/20	12.22	12.22	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/16/20	12.34	12.34	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/17/20	12.31	12.31	12.06	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/18/20	12.34	12.34	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/19/20	12.39	12.39	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/20/20	12.39	12.39	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/21/20	12.36	12.36	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/22/20	12.36	12.36	12.07	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/23/20	12.39	12.39	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/24/20	12.41	12.41	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/25/20	12.43	12.43	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/26/20	12.45	12.45	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/27/20	12.42	12.42	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/28/20	12.36	12.36	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/29/20	12.32	12.32	12.09	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/30/20	12.31	12.31	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
10/31/20	12.27	12.27	12.08	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
10/01/20	0.00	4.27	2.08	6.00	0.00	12.35
10/02/20	0.00	4.26	2.08	6.00	0.00	12.34
10/03/20	0.00	4.29	2.12	6.00	0.00	12.41
10/04/20	0.00	4.28	2.14	6.00	0.00	12.43
10/05/20	0.00	4.28	2.08	6.00	0.00	12.36
10/06/20	0.00	4.26	2.08	6.00	0.00	12.34
10/07/20	0.00	4.24	2.10	6.00	0.00	12.34
10/08/20	0.00	4.22	2.09	6.00	0.00	12.31
10/09/20	0.00	4.20	2.08	6.00	0.00	12.29
10/10/20	0.00	4.20	2.09	6.00	0.00	12.29
10/11/20	0.00	4.25	2.12	6.00	0.00	12.36
10/12/20	0.00	4.22	2.15	6.00	0.00	12.37
10/13/20	0.00	4.20	2.12	6.00	0.00	12.31
10/14/20	0.00	4.16	2.07	6.00	0.00	12.23
10/15/20	0.00	4.14	2.08	6.00	0.00	12.22
10/16/20	0.00	4.26	2.08	6.00	0.00	12.34
10/17/20	0.00	4.25	2.06	6.00	0.00	12.31
10/18/20	0.00	4.25	2.09	6.00	0.00	12.34
10/19/20	0.00	4.26	2.13	6.00	0.00	12.39
10/20/20	0.00	4.30	2.09	6.00	0.00	12.39
10/21/20	0.00	4.28	2.08	6.00	0.00	12.36
10/22/20	0.00	4.28	2.07	6.00	0.00	12.36
10/23/20	0.00	4.28	2.10	6.00	0.00	12.39
10/24/20	0.00	4.31	2.11	6.00	0.00	12.41
10/25/20	0.00	4.31	2.11	6.00	0.00	12.43
10/26/20	0.00	4.30	2.15	6.00	0.00	12.45
10/27/20	0.00	4.28	2.14	6.00	0.00	12.42
10/28/20	0.00	4.21	2.15	6.00	0.00	12.36
10/29/20	0.00	4.24	2.09	6.00	0.00	12.32
10/30/20	0.00	4.21	2.10	6.00	0.00	12.31
10/31/20	0.00	4.19	2.08	6.00	0.00	12.27

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
10/01/20	0.00	0.00	2.08	6.00	4.00	12.08
10/02/20	0.00	0.00	2.08	6.00	4.00	12.08
10/03/20	0.00	0.00	2.12	6.00	4.00	12.12
10/04/20	0.00	0.00	2.14	6.00	4.00	12.14
10/05/20	0.00	0.00	2.08	6.00	4.00	12.08
10/06/20	0.00	0.00	2.08	6.00	4.00	12.08
10/07/20	0.00	0.00	2.10	6.00	4.00	12.10
10/08/20	0.00	0.00	2.09	6.00	4.00	12.09
10/09/20	0.00	0.00	2.08	6.00	4.00	12.08
10/10/20	0.00	0.00	2.09	6.00	4.00	12.09
10/11/20	0.00	0.00	2.12	6.00	4.00	12.12
10/12/20	0.00	0.00	2.15	6.00	4.00	12.15
10/13/20	0.00	0.00	2.12	6.00	4.00	12.12
10/14/20	0.00	0.00	2.07	6.00	4.00	12.07
10/15/20	0.00	0.00	2.08	6.00	4.00	12.08
10/16/20	0.00	0.00	2.08	6.00	4.00	12.08
10/17/20	0.00	0.00	2.06	6.00	4.00	12.06
10/18/20	0.00	0.00	2.09	6.00	4.00	12.09
10/19/20	0.00	0.00	2.13	6.00	4.00	12.13
10/20/20	0.00	0.00	2.09	6.00	4.00	12.09
10/21/20	0.00	0.00	2.08	6.00	4.00	12.08
10/22/20	0.00	0.00	2.07	6.00	4.00	12.07
10/23/20	0.00	0.00	2.10	6.00	4.00	12.10
10/24/20	0.00	0.00	2.11	6.00	4.00	12.11
10/25/20	0.00	0.00	2.11	6.00	4.00	12.11
10/26/20	0.00	0.00	2.15	6.00	4.00	12.15
10/27/20	0.00	0.00	2.14	6.00	4.00	12.14
10/28/20	0.00	0.00	2.15	6.00	4.00	12.15
10/29/20	0.00	0.00	2.09	6.00	4.00	12.09
10/30/20	0.00	0.00	2.10	6.00	4.00	12.10
10/31/20	0.00	0.00	2.08	6.00	4.00	12.08

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
10/01/20	4.60	4.65	4.61	4.43	4.44	4.48	4.59	4.36	4.42	4.43	4.58	4.52	4.47	4.29	4.34	4.44
10/02/20	4.55	4.62	4.62	4.40	4.40	4.50	4.56	4.34	4.44	4.45	4.59	4.48	4.57	4.28	4.45	4.45
10/03/20	4.57	4.62	4.63	4.39	4.38	4.46	4.59	4.32	4.41	4.43	4.72	4.48	4.58	4.29	4.47	4.43
10/04/20	4.57	4.67	4.63	4.41	4.38	4.46	4.59	4.34	4.45	4.43	4.74	4.46	4.55	4.28	4.48	4.42
10/05/20	4.58	4.60	4.63	4.37	4.50	4.50	4.56	4.36	4.48	4.43	4.76	4.47	4.54	4.28	4.47	4.42
10/06/20	4.52	4.61	4.58	4.40	4.53	4.47	4.54	4.40	4.43	4.42	4.73	4.48	4.56	4.26	4.48	4.39
10/07/20	4.55	4.63	4.61	4.40	4.53	4.47	4.57	4.38	4.42	4.40	4.72	4.64	4.57	4.40	4.47	4.41
10/08/20	4.48	4.78	4.55	4.35	4.50	4.45	4.54	4.36	4.43	4.40	4.72	4.65	4.54	4.48	4.45	4.37
10/09/20	4.51	4.82	4.53	4.29	4.53	4.39	4.53	4.36	4.47	4.35	4.74	4.61	4.54	4.49	4.44	4.35
10/10/20	4.73	4.80	4.53	4.30	4.53	4.39	4.55	4.38	4.49	4.35	4.75	4.62	4.55	4.47	4.45	4.35
10/11/20	4.75	4.74	4.49	4.29	4.53	4.40	4.63	4.36	4.48	4.36	4.72	4.63	4.53	4.44	4.45	4.32
10/12/20	4.74	4.77	4.55	4.29	4.52	4.37	4.69	4.34	4.47	4.37	4.73	4.62	4.53	4.45	4.43	4.33
10/13/20	4.70	4.78	4.49	4.38	4.50	4.36	4.66	4.33	4.44	4.33	4.69	4.60	4.52	4.44	4.41	4.47
10/14/20	4.70	4.75	4.50	4.51	4.54	4.57	4.67	4.33	4.45	4.32	4.70	4.61	4.52	4.40	4.38	4.52
10/15/20	4.67	4.75	4.42	4.52	4.48	4.55	4.65	4.38	4.44	4.31	4.68	4.57	4.54	4.39	4.39	4.50
10/16/20	4.69	4.69	4.47	4.46	4.47	4.47	4.63	4.34	4.47	4.29	4.67	4.57	4.50	4.37	4.39	4.50
10/17/20	4.68	4.73	4.66	4.48	4.48	4.49	4.64	4.34	4.43	4.31	4.64	4.57	4.47	4.39	4.39	4.46
10/18/20	4.68	4.75	4.76	4.51	4.47	4.49	4.65	4.34	4.42	4.31	4.63	4.57	4.47	4.40	4.39	4.44
10/19/20	4.66	4.77	4.73	4.53	4.48	4.52	4.63	4.36	4.46	4.31	4.66	4.60	4.47	4.43	4.39	4.53
10/20/20	4.64	4.75	4.69	4.52	4.46	4.55	4.60	4.37	4.45	4.30	4.67	4.55	4.41	4.42	4.36	4.49
10/21/20	4.66	4.70	4.70	4.46	4.45	4.49	4.63	4.29	4.48	4.28	4.64	4.56	4.41	4.39	4.38	4.48
10/22/20	4.67	4.75	4.73	4.53	4.44	4.53	4.63	4.28	4.50	4.42	4.65	4.55	4.42	4.36	4.36	4.48
10/23/20	4.63	4.67	4.68	4.47	4.43	4.48	4.62	4.28	4.45	4.44	4.62	4.54	4.41	4.37	4.32	4.45
10/24/20	4.63	4.69	4.66	4.44	4.42	4.47	4.59	4.39	4.45	4.44	4.59	4.51	4.42	4.35	4.34	4.46
10/25/20	4.64	4.67	4.69	4.45	4.44	4.49	4.59	4.38	4.66	4.46	4.60	4.51	4.42	4.33	4.31	4.45
10/26/20	4.58	4.66	4.69	4.43	4.42	4.45	4.61	4.38	4.66	4.44	4.56	4.51	4.39	4.34	4.31	4.42
10/27/20	4.62	4.68	4.62	4.46	4.39	4.45	4.62	4.38	4.65	4.44	4.55	4.51	4.38	4.34	4.32	4.42
10/28/20	4.58	4.64	4.58	4.41	4.33	4.45	4.55	4.29	4.66	4.37	4.53	4.48	4.52	4.26	4.27	4.39
10/29/20	4.54	4.54	4.57	4.37	4.32	4.44	4.56	4.29	4.63	4.42	4.73	4.44	4.53	4.25	4.25	4.37
10/30/20	4.47	4.52	4.54	4.26	4.27	4.38	4.51	4.25	4.56	4.45	4.71	4.45	4.52	4.24	4.22	4.34
10/31/20	4.46	4.48	4.53	4.27	4.46	4.37	4.50	4.25	4.54	4.46	4.68	4.46	4.53	4.23	4.21	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															
	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
10/01/20	4.44	4.33	4.27	4.43	4.36	4.45	4.36	4.36	4.39	4.48	4.45	4.40	4.70	4.39	4.37	4.40
10/02/20	4.42	4.30	4.26	4.40	4.34	4.43	4.34	4.35	4.40	4.43	4.43	4.34	4.70	4.41	4.36	4.42
10/03/20	4.43	4.30	4.46	4.39	4.31	4.39	4.35	4.33	4.41	4.38	4.42	4.34	4.69	4.43	4.35	4.49
10/04/20	4.42	4.30	4.60	4.40	4.33	4.38	4.37	4.34	4.39	4.39	4.42	4.38	4.69	4.43	4.36	4.68
10/05/20	4.39	4.28	4.55	4.41	4.31	4.38	4.35	4.33	4.47	4.29	4.42	4.37	4.69	4.41	4.38	4.63
10/06/20	4.40	4.27	4.52	4.40	4.29	4.39	4.31	4.32	4.62	4.40	4.41	4.37	4.67	4.40	4.37	4.58
10/07/20	4.40	4.24	4.49	4.37	4.29	4.37	4.41	4.30	4.56	4.49	4.40	4.33	4.66	4.38	4.30	4.62
10/08/20	4.40	4.22	4.51	4.34	4.28	4.33	4.51	4.27	4.56	4.49	4.39	4.38	4.62	4.35	4.28	4.60
10/09/20	4.37	4.20	4.48	4.32	4.25	4.31	4.44	4.24	4.58	4.46	4.34	4.58	4.60	4.34	4.29	4.55
10/10/20	4.37	4.20	4.49	4.33	4.26	4.33	4.47	4.23	4.59	4.45	4.36	4.52	4.63	4.32	4.29	4.56
10/11/20	4.38	4.35	4.53	4.34	4.25	4.33	4.54	4.25	4.59	4.69	4.40	4.56	4.64	4.34	4.36	4.60
10/12/20	4.36	4.42	4.52	4.31	4.22	4.30	4.52	4.22	4.55	4.60	4.47	4.51	4.58	4.34	4.49	4.59
10/13/20	4.33	4.41	4.44	4.27	4.20	4.43	4.51	4.20	4.54	4.40	4.57	4.45	4.55	4.29	4.43	4.53
10/14/20	4.32	4.38	4.43	4.24	4.18	4.54	4.48	4.16	4.57	4.47	4.56	4.49	4.57	4.34	4.43	4.52
10/15/20	4.30	4.36	4.42	4.24	4.33	4.51	4.45	4.14	4.57	4.42	4.54	4.48	4.55	4.41	4.47	4.51
10/16/20	4.26	4.35	4.37	4.43	4.44	4.48	4.43	4.31	4.52	4.41	4.53	4.46	4.48	4.41	4.46	4.50
10/17/20	4.25	4.38	4.38	4.52	4.42	4.49	4.42	4.47	4.51	4.41	4.50	4.43	4.49	4.45	4.44	4.53
10/18/20	4.25	4.39	4.40	4.48	4.42	4.51	4.42	4.45	4.54	4.42	4.50	4.43	4.49	4.46	4.44	4.53
10/19/20	4.26	4.41	4.39	4.49	4.43	4.49	4.45	4.44	4.49	4.42	4.54	4.48	4.52	4.41	4.44	4.50
10/20/20	4.40	4.39	4.35	4.51	4.44	4.48	4.47	4.43	4.50	4.42	4.53	4.45	4.62	4.42	4.45	4.52
10/21/20	4.45	4.38	4.34	4.47	4.43	4.46	4.46	4.45	4.51	4.38	4.53	4.43	4.73	4.42	4.45	4.50
10/22/20	4.44	4.36	4.37	4.44	4.40	4.47	4.42	4.41	4.50	4.35	4.55	4.40	4.67	4.38	4.42	4.48
10/23/20	4.42	4.34	4.34	4.41	4.39	4.43	4.40	4.39	4.44	4.35	4.54	4.44	4.68	4.42	4.39	4.48
10/24/20	4.40	4.33	4.31	4.40	4.39	4.39	4.40	4.40	4.42	4.32	4.52	4.41	4.68	4.42	4.40	4.45
10/25/20	4.41	4.32	4.32	4.42	4.36	4.41	4.41	4.40	4.44	4.32	4.51	4.36	4.68	4.40	4.40	4.43
10/26/20	4.42	4.31	4.30	4.40	4.35	4.40	4.39	4.39	4.41	4.34	4.51	4.36	4.68	4.39	4.41	4.42
10/27/20	4.41	4.31	4.28	4.38	4.36	4.38	4.35	4.37	4.38	4.31	4.52	4.36	4.64	4.40	4.40	4.40
10/28/20	4.38	4.27	4.21	4.36	4.36	4.35	4.33	4.36	4.37	4.30	4.46	4.35	4.63	4.41	4.31	4.40
10/29/20	4.39	4.24	4.38	4.33	4.33	4.31	4.29	4.31	4.33	4.26	4.42	4.35	4.63	4.38	4.30	4.48
10/30/20	4.37	4.21	4.52	4.31	4.30	4.28	4.25	4.27	4.28	4.22	4.40	4.36	4.62	4.33	4.25	4.70
10/31/20	4.35	4.19	4.47	4.29	4.28	4.25	4.25	4.27	4.30	4.23	4.42	4.30	4.65	4.35	4.30	4.61

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
10/01/20	4.46	4.41	4.98	4.97
10/02/20	4.48	4.37	4.83	4.94
10/03/20	4.45	4.35	4.87	4.91
10/04/20	4.45	4.35	4.93	5.07
10/05/20	4.57	4.33	4.87	5.03
10/06/20	4.52	4.33	4.88	4.96
10/07/20	4.49	4.31	4.96	5.06
10/08/20	4.45	4.34	4.79	5.00
10/09/20	4.47	4.48	4.87	4.94
10/10/20	4.40	4.48	4.84	5.05
10/11/20	4.40	4.49	4.82	4.91
10/12/20	4.43	4.49	4.84	5.01
10/13/20	4.46	4.51	4.98	5.03
10/14/20	4.48	4.50	4.76	4.94
10/15/20	4.49	4.45	4.81	4.82
10/16/20	4.47	4.47	4.93	4.85
10/17/20	4.46	4.49	4.81	4.89
10/18/20	4.46	4.47	4.82	4.89
10/19/20	4.41	4.44	4.89	5.00
10/20/20	4.42	4.44	4.70	4.95
10/21/20	4.42	4.46	4.84	4.87
10/22/20	4.42	4.43	5.00	5.01
10/23/20	4.50	4.44	4.89	4.93
10/24/20	4.50	4.41	4.94	4.87
10/25/20	4.47	4.39	4.98	4.87
10/26/20	4.44	4.39	4.81	4.77
10/27/20	4.45	4.34	4.80	4.81
10/28/20	4.41	4.32	4.94	4.81
10/29/20	4.36	4.33	4.72	4.71
10/30/20	4.36	4.26	4.77	4.66
10/31/20	4.45	4.23	4.79	4.63

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
10/01/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02
10/02/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
10/03/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.08	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
10/04/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.03	0.02	0.03	0.02
10/05/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
10/06/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
10/07/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.04	0.02	0.02	0.02	0.03	0.02
10/08/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10/09/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10/10/20	0.02	0.03	0.02	0.03	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.06	0.02	0.02	0.02
10/11/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
10/12/20	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
10/13/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
10/14/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.06	0.02	0.05	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
10/15/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
10/16/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
10/17/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
10/18/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02
10/19/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02
10/20/20	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.04	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02
10/21/20	0.02	0.03	0.02	0.03	0.02	0.03	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
10/22/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.05	0.02
10/23/20	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02
10/24/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10/25/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10/26/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
10/27/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
10/28/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
10/29/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02
10/30/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.10	0.02	0.02	0.03	0.04	0.02
10/31/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.04	0.02	0.03	0.04	0.04	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
10/01/20	0.011	0.011	8.286	7.318	9.651	0.069	0.062	0.079	1,725	1,642	1,830	40	35	46	99.17	2.08	97.71	1.64
10/02/20	0.013	0.020	7.978	5.799	9.494	0.067	0.060	0.075	1,719	1,645	1,784	42	37	49	99.17	2.08	97.54	1.61
10/03/20	0.012	0.016	8.146	7.220	9.207	0.062	0.055	0.071	1,685	1,635	1,751	43	40	51	99.24	2.12	97.48	1.60
10/04/20	0.011	0.011	8.023	7.181	9.248	0.058	0.051	0.066	1,614	1,553	1,666	41	38	45	99.28	2.14	97.47	1.60
10/05/20	0.011	0.011	8.155	7.228	9.439	0.068	0.054	0.426 **	1,569	1,485	1,657	39	35	49	99.17	2.08	97.49	1.60
10/06/20	0.011	0.011	8.292	7.425	9.428	0.069	0.062	0.083	1,653	1,561	1,791	41	38	48	99.17	2.08	97.49	1.60
10/07/20	0.011	0.011	8.412	7.660	9.244	0.067	0.062	0.073	1,687	1,607	1,778	42	38	48	99.21	2.10	97.52	1.61
10/08/20	0.012	0.013	8.422	7.572	9.551	0.068	0.062	0.086	1,678	1,615	1,747	40	37	43	99.19	2.09	97.60	1.62
10/09/20	0.011	0.012	8.436	7.516	9.551	0.070	0.062	0.086	1,655	1,577	1,733	38	33	42	99.17	2.08	97.73	1.64
10/10/20	0.011	0.011	8.322	7.417	9.217	0.068	0.063	0.078	1,657	1,600	1,714	36	34	40	99.19	2.09	97.81	1.66
10/11/20	0.011	0.011	8.080	7.206	9.081	0.062	0.051	0.071	1,593	1,549	1,647	34	32	38	99.23	2.12	97.85	1.67
10/12/20	0.011	0.011	8.085	7.083	9.310	0.057	0.053	0.064	1,552	1,497	1,603	33	31	37	99.29	2.15	97.85	1.67
10/13/20	0.011	0.012	8.093	7.068	9.437	0.062	0.055	0.071	1,626	1,555	1,785	35	31	40	99.23	2.12	97.87	1.67
10/14/20	0.011	0.011	7.912	7.170	8.741	0.067	0.057	0.084	1,690	1,634	1,778	37	33	41	99.15	2.07	97.84	1.67
10/15/20	0.011	0.011	7.768	7.087	8.413	0.065	0.055	0.072	1,666	1,571	1,756	36	33	42	99.17	2.08	97.81	1.66
10/16/20	0.011	0.011	7.588	6.864	8.337	0.063	0.053	0.076	1,680	1,627	1,745	36	33	40	99.17	2.08	97.86	1.67
10/17/20	0.011	0.011	7.501	6.771	8.304	0.066	0.056	0.133 ***	1,661	1,607	1,728	36	33	40	99.12	2.06	97.85	1.67
10/18/20	0.011	0.011	7.330	6.663	8.378	0.060	0.050	0.072	1,568	1,503	1,643	33	31	36	99.18	2.09	97.88	1.67
10/19/20 *	0.022	0.041	7.759	6.941	8.576	0.057	0.050	0.066	1,552	1,447	1,713	33	30	38	99.27	2.13	97.89	1.68
10/20/20	0.033	0.048	7.732	6.993	8.426	0.062	0.051	0.072	1,654	1,570	1,752	34	31	37	99.19	2.09	97.94	1.69
10/21/20	0.028	0.050	7.752	6.999	8.397	0.064	0.057	0.072	1,709	1,630	1,783	34	30	37	99.17	2.08	98.00	1.70
10/22/20	0.025	0.032	7.690	7.102	8.309	0.065	0.058	0.077	1,698	1,630	1,783	33	31	38	99.15	2.07	98.04	1.71
10/23/20	0.023	0.030	7.692	7.088	8.319	0.061	0.000	0.074	1,698	1,624	1,782	33	30	37	99.21	2.10	98.03	1.71
10/24/20	0.027	0.028	7.677	7.090	8.416	0.060	0.052	0.071	1,680	1,616	1,752	33	31	36	99.22	2.11	98.03	1.70
10/25/20	0.027	0.029	7.582	6.978	8.431	0.058	0.047	0.070	1,610	1,546	1,674	31	29	34	99.23	2.11	98.06	1.71
10/26/20	0.027	0.028	7.769	6.990	8.769	0.055	0.044	0.065	1,591	1,532	1,645	30	28	33	99.29	2.15	98.11	1.72
10/27/20	0.026	0.034	8.166	7.208	9.542	0.059	0.050	0.067	1,640	1,565	1,768	31	28	35	99.28	2.14	98.12	1.73
10/28/20	0.029	0.035	8.661	7.900	9.750	0.061	0.055	0.069	1,710	1,611	1,829	32	29	37	99.30	2.15	98.11	1.72
10/29/20	0.026	0.035	8.898	7.759	10.277	0.073	0.059	0.102	1,712	1,634	1,782	34	29	57	99.18	2.09	98.04	1.71
10/30/20	0.026	0.034	7.571	7.059	8.767	0.060	0.050	0.067	1,705	1,615	1,805	32	29	36	99.21	2.10	98.11	1.72
10/31/20	0.027	0.038	7.468	6.934	8.205	0.062	0.051	0.118 ****	1,700	1,644	1,791	32	29	37	99.18	2.08	98.12	1.73

Notes: * ROP turbidity analyzer drained and cleaned on 10/19.

** A short term increase in TOC a result of bringing RO unit D01 online with new membranes without sufficient flush time prior to start up.

*** A short term increase in TOC a result of bringing RO unit C01 online with new membranes after customary flush period.

**** A short term increase in TOC a result of bringing RO unit B01 online with new membranes after customary flush period.

Orange County Water District - Ground Water Replenishment System (GWRS)
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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
10/01/20	96.93	92.074	23,652.2	0.26	3.0	6
10/02/20	96.76	89.883	23,625.6	0.26	3.0	6
10/03/20	97.05	91.916	23,620.4	0.26	3.0	6
10/04/20	97.17	90.242	23,606.6	0.26	3.0	6
10/05/20	97.05	88.790	23,528.9	0.26	3.0	6
10/06/20	97.22	89.607	23,768.0	0.26	3.0	6
10/07/20	96.98	90.523	23,857.9	0.27	3.0	6
10/08/20	96.92	91.013	23,852.4	0.26	3.0	6
10/09/20	97.16	89.543	24,052.9	0.27	3.0	6
10/10/20	97.14	88.857	24,103.7	0.27	3.0	6
10/11/20	97.37	89.432	24,129.4	0.27	3.0	6
10/12/20	97.19	90.536	23,858.0	0.27	3.0	6
10/13/20	97.06	94.536	24,207.9	0.26	3.0	6
10/14/20	97.15	91.020	23,702.9	0.25	3.0	6
10/15/20	96.74	91.316	23,727.8	0.26	3.0	6
10/16/20	97.16	94.462	23,684.4	0.26	3.0	6
10/17/20	97.21	91.500	23,623.9	0.25	3.0	6
10/18/20	97.63	89.626	23,623.9	0.26	3.0	6
10/19/20	97.28	89.685	23,615.1	0.26	3.0	6
10/20/20	97.49	89.389	23,609.5	0.26	3.0	6
10/21/20	97.50	88.749	23,498.3	0.26	3.0	6
10/22/20	97.57	90.909	23,853.7	0.26	3.0	6
10/23/20	96.19	93.703	23,609.2	0.26	3.0	6
10/24/20	97.22	91.755	23,588.8	0.25	3.0	6
10/25/20	97.73	89.778	23,435.7	0.26	3.0	6
10/26/20	97.55	89.800	23,694.5	0.26	3.0	6
10/27/20	97.49	92.947	23,451.5	0.26	3.0	6
10/28/20	97.52	93.703	23,253.3	0.25	3.0	6
10/29/20	97.32	85.915	23,683.0	0.25	3.0	6
10/30/20	97.50	94.174	22,733.3	0.26	3.0	6
10/31/20	97.40	92.171	23,209.0	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				
	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
11/01/20	12.29	12.29	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/02/20	12.40	12.40	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/03/20	12.35	12.35	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/04/20	12.30	12.30	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/05/20	12.27	12.27	12.11	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/06/20	12.34	12.34	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/07/20	12.35	12.35	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/08/20	12.33	12.33	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/09/20	12.35	12.35	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/10/20	12.29	12.29	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/11/20	12.32	12.32	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/12/20	12.32	12.32	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/13/20	12.37	12.37	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/14/20	12.38	12.38	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/15/20	12.42	12.42	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/16/20	12.44	12.44	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/17/20	12.37	12.37	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/18/20	12.35	12.35	12.14	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/19/20	12.35	12.35	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/20/20	12.29	12.29	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/21/20	12.37	12.37	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/22/20	12.39	12.39	12.17	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/23/20	12.40	12.40	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/24/20	12.27	12.27	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/25/20	12.34	12.34	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/26/20	12.35	12.35	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/27/20	12.35	12.35	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/28/20	12.36	12.36	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/29/20	12.35	12.35	12.27	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
11/30/20	12.36	12.36	12.26	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					
	OCSD	MF+Cl_2	RO	UV/AOP	Underground travel time (ToT)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
11/01/20	0.00	4.21	2.08	6.00	0.00	12.29
11/02/20	0.00	4.25	2.14	6.00	0.00	12.40
11/03/20	0.00	4.23	2.12	6.00	0.00	12.35
11/04/20	0.00	4.19	2.11	6.00	0.00	12.30
11/05/20	0.00	4.15	2.11	6.00	0.00	12.27
11/06/20	0.00	4.21	2.13	6.00	0.00	12.34
11/07/20	0.00	4.21	2.14	6.00	0.00	12.35
11/08/20	0.00	4.19	2.15	6.00	0.00	12.33
11/09/20	0.00	4.17	2.18	6.00	0.00	12.35
11/10/20	0.00	4.14	2.15	6.00	0.00	12.29
11/11/20	0.00	4.19	2.13	6.00	0.00	12.32
11/12/20	0.00	4.19	2.13	6.00	0.00	12.32
11/13/20	0.00	4.24	2.13	6.00	0.00	12.37
11/14/20	0.00	4.22	2.16	6.00	0.00	12.38
11/15/20	0.00	4.27	2.15	6.00	0.00	12.42
11/16/20	0.00	4.26	2.18	6.00	0.00	12.44
11/17/20	0.00	4.24	2.13	6.00	0.00	12.37
11/18/20	0.00	4.21	2.14	6.00	0.00	12.35
11/19/20	0.00	4.20	2.15	6.00	0.00	12.35
11/20/20	0.00	4.16	2.13	6.00	0.00	12.29
11/21/20	0.00	4.22	2.15	6.00	0.00	12.37
11/22/20	0.00	4.22	2.17	6.00	0.00	12.39
11/23/20	0.00	4.21	2.19	6.00	0.00	12.40
11/24/20	0.00	4.13	2.15	6.00	0.00	12.27
11/25/20	0.00	4.14	2.20	6.00	0.00	12.34
11/26/20	0.00	4.10	2.25	6.00	0.00	12.35
11/27/20	0.00	4.09	2.27	6.00	0.00	12.35
11/28/20	0.00	4.08	2.27	6.00	0.00	12.36
11/29/20	0.00	4.09	2.27	6.00	0.00	12.35
11/30/20	0.00	4.10	2.26	6.00	0.00	12.36

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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
11/01/20	0.00	0.00	2.08	6.00	4.00	12.08
11/02/20	0.00	0.00	2.14	6.00	4.00	12.14
11/03/20	0.00	0.00	2.12	6.00	4.00	12.12
11/04/20	0.00	0.00	2.11	6.00	4.00	12.11
11/05/20	0.00	0.00	2.11	6.00	4.00	12.11
11/06/20	0.00	0.00	2.13	6.00	4.00	12.13
11/07/20	0.00	0.00	2.14	6.00	4.00	12.14
11/08/20	0.00	0.00	2.15	6.00	4.00	12.15
11/09/20	0.00	0.00	2.18	6.00	4.00	12.18
11/10/20	0.00	0.00	2.15	6.00	4.00	12.15
11/11/20	0.00	0.00	2.13	6.00	4.00	12.13
11/12/20	0.00	0.00	2.13	6.00	4.00	12.13
11/13/20	0.00	0.00	2.13	6.00	4.00	12.13
11/14/20	0.00	0.00	2.16	6.00	4.00	12.16
11/15/20	0.00	0.00	2.15	6.00	4.00	12.15
11/16/20	0.00	0.00	2.18	6.00	4.00	12.18
11/17/20	0.00	0.00	2.13	6.00	4.00	12.13
11/18/20	0.00	0.00	2.14	6.00	4.00	12.14
11/19/20	0.00	0.00	2.15	6.00	4.00	12.15
11/20/20	0.00	0.00	2.13	6.00	4.00	12.13
11/21/20	0.00	0.00	2.15	6.00	4.00	12.15
11/22/20	0.00	0.00	2.17	6.00	4.00	12.17
11/23/20	0.00	0.00	2.19	6.00	4.00	12.19
11/24/20	0.00	0.00	2.15	6.00	4.00	12.15
11/25/20	0.00	0.00	2.20	6.00	4.00	12.20
11/26/20	0.00	0.00	2.25	6.00	4.00	12.25
11/27/20	0.00	0.00	2.27	6.00	4.00	12.27
11/28/20	0.00	0.00	2.27	6.00	4.00	12.27
11/29/20	0.00	0.00	2.27	6.00	4.00	12.27
11/30/20	0.00	0.00	2.26	6.00	4.00	12.26

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

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	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
11/01/20	4.52	4.47	4.58	4.27	4.51	4.42	4.53	4.30	4.54	4.47	4.69	4.41	4.50	4.22	4.40	4.33
11/02/20	4.52	4.50	4.58	4.30	4.52	4.38	4.54	4.29	4.60	4.46	4.70	4.59	4.55	4.37	4.49	4.35
11/03/20	4.51	4.88	4.56	4.29	4.53	4.40	4.53	4.36	4.60	4.46	4.69	4.65	4.54	4.44	4.47	4.33
11/04/20	4.51	4.76	4.52	4.34	4.51	4.40	4.52	4.38	4.60	4.47	4.68	4.65	4.53	4.44	4.47	4.33
11/05/20	4.49	4.72	4.52	4.31	4.49	4.37	4.51	4.36	4.53	4.52	4.65	4.62	4.51	4.46	4.46	4.29
11/06/20	4.68	4.74	4.52	4.24	4.47	4.34	4.63	4.34	4.56	4.55	4.63	4.63	4.48	4.48	4.47	4.32
11/07/20	4.71	4.74	4.51	4.27	4.46	4.34	4.65	4.34	4.53	4.46	4.65	4.61	4.52	4.45	4.46	4.31
11/08/20	4.71	4.70	4.47	4.20	4.44	4.34	4.65	4.34	4.51	4.43	4.66	4.61	4.54	4.43	4.45	4.30
11/09/20	4.71	4.69	4.47	4.52	4.45	4.52	4.65	4.32	4.53	4.59	4.63	4.62	4.52	4.42	4.42	4.50
11/10/20	4.68	4.67	4.43	4.43	4.46	4.53	4.63	4.31	4.50	4.56	4.62	4.62	4.51	4.42	4.41	4.50
11/11/20	4.64	4.65	4.37	4.42	4.42	4.50	4.62	4.28	4.45	4.51	4.56	4.63	4.45	4.39	4.39	4.48
11/12/20	4.69	4.67	4.69	4.47	4.43	4.50	4.62	4.27	4.44	4.50	4.54	4.64	4.42	4.37	4.38	4.48
11/13/20	4.61	4.71	4.74	4.45	4.45	4.48	4.60	4.35	4.43	4.56	4.57	4.59	4.43	4.35	4.38	4.47
11/14/20	4.68	4.67	4.71	4.52	4.43	4.51	4.62	4.33	4.44	4.53	4.55	4.58	4.41	4.35	4.39	4.47
11/15/20	4.60	4.59	4.73	4.45	4.43	4.47	4.57	4.27	4.43	4.50	4.51	4.56	4.39	4.33	4.37	4.48
11/16/20	4.64	4.55	4.69	4.45	4.39	4.46	4.56	4.26	4.42	4.50	4.50	4.57	4.38	4.32	4.36	4.50
11/17/20	4.62	4.58	4.63	4.36	4.38	4.48	4.59	4.27	4.40	4.50	4.47	4.54	4.28	4.29	4.32	4.45
11/18/20	4.61	4.53	4.58	4.41	4.37	4.45	4.58	4.26	4.37	4.47	4.45	4.51	4.25	4.28	4.31	4.41
11/19/20	4.59	4.58	4.66	4.44	4.36	4.45	4.57	4.24	4.32	4.43	4.44	4.50	4.32	4.26	4.32	4.40
11/20/20	4.53	4.55	4.58	4.33	4.33	4.41	4.54	4.37	4.28	4.61	4.47	4.55	4.53	4.23	4.31	4.40
11/21/20	4.53	4.54	4.61	4.36	4.31	4.39	4.52	4.33	4.56	4.66	4.50	4.58	4.56	4.22	4.29	4.42
11/22/20	4.52	4.52	4.61	4.32	4.28	4.36	4.51	4.34	4.65	4.61	4.47	4.54	4.62	4.22	4.27	4.40
11/23/20	4.53	4.50	4.60	4.34	4.26	4.35	4.51	4.34	4.65	4.60	4.46	4.52	4.65	4.22	4.27	4.39
11/24/20	4.53	4.49	4.57	4.32	4.25	4.38	4.51	4.37	4.61	4.63	4.61	4.53	4.54	4.13	4.24	4.35
11/25/20	4.47	4.43	4.45	4.28	4.46	4.36	4.48	4.37	4.62	4.59	4.67	4.52	4.53	4.14	4.22	4.33
11/26/20	4.44	4.42	4.50	4.26	4.49	4.32	4.47	4.36	4.55	4.55	4.68	4.48	4.50	4.10	4.20	4.29
11/27/20	4.38	4.38	4.48	4.23	4.51	4.31	4.46	4.31	4.59	4.58	4.71	4.48	4.40	4.38	4.18	4.30
11/28/20	4.37	4.36	4.41	4.16	4.43	4.31	4.46	4.31	4.60	4.58	4.72	4.48	4.19	4.50	4.18	4.31
11/29/20	4.39	4.38	4.39	4.18	4.49	4.29	4.41	4.38	4.57	4.52	4.68	4.78	4.35	4.41	4.13	4.26
11/30/20	4.36	4.78	4.39	4.12	4.50	4.26	4.40	4.37	4.53	4.56	4.71	4.74	4.46	4.41	4.33	4.21

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
11/01/20	4.38	4.21	4.55	4.37	4.28	4.30	4.30	4.28	4.43	4.31	4.41	4.28	4.66	4.32	4.30	4.56
11/02/20	4.39	4.26	4.58	4.40	4.25	4.37	4.49	4.28	4.57	4.46	4.42	4.27	4.61	4.31	4.28	4.58
11/03/20	4.36	4.23	4.51	4.35	4.24	4.34	4.57	4.28	4.56	4.43	4.40	4.25	4.56	4.31	4.29	4.53
11/04/20	4.34	4.19	4.46	4.31	4.22	4.29	4.52	4.30	4.55	4.43	4.39	4.20	4.58	4.31	4.29	4.54
11/05/20	4.33	4.15	4.40	4.29	4.22	4.27	4.50	4.24	4.48	4.46	4.31	4.50	4.59	4.29	4.20	4.54
11/06/20	4.35	4.35	4.47	4.30	4.21	4.27	4.52	4.23	4.51	4.46	4.32	4.44	4.59	4.29	4.33	4.54
11/07/20	4.34	4.47	4.46	4.29	4.22	4.27	4.51	4.21	4.52	4.45	4.45	4.45	4.58	4.29	4.48	4.55
11/08/20	4.31	4.45	4.43	4.25	4.21	4.24	4.49	4.19	4.49	4.40	4.58	4.48	4.54	4.27	4.41	4.53
11/09/20	4.28	4.45	4.41	4.27	4.17	4.55	4.50	4.18	4.50	4.45	4.57	4.49	4.54	4.27	4.45	4.52
11/10/20	4.28	4.39	4.37	4.22	4.35	4.50	4.45	4.14	4.48	4.49	4.52	4.45	4.50	4.28	4.44	4.49
11/11/20	4.27	4.37	4.33	4.19	4.51	4.49	4.44	4.28	4.47	4.47	4.50	4.43	4.43	4.38	4.40	4.49
11/12/20	4.27	4.38	4.31	4.19	4.48	4.50	4.45	4.44	4.44	4.47	4.53	4.46	4.43	4.43	4.48	4.46
11/13/20	4.24	4.38	4.36	4.47	4.44	4.45	4.41	4.36	4.48	4.39	4.53	4.44	4.47	4.43	4.42	4.48
11/14/20	4.22	4.36	4.34	4.48	4.42	4.45	4.41	4.39	4.49	4.38	4.50	4.45	4.46	4.41	4.43	4.48
11/15/20	4.41	4.37	4.30	4.47	4.42	4.45	4.40	4.40	4.45	4.28	4.48	4.44	4.44	4.40	4.43	4.47
11/16/20	4.53	4.38	4.28	4.46	4.43	4.45	4.41	4.40	4.42	4.28	4.52	4.40	4.42	4.42	4.40	4.45
11/17/20	4.50	4.31	4.24	4.46	4.38	4.40	4.37	4.39	4.43	4.34	4.46	4.36	4.66	4.40	4.36	4.42
11/18/20	4.46	4.29	4.21	4.46	4.38	4.37	4.34	4.38	4.38	4.26	4.44	4.34	4.66	4.36	4.32	4.39
11/19/20	4.45	4.29	4.20	4.46	4.36	4.34	4.32	4.36	4.33	4.23	4.47	4.29	4.69	4.36	4.33	4.37
11/20/20	4.45	4.26	4.16	4.52	4.33	4.31	4.29	4.33	4.32	4.23	4.47	4.26	4.67	4.37	4.31	4.32
11/21/20	4.44	4.26	4.36	5.04	4.31	4.33	4.28	4.31	4.33	4.28	4.45	4.32	4.64	4.38	4.32	4.29
11/22/20	4.43	4.23	4.48	4.96	4.32	4.34	4.28	4.33	4.34	4.26	4.42	4.35	4.65	4.38	4.34	4.30
11/23/20	4.43	4.21	4.46	4.94	4.32	4.32	4.28	4.33	4.33	4.24	4.39	4.35	4.65	4.35	4.35	4.29
11/24/20	4.38	4.16	4.44	4.96	4.26	4.30	4.21	4.27	4.27	4.25	4.37	4.25	4.64	4.32	4.23	4.36
11/25/20	4.37	4.16	4.45	5.00	4.25	4.28	4.19	4.25	4.21	4.24	4.36	4.23	4.65	4.32	4.25	4.61
11/26/20	4.36	4.13	4.44	5.03	4.25	4.24	4.18	4.21	4.15	4.19	4.34	4.17	4.66	4.32	4.23	4.53
11/27/20	4.34	4.09	4.43	4.96	4.18	4.21	4.20	4.18	4.30	4.32	4.32	4.14	4.59	4.30	4.23	4.53
11/28/20	4.34	4.08	4.44	4.93	4.13	4.22	4.23	4.20	4.49	4.54	4.33	4.13	4.58	4.28	4.20	4.50
11/29/20	4.30	4.09	4.38	4.96	4.12	4.20	4.34	4.15	4.49	4.49	4.29	4.17	4.62	4.24	4.15	4.52
11/30/20	4.29	4.35	4.38	4.93	4.10	4.17	4.51	4.12	4.47	4.44	4.23	4.20	4.59	4.18	4.10	4.50

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												
11/01/20	4.54	4.24	4.77	4.84												
11/02/20	4.51	4.28	4.82	4.85												
11/03/20	4.50	4.33	4.80	4.84												
11/04/20	4.50	4.44	4.76	4.91												
11/05/20	4.44	4.49	4.84	4.76												
11/06/20	4.46	4.48	4.85	4.76												
11/07/20	4.37	4.49	4.82	4.87												
11/08/20	4.35	4.49	4.88	4.89												
11/09/20	4.38	4.46	4.98	4.92												
11/10/20	4.38	4.48	4.70	4.81												
11/11/20	4.53	4.43	4.60	4.77												
11/12/20	4.48	4.39	4.59	4.95												
11/13/20	4.42	4.44	4.79	4.77												
11/14/20	4.39	4.41	4.62	4.81												
11/15/20	4.39	4.40	4.68	4.95												
11/16/20	4.32	4.39	4.92	4.84												
11/17/20	4.34	4.43	4.80	4.88												
11/18/20	4.29	4.38	4.85	4.83												
11/19/20	4.36	4.32	4.67	4.81												
11/20/20	4.62	4.31	4.67	4.67												
11/21/20	4.53	4.30	4.59	4.80												
11/22/20	4.49	4.29	4.71	4.81												
11/23/20	4.43	4.26	4.60	4.86												
11/24/20	4.43	4.23	4.86	4.74												
11/25/20	4.38	4.14	4.54	4.67												
11/26/20	4.38	4.13	4.59	4.74												
11/27/20	4.40	4.15	4.77	4.73												
11/28/20	4.41	4.13	4.62	4.60												
11/29/20	4.47	4.16	4.41	4.64												
11/30/20	4.46	4.41	4.45	4.69												

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
11/01/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.04	0.06	0.02
11/02/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.03	0.05	0.11	0.02
11/03/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.06	0.07	0.03
11/04/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.06	0.07	0.03
11/05/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.07	0.02
11/06/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
11/07/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02
11/08/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02
11/09/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.02	0.03	0.02
11/10/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
11/11/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02
11/12/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02
11/13/20	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.03	0.02	0.04	0.03	0.03	0.02	0.03	0.02	0.03	0.02	0.02	0.02
11/14/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.04	0.02	0.05	0.02	0.03	0.02
11/15/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.04	0.02	0.03	0.02
11/16/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.04	0.02	0.03	0.03	0.03	0.02
11/17/20	0.02	0.03	0.02	0.03	0.02	0.08	0.02	0.02	0.02	0.04	0.03	0.05	0.02	0.04	0.02	0.02	0.03	0.03	0.02
11/18/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.02
11/19/20	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.06	0.03	0.04	0.02	0.07	0.02	0.03	0.02	0.05	0.02
11/20/20	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.07	0.02
11/21/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.06	0.03	0.03	0.02	0.05	0.02	0.02	0.02	0.03	0.02
11/22/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02
11/23/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.07	0.02	0.03	0.02	0.02	0.03	0.04	0.02
11/24/20	0.02	0.03	0.02	0.03	0.02	0.04	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.04	0.03	0.04	0.02
11/25/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.05	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.04	0.02
11/26/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.02	0.03	0.04	0.07	0.02
11/27/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.03	0.04	0.02	0.06	0.02	0.02	0.04	0.05	0.02
11/28/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.04	0.02	0.06	0.02	0.02	0.04	0.05	0.03
11/29/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.02	0.04	0.02	0.02	0.04	0.05	0.03
11/30/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.02	0.03	0.02	0.02	0.05	0.05	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
11/01/20	0.027	0.036	7.287	6.534	8.669	0.061	0.049	0.076	1,586	1,518	1,657	31	28	35	99.17	2.08	98.05	1.71
11/02/20	0.029	0.037	8.189	7.506	9.044	0.059	0.051	0.113	1,553	1,449	1,695	31	27	35	99.28	2.14	98.02	1.70
11/03/20	0.044	0.722*	8.157	6.894	9.172	0.062	0.051	0.072	1,670	1,567	1,777	32	28	36	99.24	2.12	98.10	1.72
11/04/20	0.049	0.067	8.237	7.319	9.265	0.064	0.051	0.078	1,709	1,640	1,779	33	29	36	99.22	2.11	98.10	1.72
11/05/20	0.037	0.074	8.264	7.500	9.305	0.064	0.054	0.079	1,696	1,616	1,773	32	29	38	99.23	2.11	98.09	1.72
11/06/20	0.025	0.027	8.158	7.449	9.122	0.061	0.051	0.084	1,666	1,602	1,748	31	29	34	99.26	2.13	98.11	1.72
11/07/20	0.025	0.025	8.504	7.694	9.504	0.062	0.053	0.078	1,681	1,627	1,757	30	28	34	99.27	2.14	98.19	1.74
11/08/20	0.025	0.025	8.334	7.506	9.503	0.059	0.048	0.074	1,587	1,527	1,644	29	27	31	99.29	2.15	98.18	1.74
11/09/20	0.025	0.025	8.285	6.598	9.627	0.055	0.049	0.064	1,565	1,450	1,724	29	25	36	99.33	2.18	98.16	1.73
11/10/20	0.025	0.025	8.478	7.502	9.678	0.060	0.053	0.074	1,674	1,585	1,793	30	26	34	99.29	2.15	98.19	1.74
11/11/20	0.025	0.025	8.372	7.430	9.483	0.062	0.054	0.074	1,722	1,638	1,819	31	28	34	99.26	2.13	98.20	1.75
11/12/20	0.025	0.025	8.463	7.561	9.555	0.063	0.056	0.075	1,739	1,662	1,841	31	28	36	99.26	2.13	98.21	1.75
11/13/20	0.026	0.027	8.357	7.504	9.555	0.062	0.053	0.078	1,721	1,650	1,819	31	28	35	99.26	2.13	98.20	1.74
11/14/20	0.025	0.026	8.362	7.505	9.217	0.058	0.052	0.068	1,699	1,637	1,764	31	29	34	99.30	2.16	98.15	1.73
11/15/20	0.025	0.025	8.109	7.111	9.268	0.057	0.047	0.065	1,606	1,535	1,685	30	27	32	99.30	2.15	98.15	1.73
11/16/20	0.025	0.025	8.438	7.373	9.891	0.056	0.046	0.072	1,568	1,453	1,725	29	25	33	99.34	2.18	98.16	1.74
11/17/20	0.025	0.025	8.746	7.778	9.891	0.065	0.056	0.078	1,689	1,602	1,800	31	28	35	99.26	2.13	98.19	1.74
11/18/20	0.025	0.025	8.708	7.945	9.749	0.063	0.055	0.078	1,713	1,641	1,798	31	29	35	99.28	2.14	98.18	1.74
11/19/20	0.025	0.025	8.841	7.936	9.729	0.062	0.056	0.071	1,725	1,639	1,827	32	28	36	99.30	2.15	98.17	1.74
11/20/20	0.025	0.027	8.767	7.977	9.695	0.065	0.056	0.072	1,733	1,660	1,821	31	27	34	99.26	2.13	98.23	1.75
11/21/20	0.025	0.025	8.757	7.866	9.910	0.062	0.054	0.071	1,716	1,672	1,777	31	28	34	99.29	2.15	98.22	1.75
11/22/20	0.025	0.025	8.827	7.781	9.894	0.060	0.053	0.069	1,629	1,576	1,669	29	27	32	99.32	2.17	98.20	1.74
11/23/20	0.025	0.025	8.993	7.963	10.081	0.058	0.051	0.074	1,593	1,517	1,678	29	26	32	99.35	2.19	98.19	1.74
11/24/20	0.025	0.025	9.013	8.107	10.279	0.064	0.051	0.101	1,668	1,577	1,799	30	27	34	99.29	2.15	98.23	1.75
11/25/20	0.025	0.025	8.991	8.356	10.081	0.057	0.049	0.094	1,729	1,662	1,804	31	28	34	99.37	2.20	98.22	1.75
11/26/20	0.025	0.025	8.775	8.001	9.752	0.050	0.043	0.056	1,682	1,618	1,760	29	26	32	99.43	2.25	98.28	1.76
11/27/20	0.025	0.025	8.075	7.332	9.355	0.044	0.041	0.048	1,610	1,535	1,687	28	25	32	99.46	2.27	98.29	1.77
11/28/20	0.025	0.025	8.364	7.378	9.409	0.045	0.042	0.086	1,591	1,526	1,657	29	27	31	99.47	2.27	98.19	1.74
11/29/20	0.025	0.025	8.590	7.583	9.736	0.046	0.038	0.051	1,572	1,504	1,658	27	24	31	99.46	2.27	98.26	1.76
11/30/20	0.025	0.025	8.989	7.317	10.177	0.049	0.045	0.067	1,596	1,505	1,726	28	24	33	99.45	2.26	98.23	1.75

Notes:

* Elevated result recorded briefly during maintenance to adjust needle valve flow rate

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
11/01/20	97.73	88.796	22,975.8	0.25	3.0	6
11/02/20	97.35	82.296	23,852.7	0.26	3.0	6
11/03/20	97.22	94.882	21,661.0	0.26	3.0	6
11/04/20	97.15	94.902	23,773.8	0.25	3.0	6
11/05/20	97.33	94.024	23,392.7	0.25	3.0	6
11/06/20	97.51	87.595	23,310.4	0.25	3.0	6
11/07/20	97.48	92.724	22,200.5	0.25	3.0	6
11/08/20	97.55	89.518	23,222.4	0.25	3.0	6
11/09/20	97.49	92.744	23,285.9	0.26	3.0	6
11/10/20	97.15	94.914	23,199.9	0.25	3.0	6
11/11/20	97.14	92.893	23,410.1	0.25	3.0	6
11/12/20	97.19	92.427	23,278.4	0.25	3.0	6
11/13/20	97.20	91.099	23,412.7	0.25	3.0	6
11/14/20	97.37	93.069	23,414.5	0.26	3.0	6
11/15/20	97.33	88.976	23,420.7	0.25	3.0	6
11/16/20	97.43	92.522	23,265.8	0.26	3.0	6
11/17/20	97.46	94.439	23,392.6	0.25	3.0	6
11/18/20	97.28	93.501	23,466.0	0.25	3.0	6
11/19/20	97.30	91.826	24,042.4	0.26	3.0	6
11/20/20	97.39	92.050	23,607.7	0.26	3.0	6
11/21/20	97.47	92.304	23,490.4	0.26	3.0	6
11/22/20	97.14	91.572	23,422.5	0.26	3.0	6
11/23/20	97.10	93.308	23,600.9	0.26	3.0	6
11/24/20	97.05	94.241	23,215.5	0.25	3.0	6
11/25/20	97.19	87.687	23,460.9	0.25	3.0	6
11/26/20	97.11	91.390	22,483.9	0.25	3.0	6
11/27/20	97.18	86.856	23,571.4	0.26	3.0	6
11/28/20	97.02	84.099	23,030.7	0.26	3.0	6
11/29/20	97.08	86.944	22,214.5	0.26	3.0	6
11/30/20	96.99	90.639	22,749.4	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
12/01/20	12.28	12.28	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/02/20	12.27	12.27	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/03/20	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/04/20	12.21	12.21	12.20	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/05/20	12.23	12.23	12.22	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/06/20	12.26	12.26	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/07/20	12.29	12.29	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/08/20	12.22	12.22	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/09/20	12.21	12.21	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/10/20	12.33	12.33	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/11/20	12.23	12.23	12.08	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/12/20	12.28	12.28	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/13/20	12.31	12.31	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/14/20	12.29	12.29	12.19	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/15/20	12.23	12.23	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/16/20	12.20	12.20	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/17/20	12.19	12.19	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/18/20	12.24	12.24	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/19/20	12.28	12.28	12.24	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/20/20	12.33	12.33	12.25	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/21/20	12.33	12.33	12.26	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/22/20	12.31	12.31	12.23	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/23/20	12.23	12.23	12.21	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/24/20	12.18	12.18	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/25/20	12.16	12.16	12.10	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/26/20	12.16	12.16	12.13	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/27/20	12.17	12.17	12.16	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/28/20	12.21	12.21	12.18	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/29/20	12.19	12.19	12.15	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/30/20	12.17	12.17	12.12	Y	Y	Y	0.0	0.0	0.0	0.0	0.0
12/31/20	12.26	12.26	12.13	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (ToT)	Total
	LRV	*LRV*	*LRV*	*LRV*	*LRV*	*LRV*
12/01/20	0.00	4.08	2.20	6.00	0.00	12.28
12/02/20	0.00	4.08	2.19	6.00	0.00	12.27
12/03/20	0.00	4.02	2.21	6.00	0.00	12.23
12/04/20	0.00	4.01	2.20	6.00	0.00	12.21
12/05/20	0.00	4.01	2.22	6.00	0.00	12.23
12/06/20	0.00	4.01	2.25	6.00	0.00	12.26
12/07/20	0.00	4.03	2.26	6.00	0.00	12.29
12/08/20	0.00	4.06	2.15	6.00	0.00	12.22
12/09/20	0.00	4.08	2.13	6.00	0.00	12.21
12/10/20	0.00	4.17	2.16	6.00	0.00	12.33
12/11/20	0.00	4.15	2.08	6.00	0.00	12.23
12/12/20	0.00	4.12	2.16	6.00	0.00	12.28
12/13/20	0.00	4.10	2.21	6.00	0.00	12.31
12/14/20	0.00	4.11	2.19	6.00	0.00	12.29
12/15/20	0.00	4.08	2.16	6.00	0.00	12.23
12/16/20	0.00	4.05	2.15	6.00	0.00	12.20
12/17/20	0.00	4.02	2.18	6.00	0.00	12.19
12/18/20	0.00	4.03	2.21	6.00	0.00	12.24
12/19/20	0.00	4.04	2.24	6.00	0.00	12.28
12/20/20	0.00	4.08	2.25	6.00	0.00	12.33
12/21/20	0.00	4.07	2.26	6.00	0.00	12.33
12/22/20	0.00	4.08	2.23	6.00	0.00	12.31
12/23/20	0.00	4.02	2.21	6.00	0.00	12.23
12/24/20	0.00	4.06	2.12	6.00	0.00	12.18
12/25/20	0.00	4.06	2.10	6.00	0.00	12.16
12/26/20	0.00	4.03	2.13	6.00	0.00	12.16
12/27/20	0.00	4.01	2.16	6.00	0.00	12.17
12/28/20	0.00	4.04	2.18	6.00	0.00	12.21
12/29/20	0.00	4.04	2.15	6.00	0.00	12.19
12/30/20	0.00	4.05	2.12	6.00	0.00	12.17
12/31/20	0.00	4.13	2.13	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					
	OCSD	$MF+Cl_2$	RO	UV/AOP	Underground travel time (1)	Total
Date	LRV	LRV	LRV	LRV	LRV	LRV
12/01/20	0.00	0.00	2.20	6.00	4.00	12.20
12/02/20	0.00	0.00	2.19	6.00	4.00	12.19
12/03/20	0.00	0.00	2.21	6.00	4.00	12.21
12/04/20	0.00	0.00	2.20	6.00	4.00	12.20
12/05/20	0.00	0.00	2.22	6.00	4.00	12.22
12/06/20	0.00	0.00	2.25	6.00	4.00	12.25
12/07/20	0.00	0.00	2.26	6.00	4.00	12.26
12/08/20	0.00	0.00	2.15	6.00	4.00	12.15
12/09/20	0.00	0.00	2.13	6.00	4.00	12.13
12/10/20	0.00	0.00	2.16	6.00	4.00	12.16
12/11/20	0.00	0.00	2.08	6.00	4.00	12.08
12/12/20	0.00	0.00	2.16	6.00	4.00	12.16
12/13/20	0.00	0.00	2.21	6.00	4.00	12.21
12/14/20	0.00	0.00	2.19	6.00	4.00	12.19
12/15/20	0.00	0.00	2.16	6.00	4.00	12.16
12/16/20	0.00	0.00	2.15	6.00	4.00	12.15
12/17/20	0.00	0.00	2.18	6.00	4.00	12.18
12/18/20	0.00	0.00	2.21	6.00	4.00	12.21
12/19/20	0.00	0.00	2.24	6.00	4.00	12.24
12/20/20	0.00	0.00	2.25	6.00	4.00	12.25
12/21/20	0.00	0.00	2.26	6.00	4.00	12.26
12/22/20	0.00	0.00	2.23	6.00	4.00	12.23
12/23/20	0.00	0.00	2.21	6.00	4.00	12.21
12/24/20	0.00	0.00	2.12	6.00	4.00	12.12
12/25/20	0.00	0.00	2.10	6.00	4.00	12.10
12/26/20	0.00	0.00	2.13	6.00	4.00	12.13
12/27/20	0.00	0.00	2.16	6.00	4.00	12.16
12/28/20	0.00	0.00	2.18	6.00	4.00	12.18
12/29/20	0.00	0.00	2.15	6.00	4.00	12.15
12/30/20	0.00	0.00	2.12	6.00	4.00	12.12
12/31/20	0.00	0.00	2.13	6.00	4.00	12.13

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
12/01/20	4.32	4.75	4.29	4.35	4.49	4.20	4.35	4.32	4.53	4.54	4.65	4.71	4.43	4.37	4.39	4.19
12/02/20	4.63	4.71	4.24	4.42	4.48	4.19	4.34	4.31	4.53	4.53	4.64	4.71	4.41	4.34	4.34	4.18
12/03/20	4.66	4.71	4.35	4.39	4.43	4.14	4.57	4.29	4.49	4.47	4.60	4.69	4.45	4.33	4.33	4.35
12/04/20	4.59	4.73	4.58	4.37	4.42	4.48	4.58	4.27	4.43	4.43	4.53	4.67	4.26	4.29	4.29	4.39
12/05/20	4.57	4.67	4.59	4.37	4.36	4.43	4.57	4.30	4.39	4.40	4.51	4.65	4.17	4.26	4.22	4.41
12/06/20	4.58	4.67	4.60	4.38	4.36	4.42	4.57	4.30	4.39	4.39	4.51	4.65	4.15	4.27	4.19	4.44
12/07/20	4.63	4.67	4.58	4.39	4.34	4.45	4.57	4.30	4.38	4.38	4.55	4.63	4.36	4.25	4.20	4.41
12/08/20	4.59	4.66	4.54	4.35	4.37	4.40	4.54	4.26	4.35	4.32	4.51	4.60	4.35	4.24	4.18	4.41
12/09/20	4.55	4.57	4.54	4.26	4.33	4.43	4.53	4.32	4.35	4.29	4.49	4.59	4.23	4.25	4.17	4.40
12/10/20	4.59	4.55	4.52	4.29	4.34	4.44	4.53	4.31	4.35	4.29	4.49	4.58	4.20	4.25	4.17	4.40
12/11/20	4.53	4.60	4.48	4.27	4.32	4.40	4.52	4.28	4.26	4.27	4.45	4.55	4.58	4.22	4.15	4.35
12/12/20	4.54	4.53	4.51	4.19	4.21	4.39	4.54	4.28	4.54	4.55	4.43	4.55	4.59	4.19	4.12	4.31
12/13/20	4.53	4.53	4.51	4.22	4.23	4.39	4.50	4.27	4.59	4.60	4.41	4.54	4.55	4.16	4.10	4.34
12/14/20	4.49	4.53	4.52	4.20	4.21	4.39	4.50	4.25	4.59	4.59	4.41	4.54	4.56	4.15	4.11	4.36
12/15/20	4.55	4.61	4.57	4.28	4.24	4.41	4.54	4.28	4.57	4.60	4.47	4.51	4.52	4.17	4.08	4.33
12/16/20	4.46	4.57	4.47	4.24	4.23	4.35	4.49	4.28	4.53	4.59	4.46	4.51	4.54	4.18	4.05	4.34
12/17/20	4.48	4.57	4.52	4.22	4.24	4.37	4.53	4.42	4.57	4.60	4.40	4.51	4.52	4.15	4.02	4.38
12/18/20	4.50	4.47	4.47	4.15	4.21	4.33	4.46	4.32	4.51	4.57	4.36	4.50	4.50	4.10	4.03	4.33
12/19/20	4.46	4.42	4.44	4.13	4.18	4.32	4.45	4.35	4.50	4.56	4.35	4.50	4.50	4.09	4.04	4.29
12/20/20	4.45	4.45	4.43	4.28	4.16	4.33	4.43	4.31	4.53	4.54	4.34	4.47	4.46	4.08	4.39	4.26
12/21/20	4.40	4.39	4.35	4.42	4.43	4.29	4.39	4.32	4.50	4.51	4.58	4.43	4.48	4.07	4.45	4.25
12/22/20	4.40	4.41	4.33	4.47	4.47	4.29	4.41	4.33	4.46	4.49	4.70	4.40	4.46	4.08	4.44	4.21
12/23/20	4.32	4.38	4.33	4.39	4.50	4.30	4.41	4.28	4.45	4.48	4.71	4.39	4.45	4.09	4.42	4.19
12/24/20	4.37	4.40	4.31	4.31	4.47	4.18	4.37	4.25	4.43	4.45	4.60	4.65	4.37	4.27	4.38	4.13
12/25/20	4.33	4.87	4.43	4.36	4.45	4.16	4.37	4.27	4.41	4.43	4.57	4.73	4.34	4.34	4.32	4.16
12/26/20	4.32	4.75	4.66	4.35	4.44	4.19	4.34	4.30	4.42	4.40	4.62	4.68	4.36	4.35	4.35	4.15
12/27/20	4.26	4.76	4.61	4.33	4.46	4.20	4.33	4.34	4.43	4.39	4.63	4.67	4.37	4.34	4.38	4.13
12/28/20	4.69	4.66	4.59	4.34	4.38	4.15	4.61	4.30	4.40	4.40	4.61	4.72	4.34	4.28	4.34	4.11
12/29/20	4.65	4.72	4.59	4.28	4.38	4.14	4.62	4.27	4.33	4.35	4.57	4.65	4.28	4.27	4.31	4.07
12/30/20	4.62	4.65	4.61	4.27	4.40	4.45	4.62	4.26	4.31	4.30	4.55	4.64	4.26	4.34	4.30	4.31
12/31/20	4.59	4.62	4.58	4.19	4.39	4.43	4.64	4.26	4.29	4.27	4.56	4.66	4.28	4.29	4.31	4.39

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
12/01/20	4.24	4.40	4.38	4.86	4.10	4.12	4.46	4.08	4.48	4.40	4.20	4.43	4.52	4.17	4.11	4.51
12/02/20	4.21	4.33	4.38	4.81	4.09	4.09	4.42	4.08	4.48	4.39	4.20	4.44	4.51	4.16	4.10	4.51
12/03/20	4.16	4.30	4.38	4.82	4.07	4.02	4.41	4.03	4.41	4.44	4.30	4.44	4.58	4.09	4.18	4.41
12/04/20	4.14	4.30	4.68	4.82	4.04	4.02	4.36	4.01	4.40	4.44	4.48	4.39	4.42	4.03	4.47	4.38
12/05/20	4.14	4.29	5.34	4.81	4.01	4.25	4.32	4.01	4.41	4.44	4.47	4.36	4.02	4.14	4.40	4.37
12/06/20	4.13	4.28	5.17	4.81	4.01	4.45	4.31	4.02	4.39	4.44	4.45	4.37	N/A *	4.37	4.42	4.39
12/07/20	4.06	4.31	5.14	4.81	4.27	4.40	4.34	4.03	4.40	4.42	4.48	4.43	4.41	4.34	4.39	4.36
12/08/20	4.06	4.31	5.35	4.86	4.55	4.37	4.36	4.37	4.43	4.35	4.48	4.43	4.38	4.35	4.41	4.31
12/09/20	4.08	4.31	5.37	4.89	4.46	4.33	4.39	4.37	4.43	4.34	4.46	4.39	4.33	4.37	4.39	4.34
12/10/20	4.31	4.31	5.29	4.89	4.39	4.28	4.33	4.33	4.39	4.31	4.41	4.33	4.31	4.34	4.35	4.33
12/11/20	4.39	4.49	5.28	4.85	4.31	4.19	4.18	4.28	4.32	4.25	4.45	4.31	4.40	4.30	4.33	4.28
12/12/20	4.37	5.39	5.25	4.91	4.28	4.18	4.20	4.31	4.29	4.19	4.41	4.26	4.65	4.28	4.31	4.22
12/13/20	4.41	5.38	5.31	4.93	4.40	4.29	4.25	4.36	4.32	4.19	4.41	4.27	4.65	4.32	4.30	4.24
12/14/20	4.44	5.38	5.35	4.91	4.48	4.36	4.24	4.35	4.37	4.19	4.37	4.24	4.62	4.34	4.27	4.24
12/15/20	4.38	5.33	5.36	4.91	4.38	4.26	4.23	4.29	4.31	4.20	4.40	4.30	4.62	4.34	4.30	4.24
12/16/20	4.35	5.35	5.33	4.91	4.34	4.24	4.18	4.25	4.30	4.19	4.40	4.31	4.63	4.32	4.32	4.25
12/17/20	4.41	5.40	5.42	4.94	4.36	4.27	4.20	4.27	4.35	4.21	4.41	4.25	4.64	4.31	4.32	4.22
12/18/20	4.39	5.36	5.40	4.93	4.29	4.28	4.19	4.29	4.31	4.17	4.35	4.25	4.70	4.29	4.30	4.23
12/19/20	4.35	5.31	5.31	4.90	4.18	4.22	4.11	4.23	4.23	4.08	4.29	4.24	4.70	4.27	4.27	4.20
12/20/20	4.29	5.30	5.30	5.03	4.29	4.15	4.12	4.20	4.17	4.12	4.32	4.15	4.57	4.22	4.22	4.26
12/21/20	4.26	5.30	5.29	5.04	4.24	4.15	4.11	4.20	4.18	4.11	4.28	4.21	4.59	4.24	4.23	4.57
12/22/20	4.27	5.29	5.31	4.95	4.18	4.11	4.09	4.13	4.16	4.08	4.27	4.12	4.60	4.25	4.22	4.54
12/23/20	4.28	5.29	5.32	4.92	4.15	4.10	4.09	4.05	4.13	4.02	4.26	4.02	4.59	4.18	4.22	4.49
12/24/20	4.19	5.28	5.24	4.87	4.13	4.11	4.10	4.06	4.51	4.20	4.22	4.22	4.53	4.14	4.12	4.43
12/25/20	4.19	5.27	5.28	4.89	4.14	4.13	4.23	4.09	4.48	4.39	4.20	4.43	4.51	4.12	4.06	4.39
12/26/20	4.22	5.31	5.28	4.95	4.17	4.14	4.39	4.13	4.47	4.47	4.22	4.42	4.53	4.14	4.03	4.45
12/27/20	4.23	5.33	5.26	4.97	4.17	4.13	4.41	4.14	4.42	4.49	4.18	4.43	4.48	4.10	4.01	4.45
12/28/20	4.17	5.23	5.26	4.92	4.09	4.04	4.31	4.04	4.45	4.32	4.17	4.36	4.49	4.06	4.04	4.41
12/29/20	4.12	5.21	5.20	4.81	4.09	4.04	4.23	4.04	4.45	4.37	4.31	4.29	4.43	4.06	4.15	4.35
12/30/20	4.11	5.18	5.15	4.75	4.27	4.26	4.22	4.05	4.41	4.41	4.47	4.35	4.36	4.16	4.40	4.38
12/31/20	4.13	5.17	5.29	4.80	4.47	4.38	4.22	4.21	4.40	4.39	4.42	4.38	4.31	4.36	4.33	4.37

Notes:

Giardia and Crypto LRV based on USEPA Membrane Filtration Guidance Manual and sensitive at less than 3 micron.

* Cell not operated due to maintenance / repair

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 LRV	**E02** LRV	**E03** LRV	**E04** LRV
12/01/20	4.43	4.38	4.52	4.67
12/02/20	4.46	4.37	4.40	4.73
12/03/20	4.39	4.37	4.63	4.79
12/04/20	4.36	4.36	4.49	4.59
12/05/20	4.28	4.32	4.40	4.49
12/06/20	4.27	4.31	4.52	4.50
12/07/20	4.32	4.35	4.52	4.71
12/08/20	4.35	4.31	4.39	4.58
12/09/20	4.52	4.37	4.49	4.89
12/10/20	4.44	4.39	4.54	4.68
12/11/20	4.33	4.30	4.39	4.72
12/12/20	4.35	4.22	4.53	4.79
12/13/20	4.31	4.25	4.39	4.66
12/14/20	4.31	4.27	4.34	4.53
12/15/20	4.35	4.26	4.45	4.79
12/16/20	4.37	4.28	4.41	4.67
12/17/20	4.52	4.26	4.31	4.51
12/18/20	4.48	4.22	4.42	4.59
12/19/20	4.44	4.15	4.54	4.68
12/20/20	4.43	4.14	4.38	4.55
12/21/20	4.41	4.10	4.42	4.54
12/22/20	4.39	4.12	4.35	4.77
12/23/20	4.41	4.09	4.44	4.49
12/24/20	4.30	4.12	4.47	4.70
12/25/20	4.31	4.35	4.28	4.57
12/26/20	4.40	4.37	4.37	4.56
12/27/20	4.46	4.42	4.34	4.78
12/28/20	4.35	4.33	4.34	4.48
12/29/20	4.28	4.33	4.35	4.49
12/30/20	4.32	4.38	4.58	4.72
12/31/20	4.35	4.37	4.45	4.61

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
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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
12/01/20	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.02	0.02	0.02	0.02	0.05	0.07	0.03
12/02/20	0.02	0.03	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	0.05	0.06	0.03
12/03/20	0.02	0.03	0.02	0.03	0.02	0.06	0.02	0.03	0.02	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.06	0.06	0.03
12/04/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.05	0.04	0.04	0.02	0.03	0.02	0.03	0.06	0.06	0.03
12/05/20	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.03	0.03	0.03	0.04	0.05	0.02	0.02	0.02	0.03	0.06	0.06	0.03
12/06/20	0.02	0.03	0.02	0.02	0.02	0.11	0.02	0.02	0.02	0.03	0.04	0.04	0.02	0.02	0.02	0.03	0.06	0.07	0.03
12/07/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.02	0.03	0.07	0.07	0.03
12/08/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.02	0.03	0.02	0.02	0.07	0.08	0.03
12/09/20	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.05	0.07	0.03
12/10/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.04	0.05	0.02	0.03	0.02	0.02	0.04	0.04	0.03
12/11/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.04	0.03	0.06	0.04	0.05	0.02	0.03	0.02	0.02	0.05	0.27	0.03
12/12/20	0.02	0.03	0.02	0.02	0.02	0.04	0.02	0.02	0.03	0.04	0.04	0.05	0.02	0.03	0.02	0.02	0.05	0.05	0.03
12/13/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.05	0.02	0.03	0.02	0.02	0.05	0.06	0.03
12/14/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.06	0.06	0.03
12/15/20	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.02	0.02	0.02	0.02	0.06	0.06	0.03
12/16/20	0.02	0.03	0.02	0.05	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.02	0.03	0.02	0.02	0.07	0.07	0.03
12/17/20	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.08	0.02	0.04	0.02	0.02	0.07	0.13	0.03
12/18/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.05	0.02	0.02	0.02	0.02	0.04	0.07	0.03
12/19/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.13	0.05	0.05	0.02	0.02	0.02	0.03	0.02	0.02	0.02
12/20/20	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.07	0.02	0.05	0.05	0.06	0.02	0.05	0.02	0.02	0.02	0.02	0.02
12/21/20	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.06	0.07	0.02	0.05	0.02	0.04	0.02	0.03	0.03
12/22/20	0.02	0.03	0.02	0.02	0.02	0.20	0.03	0.20	0.02	0.03	0.08	0.08	0.02	0.02	0.02	0.03	0.02	0.02	0.03
12/23/20	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.06	0.09	0.02	0.04	0.02	0.02	0.02	0.07	0.03
12/24/20	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.05	0.05	0.02	0.04	0.02	0.02	0.02	0.03	0.03
12/25/20	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.02	0.15	0.05	0.06	0.02	0.03	0.02	0.02	0.02	0.03	0.02
12/26/20	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.04	0.02	0.03	0.05	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.03
12/27/20	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.05	0.02	0.03	0.05	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.03
12/28/20	0.02	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.03	0.05	0.05	0.03	0.06	0.02	0.02	0.03	0.03	0.03
12/29/20	0.02	0.03	0.02	0.02	0.02	0.05	0.03	0.03	0.02	0.05	0.05	0.05	0.02	0.03	0.02	0.02	0.03	0.03	0.03
12/30/20	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.05	0.06	0.03	0.03	0.02	0.02	0.03	0.04	0.03
12/31/20	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.04	0.04	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
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	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
12/01/20	0.025	0.025	9.209	8.249	10.280	0.058	0.052	0.068	1,692	1,593	1,834	30	26	35	99.37	2.20	98.22	1.75
12/02/20	0.025	0.025	9.051	8.100	10.280	0.058	0.053	0.067	1,721	1,625	1,802	30	27	34	99.36	2.19	98.24	1.75
12/03/20	0.025	0.025	9.038	8.117	10.382	0.056	0.052	0.065	1,739	1,657	1,840	30	27	43	99.38	2.21	98.28	1.77
12/04/20	0.025	0.027	9.270	8.561	10.383	0.058	0.052	0.068	1,726	1,667	1,796	28	26	31	99.37	2.20	98.36	1.79
12/05/20	0.025	0.025	8.871	7.882	10.280	0.053	0.047	0.064	1,682	1,630	1,735	27	25	30	99.40	2.22	98.39	1.79
12/06/20	0.025	0.025	8.654	7.783	9.764	0.049	0.045	0.053	1,582	1,524	1,652	26	24	29	99.44	2.25	98.35	1.78
12/07/20	0.025	0.025	8.940	7.974	10.472	0.049	0.041	0.072	1,551	1,454	1,687	26	23	30	99.46	2.26	98.34	1.78
12/08/20	0.025	0.025	8.224	7.669	10.472	0.058	0.050	0.072	1,658	1,558	1,784	28	23	48	99.29	2.15	98.32	1.77
12/09/20	0.025	0.025	7.718	7.210	8.658	0.057	0.051	0.072	1,670	1,597	1,761	27	25	36	99.26	2.13	98.36	1.78
12/10/20	0.025	0.025	7.751	7.010	8.756	0.053	0.047	0.064	1,658	1,573	1,739	28	24	31	99.31	2.16	98.34	1.78
12/11/20	0.025	0.025	8.359	7.549	9.019	0.069	0.053	0.087	1,640	1,573	1,700	27	25	29	99.18	2.08	98.37	1.79
12/12/20	0.025	0.025	7.743	7.004	8.690	0.053	0.047	0.071	1,619	1,569	1,697	26	23	31	99.31	2.16	98.38	1.79
12/13/20	0.025	0.025	7.678	6.913	8.808	0.047	0.044	0.053	1,543	1,483	1,599	25	22	28	99.38	2.21	98.39	1.79
12/14/20	0.025	0.025	7.761	7.159	8.996	0.050	0.047	0.054	1,519	1,446	1,633	24	22	28	99.35	2.19	98.40	1.80
12/15/20	0.025	0.025	7.440	6.946	8.213	0.052	0.047	0.058	1,603	1,537	1,697	25	23	28	99.30	2.16	98.42	1.80
12/16/20	0.025	0.025	7.519	6.770	8.690	0.053	0.049	0.058	1,636	1,575	1,716	26	24	29	99.29	2.15	98.42	1.80
12/17/20	0.025	0.025	8.224	6.990	9.217	0.055	0.047	0.106	1,665	1,593	1,716	27	22	30	99.33	2.18	98.36	1.79
12/18/20	0.025	0.025	8.528	7.692	9.896	0.053	0.046	0.061	1,674	1,594	1,786	26	23	30	99.38	2.21	98.43	1.81
12/19/20	0.025	0.025	8.814	7.721	10.082	0.051	0.046	0.056	1,705	1,659	1,791	26	23	30	99.43	2.24	98.47	1.81
12/20/20	0.025	0.025	8.753	7.644	9.979	0.049	0.043	0.053	1,646	1,571	1,707	25	23	28	99.44	2.25	98.47	1.82
12/21/20	0.025	0.025	8.904	8.089	10.080	0.049	0.043	0.056	1,642	1,536	1,784	26	23	30	99.45	2.26	98.45	1.81
12/22/20	0.025	0.025	8.925	7.984	10.081	0.052	0.049	0.058	1,719	1,635	1,852	27	24	31	99.41	2.23	98.43	1.80
12/23/20	0.025	0.025	8.877	8.039	9.978	0.054	0.050	0.070	1,799	1,708	1,930	28	26	32	99.39	2.21	98.42	1.80
12/24/20	0.025	0.025	8.868	8.142	9.798	0.067	0.057	0.082	1,768	1,701	1,842	27	25	31	99.25	2.12	98.48	1.82
12/25/20	0.025	0.025	7.987	7.197	9.476	0.063	0.055	0.077	1,647	1,578	1,733	26	23	29	99.21	2.10	98.43	1.80
12/26/20	0.025	0.025	8.132	7.165	9.744	0.061	0.051	0.067	1,573	1,498	1,656	25	22	29	99.26	2.13	98.38	1.79
12/27/20	0.025	0.025	8.721	7.865	10.081	0.061	0.051	0.067	1,584	1,515	1,693	25	22	29	99.30	2.16	98.44	1.81
12/28/20	0.025	0.025	9.190	8.207	10.280	0.061	0.056	0.067	1,633	1,572	1,721	24	22	27	99.33	2.18	98.51	1.83
12/29/20	0.025	0.025	9.015	8.089	10.280	0.064	0.055	0.081	1,612	1,510	1,749	23	20	27	99.29	2.15	98.58	1.85
12/30/20	0.025	0.025	8.945	8.129	10.082	0.068	0.056	0.083	1,684	1,601	1,793	24	22	28	99.24	2.12	98.55	1.84
12/31/20	0.025	0.025	8.874	7.884	9.958	0.065	0.046	0.099	1,695	1,629	1,763	25	23	28	99.26	2.13	98.52	1.83

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
12/01/20	96.90	91.792	23,210.9	0.26	3.0	6
12/02/20	97.11	90.218	23,822.1	0.26	3.0	6
12/03/20	97.07	90.259	23,780.2	0.26	3.0	6
12/04/20	97.00	94.272	23,794.4	0.26	3.0	6
12/05/20	97.08	93.490	24,021.6	0.26	3.0	6
12/06/20	96.90	91.017	23,922.8	0.26	3.0	6
12/07/20	96.80	92.096	23,782.4	0.26	3.0	6
12/08/20	97.14	79.424	23,592.5	0.26	3.0	6
12/09/20	97.07	82.690	21,188.1	0.27	3.0	6
12/10/20	97.10	93.538	22,137.1	0.27	3.0	6
12/11/20	97.30	89.303	24,158.1	0.26	3.0	6
12/12/20	97.45	92.921	23,559.0	0.26	3.0	6
12/13/20	97.34	90.834	24,111.0	0.26	3.0	6
12/14/20	97.39	85.121	23,649.3	0.26	3.0	6
12/15/20	97.39	82.203	22,887.6	0.27	3.0	6
12/16/20	97.83	78.191	22,798.6	0.27	3.0	6
12/17/20	97.79	65.905	21,298.6	0.27	3.0	6
12/18/20	97.41	93.596	17,983.5	0.27	3.0	6
12/19/20	98.04	89.957	24,448.9	0.26	3.0	6
12/20/20	98.17	89.495	23,702.9	0.26	3.0	6
12/21/20	97.95	91.642	23,569.2	0.26	3.0	6
12/22/20	97.91	92.127	24,025.0	0.26	3.0	6
12/23/20	97.68	90.029	23,920.4	0.26	3.0	6
12/24/20	97.71	91.950	23,545.8	0.26	3.0	6
12/25/20	97.92	85.268	23,564.8	0.26	3.0	6
12/26/20	97.85	83.504	21,959.6	0.26	3.0	6
12/27/20	97.72	90.377	21,955.7	0.26	3.0	6
12/28/20	97.75	93.189	23,134.1	0.26	3.0	6
12/29/20	97.64	91.718	23,895.4	0.26	3.0	6
12/30/20	97.61	92.626	23,884.1	0.26	3.0	6
12/31/20	97.79	92.613	24,093.6	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

Appendix G

Groundwater Quality Data at the Talbert Barrier

Orange County Water District
Groundwater Replenishment System
2020 Annual Report

GWRS 2020 Quarterly Sampling Dates

OCWD Water Quality Department

TALBERT BARRIER - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
OCWD-M10/1-4	01/08/2020	04/08/2020	07/08/2020	10/07/2020
OCWD-M11/1-4	01/20/2020	04/20/2020	07/20/2020	10/19/2020
OCWD-M19/3	01/22/2020	04/22/2020	07/22/2020	10/21/2020
OCWD-M45/1-5	01/07/2020	04/23/2020	07/07/2020	10/07/2020
OCWD-M46/2-5	02/05/2020	05/04/2020	08/03/2020	11/02/2020
OCWD-M46A/1	01/06/2020	04/08/2020	07/06/2020	10/05/2020
OCWD-M47/1-5	01/21/2020	04/21/2020	07/21/2020	10/20/2020

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 2020 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), and casing number (e.g., M10/1, M10/2, M10/3 and M10/4), as appropriate. Reported ranges such as ND - <NL, ND - <RL, ND - <SMCL, ND - <MCL, etc. indicate that results for the quarter ranged from not detected at the reportable detection level (RDL) to a detection less than the applicable regulatory limit.

► 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

► RDL: reportable detection level

► RL: SWRCB Division of Drinking Water (DDW) Response Level

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace; indicates a detection at no greater than the RDL and no less than one-half of the RDL

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 - 2015	x		Q1 - 2018		x
Q2 - 2015		x	Q2 - 2018		x
Q3 - 2015		x	Q3 - 2018		x
Q4 - 2015		x	Q4 - 2018	x	
Q1 - 2016		x	Q1 - 2019	x	
Q2 - 2016	x		Q2 - 2019		x
Q3 - 2016		x	Q3 - 2019		x
Q4 - 2016		x	Q4 - 2019		x
Q1 - 2017		x	Q1 - 2020		x
Q2 - 2017		x	Q2 - 2020	x	
Q3 - 2017	x		Q3 - 2020		x
Q4 - 2017		x	Q4 - 2020		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 2020 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 - 6.6	ND - 9.9	ND - 12.8	ND - 6.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.9	ND - 3.1	ND - 2.7	ND - 2.9
Barium (Ba), ug/L	OCWD	1000	8.5 - 147	8.6 - 124	9.2 - 142	10.1 - 147
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	0.25 - 0.57	0.24 - 0.54	0.22 - 0.55	0.21 - 0.55
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 2.7	ND - 2.6	ND - 4	ND - 2.8
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.32	ND - 1.66	ND - 2.2	ND - 1.99
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.011	Not Required	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.8	ND - 1.6	ND - 1.6	ND - 1.4
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	175 - 1,120	177 - 1,030	186 - 1,140	198 - 1,160
Iron (Fe), ug/L	OCWD	300	ND - 14.5	ND - 23.4	ND - 16.6	ND - 10.6
Manganese (Mn), ug/L	OCWD	50	2.8 - 35.2	2.6 - 31.8	2.3 - 37.8	1.8 - 31.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	2.7 - 35.1	2.2 - 34.5	2.3 - 35.8	2 - 33.6
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND - 4	ND - 2	ND - 2
Total Dissolved Solids (TDS), mg/L	OCWD	500	98 - 714	110 - 672	116 - 768	128 - 778
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.1	ND - 0.1	ND	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1	ND - 1.2	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.13 - 0.25	0.14 - 0.25	0.14 - 0.26	0.13 - 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 - 3.5	ND - 3	ND - 3.7	ND - 2.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND - 0.3	ND - 0.2
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 - <RL	ND - <RL	ND - <RL	ND - <RL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND	ND - <MCL	ND - <MCL	ND - <MCL
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M10/1
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/20/2020 10:50	1,4-Dioxane (14DIOX)	1.0	ug/L	1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/20/2020 10:50	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/20/2020 11:20	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/20/2020 11:20	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
7/20/2020 11:30	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/19/2020 11:55	1,4-Dioxane (14DIOX)	1.0	ug/L	0.5

OCWD-M10/2
Organic Detections by Method

Year 2020, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/20/2020	10:05	cis-1,2-Dichloroethene (c12DCE)	0.5	ug/L	0.5
7/20/2020	10:05	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
8/10/2020	9:35	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
8/10/2020	9:35	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
8/10/2020	9:45	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
8/10/2020	9:45	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/19/2020	11:20	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
10/19/2020	11:20	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2

OCWD-M10/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/20/2020	9:55	1,4-Dioxane (14DIOX)	4.8	ug/L	1
2/18/2020	11:15	1,4-Dioxane (14DIOX)	5.8	ug/L	1

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/20/2020	10:15	1,4-Dioxane (14DIOX)	5.8	ug/L	1

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/20/2020	10:15	Primidone (PRIMDN)	3.9	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/20/2020	10:45	1,4-Dioxane (14DIOX)	5.2	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/19/2020	10:35	1,4-Dioxane (14DIOX)	5.2	ug/L	0.5

OCWD-M10/4
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/20/2020	9:15	1,4-Dioxane (14DIOX)	1.1	ug/L	1

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/20/2020	9:35	1,4-Dioxane (14DIOX)	1.4	ug/L	1

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/20/2020	9:35	Carbamazepine (CBMAZP)	1.0	ng/L	1
4/20/2020	9:35	Gemfibrozil (GMFIBZ)	3.5	ng/L	1
4/20/2020	9:35	N,N-diethyl-m-toluamide (DEET)	3.2	ng/L	1
4/20/2020	9:35	Primidone (PRIMDN)	1.0	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/20/2020	9:30	1,4-Dioxane (14DIOX)	1.5	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/19/2020	9:45	1,4-Dioxane (14DIOX)	1.9	ug/L	0.5

Summary of All 2020 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 - 3	ND - 4.8	ND - 5	ND - 7
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.1	ND - 1.7	ND - 1.9	ND - 1.7
Barium (Ba), ug/L	OCWD	1000	11.6 - 136	12.2 - 151	12.7 - 144	12.3 - 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	0.34 - 0.67	0.33 - 0.65	0.33 - 0.61	0.33 - 0.59
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.49	ND - 0.34	ND - 0.25	ND - 0.26
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 2.4	ND - 2.2	ND - 3	ND - 2
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.18 - 1.99	1.03 - 2.06	1.16 - 2.03	1.08 - 2.11
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.003	Not Required	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2.5	ND - 2.6	ND - 2.6	ND - 2.6
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 - 0.6	ND - 0.25	ND - 0.25	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	170 - 925	167 - 946	168 - 944	156 - 924
Iron (Fe), ug/L	OCWD	300	ND	ND	ND	ND
Manganese (Mn), ug/L	OCWD	50	ND - 1.9	ND - 2.8	ND - 5.2	ND - 5.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 2.2	ND - 1.8	ND - 4.6	ND - 5.3
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND - 2
Total Dissolved Solids (TDS), mg/L	OCWD	500	108 - 588	98 - 618	106 - 602	96 - 570
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND	ND	ND - 0.1	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	0.14 - 0.27	0.13 - 0.26	0.12 - 0.27	0.12 - 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	1.9 - 3.3	2 - 3.5	2.1 - 4.2	1.7 - 4.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 - <RL	ND - <RL	ND - <RL	ND - <RL
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND - <MCL	ND - <MCL	ND - <MCL	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	Not Required	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	Not Required	ND - Detections	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M11/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/22/2020	9:45	1,4-Dioxane (14DIOX)	1.6	ug/L	1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/22/2020	9:45	Chloroform (CHCl3)	0.6	ug/L	0.5
1/22/2020	9:45	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/22/2020	10:30	1,4-Dioxane (14DIOX)	1.1	ug/L	1

METHOD: 537.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/22/2020	10:30	Perfluoro hexane sulfonic acid (PFHxS)	3.0	ng/L	2

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/22/2020	10:10	1,4-Dioxane (14DIOX)	1.2	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/21/2020	9:45	1,4-Dioxane (14DIOX)	1.3	ug/L	0.5

OCWD-M11/2
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 537.1

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/22/2020 10:55	Perfluoro hexane sulfonic acid (PFHxS)	3.0	ng/L	2

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/22/2020 11:25	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/21/2020 11:20	1,4-Dioxane (14DIOX)	0.8	ug/L	0.5

OCWD-M11/3
Organic Detections by Method

Year 2020, Quarter 2

METHOD: ***CEC***

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
4/22/2020 11:30	Sulfamethoxazole (SULTHZ)	1.5	ng/L	1

OCWD-M11/4
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/22/2020	10:50	Chloroform (CHCl3)	0.5	ug/L	0.5
1/22/2020	10:50	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/22/2020	12:05	1,4-Dioxane (14DIOX)	1.0	ug/L	1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/22/2020	12:05	Chloroform (CHCl3)	TR	ug/L	0.5
4/22/2020	12:05	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/22/2020	12:05	Carbamazepine (CBMAZP)	1.1	ng/L	1
4/22/2020	12:05	Sulfamethoxazole (SULTHZ)	2.1	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/22/2020	10:45	1,4-Dioxane (14DIOX)	0.9	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/22/2020	10:45	Chloroform (CHCl3)	TR	ug/L	0.5
7/22/2020	10:45	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

OCWD-M11/4
Organic Detections by Method

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/21/2020	10:40	1,4-Dioxane (14DIOX)	1.1	ug/L	0.5

Summary of All 2020 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	6.4	4.7	13.2	5.4
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.1	1	ND	1.1
Arsenic (dissolved) (As-DIS), ug/L	OCWD	10	1.6	Not Required	Not Required	Not Required
Barium (Ba), ug/L	OCWD	1000	11.4	16.3	14.7	12.7
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	ND	ND	ND	0.11
Hexavalent Chromium (CrVI), ug/L	OCWD	10	0.27	0.48	0.51	0.32
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	1.29	1.27	1.29
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	0.004	Not Required	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	1.6	1.6	2	2
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	ND	Not Required	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	Not Required	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	ND	Not Required	ND	ND
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	102	141	115	111
Iron (Fe), ug/L	OCWD	300	ND	ND	ND	ND
Manganese (Mn), ug/L	OCWD	50	2	1.9	6.7	4.8
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	54	86	70	68
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.2	0.3	0.2	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	0.26	0.26	0.25	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	3.5	2.9	3.3	2.8
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	Not Required	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M19/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/7/2020 10:05	Chloroform (CHCl3)	1.6	ug/L	0.5
1/7/2020 10:05	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/23/2020 11:00	Chloroform (CHCl3)	1.6	ug/L	0.5
4/23/2020 11:00	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/7/2020 10:05	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
7/7/2020 10:05	Chloroform (CHCl3)	2.0	ug/L	0.5
7/7/2020 10:05	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/7/2020 10:15	Chloroform (CHCl3)	2.0	ug/L	0.5
10/7/2020 10:15	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

Summary of All 2020 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 - 13.4	ND - 16.8	ND - 21.9	ND - 20.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 3.1	ND - 2.7	ND - 2.8	ND - 3.1
Barium (Ba), ug/L	OCWD	1000	9.5 - 59.5	10.1 - 62.7	9.2 - 58.2	9.2 - 54.3
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	0.33 - 0.93	0.35 - 0.89	0.32 - 0.87	0.31 - 0.84
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND - 0.25	ND - 0.24
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 3.8	ND - 2.6	ND - 4	ND - 2.7
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 2.7	ND - 2.74	ND - 3.23	ND - 2.66
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.069	Not Required	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 3	ND - 2.8	ND - 2.7	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 - 0.6	ND - 0.7	ND - 0.7	ND - 0.6
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 120	ND - 100	ND - 110	ND - 130
Electrical Conductivity (EC), uS/cm	OCWD	900	190 - 1,100	207 - 1,110	200 - 1,110	185 - 1,100
Iron (Fe), ug/L	OCWD	300	ND - 162	ND - 138	ND - 169	ND - 150
Manganese (Mn), ug/L	OCWD	50	ND - 16.7	ND - 17.5	ND - 15	ND - 16.3
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	1.1 - 17	1.2 - 17.3	ND - 16.8	1 - 14.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND - 4	ND - 4	ND - 4
Total Dissolved Solids (TDS), mg/L	OCWD	500	110 - 608	130 - 704	134 - 718	122 - 766
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND -
Turbidity (TURB), NTU	OCWD	5	ND - 0.4	ND - 0.3	ND - 0.3	ND - 0.3
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 2.2	ND - 2.6	ND - 2.8	ND - 3
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.1 - 0.32	0.12 - 0.33	0.12 - 0.33	0.11 - 0.32
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 - 4.2	ND - 4.5	ND - 4.1	ND - 4.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND - 0.2	ND - 0.3
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 - <RL	ND - <RL	ND - <RL	ND - <RL
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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND - Detections	Not Required	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M45/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/5/2020	9:10	Tetrachloroethene (PCE)	TR	ug/L	0.5
2/5/2020	9:10	Trichloroethene (TCE)	TR	ug/L	0.5

METHOD: 537.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/5/2020	9:10	Perfluoro butane sulfonic acid (PFBS)	2.8	ng/L	2
2/5/2020	9:10	Perfluoro hexane sulfonic acid (PFHxS)	6.5	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/4/2020	11:15	Tetrachloroethene (PCE)	TR	ug/L	0.5
5/4/2020	11:15	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/3/2020	10:05	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
8/3/2020	10:05	Methyl tert-butyl ether (MTBE)	0.2	ug/L	0.2
8/3/2020	10:05	Tetrachloroethene (PCE)	TR	ug/L	0.5
8/3/2020	10:05	Trichloroethene (TCE)	TR	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/2/2020	9:45	cis-1,2-Dichloroethene (c12DCE)	TR	ug/L	0.5
11/2/2020	9:45	Methyl tert-butyl ether (MTBE)	0.3	ug/L	0.2
11/2/2020	9:45	Tetrachloroethene (PCE)	TR	ug/L	0.5
11/2/2020	9:45	Trichloroethene (TCE)	TR	ug/L	0.5

OCWD-M45/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/5/2020	10:20	Chloroform (CHCl3)	0.6	ug/L	0.5
2/5/2020	10:20	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/4/2020	10:40	Chloroform (CHCl3)	0.7	ug/L	0.5
5/4/2020	10:40	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/3/2020	11:30	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/3/2020	11:30	Chloroform (CHCl3)	0.7	ug/L	0.5
8/3/2020	11:30	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/2/2020	10:20	Chloroform (CHCl3)	0.6	ug/L	0.5
11/2/2020	10:20	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

OCWD-M45/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: ***14DIOX***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
2/5/2020	10:50	1,4-Dioxane (14DIOX)	3.1	ug/L	1

Year 2020, Quarter 2

METHOD: ***14DIOX***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/4/2020	9:40	1,4-Dioxane (14DIOX)	7.4	ug/L	1

METHOD: ***CEC***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/4/2020	9:40	Primidone (PRIMDN)	3.6	ng/L	1

Year 2020, Quarter 3

METHOD: ***14DIOX***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
8/3/2020	10:50	1,4-Dioxane (14DIOX)	5.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: ***14DIOX***

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
11/2/2020	11:00	1,4-Dioxane (14DIOX)	3.9	ug/L	0.5

OCWD-M45/4
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/5/2020	9:55	1,4-Dioxane (14DIOX)	1.3	ug/L	1

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/4/2020	10:25	1,4-Dioxane (14DIOX)	1.8	ug/L	1

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/4/2020	10:25	Carbamazepine (CBMAZP)	1.4	ng/L	1
5/4/2020	10:25	Primidone (PRIMDN)	1.5	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/3/2020	12:20	1,4-Dioxane (14DIOX)	1.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/2/2020	11:40	1,4-Dioxane (14DIOX)	1.3	ug/L	0.5

Summary of All 2020 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	7.7 - 19.4	8.9 - 17.5	5 - 15.7	5.8 - 17.2
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 4.2	ND - 4.3	ND - 4	ND - 3.7
Arsenic (dissolved) (As-DIS), ug/L	OCWD	10	ND - 4.9	Not Required	Not Required	Not Required
Barium (Ba), ug/L	OCWD	1000	4.7 - 18.2	4.8 - 17.8	4.6 - 18.1	4.5 - 17.7
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	ND - 0.73	ND - 0.68	ND - 0.69	ND - 0.7
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.25	ND - 0.22	ND - 0.26	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 - 1.18	ND - 1.1	ND - 1.14	ND - 1.23
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.003	Not Required	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.2	ND - 1.1	ND - 1.4	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 - 1.8	ND - 1.8	ND - 1.7	ND - 2.1
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 50	ND - 50	ND - 55	ND - 65
Electrical Conductivity (EC), uS/cm	OCWD	900	125 - 381	117 - 382	126 - 378	124 - 374
Iron (Fe), ug/L	OCWD	300	7.3 - 26.1	13.7 - 23.7	5.7 - 30.3	ND - 28.1
Manganese (Mn), ug/L	OCWD	50	ND - 5.2	ND - 5.5	ND - 5.2	ND - 5.8
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 5.4	ND - 5.3	ND - 4.7	ND - 5.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 16	ND - 8	ND - 8	ND - 8
Total Dissolved Solids (TDS), mg/L	OCWD	500	82 - 238	74 - 242	78 - 236	78 - 242
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.1 - 0.8	0.2 - 0.4	ND - 0.2	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 2	ND - 2.2	ND - 1.5	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 - 0.24	0.11 - 0.24	0.12 - 0.26	0.11 - 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 - 10	ND - 9.8	ND - 9.2	ND - 9.1
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 - <RL	ND - <RL	ND - <RL	ND - <RL
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	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	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 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/6/2020	11:15	Chloroform (CHCl3)	1.7	ug/L	0.5
1/6/2020	11:15	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/6/2020	11:15	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/8/2020	10:10	Chloroform (CHCl3)	1.8	ug/L	0.5
4/8/2020	10:10	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
4/8/2020	10:10	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2020	9:20	Chloroform (CHCl3)	1.7	ug/L	0.5
7/6/2020	9:20	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
7/6/2020	9:20	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2

OCWD-M46A/1
Organic Detections by Method

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2020	9:30	Chloroform (CHCl3)	1.7	ug/L	0.5
10/5/2020	9:30	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2020	9:30	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2

OCWD-M46/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
1/6/2020	9:35	Chloroform (CHCl3)	1.8	ug/L	0.5
1/6/2020	9:35	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/8/2020	12:25	Chloroform (CHCl3)	1.4	ug/L	0.5
4/8/2020	12:25	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2020	10:05	Chloroform (CHCl3)	1.6	ug/L	0.5
7/6/2020	10:05	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/5/2020	11:05	Chloroform (CHCl3)	2.1	ug/L	0.5
10/5/2020	11:05	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5

OCWD-M46/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/6/2020	10:30	Chloroform (CHCl3)	TR	ug/L	0.5
1/6/2020	10:30	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/5/2020	10:55	Chloroform (CHCl3)	TR	ug/L	0.5
10/5/2020	10:55	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

OCWD-M46/5
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/6/2020 10:05	1,4-Dioxane (14DIOX)	2.8	ug/L	1

Year 2020, Quarter 2

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/8/2020 10:40	1,4-Dioxane (14DIOX)	3.5	ug/L	1

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/8/2020 10:40	Primidone (PRIMDN)	1.5	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/6/2020 10:00	1,4-Dioxane (14DIOX)	3.5	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/5/2020 10:10	1,4-Dioxane (14DIOX)	3.5	ug/L	0.5

Summary of All 2020 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	2.2 - 39.2	2.3 - 59.8	2.3 - 41.2	2.1 - 21.2
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 7.2	ND - 6.4	ND - 6.1	ND - 6
Barium (Ba), ug/L	OCWD	1000	3.7 - 33.8	4 - 32.8	4.1 - 32.1	3.7 - 32.1
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	ND	ND
Fluoride (F), mg/L	OCWD	2	0.29 - 0.85	0.28 - 0.83	0.29 - 0.83	0.28 - 0.82
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.26	ND - 0.26	ND - 0.26	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 - 1.26	ND - 1.27	ND - 1.23	ND - 1.19
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.005	Not Required	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 - 1.4	ND - 1.7	ND - 1.8	ND - 1.4
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 80	ND - 80	ND - 80	ND - 80
Electrical Conductivity (EC), uS/cm	OCWD	900	182 - 358	181 - 360	176 - 357	168 - 352
Iron (Fe), ug/L	OCWD	300	8.9 - 67.3	7.6 - 73.8	6 - 63.4	5 - 50.2
Manganese (Mn), ug/L	OCWD	50	ND - 18.3	1.2 - 17	ND - 16.8	ND - 17.1
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 18.2	ND - 18	ND - 16.8	ND - 18.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 4	ND - 4	ND - 2	ND - 2
Total Dissolved Solids (TDS), mg/L	OCWD	500	128 - 218	108 - 226	108 - 232	114 - 226
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.4	ND - 0.8	ND - 0.6	0.1 - 0.5
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.5	ND - 1.9	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	ND - 0.25	ND - 0.23	ND - 0.24	ND - 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 - 3.6	ND - 3.6	ND - 3.3	ND - 6.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	ND - <NL	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

OCWD-M47/1
Organic Detections by Method

Year 2020, Quarter 2

METHOD: CEC

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
4/21/2020	9:45	Carbamazepine (CBMAZP)	1.1	ng/L	1

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
7/21/2020	9:45	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
10/20/2020	9:15	1,4-Dioxane (14DIOX)	0.7	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
1/21/2020 10:00	Chloroform (CHCl3)	1.4	ug/L	0.5
1/21/2020 10:00	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
4/21/2020 10:45	Chloroform (CHCl3)	1.7	ug/L	0.5
4/21/2020 10:45	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

Year 2020, Quarter 3

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/21/2020 10:40	1,4-Dioxane (14DIOX)	0.5	ug/L	0.5

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/21/2020 10:40	Chloroform (CHCl3)	1.8	ug/L	0.5
7/21/2020 10:40	Total Trihalomethanes (TTHMs)	1.8	ug/L	0.5

Year 2020, Quarter 4

METHOD: 14DIOX

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/20/2020 10:05	1,4-Dioxane (14DIOX)	0.6	ug/L	0.5

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
10/20/2020 10:05	Chloroform (CHCl3)	1.4	ug/L	0.5

OCWD-M47/2
Organic Detections by Method

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time	*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
10/20/2020 10:05	Total Trihalomethanes (TTHMs)	1.4	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
2020 Annual Report

TABLE H-1
MONITORING WELL OCWD-M10
1,4-dioxane and NDMA Concentrations, 2016 - 2020

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)
1/25/2016	1.9	<2	1/25/2016	<1	<2	1/25/2016	5.7	<2	1/25/2016	<1	<2
4/18/2016	2.3	<2	4/18/2016	1.3	<2	4/18/2016	8	<2	4/18/2016	<1	<2
7/25/2016	1.5	<2	7/25/2016	<1	<2	7/25/2016	10	<2	7/25/2016	<1	<2
10/17/2016	1.5	na	10/17/2016	<1	na	10/17/2016	7.6	na	10/17/2016	<1	na
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
						10/19/2020	5.2	<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, 2016 - 2020

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)
1/27/2016	<1	<2	1/27/2016	<1	<2	1/27/2016	<1	<2	1/27/2016	3.1	<2
4/20/2016	<1	<2	4/20/2016	<1	<2	4/20/2016	<1	<2	4/20/2016	3.6	<2
7/26/2016	<1	<2	7/26/2016	<1	<2	7/26/2016	<1	<2	7/26/2016	3.1	<2
10/19/2016	<1	na	10/19/2016	<1	na	10/19/2016	<1	na	10/19/2016	2.5	na
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

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, 2016 - 2020

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)
04/06/16	<1	na	04/06/16	<1	na	01/12/16	<1	<2
10/05/16	<1	na	10/05/16	<1	na	04/06/16	<1	<2
02/23/17	<1	na	02/23/17	<1	na	07/12/16	<1	2.7
10/04/17	<1	na	10/04/17	<1	na	10/05/16	<1	<2
04/11/18	<1	na	04/11/18	<1	na	02/23/17	<1	<2
10/10/18	<1	na	10/10/18	<1	na	04/05/17	<1	<2
						07/12/17	<1	<2
						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

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, 2016 - 2020

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)
01/11/16	<1	<2	01/11/16	<1	<2	01/11/16	10.9	<2
04/05/16	<1	<2	04/05/16	<1	<2	04/05/16	14.9	<2
07/11/16	<1	<2	07/11/16	<1	<2	04/13/16	9.8	na
10/04/16	<1	<2	10/04/16	<1	<2	07/11/16	14.5	<2
1/10/17	<1	<2	01/10/17	<1	<2	10/04/16	11.5	<2
4/4/17	<1	<2	04/04/17	<1	<2	01/10/17	10.3	<2
7/11/17	<1	<2	07/11/17	<1	<2	04/04/17	9.1	<2
10/3/17	<1	<2	10/03/17	<1	<2	07/11/17	7.7	<2
1/10/18	<1	<2	01/10/18	<1	<2	10/03/17	5.5	<2
4/10/18	<1	<2	04/10/18	<1	<2	01/10/18	6.7	<2
7/10/18	<1	<2	07/10/18	<1	<2	04/10/18	4.9	<2
10/9/18	<1	<2	10/09/18	<1	<2	07/10/18	3.7	<2
1/24/19	<1	<2	01/07/19	<1	<2	10/09/18	5.1	<2
5/7/19	<1	<2	05/07/19	<1	<2	01/07/19	5.5	<2
7/9/19	<1	<2	07/09/19	<1	<2	05/07/19	3.5	<2
10/8/19	<1	<2	10/08/19	<1	<2	07/09/19	7.2	<2
2/5/20	<1	<2	02/05/20	<1	<2	10/08/19	3.8	<2
5/4/20	<1	<2	05/04/20	<1	<2	02/05/20	3.1	<2
8/3/20	<0.5	<2	08/03/20	0.5	<2	05/04/20	7.4	<2
11/2/20	<0.5	<2	11/02/20	<0.5	<2	08/03/20	5.6	<2
						11/02/20	3.9	<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)
01/12/16	1.7	<2	01/11/16	<1	<2
04/05/16	<1	<2	04/05/16	<1	<2
04/13/16	1.6	na	07/11/16	<1	<2
07/11/16	3	<2	10/04/16	<1	<2
10/04/16	3	<2	01/10/17	<1	<2
01/10/17	<1	<2	04/04/17	<1	<2
04/04/17	<1	<2	07/11/17	<1	<2
07/11/17	1.3	<2	10/03/17	<1	<2
07/19/17	1.1	na	01/10/18	<1	<2
10/03/17	<1	<2	04/10/18	<1	<2
01/10/18	2.4	<2	07/10/18	<1	<2
04/10/18	1.8	<2	10/09/18	<1	<2
07/10/18	1.6	<2	01/07/19	<1	<2
10/09/18	1.2	<2	05/07/19	<1	<2
01/07/19	1.9	<2	07/09/19	<1	<2
05/07/19	<1	<2	10/08/19	<1	<2
07/09/19	<1	<2	02/05/20	<1	<2
10/08/19	<1	<2	05/04/20	<1	<2
02/05/20	1.3	<2	08/03/20	<0.5	<2
05/04/20	1.8	<2	11/02/20	<0.5	<2
08/03/20	1.6	<2			
11/02/20	1.3	<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, 2016 - 2020

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)
01/27/16	<1	2.5	05/04/15	<1	<2	01/27/16	<1	<2	01/27/16	<1	<2	01/27/16	1.1	<2
05/03/16	<1	3.4	07/13/15	<1	<2	05/03/16	<1	<2	05/03/16	<1	<2	05/03/16	<1	<2
08/09/16	<1	<2	11/02/15	<1	<2	08/09/16	<1	<2	08/09/16	<1	<2	08/09/16	1.1	<2
11/01/16	<1	2.3	01/27/16	<1	<2	11/01/16	<1	<2	11/01/16	<1	<2	11/01/16	<1	<2
02/07/17	<1	3.3	05/03/16	<1	<2	02/07/17	<1	<2	02/07/17	<1	<2	02/07/17	1.3	<2
05/02/17	<1	<2	08/09/16	<1	<2	05/02/17	<1	<2	05/02/17	<1	<2	05/02/17	<1	<2
08/08/17	<1	2.7	11/01/16	<1	<2	08/08/17	<1	<2	08/08/17	<1	<2	08/08/17	1.2	<2
10/31/17	<1	2.2	02/07/17	<1	<2	10/31/17	<1	<2	10/31/17	<1	<2	10/31/17	1.4	<2
01/23/18	<1	2.2	05/02/17	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2	01/23/18	<1	<2
05/07/18	<1	3.1	08/08/17	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2	05/07/18	<1	<2
08/07/18	<1	2.5	10/31/17	<1	<2	08/07/18	<1	<2	08/07/18	<1	<2	08/07/18	1.1	<2
10/08/18	<1	2.8	01/23/18	<1	<2	10/08/18	<1	<2	10/08/18	<1	<2	10/08/18	1	<2
01/23/19	<1	3.5	05/07/18	<1	<2	01/23/19	<1	<2	01/23/19	<1	<2	01/23/19	1	<2
04/02/19	<1	3.3	08/07/18	<1	<2	04/02/19	<1	<2	04/02/19	<1	<2	04/02/19	1.9	<2
08/06/19	<1	3.1	10/08/18	<1	<2	08/06/19	<1	<2	08/06/19	<1	<2	08/06/19	2.5	<2
10/07/19	<1	2.2	01/23/19	<1	<2	10/07/19	<1	<2	10/07/19	<1	<2	10/07/19	2.6	<2
01/06/20	<1	3.1	04/02/19	<1	<2	01/06/20	<1	<2	01/06/20	<1	<2	01/06/20	2.8	<2
04/08/20	<1	3.5	08/06/19	<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	10/07/19	<1	<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	01/06/20	<1	<2	10/05/20	<0.5	<2	10/05/20	<0.5	<2	10/05/20	3.5	<2
			04/08/20	<1	<2									
			07/06/20	<0.5	<2									
			10/05/20	<0.5	<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
2016 - 2020

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)
02/09/16	1.1	<2	02/09/16	<1	<2	02/09/16	<1	<2
04/19/16	<1	<2	04/19/16	<1	<2	04/19/16	<1	<2
07/27/16	<1	<2	07/27/16	<1	<2	07/27/16	<1	<2
10/18/16	<1	na	10/18/16	<1	na	10/18/16	<1	na
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

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)
02/09/16	<1	<2	02/09/16	<1	<2
04/19/16	<1	<2	04/19/16	<1	<2
07/27/16	<1	<2	07/27/16	<1	<2
10/18/16	<1	na	10/18/16	<1	na
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

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
2016 - 2020

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	01/25/16	0.049	20.8	184	76.2	<0.2	0.002	1.23	0.22
	04/18/16	0.047	18.2	184	73.6	<0.2	<0.002	1.4	0.15
	07/25/16	0.033	14.2	164	59.5	<0.2	<0.002	1.63	0.14
	10/17/16	0.031	13.5	172	57.9	<0.2	0.002	1.4	0.13
	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
M10/2 Beta-I,II Perforations 175-195 ft bgs	01/25/16	0.029	14	110	40.9	<0.2	0.003	2.61	0.14
	04/18/16	0.033	14	124	40.2	<0.2	<0.002	2.51	0.1
	07/25/16	0.026	11.8	118	37.6	<0.2	<0.002	2.64	0.09
	10/17/16	0.022	9.4	104	31.7	<0.2	<0.002	2.32	0.09
	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
M10/3 Beta-III Perforations 215-240 ft bgs	01/25/16	0.095	42.5	284	116	<0.2	0.017	0.19	0.35
	04/18/16	0.110	45.7	304	123	<0.2	0.008	0.15	0.32
	07/25/16	0.101	41.3	270	109	<0.2	0.013	0.3	0.3
	10/17/16	0.105	42.3	298	115	<0.2	0.013	0.17	0.29
	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

TABLE H-7
MONITORING WELL OCWD-M10
General Water Quality Data
2016 - 2020

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	01/25/16	0.020	11.9	86	30.5	<0.2	<0.002	<0.1	0.27
	04/18/16	0.026	11.8	98	30.8	<0.2	<0.002	0.1	0.22
	07/25/16	0.021	11.7	92	30	<0.2	<0.002	<0.1	0.2
	10/17/16	0.020	10.2	80	30.2	0.2	<0.002	<0.1	0.24
	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

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
2016 - 2020

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	01/27/16	0.023	11.4	172	80.9	<0.2	<0.002	1.6	0.2
	04/20/16	0.029	12.5	146	80.4	<0.2	<0.002	1.7	0.15
	07/26/16	0.025	11.6	136	74.6	<0.2	<0.002	1.6	0.13
	10/19/16	0.023	9.9	160	69.4	<0.2	<0.002	1.3	0.11
	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
M11/2 Talbert, Alpha-III Perforations 125-150 ft bgs	01/27/16	0.036	13.6	128	60.1	<0.2	0.003	2.64	0.1
	04/20/16	0.026	11.9	130	62.9	<0.2	<0.002	2.3	0.09
	07/26/16	0.020	8.8	106	49.6	<0.2	<0.002	2.11	0.07
	10/19/16	0.018	8	112	43.5	<0.2	<0.002	1.83	0.07
	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
M11/3 Beta-I, -II, -III Perforations 170-225 ft bgs	01/27/16	0.022	10.3	94	28	<0.2	<0.002	2.97	0.16
	04/20/16	0.018	10.6	89	29.6	<0.2	<0.002	3.07	0.09
	07/26/16	0.019	10.1	82	30.7	0.5	<0.002	2.94	0.1
	10/19/16	0.015	7.9	86	28.6	<0.2	0.002	2.63	0.07
	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

TABLE H-8
MONITORING WELL OCWD-M11
General Water Quality Data
2016 - 2020

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	01/27/16	0.110	33.6	166	101	<0.2	0.002	1.59	0.24
	04/20/16	0.093	31.3	189	97	<0.2	<0.002	1.73	0.15
	07/26/16	0.086	27.8	172	90.4	0.4	<0.002	1.64	0.18
	10/19/16	0.069	22.9	170	71	<0.2	<0.002	1.5	0.13
	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

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
2016 - 2020

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 Talbert Perforations 60-110 ft bgs	04/06/16	0.27	78.4	566	378	na	<0.002	2.47	na
	10/05/16	0.22	80.4	588	376	<0.2	<0.002	2.67	na
	02/23/17	0.37	79.9	588	404	<0.2	<0.002	2.52	na
	10/04/17	0.18	78.5	548	393	<0.2	<0.002	2.48	na
	04/11/18	0.3	77.8	512	389	<0.2	<0.002	3.01	na
	10/10/18	0.25	81.2	566	392	<0.2	<0.002	3.65	na
M19/2 Alpha Perforations 130-195 ft bgs	04/06/16	<0.1	18.3	161	82.6	na	<0.002	2.21	na
	10/05/16	<0.1	17.2	146	82	<0.2	<0.002	1.81	na
	02/23/17	<0.1	25	198	117	<0.2	<0.002	1.85	na
	10/04/17	<0.1	31.1	230	145	<0.2	<0.002	1.62	na
	04/11/18	<0.1	29.6	202	136	<0.2	<0.002	1.58	na
	10/10/18	0.13	36.5	258	184	<0.2	<0.002	1.77	na
M19/3 Beta Perforations 215-265 ft bgs	01/12/16	0.021	9.1	84	28.8	<0.2	<0.002	2.1	0.19
	04/06/16	0.001	6.8	69	27.1	<0.2	<0.002	1.62	0.11
	07/12/16	0.016	8.0	62	33.2	<0.2	<0.002	1.73	0.09
	10/05/16	0.019	9.7	94	44.7	<0.2	<0.002	1.86	0.09
	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
	10/10/18	0.018	7.4	79	42.9	<0.2	<0.002	1.43	0.06
	01/09/19	0.025	9.1	89	59.6	<0.2	<0.002	1.58	0.08
	04/03/19	0.017	6.1	64	41.0	na	na	1.38	0.09
	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

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
2016 - 2020 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	01/11/16	0.389	93.5	690	453	<0.2	0.107	1.72	0.49
	04/05/16	0.402	94.0	698	454	<0.2	0.043	1.8	0.43
	07/11/16	0.384	92.3	678	433	<0.2	0.103	1.64	0.4
	10/04/16	0.362	85.7	644	437	<0.2	0.075	1.55	0.35
	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
M45/2 Beta-III Perforations 250-260 ft bgs	01/11/16	0.044	16.5	120	53.9	<0.2	0.084	2.39	0.16
	04/05/16	0.036	15.8	126	54.2	<0.2	0.06	2.71	0.11
	07/11/16	0.036	13.8	124	48	<0.2	0.047	2.62	0.12
	10/04/16	0.032	12.5	122	47	<0.2	0.043	2.48	0.11
	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	113.0	na	na	1.72	0.13
	11/02/20	0.095	24.9	242	119.0	na	na	1.43	0.13
M45/3 Omicron Perforations 335-345 ft bgs	01/11/16	0.127	44.3	322	104	<0.2	<0.002	<0.1	0.37
	04/05/16	0.124	45.6	294	112	<0.2	<0.002	<0.1	0.58
	07/11/16	0.133	43.5	302	118	<0.2	<0.002	<0.1	0.35
	10/04/16	0.129	42.4	298	110	<0.2	<0.002	<0.1	0.31
	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

TABLE H-10
MONITORING WELL OCWD-M45
2016 - 2020 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	01/12/16	0.036	15.1	148	41.9	<0.2	<0.002	<0.1	0.27
	04/05/16	0.021	12.2	115	41.4	<0.2	<0.002	<0.1	0.24
	07/11/16	0.040	17.5	136	52	<0.2	<0.002	<0.1	0.25
	10/04/16	0.040	16.7	154	53.2	<0.2	<0.002	<0.1	0.23
	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
M45/5 Main Perforations 780-790 ft bgs	01/11/16	0.127	13.3	298	27.5	0.6	<0.002	<0.1	5.43
	04/05/16	0.125	13.2	270	29.3	0.5	<0.002	<0.1	6.14
	07/11/16	0.141	13.4	284	28.6	0.7	0.006	<0.1	6.08
	10/04/16	0.14	13.1	298	29	0.8	0.007	<0.1	6.22
	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

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
2016 - 2020

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)
	01/27/16	0.019	10.3	106	45	<0.2	<0.002	2.29	0.17
	05/03/16	0.020	10.2	94	46.6	<0.2	<0.002	2.23	0.08
	08/09/16	0.017	10.2	96	45.5	<0.2	<0.002	2	0.07
	11/01/16	0.016	7.6	92	42.4	<0.2	<0.002	1.73	0.06
	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
M46A/1	10/31/17	0.012	6.4	88	42.2	<0.2	<0.002	1.51	0.06
Lambda/Omicron	01/23/18	0.011	5.8	80	42.0	<0.2	<0.002	1.39	0.43
Perforations	05/07/18	0.018	6.4	92	39.9	na	na	1.45	0.05
350-370 ft bgs	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
	01/27/16	0.034	14.2	112	58.1	<0.2	0.002	2.07	0.16
	05/03/16	0.032	13.7	119	59.8	<0.2	<0.002	2.02	0.11
	08/09/16	0.032	13.2	134	60.5	<0.2	<0.002	1.87	0.08
	11/01/16	0.029	12.5	118	57.1	<0.2	<0.002	1.79	0.08
	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
M46/2	10/31/17	0.021	8.8	106	45.7	<0.2	<0.002	1.56	0.12
Upper Rho	01/23/18	0.014	6.0	74	34.6	<0.2	<0.002	1.27	0.12
Perforations	05/07/18	0.024	8.7	118	46	na	na	1.44	0.06
420-430 ft bgs	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

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2016 - 2020

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	01/27/16	0.03	13.5	106	41.8	<0.2	0.002	0.25	0.16
	05/03/16	0.03	13	136	42.4	<0.2	<0.002	0.23	0.14
	08/09/16	0.029	12.5	154	41.1	<0.2	<0.002	0.22	0.21
	11/01/16	0.027	12.1	168	40.8	<0.2	<0.002	0.2	0.13
	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
M46/4 Main Perforations 640-660 ft bgs	01/27/16	0.054	16.4	214	16.7	<0.2	0.003	<0.1	1.19
	05/03/16	0.057	15.8	188	16.6	<0.2	<0.002	<0.1	1.09
	08/09/16	0.065	15.8	220	16.8	<0.2	<0.002	<0.1	1.05
	11/01/16	0.057	15.6	214	17	<0.2	<0.002	<0.1	1.07
	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	na	0.002	<0.1	1.18
	01/06/20	0.049	14.1	230	16	na	na	<0.1	1.16
	04/08/20	0.048	13.6	222	16	<0.2	<0.002	<0.1	1.03
	07/06/20	0.049	13.6	220	16	na	na	<0.1	1.03
	10/05/20	0.05	13.5	226	16	na	na	<0.1	0.97

TABLE H-11
MONITORING WELL OCWD-M46
General Water Quality Data
2016 - 2020

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	01/27/16	0.043	14.7	228	13.4	0.4	0.004	<0.1	1.85
	05/03/16	0.044	14.4	216	13.2	0.4	<0.002	<0.1	1.76
	08/09/16	0.051	15.5	206	13.6	0.4	<0.002	<0.1	1.82
	11/01/16	0.046	14.6	236	13.4	0.4	0.002	<0.1	1.78
	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

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
2016 - 2020 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	02/09/16	0.022	9.1	148	40.3	<0.2	<0.002	<0.1	0.16
	04/19/16	0.023	10.6	140	40.7	<0.2	<0.002	<0.1	0.18
	07/27/16	0.024	10.7	136	42.6	0.2	<0.002	<0.1	0.15
	10/18/16	0.025	10.7	156	42.4	<0.2	<0.002	<0.1	0.16
	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
M47/2 Upper Rho Perforations 470-480 ft bgs	02/09/16	0.027	13.5	146	64.3	<0.2	0.005	2.33	0.13
	04/19/16	0.028	13.9	140	62.2	<0.2	0.008	2.39	0.1
	07/27/16	0.028	12.6	122	60.5	<0.2	0.005	2.13	0.1
	10/18/16	0.026	11.8	138	59.7	<0.2	0.005	1.9	0.26
	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

TABLE H-12
MONITORING WELL OCWD-M47
2016 - 2020 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	02/09/16	0.052	19.2	214	71.7	<0.2	<0.002	<0.1	0.3
	04/19/16	0.050	19.7	230	71.8	<0.2	<0.002	<0.1	0.12
	07/27/16	0.051	19.1	214	73.4	<0.2	<0.002	<0.1	0.1
	10/18/16	0.047	18.3	212	70.1	<0.2	<0.002	<0.1	0.08
	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
M47/4 Main Perforations 745-765 ft bgs	02/09/16	0.043	12.1	226	21.7	<0.2	<0.002	<0.1	1.15
	04/19/16	0.044	12.8	210	21.7	<0.2	<0.002	0.1	0.76
	07/27/16	0.042	12.8	212	22.4	0.3	0.002	<0.1	1.08
	10/18/16	0.041	12.3	208	22.7	0.3	0.002	<0.1	1.1
	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

TABLE H-12
MONITORING WELL OCWD-M47
2016 - 2020 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	02/09/16	0.059	12.3	230	11.2	0.3	0.005	<0.1	3.2
	04/19/16	0.054	12.9	222	11.3	0.3	0.005	<0.1	2.76
	07/27/16	0.059	12.9	240	11.5	0.5	0.006	<0.1	2.99
	10/18/16	0.057	12.6	238	12.6	0.5	0.005	<0.1	3.3
	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

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
2020 Annual Report

GWRS 2020 Quarterly Sampling Dates

OCWD Water Quality Department

ANAHEIM FOREBAY - GROUNDWATER

Monitoring Well	Qtr 1	Qtr 2	Qtr 3	Qtr 4
AM-7/1	03/17/2020	05/20/2020	07/28/2020	12/15/2020
AM-8/1	03/17/2020	06/16/2020	09/16/2020	12/15/2020
AM-10/1	03/17/2020	06/16/2020	09/16/2020	12/15/2020
AMD-10/1-5	02/19/2020	04/07/2020	08/19/2020	11/18/2020
AMD-12/1-5	02/18/2020	05/18/2020	08/17/2020	11/16/2020
OCWD-KB1/1	03/17/2020	06/16/2020	09/16/2020	12/15/2020

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 2020 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. Reported ranges such as ND - <NL, ND - <RL, ND - <SMCL, ND - <MCL, etc. indicate that results for the quarter ranged from not detected at the reportable detection level (RDL) to a detection less than the applicable regulatory limit.

► 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

► RL: SWRCB Division of Drinking Water (DDW) Response Level

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace; indicates a detection at no greater than the RDL and no less than one-half of the RDL

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 - 2015	x		Q1 - 2018		x
Q2 - 2015		x	Q2 - 2018		x
Q3 - 2015		x	Q3 - 2018		x
Q4 - 2015		x	Q4 - 2018	x	
Q1 - 2016		x	Q1 - 2019	x	
Q2 - 2016	x		Q2 - 2019		x
Q3 - 2016		x	Q3 - 2019		x
Q4 - 2016		x	Q4 - 2019		x
Q1 - 2017		x	Q1 - 2020		x
Q2 - 2017		x	Q2 - 2020	x	
Q3 - 2017	x		Q3 - 2020		x
Q4 - 2017		x	Q4 - 2020		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 2020 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	1.9	1.7	1.4	1.6
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	2.3	2	1.8	2
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	2.1 - 2.4	1.7 - 1.8	1.5 - 1.7	1.5 - 1.6
Barium (Ba), ug/L	OCWD	1000	37.6	44.9	54.9	39.5
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	0.13	0.11	0.1	0.12
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.2	1.6	2.1	1.9
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.63 - 0.7	0.9 - 1.04	1.5 - 1.62	1.35 - 1.38
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	0.005	0.004	0.007	0.007
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	1.6 - 1.7	1 - 1.1	0.8	0.7
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	3	3	3
Electrical Conductivity (EC), uS/cm	OCWD	900	480 - 553	605 - 659	732 - 763	602 - 632
Iron (Fe), ug/L	OCWD	300	151	167	180	185
Manganese (Mn), ug/L	OCWD	50	5	4.4	6.5	5.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	4.4 - 5.2	4.2 - 5.1	6 - 6.5	5.4 - 5.5
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	296 - 332	366 - 396	440	346 - 392
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.6	0.7	1.4	1.3
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	1.2	1.4	2.2	1.6
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.15	0.15	0.16	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	3.6	3.3	2.9	3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND - Detections	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required

AM-7/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/28/2020	9:50	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
1/28/2020	9:50	Chloroform (CHCl3)	1.6	ug/L	0.5
1/28/2020	9:50	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5
3/17/2020	10:00	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
3/17/2020	10:00	Chloroform (CHCl3)	1.7	ug/L	0.5
3/17/2020	10:00	Total Trihalomethanes (TTHMs)	1.7	ug/L	0.5

METHOD: 537.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/28/2020	9:50	Perfluoro octane sulfonic acid (PFOS)	3.4	ng/L	2
3/17/2020	10:00	Perfluoro butane sulfonic acid (PFBS)	2.0	ng/L	2
3/17/2020	10:00	Perfluoro octane sulfonic acid (PFOS)	3.4	ng/L	2

METHOD: UNKWQAN

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
1/28/2020	9:50	PFOA + PFOS (PFOAOS)	3.4	ng/L	2
3/17/2020	10:00	PFOA + PFOS (PFOAOS)	3.4	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/20/2020	9:25	Chloroform (CHCl3)	1.1	ug/L	0.5
5/20/2020	9:25	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5
6/16/2020	10:55	Chloroform (CHCl3)	1.0	ug/L	0.5
6/16/2020	10:55	Total Trihalomethanes (TTHMs)	1.0	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	10:05	Chloroform (CHCl3)	0.8	ug/L	0.5
9/16/2020	10:05	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

AM-7/1
Organic Detections by Method

Year 2020, Quarter 3

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	10:05	Atrazine (ATRAZ)	0.0010	ug/L	0.001
9/16/2020	10:05	Carbamazepine (CBMAZP)	38.7	ng/L	1
9/16/2020	10:05	Dilantin (DILANT)	21.2	ng/L	10
9/16/2020	10:05	Diuron (DIURON)	0.0080	ug/L	0.005
9/16/2020	10:05	Primidone (PRIMDN)	42.7	ng/L	1
9/16/2020	10:05	Simazine (SIMAZ)	0.0240	ug/L	0.005
9/16/2020	10:05	Sucralose (SUCRAL)	12300	ng/L	500
9/16/2020	10:05	Sulfamethoxazole (SULTHZ)	38.8	ng/L	1

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/15/2020	12:35	Chloroform (CHCl3)	0.7	ug/L	0.5
12/15/2020	12:35	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

Summary of All 2020 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	ND	ND	ND	1.3
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	ND	1.1
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	71.7	64.7	70.1	57.7
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	0.17	0.16	0.17	0.18
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.7	1.6	1.7	1.8
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.46	0.53	0.96	1.07
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	0.01	Not Required	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	2	1.5	1.4	0.9
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	3	3
Electrical Conductivity (EC), uS/cm	OCWD	900	738	691	736	666
Iron (Fe), ug/L	OCWD	300	644	821	601	1210
Manganese (Mn), ug/L	OCWD	50	11.9	11.6	15.2	36.7
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	9.5	9.2	13.4	16.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	4	4	4	2
Total Dissolved Solids (TDS), mg/L	OCWD	500	454	434	478	388
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	1.1	1.4	1.5	4.7
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	1.1	ND	1.2	1.3
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.17	0.17	0.16	0.16
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	2	1.8	2.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND - Detections	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required

AM-8/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/17/2020	11:15	Chloroform (CHCl3)	2.0	ug/L	0.5
3/17/2020	11:15	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

METHOD: 537.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/17/2020	11:15	Perfluoro butane sulfonic acid (PFBS)	2.4	ng/L	2
3/17/2020	11:15	Perfluoro octane sulfonic acid (PFOS)	2.1	ng/L	2

METHOD: UNKWQAN

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/17/2020	11:15	PFOA + PFOS (PFOAOS)	2.1	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/16/2020	10:20	Chloroform (CHCl3)	1.5	ug/L	0.5
6/16/2020	10:20	Total Trihalomethanes (TTHMs)	1.5	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	11:05	Chloroform (CHCl3)	1.4	ug/L	0.5
9/16/2020	11:05	Total Trihalomethanes (TTHMs)	1.4	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	11:05	Atrazine (ATRAZ)	0.0010	ug/L	0.001
9/16/2020	11:05	Carbamazepine (CBMAZP)	5.9	ng/L	1
9/16/2020	11:05	Primidone (PRIMDN)	10.6	ng/L	1

AM-8/1
Organic Detections by Method

Year 2020, Quarter 3

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	11:05	Simazine (SIMAZ)	0.0110	ug/L	0.005
9/16/2020	11:05	Sucralose (SUCRAL)	2590	ng/L	100
9/16/2020	11:05	Sulfamethoxazole (SULTHZ)	19.5	ng/L	1

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/15/2020	10:55	Chloroform (CHCl3)	0.9	ug/L	0.5
12/15/2020	10:55	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Summary of All 2020 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	2.5	1.7	4.7	2.6
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.4	1.4	1.1	1.5
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.4	1.5	1.2	1.5
Barium (Ba), ug/L	OCWD	1000	8.4	8.6	9.3	8.1
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	ND	ND
Fluoride (F), mg/L	OCWD	2	0.16	0.13	0.13	0.15
Hexavalent Chromium (CrVI), ug/L	OCWD	10	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	10	0.99	1	1.41	1.2
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	0.002	Not Required	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	1.9	1.6	2.7	3.1
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	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	104	105	117	109
Iron (Fe), ug/L	OCWD	300	144	115	59.4	64.2
Manganese (Mn), ug/L	OCWD	50	3.4	3.1	2.7	2.6
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	1.6	1.8	1.6	2.1
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	2	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	68	66	78	70
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.3	0.2	0.2	0.2
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	0.23	0.22	0.27	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	3.8	3.6	2.7	3.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	Not Required	ND - Detection	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	ND	Not Required	Not Required

AM-10/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/17/2020	12:15	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
3/17/2020	12:15	Chloroform (CHCl3)	1.2	ug/L	0.5
3/17/2020	12:15	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/16/2020	9:20	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
6/16/2020	9:20	Chloroform (CHCl3)	1.1	ug/L	0.5
6/16/2020	9:20	Total Trihalomethanes (TTHMs)	1.6	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	11:50	Bromodichloromethane (CHBrCl)	1.0	ug/L	0.5
9/16/2020	11:50	Chloroform (CHCl3)	1.8	ug/L	0.5
9/16/2020	11:50	Total Trihalomethanes (TTHMs)	2.7	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	11:50	Simazine (SIMAZ)	0.0050	ug/L	0.005

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/15/2020	11:45	Bromodichloromethane (CHBrCl)	1.2	ug/L	0.5
12/15/2020	11:45	Chloroform (CHCl3)	2.0	ug/L	0.5
12/15/2020	11:45	Total Trihalomethanes (TTHMs)	3.1	ug/L	0.5

Summary of All 2020 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 - 7.4	ND - 2.2	ND - 1.8	ND - 1.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 3.3	ND - 2.9	ND - 3.1	ND - 2.3
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	2.5 - 3.3	1.4 - 3	1.4 - 3	ND - 2.6
Barium (Ba), ug/L	OCWD	1000	9.8 - 75	18.7 - 92.4	16.7 - 87.8	24.5 - 84.9
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 - 0.49	ND - 0.49	ND - 0.48	ND - 0.49
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 2.4	ND - 2.4	ND - 2.4	ND - 2.3
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.11 - 1.37	0.14 - 1.36	0.19 - 1.26	0.29 - 1.51
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	0.015 - 0.035	0.017 - 0.108	0.018 - 0.038	0.021 - 0.04
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 - 1.3	ND - 1.2	ND - 0.9	ND - 0.8
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND - 20	ND - 20	ND - 10	ND - 10
Electrical Conductivity (EC), uS/cm	OCWD	900	157 - 800	169 - 876	239 - 911	358 - 887
Iron (Fe), ug/L	OCWD	300	90.6 - 752	22.8 - 874	29.1 - 1,170	54.1 - 831
Manganese (Mn), ug/L	OCWD	50	3.2 - 43.2	5.5 - 42.1	4.5 - 44	13 - 45.4
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	3.9 - 43.8	2.3 - 41.8	3.6 - 38.2	12.9 - 44
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	1 - 4	ND - 2	ND - 1
Total Dissolved Solids (TDS), mg/L	OCWD	500	100 - 534	108 - 572	144 - 578	222 - 566
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.1 - 2.5	0.1 - 4.4	0.2 - 4.4	0.2 - 2.8
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.8	ND - 1.5	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	0.16 - 0.23	0.16 - 0.23	0.16 - 0.25	0.15 - 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 - 4.3	ND - 3.1	ND - 2.8	ND - 2.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2019 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND - Detections	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	ND	Not Required	Not Required

AMD-10/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	9:50	Chloroform (CHCl3)	1.3	ug/L	0.5
2/19/2020	9:50	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	12:35	Chloroform (CHCl3)	0.7	ug/L	0.5
5/19/2020	12:35	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	12:35	Carbamazepine (CBMAZP)	4.0	ng/L	1
5/19/2020	12:35	Primidone (PRIMDN)	9.5	ng/L	1
5/19/2020	12:35	Simazine (SIMAZ)	0.0060	ug/L	0.005
5/19/2020	12:35	Sucralose (SUCRAL)	1690	ng/L	100
5/19/2020	12:35	Sulfamethoxazole (SULTHZ)	11.2	ng/L	1

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/19/2020	9:45	Chloroform (CHCl3)	0.6	ug/L	0.5
8/19/2020	9:45	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/18/2020	9:40	Chloroform (CHCl3)	0.5	ug/L	0.5
11/18/2020	9:40	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

AMD-10/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	10:50	Chloroform (CHCl3)	1.1	ug/L	0.5
2/19/2020	10:50	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	13:50	Chloroform (CHCl3)	1.2	ug/L	0.5
5/19/2020	13:50	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	13:50	Primidone (PRIMDN)	2.9	ng/L	1
5/19/2020	13:50	Simazine (SIMAZ)	0.0070	ug/L	0.005
5/19/2020	13:50	Sucralose (SUCRAL)	467	ng/L	100
5/19/2020	13:50	Sulfamethoxazole (SULTHZ)	3.9	ng/L	1

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/19/2020	10:55	Chloroform (CHCl3)	0.9	ug/L	0.5
8/19/2020	10:55	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/18/2020	10:40	Chloroform (CHCl3)	0.8	ug/L	0.5
11/18/2020	10:40	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

AMD-10/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	12:20	Chloroform (CHCl3)	0.6	ug/L	0.5
2/19/2020	12:20	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

METHOD: 537.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	12:20	Perfluoro butane sulfonic acid (PFBS)	10.9	ng/L	2
2/19/2020	12:20	Perfluoro heptanoic acid (PFHpA)	6.2	ng/L	2
2/19/2020	12:20	Perfluoro hexane sulfonic acid (PFHxS)	6.5	ng/L	2
2/19/2020	12:20	Perfluoro octane sulfonic acid (PFOS)	8.9	ng/L	2
2/19/2020	12:20	Perfluoro octanoic acid (PFOA)	10.0	ng/L	2
2/19/2020	12:20	Perfluorohexanoic acid (PFHxA)	15.9	ng/L	2

METHOD: UNKWQAN

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	12:20	PFOA + PFOS (PFOAOS)	18.9	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	12:50	Chloroform (CHCl3)	TR	ug/L	0.5
5/19/2020	12:50	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	12:50	Atrazine (ATRAZ)	0.0010	ug/L	0.001
5/19/2020	12:50	Carbamazepine (CBMAZP)	17.1	ng/L	1
5/19/2020	12:50	Dilantin (DILANT)	12.0	ng/L	10
5/19/2020	12:50	Diuron (DIURON)	0.0070	ug/L	0.005
5/19/2020	12:50	Primidone (PRIMDN)	23.2	ng/L	1
5/19/2020	12:50	Simazine (SIMAZ)	0.0150	ug/L	0.005
5/19/2020	12:50	Sucralose (SUCRAL)	5840	ng/L	500
5/19/2020	12:50	Sulfamethoxazole (SULTHZ)	29.3	ng/L	1

AMD-10/3
Organic Detections by Method

Year 2020, Quarter 3

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/19/2020	12:15	Chloroform (CHCl3)	TR	ug/L	0.5
8/19/2020	12:15	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/18/2020	12:15	Chloroform (CHCl3)	TR	ug/L	0.5
11/18/2020	12:15	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

AMD-10/4
Organic Detections by Method

Year 2020, Quarter 1

METHOD: ***537.1***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	12:35	Perfluoro butane sulfonic acid (PFBS)	3.4	ng/L	2
2/19/2020	12:35	Perfluoro hexane sulfonic acid (PFHxS)	2.1	ng/L	2
2/19/2020	12:35	Perfluoro nonanoic acid (PFNA)	2.1	ng/L	2
2/19/2020	12:35	Perfluoro octane sulfonic acid (PFOS)	9.3	ng/L	2
2/19/2020	12:35	Perfluoro octanoic acid (PFOA)	3.9	ng/L	2
2/19/2020	12:35	Perfluorohexanoic acid (PFHxA)	3.9	ng/L	2

METHOD: ***UNKWQAN***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/19/2020	12:35	PFOA + PFOS (PFOAOS)	13.2	ng/L	2

Year 2020, Quarter 2

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/19/2020	11:25	Atrazine (ATRAZ)	0.0010	ug/L	0.001
5/19/2020	11:25	Carbamazepine (CBMAZP)	4.4	ng/L	1
5/19/2020	11:25	Primidone (PRIMDN)	5.6	ng/L	1
5/19/2020	11:25	Simazine (SIMAZ)	0.0260	ug/L	0.005
5/19/2020	11:25	Sucralose (SUCRAL)	1120	ng/L	100
5/19/2020	11:25	Sulfamethoxazole (SULTHZ)	8.1	ng/L	1

AMD-10/5
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/19/2020 11:05	Chloroform (CHCl3)	0.7	ug/L	0.5
2/19/2020 11:05	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

METHOD: 537.1

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/19/2020 11:05	Perfluoro butane sulfonic acid (PFBS)	4.5	ng/L	2
2/19/2020 11:05	Perfluoro heptanoic acid (PFHpA)	3.6	ng/L	2
2/19/2020 11:05	Perfluoro hexane sulfonic acid (PFHxS)	3.8	ng/L	2
2/19/2020 11:05	Perfluoro octane sulfonic acid (PFOS)	8.6	ng/L	2
2/19/2020 11:05	Perfluoro octanoic acid (PFOA)	7.9	ng/L	2
2/19/2020 11:05	Perfluorohexanoic acid (PFHxA)	10.0	ng/L	2

METHOD: UNKWQAN

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/19/2020 11:05	PFOA + PFOS (PFOAOS)	16.5	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/19/2020 11:50	Chloroform (CHCl3)	0.6	ug/L	0.5
5/19/2020 11:50	Total Trihalomethanes (TTHMs)	0.6	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/19/2020 11:50	Atrazine (ATRAZ)	0.0010	ug/L	0.001
5/19/2020 11:50	Carbamazepine (CBMAZP)	3.2	ng/L	1
5/19/2020 11:50	Diuron (DIURON)	0.0070	ug/L	0.005
5/19/2020 11:50	Primidone (PRIMDN)	6.0	ng/L	1
5/19/2020 11:50	Simazine (SIMAZ)	0.0420	ug/L	0.005
5/19/2020 11:50	Sucralose (SUCRAL)	428	ng/L	100
5/19/2020 11:50	Sulfamethoxazole (SULTHZ)	12.8	ng/L	1

AMD-10/5
Organic Detections by Method

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/19/2020	11:20	Chloroform (CHCl3)	TR	ug/L	0.5
8/19/2020	11:20	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/18/2020	11:00	Chloroform (CHCl3)	TR	ug/L	0.5
11/18/2020	11:00	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

Summary of All 2020 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 - 1.4	ND - 1.8	ND	1.1 - 1.8
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 2.9	ND - 2.7	ND - 2.9	ND - 2.1
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND - 3	ND - 3	ND - 2.8	ND - 2.8
Barium (Ba), ug/L	OCWD	1000	23.2 - 77.5	23.3 - 74	17.7 - 71.9	18.8 - 77.2
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	ND - 0.51	0.12 - 0.51	0.11 - 0.5	0.1 - 0.5
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.31	ND - 0.26	ND - 0.25	ND - 0.21
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	1.9 - 6.4	ND - 5.8	ND - 8.6	1.7 - 8.9
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	0.44 - 1.02	0.48 - 1.08	0.42 - 1.33	0.42 - 1.38
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND	ND	ND	ND
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.1	ND - 1.1	ND - 1.1	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 - 2.5	ND - 1.3	ND - 1.3	ND - 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	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	298 - 876	324 - 866	234 - 860	244 - 836
Iron (Fe), ug/L	OCWD	300	ND - 8.8	ND - 7.5	ND - 51.6	ND
Manganese (Mn), ug/L	OCWD	50	ND - 1.6	ND - 1.5	ND	ND - 1.4
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 1.4	ND - 1.4	ND - 1.4	ND - 1.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	206 - 588	194 - 550	138 - 530	152 - 524
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
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 2.3	ND - 2.1	ND - 2.3	ND - 1.9
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.18 - 0.25	0.17 - 0.23	0.18 - 0.23	0.17 - 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	2.2 - 4.7	2.4 - 5.3	2.4 - 4.5	3 - 4.6
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeclkLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
CEC	Chemicals of Emerging Concern	OCWD	Not Required	ND - Detections	Not Required	Not Required
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	Not Required	ND	Not Required	Not Required

AMD-12/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/18/2020	10:05	Chloroform (CHCl3)	2.5	ug/L	0.5
2/18/2020	10:05	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	10:20	Chloroform (CHCl3)	1.2	ug/L	0.5
5/18/2020	10:20	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	10:20	Primidone (PRIMDN)	6.6	ng/L	1
5/18/2020	10:20	Simazine (SIMAZ)	0.0060	ug/L	0.005
5/18/2020	10:20	Sucralose (SUCRAL)	1210	ng/L	100
5/18/2020	10:20	Sulfamethoxazole (SULTHZ)	11.5	ng/L	1

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/17/2020	9:50	Chloroform (CHCl3)	0.8	ug/L	0.5
8/17/2020	9:50	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/16/2020	9:15	Chloroform (CHCl3)	0.5	ug/L	0.5
11/16/2020	9:15	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

AMD-12/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
2/18/2020	11:45	Chloroform (CHCl3)	1.2	ug/L	0.5
2/18/2020	11:45	Total Trihalomethanes (TTHMs)	1.2	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	11:35	Chloroform (CHCl3)	1.3	ug/L	0.5
5/18/2020	11:35	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	11:35	Primidone (PRIMDN)	1.4	ng/L	1
5/18/2020	11:35	Simazine (SIMAZ)	0.0080	ug/L	0.005
5/18/2020	11:35	Sulfamethoxazole (SULTHZ)	3.3	ng/L	1

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
8/17/2020	10:40	Chloroform (CHCl3)	1.3	ug/L	0.5
8/17/2020	10:40	Total Trihalomethanes (TTHMs)	1.3	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/16/2020	10:05	Chloroform (CHCl3)	1.0	ug/L	0.5
11/16/2020	10:05	Total Trihalomethanes (TTHMs)	1.0	ug/L	0.5

AMD-12/3
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
2/18/2020 12:30	Chloroform (CHCl3)	1.1	ug/L	0.5
2/18/2020 12:30	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/18/2020 12:50	Chloroform (CHCl3)	0.9	ug/L	0.5
5/18/2020 12:50	Total Trihalomethanes (TTHMs)	0.9	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/18/2020 12:50	Carbamazepine (CBMAZP)	1.2	ng/L	1
5/18/2020 12:50	Diuron (DIURON)	0.0050	ug/L	0.005
5/18/2020 12:50	Primidone (PRIMDN)	5.2	ng/L	1
5/18/2020 12:50	Simazine (SIMAZ)	0.0140	ug/L	0.005
5/18/2020 12:50	Sucralose (SUCRAL)	648	ng/L	100
5/18/2020 12:50	Sulfamethoxazole (SULTHZ)	12.6	ng/L	1

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/17/2020 11:40	Chloroform (CHCl3)	0.8	ug/L	0.5
8/17/2020 11:40	Total Trihalomethanes (TTHMs)	0.8	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/16/2020 10:55	Chloroform (CHCl3)	TR	ug/L	0.5
11/16/2020 10:55	Total Trihalomethanes (TTHMs)	TR	ug/L	0.5

AMD-12/3
Organic Detections by Method

Year 2020, Quarter 4

METHOD: *524.2*

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit

AMD-12/4
Organic Detections by Method

Year 2020, Quarter 2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	12:10	Atrazine (ATRAZ)	0.0010	ug/L	0.001
5/18/2020	12:10	Carbamazepine (CBMAZP)	4.5	ng/L	1
5/18/2020	12:10	Diuron (DIURON)	0.0090	ug/L	0.005
5/18/2020	12:10	Primidone (PRIMDN)	5.2	ng/L	1
5/18/2020	12:10	Simazine (SIMAZ)	0.0290	ug/L	0.005
5/18/2020	12:10	Sucralose (SUCRAL)	868	ng/L	100
5/18/2020	12:10	Sulfamethoxazole (SULTHZ)	11.9	ng/L	1

AMD-12/5
Organic Detections by Method

Year 2020, Quarter 2

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/18/2020	11:05	Atrazine (ATRAZ)	0.0030	ug/L	0.001
5/18/2020	11:05	Carbamazepine (CBMAZP)	10.8	ng/L	1
5/18/2020	11:05	Primidone (PRIMDN)	9.5	ng/L	1
5/18/2020	11:05	Simazine (SIMAZ)	0.0730	ug/L	0.005
5/18/2020	11:05	Sucralose (SUCRAL)	1510	ng/L	100
5/18/2020	11:05	Sulfamethoxazole (SULTHZ)	17.1	ng/L	1

Summary of All 2020 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	2.4	3.5	9.3	19.9
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND	ND	2	2.6
Arsenic (dissolved)* (As-DIS), ug/L	OCWD	N/A	ND	ND	2	2.5
Barium (Ba), ug/L	OCWD	1000	34.8	40.9	5.9	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	0.16	0.34	0.35
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND	ND	ND	ND
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	2.4	2.3	ND	ND
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	1.39	0.8	1.54	1.3
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	0.014	Not Required	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	1.1	0.5	1.1	1.6
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	5	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	666	718	155	113
Iron (Fe), ug/L	OCWD	300	ND	ND	6.5	14.5
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	404	450	98	70
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND	0.1	0.1	0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	3.3	3	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.14	0.2	0.24	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	1.9	2	3.5	5.2
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD / WeckLab	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD/ WeckLab	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	ND	Not Required	Not Required
508	Chlorinated Pesticides	WeckLab	Not Required	ND	Not Required	Not Required
515.4	Chlorinated Acids	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required
537.1	PFAS Compounds	OCWD	ND - Detections	Not Required	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	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	ND	Not Required	Not Required

OCWD-KB1/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/17/2020 13:15	Chloroform (CHCl3)	1.1	ug/L	0.5
3/17/2020 13:15	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

METHOD: 537.1

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/17/2020 13:15	Perfluoro butane sulfonic acid (PFBS)	8.7	ng/L	2
3/17/2020 13:15	Perfluoro heptanoic acid (PFHpA)	3.7	ng/L	2
3/17/2020 13:15	Perfluoro hexane sulfonic acid (PFHxS)	5.6	ng/L	2
3/17/2020 13:15	Perfluoro nonanoic acid (PFNA)	3.4	ng/L	2
3/17/2020 13:15	Perfluoro octane sulfonic acid (PFOS)	8.1	ng/L	2
3/17/2020 13:15	Perfluoro octanoic acid (PFOA)	10.1	ng/L	2
3/17/2020 13:15	Perfluorohexanoic acid (PFHxA)	11.2	ng/L	2

METHOD: UNKWQAN

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/17/2020 13:15	PFOA + PFOS (PFOAOS)	18.2	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/16/2020 11:35	Chloroform (CHCl3)	0.5	ug/L	0.5
6/16/2020 11:35	Total Trihalomethanes (TTHMs)	0.5	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/16/2020 12:35	Chloroform (CHCl3)	1.1	ug/L	0.5
9/16/2020 12:35	Total Trihalomethanes (TTHMs)	1.1	ug/L	0.5

OCWD-KB1/1
Organic Detections by Method

Year 2020, Quarter 3

METHOD: CEC

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/16/2020	12:35	Diuron (DIURON)	0.0060	ug/L	0.005
9/16/2020	12:35	Simazine (SIMAZ)	0.0070	ug/L	0.005
9/16/2020	12:35	Sucralose (SUCRAL)	136	ng/L	100
9/16/2020	12:35	Sulfamethoxazole (SULTHZ)	1.4	ng/L	1

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
12/15/2020	13:15	Chloroform (CHCl3)	1.6	ug/L	0.5
12/15/2020	13:15	Total Trihalomethanes (TTHMs)	1.6	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 2020 Annual Report

TABLE J-1
OCWD MONITORING WELL AM-7
1,4-dioxane and NDMA Concentrations
2016 - 2020

AM-7/1 *Shallow Aquifer* *Perforations: 210-225 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/22/2016	<1	<2
5/16/2016	<1	<2
8/22/2016	<1	<2
11/16/2016	<1	na
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

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-2
OCWD MONITORING WELL AM-8
1,4-dioxane and NDMA Concentrations
2016 - 2020

AM-8/1 *Shallow Aquifer* *Perforations: 268-285 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
2/22/2016	<1	<2
5/16/2016	<1	<2
8/22/2016	<1	<2
11/16/2016	<1	na
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

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
2016 - 2020

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)
02/10/16	<1	<2	02/10/16	<1	<2	02/10/16	<1	<2
05/04/16	<1	<2	05/04/16	<1	<2	05/04/16	<1	<2
08/10/16	<1	<2	08/10/16	<1	<2	08/10/16	<1	<2
11/02/16	<1	<2	11/02/16	<1	<2	11/02/16	<1	<2
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

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)
02/10/16	<1	<2	02/10/16	<1	<2
05/04/16	<1	<2	05/04/16	<1	<2
08/10/16	<1	<2	08/10/16	<1	<2
11/02/16	<1	<2	11/02/16	<1	<2
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

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
2016 - 2020

AMD-12/1 *Principal Aquifer* *Perforations: 330-350 ft bgs*			**AMD-12/2** *Principal Aquifer* *Perforations: 490-520 ft bgs*			**AMD-12/3** *Principal Aquifer* *Perforations: 595-615 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)
02/23/16	<1	<2	03/08/16	<1	<2	02/23/16	<1	<2
05/17/16	<1	<2	05/17/16	<1	<2	05/17/16	<1	<2
08/23/16	<1	<2	08/23/16	<1	<2	08/23/16	<1	<2
11/15/16	<1	na	11/15/16	<1	na	11/15/16	<1	na
02/22/17	<1	<2	2/22/2017	<1	<2	2/22/2017	<1	<2
05/16/17	<1	<2	5/16/2017	<1	<2	5/16/2017	<1	<2
08/22/17	<1	<2	8/22/2017	<1	<2	8/22/2017	<1	<2
11/06/18	<1	<2	11/06/18	<1	<2	11/06/18	<1	<2
02/19/19	<1	<2	02/19/19	<1	<2	02/19/19	<1	<2
05/18/20	<1	<2	05/18/20	<1	<2	05/18/20	<1	<2

AMD-12/4 *Principal Aquifer* *Perforations: 725-745 ft bgs*			**AMD-12/5** *Principal Aquifer* *Perforations: 940-960 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)	Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/23/16	<1	<2	02/23/16	<1	<2
05/17/16	<1	<2	05/17/16	<1	<2
08/23/16	<1	<2	08/23/16	<1	<2
11/15/16	<1	na	11/15/16	<1	na
02/22/17	<1	<2	02/22/17	<1	<2
05/16/17	<1	<2	05/16/17	<1	<2
08/22/17	<1	<2	08/22/17	<1	<2
11/06/18	<1	<2	11/06/18	<1	<2
02/19/19	<1	<2	02/19/19	<1	<2
05/18/20	<1	<2	05/18/20	<1	<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
2016 - 2020

AM-10/1 *Shallow Aquifer* *Perforations: 217-235 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
03/08/16	<1	<2
06/14/16	<1	<2
09/20/16	<1	<2
12/06/16	<1	<2
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

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
2016 - 2020

KB1 *Shallow Aquifer* *Perforations: 180-200 ft bgs*		
Date	1,4-dioxane (ug/L)	NDMA (ng/L)
02/10/16	<1	<2
05/04/16	<1	<2
08/10/16	<1	<2
11/02/16	<1	<2
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

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-7
OCWD MONITORING WELL AM-7
2016 - 2020 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	02/22/16	0.047	41.8	278	109	<0.2	0.005	1.46	0.39
	04/20/16	na	15.8	150	na	na	0.004	1.68	0.19
	05/16/16	0.021	14.8	138	42	<0.2	0.004	1.6	0.18
	06/20/16	na	8.5	94	na	na	0.004	1.49	0.14
	08/22/16	0.013	7.9	68	20.2	0.5	0.005	1.62	0.25
	10/10/16	na	12.4	128	na	na	0.005	1.46	0.19
	11/16/16	0.018	11.1	90	31.5	<0.2	0.006	1.6	0.13
	12/12/16	na	8.6	94	na	na	0.006	1.56	0.16
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-8
OCWD MONITORING WELL AM-8
2016 - 2020 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	02/22/16	0.058	59.4	368	175	<0.2	0.015	1.25	0.45
	04/20/16	na	59.6	398	na	na	0.015	1.26	0.43
	05/16/16	0.046	47.7	344	148	<0.2	0.016	1.41	0.36
	06/20/16	na	55	368	na	na	0.015	1.37	0.41
	08/22/16	0.07	53.5	338	162	0.6	0.016	1.29	0.41
	10/10/16	na	43.6	318	na	na	0.015	1.39	0.36
	11/16/16	0.031	29.2	240	92.7	<0.2	0.014	1.51	0.23
	12/12/16	na	22.8	206	na	na	0.012	1.55	0.19
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-9
OCWD MONITORING WELL AMD-10
2016 - 2020 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	02/10/16	0.022	10.9	114	36.9	<0.2	0.024	1.92	0.1
	04/11/16	na	6.6	68	na	na	0.022	1.57	0.07
	05/04/16	0.011	6	73	23.4	<0.2	0.022	1.44	0.06
	06/20/16	na	90.9	570	na	na	0.006	0.33	0.78
	08/10/16	0.065	77.1	526	305	<0.2	0.008	0.5	0.69
	10/10/16	na	13.5	132	na	na	0.011	1.63	0.15
	11/02/16	0.023	19.8	190	55.5	<0.2	0.016	1.55	0.14
	12/12/16	na	14.8	122	na	na	0.017	1.73	0.11
	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

TABLE J-9
OCWD MONITORING WELL AMD-10
2016 - 2020 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	02/10/16	0.019	15.9	138	45.6	<0.2	0.045	2.12	0.15
	04/11/16	na	14.3	114	na	na	0.055	2.1	0.11
	05/04/16	0.027	19.5	162	49.9	<0.2	0.052	1.89	0.16
	06/20/16	na	36.0	232	na	na	0.06	1.64	0.26
	08/10/16	0.027	18.4	138	53.5	<0.2	0.066	1.46	0.17
	10/10/16	na	61.7	374	na	na	0.063	0.72	0.48
	11/02/16	0.065	76.9	532	249	<0.2	0.046	0.63	0.57
	12/12/16	na	48.4	486	na	na	0.057	1.04	0.38
	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
AMD-10/3 Principal Perforations 550-570 ft bgs	02/10/16	0.096	87.2	580	249	<0.2	0.096	0.52	0.97
	05/04/16	0.088	89.9	598	267	<0.2	0.083	0.44	0.94
	08/10/16	0.103	89.3	608	274	<0.2	0.082	0.44	0.88
	11/02/16	0.102	92.6	624	266	<0.2	0.098	0.47	0.84
	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

TABLE J-9
OCWD MONITORING WELL AMD-10
2016 - 2020 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	02/10/16	0.117	88.8	584	241	<0.2	0.089	0.43	0.61
	05/04/16	0.097	88.4	590	261	<0.2	0.098	0.44	0.63
	08/10/16	0.101	89.9	612	271	<0.2	0.102	0.41	0.65
	11/02/16	0.092	90.4	652	268	<0.2	0.095	0.39	0.62
	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
AMD-10/5 Principal Perforations 934-954 ft bgs	02/10/16	0.172	93.9	548	258	<0.2	0.268	0.91	0.43
	05/04/16	0.17	94.5	550	252	<0.2	0.264	0.89	0.43
	08/10/16	0.176	93.4	574	258	<0.2	0.277	0.7	0.44
	11/02/16	0.145	93.0	618	254	<0.2	0.269	0.65	0.45
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-10
OCWD MONITORING WELL AMD-12
2016 - 2020 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	02/23/16	0.029	34.1	210	79.3	<0.2	<0.002	1.59	0.23
	04/20/16	na	18.2	160	na	na	<0.002	1.92	0.14
	05/17/16	0.024	11.7	115	33.3	<0.2	<0.002	1.76	0.09
	06/20/16	na	27.7	168	na	na	<0.002	1.3	0.21
	08/23/16	0.07	81.1	538	296	<0.2	<0.002	0.47	0.62
	10/10/16	na	60.9	452	na	na	<0.002	0.78	0.48
	11/15/16	0.036	41.5	358	163	<0.2	<0.002	1.19	0.33
	12/12/16	na	36.3	286	na	na	<0.002	1.34	0.26
	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
AMD-12/2 Principal Perforations 490-520 ft bgs	03/08/16	0.024	18.5	136	45.1	<0.2	<0.002	2.20	0.13
	05/17/16	0.028	13.7	125	33.6	<0.2	<0.002	2.05	0.12
	08/23/16	0.026	16.6	128	37.7	0.4	<0.002	1.86	0.53
	11/15/16	0.03	28.8	174	58.6	<0.2	<0.002	1.24	0.21
	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

TABLE J-10
OCWD MONITORING WELL AMD-12
2016 - 2020 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	02/23/16	0.087	81.2	546	239	<0.2	<0.002	0.80	0.68
	05/17/16	0.086	79.9	514	236	<0.2	<0.002	0.92	0.63
	08/23/16	0.088	76	494	229	<0.2	<0.002	0.89	0.57
	11/15/16	0.091	80.6	530	218	<0.2	<0.002	0.85	0.6
	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
AMD-12/4 Principal Perforations 725-745 ft bgs	02/23/16	0.17	92.4	476	212	<0.2	<0.002	<0.002	0.97
	05/17/16	0.147	90.9	524	220	0.2	<0.002	<0.002	0.81
	08/23/16	0.142	92.3	520	238	0.5	<0.002	<0.002	0.84
	11/15/16	0.108	90.2	582	243	<0.2	<0.002	<0.002	0.87
	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

TABLE J-10
OCWD MONITORING WELL AMD-12
2016 - 2020 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-12/5 Principal Perforations 940-960 ft bgs	02/23/16	0.178	90.3	534	228	<0.2	<0.002	0.75	0.63
	05/17/16	0.166	93.3	510	224	0.2	<0.002	1.17	0.6
	08/23/16	0.185	91.9	514	235	<0.2	<0.002	0.97	0.56
	11/15/16	0.15	91.8	556	236	<0.2	<0.002	0.92	0.59
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-11
OCWD MONITORING WELL AM-10
2016 - 2020 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	1/19/2016	na	29.3	192	na	<0.2	0.004	1.94	0.26
	3/8/2016	0.034	34.6	248	112	<0.2	0.004	1.64	0.24
	6/14/2016	0.019	10	106	33	<0.2	0.004	1.77	0.14
	9/20/2016	0.017	8	78	28.2	<0.2	0.004	1.59	0.16
	12/6/2016	0.016	8.8	86	28	<0.2	0.005	1.79	0.09
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE J-12
OCWD MONITORING WELL KB1
2016 - 2020 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	2/10/2016	0.014	6.3	88	20.6	<0.2	<0.002	1.63	0.16
	5/4/2016	0.015	10	90	39.6	<0.2	<0.002	1.48	0.12
	8/10/2016	0.014	7.8	74	35	<0.2	<0.002	1.82	0.09
	11/2/2016	0.018	11.6	126	53.3	<0.2	0.002	1.93	0.12
	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

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
2020 Annual Report

GWRS 2020 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	03/16/2020	06/15/2020	09/21/2020	11/30/2020
SAR-11/1-3	03/16/2020	06/15/2020	09/21/2020	11/30/2020
SAR-12/1-4	02/04/2020	05/05/2020	08/04/2020	11/05/2020
SAR-13/1-4	02/04/2020	04/01/2020	08/05/2020	11/04/2020

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 2020 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. Reported ranges such as ND - <NL, ND - <RL, ND - <SMCL, ND - <MCL, etc. indicate that results for the quarter ranged from not detected at the reportable detection level (RDL) to a detection less than the applicable regulatory limit.

► 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

► PMCL: Primary Maximum Contaminant Level

► RL: SWRCB Division of Drinking Water (DDW) Response Level

► SMCL: Secondary Maximum Contaminant Level

► TR: Trace; indicates a detection at no greater than the RDL and no less than one-half of the RDL

Summary of All 2020 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	9.6 - 104	11.7 - 644	11 - 446	9.2 - 90
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 5	ND - 4.5	ND - 4.4	ND - 5
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 5.1	ND - 4.8	ND - 4.5	ND - 4.7
Barium (Ba), ug/L	OCWD	1000	11.8 - 24.5	11.9 - 27.2	12 - 26.9	11.3 - 24.8
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	ND	ND - 0.11	ND - 0.11
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.3	ND - 0.27	ND - 0.28	ND - 0.32
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.4	ND - 2.2	ND - 2.5	ND - 1.6
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.05	ND - 1.22	ND - 1.28	ND - 1.08
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.008	Not Required	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 - 2.1	ND - 4.1	ND - 5	ND - 2.2
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	100 - 138	110 - 140	110 - 137	103 - 145
Iron (Fe), ug/L	OCWD	300	ND - 44.4	ND - 96	ND - 62.5	ND - 45.4
Manganese (Mn), ug/L	OCWD	50	ND - 4.3	ND - 4.4	ND - 4.3	ND - 4.7
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 4.1	ND - 4.1	ND - 4.1	ND - 4.5
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND - 1	ND - 1	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	60 - 86	68 - 86	68 - 82	64 - 90
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.7	ND - 4.1	ND - 2.8	ND - 1.5
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1	ND	ND	ND
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	0.23 - 0.25	0.23 - 0.26	0.24 - 0.27	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	ND - 3.7	ND - 3.5	ND - 3.2	ND - 3.5
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	Not Required
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-10/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:30	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
3/16/2020 11:30	Chloroform (CHCl3)	1.3	ug/L	0.5
3/16/2020 11:30	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:30	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 11:45	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/15/2020 11:45	Chloroform (CHCl3)	1.7	ug/L	0.5
6/15/2020 11:45	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 11:45	n-Nitrosodimethylamine (NDMA)	4.3	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 12:10	Bromodichloromethane (CHBrCl)	1.3	ug/L	0.5
9/21/2020 12:10	Chloroform (CHCl3)	2.7	ug/L	0.5
9/21/2020 12:10	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/21/2020 12:10	Total Trihalomethanes (TTHMs)	4.0	ug/L	0.5

SAR-10/1
Organic Detections by Method

Year 2020, Quarter 3

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 12:10	n-Nitrosodimethylamine (NDMA)	3.8	ng/L	2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 11:10	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
11/30/2020 11:10	Chloroform (CHCl3)	1.4	ug/L	0.5
11/30/2020 11:10	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 11:10	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2

SAR-10/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:50	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
3/16/2020 11:50	Chloroform (CHCl3)	1.4	ug/L	0.5
3/16/2020 11:50	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:50	n-Nitrosodimethylamine (NDMA)	4.6	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 10:15	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
6/15/2020 10:15	Chloroform (CHCl3)	2.1	ug/L	0.5
6/15/2020 10:15	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 10:15	n-Nitrosodimethylamine (NDMA)	5.2	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 13:15	Bromodichloromethane (CHBrCl)	1.9	ug/L	0.5
9/21/2020 13:15	Chloroform (CHCl3)	3.1	ug/L	0.5
9/21/2020 13:15	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/21/2020 13:15	Total Trihalomethanes (TTHMs)	5.0	ug/L	0.5

SAR-10/2
Organic Detections by Method

Year 2020, Quarter 3

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 13:15	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 12:10	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/30/2020 12:10	Chloroform (CHCl3)	1.5	ug/L	0.5
11/30/2020 12:10	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 12:10	n-Nitrosodimethylamine (NDMA)	4.4	ng/L	2

SAR-10/3

Organic Detections by Method

Year 2020, Quarter 1

METHOD: ***524.2***

Sample Date & Time		*Parameter*	*Result*	*Units*	*Reportable Detection Limit*
3/16/2020	10:55	Methylene Chloride (CH2Cl2)	TR	ug/L	0.5

SAR-10/4
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/16/2020	9:50	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
3/16/2020	9:50	Chloroform (CHCl3)	1.5	ug/L	0.5
3/16/2020	9:50	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
3/16/2020	9:50	n-Nitrosodimethylamine (NDMA)	5.0	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/15/2020	10:35	Bromodichloromethane (CHBrCl)	1.5	ug/L	0.5
6/15/2020	10:35	Chloroform (CHCl3)	2.6	ug/L	0.5
6/15/2020	10:35	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
6/15/2020	10:35	Total Trihalomethanes (TTHMs)	4.1	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
6/15/2020	10:35	n-Nitrosodimethylamine (NDMA)	7.6	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/21/2020	11:10	Bromodichloromethane (CHBrCl)	1.8	ug/L	0.5
9/21/2020	11:10	Chloroform (CHCl3)	3.2	ug/L	0.5
9/21/2020	11:10	Dibromochloromethane (CHBr2C)	TR	ug/L	0.5
9/21/2020	11:10	Total Trihalomethanes (TTHMs)	5.0	ug/L	0.5

SAR-10/4
Organic Detections by Method

Year 2020, Quarter 3

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/21/2020	11:10	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/30/2020	10:05	Bromodichloromethane (CHBrCl)	0.5	ug/L	0.5
11/30/2020	10:05	Chloroform (CHCl3)	1.4	ug/L	0.5
11/30/2020	10:05	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/30/2020	10:05	n-Nitrosodimethylamine (NDMA)	4.2	ng/L	2

Summary of All 2020 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	5.8 - 8.9	7.4 - 11.7	5.3 - 9.2	4.3 - 7.7
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	1.9 - 3.6	2 - 3.3	2.1 - 3.6	2.2 - 4.2
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	1.9 - 3.6	2.2 - 3.8	2.1 - 3.7	2 - 3.8
Barium (Ba), ug/L	OCWD	1000	15.3 - 27.3	15.6 - 28	16.2 - 25.9	16.2 - 29.9
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 - 1.9	ND - 3	ND	ND - 3.3
Fluoride (F), mg/L	OCWD	2	ND - 0.54	ND - 0.48	ND - 0.52	ND - 0.48
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 0.25	ND - 0.23	ND - 0.26	ND - 0.26
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1	ND	ND	ND - 1.2
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 1.14	ND - 1.03	ND - 1.14	ND - 1.08
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	Not Required	ND - 0.002	Not Required	Not Required
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 2.5	ND - 3.3	ND - 2.9	ND - 3.2
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 - 3.3	ND - 2.8	ND - 2.5	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	125 - 214	129 - 216	136 - 202	141 - 201
Iron (Fe), ug/L	OCWD	300	12.9 - 29.7	11.2 - 19.6	7.6 - 11.8	9.2 - 17.2
Manganese (Mn), ug/L	OCWD	50	ND - 7.9	ND - 8.5	ND - 9.6	ND - 12.5
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 7.5	ND - 8.2	ND - 9.6	ND - 11.4
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND - 1	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	78 - 138	80 - 130	90 - 136	92 - 134
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	0.2	0.2 - 0.3	0.2	0.2
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	0.18 - 0.25	0.17 - 0.24	0.19 - 0.24	0.17 - 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 - 10.3	ND - 10.3	ND - 9.3	ND - 9.9
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
2,6-Dinitrotoluene (26DNT), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
4,4'-DDE (DDE), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Acetochlor (ACETOC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
DCPA-Dacthal (DCPA), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
EPTC (EPTC), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required
Methyl tert-butyl ether (MTBE), ug/L	OCWD	5**	ND	ND	ND	ND
Molinate (MOLINT), ug/L	OCWD	20***	Not Required	ND	Not Required	Not Required
Terbacil (TRBACL), ug/L	OCWD	N/A	Not Required	ND	Not Required	Not Required

* MCL based on total not dissolved; ** CA Secondary MCL; *** CA Primary MCL

Summary of 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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	ND	Not Required	Not Required
551.1	Disinfection Byproducts (DBPs) - Haloacetonitriles	WeckLab	Not Required	ND	Not Required	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-11/1
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:40	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
3/16/2020 11:40	Chloroform (CHCl3)	1.5	ug/L	0.5
3/16/2020 11:40	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 11:40	n-Nitrosodimethylamine (NDMA)	2.1	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 12:00	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
6/15/2020 12:00	Chloroform (CHCl3)	1.4	ug/L	0.5
6/15/2020 12:00	Total Trihalomethanes (TTHMs)	2.1	ug/L	0.5

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 11:50	Bromodichloromethane (CHBrCl)	0.6	ug/L	0.5
9/21/2020 11:50	Chloroform (CHCl3)	1.3	ug/L	0.5
9/21/2020 11:50	Total Trihalomethanes (TTHMs)	1.9	ug/L	0.5

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 10:40	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/30/2020 10:40	Chloroform (CHCl3)	1.3	ug/L	0.5
11/30/2020 10:40	Total Trihalomethanes (TTHMs)	2.0	ug/L	0.5

SAR-11/2
Organic Detections by Method

Year 2020, Quarter 1

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 10:45	Bromodichloromethane (CHBrCl)	1.1	ug/L	0.5
3/16/2020 10:45	Chloroform (CHCl3)	2.2	ug/L	0.5
3/16/2020 10:45	Total Trihalomethanes (TTHMs)	3.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
3/16/2020 10:45	n-Nitrosodimethylamine (NDMA)	4.5	ng/L	2

Year 2020, Quarter 2

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 11:20	Bromodichloromethane (CHBrCl)	0.9	ug/L	0.5
6/15/2020 11:20	Chloroform (CHCl3)	1.9	ug/L	0.5
6/15/2020 11:20	Total Trihalomethanes (TTHMs)	2.8	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/15/2020 11:20	n-Nitrosodimethylamine (NDMA)	2.9	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 11:00	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
9/21/2020 11:00	Chloroform (CHCl3)	1.8	ug/L	0.5
9/21/2020 11:00	Total Trihalomethanes (TTHMs)	2.5	ug/L	0.5

METHOD: CEC

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 11:00	Azithromycin (AZTMCN)	74.4	ng/L	50

SAR-11/2
Organic Detections by Method

Year 2020, Quarter 3

METHOD: ***NDMA-LOW***

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
9/21/2020 11:00	n-Nitrosodimethylamine (NDMA)	2.3	ng/L	2

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 11:50	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/30/2020 11:50	Chloroform (CHCl3)	1.7	ug/L	0.5
11/30/2020 11:50	Total Trihalomethanes (TTHMs)	2.4	ug/L	0.5

METHOD: ***NDMA-LOW***

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/30/2020 11:50	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2

Summary of All 2020 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	2.2 - 11.2	1.9 - 8.2	2.3 - 8.7	1.7 - 7.7
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 1.8	ND - 1.7	ND - 1.6	ND - 2.1
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 1.9	ND - 1.7	ND - 1.6	ND - 2.2
Asbestos (ASBESTOS), MFL	EurofCEI/Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	31 - 55.5	31.7 - 55.4	31.5 - 55.2	31.8 - 57.8
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 - 2.5	ND - 4	ND - 4.1	ND - 4.1
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.26 - 0.42	0.27 - 0.43	0.24 - 0.41	0.25 - 0.42
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 2.99	ND - 4.71	ND - 5.2	ND - 5.42
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 1.5	ND - 1.1	ND - 1.1	ND - 1.1
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 0.14	ND - 0.14	ND - 0.17	ND - 0.16
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND	ND	ND - 0.002	ND - 0.004
Perchlorate (CLO4), ug/L	OCWD	6	ND	ND	ND	ND
Selenium (Se), ug/L	OCWD	50	ND - 1.6	ND - 1.2	ND - 1.1	ND - 1.1
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
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), pg/L	EuroTSac/EutalKn x	30	ND	ND	ND	ND
Primary Drinking Water Standards - Radioactivity						
Gross Alpha Excluding Uranium (TOTa-U), pCi/L	FGL	15	ND - 2.71	0.588 - 2.47	0.73 - 2.17	1.59 - 2.53
Other Radionuclides	FGL/EuroTSTL	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	ND	ND
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	Not Required	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	Not Required	ND	ND - 116.2	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	Not Required	Not Required	Not Required
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	350 - 396	347 - 395	314 - 407	236 - 430
Iron (Fe), ug/L	OCWD	300	ND - 26.2	6.2 - 14.7	ND - 16.3	ND - 11
Manganese (Mn), ug/L	OCWD	50	ND - 18.6	ND - 18.1	ND - 17.3	ND - 24.5
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 18.2	ND - 17.8	ND - 20	ND - 21.3
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND - 1	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	204 - 274	212 - 266	188 - 260	145 - 278
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND - 0.3	ND - 0.2	ND - 0.1	ND - 0.2
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.1	ND - 1	ND	ND - 1.1
Lead (Pb), ug/L	OCWD	15	ND	ND	ND	ND
CA DDW Unregulated Chemicals						
Boron (B), mg/L	OCWD	N/A	ND	ND	ND	ND
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	ND - 5	ND - 4.7	ND - 5.3
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalr / OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalr / 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	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 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 / EuTalKnx	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD / WeckLab	ND	ND	ND	ND
508	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND	ND	ND	ND - <MCL
524M-TCP	123TCP & EDB	OCWD	ND	ND	ND	ND
525.2	Semi-Volatile Organic Compounds (SOCs)	OCWD	ND	ND	ND	ND
531	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	ND	ND - <NL	ND	ND
CEC	Chemicals of Emerging Concern	OCWD	ND	ND	ND - Detection	ND
NDMA-LOW	NDMA-LOW Analytical Procedure	OCWD	ND	ND	ND	ND

SAR-12/1
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 625.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/5/2020	10:20	bis (2-ethylhexyl) phthalate (DEHP)	4.2	ug/L	20

SAR-12/2
Organic Detections by Method

Year 2020, Quarter 2

METHOD: ***625.1***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/5/2020	11:50	bis (2-ethylhexyl) phthalate (DEHP)	4.1	ug/L	20

Year 2020, Quarter 3

METHOD: ***CEC***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
9/17/2020	11:35	Caffeine (CAFFEI)	6.8	ng/L	3

SAR-12/3
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 625.1

Sample Date &	Time	Parameter	Result	Units	Reportable Detection Limit
5/5/2020	12:25	bis (2-ethylhexyl) phthalate (DEHP)	4.0	ug/L	20

SAR-12/4

Organic Detections by Method

Year 2020, Quarter 2

METHOD: ***625.1***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/5/2020	10:45	bis (2-ethylhexyl) phthalate (DEHP)	3.9	ug/L	20

Year 2020, Quarter 4

METHOD: ***524.2***

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/5/2020	10:50	Methylene Chloride (CH_2Cl_2)	TR	ug/L	0.5

Summary of All 2020 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 - 7	1.4 - 4.5	1.8 - 9.6	2.8 - 68.2
Antimony (Sb), ug/L	OCWD	6	ND	ND	ND	ND
Arsenic (As), ug/L	OCWD	10	ND - 3.9	ND - 2.1	ND - 2.6	1.4 - 3.6
Arsenic (dissolved) (As-DIS), ug/L	OCWD	N/A	ND - 3.6	ND - 2.2	ND - 2.4	1.3 - 3.7
Asbestos (ASBESTOS), MFL	EurofCEI/'Eurofins	7	ND	ND	ND	ND
Barium (Ba), ug/L	OCWD	1000	18.1 - 58.1	24.6 - 54.2	13.1 - 54.2	10.4 - 45
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 - 2.2	ND - 2	ND - 1.3	ND - 1.7
Cyanide (CN), ug/L	OCWD	150	ND	ND	ND	ND
Fluoride (F), mg/L	OCWD	2	0.23 - 0.43	0.24 - 0.45	0.23 - 0.45	0.25 - 0.56
Hexavalent Chromium (CrVI), ug/L	OCWD	10	ND - 2.78	ND - 2.8	ND - 2.45	ND - 2.29
Mercury (Hg), ug/L	OCWD	2	ND	ND	ND	ND
Nickel (Ni), ug/L	OCWD	100	ND - 2.4	ND - 2	ND	ND - 2
Nitrate Nitrogen (NO3-N), mg/L	OCWD	10	ND - 0.27	ND - 0.71	ND - 1.19	ND - 1.28
Nitrite Nitrogen (NO2-N), mg/L	OCWD	1	ND - 0.006	ND - 0.013	ND - 0.024	ND - 0.009
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	0.04 - 1.02	0.889 - 1.33	1.37 - 2.16	0.79 - 2.455
Other Radionuclides	FGL/EuroTSTL/ 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	ND - 3.3	ND - 3.2
Primary Drinking Water Standards - Biological						
E. Coli (Colilert - MPN/100mL) (ECOLIQ), MPN	OCWD	N/A	Not Required	ND	ND	ND
Total Coliform (Colilert - MPN/100mL) (TCOLIQ), MPN	OCWD	N/A	Not Required	ND	ND	ND
Total Coliform (Mult. Tube Fermentation) (TCOLIM), MPN	OCWD	N/A	ND	Not Required	Not Required	Not Required
Secondary Drinking Water Standards						
Apparent Color (unfiltered) (APCOLR), UNITS	OCWD	15	ND	ND	ND	ND
Electrical Conductivity (EC), uS/cm	OCWD	900	342 - 424	217 - 434	171 - 420	150 - 388
Iron (Fe), ug/L	OCWD	300	ND - 7.1	ND - 6.9	ND - 8.5	ND - 78.2
Manganese (Mn), ug/L	OCWD	50	ND - 21.8	ND - 20	ND - 20.3	ND - 24.5
Manganese (dissolved)* (Mn-DIS), ug/L	OCWD	N/A	ND - 21.3	ND - 20.3	ND - 17.8	ND - 19.6
Threshold Odor Number (Median) (ODOR), TON	OCWD	3	ND	ND	ND	ND
Total Dissolved Solids (TDS), mg/L	OCWD	500	198 - 256	128 - 278	106 - 268	102 - 270
Other Constituents	OCWD	Varies	ND - <SMCL	ND - <SMCL	ND - <SMCL	ND - <SMCL
Turbidity (TURB), NTU	OCWD	5	ND	ND - 0.1	0.1 - 0.2	ND - 0.5
Action Level Chemicals						
Copper (Cu), ug/L	OCWD	1300	ND - 1.5	ND - 1.2	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 - 0.14	ND - 0.15
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 - 4.4	ND - 4.4	ND - 7.7	ND - 9.7
EPA Unregulated Chemicals						
2,4-Dinitrotoluene (24DNT), ug/L	EurfCalr / OCWD	N/A	ND	ND	ND	ND
2,6-Dinitrotoluene (26DNT), ug/L	EurfCalr / 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	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 2020 Volatile and Semi-Volatile Water Quality Chemicals

Method	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 / EuTalKnx	ND	ND	ND	ND
504.1	EDB, DBCP & 123TCP	OCWD / WeckLab	ND	ND	ND	ND
508	Chlorinated Pesticides	WeckLab	ND	ND	ND	ND
515.4	Chlorinated Acids	WeckLab	ND	ND	ND	ND
524.2	Volatile Organic Compounds (VOCs)	OCWD	ND	ND	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	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	ND	ND - <NL	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

SAR-13/1
Organic Detections by Method

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/4/2020 10:15	Bromodichloromethane (CHBrCl)	TR	ug/L	0.5
11/4/2020 10:15	Chloroform (CHCl3)	0.7	ug/L	0.5
11/4/2020 10:15	Total Trihalomethanes (TTHMs)	0.7	ug/L	0.5

SAR-13/3
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 625.1

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
5/6/2020	11:55	bis (2-ethylhexyl) phthalate (DEHP)	4.1	ug/L	20
5/6/2020	11:55	Diethyl phthalate (DEP)	51	ug/L	9.9

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
11/4/2020	12:00	Bromodichloromethane (CHBrCl)	0.7	ug/L	0.5
11/4/2020	12:00	Chloroform (CHCl3)	1.5	ug/L	0.5
11/4/2020	12:00	Total Trihalomethanes (TTHMs)	2.2	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/14/2020	11:00	n-Nitrosodimethylamine (NDMA)	2.2	ng/L	2
10/26/2020	11:55	n-Nitrosodimethylamine (NDMA)	2.4	ng/L	2
11/4/2020	12:00	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2
11/18/2020	12:35	n-Nitrosodimethylamine (NDMA)	3.1	ng/L	2
12/2/2020	11:05	n-Nitrosodimethylamine (NDMA)	3.2	ng/L	2
12/14/2020	12:20	n-Nitrosodimethylamine (NDMA)	3.7	ng/L	2
12/31/2020	11:50	n-Nitrosodimethylamine (NDMA)	3.2	ng/L	2

SAR-13/4
Organic Detections by Method

Year 2020, Quarter 2

METHOD: 625.1

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
5/6/2020 10:55	bis (2-ethylhexyl) phthalate (DEHP)	4.0	ug/L	20

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
6/30/2020 10:05	n-Nitrosodimethylamine (NDMA)	2.6	ng/L	2

Year 2020, Quarter 3

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
8/5/2020 10:00	Bromodichloromethane (CHBrCl)	0.8	ug/L	0.5
8/5/2020 10:00	Chloroform (CHCl3)	1.6	ug/L	0.5
8/5/2020 10:00	Total Trihalomethanes (TTHMs)	2.3	ug/L	0.5
9/17/2020 10:45	Bromodichloromethane (CHBrCl)	1.0	ug/L	0.5
9/17/2020 10:45	Chloroform (CHCl3)	2.3	ug/L	0.5
9/17/2020 10:45	Total Trihalomethanes (TTHMs)	3.3	ug/L	0.5

METHOD: NDMA-LOW

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
7/13/2020 11:00	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2
7/27/2020 10:40	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
8/5/2020 10:00	n-Nitrosodimethylamine (NDMA)	2.8	ng/L	2
8/20/2020 10:05	n-Nitrosodimethylamine (NDMA)	3.6	ng/L	2
9/2/2020 10:25	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2
9/17/2020 10:45	n-Nitrosodimethylamine (NDMA)	3.5	ng/L	2

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time	Parameter	Result	Units	Reportable Detection Limit
11/4/2020 10:50	Bromodichloromethane (CHBrCl)	1.0	ug/L	0.5
11/4/2020 10:50	Chloroform (CHCl3)	2.2	ug/L	0.5
11/4/2020 10:50	Total Trihalomethanes (TTHMs)	3.2	ug/L	0.5

SAR-13/4
Organic Detections by Method

Year 2020, Quarter 4

METHOD: 524.2

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit

METHOD: NDMA-LOW

Sample Date & Time		Parameter	Result	Units	Reportable Detection Limit
10/1/2020	10:25	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2
10/14/2020	9:50	n-Nitrosodimethylamine (NDMA)	3.2	ng/L	2
10/26/2020	11:05	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
11/4/2020	10:50	n-Nitrosodimethylamine (NDMA)	3.3	ng/L	2
11/18/2020	11:35	n-Nitrosodimethylamine (NDMA)	3.4	ng/L	2
12/2/2020	10:20	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
12/14/2020	11:25	n-Nitrosodimethylamine (NDMA)	3.0	ng/L	2
12/31/2020	10:30	n-Nitrosodimethylamine (NDMA)	2.9	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
2020 Annual Report

TABLE L-1
OCWD MONITORING WELL SAR-10
1,4-dioxane and NDMA Concentrations
2016- 2020

SAR-10/1
Upper Rho Aquifer
Perforations: 590-600 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/20/2016	na	2.2
2/24/2016	na	2.8
3/22/2016	<1	<2
4/13/2016	na	<2
5/31/2016	<1	<2
6/22/2016	na	3.6
7/27/2016	na	4
9/7/2016	<1	3.4
12/7/2016	<1	5.8
3/21/2017	<1	2.6
5/30/2017	<1	<2
9/6/2017	<1	<2
12/4/2017	<1	2.8
3/20/2018	<1	2.6
6/18/2018	<1	4.1
9/5/2018	<1	<2
12/3/2018	<1	4.5
3/20/2019	<1	4.2
6/18/2019	<1	3.7
9/4/2019	<1	4.2
12/4/2019	<1	4.6
3/16/2020	<1	3.6
6/15/2020	<1	4.3
9/21/2020	<0.5	3.8
11/30/2020	<0.5	3.7

SAR-10/2
Lower Rho Aquifer
Perforations: 690-710 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/20/2016	na	2.3
2/24/2016	na	3
3/22/2016	<1	<2
4/13/2016	na	<2
5/31/2016	<1	2
6/22/2016	na	5.2
7/27/2016	na	6
9/7/2016	<1	5.9
12/7/2016	<1	5.8
3/21/2017	<1	3.1
5/30/2017	<1	<2
9/6/2017	<1	2.1
12/4/2017	<1	3
3/20/2018	<1	2.5
6/18/2018	<1	6
9/5/2018	<1	5.5
12/3/2018	<1	5.6
3/20/2019	<1	5.5
6/18/2019	<1	4.9
9/4/2019	<1	4.9
12/4/2019	<1	4.2
3/16/2020	<1	4.6
6/15/2020	<1	5.2
9/21/2020	<0.5	4.2
11/30/2020	<0.5	4.4

SAR-10/3
Main 2 Aquifer
Perforations: 800-820 ft bgs

Date	1,4-dioxane (ug/L)	NDMA (ng/L)
1/20/2016	na	<2
2/24/2016	na	<2
3/22/2016	<1	<2
4/13/2016	na	<2
5/31/2016	<1	<2
6/22/2016	na	<2
7/27/2016	na	<2
9/7/2016	<1	2.3
12/7/2016	<1	3.2
3/21/2017	<1	<2
5/30/2017	<1	<2
9/6/2017	<1	<2
12/4/2017	<1	<2
3/20/2018	<1	<2
6/18/2018	<1	<2
9/5/2018	<1	<2
12/3/2018	<1	2.3
3/20/2019	<1	<2
6/18/2019	<1	2.3
9/4/2019	<1	2.8
12/4/2019	<1	2
3/16/2020	<1	<2
6/15/2020	<1	<2
9/21/2020	<0.5	<2
11/30/2020	<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)
1/20/2016	na	2
2/24/2016	na	2.8
3/22/2016	<1	<2
4/13/2016	na	<2
5/31/2016	<1	3.4
6/22/2016	na	5.8
7/27/2016	na	5.3
9/7/2016	<1	4.3
12/7/2016	<1	5.2
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

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
2016 - 2020

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)
1/20/2016	na	<2	1/20/2016	na	2.2	1/20/2016	na	<2
2/24/2016	na	<2	2/24/2016	na	2.4	2/24/2016	na	<2
3/21/2016	<1	<2	3/21/2016	<1	<2	3/21/2016	<1	<2
4/13/2016	na	<2	4/13/2016	na	<2	4/13/2016	na	<2
6/1/2016	<1	<2	6/1/2016	<1	<2	6/1/2016	<1	<2
6/22/2016	na	<2	6/22/2016	na	<2	6/22/2016	na	<2
7/27/2016	na	<2	7/27/2016	na	<2	7/27/2016	na	<2
9/6/2016	<1	<2	9/6/2016	<1	<2	9/6/2016	<1	<2
12/5/2016	<1	<2	12/5/2016	<1	2.6	12/5/2016	<1	<2
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

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
2016- 2020

SAR-12/1 *Lower Rho Aquifer* *Perforations: 605-625 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

SAR-12/2 *Main 2 Aquifer* *Perforations: 755-775 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

SAR-12/3 *Main 4 Aquifer* *Perforations: 915-930 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

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

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
2016- 2020

SAR-13/1 *Lower Rho Aquifer* *Perforations: 600-620 ft bgs*			**SAR-13/2** *Main 2 Aquifer* *Perforations: 750-770 ft bgs*			**SAR-13/3** *Main 4 Aquifer* *Perforations: 910-930 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
4/1/2020	na	<2	4/1/2020	na	<2	4/1/2020	na	<2
4/15/2020	na	<2	4/15/2020	na	<2	4/15/2020	na	<2
4/30/2020	na	<2	4/30/2020	na	<2	4/30/2020	na	<2
5/6/2020	<1	<2	5/6/2020	<1	<2	5/6/2020	<1	<2
5/21/2020	na	<2	5/21/2020	na	<2	5/21/2020	na	<2
6/4/2020	na	<2	6/4/2020	na	<2	6/1/2020	na	<2
6/17/2020	na	<2	6/17/2020	na	<2	6/17/2020	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
8/5/2020	<0.5	<2	8/5/2020	<0.5	<2	8/5/2020	<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	2.2
10/26/2020	na	<2	10/26/2020	na	<2	10/26/2020	na	2.4
11/4/2020	<0.5	<2	11/4/2020	<0.5	<2	11/4/2020	<0.5	2.8
11/18/2020	na	<2	11/18/2020	na	<2	11/18/2020	na	3.1
12/2/2020	na	<2	12/2/2020	na	<2	12/2/2020	na	3.2
12/14/2020	na	<2	12/14/2020	na	<2	12/14/2020	na	3.7
12/31/2020	na	<2	12/31/2020	na	<2	12/31/2020	na	3.2

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

Notes: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-5
OCWD MONITORING WELL SAR-10
2016 - 2020 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	1/20/2016	na	7.3	6.5	74	na	na	0.044	0.9	0.28
	2/24/2016	na	7	7.1	107	na	na	0.028	0.84	0.25
	3/22/2016	0.017	6	6.3	77	44.2	<0.2	0.03	0.68	0.24
	4/13/2016	na	6.2	6.7	82	na	na	0.023	0.7	0.24
	5/31/2016	0.016	6.8	7	88	45.8	<0.2	0.025	0.79	0.19
	6/22/2016	na	7.1	8	92	na	na	0.044	0.62	0.15
	7/27/2016	na	8.2	8.5	82	na	na	0.009	1.06	0.16
	9/7/2016	0.017	8.2	7.7	98	47.2	<0.2	0.019	1.09	0.13
	12/7/2016	0.014	7	7.1	138	50.5	<0.2	0.01	1.05	0.12
	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
SAR-10/2 Lower Rho Perforations 690-710 ft bgs	1/20/2016	na	6.7	0.05	71	na	na	<0.002	1.71	0.07
	2/24/2016	na	6.1	0.6	81	na	na	<0.002	1.51	0.07
	3/22/2016	0.011	5.7	0.6	73	35.7	<0.2	<0.002	1.38	0.08
	4/13/2016	na	5.6	0.05	63	na	na	<0.002	1.47	0.06
	5/31/2016	0.015	6.4	0.05	68	39.5	<0.2	<0.002	1.55	0.06
	6/22/2016	na	7.1	0.6	62	na	na	<0.002	1.6	0.1
	7/27/2016	na	8.1	0.6	74	na	na	<0.002	1.8	0.22
	9/7/2016	0.015	7.7	0.05	82	40.1	<0.2	<0.002	1.83	0.06
	12/7/2016	0.011	6.7	0.05	70	39.5	<0.2	0.003	1.67	0.06
	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

TABLE L-5
OCWD MONITORING WELL SAR-10
2016 - 2020 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	1/20/2016	na	9.2	9.3	88	na	na	<0.002	<0.1	0.16
	2/24/2016	na	8.1	10.3	107	na	na	<0.002	<0.1	0.16
	3/22/2016	0.017	7.3	11.1	99	44.1	<0.2	<0.002	<0.1	0.16
	4/13/2016	na	6.5	10.9	81	42.4	<0.2	<0.002	<0.1	0.16
	5/31/2016	0.015	5.8	10.2	86	na	na	<0.002	<0.1	0.11
	6/22/2016	na	5.9	10.1	88	na	na	<0.002	<0.1	0.13
	7/27/2016	na	6.4	10.6	94	na	na	<0.002	<0.1	0.12
	9/7/2016	0.014	7.5	10.9	92	45.8	<0.2	<0.002	<0.1	0.11
	12/7/2016	0.014	7.6	10.8	90	47.3	<0.2	<0.002	<0.1	0.13
	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
SAR-10/4 Main 7 Perforations 1,100-1,115 ft bgs	1/20/2016	na	7.0	8.5	60	na	na	0.047	1.44	0.11
	2/24/2016	na	5.9	7.3	82	na	na	0.029	1.41	0.11
	3/22/2016	<0.01	5.8	6.7	74	45.8	<0.2	0.034	1.25	0.10
	4/13/2016	na	5.9	5.0	72	na	na	0.043	1.32	0.10
	5/31/2016	0.015	6.7	5.5	84	45.6	<0.2	0.027	1.40	0.07
	6/22/2016	na	7.2	6.8	84	na	na	0.024	1.51	0.08
	7/27/2016	na	7.8	6.0	72	na	na	0.015	1.77	0.34
	9/7/2016	0.014	7.7	5.6	78	46.4	<0.2	0.016	1.78	0.07
	12/7/2016	0.011	6.4	7.5	74	47	<0.2	0.014	1.42	0.07
	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-6
OCWD MONITORING WELL SAR-11
2016 - 2020 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	1/20/2016	na	13.3	36.1	242	na	na	<0.002	0.18	0.09
	2/24/2016	na	13.5	36.1	252	na	na	<0.002	0.22	0.12
	3/21/2016	0.039	13.4	35.4	248	143	<0.2	<0.002	0.25	0.08
	4/13/2016	na	13.1	33.9	238	na	na	<0.002	0.29	0.09
	6/1/2016	0.023	13	32.3	246	137	<0.2	<0.002	0.41	0.11
	6/22/2016	na	13.2	32.4	226	na	na	<0.002	0.44	0.11
	7/27/2016	na	12.6	28.4	214	na	na	<0.002	0.58	0.14
	9/6/2016	0.035	12.7	26.8	220	121	<0.2	<0.002	0.66	0.06
	12/5/2016	0.031	11.2	23.4	212	111	<0.2	<0.002	0.78	0.11
	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
SAR-11/2 Lower Rho Perforations 675-690 ft bgs	1/20/2016	na	11.3	7.6	170	na	na	<0.002	1.97	0.12
	2/24/2016	na	10.9	6.9	155	na	na	<0.002	1.95	0.12
	3/21/2016	0.019	10.3	6.1	142	79.1	<0.2	<0.002	1.97	0.08
	4/13/2016	na	9.8	5.6	151	na	na	<0.002	1.95	0.09
	6/1/2016	0.022	8.7	5.2	148	74.6	<0.2	<0.002	1.73	0.08
	6/22/2016	na	8.5	5.5	148	na	na	<0.002	1.69	0.42
	7/27/2016	na	7.7	5	132	na	na	<0.002	1.54	0.10
	9/6/2016	0.016	7.4	4.4	138	68.1	<0.2	<0.002	1.46	0.07
	12/5/2016	0.015	7.9	3.6	112	64.4	<0.2	0.002	1.62	0.07
	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

TABLE L-6
OCWD MONITORING WELL SAR-11
2016 - 2020 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)
	1/20/2016	na	10.8	8.7	106	na	na	<0.002	<0.1	0.15
	2/24/2016	na	10.5	8	110	na	na	<0.002	<0.1	0.13
	3/21/2016	0.017	9.8	9.1	115	27	<0.2	<0.002	<0.1	0.13
	4/13/2016	na	9	9.6	108	na	na	<0.002	<0.1	0.13
	6/1/2016	0.02	7.6	8.3	98	25.1	<0.2	<0.002	<0.1	0.12
	6/22/2016	na	7.4	8.7	100	na	na	<0.002	<0.1	0.23
	7/27/2016	na	7	8.1	94	na	na	<0.002	<0.1	0.14
	9/6/2016	0.015	7.3	8.3	94	26.5	<0.2	<0.002	<0.1	0.10
	12/5/2016	0.016	7.8	6.7	90	26.5	<0.2	<0.002	<0.1	0.11
	1/19/2017	na	8.9	9.7	120	na	na	<0.002	<0.1	0.10
SAR-11/3	3/20/2017	0.014	7.4	8.1	92	25.1	<0.2	<0.002	<0.1	0.12
Main 7	5/31/2017	0.012	6.1	8.7	90	24.3	<0.2	<0.002	<0.1	0.09
Perforations	9/5/2017	0.012	5.6	6.6	64	27.6	<0.2	<0.002	<0.1	0.11
1,100-1,110 ft bgs	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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-7
OCWD MONITORING WELL SAR-12
2016 - 2020 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
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

TABLE L-7
OCWD MONITORING WELL SAR-12
2016 - 2020 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
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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed

TABLE L-8
OCWD MONITORING WELL SAR-13
2016 - 2020 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-13/1 Lower Rho Perforations 600-620 ft bgs	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
	10/26/2020	na	12	25.9	226	119	na	<0.002	0.54	na
	11/4/2020	0.035	12.4	26	228	118	<0.2	<0.002	0.64	0.08
	11/18/2020	na	12	25.3	220	114	na	<0.002	0.63	<0.05
	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
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

TABLE L-8
OCWD MONITORING WELL SAR-13
2016 - 2020 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
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

Note: 1) <"x" signifies result was less than detection limit of "x"
2) na = not analyzed