City of Sunnyvale | Environmental Services Department

Water Pollution Control Plant

Plant Compliance

Annual NPDES Report

R2-2014-0035 / R2-2020-0002

Sunnyvale

2020

2020 ANNUAL NPDES REPORT

City of Sunnyvale

Prepared for:

Mr. Michael Montgomery

California Regional Water Quality Control Board

San Francisco Bay Region

1515 Clay Street, Suite #1400

Oakland, CA 94612

Prepared by:

City of Sunnyvale

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February 1, 2021

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February 1, 2021

Mr. Michael Montgomery
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite #1400
Oakland, CA 94612

Attn: NPDES Division

Re: 2020 Annual Self-Monitoring Report, City of Sunnyvale Water Pollution Control Plant

The attached 2020 Annual Self-Monitoring Report is submitted in accordance with the requirements of Order No. R2-2014-0035 and R2-2020-0002 for the City of Sunnyvale Water Pollution Control Plant.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact me at (408) 730-7771.

Sincerely,

Leonard Espinoza

Leonard Espinoza
Acting WPCP Division Manager

Attachment: 2020 Annual NPDES Report

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I. INTRODUCTION

1.0. BACKGROUND

The 2020 Annual National Pollutant Discharge Elimination System (NPDES) Report for the City of Sunnyvale (City) Water Pollution Control Plant (WPCP) is prepared in accordance with NPDES Permit No. CA0037621, San Francisco Bay Regional Water Quality Control Board (RWQCB) Order R2-2014-0035 (effective November 1, 2014) and R2-2020-0002 (effective April 1, 2020). This report summarizes the discharge monitoring results from the January 1 to December 31, 2020 reporting period and has been divided into six chapters to address the requirements contained in Section V.C.1.f of Attachment G, as well as Provisions VI.C.2 (Effluent Characterization Study and Report) and VI.C.4.b (Sludge and Biosolids Management) of the Order.

San Francisco Bay Mercury and PCBs Watershed Permit

The City is also subject to Waste Discharge Requirements of the Mercury and PCB Watershed Permit No. CA0038849, RWQCB Order No. R2-2017-0041. This permit's annual reporting requirements may be met either in the Annual NPDES Report or through participation in a group report submitted by the Bay Area Clean Water Agencies (BACWA). The City chose to meet these reporting requirements in the 2020 Annual NPDES Report with the reporting summarized in **Chapter II, Section 2.1.4** and **Section 2.1.5**.

San Francisco Bay Nutrients Watershed Permit

The City is also subject to Waste Discharge Requirements of the Nutrient Watershed Permit No. CA0038873, RWQCB Order No. R2-2019-0017. The City may provide its nutrient information in a separate annual report or state that it is participating in a group report submitted by BACWA. The City has elected to participate in the 2020 Group Annual Report that will be prepared and submitted by BACWA by February 1, 2021. Nutrient data are also reported electronically in the California Integrated Water Quality System (CIWQS) via monthly Self-Monitoring Reports (SMRs).

Alternate Monitoring Program

The City has elected to participate in the Alternate Monitoring Program, RWQCB Order No. R2-2016-0008. The Order establishes alternative monitoring requirements for municipal wastewater discharges subject to RWQCB Permit No. CA0038849. Participating wastewater treatment facilities can reduce their effluent monitoring costs for most organic priority pollutants and chronic toxicity species rescreening. In exchange for the reduced monitoring requirements, facilities make supplemental payments to the Regional Monitoring Program (RMP) for regional studies to inform management decisions about water quality in the San Francisco Bay.

2.0. FACILITY DESCRIPTION

The City owns and operates the Donald M. Sommers WPCP, located at 1444 Borregas Avenue, Sunnyvale, CA 94088 (**Figure 1**). The WPCP is one of 37 Publicly Owned Treatment Works (POTWs) that discharge to the San Francisco Bay. Located in the Lower South Bay subembayment, the WPCP is considered a shallow

Figure 1: WPCP Site Location Map

water discharger and is therefore subject to more stringent treatment standards compared to deep-water dischargers (**Figure 2**).

Figure 2: POTWs located in the Bay Area

The WPCP was originally constructed in 1956. Over the years, the City has periodically increased treatment capacity as Sunnyvale's population has grown to 156,503 (2020) and has incorporated new technologies in wastewater treatment processes to improve effluent water quality. Residential, commercial, and industrial wastewater collected from the surrounding service areas, including Rancho Rinconada and Moffett Field, enters the WPCP via 295 miles of gravity sewer mains and interceptors. Wastewater is subsequently treated to tertiary standards before being discharged to Moffett Channel, tributary to South San Francisco Bay via Guadalupe Slough. The average dry weather flow design capacity of the WPCP is 29.5 million gallons per day (MGD), which also corresponds to the facility's permitted effluent capacity. The peak wet weather design capacity of the WPCP is 40 MGD with a proven capability of handling instantaneous flows of 55 MGD.

2.1. Wastewater Treatment Processes

The WPCP is comprised of distinct process areas, including preliminary, primary, secondary, tertiary, and solids processing facilities (**Figure 4**). A subset of treatment units in these process areas used for in recycled water production. Wastewater entering the WPCP is treated using a combination of physical, biological, and chemical processes to remove pollutants according to the process flow diagram shown in **Figure 3**. More detailed Liquids and Solids Process Flow Diagrams are presented in **Attachment A**.

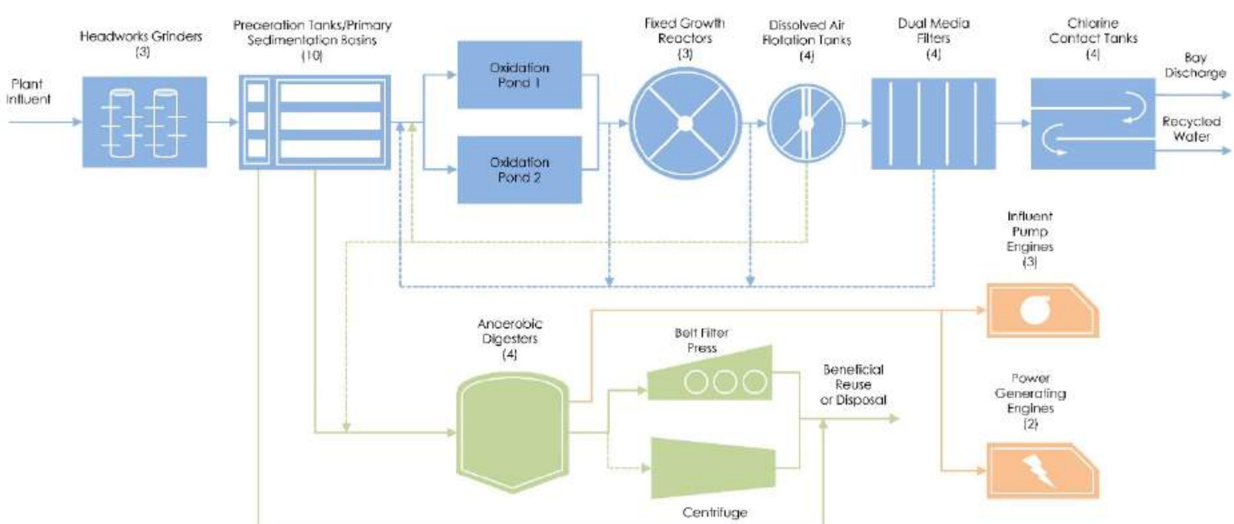


Figure 3: WPCP Process Flow Diagram. Blue lines correspond to liquid, green lines to solids flows and orange lines to gas flows. Dashed lines indicate waste/return flows or alternate flow path

Figure 4: Aerial photo of WPCP and various treatment processes

The City is in the process of implementing a 20-year Capital Improvement Program (CIP) known as the Sunnyvale Cleanwater Program that will repair or replace the majority of WPCP facilities to address rehabilitation and repair, as well as anticipated treatment needs. Individual CIP projects are referenced throughout this report and are described in more detail in **Chapter IV.**

2.1.1. *Preliminary and Primary Treatment*

The Preliminary and Primary Treatment Facilities were originally constructed in 1956 to provide influent screening/grinding, raw sewage pumping and metering, preaerated grit removal, and primary sedimentation. The facilities were expanded several times, most recently in 1984 with the construction of the tenth sedimentation basin, grit handling equipment, and the Auxiliary Pump Station (APS).

Figure 5: Barrel grinders (top), and Preaeration Basins and Primary Sedimentation Tanks (bottom)

Wastewater from the sanitary sewer collection system is primarily conveyed to the WPCP by gravity and enters the Headworks 30 feet below grade where barrel grinders breakdown large debris prior to gas-driven (biogas) centrifugal pumps conveying the raw sewage into the Preaeration Basins sequent Primary Sedimentation Tanks (**Figure 5**). Service air is injected into wastewater in the Preaeration Basins in order to discourage septic conditions and odors, and to remove grit (typically inorganic, heavy solids such as sand, gravel, coffee grounds, etc.) that could otherwise damage downstream pumping equipment and accumulate inside anaerobic digesters. Grit accumulates on the bottom of the basins and is conveyed to a screw press where it is dewatered prior to being hauled offsite for landfill disposal. Aerated wastewater then flows into the Primary Sedimentation Tanks, where the velocity is slowed to allow suspended solids to either rise to the surface (floatable solids/scum) or settle to the bottom of the tanks (settable solids/sludge). Floatable solids are skimmed off the surface while settled solids are removed from the bottom of the tanks and pumped to anaerobic digesters for further treatment. Refer to **Section 2.1.4** of this Chapter for additional information on solids handling. The clarified wastewater (primary effluent) from each basin is collected by launders and conveyed into a pipeline that leads to the Oxidation Ponds where it undergoes secondary treatment. During dry weather conditions (May-October), only five of the ten Preaeration Basins/Sedimentation Tanks are operated on any given day.

If the Headworks is unable to handle the incoming wastewater flow due to mechanical failure or excessive flows, the APS is placed in service to convey wastewater from the collection system into the Preaeration Basins and Primary Sedimentation Tanks. The APS consists of a vertical bar screen for removing large floatable and suspended debris and an electric motor-driven centrifugal submersible pump to convey the wastewater. Screenings are hand separated and hauled off-site for landfill disposal.

Construction of a new Headworks and Primary Treatment Facilities is currently underway with a projected completion year of 2021 (**Chapter IV, Section 3.0**). As a part of this project, a new 2 MW diesel generator will replace the existing 1 MW generator installed in 2018 as part of the Emergency Flow Management Project. Unlike the 1 MW generator, which can only be used to power specific areas of the WPCP that experience power outages, the 2 MW generator has the capability to provide emergency power to the entire WPCP in the event of a power loss. This project will also address Title V air regulatory requirements associated with phasing-out three combustion engines that power the influent pumps in favor of electric motor-driven pumps.

2.1.2. *Secondary Treatment*

Primary effluent undergoes secondary (biological) treatment in Oxidation Ponds with a combined surface area of 440 acres (**Figure 6**). The Oxidation Ponds were constructed in their present form in 1968 and designed to treat high biochemical oxygen demand (BOD) loadings during the summer canning season. BOD loadings were greatly reduced with the departure of the canneries in 1983. The original surface aerators (2,500 hp of total surface aeration capacity) were replaced by seven smaller (15 hp) aerators located in the distribution and return channels that help to break apart algal mats that otherwise disrupt wastewater conveyance and to supplement aeration provided by microalgae and atmospheric diffusion.

Figure 6: Oxidation Ponds, including the return/distribution channel, Pond Effluent Pump Station, and surface aerators

Primary effluent discharged into the Oxidation Ponds is mixed by recirculating pond effluent back into the distribution channel, which in effect creates a single large pond. Ammonia and organic material are readily degraded by aerobic and anaerobic bacteria through processes of nitrification and denitrification that happen simultaneously in the ponds. Ammonia removal in the Oxidation Ponds is subject to seasonal variability, with the highest removal rates observed in the warmer summer months and the lowest in the colder winter months, BOD removal is less susceptible to the same seasonal fluctuations. The average detention time of the Oxidation Ponds is 30-45 days and is dependent on flows, operating depth, and other factors.

The City implements a pond dredging program that began in 2012 to remove solids that have accumulated in the Oxidation Ponds from Primary Effluent and various process return flows, including flocculated solids and filter back wash, thereby recovering lost volume and improving overall treatment efficacy. Solids removed from this project are processed on-site before being hauled off-site as Class B biosolids. Refer to **Section 2.1.4** of this Chapter for more information on solids handling. The City manages a maintenance program to address erosion along the levees that delineate the Oxidation Ponds and are essential to their continued performance (**Chapter IV, Section 8.0**).

Following treatment in the Oxidation Ponds, effluent is then pumped to Fixed Growth Reactors (FGRs), commonly known as trickling filters, which provide additional nitrification of residual ammonia. The FGRs are comprised of plastic cross-flow media (**Figure 7**) on which a film of microorganisms (biofilm) attach and readily convert ammonia (NH_3) in wastewater to nitrate (NO_3^-). During the colder wet weather season, the nitrification efficacy of the Oxidation Ponds is reduced (or stops altogether), and the FGRs provide the majority of nitrification needed to meet ammonia discharge limits (**Chapter II, Section 1.4**).

Figure 7: Fixed Growth Reactor distributing wastewater over plastic growth media

FGR effluent flows by gravity to the Dissolved Air Flotation Tanks (DAFTs), where compressed air and polymer are introduced to coagulate and flocculate biological solids (algae and bacteria) generated during treatment in the Oxidation Ponds and FGRs (**Figure 8**). Flocs rise to the water surface, are skimmed into troughs, and returned to the Oxidation Ponds via the 36-inch Pond Return Line along with filter backwash water and other return flows.

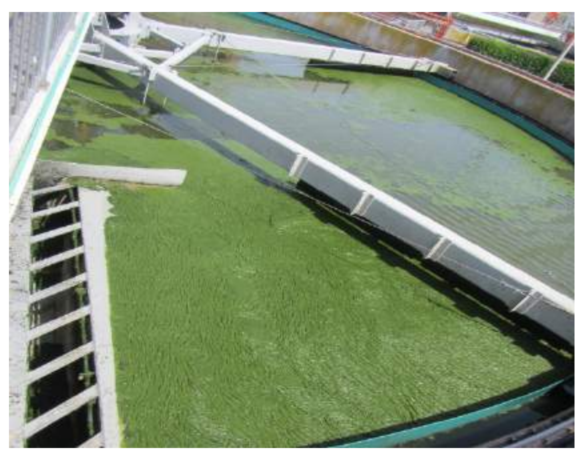


Figure 8: Algae being skimmed off the surface of wastewater in a Dissolved Air Flotation Tank

2.1.3. *Tertiary Treatment*

The Tertiary Treatment Facilities were originally constructed in 1978 and then expanded in 1984 to provide additional treatment of Oxidation Pond effluent. Additional improvements were also made in the 1990s and 2017 to allow for the production of recycled water. As a final polishing step, clarified effluent from the DAFTs is conveyed to the Dual Media Filters (DMFs), which provide additional removal of remaining algae and particulate matter via gravity filtration through anthracite (top, coarse layer) and sand (bottom, fine layer) (**Figure 9**). The filters are routinely backwashed to remove accumulated solids, with the backwash water being returned to the Oxidation Ponds.

Figure 9: Dual Media Filters treating wastewater

Effluent from the DMFs is disinfected with liquid sodium hypochlorite for at least one hour in a series of Chlorine Contact Tanks (CCTs) prior to dechlorination with sodium bisulfite, and discharged to Moffett Channel, tributary to the San Francisco Bay via Guadalupe Slough (**Figure 10**). A portion of the filtered wastewater undergoes additional treatment in dedicated CCTs to meet the requirements for disinfected tertiary recycled water as specified in Title 22 of the California Code of Regulations Section 2.4. Furthermore, a portion of the disinfected wastewater is partially dechlorinated and redistributed throughout the WPCP as process water for filter backwashing, engine cooling, and other internal purposes.

Figure 10: Wastewater being disinfected in the Chlorine Contact Tanks prior to discharge into Moffett Channel

In 2018, the City completed a project to improve its disinfection and recycled water production facilities, which included replacement of gaseous chlorine with liquid sodium hypochlorite as well as other mechanical, electrical, and instrumentation and control improvements. The City also added a second sodium bisulfite dosing location to provide additional flexibility and reliability to meet the final effluent residual chlorine discharge limit.

2.1.4. *Solids Processing*

Solids removed during primary treatment are fed into primary anaerobic digesters and detained for approximately 35 to 40 days at a temperature around 100 °F. Primary digestion is typically followed by additional treatment in a secondary digester for 12 to 15 days. Within the digesters, anaerobic bacteria breakdown organic matter and produce biogas, a mixture of methane, carbon dioxide, and hydrogen sulfide gases in addition to stabilized, nutrient rich biosolids and water.

Solids Processing

Disposal Type	Tonnage (Dry Tons)
Land Application	1,032
Compost	---
Monofill	---
Landfill	197
Annual Total	*1,229*

A portion of the biogas produced in the anaerobic digesters powers the three main influent engines. Each engine drives a dedicated centrifugal pump that lifts wastewater into the Headworks from the sanitary sewer collection system in addition to driving blowers that aerate the Preaeration Basins. Exhaust heat recovered from the main influent engines and jacket water from the PGF engines is captured and used to maintain a near constant temperature in the digesters. The remainder of the biogas is blended with landfill gas from the adjacent closed landfill and air-blended natural gas. This gas mixture is utilized by two engine generators that comprise the Power Generation Facility (PGF). The PGF produces 1.2 MW of power on average, which satisfies most of the WPCP's power demand and offsets its purchases from PG&E and Silicon Valley Clean Energy.

Historically, biosolids were conditioned with polymer and dewatered on gravity drainage tiles to 15-20% solids and then solar dried to approximately 25-30% solids prior to disposal. In contrast, biosolids generated from the Oxidation Ponds[1] were later mechanically dewatered to a similar consistency by a contractor (Synagro, Inc.) using a centrifuge in the same general area as the dewatering tiles. In 2016, the WPCP moved its solids handling location and changed the operation to accommodate construction of the new Primary Treatment Facilities (**Chapter IV, Section 7.0**), which are being placed in the same area as the former drainage tiles. Currently, all biosolids are mechanically dewatered by Synagro using either a

[1] The Oxidation Ponds essentially act as a low-temperature anaerobic digester to degrade and stabilize organic solids remaining in the primary effluent wastewater.

belt filter press or centrifuge. Filtrate and centrate are returned to the Oxidation Ponds for additional treatment. A solids process flow diagram is included in **Attachment A**.

Biosolids produced at the WPCP undergo a series of analytical tests prior to being hauled off-site to ensure they are in compliance with regulations set forth in 40 CFR Part 503. Biosolids are typically disposed of through a combination of land application, which includes agricultural application and compost, and surface disposal in a landfill. The location of the disposal site varies depending on availability and the composition of the solids. In a typical year, the majority of biosolids produced at the WPCP are land applied to agricultural fields, with a much smaller portion being sent to landfill disposal or for further treatment off-site in order to meet Class A requirements for resale as compost. The City also has the option of disposing of biosolids through surface disposal in the Sunnyvale Biosolids Monofill (SBM). Historically, the SBM has been used for surface disposal of biosolids produced when an anaerobic digester is cleaned-out though it also has other approved uses. The frequency at which a digester is cleaned-out can vary depending on the feed rate and composition of the raw sludge, but on average occurs every 3 to 4 years.

During the 2020 reporting period, the WPCP produced 1,229 dry tons of biosolids. Of the total, 593 dry tons were dredged from the Oxidation Ponds and 636 dry tons were removed from the anaerobic digesters, which includes 349 dry tons of digester cleanings. The vast majority of the biosolids produced (1,032 dry tons) were land applied in Sacramento and Merced counties. The remaining 197 dry tons were sent to landfills in Sacramento and Solano counties for disposal or use as alternative cover. For additional information on biosolids management at the WPCP, refer to the *Biosolids Management Annual Report* for 2020, scheduled for submittal by February 19, 2021, per Provision VI.C.4.b of Order No. R2-2020-0002.

2.2. Recycled Water Production

The WPCP historically operated in two different treatment modes: 1) San Francisco Bay discharge, or 2) recycled water production. In late 2018, the WPCP completed an improvement project that allows for the simultaneous production and distribution of recycled water and discharge to San Francisco Bay, alongside improvements to its chlorination and dechlorination systems. Under the new configuration, a portion of the FGR effluent is sent to a dedicated DAFT, a pair of DMFs, and two of the CCTs for further treatment in order to meet the requirements for disinfected tertiary recycled water as specified in CCR Title 22 and in accordance with the water reclamation requirements in Regional Water Board Order No. 94-069. The facilities dedicated to recycled water production can be switched quickly to NPDES discharge if needed. The polymer dose, chlorine dose, and chlorine contact time are adjusted accordingly to meet the more stringent requirements. As a final

Recycled Water

Flow Type	Volume (MG)
Recycled Water Produced *WPCP*	123
Potable Water Added *WPCP*	19
Potable Water Added *San Lucar Facility*	181
Total Delivered	***323***

production step, recycled water is partially dechlorinated with sodium bisulfite prior to entering the distribution system.

Recycled water is distributed in "purple pipes" throughout the service area for irrigation of private and public landscapes, parks, and golf courses for use in decorative ponds and for other approved uses. Typically around 8% of the daily wastewater flow is diverted for recycled water. In addition, disinfected secondary recycled water (No. 3 Water) is partially dechlorinated and reused internally for filter backwashing, engine cooling, and other purposes. Use of No. 3 Water is relatively constant throughout the year with an average annual use around 250-300 MG.

During the 2020 reporting period, the WPCP produced a total of 123 MG of recycled water and delivered 323 MG to the recycled water system. The difference represents potable water additions made at the WPCP or the off-site San Lucar Facility to satisfy total system demand (**Figure 11**). In 2020, recycled water production at the WPCP was lower than previous years due to the unexpected failure of the Secondary Effluent Pipeline (**Chapter II, Section 2.2**), which placed additional constraints on the use of the Pond Return Line and other key equipment normally involved in the production of recycled water. However, demand for recycled water, as reflected in the data for total recycled water system deliveries, remained relatively consistent with previous years despite the COVID-19 pandemic and the absence of the daily workforce influx to the City. For additional information on recycled water production at the WPCP, refer to the *Recycled Water Annual Report* for 2020, scheduled for submittal to the RWQCB by March 15, 2021, as well as submittal on the State Water Board's GeoTracker system by April 30, 2021, per the requirement of Sections VIII and IX.D. of Attachment E of the current NPDES permit.

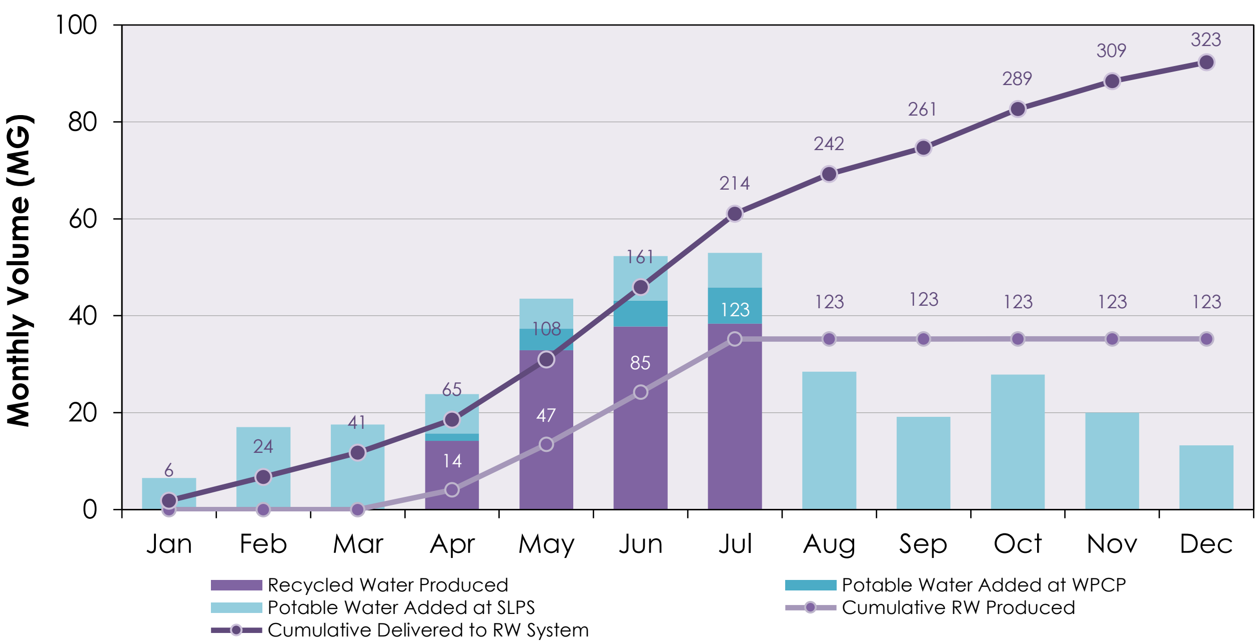


Figure 11: Recycled water production and distribution in 2020. The difference between produced and delivered represents potable water added at either the WPCP or SLPS

2.3. WPCP Laboratory

The WPCP operates an on-site laboratory that analyzes samples for monitoring treatment process and permit compliance, industrial pretreatment samples collected from industrial facilities that discharge to the sanitary sewer system, and City drinking water samples to monitor for compliance with drinking water regulatory standards. A list of the Laboratory's approved analyses and the current environmental certification, which is interim pending an annual audit that has been delayed due to the COVID pandemic, is included in **Attachment B**.

The laboratory utilizes a Laboratory Information Management System (LIMS) to effectively manage data from different analysis/instruments and generate lab reports. LIMS has greatly improved data entry efficiency and integrity through its automation features. As part of the WPCP rebuild effort, design of the Cleanwater Center, which includes new Administration, Laboratory, and Maintenance facilities within one building, continued during the 2020 reporting period (**Chapter IV, Section 5.0**). Construction of the Cleanwater Center has been deferred to prioritize the Condition Assessment and Existing Plant Rehabilitation Project.

2.4. Stormwater Management

All stormwater collected from within the WPCP, as well as from storm inlets on Carl Road just outside WPCP boundaries and the Sunnyvale biosolids monofill, is directed to the Headworks. Therefore, coverage under the statewide permit for discharges of stormwater associated with industrial activities (NPDES General Permit No. CAS000001) is not required.

2.5. Facility Condition Assessment and Ongoing Plant Rehabilitation

Due to the overall age of facilities at the WPCP, critical elements of the existing treatment processes need to be rehabilitated or replaced to maintain permit compliance and keep them operational until they are fully replaced with the final plant build-out (2035±). In 2020, the WPCP continued progress on the Facilities Rehabilitation Project following the findings and recommendations from the Condition Assessment performed in 2017. Refer to **Chapter IV, Section 2.0** for additional information on the project.

II. Plant Performance and Compliance

1.0. PLANT PERFORMANCE

The WPCP continues to maintain a high level of performance as discussed herein. Compliance with permit limits is discussed in **Section 2.0** of this Chapter.

1.1. WPCP Wastewater Flows

The WPCP is designed and permitted for a daily average dry weather effluent flow of 29.5 MGD and has a peak wet weather flow design capacity of 40.0 MGD.

WPCP Flow Rates

Flow Type (MGD)	Influent	Effluent
Average Daily	12.8	10.5
Average Dry Weather	12.6	8.2
Average Wet Weather	12.8	11.6
Average Daily Max	16.7	19.9
Peak-Hourly Max	25.8	---
Instantaneous Max	30.5	---
Total Treated (MG)	4,670	---

Overall, the WPCP treated 4,670 MG of influent wastewater during this reporting period at an average rate of 12.8 MGD and discharged an average 10.5 MGD. An average daily maximum influent flow rate of 16.7 MGD occurred on April 5, 2020, with an associated influent peak hourly flow rate of 25.8 MGD and an instantaneous flow rate of 30.5 MGD, and corresponded with the heaviest storm event of the year where more than one-inch of rainfall was recorded over 24-hours.

Average daily influent and effluent flow rates are shown in **Figure 12A**. A general comparison between influent and effluent flow rates reveals the seasonal effects of recycled water production and evaporation from the Oxidation Ponds. For example, during summer months (May-Aug) when recycled water production and evaporation rates are highest, influent flow rates exceed effluent flows by the greatest margins. Influent flows are also influenced by seasonal precipitation patterns, resulting in higher flow rates during the wet weather season. Effluent flow rates typically follow influent flow trends during the wet weather season but are often much higher in order to offset precipitation directly into the Oxidation Ponds and maintain a relatively consistent operating depth. The large variation in effluent flow rates reflects the storage capacity of, and evaporation (estimated at 1-2 MGD on average) from, the Oxidation Ponds, as well as recycled water production. Effluent flow rates below 8 MGD correspond to the WPCP's Flow Management Strategy and oftentimes reflect a shutdown of the Tertiary Treatment Facilities. Zero-discharges, which correspond to a shutdown of the Tertiary Treatment Facilities and the temporary cessation of effluent flow entirely, are omitted for clarity from **Figure 12A** but are used in the calculation of average flows. The storage capacity of the Oxidation Ponds (50-100 MG depending on depth) forms the cornerstone of the WPCP's Flow Management Strategy, which allows Operations staff

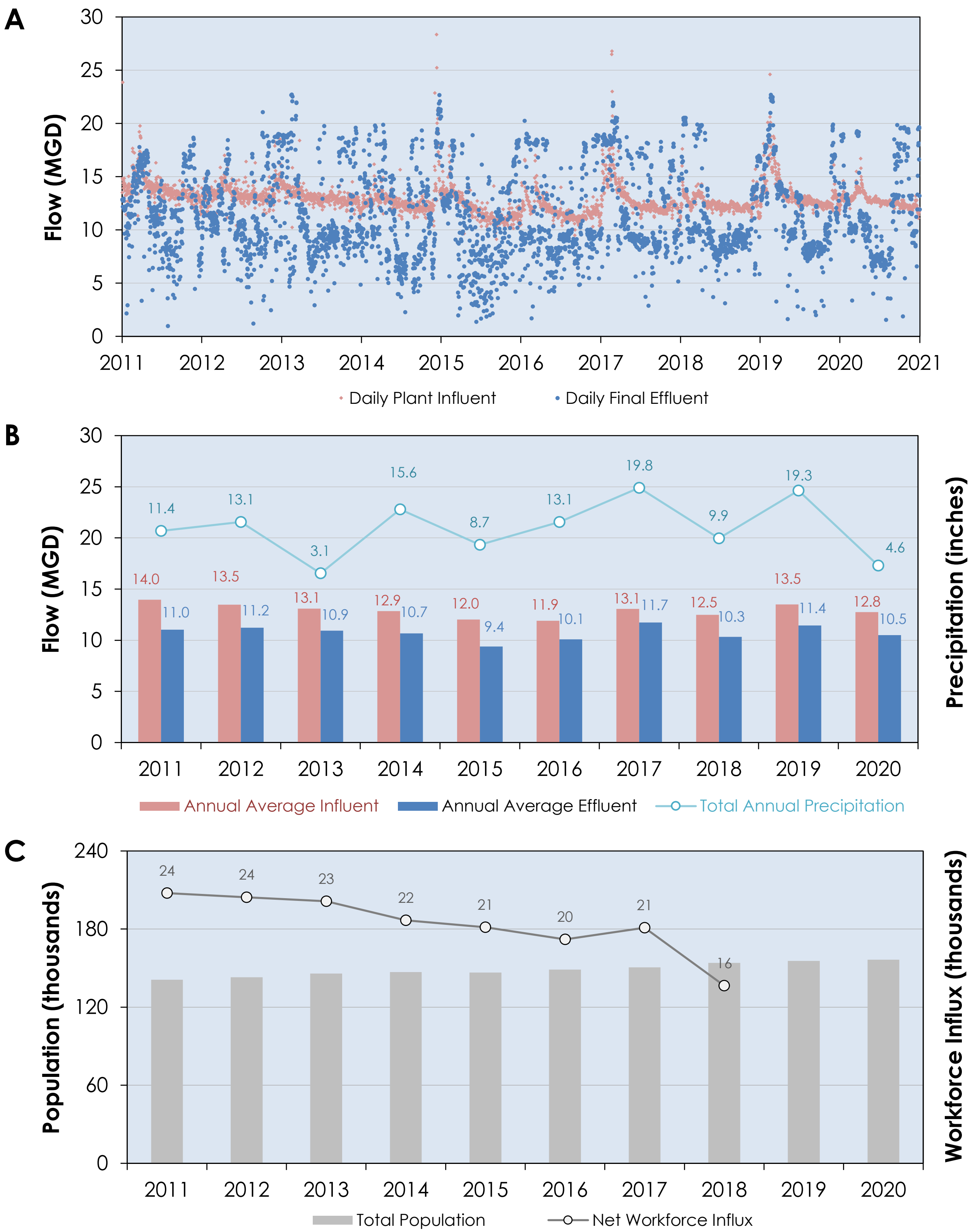


Figure 12: WPCP Wastewater Flow Rate Trends from 2011-2020. A) Daily and B) Annual Average Influent and Effluent Wastewater Flows through the WPCP from 2011-2020. C) Total Population and Net Workforce Influx (thousands) in Sunnyvale from 2011-2020 (net workforce influx data not yet available for 2019-2020)

to maintain water elevation for optimal treatment and required storage; operate the Tertiary Treatment Facilities at a constant flow rate (flow equalization); and maintain flexibility to repair and rehabilitate the Tertiary Treatment Facilities.

Average daily influent flow rates during the 2020 reporting period remained well within the design capacity of the WPCP and relatively consistent with a 10-year average of 13.0 MGD (**Figure 12B**) despite being slightly lower than 2019. This is primarily attributed to lower precipitation rates as compared with the previous year, compounded with a lower population growth rate and an assumed reduction in daily net workforce influx as a result of the COVID-19 pandemic. For example, the City experienced a growth rate of 0.6%, which is lower than the more than 1% increases observed over the last four years (**Figure 12C**). Moreover, the City's typical daily net workforce influx of approximately 20,000 (15%) non-resident workers[2] was likely reduced significantly in response to the shelter-in-place orders and a shift in commuter behavior during 2020 to favor more teleworking from home. Nevertheless, influent flows in 2020 remained higher than those recorded during 2015-2016, consistent with potable water use (**Figure 13**), suggesting that the post-drought rebound in flow rates is holding steady.

Daily effluent flow rates in 2020 followed a typical seasonal pattern over the ten-year period presented in **Figure 12A** and ranged from 1.6 to 19.9 MGD. The annual average effluent flow rate of 10.5 MGD is also consistent with the 10-year average of 10.8 MGD shown in **Figure 12B** and well within the permitted capacity of 29.5 MGD. Due to the storage capacity of the Oxidation Ponds, effluent flow rates are largely decoupled from influent flows. Moreover, in the wet weather season Oxidation Ponds can receive a significant amount of precipitation directly, in addition to contributions from influent flows.

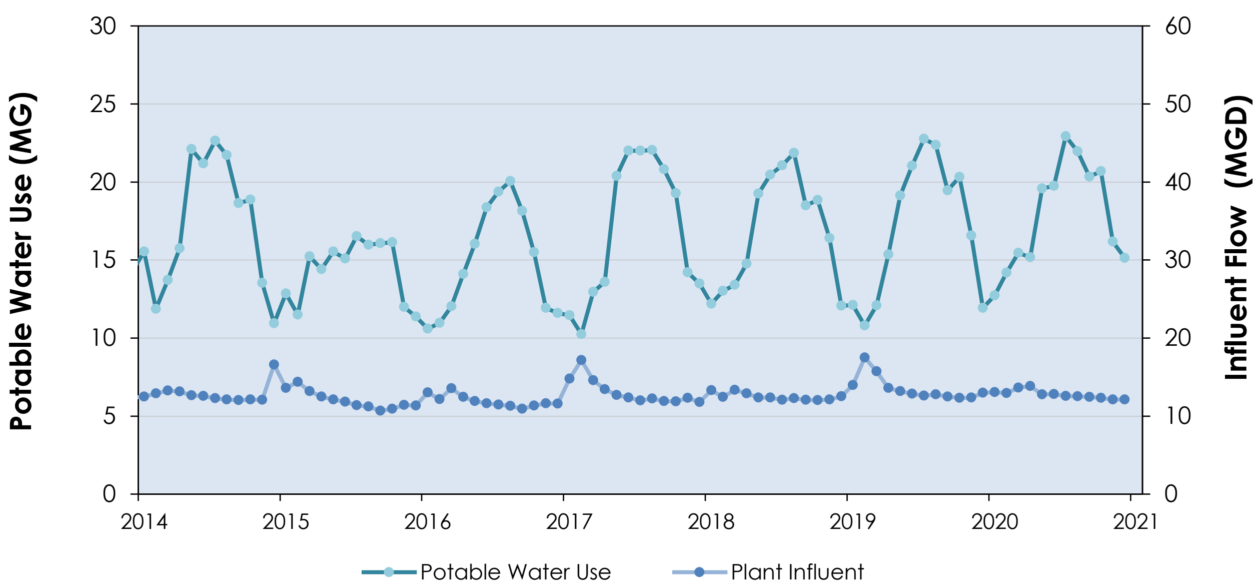


Figure 13: Monthly Average Citywide Potable Water Use and WPCP Influent Flows from 2014-2020

[2] Calculated as an annual average from U.S. Census Bureau data available from 2002-2018 (https://onthemap.ces.census.gov/). Daily workforce influx data unavailable for 2019-2020 and assumed to be at least the same as previous years.

1.2. Carbonaceous Biochemical Oxygen Demand

CBOD		
Type	Limit	Performance
% Removal:	85%	97%
Daily (MDEL):	20 mg/L	2.0 – 10.0 mg/L
Monthly (AMEL):	10 mg/L	2.7 – 7.3 mg/L

Carbonaceous biochemical oxygen demand (CBOD) measures organic content in wastewater and is used by the RWQCB as one of the parameters for evaluating and regulating WPCP performance.

Figure 14 summarizes CBOD concentration data and removal performance from 2016 to 2020. Influent and effluent CBOD samples are collected as flow-weighted composites over a 24-hour period. In mid-2019 it was identified that rag accumulation on the composite sampler intake line was a contributing factor to high CBOD data variability and the influent sampling point was modified. Data variability subsequently reduced and remained more consistent for the remainder of 2019. Despite the influences from COVID-19 pandemic, influent CBOD concentrations remained relatively consistent, indicating a high degree of precision was also maintained during the 2020 reporting periods. In fact, data variability during the 2020 reporting period was some of the lowest observed in the last 5-years and may also reflect a less variable daily commuter workforce influx during the COVID-19 pandemic.

As shown in **Figure 14A** and **Figure 14B**, influent CBOD concentrations trended significantly lower in 2020 as compared to previous years, with an annual average of 200 mg/L, despite low patterns of precipitation which typically results in an increase in concentrations. This reduction is attributed to the COIVD-19 pandemic as the observed variations in CBOD influent concentrations generally followed the shelter-in-place orders and a shift in commuter behavior to favor more teleworking. For example, the most significant reductions occurred during the county shelter-in-place order in March and gradually increased over the remainder of the reporting period as the restrictions lessened and allowed the commuter workforce to gradually return to the workplace.

Effluent daily and average monthly CBOD concentrations remained well below their respective permit limits as also shown in **Figure 14A** and **Figure 14B.** The percent removal of CBOD, as measured by the difference between influent and effluent concentrations, remained well above the minimum removal rate of 85% with an average of 97% (**Figure 14C**). Effluent concentrations demonstrated a general trend of lower removal during the colder months and higher removal during the warmer months, which is a typical pattern of the unique secondary treatment system at the WPCP. Biological activity in the secondary treatment processes declines during the colder months, resulting in somewhat higher CBOD concentrations as compared with the summer months. Seasonal patterns exhibited a stronger influence on effluent CBOD concentrations than the COVID-19 pandemic due to the decoupling of influent and effluent concentrations created by the long detention times of the Oxidation Ponds.

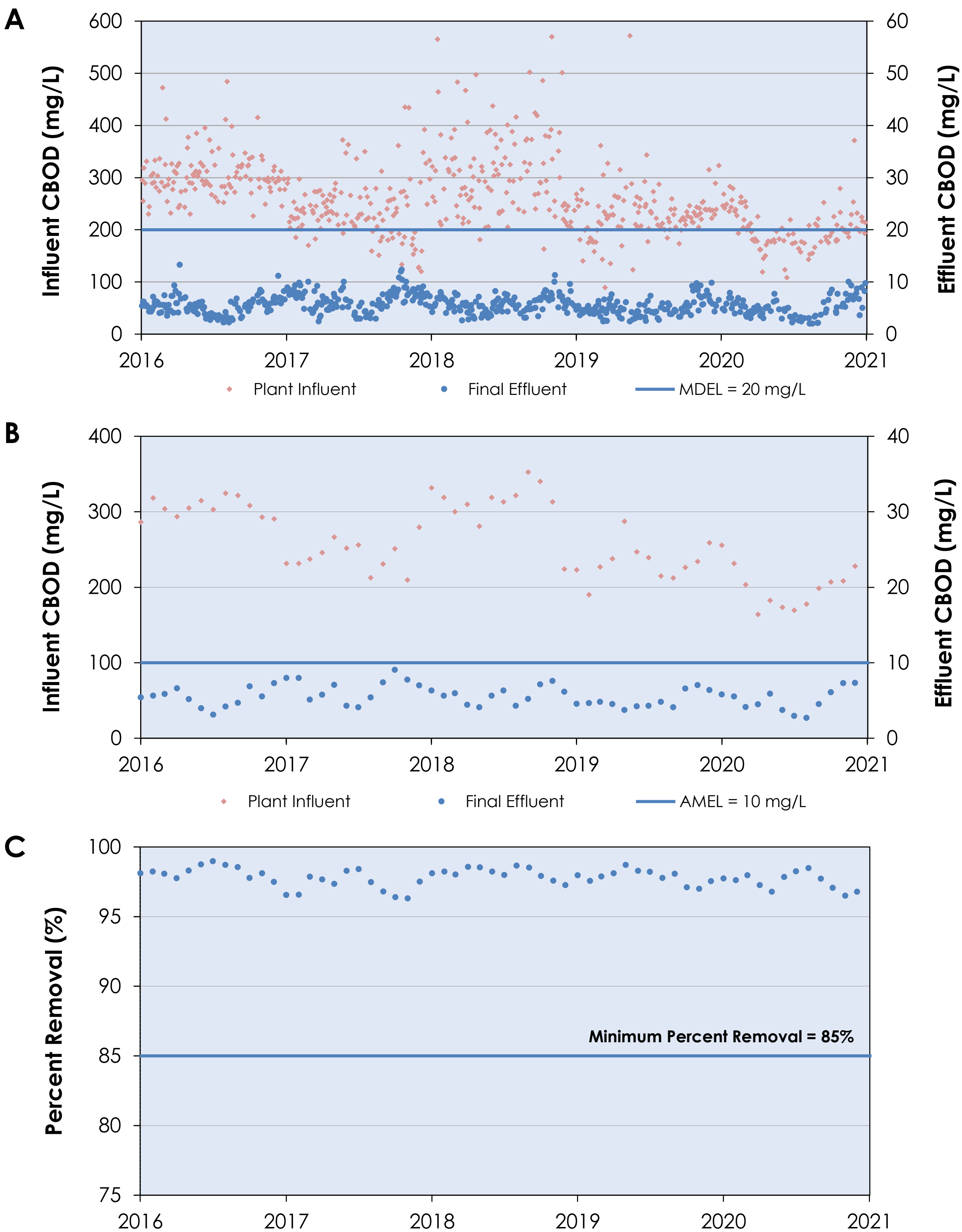


Figure 14: CBOD Trends through the WPCP from 2016-2020. A) Daily and B) Average Monthly Influent and Effluent CBOD (mg/L) through the WPCP from 2016-2020. C) Average Monthly Effluent Percent Removal of CBOD from 2016-2020

Figure 15 summarizes daily and annual influent and effluent CBOD loading rates as measured in kilograms per day (kg/day) and kilograms per year (kg/yr) from 2016 to 2020. Influent CBOD loading rates shown in **Figure 15A** exhibited a pattern similar to those observed for concentrations, despite influent flows remaining relatively consistent with previous years, suggesting that concentrations were a more significant driver of loading rates than flows in 2020. Overall, influent loading rates over the last 5-years exhibited a downward trend as shown in the average annual loading rates in **Figure 15B**; whereas, effluent loading rates remained relatively consistent across the same period.

Figure 15: Average A) Daily and B) Annual CBOD Loading Rates from 2016-2020

1.3. Total Suspended Solids

TSS		
Type	Limit	Performance
% Removal:	85%	97%
Daily (MDEL):	30 mg/L	1.5 – 15.5 mg/L
Monthly (AMEL):	20 mg/L	3.5 – 11.3 mg/L

Total suspended solids (TSS) is a measure of the suspended solids content of wastewater that will not pass through a standard laboratory glass fiber filter. Similar to CBOD, TSS is used by the RWQCB for evaluating and regulating the WPCP's performance.

Figure 16 summarizes TSS concentration data and removal performance from 2016 to 2020. Influent and effluent TSS samples are collected as flow-weighted composites over a 24-hour period. As with CBOD, data variability observed in 2018 was significantly reduced following adjustments made to the influent sampler intake line in mid-2019 to reduce rag accumulation and promote data accuracy. In typical years, influent TSS concentrations exhibit a seasonal pattern, wherein higher concentrations of TSS observed in late winter and early spring give way to lower summer and fall concentrations. These patterns coincide with some of the heaviest rainfall experienced by the region that can contribute to scouring of accumulated sediment (grit) within the collection system. Hence the absence of a similar pattern in CBOD. The spike gradually subsides as the rainy season gives way to the drier summer months and flows decrease. Occasionally, a second spike will appear toward the end of the summer months (Aug-Sep) and is attributed to enhanced water conservation efforts coupled with a steady increase in population (**Figure 12C**). This pattern was not as readily apparent during the 2020 reporting period, and influent TSS concentrations instead appear to have followed the same general pattern as CBOD as a result of the COVID-19 pandemic coupled with a lack of precipitation.

As shown in **Figure 16A** and **Figure 16B**, effluent daily and average monthly TSS concentrations remained below their respective permit limits, ranging from 1.5 to 15.5 mg/L and 3.5 to 11.3 mg/L, respectively. The percent removal of TSS, as measured by the difference between influent and effluent concentrations, remained well above the minimum removal rate of 85% at an average of 97% (**Figure 16C**). These observations are indicative of a high level of performance. Effluent TSS concentrations from 2016 to 2020 show a relatively consistent seasonal trend with higher concentrations measured in the colder months as compared with the warmer months. While effluent TSS trends are similar to influent trends, the mechanism is different and somewhat counter-intuitive. Algae grown in the Oxidation Ponds represent the largest fraction of residual solids in secondary effluent and are conveyed to the WPCP for additional treatment prior to discharge. Algae growth is usually highest during the warmer months, suggesting that the highest TSS concentrations during the year would be observed during those months. However, the dominant species of algae grown within the Oxidation Ponds typically undergoes a seasonal shift between summer and winter. In the summer months, colonial algal species (i.e. *Scenedesmus sp.*) dominate and are readily harvested and removed by the DAFTs and DMFs; whereas, single cell algal species (i.e. *Chlorella sp.*) dominate during the winter months and are more challenging to remove. Operations staff typically respond by adjusting polymer and chlorine dosing in the DAFTs and CCTs to provide a strong buffer around daily and monthly TSS permit limits, as well as turbidity limits discussed in more detail in **Section 2.1**.

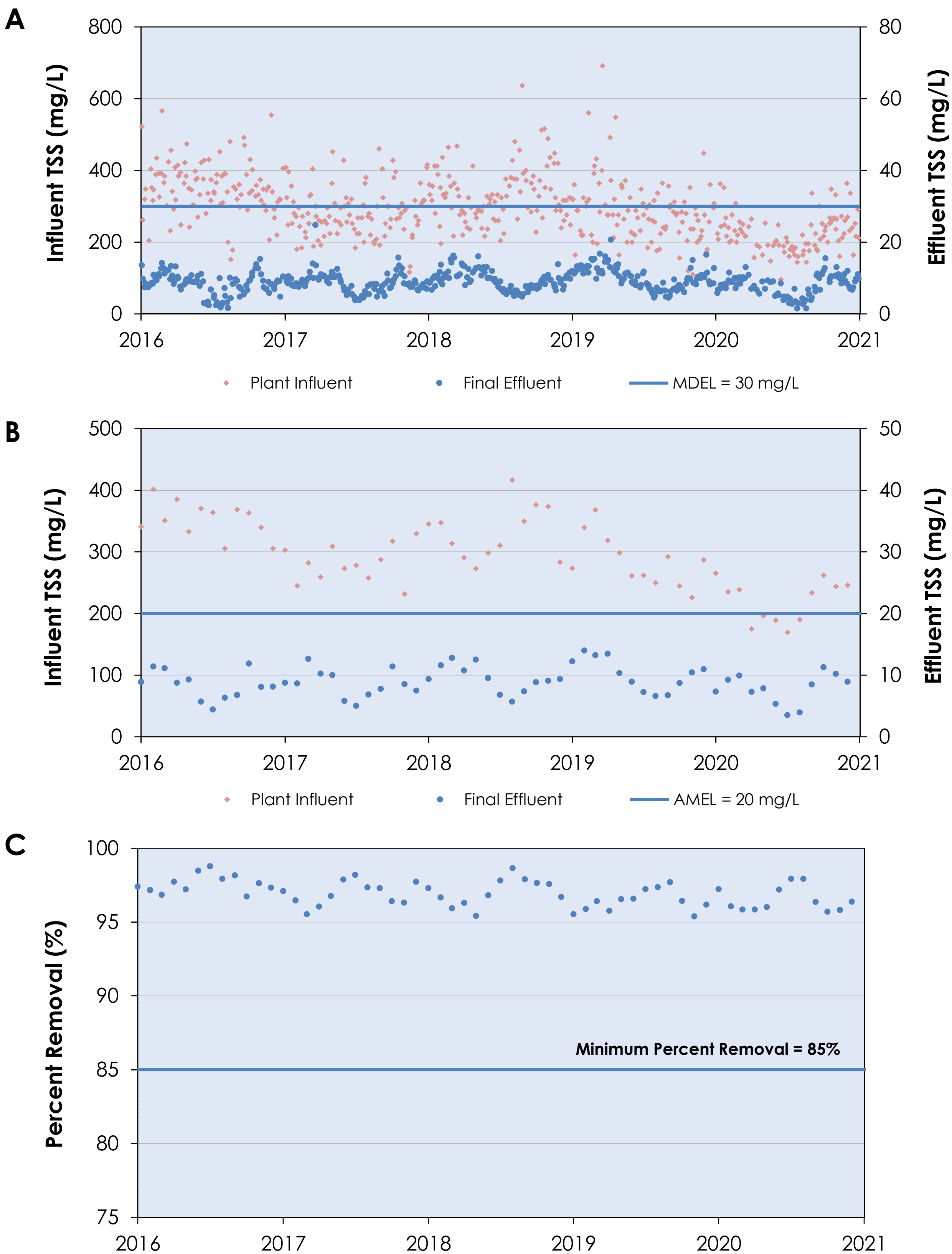


Figure 16: TSS Trends through the WPCP from 2016-2020. A) Daily and B) Average Monthly Influent and Effluent TSS (mg/L) through the WPCP from 2016-2020. C) Average Monthly Effluent Percent Removal of TSS from 2016-2020

Figure 17 summarizes daily and annual influent and effluent TSS loading rates as measured in kilograms per day (kg/day) and kilograms per year (kg/yr) from 2016 to 2020. Influent TSS loading rates shown in **Figure 17A** exhibited a pattern similar to those observed for concentrations, despite influent flows remaining relatively consistent with previous years, suggesting that concentrations were a more significant driver of loading rates than flows in 2020. Overall, influent loading rates over the last 5-years exhibited a downward trend as shown in the average annual loading rates in **Figure 17B**; whereas, effluent loading rates remained relatively consistent across the same period. These trends are also consistent with those observed for CBOD loading rates.

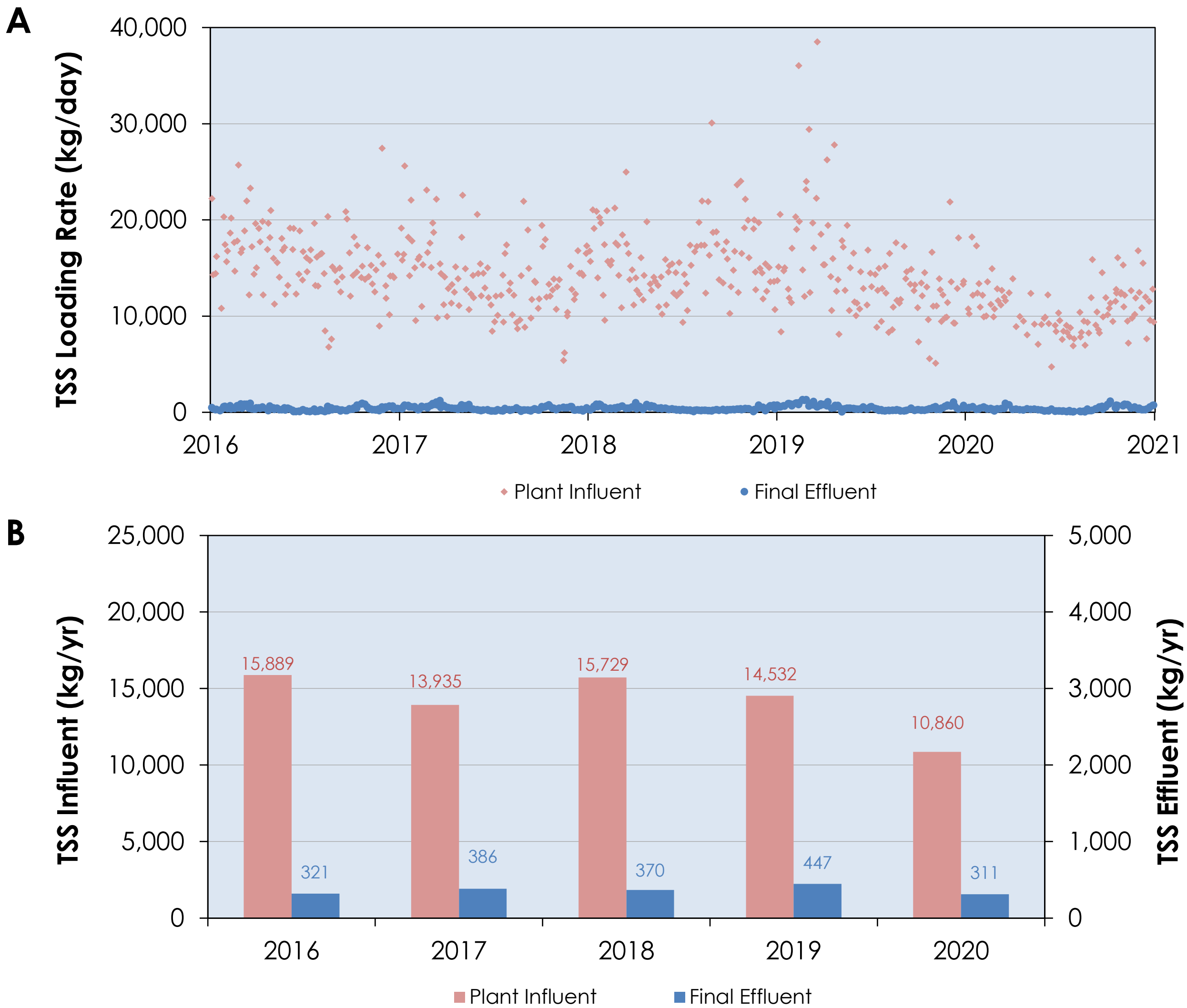


Figure 17: Average A) Daily and B) Annual TSS Loading Rates from 2016-2020

1.4. Total Ammonia

Ammonia		
Type	Limit	Performance
Daily (MDEL):	26 mg/L (Oct-May) 5 mg/L (Jun-Sept)	0.10 – 14.3 mg/L 0.07 – 0.97 mg/L
Monthly (AMEL):	18 mg/L (Oct-May) 2 mg/L (Jun-Sept)	0.13 - 8.51 mg/L 0.09 - 0.38 mg/L

Ammonia removal occurs in both the Oxidation Ponds and the FGRs. In the Oxidation Ponds, ammonia removal is achieved through biological nitrification as well as uptake by algae, and as a result it is highly susceptible to seasonal fluctuations. Lower removal rates occur during the fall/winter (Oct-May) when ambient temperatures are low and daytime is shorter; whereas, higher removal rates occur during the summer (Jun-Sep) when ambient temperatures are high and daytime is longer. Consequently, nitrification in the FGRs is the primary process of ammonia removal between October and May as they are less susceptible to ambient weather conditions. A small additional increment of ammonia removal occurs in the DMFs, so concentrations in the final effluent are slightly lower than that in the FGR effluent. The WPCP's NPDES permit includes seasonal performance limits for ammonia that reflect the seasonal variability in the performance of the two processes. A review of the data and a discussion of performance optimization strategies is provided below.

1.4.1. Data Review

Figure 18 summarizes ammonia concentration data and removal performance trends. As shown in **Figure 18A** and **Figure 18B**, influent ammonia trends were also influenced by the COVID-19 pandemic, similar to CBOD and TSS, with significant reductions in March followed by a gradual increase throughout the remainder of the year. As is also shown in these figures, daily and average monthly effluent ammonia concentrations in 2020 remained below their respective seasonal permit limits, ranging from 0.10 to 14.3 mg/L (Oct-May) and 0.07 to 0.97 mg/L (Jun-Sep) daily and 0.13 to 8.51 mg/L (Oct-May) and 0.09 to 0.38 mg/L (Jun-Sep) monthly.

Figure 18C depicts removal performance of the Oxidation Ponds and FGRs from 2016 through 2020. Seasonal removal trends are clearly visible, with the Oxidation Ponds demonstrating ammonia removal from March to October, and the FGRs removing most of the ammonia during the remainder of the year. The seasonal increase in effluent ammonia from the Oxidation Ponds is typical and attributed to low ambient temperatures and sunlight throughout the majority of January and February as well as November and December 2020. The seasonal effects on the Oxidation Ponds with respect to ammonia removal are also apparent in the FGRs and are compounded by snail predation on nitrifying bacteria as described in more detail in the *Strategies to Enhance Performance* section below. The WPCP did not perform any snail control events during the 2020 reporting period as FGR ammonia data did not indicate significant nitrifier predation that would jeopardize FGR performance and undermine the WPCP's ability to meet its effluent limits. The Oxidation Ponds exhibited a higher-than-normal level of performance in 2020 as indicated by low effluent concentrations that appear to have also offset the need for a snail abatement event.

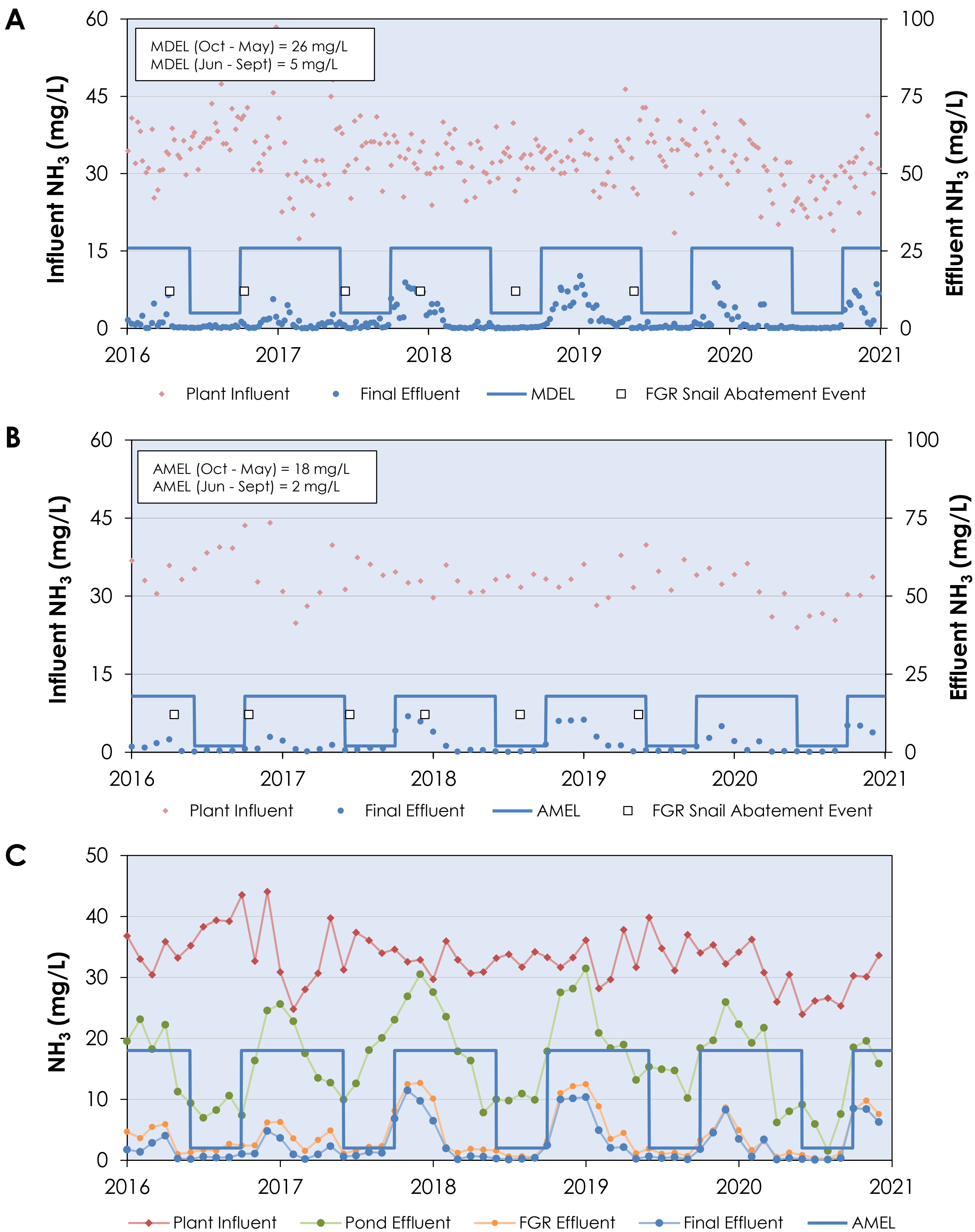
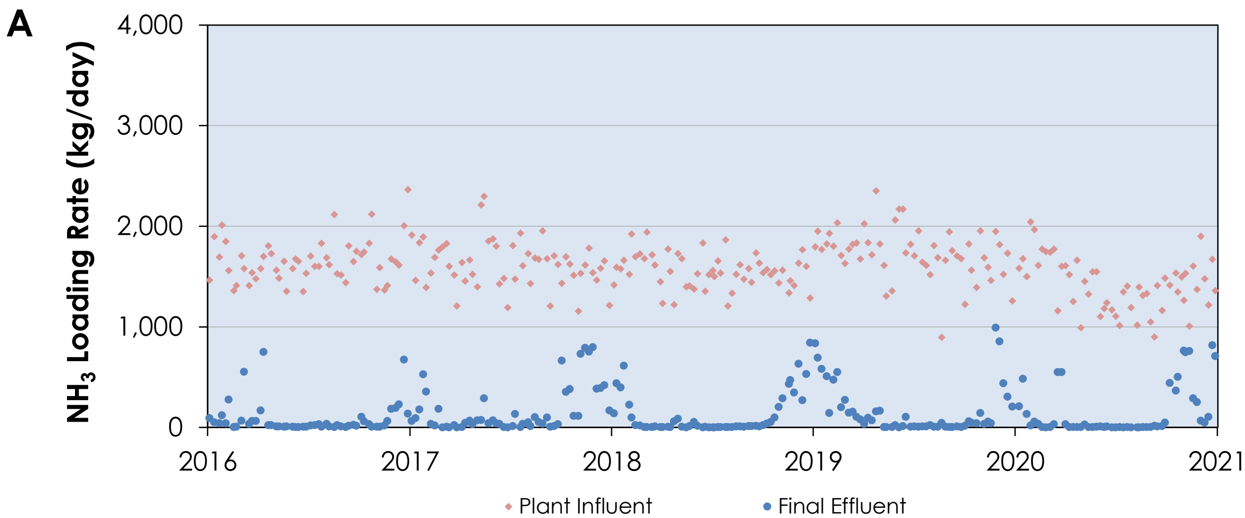


Figure 18: Ammonia Trends at the WPCP from 2016-2020. A) Daily and B) Monthly Average Influent and Effluent Total Ammonia from 2016-2020. C) Monthly Average Total Ammonia from Pond, FGR, and Final Effluent from 2016-2020.

Figure 19 summarizes average daily (kg/day) and annual (kg/yr) influent and effluent ammonia loading rates from 2016 to 2020. Influent ammonia loading rates shown in **Figure 19A** exhibited a pattern similar to those observed for concentrations, despite influent flows remaining relatively consistent with previous years, suggesting that concentrations were a more significant driver of loading rates than flows in 2020. Overall, influent loading rates over the last 5-years exhibited a downward trend as shown in the average annual loading rates in **Figure 19B**; whereas, effluent loading rates remained relatively consistent across the same time period. These trends are also consistent with those observed for CBOD and TSS loading rates. Effluent ammonia loading rates are variable with the higher values generally occurring during the wet weather season and lower values generally occurring during the dry weather season, reflecting the seasonal nature of the Oxidation Ponds and FGRs performance. Additional information pertaining to ammonia and other nutrient trends is presented in **Section 1.5** of this Chapter and is available in the *2020 Nutrient Watershed Permit Annual Report* submitted by BACWA.



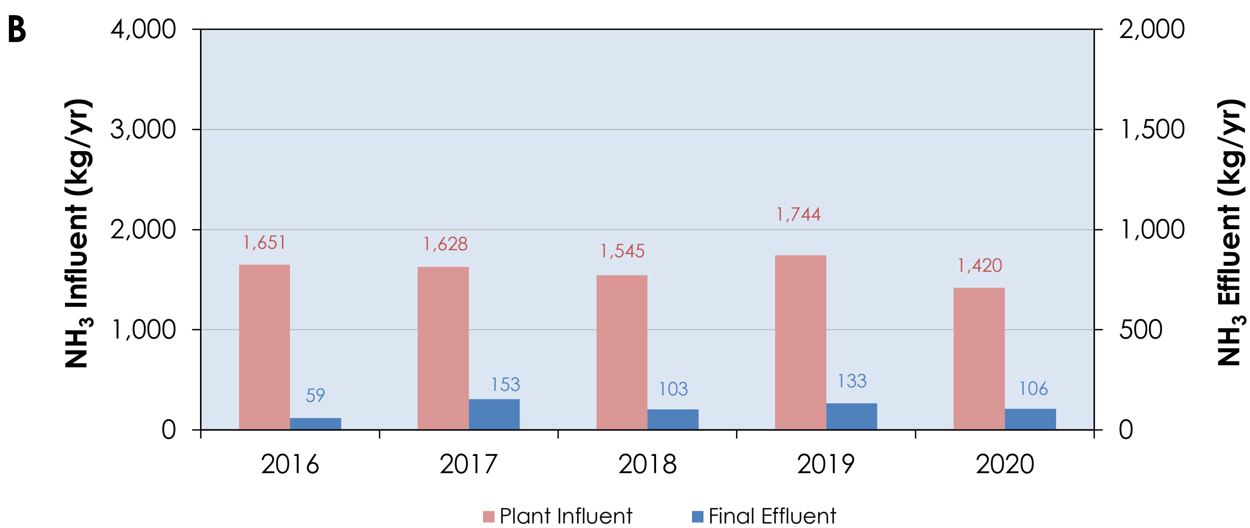


Figure 19: Average A) Daily and B) Annual Ammonia Loading Rates from 2016-2020

1.4.2. *Performance Optimization Strategies*

Oxidation Pond Dredging

Ammonia removal in the Oxidation Ponds is highly variable and seasonal in nature. Although variability in weather patterns plays a significant role, the loss of volume due to solids deposition over time has likely impacted performance by reducing the "working" capacity of the Oxidation Ponds. In addition to acting as a low-temperature anaerobic digester to stabilize solids in the sediment layer, the Oxidation Ponds promote ammonia removal by direct assimilation into photosynthetic algae cells as well as bacterial nitrification. As such, maintaining a sufficient water column and working volume is a performance essential and one of the only control variables for an open system of this type.

There are numerous entry routes for solids, including algae growth within the Oxidation Ponds, float (flocculated solids) skimmed from the DAFTs, DMF backwash water, solids handling wash water, and digester supernatant. Consequently, the City began a long-term dredging project in 2012 to restore capacity to the Oxidation Ponds (**Chapter IV, Section 7.0**). Dredging continued during this reporting period but was restricted to the wet weather season to avoid generating ammonia in excess of the FGRs' processing capacity. A total of 593 dry tons of biosolids were removed from the Oxidation Ponds in 2020, a majority of which were re-used for agricultural land application.

Snail Control Program

Trickling filters, such as the FGRs, are prone to declining ammonia removal performance because of snail predation on nitrifying bacteria that attach to the plastic growth media. As a result, the City periodically performs snail removal treatments. During a treatment event, the FGRs are placed into recirculation mode and effluent from the Oxidation Ponds is dosed with ammonium sulfate (approx. 8-9 tons at 40% solution) and sodium hydroxide (approx. 7 tons at 25% solution) in a batch process. The rise in pH from the sodium hydroxide effectively converts the ammonium sulfate to ammonia, which is toxic to the snails but beneficial to nitrifying bacteria up to a certain point. Snail shells and other solids are collected in the FGR distribution structure and wasted to the oxidation ponds, which help contribute a carbonate source to facilitate secondary treatment and act as a beneficial reuse to the pond ecosystem.

In a given year, the WPCP will typically perform one to two snail treatment events. The first typically occurs in spring and the second in fall during seasonal shifts when the potential decline in Oxidation Pond performance is at its highest and seasonal limits become more stringent. The timing of these events is dependent on performance data and may not occur at all, as in the case of 2020, if ammonia removal is high and the WPCP is able to meet its seasonal limit. The WPCP plans to continue performing these control events as long as the FGRs are required to provide nitrification.

1.5. Nutrient Summary

In addition to the current NPDES permit, the City is also subject to Waste Discharge Requirements of the Nutrient Watershed Permit No. CA0038873, RWQCB No. R2-2019-0017. The purpose of the Nutrient Watershed Permit is to track and evaluate Bay Area POTWs' treatment performance, fund nutrient monitoring programs, support load response modeling, and conduct treatment plant optimization and upgrade studies for nutrient removal. Information pertaining to the Nutrient Watershed Permit is prepared in a separate annual report by BACWA and reported electronically in CIWQS. The following summary is provided as an additional indicator of plant performance and in support of the trends presented in previous Sections.

The issuance of Order No. R2-2019-0017 shifted the focus of the previous RWQCB Order No. R2-2014-0014 from monitoring effluent total nitrogen (TN) to total inorganic nitrogen (TIN) and implemented influent monitoring of additional parameters including total phosphorus (TP). Since nitrogen is the growth-limiting nutrient for phytoplankton in the San Francisco Bay, a planning level target (PLT) was established for TIN, which is the bioavailable form of nitrogen. This Order did not establish effluent limits, primarily due to the current uncertainties in the extent that TIN is causing or contributing to impairment in the San Francisco Bay. Rather, the PLT is intended to forecast nutrient discharge performance in 2024 and provide an indication of potential future effluent limitations that ongoing performance can be measured against, such that the City can implement necessary early actions to reduce nutrients in current or future facility planning efforts. In essence, the PLTs allow time for additional scientific studies to understand the connectivity between nutrient discharges and potential impairment of the San Francisco Bay and an evaluation of cost-effective nutrient management opportunities.

The Nutrient Watershed Permit established PLTs using a two-step process. For Sunnyvale, the first step established a baseline of 630 kg/day from the maximum dry season average effluent TIN load measured between May 1, 2014 and September 30, 2017. Only dry season discharge data were used to calculate the PLT because it more accurately defines the current performance of treatment when accounting for variability in nutrient discharges caused by increased influent flows and lower temperatures during wet weather. This is also the time during the year when algae growth is more likely to contribute to adverse conditions in the San Francisco Bay. In the second step, a 15% growth factor was added to the baseline to account for a projected population growth rate of 1.5% over the next 10 years, resulting in the WPCP's PLT of 730 kg/day.

Nitrogen

Total Inorganic Nitrogen (TIN) is the measure of the total concentration of ammonia and nitrate and nitrite (NOx); whereas, total nitrogen (TN) is a measure of TIN and the organic fraction of nitrogen (Org-N). Influent TN consists primarily of ammonia and Org-N, with the contribution from NOx being negligible, as illustrated in **Figure 20A.** On average, Org-N comprises 40% of influent nitrogen with ammonia making up the remaining 60%. The composition of nitrogen in the effluent differs, as nitrification occurs in the Oxidation Ponds and FGRs, resulting in ammonia being largely oxidized to NOx. In this case, nitrate (NO_3) is the dominant form of oxidized nitrogen in the effluent, averaging 98% of NOx and roughly 85% of TIN. Effluent TIN is subject to seasonal variability for reasons discussed below.

Total Inorganic Nitrogen	
Average Dry Weather Effluent Load	**395 kg/day**
Planning Level Target (PLT)	**730 kg/day**
% Removal	**33%**

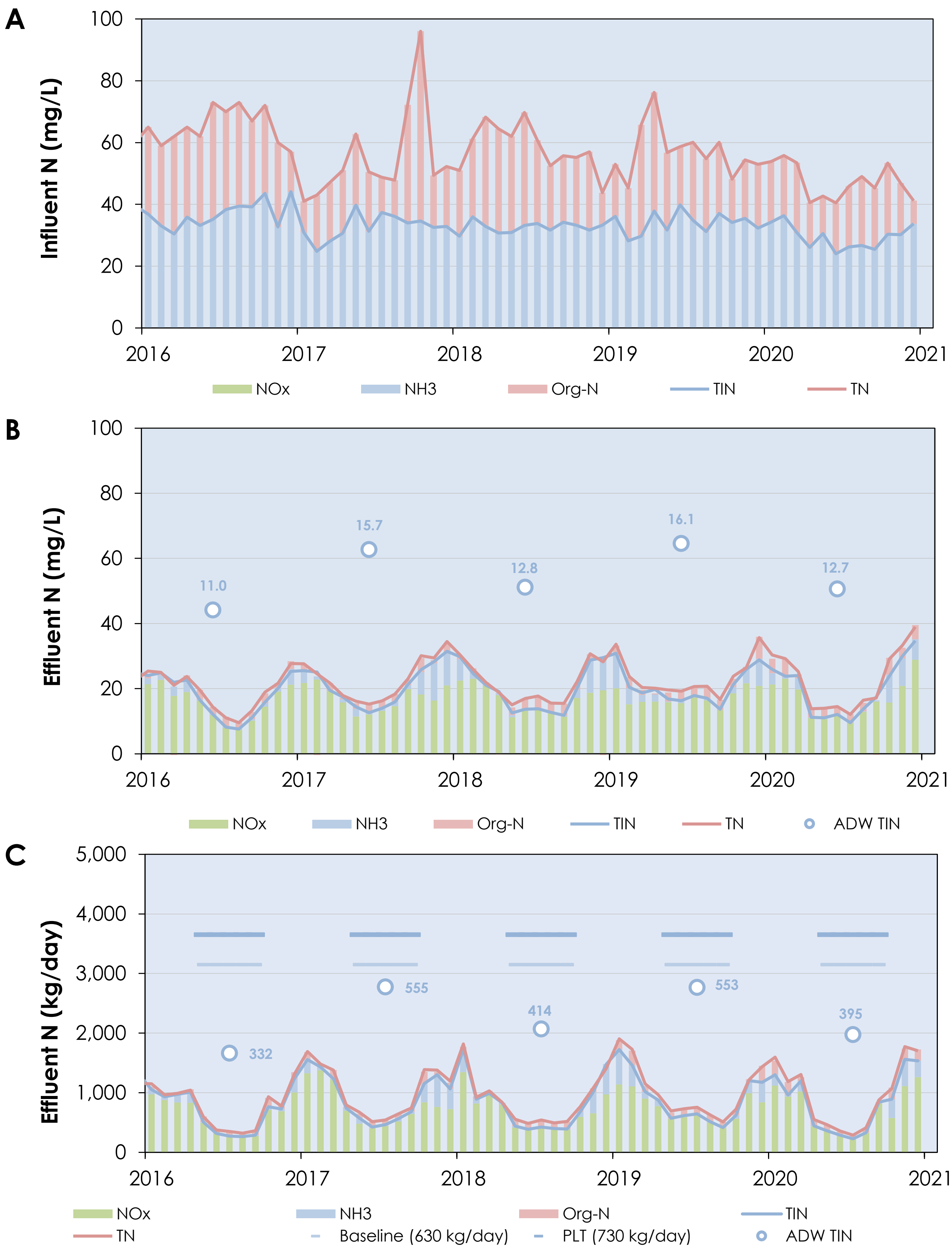


Figure 20: Nitrogen Trends at the WPCP from 2016-2020. A) Monthly Average Influent Nitrogen Concentrations. B) Speciated Monthly Average Effluent Nitrogen Concentrations and C) Effluent Nitrogen Loading Rates with ADW TIN and PLT

Figure 20A shows average monthly influent nitrogen concentrations collected as flow-weighted composite samples over a 24-hour period. In the current Nutrient Watershed Permit, influent Total Kjeldahl Nitrogen (TKN) monitoring was retained from the previous order and is considered equivalent to influent TN since NOx has been shown to be negligible. As such, influent TKN is simply referred to as TN for the purposes of this report. Monthly average influent TN concentrations in 2020 ranged from 41 to 56 mg/L with an annual average of 47 mg/L. In general, influent TN concentrations exhibited the same pattern as CBOD, TSS, and ammonia and are likewise attributed to the same COVID-19 factors. The 2020 trends are a reversal of those normally observed, wherein higher TN concentrations predominate in the summer, with lower concentrations in the winter, and are inverse to influent flow patterns. Unlike previous years (Sep-Oct 2017, Jun-Jul 2018, and Apr 2019), there were no observable spikes in influent TN.

Monthly average effluent TIN and TN concentrations are separated into the dominant forms of nitrogen (NOx, ammonia, and Org-N) in **Figure 20B**. The seasonal influence on nitrification at the WPCP becomes more apparent at this scale, with influent ammonia concentrations converting to NOx in the warmer dry weather months under more kinetically favorable biological conditions and then remaining more dominant in the colder wet weather months. Denitrification is also apparent in the dry weather months, as decreases in ammonia are not fully offset by increases in NOx, thereby driving down TIN concentrations. Though not shown graphically in this report, process data indicate that the majority of denitrification occurs in the Oxidation Ponds during the dry weather months and to a lesser degree in the DMFs where anaerobic conditions can develop. The FGRs and DAFTs promote aerobic conditions through mechanical turbulence and the introduction of dissolved air, which favor nitrification rather than denitrification. Effluent TIN concentrations during the 2020 reporting period were relatively consistent with previous years, ranging from 9.5 to 35 mg/L and an annual average of 20 mg/L. Average dry weather effluent TIN concentrations averaged 13 mg/L, which is also consistent with previous years and reflects the seasonality of the nitrification/denitrification processes at the WPCP.

Average monthly effluent nitrogen loading rates shown in **Figure 20C** are a product of the seasonal nitrification/denitrification experienced at the WPCP and also variations in flow rates associated with recycled water production and the Flow Management Strategy. Consequently, the loading rate curve peaks in the wet weather months when demand for recycled water is low and biological activity (nitrification/denitrification) slows. Higher loading rates are also observed in the wet weather months as effluent flows tend to be higher in order to offset increases operating depth of the Oxidation Ponds resulting from precipitation directly into the Oxidation Ponds and inflow/infiltration contributions to influent flows. Conversely, effluent loads are lowest during the dry weather months when recycled water production and biological activity are high but precipitation and influent flows are low. **Figure 20C** also shows the annual average dry weather (ADW) effluent TIN load in relation to the current performance (baseline) as well as the PLT. The calculated effluent ADW loads during the 2020 reporting period remained below the PLT at 395 kg/day. TIN removal efficiency, as measured by the difference between annual average influent and effluent concentrations, was approximately 33%. Reductions in influent ammonia that would otherwise drive down effluent TIN concentrations are offset by the production of

NOx as a result of nitrification in the Oxidation Ponds and FGRs. Effluent TN removal efficiency, on the other hand, remained relatively high around 52%, with most reductions in the form of Org-N.

Phosphorous

Total Phosphorous	
Annual Average Effluent	5.7 mg/L
Annual Average Effluent Load	200 kg/day
% Removal	12%

Average monthly influent and effluent total phosphorous (TP) concentrations are shown in **Figure 21A**. The WPCP began voluntarily analyzing for influent TP during 2015 to complement the monitoring requirements in the previous Nutrient Watershed Permit, RWQCB Order No. R2-2014-0014 and support nutrient discussions with a more complete dataset. Since then, influent TP monitoring requirements have been incorporated into the current Nutrient Watershed Permit, RWQCB Order No. R2-2019-0017. TP is less influenced by seasonal variation as compared to nitrogen. Influent TP data indicate relatively consistent concentrations ranging from 4.9 to 6.6 mg/L and averaging 5.7 mg/L.

As shown in **Figure 21B**, average monthly effluent TP concentrations ranged from 2.7 to 8.3 mg/L with an annual average of 5.0 mg/L. Effluent TP concentrations have been separated into the dominant forms of orthophosphate (Ortho-P) and organic phosphorous (Org-P). Ortho-P, also known as dissolved reactive phosphorous, represents the form of phosphorous that is readily available for biological growth and comprises the largest fraction of effluent TP. Analysis of the various forms of phosphorus began in 2013 and ended in July 2019 when RWQCB Order No. R2-2019-0017 became effective and shifted the focus solely to TP. During the 2020 reporting period, effluent TP concentrations peaked in warmer months and were complimented by lower concentrations during the colder months. Effluent TP concentrations trended closely with influent concentrations and were only slightly lower on average. The approximate 12% difference between influent and effluent levels is consistent with previous years and reflective of incidental removal of phosphorus at various stages throughout the treatment process.

Average and total annual phosphorous loading rates are shown in **Figure 21C**. Overall, average TP loading rates have remained relatively consistent around 200 kg/day with approximately 81 tons of TP being discharged during the 2020 reporting period. Unlike TIN, there were no PLTs established for phosphorous loads in the current Order.

1.6. Plant Performance Summary

The WPCP maintained a high level of pollutant removal efficiency during the 2020 reporting period. Influent pollutant data collected during 2020 exhibited much less variability than in previous years, suggesting a high level of accuracy and confirming the success of new preventative maintenance measures placed on the composite sampler in 2019. Pollutant trends generally followed the same patterns and strongly correlated with the various shelter-in-place restrictions due to the COVID-19 pandemic that likely dampened Sunnyvale's typical large net influx of daytime workforce. Surprisingly, influent flow rates

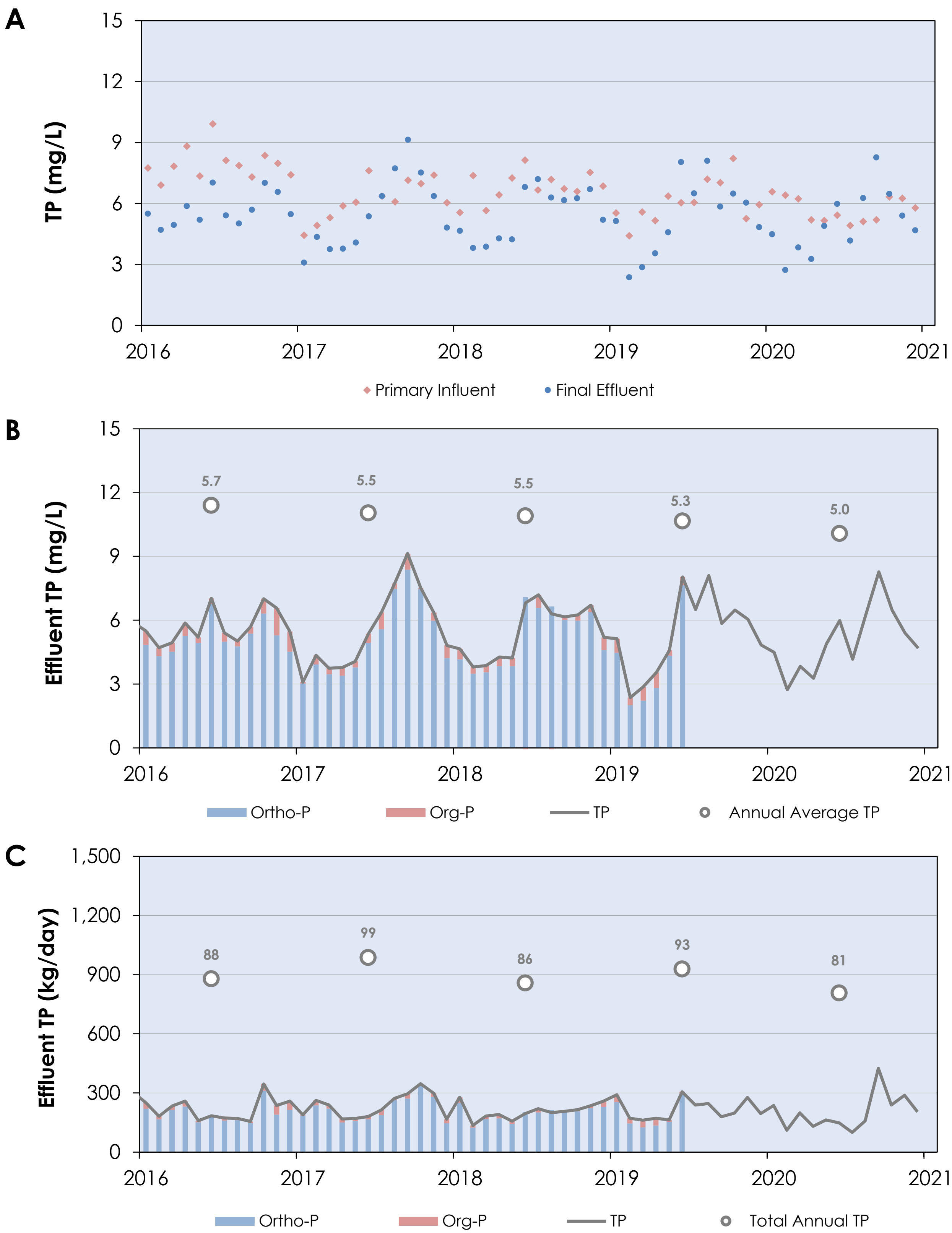


Figure 21: Phosphorous Trends at the WPCP from 2016-2020. A) Monthly Average Influent and Effluent TP Concentrations. B) Speciated Monthly Average Effluent Phosphorous Concentrations and C) Loading Rates with Annual Total TP Loads

remained relatively consistent throughout 2020 and with previous years despite changes to commuter patterns and local business operations brought about by the COVID pandemic. These trends are attributed to the lower pollutant loads observed in the WPCP's influent; whereas, effluent loads remained relatively consistent with previous years due primarily to decoupling effect of the long detention time created by the Oxidation Ponds and the associated Flow Management Strategy.

2.0. PERMIT COMPLIANCE

All required monitoring data were reported electronically to CIWQS via monthly SMRs. Per Attachment G, Provision V.C.1.h.3 of the current NPDES permit, such reporting removes the requirement for tabular and graphical summaries of monitoring data in this report. However, the City has prepared the following tabular and graphical summaries for internal use and has included them here for informational purposes.

2.1. Effluent Limitations

Table 2 summarizes effluent compliance sampling conducted during 2020. As shown, the WPCP experienced one exceedance of the nickel MDEL during the 2020 reporting period.

Nickel concentrations in the January 7, 2020, monthly compliance sample measured 58.3 µg/L, which exceeded both the MDEL of 35 µg/L and required accelerated effluent monitoring. Daily samples were also collected from two different points in the receiving water (upstream and downstream of the WPCP's outfall). Sunnyvale discontinued daily accelerated monitoring on January 15, 2020, after two consecutive samples measured effluent nickel concentrations of 3.6 µg/L, bringing the average monthly concentration for January to 22.3 µg/L and below the AMEL. Data from mid-process samples collected during this incident (**Table 1**) are confounding, in that they did not show a corresponding increase in nickel concentrations. The City investigated several potential contributing factors, including sampling equipment and protocols, ongoing construction work associated with the Cleanwater Program, treatment process adjustments or anomalies, and upstream sources, but found no clear correlation with this incident. The quick return to lower levels of nickel in subsequent samples, despite a typical residence time in the Oxidation Ponds of more than 30 days, further suggests that the January 7, 2020 sample result was invalid.

Table 1: Nickel data during the exceedance and accelerated monitoring

	Composite Sample						Grab Sample	
	INF-001	*Mid-Process*				*EFF-001*	*Receiving Water*	
Nickel	Influent (µg/L)	Primary Effluent (µg/L)	Pond Effluent (µg/L)	FGR Effluent (µg/L)	DAFT Effluent (µg/L)	Final Effluent (µg/L)	Upstream (µg/L)	Downstream (µg/L)
1/7/2020	22.2	4.81	4.51	3.91	3.57	58.3	---	---
1/13/2020	---	---	---	---	---	---	49.2	12.9
1/14/2020	7.18	5.34	4.33	4.18	3.92	3.6	3.9	4.1
1/15/2020	6.21	4.52	4.72	6.22	6.27	3.6	4.2	4.2

Table 2: Effluent Monitoring Summary and Compliance with Discharge Limits in 2020

Parameter Class	Parameter	Parameter Limit Type	Parameter Limit	2020 Final Effluent Min	2020 Final Effluent Avg	2020 Final Effluent Max	Number of Samples[1] / Exceedance
Standard	CBOD	MDEL (mg/L)	20	<2.0	5.1	10.0	93 / 0
		AMEL (mg/L)	10	2.7	5.0	7.3	12 / 0
		Percent Removal (%)	85	96	97	98	12 / 0
	TSS	MDEL (mg/L)	30	1.5	7.8	15.5	91 / 0
		AMEL (mg/L)	20	3.5	7.8	11.3	12 / 0
		Percent Removal (%)	85	96	97	98	12 / 0
	Ammonia (as N)	MDEL [Oct-May] (mg/L)	26	<0.1	4.0	14.3	34 / 0
		AMEL [Oct-May] (mg/L)	18	<0.1	3.9	8.5	8 / 0
		MDEL [Jun-Sept] (mg/L)	5.0	<0.1	0.2	1.0	18 / 0
		AMEL [Jun-Sept] (mg/L)	2.0	<0.1	0.2	0.4	4 / 0
	Oil & Grease	MDEL (mg/L)	10	<1.5	<1.5	<1.5	4 / 0
		AMEL (mg/L)	5.0	<1.5	<1.5	<1.5	4 / 0
	Turbidity[4]	MDEL [Oct-May] (NTU)	10 (TSS ≥20 mg/L)	5.8	9.0	11.8	38 / 0
		MDEL [Jun-Sep] (NTU)	10	1.4	3.1	6.1	18 / 0
	pH[1]	Max / Min	8.5 / 6.5	6.8	7.2	7.8	333 / 0
	Cl_2 Residual[1]	IMEL (mg/L)	0.0	0.0	0.0	0.0	333 / 0
	Enterococci	GeoMean (month) [MPN/100 mL]	35	1.3	1.7	2.4	3 / 0
		90th percentile (month) [MPN/100 mL]	110	3.0	9.4	17.3	9 / 0
		6-wk Rolling GeoMean (MPN/100mL)	30	1.1	3.1	8.2	39 / 0
Toxicity	Acute Toxicity	90th% (% Survival)	70	100	100	100	4 / 0
		Moving Median (% Survival)	90	100	100	100	4 / 0
Organics	Cyanide[3]	MDEL (ug/L)	17	<1.2	<1.4	2.4	12 / 0
		AMEL (ug/L)	7.5/7.0	<1.2	<1.4	2.4	12 / 0
	Dioxin TEQ[2]	AMEL (ug/L)	1.4×10^{-8}	---	---	---	--- / ---
		MDEL (ug/L)	2.8×10^{-8}	---	---	---	--- / ---
	Bis-2[5]	MDEL (mg/L)	12	<0.05	<0.05	<0.05	1 / 0
		AMEL (mg/L)	5.9	<0.05	<0.05	<0.05	1 / 0
Metals	Copper	MDEL (ug/L)	19	1.3	2.9	5.4	14 / 0
		AMEL (ug/L)	10	1.3	2.8	5.4	14 / 0
	Mercury	AMEL (ug/L)	0.025	0.0002 J	0.0012	0.0021	12 / 0
		AAEL (kg/yr)	0.120	---	---	0.018	1 / 0
	Nickel[3]	MDEL (ug/L)	35/33	3.0	9.6	58.3	14 / 1
		AMEL (ug/L)	24	3.0	7.5	21.8	14 / 0

Notes:
1: Sample collection required only during active discharge – sample count below 365 indicates periods of zero discharge to San Francisco Bay
2: Sampling conducted for Dioxin TEQ once every permit cycle (RWQCB Order R2-2016-0008); sampling for current permit (Order No. R2-2020-0002) pending
3: Cyanide AMEL changed to 7.0 ug/L and the nickel MDEL changed to 33 ug/L on April 1, 2020 with the reissuance of the NPDES permit (Order No. R2-2020-0002)
4: The 10 NTU limit for turbidity is not applied during June 1 through September 30 if concurrent effluent TSS concentrations are less than 20 mg/L
5: Bis-2 did not trigger reasonable potential during NPDES permit reissuance (Order No. R2-2020-0002); quarterly monitoring not required as of April 1, 2020
AAEL: Average annual effluent limit; AMEL: Average monthly effluent limit; AWEL: Average weekly effluent limit; IMEL: Instantaneous maximum effluent limit
MDEL: Maximum daily effluent limit
J: Analyte detected, but not quantifiable
<#: Analytical results less than the laboratory detection limit
---: Indicates that data are not available or applicable

2.1.1. *Constituent Removal*

Figure 22 through **Figure 26** show constituent removal and corresponding effluent limits (MDEL, AMEL) and water quality objectives (WQOs). WQOs are numerical standards established in the California Toxics Rule or other governing documents and are distinct from effluent limitations even though they form the basis for effluent limitations, if required. WQOs are designed to protect water quality, aquatic life, and human health in the receiving water and prompt no immediate regulatory action. Therefore, WQOs presented in the following figures, which are taken from the current NPDES permit, are included solely for informational purposes.[3]

As described in the previous section, and shown in **Figure 22**, there was one incident during the 2020 reporting period wherein effluent nickel exceeded the MDEL. The remainder of pollutants presented in **Figure 22** through **Figure 24** remained below their respective effluent limits or WQOs. Section VI.C of the current NPDES permit Fact Sheet establishes priority pollutant monitoring requirements and frequencies. The City has opted to participate in the *Alternate Monitoring and Reporting Requirements for Municipal Wastewater Discharges* Order No. R2-2016-0008, which changes the monitoring frequency to once-per-permit in exchange for diverting the analytical costs associated with priority pollutant monitoring to supplement the Regional Monitoring Program. The City has not yet performed this monitoring under its current permit but satisfied this requirement with 2014 and 2015 data collected and reported under the previous NPDES permit.

Figure 25 shows data from common physical parameters collected as grab samples at the WPCP, of which only turbidity (**Figure 25A**) and pH (**Figure 25B**) have effluent limits. Influent and effluent temperature data (**Figure 25C**) are relevant for evaluating trends in biological treatment performance and are included in this report for informational purposes only. The variability in turbidity data shown in **Figure 25A** is a function of polymer dosing in the DAFTs, which is correlated with the dominant form of algae present. Prior to improvements completed in 2018, the production of recycled water heavily influenced effluent turbidity during the dry season because the WPCP was not configured for simultaneous production of recycled water and NPDES discharge. Consequently, all flow was treated to CCR Title 22 standards (2 NTU) beginning in the DAFTs. During the transition from recycled water production back to NPDES discharge, 2 NTU effluent would be discharged. Under the current configuration, both recycled water production/distribution and NPDES discharge can occur simultaneously.

The current NPDES permit changed the way the 10 NTU turbidity limit is applied. The limit is continuously applied during the dry weather season (Jun-Sep) but now is only applied during the wet weather season (Oct-May) when effluent TSS exceeds 20 mg/L. This allowance is illustrated in **Figure 25A** and reflects a defining treatment feature of the Oxidation Ponds. As previously described, influent nitrogen is assimilated during algal photosynthesis in the Oxidation Ponds, which in turn oxygenates surface waters and promotes favorable nitrifying conditions while also allowing denitrification to occur in

[3] The WQO listed in the chart for total chromium is the limit for chromium (VI) and is conservatively applied to effluent total chromium.

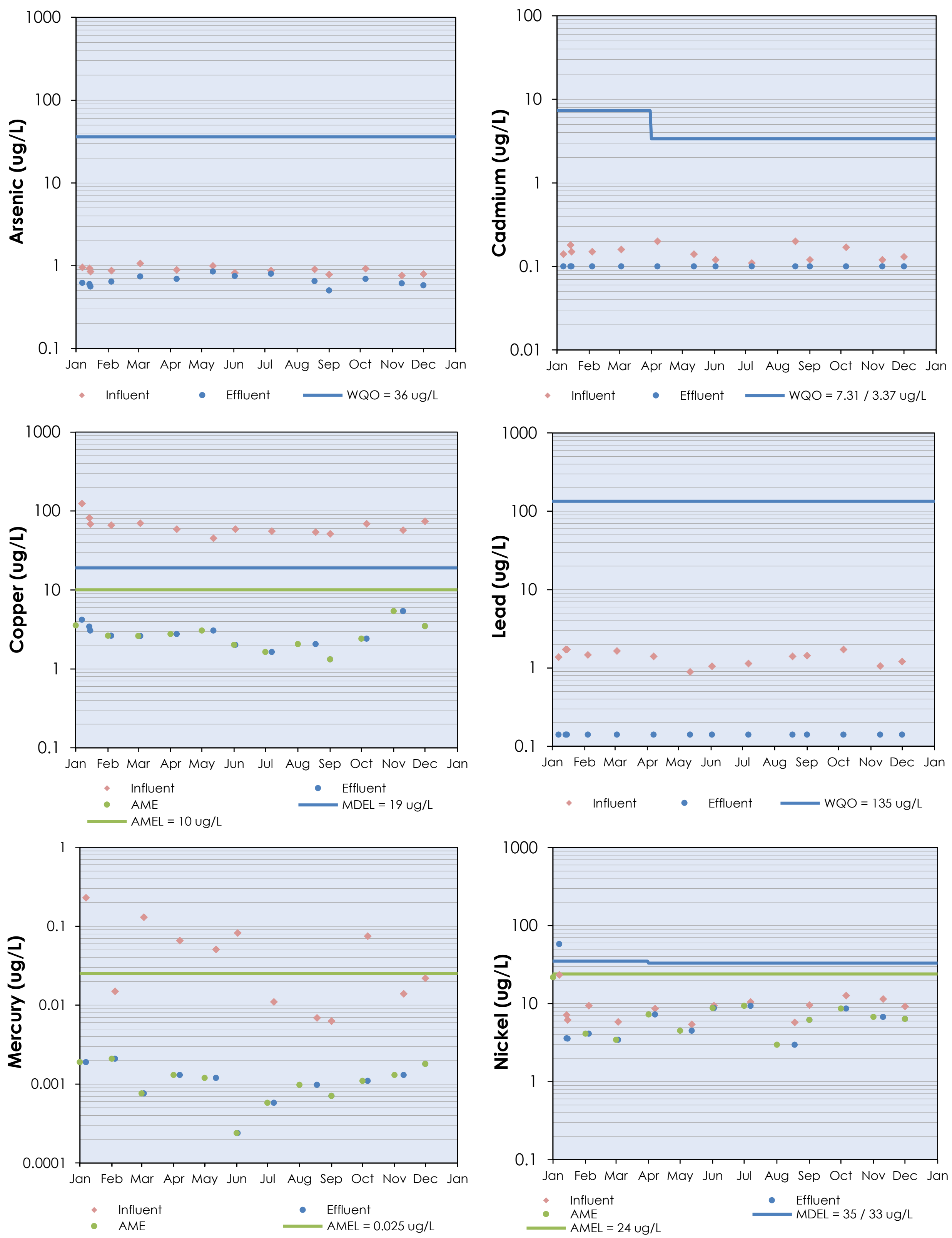


Figure 22: Select Metal Pollutants measured during 2020

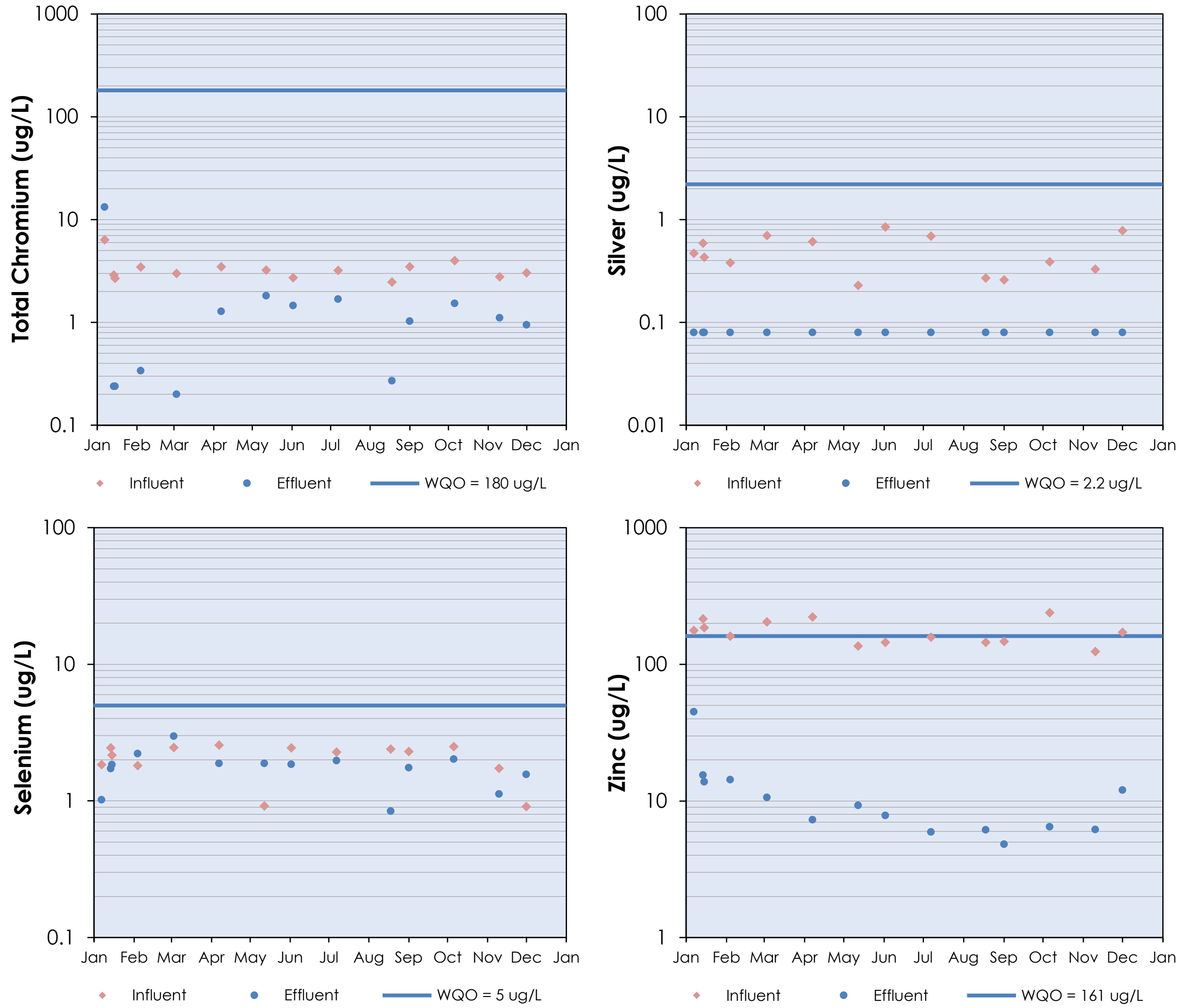


Figure 23: Select Metal Pollutants measured during 2020. Total Chromium WQO is for Chromium (III)

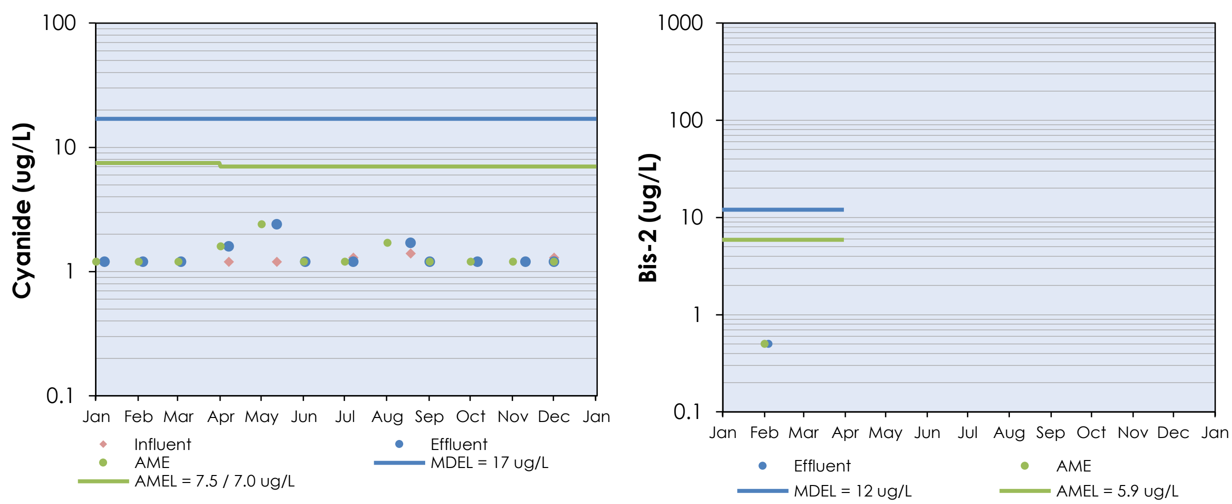


Figure 24: Cyanide and Bis-2 trends during 2020

benthic anaerobic zones. Algae undergo annual seasonal shifts that follow ambient weather conditions, such that colonial species that are easily harvested in the DAFTs and filtered-out in the DMFs predominate during the dry weather season with more solitary species that challenge removal efficiencies predominating in the wet weather season. This generally results in higher effluent turbidity and TSS during the winter months as compared with the summer months since algae form a larger fraction of solids during these months. Polymer consumption is highest during these months and the approach has the benefit of reducing the amount of polymer discharged to the San Francisco Bay by acknowledging that a higher seasonal allowance of algae (turbidity) does not substantially increase TSS. The TSS trigger of 20 mg/L is below the 30 mg/L MDEL and equivalent to the AMEL, thereby providing assurances that these allowances will not degrade receiving water quality or circumvent existing limits. Turbidity in the receiving waters is around 5-10 times greater than the WPCP's effluent. During the 2020 reporting period, turbidity exceeded 10 NTU on several occasions during the wet weather season only, with corresponding TSS values remaining below the 20 mg/L trigger.

Effluent pH values occasionally approach the lower discharge limit of 6.5 as shown in **Figure 25B**. The depression in pH was historically attributed to the use of chlorine gas (which depresses pH) for disinfection, coupled with the more stringent Title 22 water quality requirements associated with recycled water production, which required higher chlorine doses. As of 2018, disinfection for recycled water production is now separate from disinfection for discharge to the San Francisco Bay, and sodium hypochlorite (which does not depress pH) is now used rather than chlorine gas. Seasonal variations in effluent pH still occur with lower pH observed in the wet weather months, but pH levels are not expected to approach the lower pH limit to the degree that occurred in the past.

Influent and effluent temperatures at the WPCP vary seasonally but follow the same general pattern (**Figure 25C**). The significant difference between the influent and effluent temperatures is the result of the long residence time in the Oxidation Ponds. On average, primary effluent is held in the Oxidation Ponds for 30-45 days. In contrast, wastewater passes through primary treatment and reaches secondary treatment in the Oxidation Ponds within 1-2 hours on average. As a result, the wastewater undergoing secondary treatment is heavily influenced by ambient temperatures and carried through to the final effluent.

Enterococcus limits were changed from the previous 30-day geomean limit of 35 MPN/100 mL mid-year with the reissuance of the NPDES permit. While the required sampling frequency remains the same (5 sample per week), compliance is now evaluated against a 30-day 90th percentile limit of 110 MPN/100 mL and a 6-week rolling geometric mean limit of 30 MPN/100 mL. Compliance with these new limits was maintained during the 2020 reporting period. Occasional spikes in the daily samples contributed to the higher calculated values observed in **Figure 26** and have been correlated with regrowth in the flow-through sampling system rather than effluent water quality. To avoid these anomalies, the WPCP has implemented more rigorous preventative maintenance cleaning protocols for the sampling system.

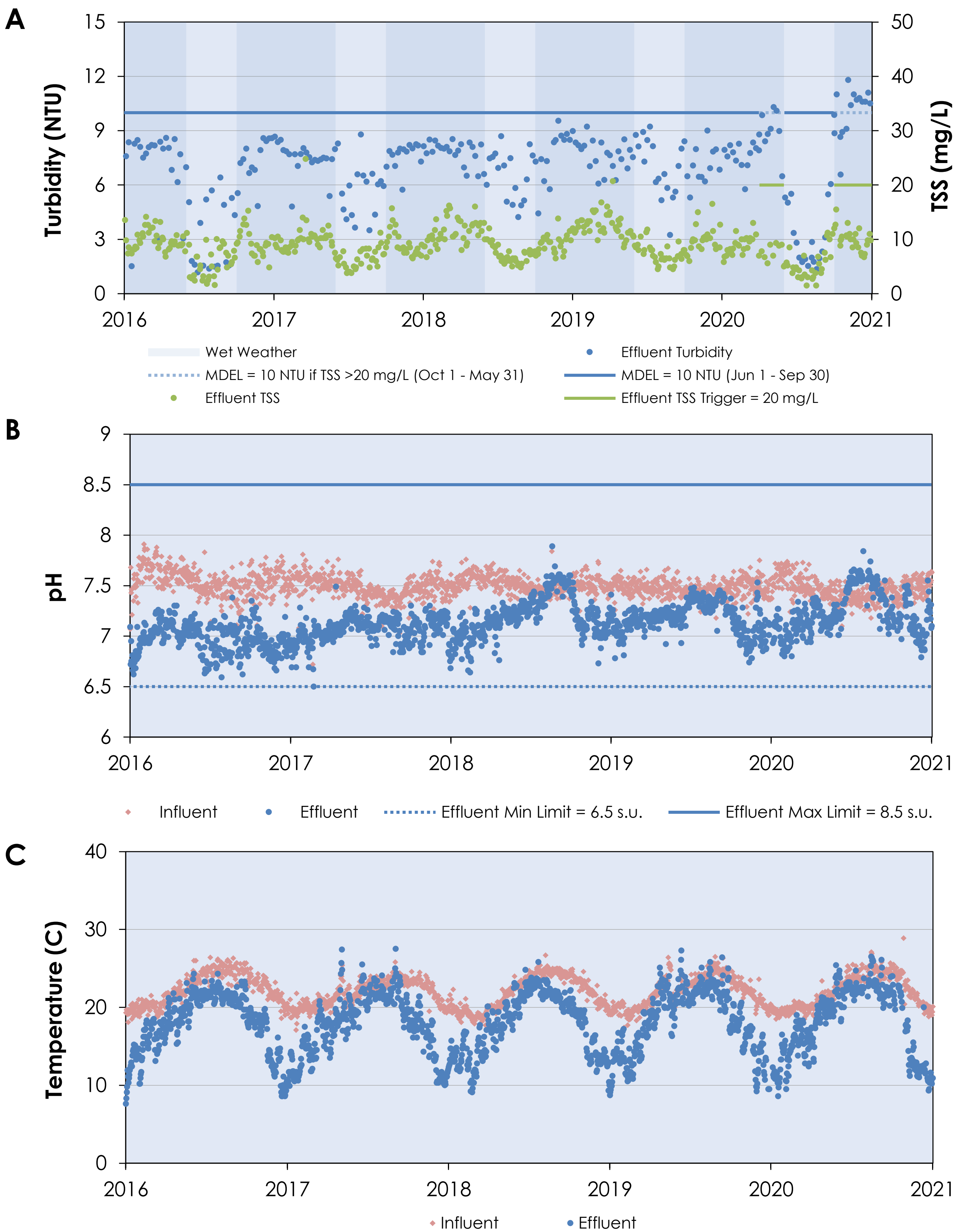


Figure 25: Turbidity, pH, and Temperature trends from 2016-2020

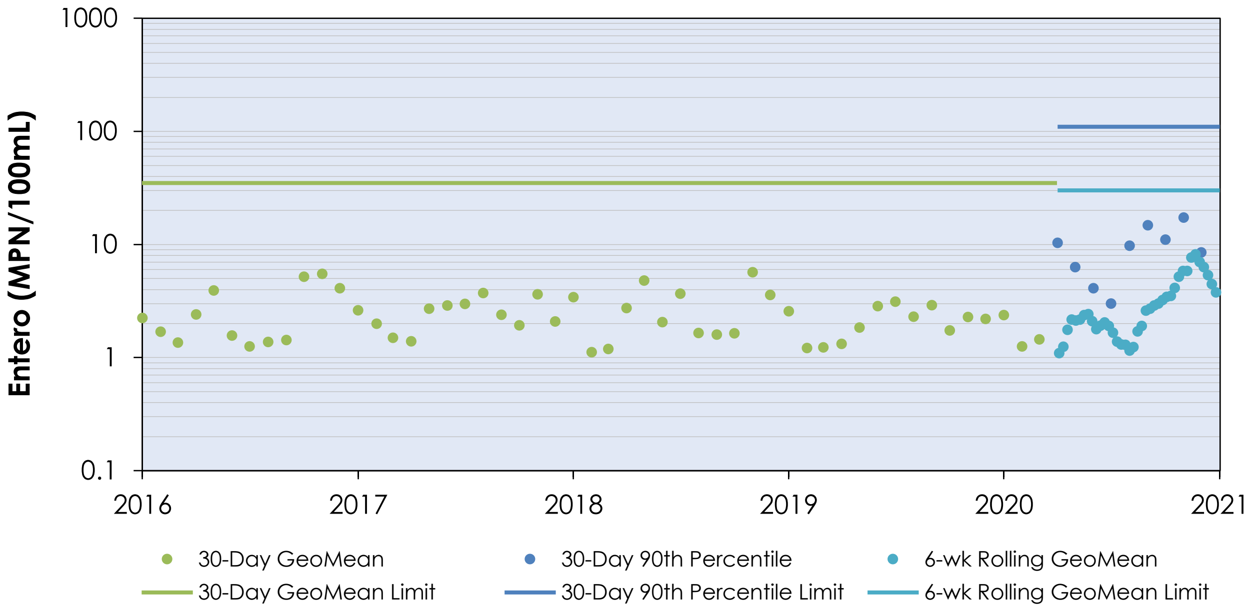


Figure 26: Enterococcus trends from 2016-2020

2.1.2. Chronic Toxicity Effluent Triggers

The required frequency of chronic toxicity testing changed from monthly to quarterly under the reissued NPDES permit beginning April 1, 2020. *Thalassiosira pseudonana*, a marine alga (diatom) was selected as the most sensitive species based on a chronic toxicity screening testing conducted during the 2014 permit renewal process (**Figure 27**). The chronic toxicity test is conducted by the City's contract laboratory, Pacific Ecorisk Laboratory (PERL), and is performed over a four-day period with growth measured as the endpoint.

As required by the current NPDES permit, the City developed a Generic TRE Workplan, which includes a six-tiered approach for evaluating and responding to chronic toxicity events. The basic approach is to start at Tier 1 (accelerated monitoring) and Tier 2 (review of available effluent data, examination of operational practices and process chemical use) to identify potential causes or sources of toxicity before moving on to more complex and costly laboratory investigations or potential operational or physical modifications. The workplan further requires the implementation of a Toxicity Identification Evaluation (TIE) upon exceedance of a trigger value of 1.25 toxicity units (TUc) based on EC_{50} or IC_{50}[4] values.

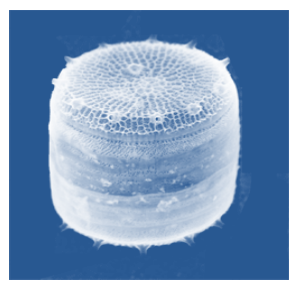


Figure 27: ***Thalassiosira pseudonana***

[4] EC_{50} is the concentration which results in 50% of the maximal response. IC_{50} is the concentration which results in a 50% reduction in growth or growth rate.

Provision V.B.3.b. in Attachment E of the current NPDES permit contains effluent triggers if the single test maximum exceeds 2.0 TUc or the three-sample median exceeds 1.0 TUc based on the IC_{25}[5]. If either condition is triggered, the City must implement an accelerated monitoring schedule for chronic toxicity testing of once-per-month and submit an event-specific Toxicity Reduction Evaluation (TRE) Workplan to the RWQCB within 30 days of detecting toxicity. The City may only return to routine (quarterly) monitoring of chronic toxicity if results from the accelerated monitoring fail to confirm toxicity and do not exceed the permit triggers described above. The City must implement the TRE Workplan if the accelerated monitoring confirms toxicity and initiate investigative and corrective actions until toxicity results are shown to be below trigger levels or as directed by the Executive Officer.

As shown in **Table 3**, there was one exceedance of the single test maximum trigger of 2.0 TUc during the 2020 reporting period. On September 2, 2020, the chronic toxicity compliance test detected toxicity at 2.4 TUc. Consequently, the WPCP initiated accelerated monitoring to monthly and submitted an event-specific TRE Work Plan. While implementation of the TRE Work Plan is not required unless toxicity is confirmed, the WPCP implemented the early tiers of the work plan to promptly identify and resolve potential contributors to toxicity and to prepare for the potential implementation of a TIE. The results from the October 7, 2020, accelerated monitoring test did not detect toxicity (<1.0 TUc), and therefore, the focused TIE tests were not conducted. The accelerated monitoring test conducted in October served as a routine monitoring test for the last quarter of 2020. The City will resume routine quarterly monitoring in January 2021, as accelerated monitoring did not confirm toxicity and toxicity dropped below permit triggers.

Table 3: Summary of Chronic Toxicity Testing Results for WPCP Effluent during 2020

Test #	Sample Date	Growth TU_c	3-Sample Median (Growth TU_c)
1	1/8/2020	<1.0	<1.0
2	2/19/2020	<1.0	<1.0
3	3/4/2020	<1.0	<1.0
4	5/13/20	<1.0	<1.0
5	9/2/2020	2.4	<1.0
6	10/7/2020	<1.0	<1.0

2.1.3. *Effluent Residual Chlorine*

There were no “on-the-hour” residual chlorine excursions of the IMEL during the 2020 reporting period.

[5] IC stands for inhibition concentration. IC_{25} is the statistical calculation of the effluent concentration which causes a 25% reduction in growth or reproduction of test organisms.

2.1.4. *Mercury Effluent Limitations and Trigger*

The WPCP continues to be an active member of BACWA and participates in the annual submittal of water quality data pertaining to mercury discharge. In accordance with the Mercury and PCBs Watershed Permit, effluent mercury concentrations are measured monthly for regulatory compliance and shown in **Figure 28.** Influent concentrations and loading rates have been included for evaluating removal performance over the reporting period. As shown in **Figure 28A**, effluent mercury concentrations remained below the average monthly trigger (0.011 ug/L) and limit (0.025 ug/L) and were significantly lower than influent concentrations. Similarly, the cumulative annual effluent mercury load of 0.018 kg/yr is well below the permit limit of 0.12 kg/yr and significantly lower than influent loads (**Figure 28B).**

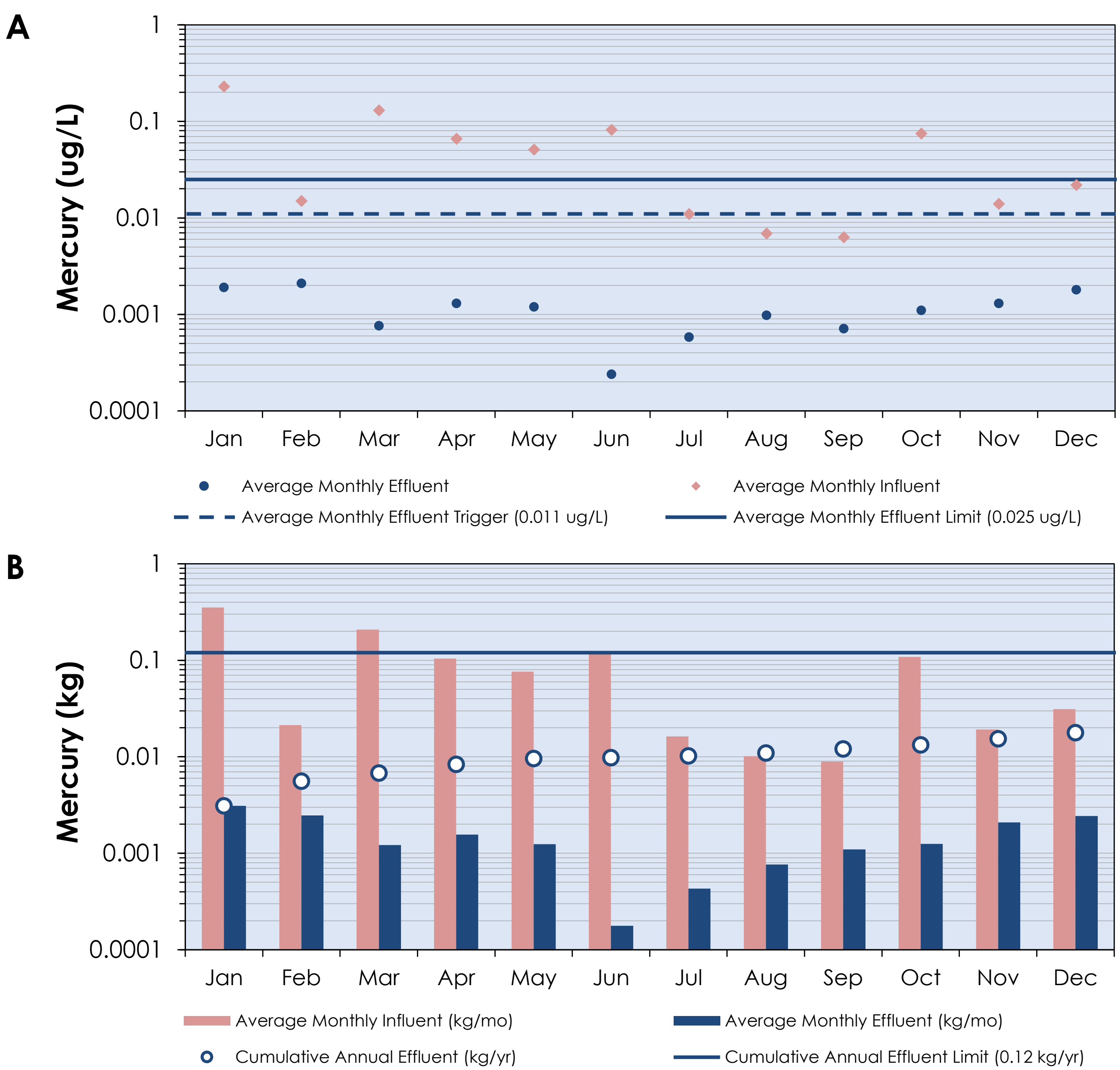


Figure 28: Influent and Effluent Mercury A) Concentration and B) Loading Rate Trends during 2020

2.1.5. *PCB Effluent Limitations*

In accordance with the Mercury and PCBs Watershed Permit, the WPCP is also required to measure and report total PCBs as congeners semi-annually using EPA Proposed Method 1668c. Results from this method are provided to the RWQCB for informational purposes and are used to verify assumptions and evaluate the need to refine wasteload allocations. The requirement for monitoring of PCBs as Aroclors for compliance with effluent limitations was reduced to once per permit cycle by the *Alternate Monitoring and Reporting Requirements for Municipal Wastewater Discharges* Order No. R2-2016-0008. PCBs as Aroclor data were submitted in 2015 under the previous NPDES permit (Order No. R2-2014-0035) to satisfy the once-per-permit-cycle requirement established in Provision VI.C.1. The WPCP has not conducted the requisite monitoring under the reissued NPDES permit (Order No. R2-2020-0002) and will include the results in a subsequent annual report once they are available.

2.2. Unauthorized Discharge

The WPCP experienced one unauthorized discharge[6] incident during the 2020 reporting period. On July 30, 2020, the City confirmed that a rupture in the Secondary Effluent Pipeline resulted in the unauthorized discharge of approximately 293,000 gallons of substantially treated secondary effluent into a U.S. Fish and Wildlife conveyance channel (FWS Channel). The WPCP completed the notifications to various agencies as required by Section V.E.2 of Attachment G and submitted a detailed 5-Day Written Report on August 5, 2020. The City is providing weekly updates on the construction progress of an intermediate solution to the various regulatory agencies in addition to monthly SMR updates.

<u>Sequence of Events and Immediate Corrective Actions</u>

On the evening of July 29, 2020, WPCP Operations staff performing the second of two daily inspections at the Oxidation Ponds observed an unusual disturbance (upwelling) on the surface water in the FWS Channel along the alignment of a buried 36-inch welded steel force main (Secondary Effluent Pipeline) that conveys secondarily treated effluent to the WPCP for further treatment (**Figure 29**). Operations staff immediately shut-down the pumps at the Pond Effluent Pump Station until further investigations could be conducted safely the following day to determine if there was a connection between pump operation and the observed upwelling. In addition, final effluent discharge from the WPCP was halted due to the disruption of the treatment process. On July 30, 2020, Operations accessed the point of upwelling in the FWS Channel by boat, resumed pumping through the Secondary Effluent Pipeline, and observed upwelling similar to the previous evening. After collecting samples from the point of upwelling, Operations once again secured secondary effluent flow thereby ceasing any additional discharge into the FWS Channel. Based on information assessed from sampling results and estimated duration and measured flow, Sunnyvale estimated 293,000 gallons of substantially treated secondary effluent was discharged to the FWS Channel. Material discharged into the FWS Channel was unrecoverable due to the release occurring in an open area of conveyance.

[6] California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment, or disposal system.

Figure 29: Alignment of WPCP process piping and point of unauthorized discharge in FWS Channel

The immediate mitigation measure was to cease discharge from the WPCP, retain flows in the Oxidation Ponds (estimated to have approximately 10-days of detention time), and recirculate flow from the Tertiary Drainage Pump Station over the FGRs to keep the biofilms from drying-out. Following these immediate mitigation measures, a temporary pump system was configured at the Tank Drainage Pump Station to pull secondary effluent from the return channel in Oxidation Pond 2 through an alternate pipeline (Pond Return Line), thereby bypassing the Secondary Effluent Pipeline and allowing full treatment to resume without additional discharge to the FWS Channel. The Pond Return Line is a 48-inch pipe that runs parallel to the Secondary Effluent Pipeline under the FWS Channel and is normally used to gravity feed backwash and other tertiary plant flows, referred to as return flows, back to the Oxidation Ponds. Under the alternate flow configuration, the Pond Return Line serves two functions: the continuous conveyance of secondary effluent through the Pond Return Line (primary), and the intermittent conveyance of return flows (secondary).

<u>Notification and Monitoring</u>

The Operations Manager notified the California Emergency Management Agency (CALEMA), the Santa Clara County Department of Environmental Health (DEH), and the RWQCB of the incident within 2-hours after confirming the unauthorized discharge on July 30, 2020. Concurrent with notifications to the appropriate agencies, WPCP staff posted warning signs around Pond A4 to deter the public from accessing locations of potential exposure that could be caused by the discharge. These signs were posted in addition to the existing standard permanent signage located throughout the Oxidation Pond levee roads, which notify the public of the potential dangers of coming into contacting with treatment pond water. No signs were posted around Pond A3W as public access is already restricted.

Sunnyvale also notified FWS and Valley Water of the incident. During discussions with FWS, Sunnyvale learned that flow in the FWS Channel is primarily driven by a muted tidal influence from the Alviso 3 West (A3W) pond complex that receives input through a series of gates and syphons from adjacent ponds connected to South San Francisco Bay (**Figure 30**). This is an artifact of the channel's former role as part of a larger pond complex owned and operated by Cargill Salt for salt production. Pond A3W is not under active management. The gate connection between Pond A3W and Guadalupe Slough was described by FWS as a passively managed cross-directional flow. Closer to the WPCP, the connection between Pond A3W and the FWS Channel is passive, and it is Sunnyvale's conclusion that the WPCP's discharge was likely attenuated within the channel as the predominant flow direction is from Pond A3W into the channel.

Monitoring was conducted to evaluate the potential impact of the discharge. In addition to the sampling described above at the point of observed upwelling on July 30, samples were also collected at the Pond Effluent Pump Station pier to provide a background profile of the pond effluent. In order to achieve a better understanding of the extent of the potential impact of the discharge, additional samples were collected on July 31, 2020, at a crossover bridge located at the connection point between the FWS Channel and FWS Pond Alviso 3 West (A3W), as well as at the gated connection between Pond A3W and Guadalupe Slough, during an ebbing tide. All samples were analyzed for ammonia, pH, biological oxygen demand (BOD), dissolved oxygen (DO), enterococcus, and total suspended solids (TSS). Visual observations made during each day of sampling did not indicate any impact to biota or water quality. Monitoring locations are shown in **Figure 31** and analytical results are presented in **Table 4**. Dissolved oxygen, pH, and TSS values were within an expected range of those likely considered to be normal for the FWS Channel.

Figure 30: Connectivity of pond complexes adjacent to the FWS Channel

Probable Cause and Intermediate Solution

Sunnyvale believes that the age and condition of the Secondary Effluent Pipeline are the contributing factors to the breakage. The pipeline is included in the Cleanwater Program's Existing Plant Rehabilitation Project to address critical equipment that would need to be repaired or replaced in order to extend the useful life of the facility. In response to this pipeline break incident, the Secondary Effluent Line is being given higher priority within the Rehabilitation Project.

Since the rehabilitation project will be a significant construction effort and will not be completed in a feasible timeframe to address the immediate needs of the facility, Sunnyvale began construction of an intermediate solution under the WPCP's emergency permits to replace the temporary alternate flow configuration with a solution that is less disruptive to WPCP operations and reduces the risk of additional discharge to the FWS Channel. The City has made substantial progress on the intermediate solution, which entails the installation of dual 24-inch HDPE pipelines across the FWS Channel and a new utility bridge across Moffett Channel, while also balancing the construction needs and overlap of the Headworks and Primary Facilities Project. The dual pipelines are neutrally buoyant, and will float on or just below the water surface in the FWS Channel. A new pump head was fabricated and installed at the Pond Effluent Pump Station to connect the new pipelines to the existing pumps. The utility bridge was installed on new footings that were required to support the weight of the dual pipelines as well as other existing process piping. The intermediate solution is scheduled to be completed by February 15, 2021, and will be in place for approximately 2-4 years to provide enough time for Sunnyvale to design, permit, and construct a permanent solution that also fits into planned facility upgrades in the Cleanwater Program.

Figure 31: Monitoring locations associated with the unauthorized discharge incident

Table 4: Secondary Effluent Pipeline incident sample results

Sample Date/Time	Sample ID	Sample Location	TSS (mg/L)	CBOD (mg/L)	Ammonia (mg/l)	Enterococcus (MPN/100mL)	DO (mg/L)	pH (S.U.)
7/30/2020 *9:15 am*	12123	Pond Effluent	60	22	6.49	>2420	7.82	8.87
7/30/2020 *9:20 am*	12124	Pond Effluent	60	20	6.44	>2420	8.17	8.86
7/30/2020 *9:15 am*	12121 (*pumps off*)	FWS Channel	89	38	ND	>2420	8.42	9.50
7/30/2020 *9:20 am*	12122 (*pumps off*)	FWS Channel	77	35	ND	>2420	8.52	9.50
7/30/2020 *9:22 am*	12125 (*pumps on*)	FWS Channel	73	20	0.54	>2420	7.23	9.14
7/31/2020 *12:15 pm*	SP-01	FWS A3W	38	8.0	ND	14.8	7.95	8.88
7/31/2020 *12:43 pm*	SP-02	FWS Guadalupe Gate	29	<2.0	0.16	168	5.08	7.96

2.3. Avian Botulism Control Program

In accordance with Provision VI.C.5.A of the current NPDES permit, Sunnyvale submits an annual *Avian Botulism Control Program Report* by February 28 for the preceding year. The program consists of monitoring for the occurrence of avian botulism and the collection of sick or dead birds and other dead vertebrates found along Guadalupe Slough, Moffett Channel, and the Oxidation Ponds and levees. Controls to limit the outbreak and spread of this disease consist primarily of the collection and proper disposal of sick and dead birds. The San Francisco Bay Bird Observatory was contracted by the City to locate and collect sick birds and dead vertebrates from June through November of 2020 when the potential for outbreak is the highest. WPCP Operations and Laboratory staff also conduct weekly surveys throughout the year around the Oxidation Ponds and collect sick, injured, or dead birds and mammals. No cases of avian botulism were identified during the 2020 reporting period.

III. Facility Reports

1.0. OPERATION AND MAINTENANCE MANUAL

During the 2020 reporting period, the WPCP continued the transition from a hard copy Operation and Maintenance (O&M) Manual to an on-line electronic O&M Manual (EOMM) using the Atlassian Confluence application, which seamlessly links to supporting information on the City's SharePoint network or elsewhere. In addition, the Confluence application provides enhanced functionality and greatly facilitates the updating process by eliminating multiple hard copies of the manual. This results in an intuitive, centralized interface that provides easy access to all relevant O&M Materials, including content from the earlier manual, SOPs, record drawings, equipment information/manuals, permits etc., in a completely electronic format.

Similar to the previous manual, the EOMM is organized into sections (pages) that correspond to individual treatment unit processes and plant-wide support utilities. There are also several pages related to training, and an overview page that provides general information about the WPCP and its programs. The unit process pages share a common template that make extensive use of "expanding" headings. Once headings are clicked on, detailed content including links to internal and external content become visible. The main elements of the common template are: Introduction (Purpose & Goals and Theory of Operation), Description of Process (including design criteria), Process Control, Operating Procedures, and Other Reference Materials.

EOMM pages for the existing secondary and tertiary processes and plant utilities were developed using information from the previous manual during the 2020 reporting period. The EOMM is now the official O&M Manual for all secondary, tertiary, and related support processes. Minor revisions were made during the development process of those pages and additional content added to match the format of the EOMM. The previous O&M Manual's headworks, influent pumping, and primary treatment sections were not incorporated into the EOMM. Rather, they will remain accessible in the previous manual until they are decommissioned in 2021.

Pages for the new Headworks and Primary Treatment Facilities Project currently under construction are being developed in the EOMM concurrent with the transition process. These pages are reliant on the construction documents and information provided by the construction contractor and will be reevaluated and updated by the City as part of the commissioning process in 2021. Preliminary EOMM content developed for these facilities during the 2020 reporting period include:

- Headworks and Primary Treatment Facility (Introductory Page)
- Screenings Facility
- Influent Pumping
- Grit Facility
- Primary Sedimentation
- Influent Sampling

A new page for Slide Gates, of which there now are more than 100 at the WPCP, was also populated. Process control strategies for those gates that are automated were incorporated into the appropriate unit process pages. Content was also added to the EOMM User Guide page.

EOMM efforts in 2021 will focus on completing the Headworks and Primary Treatment Facility pages and creating pages for the new backup power facilities currently under construction and new electrical facilities that power the Headworks and Primary Treatment Facility.

In addition to the WPCP O&M Manual, the WPCP maintains an Operator in Training (OIT) Manual. This manual includes 32 "Ops Tasks" that address specific tasks in a highly detailed manner. New Operators must demonstrate proficiency in each Ops Task before being allowed to perform the task independently. These Ops Tasks are reviewed annually and updated as needed. No substantial updates were made to the Ops Tasks during the 2020 reporting period. Ops Tasks are kept on the WPCP network at J:\ESD\WPCP\General\Operations\OPS Training\OIT Manual\OIT Manual Updated.

The WPCP also maintains a series of Standard Operating Procedures (SOPs), which contain detailed instructions for certain operational and administrative tasks. Updating of SOPs is an ongoing process. In addition, every Operator is required to perform an annual review of every SOP. This process is tracked by support staff. These reviews feed into the annual SOP updating process. Electronic versions of the WPCP SOPs are kept at J:\ESD\WPCP\WPCPData\SOPs\SOP - signed PDF. The following is a list of SOPs that were updated, created, or deleted during this reporting period:

<u>SOPs Updated</u>

- SOP #1010F: Grit Pick-up Procedure
- SOP #2026D: Hot Work Program
- SOP #4011B: PLC/HMI Changes

2.0. PLANT MAINTENANCE PROGRAM

During the 2020 reporting period, the Plant Maintenance Program utilized the Infor Enterprise Asset Management System (EAMS) implemented in 2018. Infor EAMS provides the functions of a computerized maintenance system (CMMS), including work order generation/tracking and other maintenance data management function, advanced features for asset tracking and life-cycle management, predictive and condition-based maintenance, materials and supplies purchasing, and other features (**Chapter IV, Section 10.0**). Maintenance and Operations staff use iPad handheld tablets with the Infor EAM Mobile app to interface with the Asset Management System. The tablets provide a field interface to work orders for corrective maintenance (CM) and preventative maintenance (PM) procedures, equipment information (via a bar-code reader), and expedited data entry for work orders and other maintenance/process control measurements. The tablets were also used by the Maintenance staff for on-line trainings and meetings due to the COVID-19 pandemic gathering limitations. Other COVID-19 measures included moving mechanics temporarily to a swing shift to establish staff separation.

The Operations and Maintenance staff continues to review and develop the Preventative Maintenance program to provide improved reporting on asset condition and work history. The WPCP places a strong emphasis on preventative maintenance to achieve high mechanical reliability. Staff members from both Operations and Maintenance sections perform preventative maintenance functions. There are currently more than 3,400 pieces of equipment identified in the Infor EAMS equipment database. The system has improved the efficiency of the WPCP's Maintenance Program and contributes to WPCP reliability through more timely access to maintenance information and work order status, better inventory control, and predictive maintenance. As shown in **Table 5**, the WPCP maintained a high level of efficiency by completing most of the work orders issued in 2020. During the 2020 reporting period, the Maintenance group generated approximately 2,006 corrective and preventative maintenance related work orders, of which 1,859 were completed in the same year (93%). In addition, the Operations group completed 6,146 PMs of the 6,223 that were generated (99%). The remaining work orders will be carried over into 2021 and completed according to schedule.

Table 5: Tabulation of 2020 Work Orders Issued and Completed

2020	PM (Maintenance)	CM (Maintenance)	PM (Operations)
Completed	1,070	789	6,146
Released/On Hold/Waiting for Parts	7	140	77
Total Work Orders	***1,077***	929	***6,223***
% Completed	***99%***	***85%***	***99%***

The WPCP also uses an on-line system (D-A Lube) for tracking results from laboratory analysis of lubricating oil removed from WPCP equipment under the preventative maintenance program. D-A Lube provides rapid reporting of analytical results, and flags high contaminant levels and other conditions that may indicate mechanical problems (e.g. excessive wear, presence of moisture, etc.).

Some of the more significant maintenance and upgrades to WPCP equipment in 2020 included:

- Plant electrical thermographic testing
- Chemical Building roof replacement
- Atlas Copco service air compressor and air dryer replacements
- Top End overhaul of the #1 Power Generator Unit
- Rehabilitation of #4 Pond Circulation Pump
- Top end overhaul of the #1 Main Influent Pump Engine
- Power Generation Engines control power battery bank replacement
- Replacement of Baylands 1 pump storm water station pumps and gearboxes

3.0. WASTEWATER FACILITIES REVIEW AND EVALUATION

Provision VI.C.4.a requires that the City regularly review and evaluate its wastewater facilities and operational practices to ensure that the wastewater collection, treatment, and disposal facilities are adequately staffed, supervised, financed, operated, maintained, repaired, and upgraded as necessary to provide adequate and reliable transport, treatment, and disposal of all wastewater from both existing and planned future wastewater sources under the City's service responsibilities.

The responsibility to conduct reviews of the WPCP, to develop goals, objectives and priorities, to formulate rules and procedures, and to maintain budgetary control are explicitly listed as duties of the ESD Division Managers (WPCP, Water and Sewer Services, Solid Waste Programs, and Regulatory Programs) and section managers within these Divisions. In some cases, assistance for the review and evaluation process is provided through special studies conducted by outside consultants, such as the WPCP's Master Planning and Condition Assessment efforts. These efforts are described elsewhere in this annual report. The Environmental Management Chapter of the City's General Plan also plays a role by establishing long-term goals and policies and providing action statements designed to ensure their implementation. For the sewer system, metrics used to assess the effectiveness of collection system operations are described in the City's Sewer System Management Plan, which is audited on a biennial basis. Results of the current evaluation are summarized below, in other sections of this annual report, and in other regulatory and planning documents. The City believes that current staff allocation and supervision are sufficient to perform its mission and meet the requirements listed above.

Facility Upgrades

Numerous WPCP upgrade projects, as well as the City's current Master Plan for the WPCP rebuild are currently in progress as described in **Chapter IV**.

Financing

The WPCP and associated collection system are financed by revenues generated from fees collected from users of the sanitary sewer system. Sewer rates are evaluated periodically by a financial consultant to determine if revenues are sufficient to support current and future operations and maintenance, equipment replacement, and planned capital improvements. The City also uses State Revolving Funds (SRF) and Water Infrastructure Finance and Innovation Act (WIFIA) loans to finance elements of the Cleanwater Program.

Utility rates are typically adjusted by the City Council each fiscal year to keep revenues and expenditures in balance. The Council adopted new utility rates effective on July 1, 2020, approving an overall 4% increase in the sewer service rate for Fiscal Year 2020-2021. The actual rate increases vary by customer class and reflect needed improvements to the City's aging infrastructure and increases in operating and regulatory compliance costs. This translates into a monthly increase of $2.05 ($53.38 per month total) for an average single-family residence and $1.42 ($36.96 per month total) for multi-family residences.

Capital and operating budgets are projected over a 20-year horizon and are updated on an alternating biennial cycle. The current capital budget projections include funding for major WPCP reconstruction and/or rehabilitation projects, which were ongoing in 2020. City budgets also provide for ongoing rehabilitation of the sewer system.

Staffing and Supervision

The WPCP is operated and maintained by the WPCP Division, with laboratory, pretreatment, regulatory, and technical support from the Regulatory Programs Division of ESD. Staffing is as follows:

Division Managers	The WPCP Division Manager is responsible for the overall operation and maintenance of the WPCP. The Regulatory Programs Division Manager supports the WPCP Division on regulatory issues, and has responsibility for the Laboratory, Pretreatment Program, and Compliance Programs, which also operate at the WPCP. Both Managers report to the ESD Director.
WPCP Managers	The WPCP Operations Manager (who also serves as the Chief Plant Operator) and WPCP Maintenance Manager report to the WPCP Division Manager. The Lab Manager reports to the Regulatory Programs Division Manager.
Operations Staff	25 full-time Operators, including two Principal Operators, four Senior Operators, and 19 Operators. In addition, there is one Utility Worker.
Maintenance Staff	One Senior Mechanic, eight Mechanics, and one Senior Storekeeper.
Laboratory Staff	Two Senior Environmental Chemists, three Chemists, and three Lab/Field Technicians.
Pretreatment/Compliance Inspection Staff	One Senior Inspector, five Environmental Compliance Inspectors, and two Lab/Field Technicians.
Compliance and Technical Support Staff	Three Environmental Engineering Coordinators and one WPCP Control Systems Integrator.

Operations

WPCP operations are performed by a highly skilled group of State Water Resources Control Board-certified Wastewater Operators organized into five shifts (Days I, Days II, Graves I, Graves II, and a training and coverage shift). Five Operators are on duty at all times, including at least one Senior or Principal Operator (both the Senior and Principal Operators are shift supervisors as defined by the SWRCB). The WPCP places major emphasis on training new and existing Operators to develop and maintain a high level of skill. The Operator in Training (OIT) Program provides both mentoring and rigorous training in all areas of WPCP operations. The WPCP Operation & Maintenance (O&M) Manual and OIT Training Manual are key elements of the OIT Program. In addition to demonstrating an understanding of the concepts and practices in the O&M Manual, OITs must also be familiar with all applicable Standard Operating Procedures (SOPs) and be trained by veteran operators and then signed off by a shift supervisor in 32 task-specific SOPs before being allowed to perform those tasks independently. All OITs work with other highly trained veteran operators that provide direct supervision as defined by the SWRCB. Safety training is an ongoing and mandatory process for all Operators, and numerous elective training and career advancement opportunities are also provided. Operators perform all routine WPCP operational tasks, special assignments, and are responsible for preventative maintenance, as described under the Plant Maintenance Program in **Section 2.0** of this Chapter. Operators receive ongoing support from the WPCP Chief Plant Operator, Division Manager, Support Services staff, and outside consultants.

Maintenance

WPCP maintenance is performed by a skilled crew of eight journey level Maintenance Mechanics under the supervision of one Senior Mechanic with the direction of the WPCP Maintenance Manager. Maintenance staff is responsible for the corrective maintenance and major preventive maintenance tasks, with certain specialty maintenance functions (such as PGF engine overhauls) performed by outside contractors. Maintenance staff has mandatory training requirements in addition to opportunities for elective trainings. The Maintenance section currently uses the Infor EAMS CMMS, as described under the Plant Maintenance Program. WPCP Maintenance staff work collaboratively with the Water and Sewer Systems Division to maintain the wastewater and storm water sewer systems. The Division also utilizes outside contractors for specialty services and receives engineering and regulatory support from other City work units and consultants.

Collection System

The sanitary sewer collection system is operated and maintained by the ESD Water and Sewer Systems Division whose offices are located at the City's Corporation Yard. WPCP and Water and Sewer services are supported by administrative staff at the WPCP and Corporation Yard, the ESD Director, the ESD Regulatory Programs Division, the Department of Public Works Engineering Division (providing engineering support for CIP projects), and staff from other City Departments. The City also has contracts with various consultant firms for technical and regulatory support, planning studies, engineering design for CIP projects, and other needs. Staffing is as follows (wastewater-related positions only):

Division Managers	The Water and Sewer Systems Division Manager is responsible for the overall operation and maintenance of the potable water distribution, sanitary sewer and storm water collection systems, and shares responsibility with the WPCP Division Manager for the production of recycled water. The Division Manager reports to the ESD Director.
Managers	The Senior Environmental Engineer whose role includes acting as the Wastewater Operations Manager reports to the Water and Sewer Systems Division Manager.
Operations and Maintenance Staff	13 full-time workers, including a Wastewater Collections Supervisor, two Wastewater Collections Crew Leaders, three Senior Wastewater Collections Workers, and seven Maintenance Worker I/II.
Shared Technical Support and Maintenance Staff	Several positions in the Water Program and at the WPCP provide shared support services to the Wastewater Collections program. These include: one Senior Mechanic, eight Mechanics, and one Senior Storekeeper who are shared between the WPCP and the Wastewater Operations program. In addition, one Senior Civil Engineer, one Water Distribution Supervisor, one Water Distribution Crew Leader, one Senior Water Distribution Worker, and two water distribution Workers are shared between the Water Program and Wastewater Operations program.

A series of prioritized CIP projects have been developed for the sewer system in addition to allocating funding annually for ongoing emergency or incidental sewer repair and rehabilitation. In 2018, the City completed construction of the 2016-2017 Sanitary Sewer Main Replacement Phase 4 project, and the Baylands Storm Pump Station No. 2 Rehabilitation Project. In addition, the City solicited bids for the Storm Pump Station No. 1 upgrade project which is addressing the immediate needs identified in a previous condition assessment project. The project includes seismic upgrades, the replacement of discharge piping and inlet grating to protect wet wells, completed the design of the Lawrence Sanitary Sewer Trunk Main Rehabilitation Phase 1 project. On December 8, 2020, the City council awarded $4.1 million contract for construction.

In 2019, the City began design of the 2019-2020 Sanitary Sewer Main Replacement project. As a part of the project, approximately 4,900 linear feet will be replaced at a budgeted cost of $4.7 million. In 2019, the City completed the Sanitary Sewer Siphon Cleaning Phase I Project, and an additional $743,000 is budgeted to complete the siphon cleaning in 2021. In addition, the City awarded a contract to upgrade and expand its sanitary sewer hydraulic model which will be completed in 2021. The City also manages its own construction crews and performs point repairs regularly, as well as manhole and lateral repairs.

4.0. CONTINGENCY PLAN

On December 1, 1999, the WPCP submitted a revised Contingency Plan pursuant to Provision 10 of NPDES Order 98-053 and RWQCB Resolution 74-10. Since that time, the Plan has been updated annually, and was reprinted in 2005, 2007, 2012, and 2013. The City made significant revisions to the Contingency Plan during the 2020 reporting period to reflect more current operational practices and equipment at the WPCP. This major update was originally planned to be completed as part of the Headworks and Primary Treatment Facilities Project[7] commissioning packet submitted to the RWQCB per Provision VI.C.5.d of the current permit. However, due to construction delays primarily associated with difficulties in PG&E negotiations, necessary updates to the existing facilities were completed in 2020 that do not reflect the new facilities. The City will perform a similar update following the commissioning process and operational experience with the new facilities in 2021-2022.

5.0. SPILL PREVENTION CONTROL AND COUNTERMEASURE

The Spill Prevention Control and Countermeasure (SPCC) Plan is documented in the Contingency Plan and has not changed. The SPCC Plan also addresses spill response for non-wastewater spills at the WPCP.

[7] The Headworks and Primary Treatment Facilities Project will enhance overall treatment reliability through new influent pumping facilities, use of influent screens, a new electrical distribution system (initially for the primary facilities and later to be expanded to the entire plant), and a permanently installed 2 MW back-up power system that will be able to service all the WPCP's electrical loads.

IV. Sunnyvale Capital Improvement Program

1.0. OVERVIEW

The original components of the WPCP were completed in 1956 and many are still in service. Most of the other major components of the WPCP were completed over the subsequent 15-20 years. Based on a 2006 Asset Condition Assessment Report, the City began implementing several rehabilitation projects and developed a long-term Strategic Infrastructure Plan to serve as a road map for the physical improvements and process enhancements needed to maintain a high level of treatment and to meet current and expected regulatory requirements and stewardship objectives. To help implement the Strategic Infrastructure Plan, in 2013, the City secured the professional services of an engineering design team of consultants to develop a Capital Improvement Program (CIP) and comprehensive Master Plan, which included the "basis of design" development for the various process areas to be rebuilt and a Programmatic Environmental Impact Report.

The City Council approved the WPCP's Master Plan and PEIR in August 2016, thereby authorizing the City to begin implementing the design and construction of the various components necessary to complete the massive 20-year reconstruction project, also known as the Sunnyvale Cleanwater Program (CWP). With an estimated cost of approximately $596 million[8], the CWP will replace the WPCP's aging infrastructure and operation. **Table 6** lists current major projects within the CIP, including several from the CWP. Key projects currently underway and recently completed are highlighted in the table and presented in Fact Sheets[9].

Figure 32: View of WPCP looking east

[8] Budgeted amount for Phases 1-3 of the Master Plan. Phases 4-5 are not included.
[9] CIP information gathered from the *Adopted Budget and Resource Allocation Plan for the City of Sunnyvale Fiscal Year 2019-2020, Volume II – Project Budget*.

Table 6: Summary of select CIP Projects at the WPCP

CIP Project Name	Estimated Project Life Total Cost	Status	Estimated Completion Date	Treatment Process Improvements					
				Headworks	Primary	Secondary	Tertiary	Solids Handling	PGF
Condition Assessment and Existing Plant Rehabilitation	$ 65,676,952	A	2023			X	X		
Headworks and Primary Treatment Facilities	$ 123,182,399	A	2021	X	X				
Secondary Treatment and Dewatering Facilities	$223,043,207	A	2026			X	X	X	
Cleanwater Center	$ 45,512,418	A	2024	X	X	X	X	X	X
Caribbean Drive Parking and Bay Trail Access Enhancements	$ 1,091,761	C	2020				X		
Biosolids Processing	$ 27,478,184	A	2026		X	X		X	
Levee Maintenance Program	$ 9,319,929	A	2028			X			
Electronic O&M Manual	$ 514,080	A	2021	X	X	X	X	X	X
Asset Management Program	$ 367,107	C	2019	X	X	X	X	X	X
Solids/Dewatering Repairs	$ 175,000	A	2020					X	
CWP Program Management	$ 63,214,020	A	2029	X	X	X	X	X	X
CWP Construction Management	$ 35,360,001	A	2029	X	X				
Waste Gas Burner Replacement	$ 3,396,134	A	2029						X
Primary Process Repairs	$ 562,441	A	2021		X				
Secondary Process Repairs	$ 744,809	A	2024			X			
Tertiary Process Repairs	$ 2,255,716	A	2022				X		
PGF Repairs	$ 2,450,000	A	2026						X
Support Facilities Repairs	$ 1,282,834	A	2025	X	X	X	X	X	X
CIP Total	***$ 605,626,992***								

Notes:

1) Rows highlighted indicate key projects presented in Fact Sheets in the following section.

2) Status Legend: A = Active, C =Completed

2.0. CONDITION ASSESSMENT & EXISTING PLANT REHABILITATION

SUNNYVALE
CLEANWATER
PROGRAM

ASSESSMENT CONTRACTOR
AECOM

REHABILITATION DESIGN
Carollo Engineers
Brown and Caldwell

START DATE
May 2017

PROJECT STATUS

Condition Assessment
Completed
Nov 2017

Rehabilitation Design
In Progress
60% Design

Facilities Rehabilitation
Pending

Sunnyvale

Condition Assessment and Existing Plant Rehabilitation

WHAT IS IT?

Under the Condition Assessment project, the contractor performed physical assessments of critical equipment and structures within the secondary and tertiary process areas of the WPCP. Their findings and recommendations are being used to refine the scope for facility rehabilitation project, which will ensure the plant facilities remain functional until Stage 2 of the Secondary treatment facilities are complete or through 2035±.

WHY?

Due to the age of overall facilities at the WPCP, critical elements of the existing treatment processes need to be rehabilitated or replaced to maintain permit compliance and keep them operational until they are fully replaced with the final build-out of all the conventional activated sludge (CAS) facilities (2035±). Furthermore, the WPCP's Master Plan identified more than 30 capital improvement projects, of which a detailed condition assessment was needed to further quantify existing conditions prior to implementing facilities rehabilitation projects.

PROJECT AREAS

3.0. HEADWORKS AND PRIMARY TREATMENT FACILITIES

SUNNYVALE

CLEANWATER

PROGRAM

DESIGN FIRM

Carollo Engineers

CONSTRUCTION FIRMS

Anderson Pacific (P1)
OVERAA (P2)

START DATE

July 2016

PROJECT STATUS

Package 1

Completed
October 2017

Package 2

In Progress

Sunnyvale

Headworks and Primary Treatment Facilities

WHAT IS IT?

The Headworks and Primary Treatment Facilities project includes the phased design and construction of new headworks, primary sedimentation tanks, influent pump station, grit removal facilities, and associated electrical, mechanical, and control systems. Along with the use of modern sedimentation tank design for solids removal, the new facilities will improve protection of downstream processes and biosolids quality through use of bar screens and high-efficiency grit basins. This project also includes the construction of the first phase of a flood wall that will ultimately surround and protect the WPCP from future flood events.

WHY?

Much of these facilities were part of the original plant built in 1956 and do not meet current seismic requirements, leaving them vulnerable to earthquake damage. The concrete in these tanks is eroding and exposing the reinforced steel inside the structures. Full replacement and relocation of these facilities as recommended in the WPCP's Strategic Infrastructure Plan (2010) is currently underway and expected to be complete in Fall 2021.

4.0. SECONDARY TREATMENT AND DEWATERING FACILITIES

SUNNYVALE

CLEANWATER

PROGRAM

DESIGN FIRM
Carollo Engineers

CONSTRUCTION FIRMS
TBD

START DATE
Aug 2016

PROJECT STATUS

Design
In Progress
60% Design

Site Preparation Package
Pending

Main Package
Pending

Sunnyvale

Secondary Treatment and Dewatering Facilities

WHAT IS IT?

This project will be split into two Packages due to its size, complexity, and space constraints. The Site Preparation Package includes the demolition of existing facilities and construction of temporary offices and Maintenance Building. The Main Package will include the design and construction of a Conventional Activated Sludge (CAS) system and Thickening and Dewatering Facility. This project will also include the construction of a DEMON sidestream treatment system, digested sludge storage tank, 2 MW emergency generator, odor control facility, and associated appurtenances along with other various improvements to existing facilities. The remaining segments of the flood wall will are also part of this Project.

WHY?

This project will improve the reliability and performance of secondary treatment at the WPCP while also providing contingencies for meeting anticipated future regulatory requirements. The CAS system will be operated in parallel with the existing secondary system in a split flow configuration, with the CAS system forming the main secondary treatment process. Once the CAS system is completed, a Thickening and Dewatering Facility will be constructed to process the additional biosolids generated during anaerobic digestion with support from a DEMON system to process associated nitrogen loads. Odors will be abated by the odor control facility.

PROJECT AREAS

5.0. CLEANWATER CENTER

SUNNYVALE
CLEANWATER
PROGRAM

DESIGN FIRM
MWA Architects

CONSTRUCTION FIRM
TBD

START DATE
September 2017

PROJECT STATUS
Design
In Progress
60% Design

Construction
Pending

Sunnyvale

Cleanwater Center

WHAT IS IT?

The Cleanwater will provide a much needed facility update to the WPCP by replacing the functionality of the existing Admin Building, Laboratory, and Maintenance Shop under one roof. Additional offices will be added to provide a common space to foster collaboration amongst various groups from within the WPCP and Regulatory Programs Divisions that are presently spread across different facilities. The Cleanwater Center will be designed to meet U.S. Green Building Council LEED standards.

WHY?

The City is engaged in the Sunnyvale Cleanwater Program to renovate the existing WPCP in order to reliably treat and dispose of municipal sewage over the next 30 or more years. The current Administration Building is outdated and in the path of the new floodwall. Construction of a new Administration, Laboratory, and Maintenance Building will not only provide a much needed facility update, but will also provide additional office space for City staff that are currently spread across various facilities.

PROJECT AREAS

6.0. CARIBBEAN DRIVE PARKING AND BAY TRAIL ACCESS ENHANCEMENTS

SUNNYVALE
CLEANWATER
PROGRAM

DESIGN FIRM
Mark Thomas

CONSTRUCTION FIRM
Redgwick Construction

START DATE
March 2017

PROJECT STATUS
Completed
Nov 2020

Sunnyvale

Caribbean Drive Park and Bay Trail Access Enhancements

WHAT IS IT?

The City has maintains a parking lot and trailhead at the end of Carl Road that provides public access to the Bay Trail. The City will be shifting the parking spaces and trail access point from their current position to Caribbean Drive. The work associated with this project includes converting a portion of one lane of westbound travel on Caribbean Drive to 18 parking parallel parking spaces; installing curbside bioretention cells between the parking spaces to treat stormwater; a new multi-use trail; and striping modifications for transitioning from three lanes to two and back to three lanes.

WHY?

The City is looking to enhance the entrance of the Bay Trail by relocating it to Caribbean Drive for several reasons. Currently, there is no opportunity for expanding the public parking to meet the demands of increased Bay Trail use. Furthermore, the current access point is located in an area heavily trafficked with regular Plant deliveries. Lastly, the construction related to the Sunnyvale Clean Water Program as well as future changes with Plant site layout will increase the congestion.

PROJECT AREAS

7.0. OXIDATION POND AND DIGESTER DEWATERING

SUNNYVALE

CAPITAL IMPROVEMENT

PROGRAM

CONTRACTOR

Synagro

START DATE

January 2014

PROJECT STATUS

In progress

Sunnyvale

Solids Dewatering

WHAT IS IT?

The Synagro Dewatering project was initiated in 2009 to address the accumulation of solids in the Oxidation Ponds through dredging and dewatering with a centrifuge prior to hauling off-site for beneficial reuse. No solids had been removed since the ponds were converted for use as a secondary treatment process in the late 1960s. In late February, 2015, Synagro's processing work site was relocated to the north side of the Primary Sedimentation Basins to make way for the new Primary Treatment Facilities. In addition to pond solids, Synagro began dewatering digester solids on a belt filter press following their relocation. Previously, digester solids were dewatered by Operations staff in a system that used slotted dewatering tiles to drain excess water before moving them to a solar drying tarmac. The new configuration will likely continue until the new dewatering facility is constructed.

WHY?

According to a 2006 study, solids carried over from various stages in the WPCP's treatment process have accumulated to an estimated 35-45% of pond volume, resulting in a decline in treatment capacity and efficacy.

PROJECT AREAS

8.0. LEVEE MAINTENANCE PROGRAM

SUNNYVALE

CAPITAL IMPROVEMENT

PROGRAM

ASSESSMENT FIRM

Cal Engineering & Geology, Inc. and NVS

DEVELOPMENT FIRM

HDR

START DATE

April 2016

PROJECT STATUS

O&M Manual

Completed

November 2018

Levee Repairs

In Progress

Sunnyvale

Levee Maintenance Program

WHAT IS IT?

The City has developed the Operation and Maintenance Manual of Oxidation Pond Levees (O&M) to assist in managing repairs and maintenance efforts for the existing levees surrounding the Water Pollution Control Plant (WPCP) ponds. The 440 acres of Oxidation Ponds at the WPCP are enclosed by inner and outer levee roads that are in various stages of erosion. The inner levees form the pond distribution and recirculation channels, and the outer levees are responsible for containing the wastewater and preventing its release into the environment. In 2016, contractors completed the Levee Asset Management Plan (LAMP), a comprehensive condition assessment of the city roads and bridges, which included the WPCP pond levees. The City has used the results to complete a corresponding digital GIS mapping and O&M to successfully monitor and maintain the levees for the next 20 plus years.

WHY?

The levee roads are critical to the successful operation of the WPCP for the next 20 plus years. These levees are in various stages of erosion and require immediate attention to safeguard public and WPCP staff safety.

PROJECT AREAS

9.0. ELECTRONIC O&M MANUAL

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

CONTRACTOR
Atlassian

START DATE
August 2018

PROJECT STATUS
In Progress

Sunnyvale

Electronic O&M Manual

WHAT IS IT?

This project includes the implementation of a comprehensive Electronic Operations & Maintenance Manual for the WPCP to replace the current limited, narrative-based, paper O&M manual. The goal of the electronic O&M manual is to develop a living document repository and interface where information pertinent to operations and maintenance is located and that leverages information in the City's other enterprise applications. Quick access to facility documentation is imperative to effective process operations and troubleshooting by reducing the amount of time spent searching through endless folders of partially obsolete information.

WHY?

With the reconstruction of the Water Pollution Control Plant already underway, an intuitive method of storing and retrieving all of the facility documentation is needed. With significant changes in nearly every future process, Operations and Maintenance staff will need a centralized, user friendly, interface that allows access to SOPs, record drawings, equipment information, process control descriptions, operating manuals, regulatory information and historical data from LIMS, EAMS/CMMS and SCADA. An electronic O&M manual would facilitate training new employees, refreshing the knowledge of existing staff and function as an up-to-date reference for a wide variety of information.

PROJECT AREAS

10.0. ASSET MANAGEMENT PROGRAM

SUNNYVALE

CAPITAL IMPROVEMENT PROGRAM

CONTRACTOR

The Arcanum Group

START DATE

May 2017

PROJECT STATUS

Go-Live

Completed

March 2018

Single Sign-On (SSO)

Completed

June 2019

Sunnyvale

Asset Management Program

WHAT IS IT?

WPCP infrastructure consists of approximately 3,225 assets that each have life expectancy and maintenance needs. The WPCP's Asset Management Program is a strategic, organization-wide program that achieves an appropriate balance of risk, cost, performance and longevity to maximize asset value. The WPCP's Asset Management Program is supported by an Asset Information System, which is the main business process tool used for tracking asset maintenance needs, repair costs, and life cycle costs used in evaluating replacement versus repair decisions at the Plant. The project is intended to update the Asset Management Program at the WPCP and upgrade the existing, outdated and unsupported Maximo Asset Management System with a new Enterprise Asset Management System (EAMS) that will better align with the needs of the new Plant being built as part of the Clean Water Program. 'Infor EAM' was selected as the new EAMS and went live in March of 2018.

WHY?

The WPCP's Asset Management Program contributes to the economic health of the WPCP by keeping its facilities and infrastructure functioning effectively at the lowest life cycle cost. The WPCP's Asset Information System received its last major upgrade at the WPCP in 1999 and has not been supported by the manufacturer since 2008. City IT staff assessed the current Maximo system as unstable and prone to frequent failures causing significant disruption to work flow and availability of assets in a critical situation.

PROJECT AREAS

V. PERMIT SPECIAL STUDIES

Neither the current Order (R2-2020-0002) nor the most previous Order (R2-2014-0035) contained requirements for the City to conduct any special studies. Under Order R2-2009-0061, the City was required to perform several special studies, including 1) Chronic Toxicity Identification and Toxicity Reduction Study; 2) Receiving Water Ammonia Characterization Study; and 3) Total Suspended Solids Removal Study. All of these special studies were completed and reported prior to 2015.

VI. OTHER STUDIES AND PROGRAMS

1.0. EFFLUENT CHARACTERIZATION STUDY AND REPORT

The WPCP is required under Provision VI.C.2 of its current NPDES permit to continue to characterize and evaluate the final effluent to verify that the reasonable potential analysis conclusions of the current Order remain valid and to inform the next permit issuance. No priority pollutant data other than the parameters listed in **Chapter II** were collected in 2020 as the WPCP elected participate in the *Alternate Monitoring and Reporting Requirements for Municipal Wastewater Discharges (Order No. R2-2016-0008)* and divert the analytical costs associated with priority pollutant monitoring to supplement the Regional Monitoring Program. This requirement was previously satisfied under Order R2-2014-0035 with monitoring performed in 2015, and data showed no significant increases were observed between the datasets where analytical results were above detection limits.

2.0. NUTRIENT MONITORING FOR REGIONAL NUTRIENT PERMIT

In 2020, the City continued to collect influent and effluent samples for analysis of nutrients in accordance with the Order R2-2019-0017. As required by that Order, results from the WPCP's ongoing monitoring are submitted electronically to CIWQS in monthly SMRs. These results are compiled by BACWA into a group annual report and submitted to the RWQCB. In addition, the WPCP has elected to include nutrient data in **Chapter II, Section 1.5** of this report.

3.0. REGIONAL WATER MONITORING PROGRAM

Provision VI in Attachment E of the WPCP's current NPDES permit requires the City to continue its participation in the Regional Water Monitoring Program (RMP), which was formally established in 1993 and is the only comprehensive environmental monitoring program to measure pollutants and trends in the SF Bay. The goal of the RMP is to collect data and communicate information about water quality in the SF Bay in support of management decisions. The accomplishments of the RMP over the past two years are summarized in The Pulse of the Bay report.

In March 2016, the Water Board adopted Order R2-2016-0008, establishing an alternative monitoring requirement (AMR) for municipal wastewater discharges to San Francisco Bay and its tributaries, in exchange for a set schedule of increased payments to the RMP. Participating wastewater treatment facilities who opt-in to this alternative can reduce their effluent monitoring costs for most organic priority pollutants and chronic toxicity species rescreening. In exchange for the reduced monitoring requirements, facilities make supplemental payments to the RMP for regional studies to inform management decisions about water quality in the Bay. Through these financial contributions, the RMP is able to conduct regional monitoring to assess the cumulative impact of multiple sources of pollutants to the SF Bay. The City's RMP participation is documented in a letter issued by BACWA annually, located at https://bacwa.org/document/bacwa-npdes-permit-letter-2021-submitted/

ATTACHMENTS

ATTACHMENT A

Wastewater Treatment Process Schematic

Solids Treatment Process Schematic

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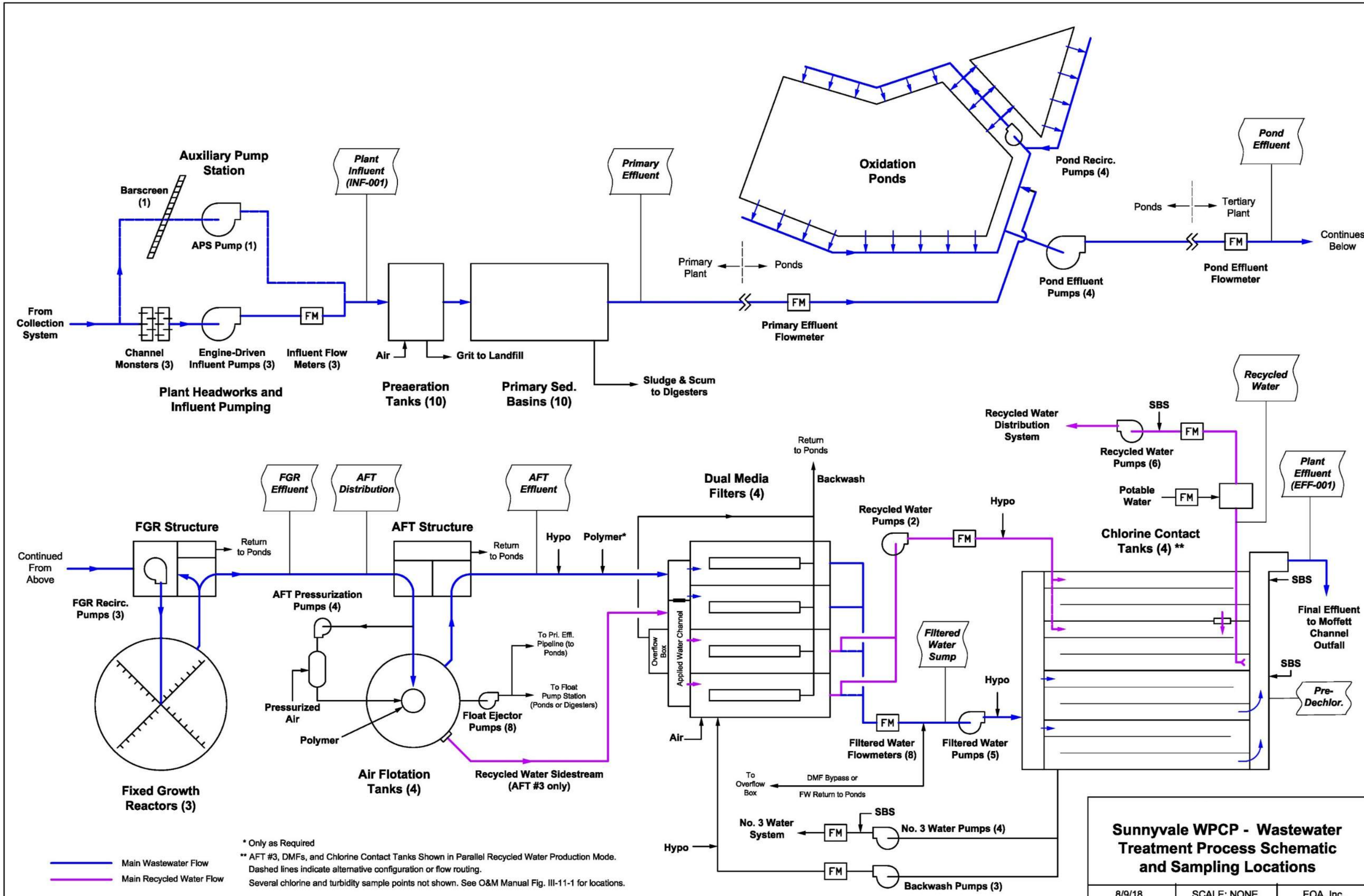
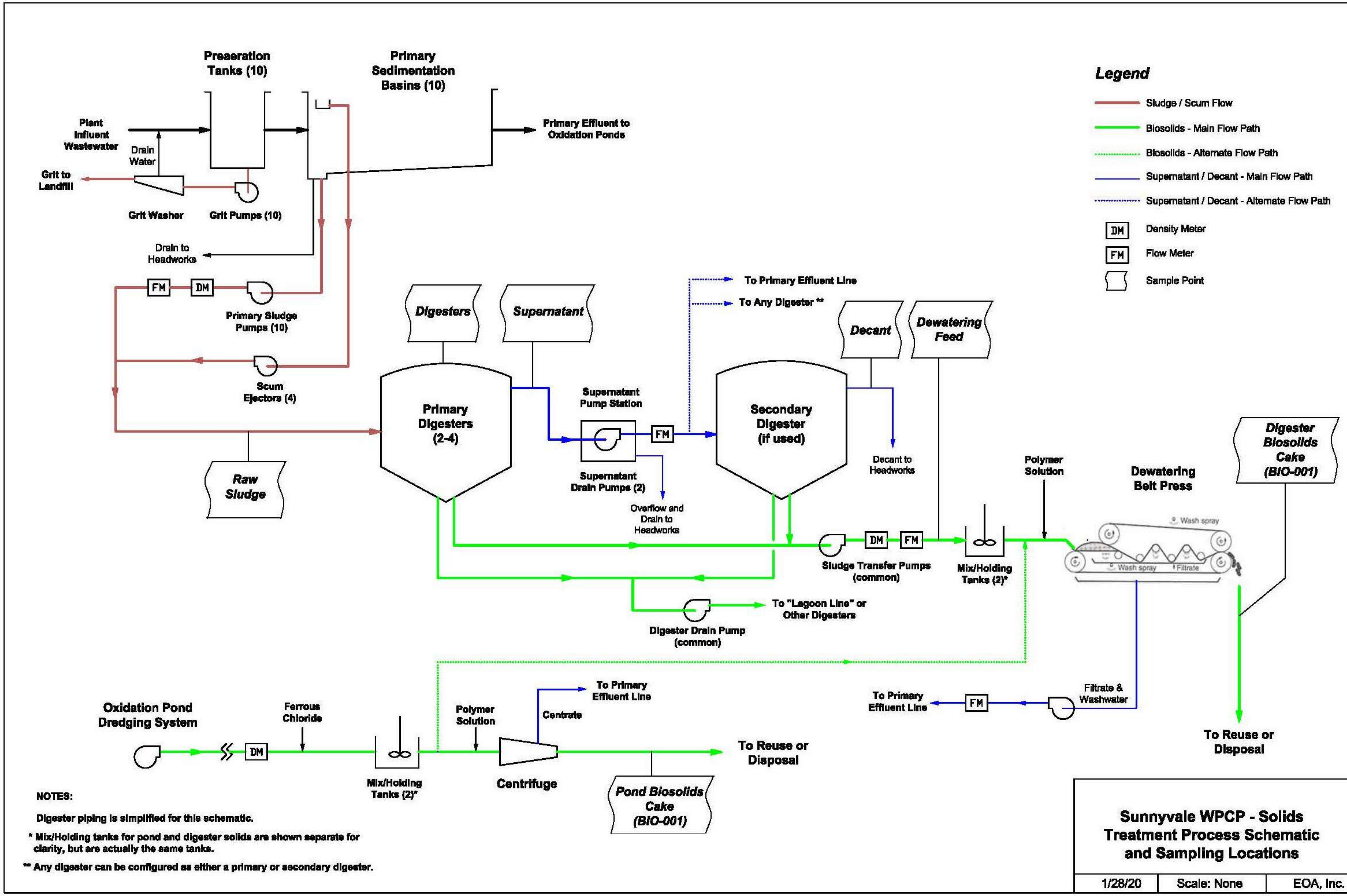

Auxiliary Pump Station
Barscreen (1)
APS Pump (1)
Plant Influent (INF-001)
Primary Effluent
Oxidation Ponds
Pond Recirc. Pumps (4)
Pond Effluent
Ponds
Tertiary Plant
Continues Below
Pond Effluent Flowmeter
Pond Effluent Pumps (4)
Primary Plant
Ponds
Primary Effluent Flowmeter
From Collection System
Channel Monsters (3)
Engine-Driven Influent Pumps (3)
Influent Flow Meters (3)
Air
Grit to Landfill
Sludge & Scum to Digesters
Plant Headworks and Influent Pumping
Preaeration Tanks (10)
Primary Sed. Basins (10)
Recycled Water
Recycled Water Distribution System
SBS
Recycled Water Pumps (6)
Return to Ponds
Backwash
Dual Media Filters (4)
Plant Effluent (EFF-001)
Potable Water
FGR Effluent
AFT Distribution
AFT Effluent
Recycled Water Pumps (2)
Hypo
FGR Structure
AFT Structure
Chlorine Contact Tanks (4) **
Continued From Above
Return to Ponds
Return to Ponds
Hypo
Polymer*
SBS
FGR Recirc. Pumps (3)
AFT Pressurization Pumps (4)
Final Effluent to Moffett Channel Outfall
To Pri. Effl. Pipeline (to Ponds)
Overflow Box
Applied Water Channel
Filtered Water Sump
SBS
To Float Pump Station (Ponds or Digesters)
Hypo
Pre-Dechlor.
Pressurized Air
Float Ejector Pumps (8)
Polymer
Air
Filtered Water Flowmeters (8)
Filtered Water Pumps (5)
Air Flotation Tanks (4)
Recycled Water Sidestream (AFT #3 only)
Fixed Growth Reactors (3)
To Overflow Box
DMF Bypass or FW Return to Ponds
SBS
No. 3 Water System
No. 3 Water Pumps (4)
Hypo
Backwash Pumps (3)
FM
Main Wastewater Flow
Main Recycled Water Flow
* Only as Required
** AFT #3, DMFs, and Chlorine Contact Tanks Shown in Parallel Recycled Water Production Mode.
Dashed lines indicate alternative configuration or flow routing.
Several chlorine and turbidity sample points not shown. See O&M Manual Fig. III-11-1 for locations.
Sunnyvale WPCP - Wastewater Treatment Process Schematic and Sampling Locations
8/9/18
SCALE: NONE
EOA, Inc.


Preaeration Tanks (10)
Primary Sedimentation Basins (10)
Plant Influent Wastewater
Drain Water
Primary Effluent to Oxidation Ponds
Grit to Landfill
Grit Washer
Grit Pumps (10)
Drain to Headworks
FM
DM
Primary Sludge Pumps (10)
Scum Ejectors (4)
Raw Sludge
Digesters
Supernatant
Primary Digesters (2-4)
Supernatant Pump Station
Supernatant Drain Pumps (2)
Overflow and Drain to Headworks
To Primary Effluent Line
To Any Digester **
Secondary Digester (if used)
Decant
Dewatering Feed
Decant to Headworks
Sludge Transfer Pumps (common)
Mix/Holding Tanks (2)*
Polymer Solution
Dewatering Belt Press
Wash spray
Filtrate
Digester Biosolids Cake (BIO-001)
Digester Drain Pump (common)
To "Lagoon Line" or Other Digesters
To Primary Effluent Line
Filtrate & Washwater
To Reuse or Disposal
Oxidation Pond Dredging System
Ferrous Chloride
Mix/Holding Tanks (2)*
Polymer Solution
Centrate
To Primary Effluent Line
Centrifuge
To Reuse or Disposal
Pond Biosolids Cake (BIO-001)
Legend
Sludge / Scum Flow
Biosolids - Main Flow Path
Biosolids - Alternate Flow Path
Supernatant / Decant - Main Flow Path
Supernatant / Decant - Alternate Flow Path
DM Density Meter
FM Flow Meter
Sample Point
NOTES:
Digester piping is simplified for this schematic.
* Mix/Holding tanks for pond and digester solids are shown separate for clarity, but are actually the same tanks.
** Any digester can be configured as either a primary or secondary digester.
Sunnyvale WPCP - Solids Treatment Process Schematic and Sampling Locations
1/28/20
Scale: None
EOA, Inc.

ATTACHMENT B

WPCP Certificate of Environmental Accreditation

WPCP Approved Analyses

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CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

Interim

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

City of Sunnyvale Environmental Laboratory

Regulatory Programs Division

1444 Borregas Avenue

Sunnyvale, CA 94088

Scope of the certificate is limited to the
"Fields of Testing"
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site inspection, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1340**

Expiration Date: **10/31/2021**

Effective Date: **11/1/2020**

Sacramento, California
subject to forfeiture or revocation

Christine Sotelo, Chief
Environmental Laboratory Accreditation Program

CALIFORNIA STATE
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

City of Sunnyvale Environmental Laboratory
Regulatory Programs Division
1444 Borregas Avenue
Sunnyvale, CA 94088
Phone: 4087307260

Certificate No. **1340**
Expiration Date 10/31/2021
INTERIM

Field of Testing: 101 - Microbiology of Drinking Water			
	002	Heterotrophic Bacteria	SimPlate
101.010	002	Heterotrophic Bacteria	SimPlate
101.050	001	Total Coliform P/A	SM 9223 B Colilert
101.050	001	Total Coliform P/A	SM 9223 B Colilert
101.050	002	E. coli P/A	SM 9223 B Colilert
101.050	002	E. coli P/A	SM 9223 B Colilert
101.050	003	Total Coliform (Enumeration)	SM 9223 B Colilert
101.050	003	Total Coliform (Enumeration)	SM 9223 B Colilert
101.050	004	E. coli (Enumeration)	SM 9223 B Colilert
101.050	004	E. coli (Enumeration)	SM 9223 B Colilert
Field of Testing: 102 - Inorganic Chemistry of Drinking Water			
102.030	003	Chloride	EPA 300.0
102.030	003	Chloride	EPA 300.0
102.030	006	Nitrate (as N)	EPA 300.0
102.030	006	Nitrate (as N)	EPA 300.0
102.030	008	Phosphate,Ortho (as P)	EPA 300.0
102.030	008	Phosphate,Ortho (as P)	EPA 300.0
102.030	009	Sulfate (as SO4)	EPA 300.0
102.030	009	Sulfate (as SO4)	EPA 300.0
102.095	001	Turbidity	SM 2130 B-2001
102.095	001	Turbidity	SM 2130 B-2001
102.100	001	Alkalinity	SM 2320 B-1997
102.100	001	Alkalinity	SM 2320 B-1997
102.121	001	Hardness	SM 2340 C-1997
102.121	001	Hardness	SM 2340 C-1997
102.130	001	Specific Conductance	SM 2510 B-1997
102.130	001	Specific Conductance	SM 2510 B-1997
102.148	001	Calcium	SM 3500-Ca B-1997
102.148	001	Calcium	SM 3500-Ca B-1997
102.175	001	Chlorine, Free	SM 4500-Cl G-2000
102.175	001	Chlorine, Free	SM 4500-Cl G-2000
102.175	002	Chlorine, Total Residual	SM 4500-Cl G-2000
102.175	002	Chlorine, Total Residual	SM 4500-Cl G-2000

As of 11/1/2020 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

102.200	001	Fluoride	SM 4500-F C-1997
102.200	001	Fluoride	SM 4500-F C-2011
102.203	001	Hydrogen Ion (pH)	SM 4500-H+ B-2000
102.203	001	Hydrogen Ion (pH)	SM 4500-H+ B-2000
102.220	001	Nitrite (as N)	SM 4500-NO2 B-2000
102.220	001	Nitrite (as N)	SM 4500-NO2 B-2000

Field of Testing: 103 - Toxic Chemical Elements of Drinking Water

103.140	001	Aluminum	EPA 200.8
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	017	Boron	EPA 200.8
103.140	018	Vanadium	EPA 200.8
103.140	018	Vanadium	EPA 200.8

Field of Testing: 104 - Volatile Organic Chemistry of Drinking Water

104.040	000	Volatile Organic Compounds	EPA 524.2
104.040	001	Benzene	EPA 524.2
104.040	001	Benzene	EPA 524.2
104.040	007	n-Butylbenzene	EPA 524.2
104.040	007	n-Butylbenzene	EPA 524.2
104.040	008	sec-Butylbenzene	EPA 524.2
104.040	008	sec-Butylbenzene	EPA 524.2
104.040	009	tert-Butylbenzene	EPA 524.2
104.040	009	tert-Butylbenzene	EPA 524.2
104.040	010	Carbon Tetrachloride	EPA 524.2
104.040	010	Carbon Tetrachloride	EPA 524.2
104.040	011	Chlorobenzene	EPA 524.2
104.040	011	Chlorobenzene	EPA 524.2
104.040	015	2-Chlorotoluene	EPA 524.2
104.040	015	2-Chlorotoluene	EPA 524.2
104.040	016	4-Chlorotoluene	EPA 524.2
104.040	016	4-Chlorotoluene	EPA 524.2
104.040	019	1,3-Dichlorobenzene	EPA 524.2
104.040	019	1,3-Dichlorobenzene	EPA 524.2
104.040	020	1,2-Dichlorobenzene	EPA 524.2
104.040	020	1,2-Dichlorobenzene	EPA 524.2
104.040	021	1,4-Dichlorobenzene	EPA 524.2
104.040	021	1,4-Dichlorobenzene	EPA 524.2
104.040	022	Dichlorodifluoromethane	EPA 524.2
104.040	022	Dichlorodifluoromethane	EPA 524.2
104.040	023	1,1-Dichloroethane	EPA 524.2
104.040	023	1,1-Dichloroethane	EPA 524.2
104.040	024	1,2-Dichloroethane	EPA 524.2
104.040	024	1,2-Dichloroethane	EPA 524.2
104.040	025	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 524.2
104.040	025	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 524.2
104.040	026	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene)	EPA 524.2
104.040	026	cis-1,2-Dichloroethylene (cis 1,2 Dichloroethene)	EPA 524.2
104.040	027	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene	EPA 524.2
104.040	027	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethene	EPA 524.2
104.040	028	Dichloromethane (Methylene Chloride)	EPA 524.2
104.040	028	Dichloromethane (Methylene Chloride)	EPA 524.2
104.040	029	1,2-Dichloropropane	EPA 524.2
104.040	029	1,2-Dichloropropane	EPA 524.2
104.040	033	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 524.2
104.040	033	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 524.2
104.040	034	trans-1,3-Dichloropropylene (trans-1,3 Dichloroprope	EPA 524.2

104.040	034	trans-1,3-Dichloropropylene (trans-1,3 Dichloroprop	EPA 524.2
104.040	035	Ethylbenzene	EPA 524.2
104.040	035	Ethylbenzene	EPA 524.2
104.040	037	Isopropylbenzene	EPA 524.2
104.040	037	Isopropylbenzene	EPA 524.2
104.040	039	Naphthalene	EPA 524.2
104.040	039	Naphthalene	EPA 524.2
104.040	041	N-propylbenzene	EPA 524.2
104.040	041	N-propylbenzene	EPA 524.2
104.040	042	Styrene	EPA 524.2
104.040	042	Styrene	EPA 524.2
104.040	043	1,1,1,2-Tetrachloroethane	EPA 524.2
104.040	043	1,1,1,2-Tetrachloroethane	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	045	Tetrachloroethylene (Tetrachloroethene)	EPA 524.2
104.040	045	Tetrachloroethylene (Tetrachloroethene)	EPA 524.2
104.040	046	Toluene	EPA 524.2
104.040	046	Toluene	EPA 524.2
104.040	047	1,2,3-Trichlorobenzene	EPA 524.2
104.040	047	1,2,3-Trichlorobenzene	EPA 524.2
104.040	048	1,2,4-Trichlorobenzene	EPA 524.2
104.040	048	1,2,4-Trichlorobenzene	EPA 524.2
104.040	049	1,1,1-Trichloroethane	EPA 524.2
104.040	049	1,1,1-Trichloroethane	EPA 524.2
104.040	050	1,1,2-Trichloroethane	EPA 524.2
104.040	050	1,1,2-Trichloroethane	EPA 524.2
104.040	051	Trichloroethylene (Trichloroethene)	EPA 524.2
104.040	051	Trichloroethylene (Trichloroethene)	EPA 524.2
104.040	052	Trichlorofluoromethane	EPA 524.2
104.040	052	Trichlorofluoromethane	EPA 524.2
104.040	054	1,2,4-Trimethylbenzene	EPA 524.2
104.040	054	1,2,4-Trimethylbenzene	EPA 524.2
104.040	055	1,3,5-Trimethylbenzene	EPA 524.2
104.040	055	1,3,5-Trimethylbenzene	EPA 524.2
104.040	056	Vinyl Chloride	EPA 524.2
104.040	056	Vinyl Chloride	EPA 524.2
104.040	057	Xylenes, Total	EPA 524.2
104.040	058	m-Xylene	EPA 524.2
104.040	059	o-Xylene	EPA 524.2
104.040	060	p-Xylene	EPA 524.2
104.045	000	Trihalomethanes, Total	EPA 524.2

104.045	001	Bromodichloromethane	EPA 524.2
104.045	001	Bromodichloromethane	EPA 524.2
104.045	002	Bromoform	EPA 524.2
104.045	002	Bromoform	EPA 524.2
104.045	003	Chloroform	EPA 524.2
104.045	003	Chloroform	EPA 524.2
104.045	004	Dibromochloromethane (Chlorodibromomethane)	EPA 524.2
104.045	004	Dibromochloromethane (Chlorodibromomethane)	EPA 524.2
104.050	002	Methyl tert-butyl Ether (MTBE)	EPA 524.2
104.050	002	Methyl tert-butyl Ether (MTBE)	EPA 524.2
104.050	005	Trichlorotrifluoroethane	EPA 524.2
104.050	005	Trichlorotrifluoroethane (Freon 113)	EPA 524.2

Field of Testing: 107 - Microbiological Methods for Non-Potable Water and Sewage Sludge

107.017	001	Enterococci	Enterolert
107.242	001	Enterococci	Enterolert

Field of Testing: 108 - Inorganic Constituents in Non-Potable Water

108.007	001	Residue, Volatile	EPA 160.4 (1971)
108.015	001	Calcium	EPA 200.8 (1994 Rev. 5.4)
108.015	002	Magnesium	EPA 200.8 (1994 Rev. 5.4)
108.015	003	Potassium	EPA 200.8 (1994 Rev. 5.4)
108.015	005	Sodium	EPA 200.8 (1994 Rev. 5.4)
108.017	002	Chloride	EPA 300.0 (1993 Rev. 2.1)
108.017	004	Nitrate (as N)	EPA 300.0 (1993 Rev. 2.1)
108.017	008	Sulfate (as SO4)	EPA 300.0 (1993 Rev. 2.1)
108.047	001	Phenols, Total	EPA 420.1 (1978 Rev. 1.0)
108.059	001	Turbidity	SM 2130 B-2011
108.063	001	Alkalinity	SM 2320 B-2011
108.067	001	Hardness	SM 2340 C-2011
108.069	001	Specific Conductance	SM 2510 B-2011
108.071	001	Residue, Total	SM 2540 B-2011
108.073	001	Residue, Filterable TDS	SM 2540 C-2011
108.075	001	Residue, Non-filterable TSS	SM 2540 D-2011
108.087	001	Calcium	SM 3500-Ca B-2011
108.090	001	Residue, Volatile	EPA 160.4
108.105	001	Chlorine, Total Residual	SM 4500-Cl C-2011
108.113	001	Boron	EPA 200.8
108.113	002	Calcium	EPA 200.8
108.113	003	Magnesium	EPA 200.8
108.113	004	Potassium	EPA 200.8
108.113	006	Sodium	EPA 200.8
108.120	002	Chloride	EPA 300.0
108.120	008	Sulfate (as SO4)	EPA 300.0

108.120	012	Nitrate (as N)	EPA 300.0
108.125	001	Cyanide, Total	SM 4500-CN E-2011
108.131	001	Fluoride	SM 4500-F C-2011
108.137	001	Hydrogen Ion (pH)	SM 4500-H+ B-2011
108.140	001	Ammonia (as N)	SM 4500-NH3 D-2011
108.140	001	Ammonia (as N)	SM 4500-NH3 D-2011
108.153	001	Nitrite (as N)	SM 4500-NO2 B-2011
108.165	001	Oxygen, Dissolved	SM 4500-O C-2011
108.173	001	Oxygen, Dissolved	SM 4500-O G-2011
108.175	001	Phosphate,Ortho (as P)	SM 4500-P E-2011
108.175	002	Phosphorus,Total	SM 4500-P E-2011
108.207	001	Biochemical Oxygen Demand	SM 5210 B-2011
108.207	002	Carbonaceous BOD	SM 5210 B-2011
108.215	001	Organic Carbon-Total (TOC)	SM 5310 B-2011
108.251	001	Oxygen, Dissolved	ASTM D888-09C
108.251	001	Oxygen, Dissolved	ASTM D888-09C
108.325	001	Chemical Oxygen Demand	Hach 8000
108.331	001	Kjeldahl Nitrogen,Total (as N)	Hach 10242
108.331	001	Kjeldahl Nitrogen,Total (as N)	Hach 10242
108.360	001	Phenols, Total	EPA 420.1
108.390	001	Turbidity	SM 2130 B-2001
108.410	001	Alkalinity	SM 2320 B-1997
108.421	001	Hardness	SM 2340 C-1997
108.430	001	Specific Conductance	SM 2510 B-1997
108.440	001	Residue, Total	SM 2540 B-1997
108.441	001	Residue, Filterable TDS	SM 2540 C-1997
108.442	001	Residue, Non-filterable TSS	SM 2540 D-1997
108.449	001	Calcium	SM 3500-Ca B-1997
108.461	001	Chlorine, Total Residual	SM 4500-Cl C-2000
108.470	001	Cyanide, Total	SM 4500-CN B or C-1999
108.472	001	Cyanide, Total	SM 4500-CN E-1999
108.480	001	Fluoride	SM 4500-F B,C-1997
108.490	001	Hydrogen Ion (pH)	SM 4500-H+ B-2000
108.514	001	Nitrite (as N)	SM 4500-NO2 B-2000
108.532	001	Oxygen, Dissolved	SM 4500-O C-2001
108.536	001	Oxygen, Dissolved	SM 4500-O G-2001
108.540	001	Phosphate,Ortho (as P)	SM 4500-P E-1999
108.541	001	Phosphorus,Total	SM 4500-P E-1999
108.592	001	Biochemical Oxygen Demand	SM 5210 B -2001
108.592	002	Carbonaceous BOD	SM 5210 B -2001
108.596	001	Organic Carbon-Total (TOC)	SM 5310 B-2000
108.660	001	Chemical Oxygen Demand	Hach 8000

Field of Testing: 109 - Metals and Trace Elements in Non-Potable Water			
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8
109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8
109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	017	Vanadium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.020	021	Iron	EPA 200.8
109.625	001	Aluminum	EPA 200.8 (1994 Rev. 5.4)
109.625	002	Antimony	EPA 200.8 (1994 Rev. 5.4)
109.625	003	Arsenic	EPA 200.8 (1994 Rev. 5.4)
109.625	004	Barium	EPA 200.8 (1994 Rev. 5.4)
109.625	005	Beryllium	EPA 200.8 (1994 Rev. 5.4)
109.625	007	Cadmium	EPA 200.8 (1994 Rev. 5.4)
109.625	008	Chromium	EPA 200.8 (1994 Rev. 5.4)
109.625	009	Cobalt	EPA 200.8 (1994 Rev. 5.4)
109.625	010	Copper	EPA 200.8 (1994 Rev. 5.4)
109.625	012	Iron	EPA 200.8 (1994 Rev. 5.4)
109.625	013	Lead	EPA 200.8 (1994 Rev. 5.4)
109.625	014	Manganese	EPA 200.8 (1994 Rev. 5.4)
109.625	015	Molybdenum	EPA 200.8 (1994 Rev. 5.4)
109.625	016	Nickel	EPA 200.8 (1994 Rev. 5.4)
109.625	017	Selenium	EPA 200.8 (1994 Rev. 5.4)
109.625	018	Silver	EPA 200.8 (1994 Rev. 5.4)
109.625	019	Thallium	EPA 200.8 (1994 Rev. 5.4)
109.625	022	Vanadium	EPA 200.8 (1994 Rev. 5.4)
109.625	023	Zinc	EPA 200.8 (1994 Rev. 5.4)
Field of Testing: 110 - Volatile Organic Constituents in Non-Potable Water			
110.040	000	Purgeable Organic Compounds	EPA 624
110.040	005	Benzene	EPA 624.1

110.040	006	Bromodichloromethane	EPA 624.1
110.040	007	Bromoform	EPA 624.1
110.040	008	Bromomethane (Methyl Bromide)	EPA 624.1
110.040	010	Carbon Tetrachloride	EPA 624.1
110.040	011	Chlorobenzene	EPA 624.1
110.040	012	Chloroethane	EPA 624.1
110.040	013	2-Chloroethyl vinyl Ether	EPA 624.1
110.040	014	Chloroform	EPA 624.1
110.040	015	Chloromethane (Methyl Chloride)	EPA 624.1
110.040	016	Dibromochloromethane (Chlorodibromomethane)	EPA 624.1
110.040	017	1,2-Dichlorobenzene	EPA 624.1
110.040	018	1,3-Dichlorobenzene	EPA 624.1
110.040	019	1,4-Dichlorobenzene	EPA 624.1
110.040	020	1,1-Dichloroethane	EPA 624.1
110.040	021	1,2-Dichloroethane	EPA 624.1
110.040	022	1,1-Dichloroethylene (1,1-Dichloroethene)	EPA 624.1
110.040	023	trans-1,2-Dichloroethylene (trans- 1,2 Dichloroethen	EPA 624.1
110.040	024	1,2-Dichloropropane	EPA 624.1
110.040	025	cis-1,3-Dichloropropylene (cis 1,3 Dichloropropene)	EPA 624.1
110.040	026	trans-1,3-Dichloropropylene (trans-1,3 Dichloroprop	EPA 624.1
110.040	029	Ethylbenzene	EPA 624.1
110.040	031	Methylene Chloride (Dichloromethane)	EPA 624.1
110.040	034	1,1,2,2-Tetrachloroethane	EPA 624.1
110.040	035	Tetrachloroethylene (Tetrachloroethene)	EPA 624.1
110.040	037	Toluene	EPA 624.1
110.040	038	1,1,1-Trichloroethane	EPA 624.1
110.040	039	1,1,2-Trichloroethane	EPA 624.1
110.040	040	Trichloroethylene (Trichloroethene)	EPA 624.1
110.040	041	Vinyl Chloride	EPA 624.1
110.040	045	Trichlorofluoromethane	EPA 624.1
Field of Testing: 113 - Environmental Toxicity Methods			
113.013	003C	Rainbow trout (O. mykiss)	EPA 2019.0, Continuous Flow
Field of Testing: 120 - Physical Properties of Hazardous Waste			
120.010	001	Ignitability	EPA 1010
120.010	001	Ignitability	EPA 1010
Field of Testing: 126 - Microbiological Methods for Ambient Water			
126.015	001	E. coli (Enumeration)	Colilert
126.019	001	Enterococci	Enterolert
126.050	001	Total Coliform (Enumeration)	SM 9223 B Colilert
126.050	002	E. coli (Enumeration)	SM 9223 B Colilert
126.080	001	Enterococci	Enterolert