City of Sunnyvale | Environmental Services Department

Water Pollution Control Plant

Plant Compliance

Annual NPDES Report
R2-2014-0035

Sunnyvale

2018

2018 ANNUAL NPDES REPORT

City of Sunnyvale

Prepared for:

Mr. Thomas Mumley

California Regional Water Quality Control Board

San Francisco Bay Region

1515 Clay Street, Suite #1400

Oakland, CA 94612

Prepared by:

City of Sunnyvale

Environmental Services Department

Regulatory Programs Division

P.O. Box 3707

Sunnyvale, CA 94088-3707

February 1, 2019

Sunnyvale

Water Pollution Control Plant
1444 Borregas Avenue
Sunnyvale, CA 94088-3707
TDD/TYY 408-730-7501
sunnyvale.ca.gov

February 1, 2019

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

Attn: NPDES Division

Re: 2018 Annual Self-Monitoring Report, City of Sunnyvale Water Pollution Control Plant

The attached 2018 Annual Self-Monitoring Report is submitted in accordance with the requirements of Order No. R2-2014-0035 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) 730-7261.

Sincerely,

Leonard Espinoza

Leonard Espinoza
Interim WPCP Division Manager

Attachment: 2018 Annual NPDES Report

This Page Intentionally Left Blank

Table of Contents

List of Figures

List of Tables

I. Introduction

1.0. BACKGROUND

The 2018 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 Number CA0037621, San Francisco Bay Regional Water Quality Control Board (RWQCB) Order R2-2014-0035. This report summarizes the discharge monitoring results from the reporting period of January 1 to December 31, 2018, 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, made effective January 1, 2013, and reissued January 1, 2018 under 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 2018 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, Order No. R2-2014-0014 issued July 1, 2014, by the RWQCB. Beginning in 2015, by September 1 of each year, the City provides its nutrient information in a separate annual report or states that it is participating in a group report submitted by BACWA. The 2018 Group Annual Report was prepared and submitted by BACWA on October 1, 2018. Nutrient data are also reported electronically in the California Integrated Water Quality System (CIWQS) via monthly Self-Monitoring Reports (SMRs).

Alternate Monitoring Program Permit

The City is also subject to the Alternate Monitoring Program Order No. R2-2016-0008, which was made effective by the RWQCB on April 1, 2016. The permit 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, in the lower south bay subembayment of the San Francisco Bay (**Figure 1**). The WPCP was originally constructed in 1956. Over the years, the City has periodically increased treatment capacity as

Figure 1: WPCP Site Location Map

Sunnyvale's population has grown to 153,389 (2018) 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 283 miles of gravity sewer pipes and is subsequently treated to tertiary standards before being discharged to Moffett Channel, tributary to South San Francisco Bay via Guadalupe Slough. Five main trunklines convey raw sewage to the WPCP. Locations of the various treatment process features and the final effluent outfall are shown in **Figure 4**.

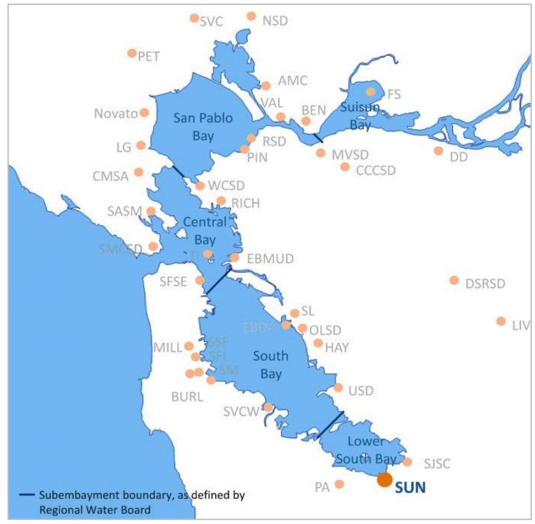


Figure 2: POTWs located in the Bay Area

The WPCP is one of 37 Publicly Owned Treatment Works (POTWs) that discharge to the San Francisco Bay (**Figure 2**). The average dry weather flow design capacity of the WPCP is 29.5 million gallons per day (MGD), which also corresponds to the permitted capacity. Peak wet weather design capacity of the WPCP is 40 MGD. Over the past 10 years, the highest recorded daily dry weather inflow was 16.5 MGD, which occurred on June 15, 2009, and the highest wet weather inflow was 28.4 MGD on December 11, 2014.

2.1. Wastewater Treatment Processes

The WPCP is comprised of four distinct process areas, which include 1) the Headworks and Primary Treatment Facilities; 2) Secondary Treatment Facilities; 3) Tertiary Treatment Facilities; 4) and Solids Processing Facilities. 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**.

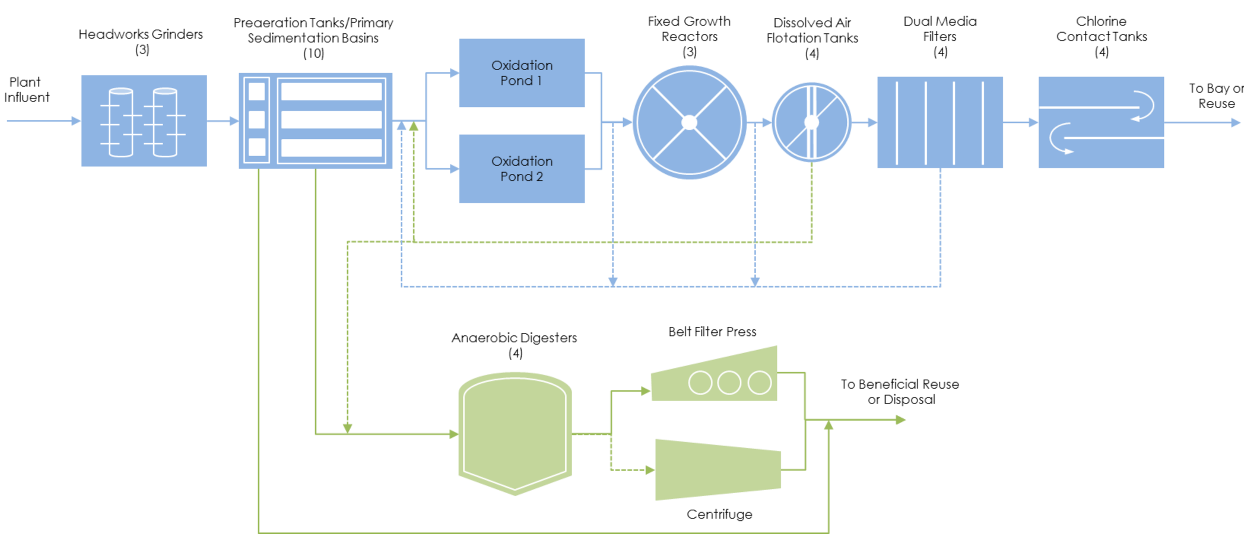


Figure 3: WPCP Process Flow Diagram. Blue corresponds to liquid and green to solids flows

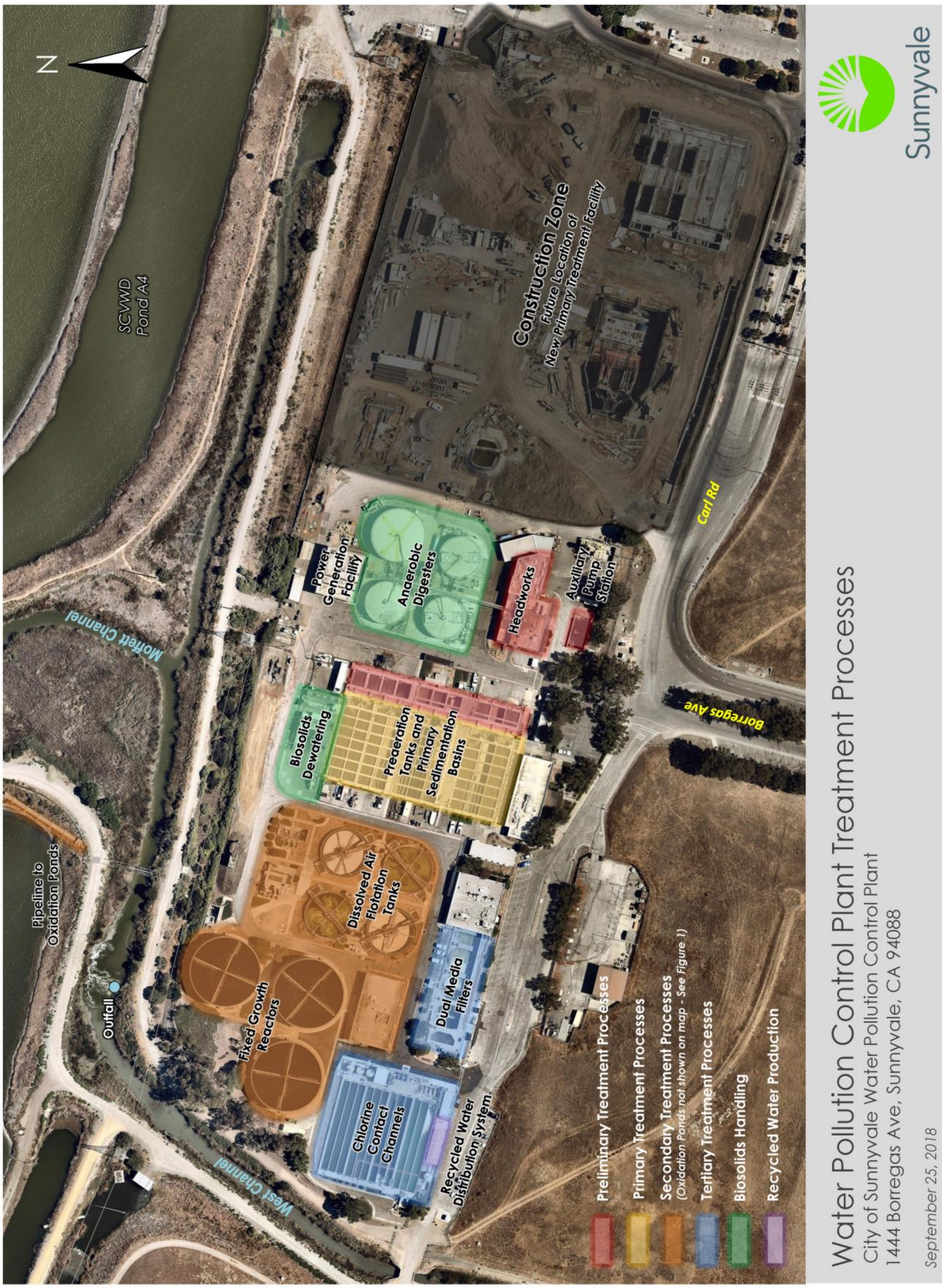


Figure 4: Aerial photo of the various WPCP treatment processes and outfall

The City is in the process of implementing a 20-year Capital Improvement Program (CIP) known as the *Sunnyvale Cleanwater Program* (SCWP) 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 the report and are described in more detail in **Chapter IV.**

2.1.1. Headworks and Primary Treatment

The Headworks 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).

Wastewater from the sanitary sewer collection system initially enters the Headworks 30 feet below grade where Channel Monsters® grind large debris prior to pumping the raw sewage into the Preaeration Tanks and subsequent Primary Sedimentation Basins (**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. Aerated wastewater then flows into the Primary Sedimentation Basins, 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 basins (settable solids/sludge). Floatable solids are skimmed off the surface water, while settled solids are removed from the bottom of the basins and pumped to anaerobic digesters for further treatment. Refer to **Section 2.3** 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 Tanks/Sedimentation Basins are operated on any given day.

Figure 5: Preaeration Tanks and Primary Sedimentation Basins

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 tanks and primary sedimentation basins. The APS consists of a vertical bar screen to remove large floatable and suspended debris and an electric motor-driven centrifugal submersible pump to convey the wastewater. Screenings are hand separated prior to conveyance into the primary influent structure.

Construction of new Primary Treatment Facilities, including a new Headworks and influent pump station, is currently underway with a projected completion year of 2021 (**Chapter IV, Section 3.0**). 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. In 2018, the City completed work on an Emergency Flow Management Project that provides a 1 MW trailer-mounted backup diesel generator that can be used to power specific areas of the WPCP that experience power outages. The generator will power the Headworks and Primary Treatment Facility during outages, with primary effluent stored in the Oxidation Ponds until power is restored (**Chapter III, Section 9.0**).

2.1.2. Secondary Treatment

Primary effluent undergoes secondary (biological) treatment through the use of two Oxidation Ponds with a combined surface area of 440 acres (**Figure 6**). The Oxidation Ponds were constructed in their present form in 1968, and were originally designed to treat high BOD (biochemical oxygen demand) loadings during the summer canning season. BOD loadings were greatly reduced with the departure of the canneries in 1983, and 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 to supplement aeration provided by microalgae and atmospheric diffusion.

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[1]. The average detention time of the Oxidation Ponds is 30-45 days and is dependent on flows, operating depth, and other factors. The Oxidation Ponds provide the added benefit of flow equalization for primary effluent so that downstream processes can be operated at a near constant flow rate. Flow equalization capacity is a function of pond depth but typically ranges from 50 to 100 million gallons (MG).

Figure 6: Aerial photo of the Oxidation Ponds (highlighted in green)

[1] 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; whereas, BOD removal is less susceptible to the same seasonal fluctuations.

The City has implemented a long-term pond dredging project since late 2012 to remove solids that have accumulated in the Oxidation Ponds (**Chapter IV, Section 10.0**), 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 2.3** of this Chapter for more information on solids handling. The City has embarked on a long-term maintenance program to address erosion along the levees which delineate the Oxidation Ponds and are essential to their performance (**Chapter IV, Section 12.0**).

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

Following treatment in the Oxidation Ponds, effluent is then conveyed to Fixed Growth Reactors (FGRs), commonly known as trickling filters, which provide additional nitrification of ammonia. The FGRs are filled with plastic cross-flow media (**Figure 7**) on which a film of microorganisms (biofilm) convert ammonia (NH_3) in wastewater to nitrate (NO_3^-). During the colder winter months, the nitrification efficacy of the Oxidation Ponds is reduced (or stops altogether), and the FGRs provide the majority of nitrification needed to meet discharge limitations.

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

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, and are skimmed off and returned to the Oxidation Ponds. The City completed improvements to the DAFTs in February 2015, which consisted of equipment and concrete repair and rehabilitation on two of the four units. Additional repairs and improvements were completed in 2017 for the remaining units to extend their useful life by at least 10 years. Concurrent with upgrades to the recycled water facility (**Section 2.4**) in 2017, one of the four DAFTs was reconfigured to be flexibly operated as a dedicated clarifier for continuous recycled water production or Bay discharge.

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 to facilitate 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 clear-out accumulated solids, with the backwash water being returned to the Oxidation Ponds. Repairs were made to two of four filters in 2016, which consisted of replacement of filter media and nozzles, repair of the underdrain system, and corrosion protection. Similar repairs were made to the other two filters in 2013.

Figure 9: Dual Media Filters treating wastewater

Effluent from the DMFs is disinfected with liquid sodium hypochlorite (formerly, chlorine gas) 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 treated wastewater undergoes additional treatment to meet the requirements for disinfected tertiary recycled water as specified in Title 22 of the California Code of Regulations. 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.

In 2018, the City completed a project to improve its disinfection and recycled water production facilities (**Chapter IV, Section 8.0**), which includes replacement of gaseous chlorine with liquid sodium hypochlorite as well as other mechanical, electrical, and instrumentation and control improvements (**Chapter IV, Section 6.0**). The City also added a second sodium bisulfite dosing location to provide additional flexibility and reliability to meet final effluent residual chlorine discharge limits (**Chapter IV, Section 7.0**).

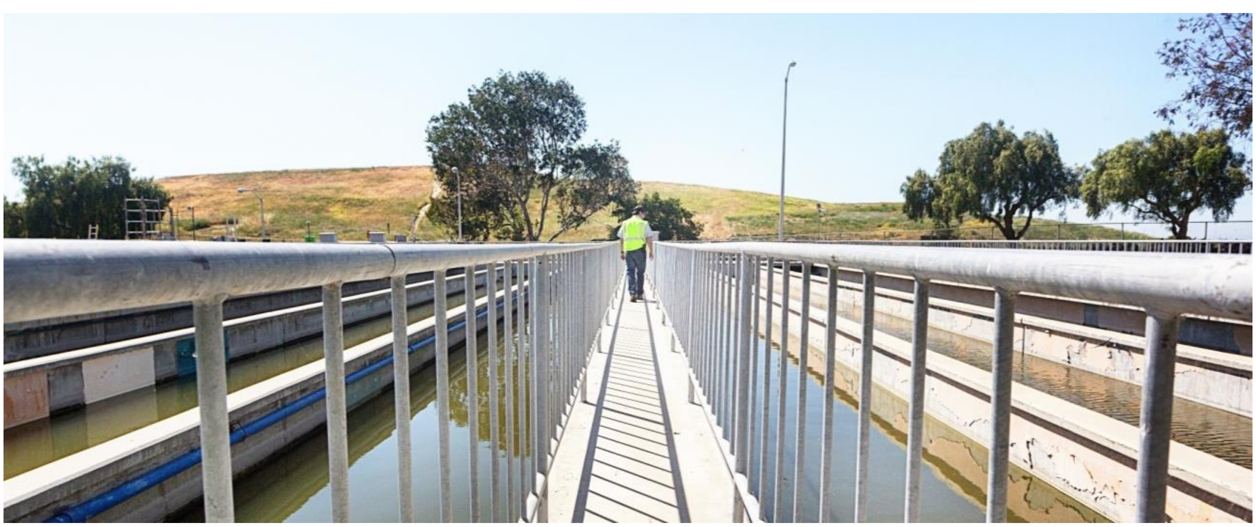


Figure 10: Wastewater being disinfected in the Chlorine Contact Tanks prior to discharge into Moffett Channel

2.2. 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 approved analyses for the laboratory, and the current environmental certification, is included in **Attachment B**.

The laboratory continues to use the new Laboratory Information Management System (LIMS) implemented in January 2017 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 a new upgraded Administration and Laboratory Building continues, with construction expected to begin in late 2020 and be completed in early 2022 (**Chapter IV, Section 4.0**). As part of this construction, the City will also be improving and relocating the current Bay Trail access point to Caribbean Drive (**Chapter IV, Section 5.0**).

2.3. Sludge and Biosolids Management

Biosolids Management

Disposal Type	Tonnage (Dry Tons)
Land Application	2,723
Compost	---
Monofill	---
Landfill	---
Annual Total	**2,723**

Solids removed during primary treatment are fed into primary anaerobic digesters and detained for approximately 35 to 40 days at a temperature of 96 to 103 °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, producing a mixture of methane gas, carbon dioxide, and hydrogen sulfide (biogas) in addition to stabilized organic solids and water.

A portion of the biogas produced in the anaerobic digesters powers the three main influent pump 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 Tanks. Exhaust heat recovered from the main influent pump 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 (LFG) 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). On average, the PGF produces 1.2 megawatts (MW) of power, which provides the majority of power used by the WPCP and offsets its purchases from PG&E and Silicon Valley Clean Energy.

Historically, sludge from the Anaerobic Digesters (biosolids) was 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[2] were mechanically dewatered to a similar consistency by a contractor (Synagro, Inc.) using a centrifuge in the same general area as the dewatering tiles. Beginning in February 2016, the WPCP moved its solids handling location and changed the operation to accommodate construction of the new Primary Treatment Facilities (**Chapter IV, Section 10.0**), which are being placed in the same area as the former drainage tiles. Currently, all biosolids are sent to a location adjacent to the Sedimentation Basins and mechanically dewatered by Synagro using either a 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 surface 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 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 2018 reporting period, the WPCP produced 2,723 dry tons of biosolids. Of the total, 2,432 dry tons were dredged from the Oxidation Ponds and 290 dry tons were removed from the anaerobic digesters. The majority of the biosolids produced (2,704 dry tons) were land applied in Sacramento and Merced counties, with the remaining 19 dry tons being sent to the Central Valley Composting Facility in Merced County. No biosolids produced at the WPCP were sent to a landfill for disposal or use as alternate daily cover. For additional information on biosolids management at the WPCP, refer to the *Biosolids Management Annual Report* for 2018, scheduled for submittal by February 19, 2019, per Provision VI.C.4.b of Order No. R2-2014-0035.

2.4. Recycled Water Production

The WPCP historically operated in two different treatment modes: 1) San Francisco Bay discharge, or 2) recycled water production. In late 2017, the WPCP completed an improvement project that allows for the simultaneous production and distribution of recycled water and discharge to San Francisco Bay (**Chapter IV, Section 8.0**), alongside improvements to its chlorination (**Chapter IV, Section 6.0**) and dechlorination (**Chapter IV, Section 7.0**) systems. Under the new configuration, a portion of the FGR effluent is sent to a dedicated DAFT and a pair of DMFs 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 DAFT polymer dose, chlorine

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

dose, and chlorine contact time are adjusted accordingly to meet the more stringent requirements. As a final production step, recycled water is partially dechlorinated with sodium bisulfite prior to entering the distribution system. Refer to the process flow diagram in **Attachment A** for more detail.

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. Historically, up to 8% of the daily wastewater flow has been 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 300 MG.

Recycled Water

Flow Type	Volume (MG)
Recycled Water Produced *WPCP*	**263**
Potable Water Added *WPCP*	**10**
Potable Water Added *San Lucar Facility*	**97**
Total Delivered	***370***

During the 2018 reporting period, the WPCP produced a total of 263 MG of recycled water and delivered 370 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 demand placed on the system that exceeds production (**Figure 11**). The WPCP is also in the process of implementing a Recycled Water Truck program, whereby commercial customers have the opportunity to utilize recycled water for construction in areas otherwise inaccessible by pipe. For additional information on recycled water production at the WPCP, refer to the *Recycled Water Annual Report* for 2018, scheduled for submittal to the RWQCB by March 15, 2019.

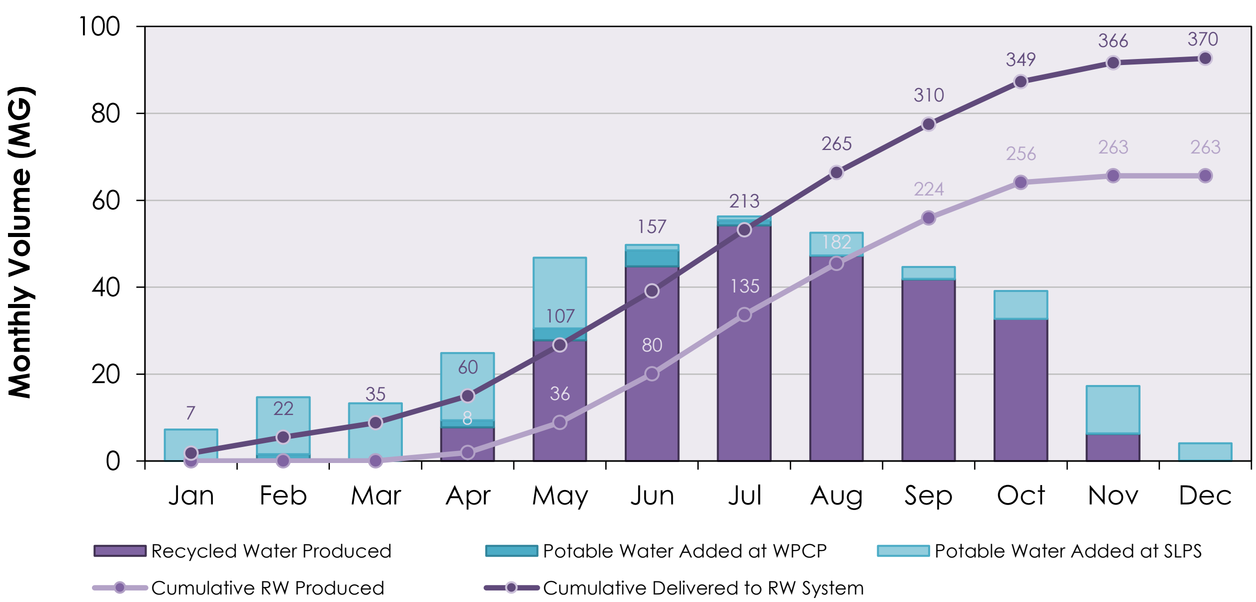


Figure 11: Recycled Water Production and Distribution in 2018. The difference between production and delivered represents potable water added at either the WCP or the San Lucar Facility

2.5. Stormwater Management

All stormwater collected from within the WPCP, as well as from inlets in Carl Road just outside WPCP boundaries and the SBM, 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.

2.6. 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 build-out (2035±). In 2018, 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. Permit Compliance 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. Average daily influent and effluent flow rates are shown in **Figure 12A**. The annual average influent and effluent flow rates for this reporting period were 12.5 and 10.3 MGD, respectively. Annual average dry weather flows (May 1-Sept 30) were approximately 12.2 MGD for influent and 8.5 MGD for effluent. Annual average wet weather flows (Oct 1-Apr 30) were approximately 12.7 MGD for influent and 11.6 MGD for effluent.

WPCP Flow Rates

Flow Type (MGD)	Influent	Effluent
Average Daily	12.5	10.3
Average Dry Weather	12.2	8.5
Average Wet Weather	12.7	11.6
Peak-Hourly Max	25.1	---
Instantaneous Max	27.5	---
Total Treated (MG)	4,558	---

Overall, the WPCP treated 4,558 MG of influent wastewater during this reporting period at an average rate of 12.5 MGD. A maximum daily average flow rate of 17.6 MGD occurred on January 9, 2018. While significantly lower than 2017, which experienced an unusually heavy wet season, it is consistent with 2015 and 2016 influent data. The WPCP experienced an influent peak hourly flow rate of 25.1 MGD and an instantaneous flow rate of 27.5 MGD, which are also notably lower than 2017 flows that were observed in excess of 40 MGD at times.

Daily influent flow rates reveal a slight increase from the previous two years (2016-2017), but displays a decreasing slope when compared to 2017. The drop in influent flows is mainly attributed to total precipitation returning to pre-2017 trends, despite the City experiencing the largest population increase (1.8%) within the last four years (**Figure 12C**). In **Figure 12B,** the daily flows and precipitation are captured on an annual average basis. As shown, annual average influent flows show a slight increase in 2018 when compared to data from 2015 and 2016, but contribute to the overall decreasing tread by approximately 20% over the last ten years. Potable water use remained consistent during the 2018 reporting period (**Figure 13**) as compared with 2017. In contrast, the influent flow rates observed during the 2014 through 2016 reporting periods were some of the lowest on record, despite an approximate 1.6% population increase and a large daily net workforce influx of approximately 20,000 (15%) non-resident workers during

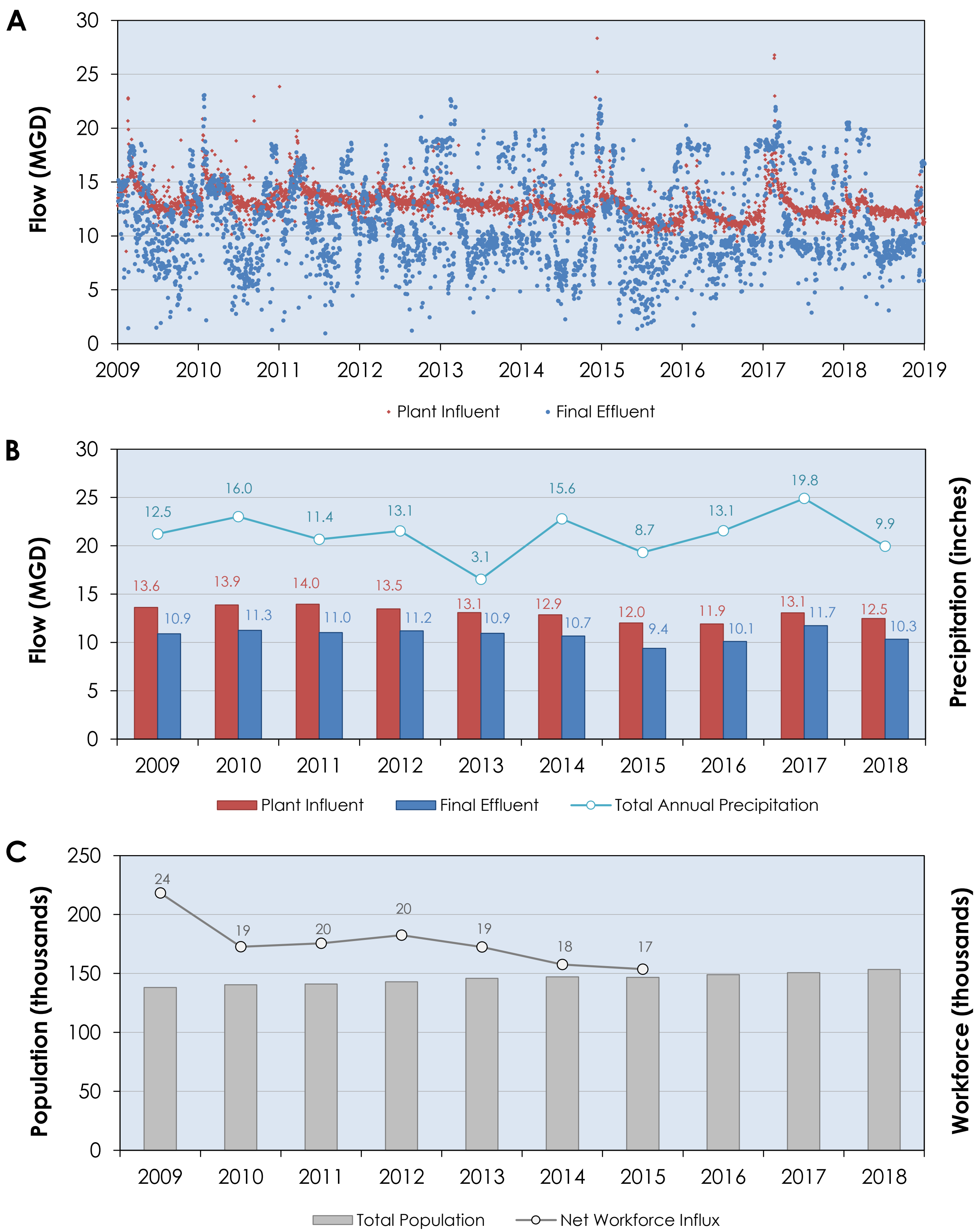


Figure 12: WPCP Wastewater Flow Rate Trends from 2009-2018. A) Daily and B) Annual Average Influent and Effluent Wastewater Flows through the WPCP from 2009-2018. C) Total Population and Net Workforce Influx (thousands) in Sunnyvale from 2009-2018 (net workforce influx data not yet available for 2015-2018)

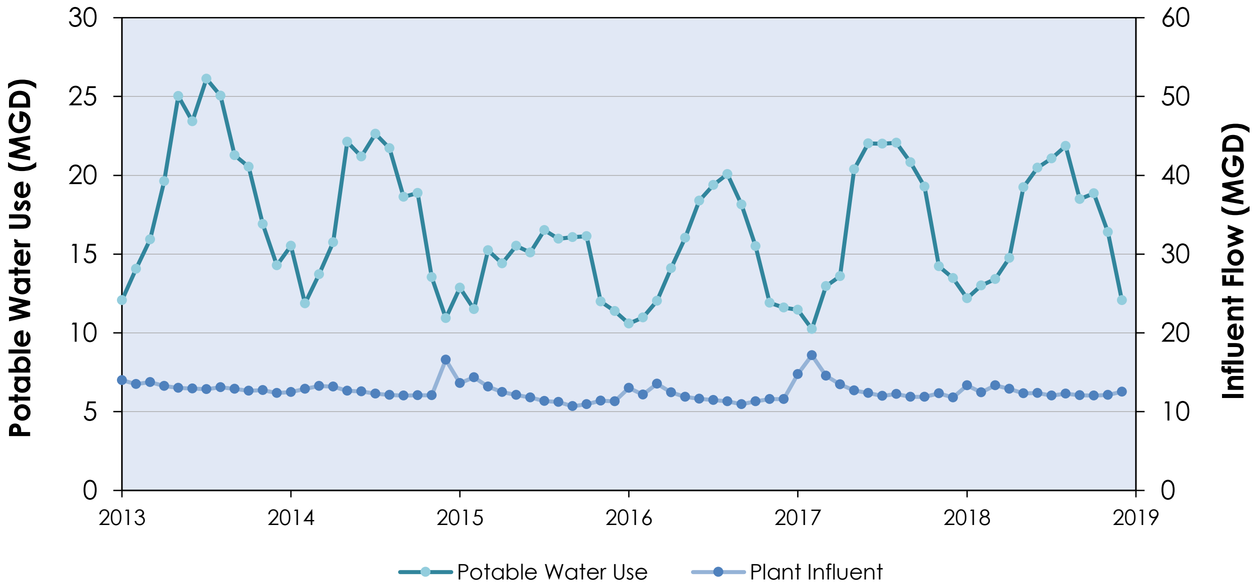


Figure 13: Monthly Average Citywide Potable Water Use and WPCP Influent Flows from 2013-2018

those respective reporting periods (**Figure 12C**)[3]. The significant decrease in flow during that time was the result of reductions in water use in response to the drought and State mandated restrictions.[4] By the end of 2018, the City had achieved a total annual reduction of 15%, as compared with 2013, which meets the minimum reduction goal of 15% set by the Stage 1 Water Reduction Target.

Daily effluent flow rates mimicked the seasonal pattern observed in influent flow rates over the ten-year period presented in **Figure 12A** and ranged from 2.9 to 22.0 MGD. The large variation and difference between influent and effluent flow rates is primarily attributed to the storage capacity of, and evaporation (estimated at 1-2 MGD on average) from, the Oxidation Ponds, as well as recycled water production.[5] Historically, effluent flows have been highly variable throughout the year as compared with influent flows due in large part to the production of recycled water, a process which had been discontinuous with SF Bay discharge. However, with the completion of the Continuous Recycled Water Production Facility project and the resumption of recycled water production in April 2018 as described in **Section 2.4** of the previous Chapter, effluent flow rates showed a more consistent rate. The resultant 263 MG of recycled water produced during the 2018 reporting period is representative of a typical production year, and is a

[3] Calculated as an annual average from U.S. Census Bureau data available from 2002-2014 (https://onthemap.ces.census.gov/). Daily workforce influx data unavailable for 2015-2018 and assumed to be at least the same as previous years.

[4] On April 1, 2015, Governor Brown signed an executive order imposing additional drought restrictions and directed the State Water Board to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016, and later extended through October 2016, as compared with 2013 levels. In response to this executive order, on May 12, 2015, the Sunnyvale City Council adopted a resolution declaring a 30% water reduction target through June 30, 2016, and instituted measures in pursuit of that goal (City of Sunnyvale - Drought and Water Conservation). On June 30, 2016, the City Council set a Stage 1 Water Reduction Target of 15% through June 30, 2017. The 15% target was not renewed as of June 30, 2017.

[5] Effluent flow rates below approximately 8 MGD correspond to the WPCP's Flow Management Strategy and tertiary shutdowns. Daily effluent flow rates can reach 0 MGD (zero discharge) during extended shutdowns, in which case the influent flow is held in the Oxidation Ponds until the tertiary process is restored. The storage capacity of the Oxidation Ponds is estimated at >550 MG and their use for temporary storage can have a large impact on the difference between daily influent and effluent flow rates. Zero discharge days are used to calculate average effluent flow rates but have been omitted from reporting the range of effluent flows.

significant increase from 2017, when the WPCP was only able to produce 11 MG of recycled water due to construction associated with process and infrastructure improvements.

Annual average effluent flow rates shown in **Figure 12B** have remained relatively consistent across the same time period with the exception of 2015 and 2016, which showed marked decreases from previous years. This is primarily attributed to an increase in recycled water production as well as a decrease in influent flows during those reporting periods in response to drought conditions. In comparison, 2017 annual average effluent flows were significantly higher than normal due to a lack of recycled water production coupled with higher influent flow rates and precipitation. Overall, effluent flow rates during the 2018 reporting period decreased to a level that is more consistent with pre-2017 flows.

Average monthly flow rates during this reporting period are shown in **Figure 14**. A comparison between influent and effluent monthly average flow rates reveals the seasonal effects of recycled water production

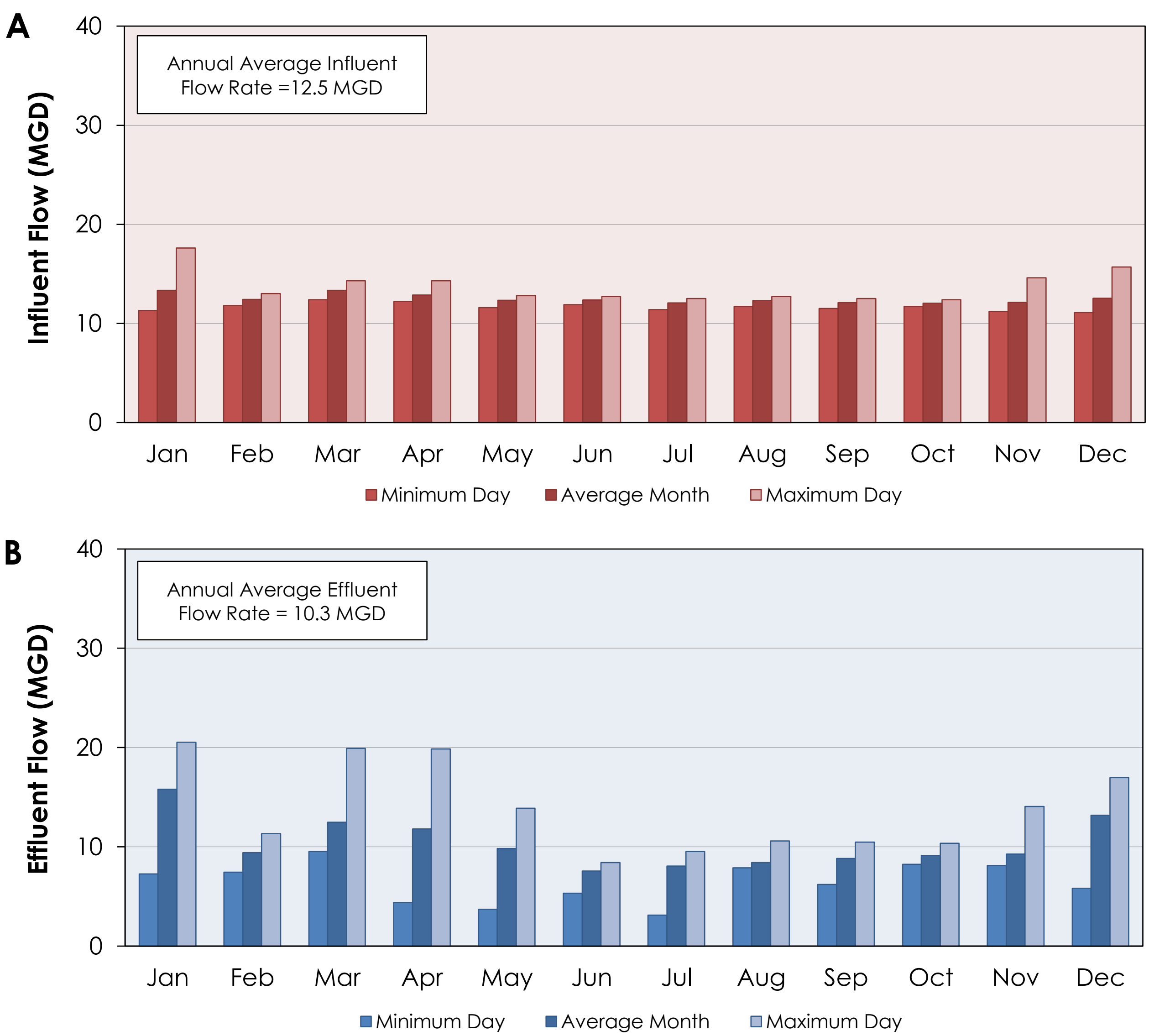


Figure 14: Monthly and Annual Average A) Influent and B) Effluent Wastewater Flow Rates through the WPCP during 2018

and evaporation from the Oxidation Ponds. During summer months (May-August), when recycled water production and evaporation rates are highest, influent monthly average flow rates are significantly higher than the corresponding effluent flow rate. The opposite is true during the fall and winter months (September-January), where recycled water production and evaporation rates are generally at their lowest and precipitation rates are at their highest. Exceptional precipitation during late-2017 and early-2018 caused an increase of influent flow rates (**Figure 14A**) and contributed to the rise in volume of rain water in the Oxidation Ponds. The excess volume stored in the Oxidation Ponds was discharged at higher rates over a longer period of time to maintain an appropriate operating level consistent with the WPCP's Flow Management Strategy described below. This strategy coupled with the absence of recycled water production in the early shoulder months (January-April) underscores the higher than normal final effluent depicted in **Figure 14B**.

The Oxidation Ponds have an available storage capacity of 50 to 100 MG, depending on the pond depth. This storage capacity forms the cornerstone of the WPCP's Flow Management Strategy, which allows Operations staff 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 aging Tertiary Treatment Facilities.

Toward the end of the 2016 reporting period, WPCP staff identified three wastewater streams that are returned to the Headworks and recounted by the influent flow meters. The return streams include:

- Engine cooling water for the PGF and Main Influent Engines
- Digester supernatant overflow
- Primary treated wastewater that is drained when a Sedimentation Basin requires maintenance

Initial estimations of the return flows indicate that they comprise roughly 4% of the total influent flow. These return flows are being addressed by the Headworks and Primary Treatment Facility project.

1.2. Carbonaceous Biochemical Oxygen Demand

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.

CBOD Removal

Type	Limit	Performance
% Removal:	85%	98%
Daily (MDEL):	20 mg/L	2.6 – 11.3 mg/L
Monthly (AMEL):	10 mg/L	4.1 – 7.6 mg/L

Figure 15 summarizes CBOD concentration data and removal performance from 2014 to 2018. Influent and effluent CBOD samples are collected as flow-weighted composites over a 24-hour period. During the 2018 reporting period, influent CBOD concentrations mirrored the trends observed in 2015 and 2016 with an annual average concentration around 310 mg/L, which is reflective of the lower influent flows, higher population growth and average daytime non-resident workforce influx of roughly 15% as compared to 2017 data.

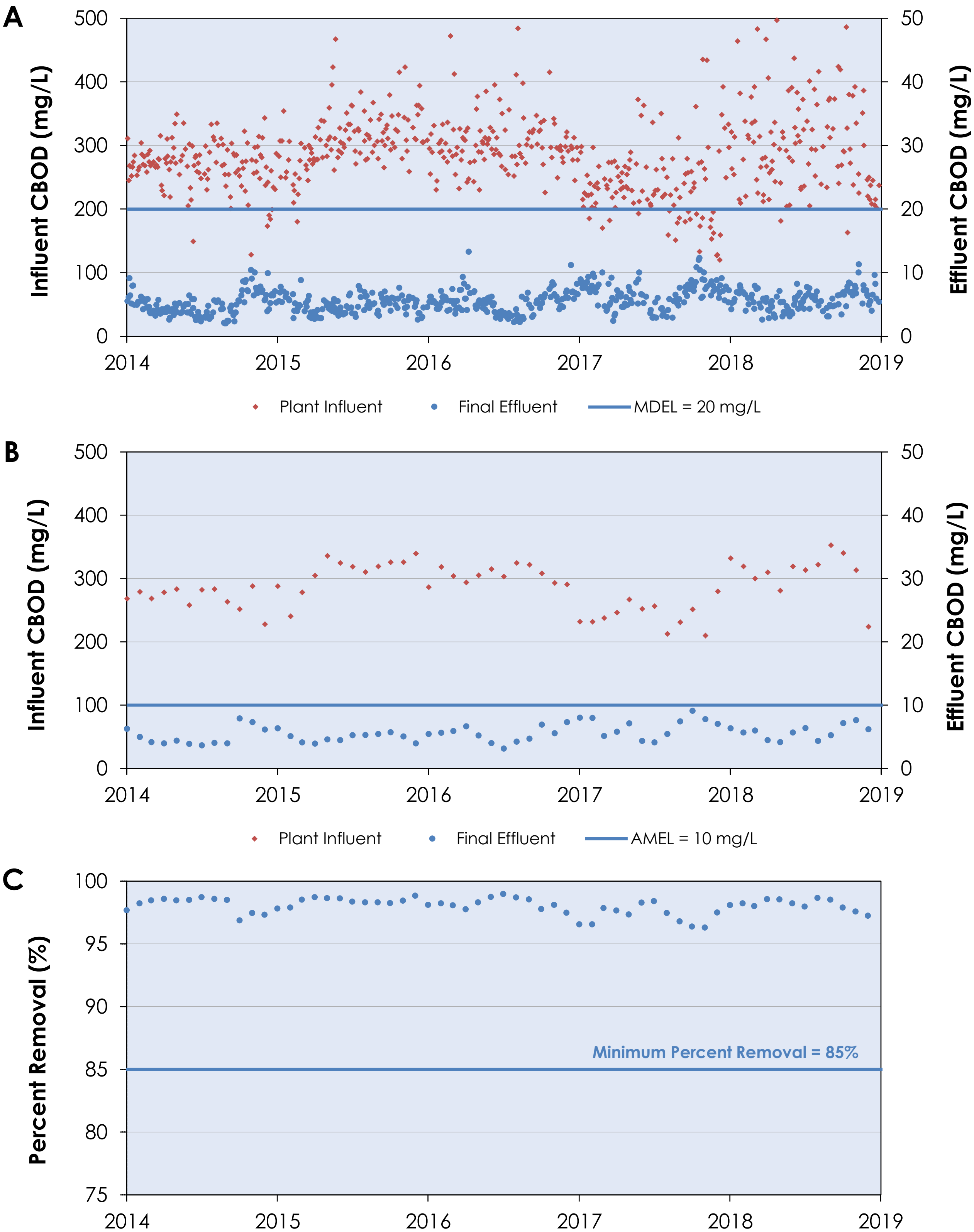


Figure 15: CBOD Trends through the WPCP from 2014-2018. A) Daily and B) Average Monthly Influent and Effluent CBOD (mg/L) through the WPCP from 2014-2018. C) Average Monthly Effluent Percent Removal of CBOD from 2014-2018

As shown in **Figure 15A** and **Figure 15B**, effluent daily composite and average monthly effluent CBOD concentrations remained below their respective permit limits during the reporting period. The percent removal of CBOD, as measured by the difference in influent and effluent concentrations, remained well above the minimum removal rate of 85% with an average of 98% (**Figure 15C**). Effluent concentrations demonstrated a general trend of lower removal during the colder months and higher removal during the warmer months. Metabolic activity in the secondary treatment processes declines during the colder months, resulting in higher CBOD concentrations as compared with the summer months. Influent CBOD data show significant variability throughout 2018, a trend that the WPCP is currently investigating. Nevertheless, effluent data collected during the 2018 reporting period indicate a high level of performance at the WPCP.

Figure 16 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 2014 to 2018. Influent CBOD loading rates

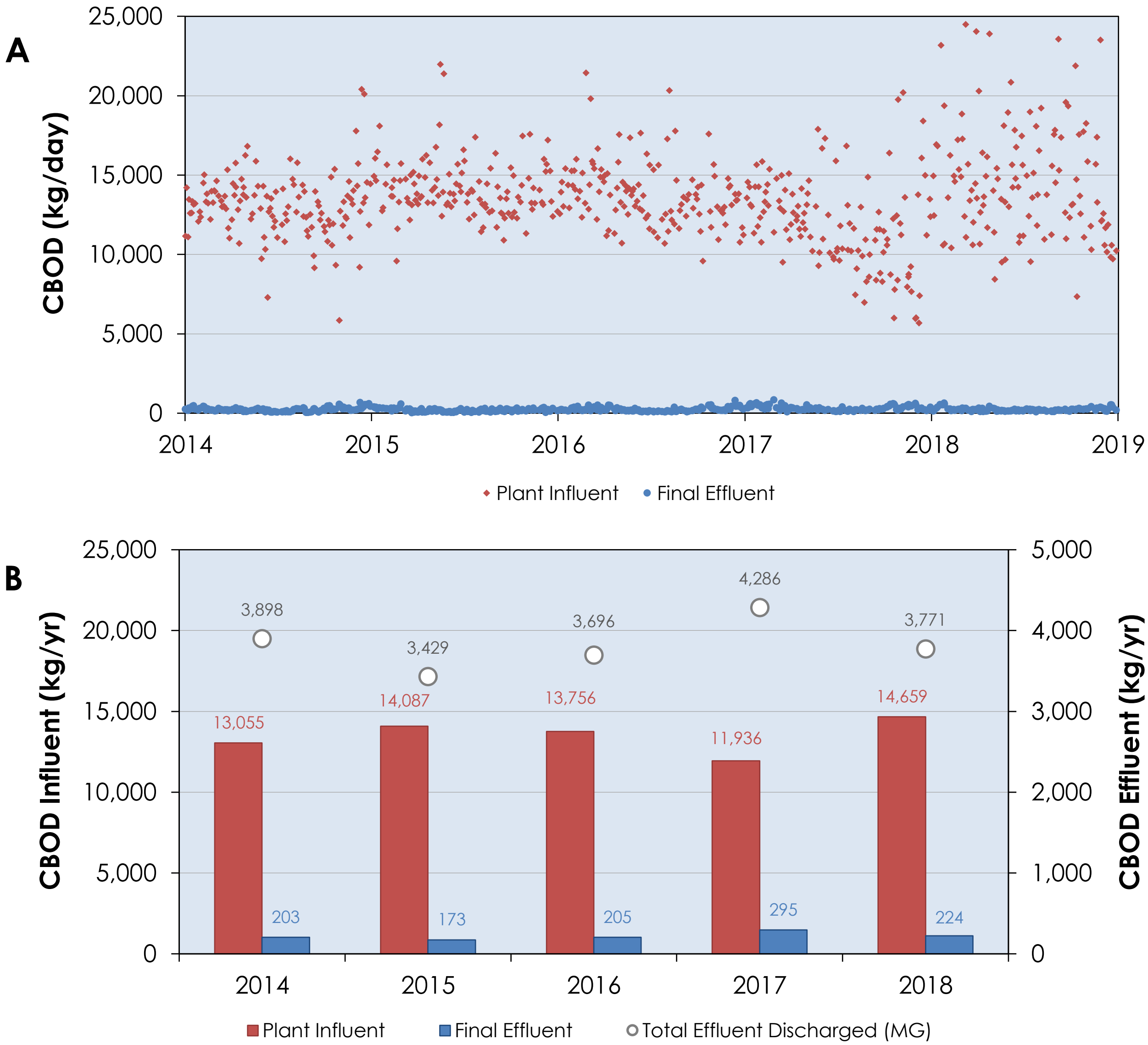


Figure 16: Average A) Daily and B) Annual CBOD Loading Rates and Total Effluent Discharged from 2014-2018

experienced a sharp upwards turn in 2018. This is also reflected in the influent CBOD concentration data trend shown in **Figure 15**. In contrast, effluent CBOD loading rates decreased as compared with 2017, which is primarily attributed to the restart of recycled water production in April 2018.

1.3. Total Suspended Solids

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

TSS Removal

Type	Limit	Performance
% Removal:	85%	97%
Daily (MDEL):	30 mg/L	4.8 – 16.2 mg/L
Monthly (AMEL):	20 mg/L	5.7 – 12.8 mg/L

Figure 17 summarizes TSS concentration data and removal performance from 2014 to 2018. Influent TSS showed a steady drop from around 345 mg/L in January to around 270 mg/L in May, which is a typical pattern observed in most years as it coincides with some of the heaviest rainfall experienced by the region that can contribute to scouring of accumulated sediment within the collection system. 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 (August-September). This can be attributed to enhanced water conservation efforts coupled with an upsurge in population (**Figure 12C**). Unlike CBOD, influent TSS data did not show a high degree of variability during this reporting period. Prior to 2014, although not shown in the corresponding charts, influent TSS data showed similar levels of variability that have since been corrected by the adjustment of the influent sampler to a location that improved mixing and captured the most representative sample.

As shown in **Figure 17A** and **Figure 17B**, effluent daily and average monthly TSS concentrations remained below their respective permit limits. The percent removal of TSS, as measured by the difference in influent and effluent concentrations, remained well above the minimum removal rate of 85%, with an average of 97% over the reporting period (**Figure 17C**), indicating a high level of performance. Effluent TSS concentration data from 2014 to 2018 show a relatively consistent seasonal trend with higher concentrations measured in the colder months as compared with the warmer months. The dominant species of algae within the Oxidation Ponds typically undergoes a seasonal shift between summer and winter. In the summer months, colonial algal species dominate and are readily removed by the DAFTs and DMFs; whereas, single cell algal species 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 permit limits. This is especially true during the production of recycled water since the CCR Title 22 turbidity limits are more stringent than those contained in the NPDES permit. Operations staff also perform more frequent backwashing of the DMFs to ensure filter efficiency during the summer.

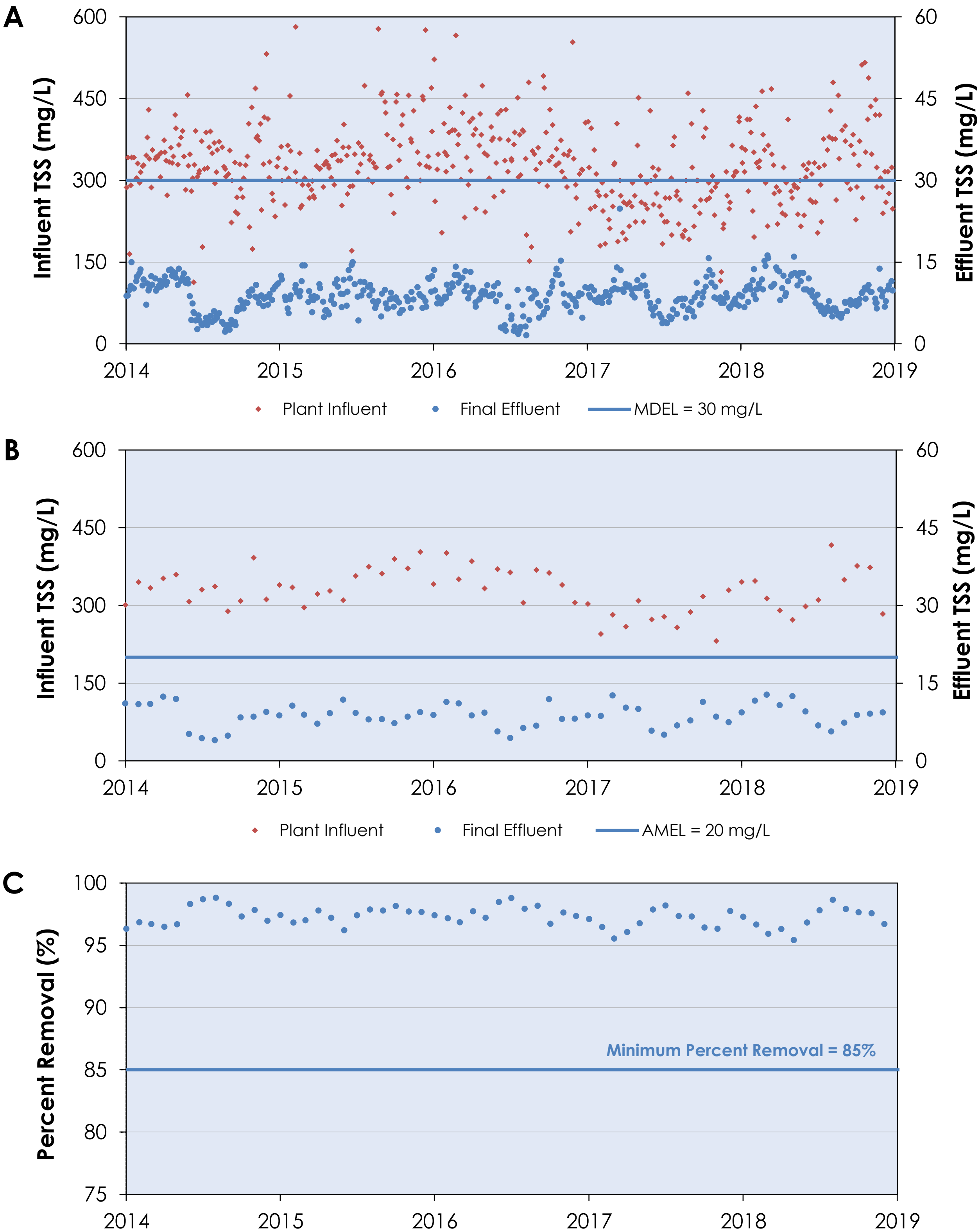
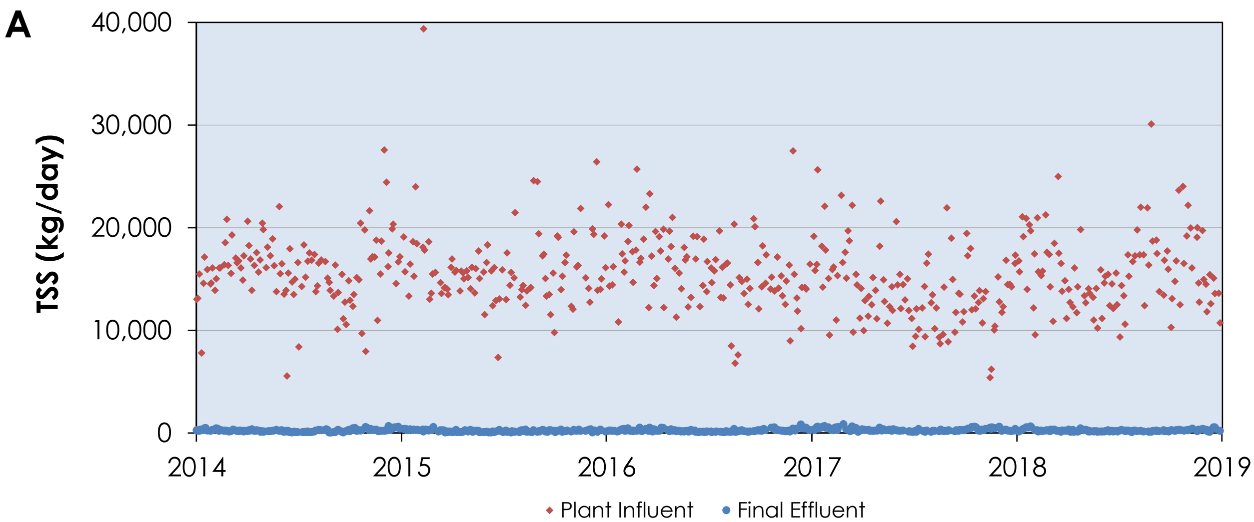


Figure 17: TSS Trends through the WPCP from 2014-2018. A) Daily and B) Average Monthly Influent and Effluent TSS (mg/L) through the WPCP from 2014-2018. C) Average Monthly Effluent Percent Removal of TSS from 2014-2018

The significant decrease in effluent TSS concentrations in mid-2014 occurred during a pilot study that assessed an alternate operational strategy for recycled water production, wherein the entire effluent was treated to meet the Title 22 recycled water turbidity requirement of 2 NTU versus the 10 NTU requirement for Bay discharge. However, the pilot study resulted in unnecessary costs and significant operational constraints and was therefore not selected as an alternate operational mode.

Figure 18 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 2014 to 2018. Influent loading rates showed an upward trend during 2014 to 2016 before declining in 2017, but again increasing in 2018. This mirrors the influent TSS concentration data trend shown in **Figure 17.** The increase in influent loading rates occurred despite a slight decline in flow rates as compared with the previous year. This is partially explained by the increase in influent TSS concentrations during 2018 as compared with previous year. By comparison, effluent TSS loading rates remained consistent with 2017 values, which is likely attributed to the absence of recycled water production during the early months (January-April).



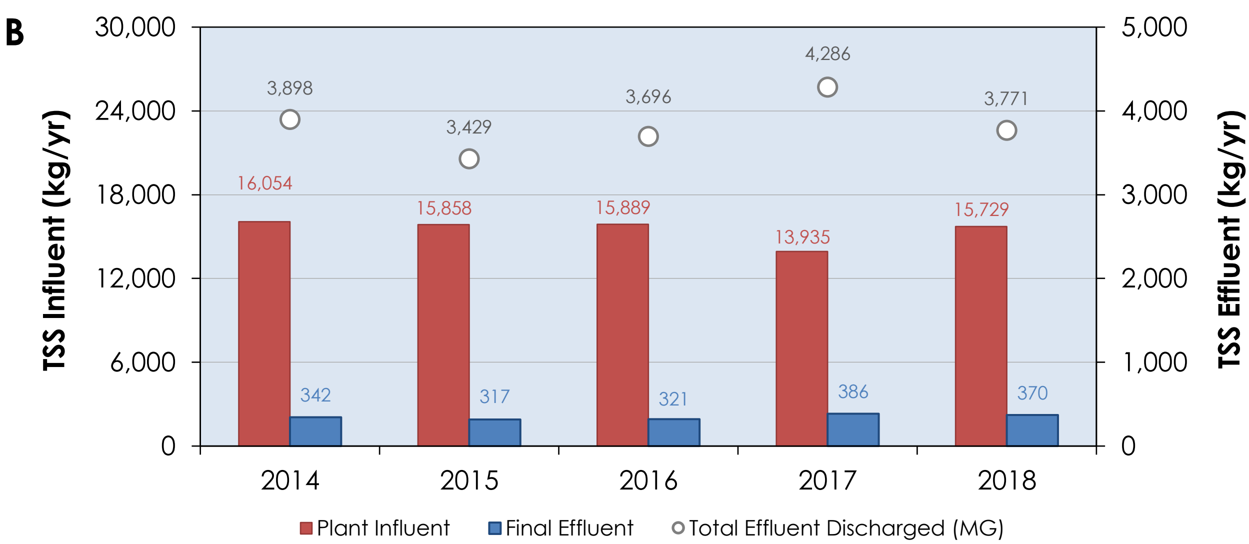


Figure 18: Average A) Daily and B) Annual TSS Loading Rates and Total Effluent Discharged from 2014-2018

1.4. Total Ammonia

Ammonia removal occurs in both the Oxidation Ponds and the FGRs. Ammonia removal in the Oxidation Ponds occurs as a result of biological nitrification and uptake by algae and is highly susceptible to seasonal fluctuations. Lower removal rates occur during the fall/winter (October-May) when ambient temperatures are low and daytime is shorter; whereas, higher removal rates occur during the summer (June-September) 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 show less influence from ambient weather conditions. The WPCP's NPDES permit includes seasonal performance limits for ammonia that reflect the variability in the performance of the two processes.

Ammonia Removal

Type	Limit	Performance
Daily (MDEL):	26 mg/L (Oct-May) 5 mg/L (Jun-Sept)	0.07 – 13.1 mg/L 0.07 – 0.6 mg/L
Monthly (AMEL):	18 mg/L (Oct-May) 2 mg/L (Jun-Sept)	0.1 – 10.2 mg/L 0.1 – 0.4 mg/L

1.4.1. Data Review

Figure 19 summarizes ammonia concentration data and removal performance trends. **Figure 19A** depicts removal performance of the Oxidation Ponds and FGRs during the 2018 reporting period. Seasonal removal trends are clearly visible, with the Oxidation Ponds demonstrating ammonia removal from March to October, and the FGRs removing the majority of the ammonia during the remainder of the year. The significant increase in ammonia concentrations in effluent from the Oxidation Ponds is attributed to low ambient temperatures throughout the majority of January through February and November through December 2018 and is typical. As described in more detail in the *Strategies to Enhance Performance* section below, the WPCP only performed a single snail control event in July 2018 without compromising FGR performance.

As shown in **Figure 19B** and **Figure 19C**, daily and average monthly effluent ammonia in 2018 remained below their respective seasonal permit limits. Influent ammonia concentrations, on the other hand, began increasing in 2014 but unlike CBOD and TSS appeared to have leveled-off through 2018. A record 10-year daily max of 58.4 mg/L was measured on December 27, 2016, (**Figure 19B**) but no such spikes were detected in 2018. Unlike CBOD, influent ammonia concentrations did not show significant variability during the 2018 reporting period.

Figure 20 summarizes average daily (kg/day) and annual (kg/yr) influent and effluent ammonia loading rates from 2014 to 2018. Influent loading rates showed an upward trend during 2014 through 2016 and have since leveled-off, mirroring the influent ammonia concentration data trend shown in **Figure 19**. Unlike CBOD and TSS, influent flows had less of an impact on ammonia loading rates than concentrations. Effluent ammonia loading rates are variable with the higher values generally occurring during the winter season and lower values generally occurring during the summer season, reflecting the seasonal nature of

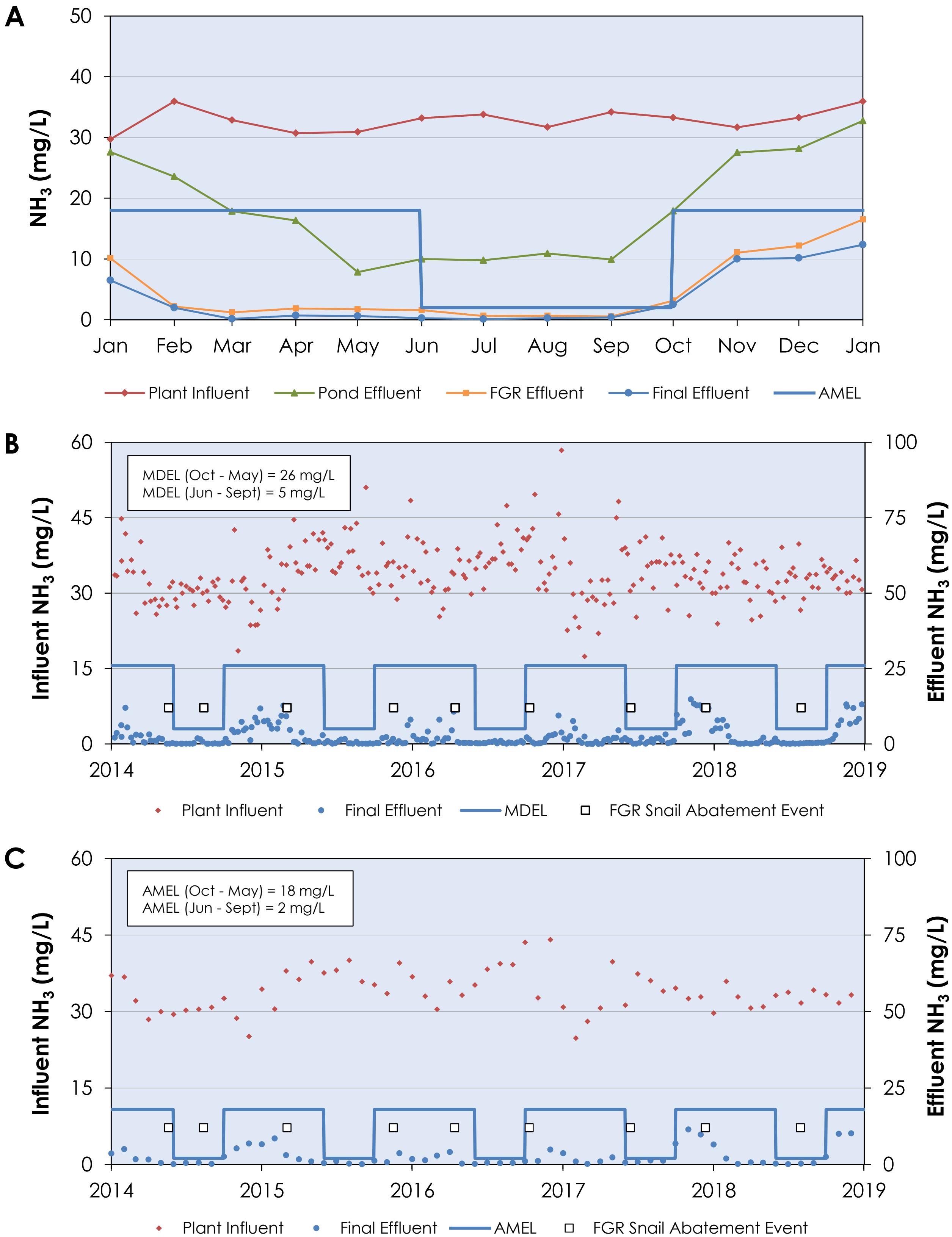


Figure 19: Ammonia Trends at the WPCP from 2014-2018. A) Monthly Average Total Ammonia from Pond, FGR, and Final Effluent during 2018. B) Daily and C) Monthly Average Influent and Effluent Total Ammonia from 2014-2018.

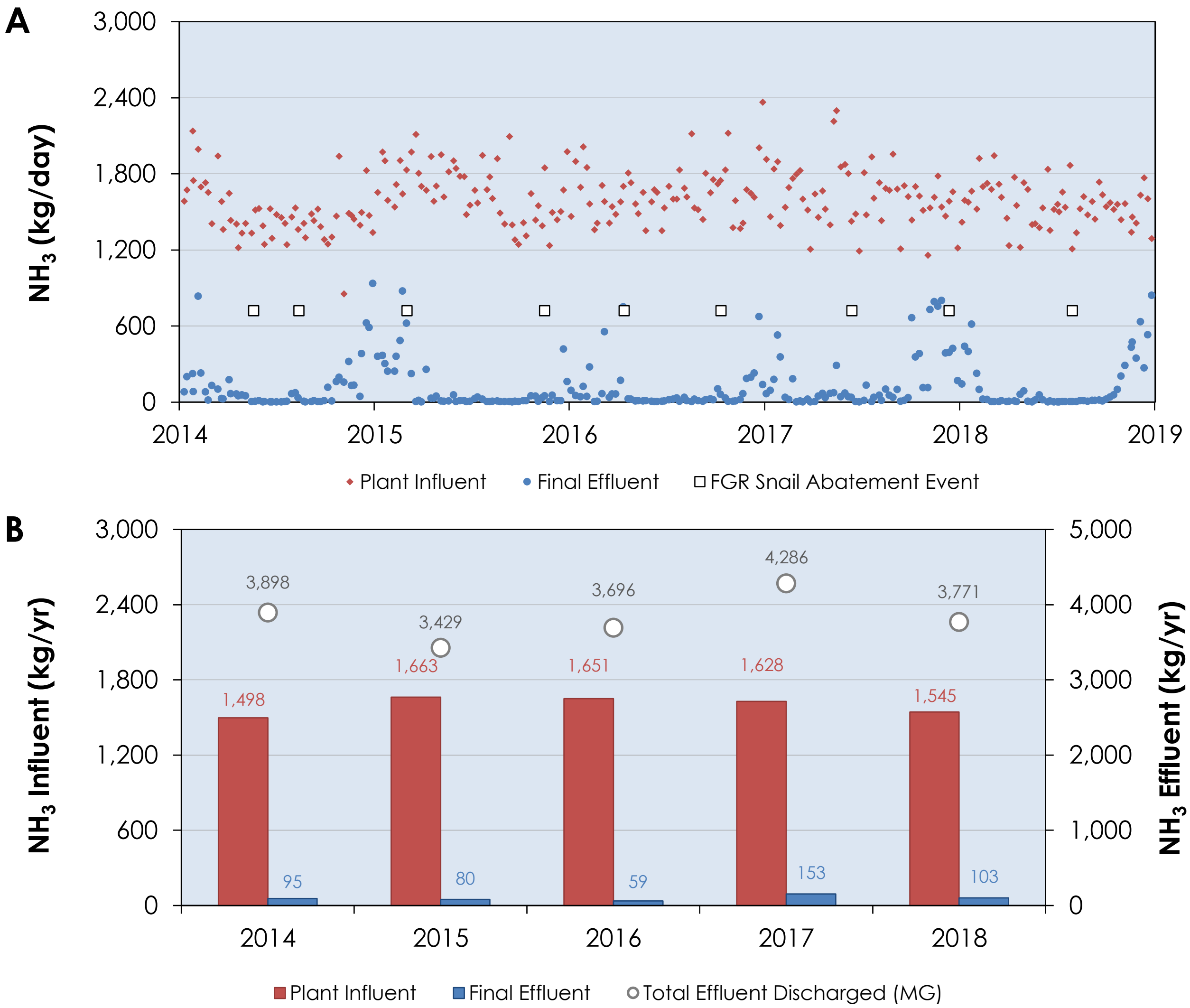


Figure 20: Average A) Daily and B) Annual Ammonia Loading Rates and Total Effluent Discharged from 2014-2018

the Oxidation Ponds and FGRs performance. Similar to CBOD, effluent ammonia loading rates decreased in 2018 as compared with 2017 primarily due to restarting recycled water production and the operation efficiency of the Oxidation Ponds and FGRs. Additional information pertaining to ammonia and other nutrient trends is presented in **Section 1.5** of this Chapter and is available in the *2018 Nutrient Watershed Permit Annual Report* submitted by BACWA.

1.4.2. Performance Optimization Strategies

<u>Oxidation Pond Dredging</u>

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, 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, carryover and emergency bypass from the Primary Treatment process, float (algae mats) skimmed from the DAFTs, DMF backwash water, and 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 10.0**). 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 2,723 dry tons of biosolids were removed from the Oxidation Ponds in 2018 and re-used for agricultural land application.

Snail Control Program

In 2013, the City instituted a periodic Snail Control Program to optimize FGR nitrification. Trickling filters, such as the FGRs, are prone to declining ammonia removal performance because of snail predation on nitrifying bacteria that inhabit the plastic growth media. 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 high levels of unionized ammonia, which is toxic to the snails but beneficial to nitrifying bacteria up to a certain point.

One snail control event was performed during this reporting period on July 31, 2018, and is depicted on **Figure 19B** and **Figure 19C**. Typically, a second control event occurs in October or early November during the seasonal shift and subsequent decline in Oxidation Pond performance. However, due to an increase in operating efficiency within the Oxidation Ponds and FGRs, a second control event was deemed unnecessary. Effluent Total Ammonia is well below the permit limit as shown in **Figure 19B** and **Figure 19C**. The WPCP plans to continue performing these control events as long as the FGRs are required to provide nitrification.

FGR Rotating Arm Reconfiguration

As an additional measure to enhance ammonia removal in the FGRs, between June 2014 and July 2015, the WPCP reconfigured the wastewater distribution arms on each FGR to better control their rotational speed. Biofilms composed primarily of ammonia oxidizing bacteria accumulate on the plastic growth media within the FGRs. Their success is in large part dependent on the wetting rate (overall application rate of the wastewater per square foot of surface area), which is set by the rotational speed of the distribution arms. The biofilms are also susceptible to shear forces from the applied Oxidation Pond effluent. By reducing the rotational speed of the arms, the wetting rate increases, biofilm growth becomes more uniform and sloughing decreases, and overall ammonia treatment is enhanced.

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 issued July 1, 2014, by the RWQCB under NPDES Permit No. CA0038873, Order No. R2-2014-0014. 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 also 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.

Prior to the issuance of the Nutrient Watershed permit, the WPCP collected nutrient data from 2012-2014 in response to a 13267 letter received from the RWQCB in March 2012. During this two-year period, samples were collected at different intervals for both influent (twice annually) and effluent (twice-per-month) and analyzed for the common forms of nitrogen (**Figure 21**) and phosphorus (**Figure 22**) to provide a complete nutrient profile. Consequently, there are periods where influent data for both nitrogen and phosphorous are sparse. Influent monitoring frequencies were voluntarily increased by the City in 2015 and then again in 2017 to provide a more complete dataset for the design of the new treatment facilities under the City's Master Plan. As such, analysis and discussion of the data presented addresses 2013 onwards when discerning trends are apparent.

Nitrogen

Total Nitrogen	
Annual Average Effluent	20 mg/L
Annual Total Effluent Load	315 tons
% Removal	66%

For the purpose of this report, influent total nitrogen (TN) is assumed to consist primarily of ammonia and organic species (Org-N), with the contribution from nitrites and nitrates (NOx) being negligible[6]. Therefore, Total Kjeldahl Nitrogen (TKN), which is a measure of the total concentration of Org-N and ammonia, is considered equivalent to influent TN. On average, Org-N comprises 40% of influent nitrogen with ammonia making up the remaining 60%. The same assumption does not apply to effluent wastewater, as nitrification occurs in the Oxidation Ponds and FGRs, resulting in ammonia being readily oxidized to NOx. In this case, nitrate (NO_3) is the dominant form of oxidized nitrogen in the effluent, averaging 97% of NOx or 75% of TN. Effluent TN is subject to seasonal variability for reasons discussed below.

Figure 21A shows average monthly influent and effluent TN concentrations collected as flow-weighted composite samples over a 24-hour period. Influent concentrations in 2018 were slightly greater than those observed in 2017, instead mirroring the levels observed in 2015 and 2016 for an annual average of 59 mg/L and a range of 51 to 69 mg/L. In general, influent TKN concentrations exhibited seasonal variation with higher concentrations in the summer and lower concentrations in the winter. These fluctuations correspond inversely with influent flow patterns. Between June and July of 2018, influent TKN concentrations were consistently high, reaching a maximum of 81 mg/L. A similar trend was observed between September and October 2017, with a maximum concentration of 120 mg/L. Ammonia concentrations during both time periods remained relatively consistent, as did CBOD and TSS, suggesting

[6] TN is the summation of ammonia, NOx, and Org-N. Assuming NOx is negligible in influent wastewater is a common practice and one that was previously verified at the WPCP between 2012-2014 as part of monitoring conducted under the 13267 letter.

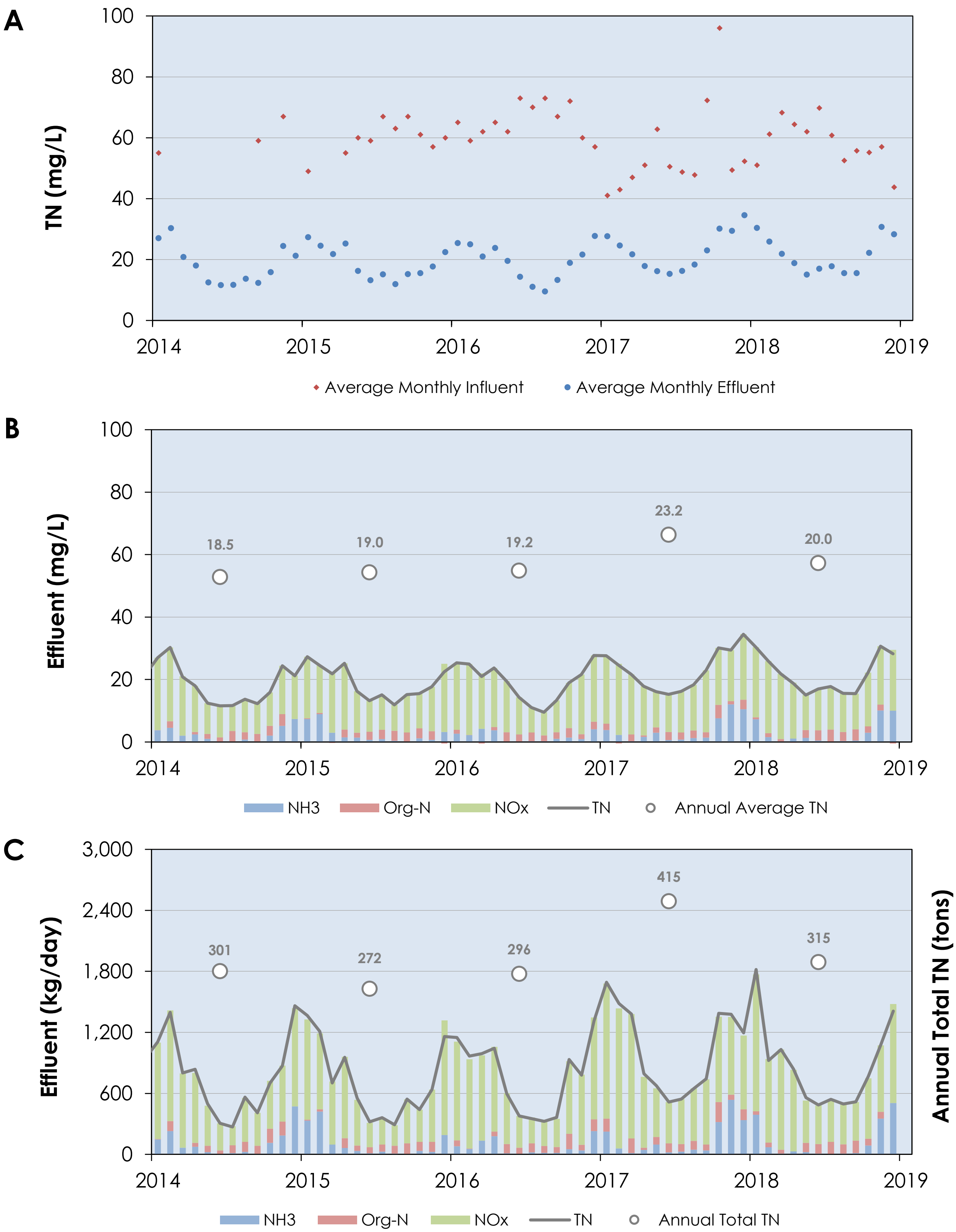


Figure 21: Nitrogen Trends at the WPCP from 2014-2018. A) Monthly Average Influent and Effluent TN Concentrations. B) Speciated Monthly Average Effluent Nitrogen Concentrations and C) Effluent Loading Rates with Annual Total TN Loads

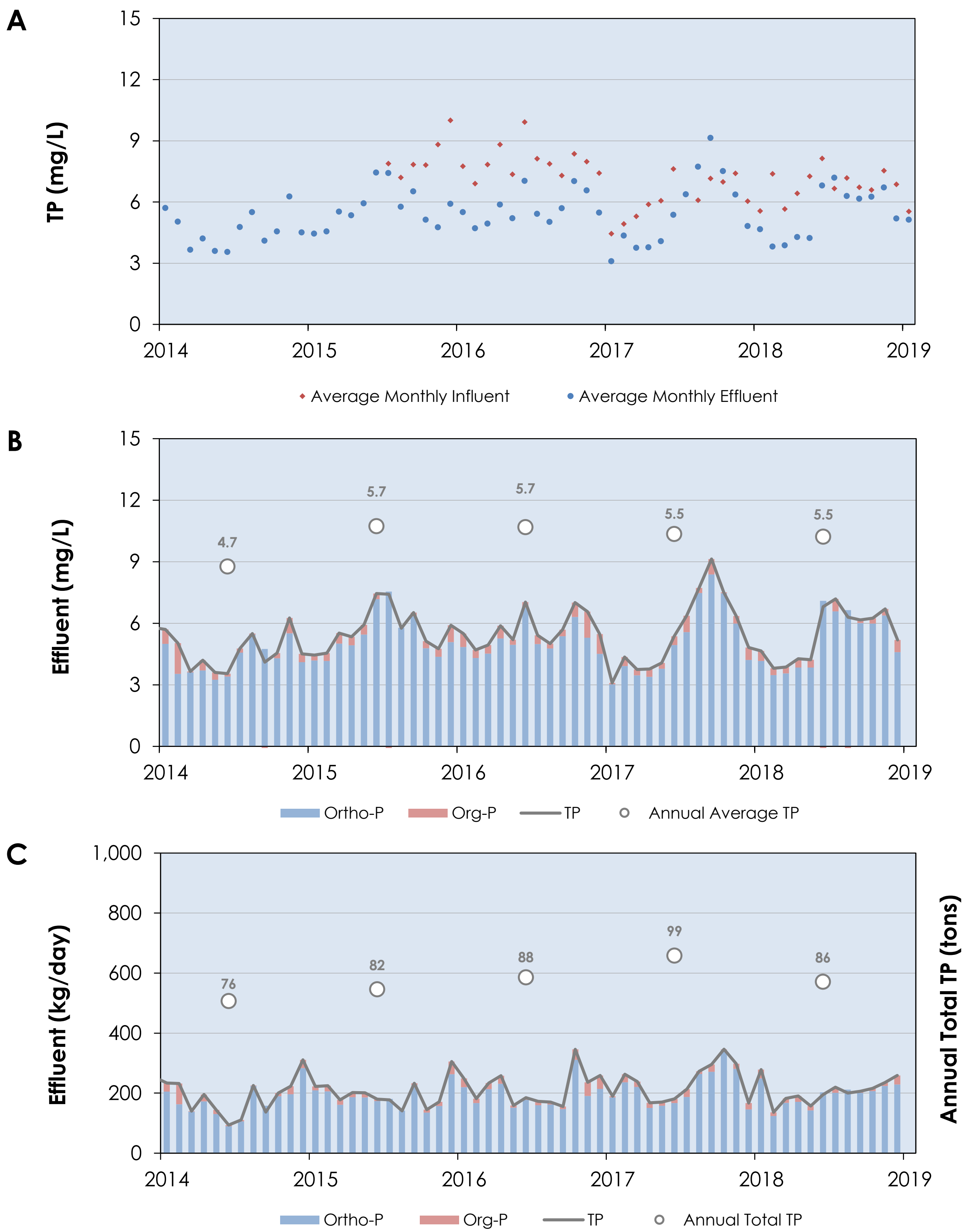


Figure 22: Phosphorous Trends at the WPCP from 2014-2018. A) Monthly Average Influent and Effluent TP Concentrations. B) Speciated Monthly Average Effluent Phosphorous Concentrations and C) Loading Rates with Annual Total TP Loads

a large Org-N driver behind the measured results. A primary source of Org-N are proteins that can be released when organic matter starts to break-down and before ammonification occurs. While the WPCP is currently investigating potential causes for these influent TKN spikes, effluent TN concentrations were consistent with historical levels, indicating a high degree of performance.

Monthly average effluent TN concentrations are separated into the dominant forms of nitrogen (ammonia, Org-N, and NOx) in **Figure 21B**. The seasonal influence on nitrification at the WPCP becomes more apparent at this scale, with ammonia concentrations giving way to NOx in the warmer summer months under more kinetically favorable biological conditions and then increasing in the colder winter months. Signs of denitrification are also apparent in the summer months, as decreases in ammonia are not fully offset by increases in NOx, thereby driving down TN concentrations. Though not shown graphically in this report, the majority of denitrification occurs in the Oxidation Ponds during the summer months. Given that the FGRs and DAFTs promote aerobic conditions through mechanical turbulence and the introduction of dissolved air, some denitrification is likely occurring in the DMFs where the anaerobic conditions necessary for denitrification can develop. Effluent TN concentrations during the 2018 reporting period appeared relatively consistent as compared with the previous year, with an annual average of 20 mg/L. However, effluent TN concentrations toward the end of 2017 beginning of 2018 were slightly higher than in previous years due to higher ammonia concentrations resulting from reduced Oxidation Pond and FGR performance.

Average monthly effluent nitrogen loading rates and annual total TN loads are shown in **Figure 21C** and depict seasonal nitrification/denitrification variations experienced at the WPCP similar to those shown in **Figure 21B**. The loading rates are also influenced by nutrient diversion through recycled water production in the summer months. Consequently, the loading rate curve displays peaks in the winter months when demand for recycled water is low and biological activity (nitrification/denitrification) slows, and deeper troughs in the summer months when recycled water production and biological activity are high. Effluent TN loadings during the 2017 reporting period were higher than observed in previous years (415 tons) primarily as a result of an absence of recycled water production coupled with a reduction in nitrification/denitrification rates in the Oxidation Ponds. With the restart of recycled water production in April 2018, coupled with an overall increase in system performance, Effluent TN loading rates dropped significantly (24%) from their 2017 levels and appear more consistent with historical trends around 315 tons. TN removal efficiency, as measured by the difference between annual average influent and effluent concentrations, remained high during the 2018 reporting period at approximately 66%.

Phosphorous

Average monthly influent and effluent total phosphorous (TP) concentrations are shown in **Figure 22A**. The WPCP began analyzing for influent TP during 2015 to complement TN data and support nutrient discussions with a more complete dataset. Since then, influent TP concentrations have been relatively consistent with slightly higher concentrations observed during 2015 and 2016, as

Total Phosphorous	
Annual Average Effluent	5.5 mg/L
Annual Total Effluent Load	86 Tons
% Removal	20%

compared with 2017 and 2018. Effluent concentrations indicate relatively consistent concentrations that are less influenced by seasonal variation as compared to nitrogen. The approximate 20% reduction in TP between influent and effluent levels observed during this reporting period is consistent with previous years and reflective of incidental removal of phosphorus at various stages throughout the treatment process, rather than a single process specifically designed for phosphorous removal.

Figure 22B shows the monthly average effluent TP concentrations separated into the dominant forms of orthophosphate (Ortho-P) and organic phosphorous (Org-P). Orthophosphate, 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. Since influent sampling began in 2013, Ortho-P concentrations have been nearly equivalent to TP and have remained relatively constant at 5-6 mg/L on average.

Average phosphorous loading rates and annual total TP loads are shown in **Figure 22C**. Overall, average TP loading rates have remained fairly consistent since 2013, with approximately 86 tons of TP being discharged to the SF Bay during the 2018 reporting period.

1.6. Plant Performance Summary

The WPCP maintained a high degree of pollutant removal efficiency during the 2018 reporting period without any exceedance of its effluent permit limitations. As shown in **Figure 23**, around June 2013 both CBOD and TSS influent concentrations began increasing concurrently with decreases in potable water use and influent flow rates that continued through the 2016 reporting period. Both influent and effluent flow rates during this period also reached record annual average lows of 11.9 MGD and 10.1 MGD, respectively. Potable water use in 2017 and 2018 rebounded alongside influent flow rates, likely due to moderate drought relief from the increased precipitation and removal of state mandated restrictions. Despite these

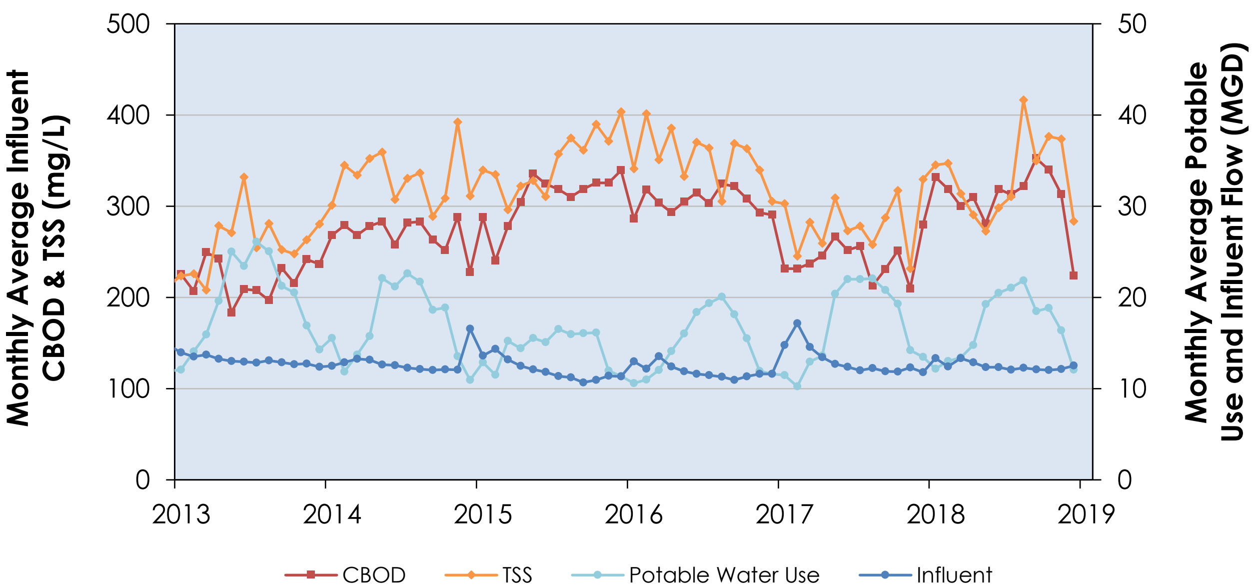


Figure 23: Monthly Average CBOD and TSS Influent Concentrations, Citywide Potable Water Use, and WPCP Influent Flows from 2013-2018

patterns, influent CBOD and TSS concentrations during 2018 showed an increase relative to 2017, and are more aligned with those observed in 2015 and 2016 when drought conditions were most severe. Similarly, increases in pollutant loading rates that began in 2013 appeared to have reversed to a downward trend but began sloping upward in 2018, with the exception of ammonia. As such, these trends are primarily attributed to the interplay between an upsurge in population (1.8%) coupled with a large daily net workforce influx of non-resident workers and patterns of precipitation and potable water use.

Beginning in 2015, there was a noticeable increase in influent CBOD concentrations and data variability that carried into 2016. In 2017, WPCP staff adjusted the maintenance frequency and protocol, as well as the sample collection schedule, for the influent composite sampler. The adjustments were made to mitigate the potential dislodging of accumulated organic matter from tubing walls and to avoid capturing the return flows identified in 2016 (digester supernatant and drainage from sedimentation basins), both of which could influence sample results and favor data scatter. Following these adjustments, data scatter was somewhat reduced. In 2018, a larger degree of scatter was observed and the WPCP is currently investigating. Additionally, the WPCP is investigating the spikes in influent TKN that occurred in 2017 and 2018.

Increases in effluent loading rates are primarily attributed to a sharp reduction in recycled water production in early 2018. Having only performed a single snail control event in 2018, the operating efficiency observed in the Oxidation Ponds appears to have contributed to lower ammonia loads than observed in recent years. The WPCP maintained a high TN removal rate around 66%.

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 permit, such reporting removes the requirement for tabular and graphical summaries of monitoring data in this annual 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 1 summarizes effluent compliance sampling conducted during 2018, including regulatory limits, the range of sample results, and the number of samples collected and exceedances. During 2018, the WPCP maintained a high degree of performance with no exceedances of regulatory limits.

2.1.1. Constituent Removal

Figure 24 through **Figure 28** show constituent removal and any applicable corresponding effluent limitation (MDEL, AMEL) or applicable water quality objective (WQO) values. 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 carry no immediate regulatory action. Therefore, WQOs presented in the following figures, which are taken from

Table 1: Effluent Monitoring Sample Results for Standard Parameters in 2018

Parameter Class	Parameter	Parameter Limit Type	Parameter Limit	2018 Final Effluent Min	2018 Final Effluent Avg	2018 Final Effluent Max	Number of Samples[1] / Exceedance
Standard	**CBOD**	MDEL (mg/L)	20	2.6	5.7	11.3	122 / 0
		AMEL (mg/L)	10	4.1	5.7	7.6	12 / 0
		Percent Removal (%)	85	97	98	99	12 / 0
	TSS	MDEL (mg/L)	30	4.8	9.5	16.2	103 / 0
		AMEL (mg/L)	20	5.7	9.5	12.8	12 / 0
		Percent Removal (%)	85	95	97	99	12 / 0
	Ammonia (as N)	MDEL [Oct-May] (mg/L)	26	0.07	3.9	13.1	35 / 0
		AMEL [Oct-May] (mg/L)	18	0.1	4.1	10.1	8 / 0
		MDEL [Jun-Sept] (mg/L)	5	0.07	0.2	0.6	18 / 0
		AMEL [Jun-Sept] (mg/L)	2	0.1	0.3	0.4	4 / 0
	Oil & Grease	MDEL (mg/L)	10	<1.5	<1.5	<1.5	4 / 0
		AMEL (mg/L)	5	<1.5	<1.5	<1.5	4 / 0
	Turbidity	MDEL (NTU)	10	4.2	7.4	9.5	52 / 0
	pH[1]	Max / Min	8.5 / 6.5	6.6	7.2	7.9	352 / 0
	Chlorine Residual[1]	IMEL (mg/L)	0	0	0	0	352 / 0
	Enterococci	Geo Mean (month) (MPN/100mL)	35	1.1	2.8	5.6	12 / 0
Toxicity	**Acute Toxicity**	90th% (% Survival)	70	100	100	100	4 / 0
		Moving Median (% Survival)	90	100	100	100	4 / 0
Organics	**Cyanide**	MDEL (ug/L)	17	<1.40	1.7	2.1	12 / 0
		AMEL (ug/L)	7.5	<1.40	1.7	2.1	12 / 0
	Dioxin TEQ[2]	AMEL (ug/L)	1.4×10^{-8}	---	---	---	--- / ---
		MDEL (ug/L)	2.8×10^{-8}	---	---	---	--- / ---
	Bis (2-Ethylhexyl) Phthalate	MDEL (mg/L)	12	<0.5	<0.5	<0.5	4 / 0
		AMEL (mg/L)	5.9	<0.5	<0.5	<0.5	4 / 0
Metals	**Copper**	MDEL (ug/L)	19	1.5	2.7	4.4	12 / 0
		AMEL (ug/L)	10	1.5	2.7	4.4	12 / 0
	Mercury	AWEL (ug/L)	0.027	0.00093	0.0014	0.0024	12 / 0
		AMEL (ug/L)	0.025	0.00093	0.0014	0.0024	12 / 0
		AAEL (kg/yr)	0.120	---	---	0.017	1 / 0
	Nickel	MDEL (ug/L)	35	2.7	3.3	4.8	12 / 0
		AMEL (ug/L)	24	2.7	3.3	4.8	12 / 0

Legend:
1: Sample collection required only during active discharge – sample count below 365 indicates periods of zero discharge to SF Bay
2: Sampling conducted for Dioxin TEQ once every permit cycle (RWQCB Order R2-2016-0008. Requirements were satisfied in March 2016.
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
MPN: Most probable number
J: Analyte detected, but not quantifiable
ND: Analyte was "not-detected" above the laboratory method detection limit
NTU: Nephelometric turbidity unit
<#: Analytical results less than the laboratory detection limit
---: Indicates that data are not available or applicable

the current NPDES permit, are included solely for informational purposes.[7] During the reporting period, effluent from the WPCP was in compliance with all limitations and remained below applicable WQOs.

In addition, per Section VI.C.2.a of the current NPDES permit Fact Sheet, the results from the 2014 and 2015 priority pollutant monitoring have been included in **Attachment C** and are discussed further in **Chapter VI, Section 1.0**. No priority pollutant data other than the parameters listed above were collected in 2018 as the City elected to divert the analytical costs associated with priority pollutant monitoring to supplement the Regional Monitoring Program under the *Alternate Monitoring and Reporting Requirements for Municipal Wastewater Discharges* Order No. R2-2016-0008. With the exception of the parameters above, the WPCP will not collect additional priority pollutant data until the next permit reissuance, as data collected in 2015 satisfies the once-per-permit-cycle requirement established in Provision VI.C.1 of the Order.

Figure 27 shows data from common physical parameters collected as grab samples at the WPCP, of which only turbidity (**Figure 27A**) and pH (**Figure 27B**) have effluent limits. Influent and effluent temperature data (**Figure 27C**) are included for informational purposes only. The variability in turbidity data shown in **Figure 27A** from 2014 through 2016 is the result of recycled water production at the WPCP, which during that period was produced separately from SF Bay discharge. Under this configuration, DAFTs and DMFs were operated to produce a lower turbidity (2 NTU as compared to the 10 NTU limit for NPDES discharge) effluent, and the filtered water from the DMFs subjected to additional treatment in the CCTs in order to meet the more stringent Title 22 requirements for tertiary disinfected wastewater. During the transition from recycled water production to NPDES discharge, 2 NTU effluent would be discharged to SF Bay. The completion of the Continuous Recycled Water Production Facility project in April 2018 has facilitated the WPCP's ability to simultaneously discharge to SF Bay and produce recycled water, which has tempered the variability in effluent turbidity since the treatment processes are now independent. The high turbidity observed toward the end of November 2018 was the result of a tertiary system restart, which also resulted in the suspension of recycled water production for the remainder of the month.

Effluent pH values occasionally approach the lower discharge limit of 6.5 as shown in **Figure 27B**. 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. Disinfection for recycled water production is now separate from disinfection for Bay discharge, and sodium hypochlorite (which does not depress pH) is now used rather than chlorine gas. Seasonal variations in effluent pH will still occur, 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 27C**). 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

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

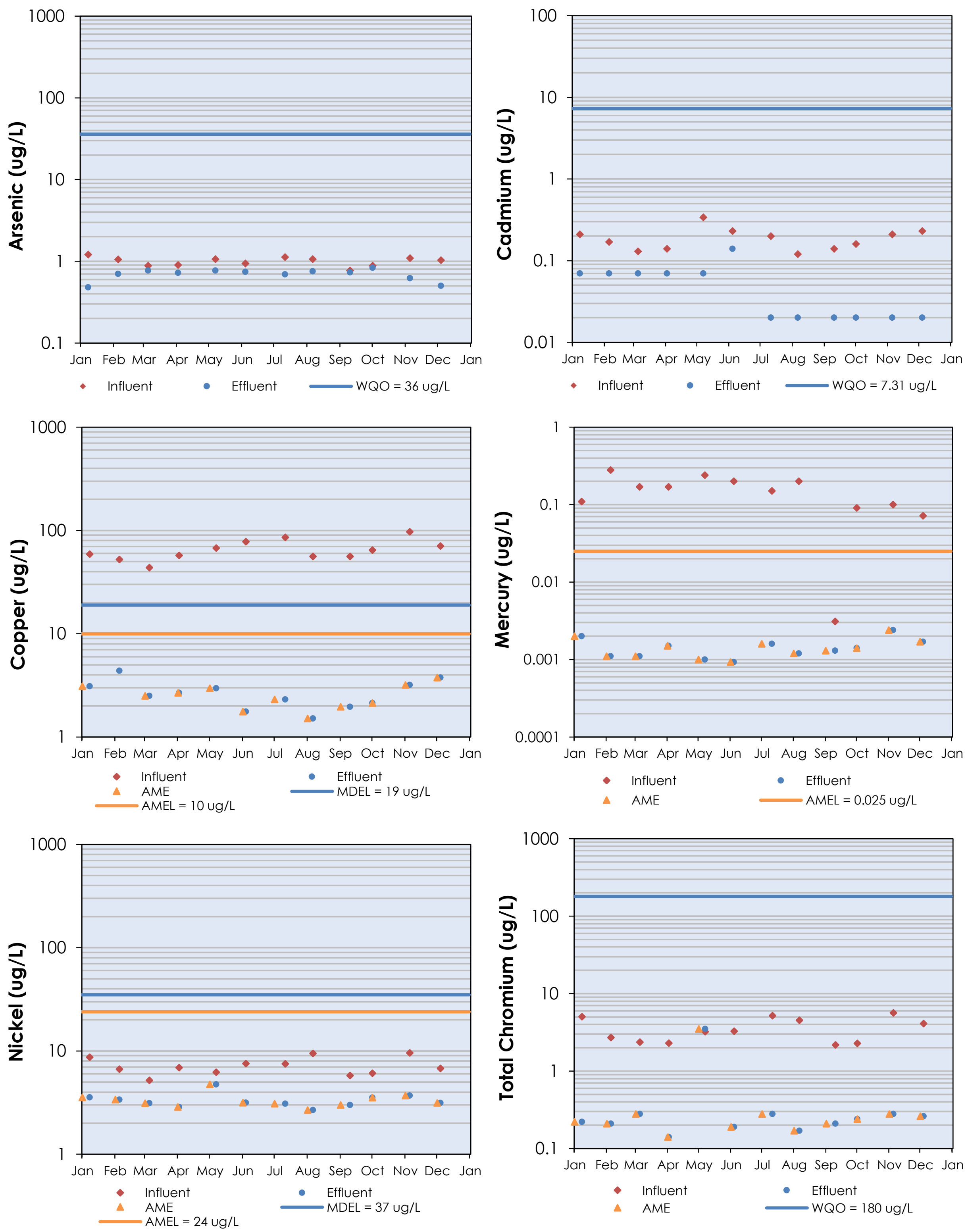


Figure 24: Concentrations of Common Metal Pollutants at the WPCP during 2018. WQO on Total Chromium chart is for WQO for Chromium (III).

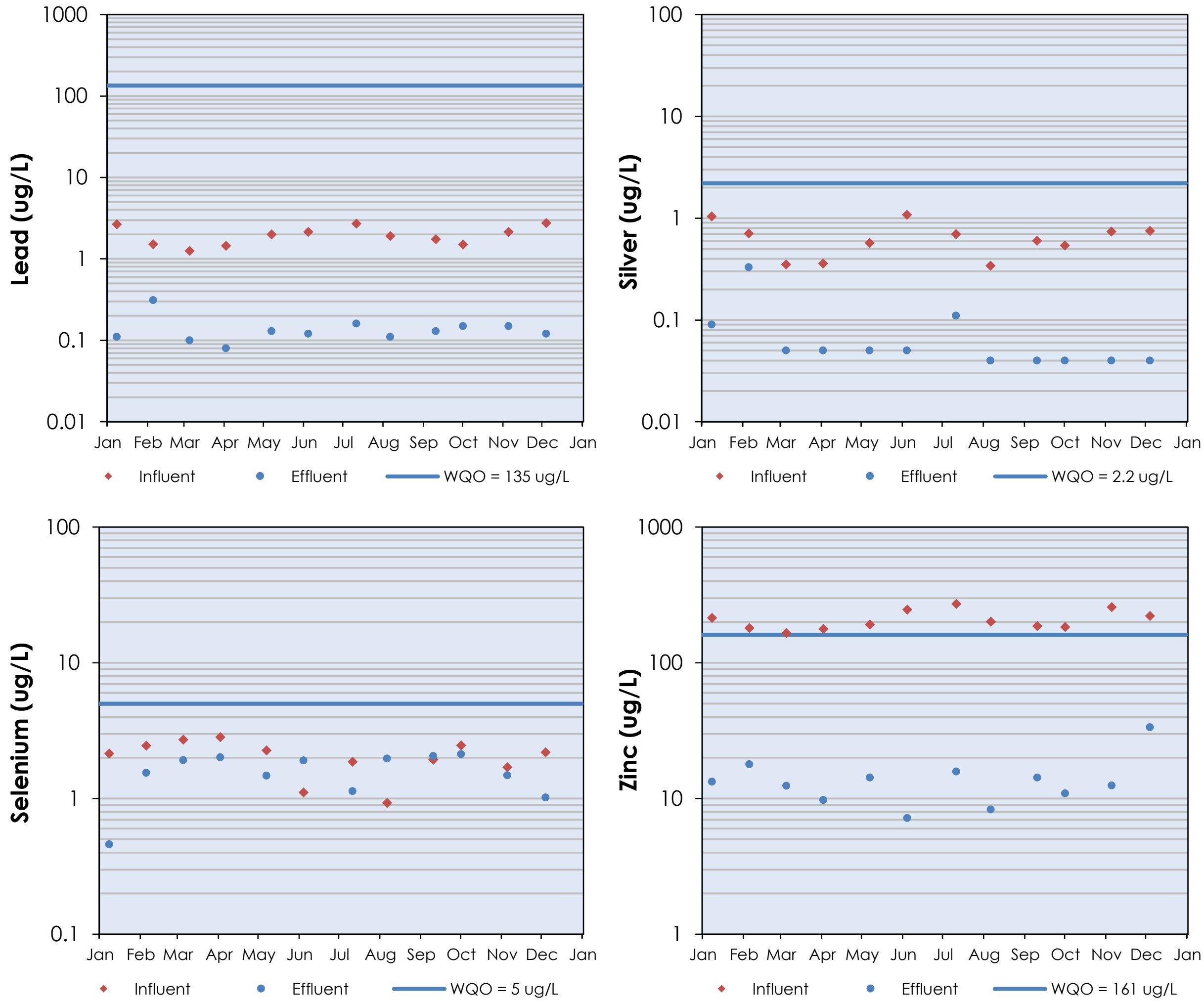


Figure 25: Concentrations of Common Metal Pollutants at the WPCP during 2018

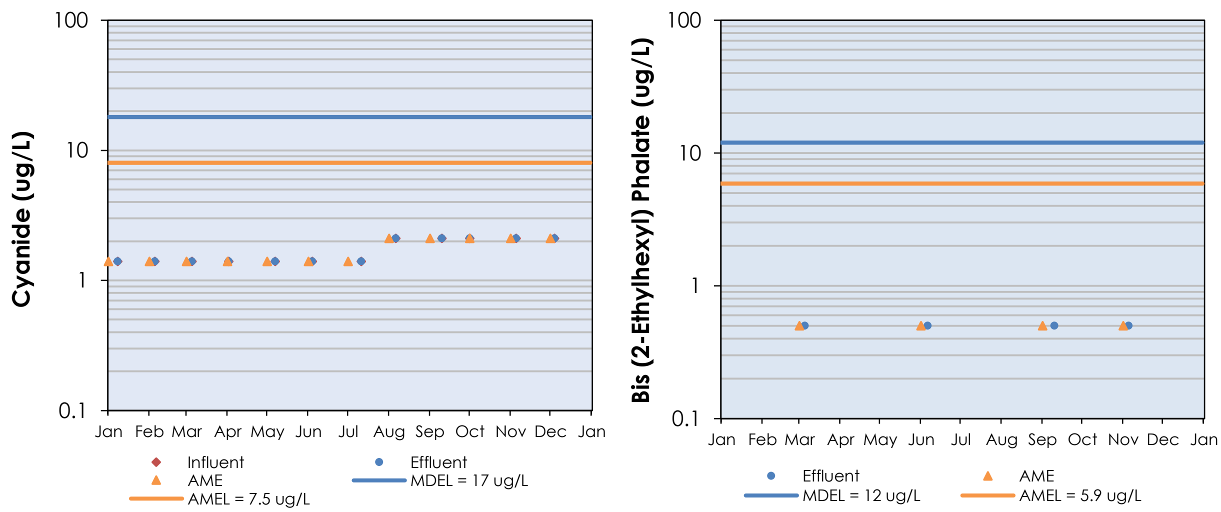


Figure 26: Concentrations of Common Organic Pollutants at the WPCP during 2018

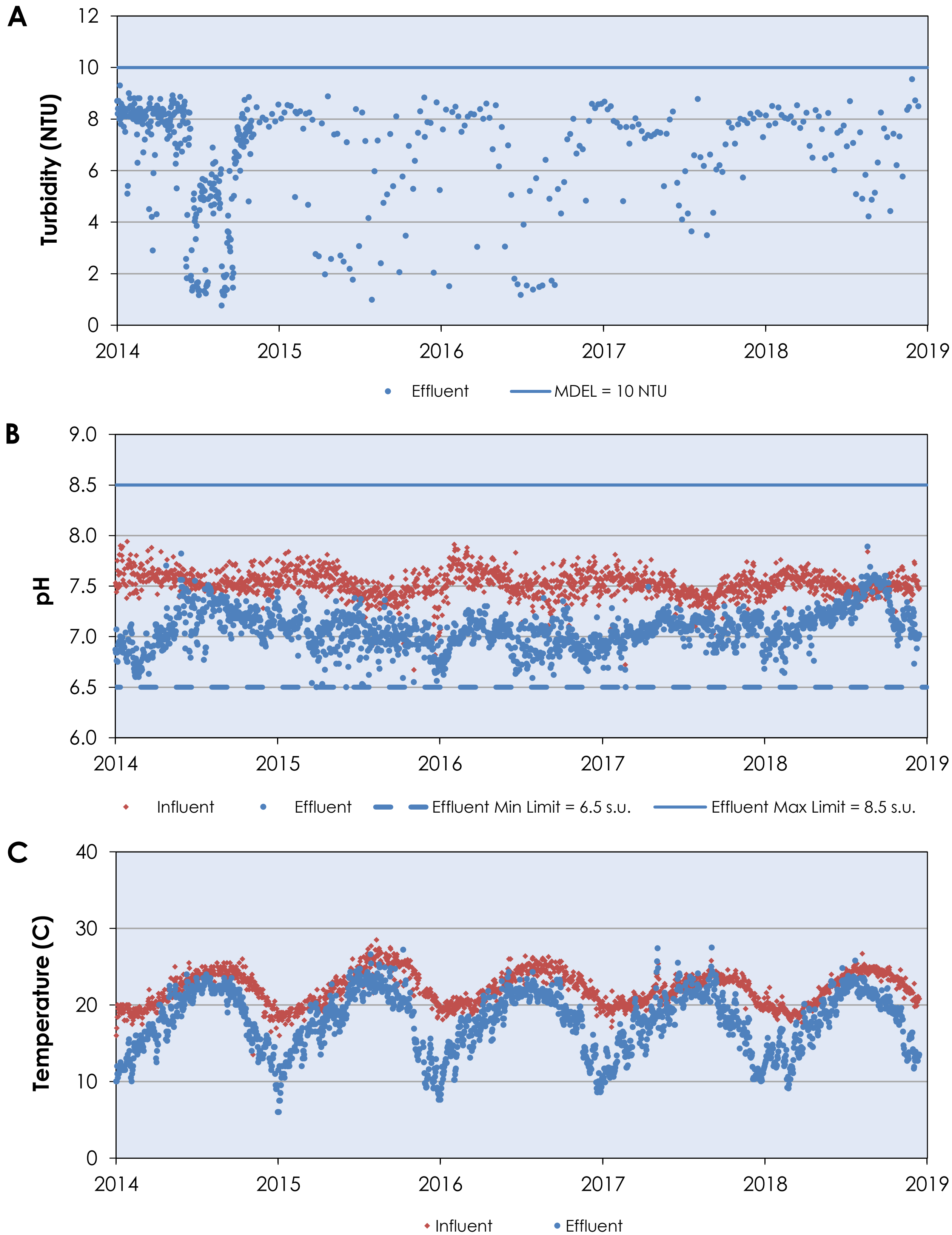


Figure 27: Common Physical Parameters at the WPCP from 2014-2018

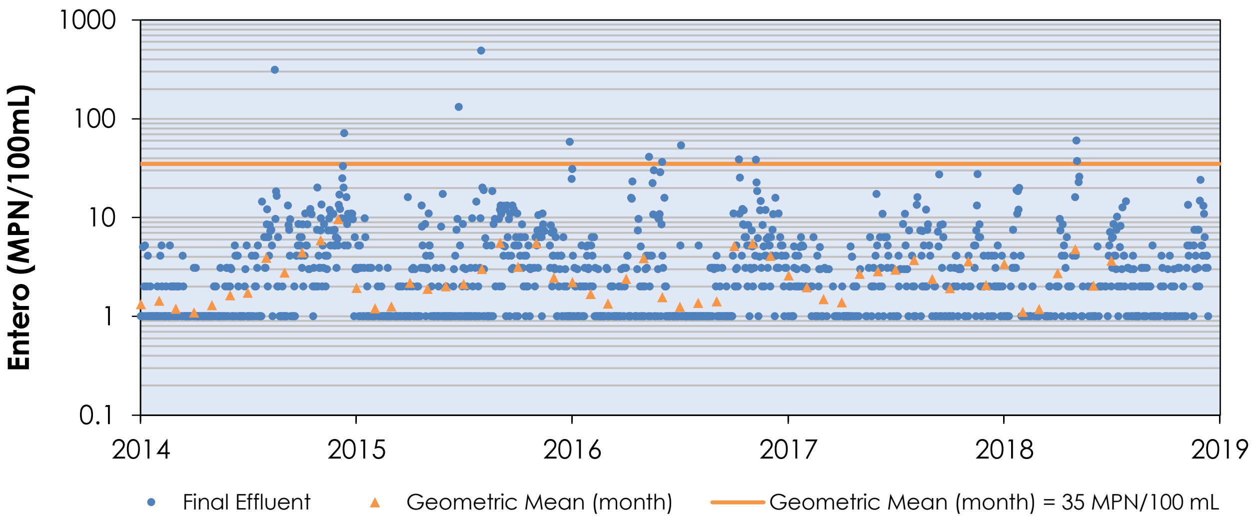


Figure 28: Effluent Enterococcus Measurements at the WPCP from 2014-2018

treatment in the Oxidation Ponds within 1-2 hours on average. As a result, the wastewater undergoing secondary treatment is influenced more by ambient temperatures and reflected in the final effluent.

2.1.2. Chronic Toxicity Effluent Triggers

Under the current NPDES permit, the Plant is required to conduct monthly chronic toxicity testing of its effluent discharge using the marine alga (diatom), *Thalassiosira pseudonana* (**Figure 29**). This species was selected as the most sensitive species based on a chronic toxicity screening testing conducted during the 2014 permit renewal process. The chronic toxicity test is conducted by the City's contract laboratory, Pacific Ecorisk Laboratory (PERL), at a minimum frequency of once-per-month. The test is performed over a four-day period using one 24-hour flow-weighted composite effluent sample, and at the end of the four-day test period, growth is measured as the endpoint.

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}. If either condition is triggered, the City must implement an accelerated monitoring schedule for chronic toxicity testing of twice-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 (monthly) monitoring of chronic toxicity if results from the accelerated monitoring fail to confirm toxicity and do not exceed the permit triggers described above. However, the City must implement the TRE Workplan if the accelerated monitoring confirms toxicity and initiate corrective actions until toxicity results are shown to be below trigger levels or as directed by the Executive Officer.

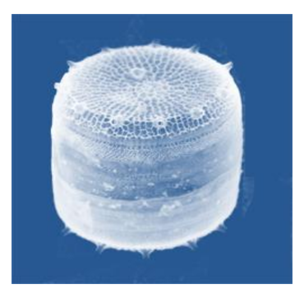


Figure 29: ***Thalassiosira pseudonana***

Following the adoption of 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 simple at Tier 1 (accelerated monitoring) and Tier 2 (process optimization, 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} values.

During the 2018 reporting period, the single sample maximum of 2 TUc and three-sample median of 1 TUc were not exceeded in any given month (**Table 2**). Toxicity was detected at very low levels in the months of April and October at 1.2 and 1.1 TUc respectively; however, neither of these results exceeded the permit triggers.

Table 2: Summary of Chronic Toxicity Testing Results for WPCP Effluent during 2018

Test #	Sample Date	Growth TU_c	3-Sample Median (Growth TU_c)
1	1/23/2018	<1.0	<1.0
2	2/6/2018	<1.0	<1.0
3	3/13/2018	<1.0	<1.0
4	4/3/2018	1.2	<1.0
5	5/8/2018	<1.0	<1.0
6	6/5/2018	<1.0	<1.0
7	7/12/2018	<1.0	<1.0
8	8/7/2018	<1.0	<1.0
9	9/11/2018	<1.0	<1.0
10	10/2/2018	1.1	<1.0
11	11/6/2018	<1.0	<1.0
12	12/5/2018	<1.0	<1.0

2.1.3. Effluent Residual Chlorine

During the 2018 reporting period, the WPCP experienced two off-hour residual chlorine excursions. On January 25, 2018, the WPCP experienced a failure of the Sodium Bisulfite (SBS) pumps due to moisture intrusion from a recent rain event, which resulted in the loss of residual SBS. In response to the failure, Operations constructed enclosures for the pump heads to prevent moisture from entering the pumps during future rain events. The second off-hour residual chlorine excursion occurred on June 19, 2018. During rotation of the SBS pumps, there was a momentary loss of SBS flow due to a closed isolation valve. Corrective actions included updating Operations' procedures in addition to staff training on all shifts. A more detailed account of this event is documented in the SMR, as required by Attachment G, Section V.C.1.a of the WPCP's NPDES permit for both on and off-hour excursions.

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, Permit CA0038849, reissued as Order R2-2012-0096, effluent mercury concentrations are measured monthly for regulatory compliance. During the reporting period, effluent mercury concentrations remained below the average monthly trigger (0.011 ug/L) and limit (0.025 ug/L). The total annual effluent mercury loading for the City was 0.017 kg/yr, which is well below the permit limit of 0.12 kg/yr (**Figure 30**).

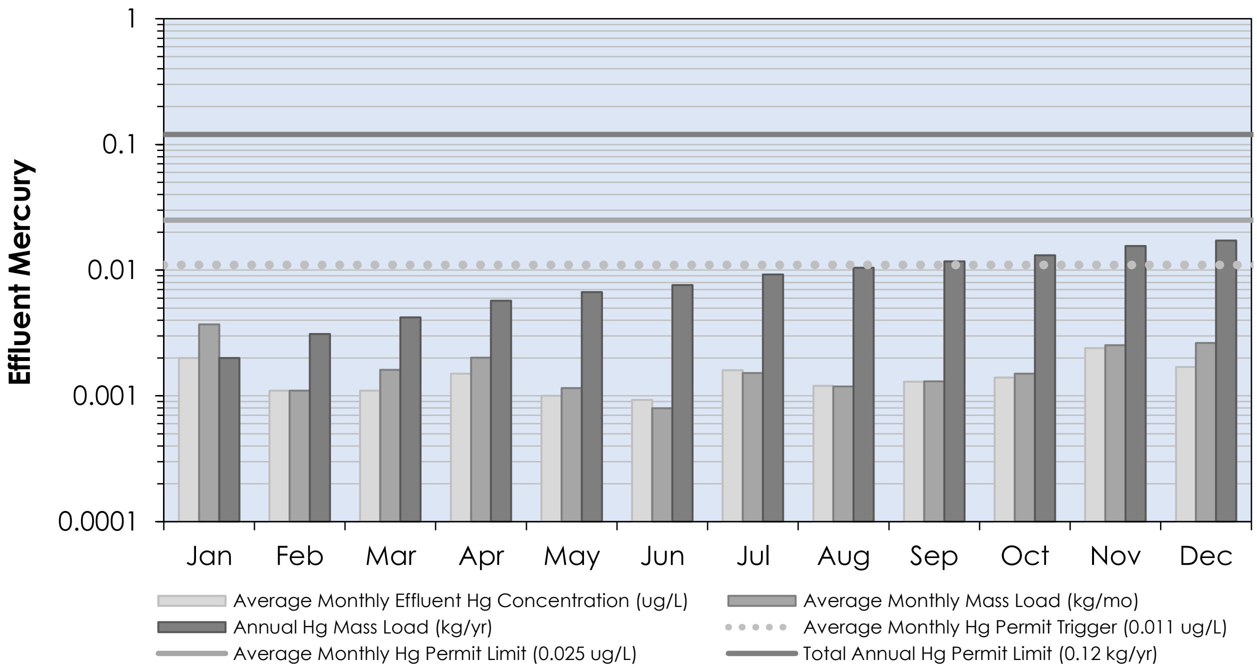


Figure 30: Effluent Mercury Concentrations and Loading Rates during 2018

2.1.5. PCB Effluent Limitations

The WPCP also participates in the annual submittal of water quality data pertaining to discharges of PCBs. In accordance with the Mercury and PCBs Watershed Permit, Permit CA0038849, Order R2-2012-0096, PCB concentrations are measured semi-annually as total aroclors using EPA Method 608 for regulatory compliance. PCBs were not detected using this method during the current reporting period. In addition to the regulatory compliance monitoring, the WPCP is also required to measure total PCBs as congeners on a quarterly basis 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.

2.2. Unauthorized Discharge

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. Per Section V.E.2 of Attachment G, the WPCP is required to notify various agencies in the event of an unauthorized wastewater treatment plant discharge. The WPCP did not experience any unauthorized discharges during the current reporting period. Reporting of unauthorized discharges from the collection system is subject to the requirements of SWRCB Order 2006-003-DWQ, Statewide General Discharge Requirements for Sanitary Sewer Systems.

2.3. Avian Botulism Control Program

In accordance with Provision VI.C.5.A of Order R2-2014-0035, the City 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 2018 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 2018 reporting period.

III. FACILITY REPORTS

1.0. OPERATION AND MAINTENANCE MANUAL

The WPCP's Operation and Maintenance (O&M) Manual is maintained in both electronic and hard copy formats. The electronic version is located on the WPCP's network at J:\ESD\WPCP\General\Operations\O&M Manual. The Manual's Table of Contents listings are hyperlinked to individual sections. Hard copy versions of the Manual are maintained in the Operations Manager's office, Maintenance Manager's office, Seniors' office, Training Room, and Tertiary Control Room.

The following sections of the O&M Manual were revised or updated during 2018 and have been added to both the electronic and hard copy versions, except as indicated:

WPCP Overview Chapter	This chapter was revised to reflect changes in staffing and Operator certification levels, addition of two updated organization charts, the addition of a brief section on the Regulatory Programs Division, and updates to the Maintenance, Primary Treatment, Solids Handling, Power Generation, and Recycled Water sections resulting from various construction projects and other initiatives completed in 2018. The Wastewater Flow Schematic (Figure I-2) was updated to show changes related to continuous recycled water production. The Solids Flow Schematic (Figure I-3) was updated to provide more detail in the vicinity of the digesters. Both of these figures now utilize color-coding to more clearly distinguish the function of process lines.
Chapter III-9 *Air Flotation Tanks*	Revisions were made to text and figures for continuous recycled water production. Revised sections are under review by WPCP Operations staff.
Chapter III-10 *Dual Media Filters*	Minor revisions were made to text and figures for continuous recycled water production.
Chapter III-11 *Chlorination/Dechlorination*	Revisions to text and figures for continuous recycled water production, the switch to sodium hypochlorite, and the new SBS injection point are in progress.
Chapter III-14 *Gas Utilization System*	Revisions to text and figures to reflect recent operational and equipment changes.
Chapter III-17 *Sodium Hypochlorite Storage and Feed System*	This chapter (formerly *Chlorine Storage and Feed System*) was completely rewritten to reflect changes from chlorine gas to sodium hypochlorite. The draft version is under review by WPCP Operations staff.
Chapter III-18 *Sodium Bisulfite Storage and Feed System*	Minor revisions were made to text and figures to reflect additional feed pumps and the new SBS injection point.

Chapter III-23 *Recycled Water Production*	Updating of this chapter is in progress, based in large part on experience gained operating the new continuous production system during the latter half of 2018. Fairly extensive changes are required. An interim document with stepwise procedures for operating the new system is in use and will be integrated into the new chapter.
Chapter III-28 *Emergency Generator*	A new O&M Manual chapter for the WPCP's 1000 kw Emergency Generator was finalized. During 2018, all site work and training needed to integrate the generator was completed, and the generator is now fully operational for standby power capacity.

The WPCP's Electronic O&M Manual (EOMM) project is intended to replace the existing O&M document with an intuitive, centralized interface that provides ready access to all relevant O&M Materials, including content from the current O&M Manual, SOPs, record drawings, equipment information/manuals, etc., in a completely electronic format. The EOMM project was formally chartered in January 2018 with full support and project management from the City's IT Department. Activities during 2018 included development of a detailed schedule, investigations of existing commercial EOMM products and structures, contacts with other agencies, the compilation of a comprehensive listing of potential EOMM elements, and other preliminary work. In the fall, the project team participated in site visits and teleconferences with selected wastewater agencies to broaden its understanding of approaches taken by those agencies, and to secure the benefits of their first-hand experience with those approaches. As a result of these investigations, and of the desire to seamlessly integrate the project into the City's IT structure, the underlying EOMM framework (Microsoft SharePoint Online) was selected. A SharePoint specialist was brought on-board as part of the EOMM team to assist with design of the underlying structure and user interface, content migration, and other elements of the project. The current schedule calls for the system to "go live" in December 2019 and will include the Anaerobic Digesters and the new Headworks and Primary Treatment Facilities. Other existing facilities will be integrated at a later date, and new facilities that are part of the SCWP will be integrated as they are completed.

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 2018 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. Several of the SOPs are safety-related, such as those for confined space entry or lock-out, tag-out. Updating of WPCP 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. A significant number of SOPs were deleted in 2018 due to the conversion from a gaseous chlorine to hypochlorite system. The following is a list of SOPs that were updated, created, or deleted during this reporting period:

SOPs Updated

- SOP #1022D: Universal Waste, Light Ballast & Lead-Acid Battery Collection, Recycling or Disposal
- SOP #1023C: Used Oil, Oily Waste, and Oil Filter Accumulation, Labeling & Recycling
- SOP #3045B: Solids Process Monitoring and Removal Procedures

SOPs Created

- SOP #4011A: PLC/HMI Changes

SOPs Deleted

- SOP #2025C: Management of Change in Acutely Hazardous Materials Processes Chlorine Gas Facility
- SOP #3002E: Chlorine Gas System Status Definitions
- SOP #3003G: Procedures for Handling the Chlorine Gas System
- SOP #3004G: Chlorine Gas Leak Emergency Response
- SOP #3005F: Respiratory Protection Use in the Chlorine Area
- SOP #3008B: Chlorine One-Ton Cylinder Leak Practice
- SOP #3030B: Mechanical Integrity Program for Hazardous Materials Processes – Chlorine Gas Facility
- SOP #3031E: Chlorine One-Ton Cylinder Pigtail/Strongback Replacement Procedure
- SOP #3032F: Chlorine One-Ton Tank Delivery Procedure

2.0. PLANT MAINTENANCE PROGRAM

During the 2018 reporting period, the WPCP completed the process, which began in May 2016, of transitioning its computerized maintenance management system (CMMS) from the previous Maximo application to a more full-featured and robust Enterprise Asset Management System (EAMS). The EAMS provides the functions of a CMMS (work order generation/tracking and other maintenance data management functions) plus advanced features for asset tracking and life-cycle management, predictive and condition-based maintenance, materials and supplies purchasing, and other features (**Chapter IV, Section 11.0**). Maintenance and Operations staff can 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, preventative operations procedures (POPs)[8], equipment information (via a bar-code reader) and expedited data entry for work orders and other maintenance/process control measurements.

To facilitate this transition, in 2018 WPCP Operations and Maintenance staff completed a comprehensive review of the Preventative Maintenance program to provide improved reporting on asset condition and work history. The WPCP places a strong emphasis on preventative maintenance as a means to achieve high mechanical reliability. Staff members from both Operations and Maintenance sections perform preventative maintenance functions. There are currently 3,258 pieces of equipment identified in the Infor EAM equipment database. The system has improved the efficiency of the WPCP's Maintenance Program

[8] POPs are preventative maintenance efforts executed specifically by Operations staff.

and contributes to WPCP reliability through more timely access to maintenance information and work order status, better inventory control, and advanced features such as predictive maintenance. PM, CM and POP counts are reduced from previous years due to the new Infor EAM software's ability to group similar tasks into a single Work Order. This simplification allows the same work to be completed with reduced data entry requirements. As shown in **Table 3**, the WPCP maintained a high level of efficiency by completing the vast majority of work orders issued in 2018. The remaining work orders that were not completed will be carried over into 2019 for completion.

Table 3: Tabulation of 2018 Work Orders Issued and Completed

2018	PM (Maintenance)	CM (Maintenance)	POP (Operations)
Maximo *Completed*	157	193	1,777
EAMS *Completed*	551	683	5,829
Subtotal *Completed*	*708*	*876*	*7,606*
EAMS *Released/On Hold/Waiting for Parts*	52	180	261
Total Work Orders	***760***	***1,056***	***7,867***
% Completed	***93%***	***83%***	***97%***

Notes:
PM: Preventative Maintenance; CM: Corrective Maintenance; POP: Preventative Operations Procedures

During the 2018 reporting period, the WPCP generated approximately 1,056 maintenance related work orders, of which 876 were completed in the same year (83%). In addition, the WPCP completed 7,606 POPs of the 7,867 that were generated. The remaining work orders will be carried over into 2019 and completed according to schedule.

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 2018 included:

- Repairs to the Digester heat loop piping
- Replacement of #2 AFT and #3 AFT buried drain valves
- Major off-frame overhaul and controls upgrades of the #2 Power Generator Unit
- Rehabilitation of #1 and #3 Pond Effluent Pumps
- Concrete repairs and upgrades to Plant grounds

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, in order 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 of 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 **Section 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. 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 on June 26, 2018, approving an overall 10% increase in the sewer service rate for Fiscal Year 2018-2019. 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 $2.26 ($49.36 per month total) for an average single-family residence and $3.72 ($34.17 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 2018. City budgets also provide for ongoing rehabilitation of the sewer system.

Staffing and Supervision

The WPCP is operated and maintained by the WPCP Division of ESD, with offices at the WPCP. 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	26 full-time Operators, including two Principal Operators, four Senior Operators, and 20 Operators. In addition, there is one Utility Worker and one WPCP Control Systems Integrator.
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.

Operations

WPCP operations are performed by a highly skilled group of State Water Board-certified Operators organized into six shifts (Day, Swing, Grave, Relief 1, Relief 2, and Monday-Friday). A minimum of four Operators are on duty at all times, including at least one Senior or Principal Operator. The WPCP places major emphasis on training new Operators as a way to maintain a high level of skill. The OIT Program provides both mentoring and rigorous training in all aspects of WPCP operations. The WPCP O&M Manual and OIT Training Manual are key elements of the OIT Program. In addition to demonstrating an understanding of the O&M Manual, OITs must also be familiar with applicable SOPs and be certified by a Senior Operator in 32 specific Operations Tasks before being allowed to perform those tasks independently. 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 POPs, as described under the Plant Maintenance Program (**Section 2.0**). 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 direction of the WPCP Maintenance Manager and Senior Mechanic. Maintenance staff is responsible for most preventive and corrective 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 EAM CMMS, as described under the Plant Maintenance Program.

ESD Water and Sewer Systems Division utilizes WPCP Maintenance staff for maintenance of 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 engineering 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 operations are supported by local 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 recycled water system. The Division Manager reports to the ESD Director.
Managers	The Wastewater Operations Manager reports to the Water and Sewer Systems Division Manager.
Operations and Maintenance Staff	12 full-time workers, including a Wastewater Collections Supervisor, two Wastewater Collections Crew Leaders, two Senior Wastewater Collections Workers, and seven Maintenance Worker I/II.
Shared Technical Support and Maintenance Staff	A number of 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 2017, the City completed the design for the 2016-2017 Sanitary Sewer Main Replacement Phase 4 project, and the Storm Pump Station No. 1 upgrade project which includes seismic upgrades, the replacement of discharge piping and inlet grate to protect wet well. In addition, the City completed an upgrade to its GIS system and CCTV software and equipment to improve condition assessment capabilities.

In 2018, the City will complete construction of Baylands Storm Pump Station No. 2 Rehabilitation Project, the 2016-2017 Sanitary Sewer Main Replacement Phase 4 project, and scheduled to begin construction of the Storm Pump Station No. 1 upgrade project in spring 2019. In addition, the City will complete the design of the Lawrence Sanitary Sewer Trunk Main Rehabilitation Phase 1 project addressing the immediate needs identified in a previous condition assessment project. The City manages its own construction crews and does 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. For the 2018 annual review, the "Emergency Only" Telephone Notification List was updated and attached to the existing Plan.

Several projects at the WPCP have impacted contingency operations as discussed below. These include the Emergency Flow Management Evaluation and Project and the Sodium Hypochlorite Conversion and Continuous Recycled Water Production Project, which were completed in 2018. The Headworks and Primary Treatment Facilities Project will also impact the Contingency Plan and is scheduled for completion in 2021. The WPCP will update the Contingency Plan in 2019.

Emergency Flow Management Project

In 2014, the City embarked on an analysis to evaluate options for conveying raw wastewater around the WPCP's Primary Treatment Facility in the event of an emergency where some or all of the facility is disabled. In addition, the WPCP evaluated alternative means of conveying primary effluent to the Oxidation Ponds in the event of a failure of the existing primary effluent pipeline. The results from the evaluation are documented in the Emergency Flow Management Evaluation Report, which was finalized in January 2016. Key findings from the report were also summarized in the 2015 Annual NPDES Report.

Based on the report's findings and recommendations, the WPCP addressed a potential failure of the primary effluent pipeline under the WPCP Primary Treatment Facility reconstruction project. This project will provide two key infrastructure components once completed: 1) a new primary effluent junction structure and 2) a new pipeline to divert primary effluent to the tertiary drainage line, providing an alternative means for primary effluent to reach the Oxidation Ponds. The new diversion pipeline will act as a permanent backup means of routing primary effluent to the Oxidation Ponds.

The City also procured a 1 MW trailer-mounted backup diesel generator that can be used to power specific areas of the plant that experience power outages, or to operate the headworks and primary treatment facilities, with primary effluent stored in the oxidation ponds until power is restored. The project includes equipment needed to connect the mobile generator to the electrical distribution system at various locations throughout the WPCP. This project was completed in June 2018, and a new chapter was added to the WPCP's O&M Manual (**Chapter IV, Section 9.0**).

The above projects will impact the description of preventative measures found in *Section 4: Spill Prevention Plan of the Contingency Plan*, specifically *Table 1: Possible Sources of Treatment Plant Spills and Bypasses*, which summarizes all potential major spills, their possible cause, consequences of the spill and preventative measures.

Headworks and Primary Treatment Facilities Project

This massive construction project will address concerns related to the reliability of the primary effluent pipeline by providing an alternative means of directing primary effluent to the Oxidations Ponds for emergency purposes. The 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 loads. The latter will have a significant and positive impact on the current emergency power provisions described in Sections 2.1, 2.2, and 3.7 of the Contingency Plan. The project has been split into three packages, the first of which was completed in 2017 and the second of which is currently under construction with an expected completion date of early 2021. Refer to **Chapter IV, Section 3.0** for more information.

Sodium Hypochlorite Conversion and Continuous Recycled Water Project

This project was completed in December 2017 with the replacement of the chlorine gas system to liquid sodium hypochlorite for use in wastewater and recycled water disinfection. Because of this change, the Toxic Gas Scrubber facility was decommissioned in early 2018. Subsequently, a formal Risk Management Plan was no longer needed. The hypochlorite conversion project completes a process that began in 2012 with the switch from use of gaseous sulfur dioxide to liquid sodium bisulfite for dechlorination. Decommissioning of the chlorine gas system impacted the emergency response procedures described in SOP #3004, which are referenced in Section 2.8 and included in Attachment D of the Contingency Plan, and elements of Section 3.5 (Chlorination/Dechlorination). New information regarding sodium hypochlorite storage, spill prevention, and emergency response was added. Refer to **Chapter IV, Section 6.0** for more information.

Updating the Contingency Plan

This status report will be appended to the Contingency Plan and will serve as the 2018 update. The WPCP will incorporate the above information, plus additional detailed information regarding changes to emergency power operations since the installation and functionality testing of a 1 MW backup generator has been completed.

5.0. SPILL PREVENTION CONTROL AND COUNTERMEASURE

In 2010, a new section was added to the Contingency Plan to specifically address the Spill Prevention Plan requirements of NPDES Permit Attachment G. The Spill Prevention Control and Countermeasure (SPCC) Plan is documented in Section 4 of the Contingency Plan and has not changed. In addition, The SPCC Plan also addresses spill response for non-wastewater spills at the WPCP.

IV. Sunnyvale Capital Improvement Program

1.0. OVERVIEW

The original components of the WPCP were completed in 1956 and many are still in service to this date. Most of the other major components of the WPCP were completed over the subsequent 15-20 years, with the exception of the PGF, Toxic Gas Ordinance scrubber, and Dewatering Area. 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* (SCWP). With an estimated cost of approximately $456 million[9], the SCWP will replace the WPCP’s aging infrastructure and operation. **Table 4** lists current major projects within the CIP, including several from the SCWP. Key projects currently underway are highlighted in the table and presented in Fact Sheets in the preceding sections[10]. During fiscal year 2017-2018, the City expended approximately $78.0 million on select CIP projects, including those under the SCWP.

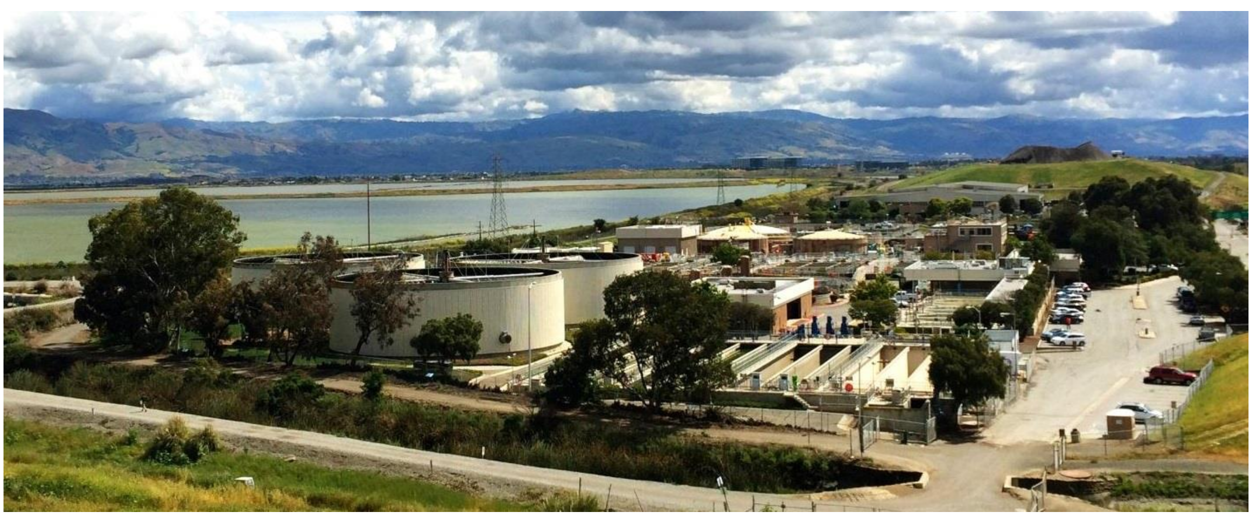


Figure 31: View of WPCP looking east

[9] Budgeted amount for Phases 1-3 of the Master Plan. Phases 4-5 are not included.
[10] CIP information gathered from the *Adopted Budget and Resource Allocation Plan for the City of Sunnyvale Fiscal Year 2018-2019, Volume III – Project Budget*.

Table 4: Summary of CIP Projects, Estimated Costs and Completion Dates

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	$ 43,960,000	A	2023			X	X		
Primary Treatment Facilities Design and Construction	$ 122,185,617	A	2021	X	X				
Administration and Laboratory Building	$ 22,870,000	A	2020	X	X			X	
Caribbean Drive Parking and Bay Trail Access Enhancements	$ 1,270,000	A	2019				X		
Hypochlorite Conversion, Dechlorination Improvements, and Continuous Recycled Water Production Facilities	$ 7,261,210	C	2018				X		
Emergency Flow Management	$ 2,883,000	C	2018		X				
Biosolids Processing	$ 27,867,648	A	2025			X		X	
Asset Management Program	$450,000	C	2018	X	X	X	X	X	X
Oxidation Pond Levee Rehabilitation	$ 4,046,471	A	2028			X			
Electronic O&M Manual	$ 514,080	A	2019	X	X	X	X	X	X
Anaerobic Digester Rehabilitation	$ 13,622,000	C	2017					X	X
Solids/Dewatering Repairs	$ 100,000	C	2018						X
Secondary Treatment Facilities (Stage 1)	$ 168,240,000	A	2024			X		X	
SCWP Program Management	$ 68,374,020	A	2028	X	X	X	X	X	X
SCWP Construction Management	$ 36,587,318	A	2028	X	X				
Waste Gas Burner Replacement	$ 695,000	A	2020						X
Primary Process Repairs	$ 564,317	P	2018		X				
Secondary Process Repairs	$ 924,809	P	2020			X			
Tertiary Process Repairs	$ 2,246,787	P	2022				X		
PGF Repairs	$2,450,000	P	2026						X
Support Facilities Repairs	$ 584,000	P	2020	X	X	X	X	X	X
CIP Total	***$ 532,731,127***								

Notes:

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

2.0. FACILITY CONDITION ASSESSMENT & PLANT REHABILITATION

SUNNYVALE
CLEANWATER
PROGRAM

PROJECT TITLE
Facility Condition Assessment

CONTRACTOR
AECOM

START DATE
May 2017

PROJECT STATUS
Condition Assessment
Completed
Nov 2017

Facilities Rehabilitation
In Progress

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.

Contractor assessing an Air Floatation Tank

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. PRIMARY TREATMENT FACILITIES DESIGN AND CONSTRUCTION

SUNNYVALE
CLEANWATER
PROGRAM

PROJECT TITLE

Primary Treatment Facilities Design and Construction

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

Primary Treatment Facilities

WHAT IS IT?

The 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 of biosolids quality through use of influent screens and high efficiency grit basins.

Construction of new Primary Facilities

WHY?

The oldest of the Primary Sedimentation Basins were part of the original plant built in 1955. The concrete in these tanks is eroding and exposing the reinforced steel inside the structures. In addition, the tanks were built before the current, more stringent seismic requirements were put in place, leaving the current structures vulnerable to earthquake damage. The WPCP Strategic Infrastructure Plan (2010) recommended full replacement and relocation of primary treatment, influent pumping and headworks, grit removal, and power distribution facilities, to the former dewatering and drying area east of the existing primary sedimentation basin area.

4.0. ADMINISTRATION AND LABORATORY BUILDING

SUNNYVALE
CLEANWATER
PROGRAM

PROJECT TITLE

Administration and Laboratory Building

DESIGN FIRM

MWA Architects

CONSTRUCTION FIRM

TBD

START DATE

September 2017

PROJECT STATUS

In Progress

Sunnyvale

Administration and Lab Building

WHAT IS IT?

The new Administration and Laboratory Building will provide a much needed facility update to the WPCP. As currently envisioned, the new building will accommodate various groups from within the WPCP and Regulatory Programs Divisions that are presently spread across different facilities and provide a common space to foster collaboration. The design of the building was awarded in September 2017 to MWA Architects and budgeted to meet LEED Gold 2009 standards. The building itself will be located across the street from the current Laboratory on the south side of Carl Road. As such, public access to the parking spaces at the end of Carl Road will be permanently restricted once construction begins. A separate project (*Caribbean Drive Parking and Trail Enhancements Project*) will provide replacement parking spaces along Caribbean Drive and a new Bay Trail access point.

WHY?

The City is engaged in the Sunnyvale Clean Water 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 Maintenance building and floodwall. Construction of a new Administration and Laboratory 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.

5.0. CARIBBEAN DRIVE PARKING AND BAY TRAIL ACCESS ENHANCEMENTS

SUNNYVALE
CLEANWATER
PROGRAM

PROJECT TITLE
Caribbean Drive Parking and Bay Trail Access Enhancements

DESIGN FIRM
Mark Thomas

CONSTRUCTION FIRM
TBD

START DATE
March 2017

PROJECT STATUS
In Progress

Sunnyvale

Caribbean Drive Parking

WHAT IS IT?

Partial Area of Bay Trail Levee Enhancements

Since 2010, the City has maintained a parking lot and trailhead at the end of Carl Road that provides public access to the San Francisco 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 west-bound travel on Caribbean Drive to a minimum of 15 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

6.0. HYPOCHLORITE CONVERSION

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Sodium Hypochlorite Conversion

CONTRACTOR
Anderson Pacific

START DATE
May/July 2015

PROJECT STATUS
Completed
May 2018

Sunnyvale

Sodium Hypochlorite Conversion

WHAT IS IT?

This project entails the design and construction of a liquid chlorine (sodium hypochlorite) disinfection system to replace the existing gaseous chlorine system. The project also includes upgrades to the SCADA system that is used to monitor and control disinfection and other tertiary processes. The Hypochlorite Conversion project was a component of a larger project that also upgrades the existing dechlorination system and modifies the current process for recycled water production.

New Sodium Hypochlorite Tank Farm

WHY?

The purpose of this project is to replace the chlorine gas currently being utilized for final effluent and recycled water disinfection with a safer, more manageable chemical: liquid, sodium hypochlorite. Chlorine gas is extremely hazardous and most POTWs have transitioned away from its use for effluent disinfection. The will included the installation of storage tanks, chemical feed pumps, yard piping, injection equipment, and an upgraded Supervisory Control and Data Acquisition (SCADA) system.

PROJECT AREAS

7.0. DECHLORINATION IMPROVEMENTS

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Dechlorination System Improvements

CONTRACTOR
Anderson Pacific

START DATE
May/June 2015

PROJECT STATUS
Completed
May 2018

Sunnyvale

Dechlorination Improvements

WHAT IS IT?

This project provides for the design and construction to improve the dichlorination process of final effluent and recycled water. This project will install an additional sodium bisulfite (SBS) injection point upstream to give the control system more time to respond to changes in SBS demand. The will included the installation of chemical feed pumps, yard piping, and injection equipment. The City is also upgrading the SCADA system that controls dechlorination and other tertiary processes and replacing core hardware. Existing control programming is being replicated in the new system, and new programing is being developed to incorporate the new SBS injection units into the dechlorination control strategy.

New Sodium Bisulfite (SBS) Dosing Point

WHY?

The purpose of this project is to address the limited time for control system response due to the distance between the final dechlorination injection point and the discharge compliance point. Historically, there has been very little time for control system response, which has necessitated the use of additional anticipatory controls and control overrides to ensure compliance with discharge requirements.

PROJECT AREAS

8.0. CONTINUOUS RECYCLED WATER PRODUCTION AND PIPELINE EXTENSION

SUNNYVALE CAPITAL IMPROVEMENT PROGRAM

PROJECT TITLE

Continuous Recycled Water Production and Wolfe Road Pipeline

CONTRACTOR

Anderson Pacific

START DATE

May 2015

PROJECT STATUS

Completed

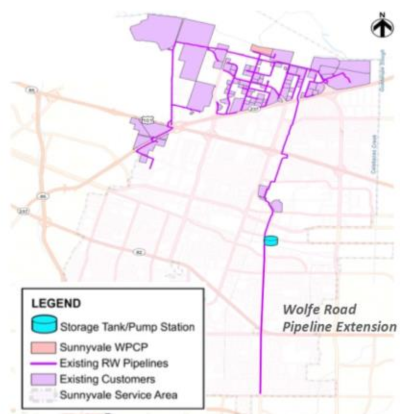
May 2018

Sunnyvale

Continuous Recycled Water Production Facilities and Wolfe Road Pipeline

WHAT IS IT?

The project includes design and construction improvements that will allow for continuous production of recycled water in parallel with discharge of treated effluent to San Francisco Bay. The project is intended to alleviate current and future drought impacts by offsetting the use of potable water in the recycled water distribution system, which is a practice utilized when customer demand exceeds production. The project also includes a new pumping station and 13,300 linear foot extension of the Wolfe Road pipeline to the new Apple Campus 2 in Cupertino under a partnership with the Santa Clara Valley Water District.



Recycled Water Service Area

WHY?

The purpose of this project is to increase recycled water production and distribution capacity, and process reliability while reducing chemical and operating costs. Furthermore, the project sets the stage for a future potable reuse project involving groundwater recharge through an additional extension of the Wolfe Road pipeline to SCVWD recharge ponds.

PROJECT AREAS

9.0. EMERGENCY FLOW MANAGEMENT

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE

Emergency Flow Management

CONTRACTOR

Anderson Pacific

START DATE

February 2016

PROJECT STATUS

Completed

June 2018

Sunnyvale

Emergency Flow Management

WHAT IS IT?

The WPCP experiences area-specific power outages, as well as plant-wide power outages that create challenging situations due to the absence of redundant centralized power distribution and back-up system. The Emergency Flow Management project will install a 1 MW trailer-mounted back-up diesel generator that can service various locations of the WPCP. The emergency generator will provide standby power for existing facilities, including the Primary Influent Pump Station, Auxiliary Pump Station and other essential Tertiary treatment equipment. Although the generator will have the ability to connect to all loads powered through the distribution system, due to size constraints it will not be capable of powering all loads simultaneously. However, through selective load shedding and other operational measures, it will be possible to maintain full treatment when operating on emergency power.

WHY?

Currently, the power generating engines are not configured to provide stand-alone power to various critical wastewater process systems. The generator will provide standby emergency power to ensure continued operation of the WPCP in the event of a power outage.

PROJECT AREAS

10.0. OXIDATION POND AND DIGESTER DEWATERING

SUNNYVALE CAPITAL IMPROVEMENT PROGRAM

PROJECT TITLE
Biosolids Processing

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.

New Synagro Dewatering Area

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.

11.0. ASSET MANAGEMENT PROGRAM

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Asset Management Program

CONTRACTOR
The Arcanum Group

START DATE
May 2017

PROJECT STATUS

Go-Live
Completed
March 2018

Single Sign-On (SSO)
In Progress

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

12.0. LEVEE MAINTENANCE PROGRAM

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Oxidation Pond Levee Rehabilitation

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?

Oxidation Pond Levees

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

13.0. ELECTRONIC O&M MANUAL

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Electronic Operation and Maintenance Manual

CONTRACTOR
SharePoint

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

V. PERMIT SPECIAL STUDIES

Under Provision VI.C of the previous 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. The current Order (R2-2014-0035) does not contain any special study provisions.

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. The results of the effluent monitoring for priority pollutants are included in **Attachment C**. No pollutants were identified as having reasonable potential based on the 2015 results, and no significant increases were observed between the datasets where analytical results were above detection limits.

No priority pollutant data other than the parameters listed in **Chapter II** were collected in 2018 as the WPCP elected to divert the analytical costs associated with priority pollutant monitoring to supplement the Regional Monitoring Program under the *Alternate Monitoring and Reporting Requirements for Municipal Wastewater Discharges,* Order No. R2-2016-0008. With the exception of the parameters listed in **Chapter II**, the WPCP will not collect additional priority pollutant data until the next permit reissuance, as data collected in 2015 satisfy the once-per-permit-cycle requirement established in Provision VI.C.1 of the Order.

2.0. NUTRIENT MONITORING FOR REGIONAL NUTRIENT PERMIT

In 2018, the City continued to collect influent and effluent samples for analysis of nutrients in accordance with the RWQCB's April 2014 Nutrients from Municipal Dischargers to San Francisco Bay, Order R2-2014-0014. As required by that Order, results from the WPCP's ongoing monitoring of its effluent 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. DILUTION STUDY

In 2013, a *Preliminary Dilution Study* was conducted to analyze the spatial and temporal dilution of WPCP effluent in Moffett Channel and Guadalupe Slough, based on data collected as part of a receiving water study for ammonia required under the WPCP's previous NPDES permit (R2-2009-0061). A second study was completed in 2014/15 to further substantiate the original analysis. Results from these efforts were not needed for the 2014 permit reissuance, but a summary will be included in the City's application packet for reissuance of its NPDES permit due by February 1, 2019.

4.0. 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 that can be accessed from http://www.sfei.org/rmp/pulse.

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 are able to 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/wp-content/uploads/2018/01/BACWA-NPDES-Permit-Letter-2018.pdf

5.0. RECEIVING WATER MONITORING PROGRAM

The City is also required under Provision VI in Attachment E of the current NPDES permit to monitor its receiving waters at or between RMP monitoring station C-1-3 and Sunnyvale station C-2-0 (**Figure 32**) near the confluence of Guadalupe Slough and Moffett Channel. This monitoring is necessary to characterize the receiving water and the effects of the discharges authorized in R2-2014-0035, and to provide data

Figure 32: RMP monitoring stations in Guadalupe Slough and the NASA/Ames Boat Ramp

necessary for reasonable potential analyses for unionized ammonia. Monitoring point C-1-3 was selected based on the results from the *Receiving Water Ammonia Characterization Study – Final Report*, dated April 15, 2012, and the existence of a significant body of historical data for that location.

Between August 2017 and July 2018, the City conducted the required monitoring using its own personnel and laboratory resources (**Figure 33**). Under the Receiving Water Monitoring Program, and in accordance with Provision VI of Attachment E, monitoring of the receiving water occurred monthly over a contiguous 12-month period during the term of the current NPDES permit. Monitoring events occurred on days when compliance samples were also collected from the final effluent sampling point (EFF-001). In addition to field observations, water quality samples were collected within one foot of the surface water and analyzed for salinity, temperature, pH, and total ammonia as nitrogen. Un-ionized ammonia concentrations were calculated from these measurements.

Figure 33: WPCP Staff collecting receiving water samples from station C-1-3

The City's most practical access point to Guadalupe Slough is a small concrete boat ramp located adjacent to the northwest corner of Oxidation Pond 2. This ramp is owned by the US Fish and Wildlife Service but maintained by the City and cleared of sediment on an annual basis (minimum) to provide its contractor with safe access to Guadalupe Slough as part of its Avian Botulism Control Program (**Chapter II, Section 2.3**). Access to Guadalupe Slough from this ramp is the safest and most practical only during the highest tides when the water line is above the sediment layer.

Provision III.A.3.d.2 of Attachment G indicates that the discharger may collect samples during the one-hour period following high slack water as an alternative approach if sampling on low slack water is impractical. Given the safety concerns associated with launching at low slack water, the City chose the alternative approach and scheduled its monitoring events to coincide with high slack water during the highest tide of the month and on days when the WPCP is actively discharging to its receiving waters. Results from the monitoring events will be included in the City's application packet for the reissuance of its NPDES permit, due February 1, 2019, as part of the preliminary reasonable potential analysis performed on the WPCP's final effluent.

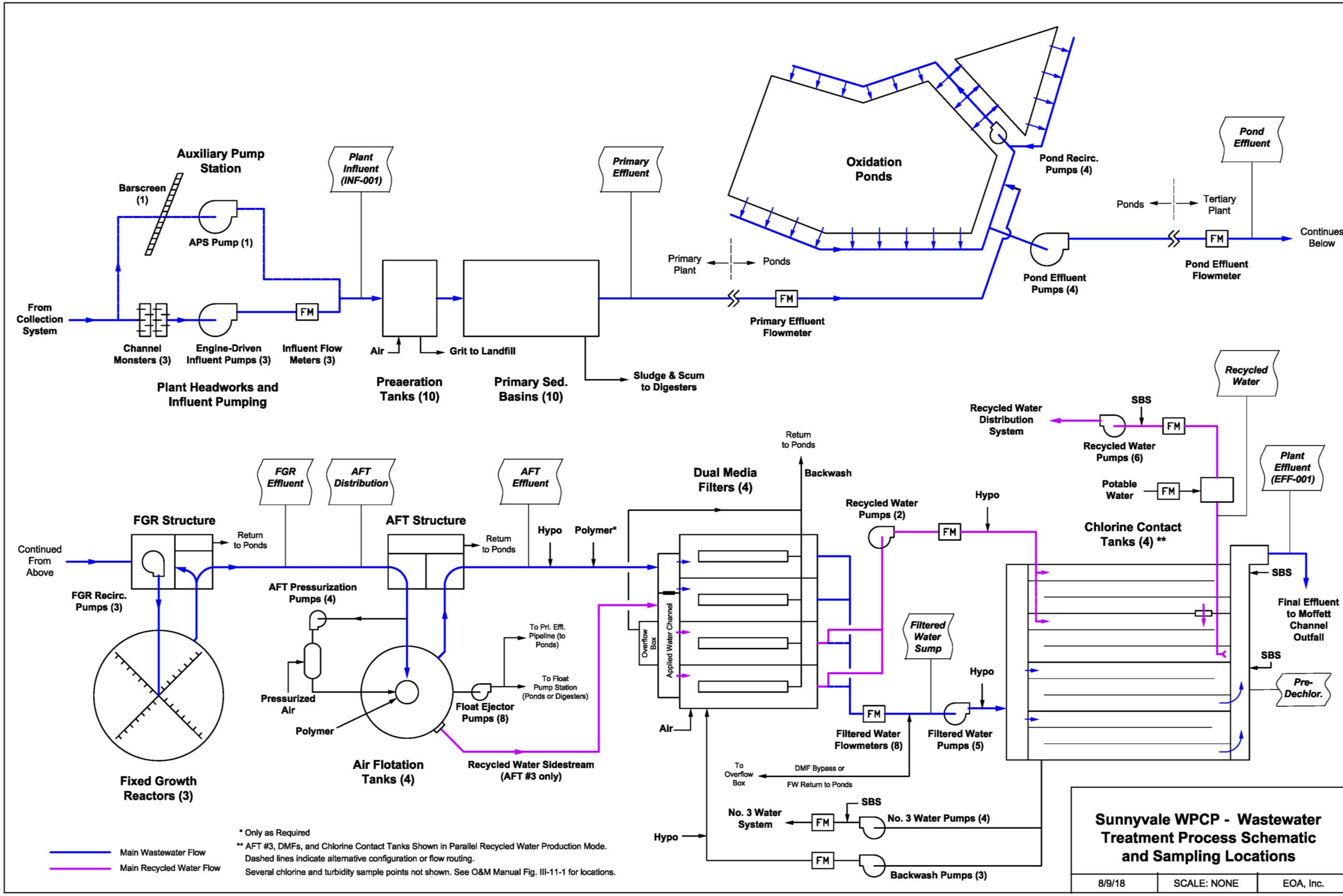
ATTACHMENTS

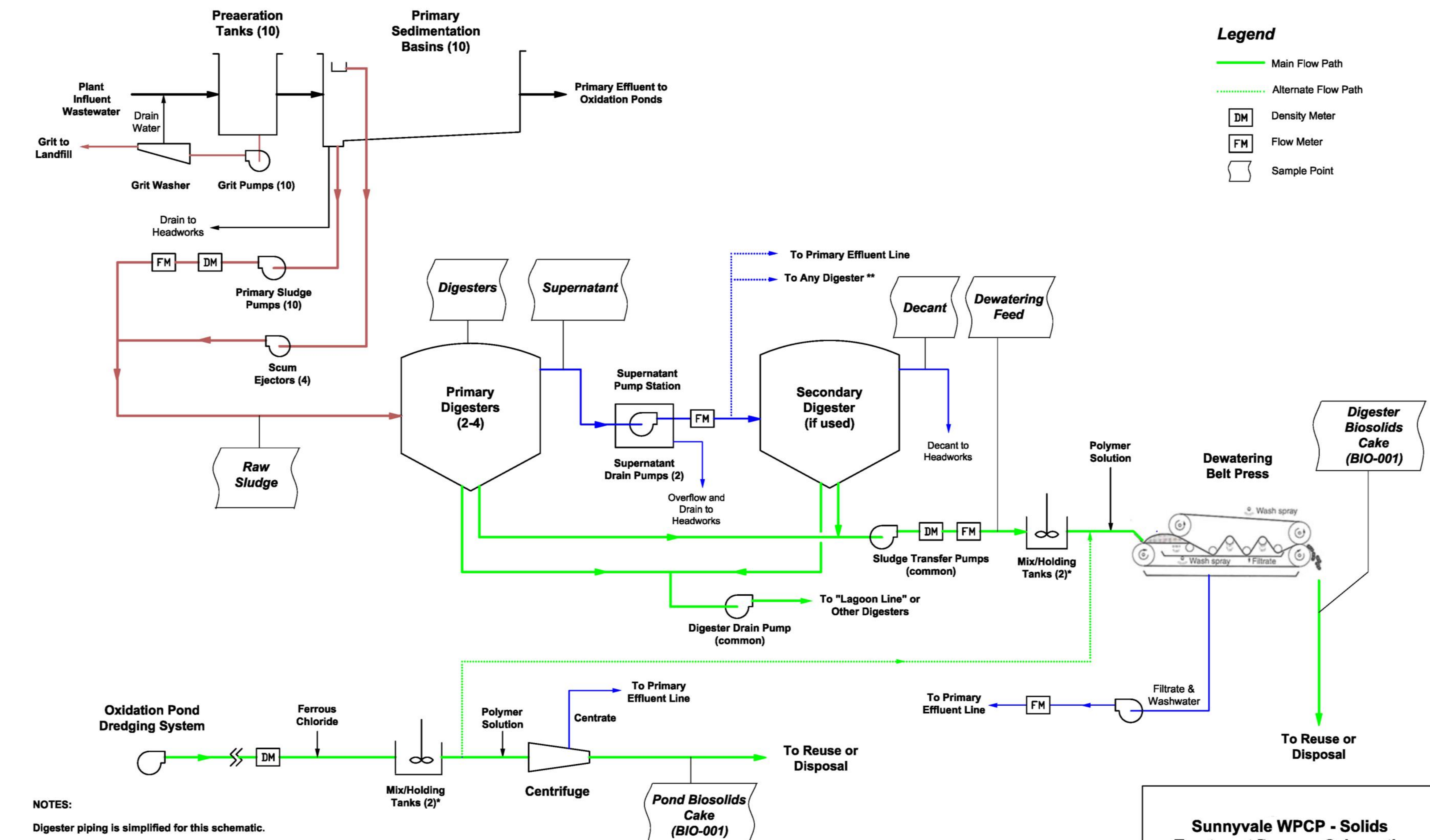
Attachment A

Wastewater Treatment Process Schematic

Solids Treatment Process Schematic

This Page Intentionally Left Blank


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
Primary Plant
Ponds
FM
Primary Effluent Flowmeter
Pond Effluent Pumps (4)
Pond 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
SBS
Recycled Water Distribution System
Recycled Water Pumps (6)
Return to Ponds
Backwash
Dual Media Filters (4)
Potable Water
Plant Effluent (EFF-001)
FGR Effluent
AFT Distribution
AFT Effluent
Recycled Water Pumps (2)
Hypo
FGR Structure
AFT Structure
Return to Ponds
Hypo
Polymer*
Chlorine Contact Tanks (4) **
Continued From Above
FGR Recirc. Pumps (3)
AFT Pressurization Pumps (4)
To Pri. Eff. Pipeline (to Ponds)
To Float Pump Station (Ponds or Digesters)
Overflow Box
Applied Water Channel
Filtered Water Sump
Final Effluent to Moffett Channel Outfall
Pressurized Air
Polymer
Float Ejector Pumps (8)
Pre-Dechlor.
Filtered Water Flowmeters (8)
Filtered Water Pumps (5)
Fixed Growth Reactors (3)
Air Flotation Tanks (4)
Recycled Water Sidestream (AFT #3 only)
To Overflow Box
DMF Bypass or FW Return to Ponds
No. 3 Water System
No. 3 Water Pumps (4)
Backwash Pumps (3)
* 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.
Main Wastewater Flow
Main Recycled Water Flow
Sunnyvale WPCP - Wastewater Treatment Process Schematic and Sampling Locations
8/9/18
SCALE: NONE
EOA, Inc.



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

11/7/18	Scale: None	EOA, Inc.

ATTACHMENT B

WPCP Certificate of Environmental Accreditation

WPCP Approved Analyses

This Page Intentionally Left Blank

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

Laboratory: City of Sunnyvale Environmental Laboratory

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: **10/31/2019**

Effective Date: **11/1/2018**

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
Environmental Services Dept. - Regulatory Programs
1444 Borregas Avenue
Sunnyvale, CA 94088
Phone: (408) 730-7260

Certificate No. **1340**
Expiration Date 10/31/2019
INTERIM

Field of Testing: 101 - Microbiology of Drinking Water

101.010	002	Heterotrophic Bacteria	SimPlate
101.050	001	Total Coliform P/A	SM9223 B (Colilert)
101.050	002	E. coli P/A	SM9223 B (Colilert)
101.050	003	Total Coliform (Enumeration)	SM9223 B (Colilert)
101.050	004	E. coli (Enumeration)	SM9223 B (Colilert)

Field of Testing: 102 - Inorganic Chemistry of Drinking Water

102.030	003	Chloride	EPA 300.0
102.030	006	Nitrate (as N)	EPA 300.0
102.030	008	Phosphate, Ortho (as P)	EPA 300.0
102.030	009	Sulfate	EPA 300.0
102.095	001	Turbidity	SM2130B-2001
102.100	001	Alkalinity	SM2320B-1997
102.121	001	Hardness	SM2340C-1997
102.130	001	Conductivity	SM2510B-1997
102.148	001	Calcium	SM3500-Ca B-1997
102.175	001	Chlorine, Free	SM4500-Cl G-2000
102.175	002	Chlorine, Total Residual	SM4500-Cl G-2000
102.200	001	Fluoride	SM4500-F C-2011
102.203	001	Hydrogen Ion (pH)	SM4500-H+ B-2000
102.220	001	Nitrite (as N)	SM4500-NO2 B-2000

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

103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8
103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8

As of 10/30/2018 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	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	007	n-Butylbenzene	EPA 524.2
104.040	008	sec-Butylbenzene	EPA 524.2
104.040	009	tert-Butylbenzene	EPA 524.2
104.040	010	Carbon Tetrachloride	EPA 524.2
104.040	011	Chlorobenzene	EPA 524.2
104.040	015	2-Chlorotoluene	EPA 524.2
104.040	016	4-Chlorotoluene	EPA 524.2
104.040	019	1,3-Dichlorobenzene	EPA 524.2
104.040	020	1,2-Dichlorobenzene	EPA 524.2
104.040	021	1,4-Dichlorobenzene	EPA 524.2
104.040	022	Dichlorodifluoromethane	EPA 524.2
104.040	023	1,1-Dichloroethane	EPA 524.2
104.040	024	1,2-Dichloroethane	EPA 524.2
104.040	025	1,1-Dichloroethene (1,1-Dichloroethylene)	EPA 524.2
104.040	026	cis-1,2-Dichloroethene	EPA 524.2
104.040	027	trans-1,2-Dichloroethene	EPA 524.2
104.040	028	Dichloromethane (Methylene Chloride)	EPA 524.2
104.040	029	1,2-Dichloropropane	EPA 524.2
104.040	033	cis-1,3-Dichloropropene	EPA 524.2
104.040	034	trans-1,3-Dichloropropene	EPA 524.2
104.040	035	Ethylbenzene	EPA 524.2
104.040	037	Isopropylbenzene	EPA 524.2
104.040	039	Naphthalene	EPA 524.2
104.040	041	N-propylbenzene	EPA 524.2
104.040	042	Styrene	EPA 524.2
104.040	043	TNI	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	045	Tetrachloroethylene (Perchloroethylene)	EPA 524.2
104.040	046	Toluene	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	049	1,1,1-Trichloroethane	EPA 524.2
104.040	050	1,1,2-Trichloroethane	EPA 524.2
104.040	051	Trichloroethene	EPA 524.2
104.040	052	Trichlorofluoromethane	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	056	Vinyl Chloride	EPA 524.2
104.040	057	Xylenes, Total	EPA 524.2
104.045	000	Trihalomethanes, Total	EPA 524.2
104.045	001	Bromodichloromethane	EPA 524.2
104.045	002	Bromoform	EPA 524.2
104.045	003	Chloroform	EPA 524.2
104.045	004	Dibromochloromethane	EPA 524.2
104.050	002	Methyl tert-butyl Ether (MTBE)	EPA 524.2
104.050	005	Trichlorotrifluoroethane	EPA 524.2

Field of Testing: 107 - Microbiology of Wastewater

107.242	001	Enterococci	Enterolert

Field of Testing: 108 - Inorganic Chemistry of Wastewater

108.090	001	Residue, Volatile	EPA 160.4
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	EPA 300.0
108.120	012	Nitrate (as N)	EPA 300.0
108.360	001	Phenols, Total	EPA 420.1
108.390	001	Turbidity	SM2130B-2001
108.410	001	Alkalinity	SM2320B-1997
108.421	001	Hardness	SM2340C-1997
108.430	001	Conductivity	SM2510B-1997
108.440	001	Residue, Total	SM2540B-1997
108.441	001	Residue, Filterable TDS	SM2540C-1997
108.442	001	Residue, Non-filterable TSS	SM2540D-1997
108.449	001	Calcium	SM3500-Ca B-1997
108.461	001	Chlorine, Total Residual	SM4500-Cl C-2000
108.470	001	Cyanide, Total	SM4500-CN B or C-1999
108.472	001	Cyanide, Total	SM4500-CN E-1999
108.480	001	Fluoride	SM4500-F B,C-1997
108.490	001	Hydrogen Ion (pH)	SM4500-H+ B-2000
108.514	001	Nitrite (as N)	SM4500-NO2 B-2000
108.532	001	Oxygen, dissolved	SM4500-O C-2001
108.536	001	Oxygen, dissolved	SM4500-O G-2001
108.540	001	Phosphate, Ortho (as P)	SM4500-P E-1999
108.541	001	Phosphorus, Total	SM4500-P E-1999

As of 10/30/2018 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

108.592	001	Biochemical Oxygen Demand	SM5210B-2001
108.592	002	Carbonaceous BOD	SM5210B-2001
108.596	001	Organic Carbon-Total (TOC)	SM5310B-2000
108.660	001	Chemical Oxygen Demand	HACH8000

Field of Testing: 109 - Toxic Chemical Elements of Wastewater

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

Field of Testing: 110 - Volatile Organic Chemistry of Wastewater

110.040	000	Purgeable Organic Compounds	EPA 624

Field of Testing: 113 - Whole Effluent Toxicity of Wastewater

113.022	003C	Rainbow trout (O. mykiss)	EPA 2019 (EPA-821-R-02-012), Continuous Flow

Field of Testing: 120 - Physical Properties of Hazardous Waste

120.010	001	Ignitability	EPA 1010

Field of Testing: 126 - Microbiology of Recreational Water

126.050	001	Total Coliform (Enumeration)	SM9223 B (Colilert/Quanti-Tray)
126.050	002	E. coli (Enumeration)	SM9223 B (Colilert/Quanti-Tray)
126.080	001	Enterococci	Enterolert

As of 10/30/2018 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

This Page Intentionally Left Blank

Attachment C

Effluent Characterization Study and Report Monitoring Results 2014 - 2015

This Page Intentionally Left Blank

Table 5: Analytical Results and Significance Determination for Priority Pollutants 2014-2015

CTR #	Priority Pollutant	Governing Water Quality Objective (ug/L)	2014 Result (ug/L)	2015 Result (ug/L)	Significant Increase (Y/N)	Comment /Note
1	Antimony	4,300	0.355	0.205 DNQ	N	
2	Arsenic	36	1.03 DNQ	0.893 DNQ	N	
3	Beryllium	NNC	ND	ND	N	
4	Cadmium	7.31	ND	ND	N	
5a	Chromium (III)	644	ND	ND	N	
5b	Chromium (VI)	180	ND	ND	N	
6	Copper	13	2.27	1.94	N	
7	Lead	135	0.406	0.32 DNQ	N	
8	Mercury (303(d) listed) [4]	---	0.00241	0.00140	N	
9	Nickel	27	3.86	4.02	N	
10	Selenium (303(d) listed)	5	0.708	0.605 DNQ	N	
11	Silver	2.20	ND	ND	N	
12	Thallium	6	ND	ND	N	
13	Zinc	161	7.44 DNQ	7.44 DNQ	N	
14	Cyanide	2.9	2.8	1.72	N	
15	Asbestos	NNC	NA	NA	N	
16	2,3,7,8-TCDD (303(d) listed)	1.40×10^{-8}	ND	ND	N	
	Dioxin-TEQ (303(d) listed)	1.40×10^{-8}	ND	ND	N	
17	Acrolein	780	ND	ND	N	
18	Acrylonitrile	0.66	ND	ND	N	
19	Benzene	71	ND	ND	N	
20	Bromoform	360	26.80	5.65	N	
21	Carbon Tetrachloride	4.4	0.18 DNQ	0.58	N	
22	Chlorobenzene	21,000	ND	ND	N	
23	Chlorodibromomethane	34	11.8	16.2	N	
24	Chloroethane	NNC	ND	ND	N	
25	2-Chloroethylvinyl ether	NNC	ND	ND	N	
26	Chloroform	NNC	9.15	8.45	N	
27	Dichlorobromomethane	46	8.70	16.6	N	
28	1,1-Dichloroethane	---	ND	ND	N	
29	1,2-Dichloroethane	99	ND	ND	N	
30	1,1-Dichloroethylene	3.20	ND	ND	N	
31	1,2-Dichloropropane	39	ND	ND	N	
32	1,3-Dichloropropylene	1,700	ND	ND	N	
33	Ethylbenzene	29,000	ND	ND	N	
34	Methyl Bromide	4,000	ND	ND	N	
35	Methyl Chloride	---	ND	ND	N	
36	Methylene Chloride	1,600	ND	ND	N	
37	1,1,2,2-Tetrachloroethane	11	ND	ND	N	

CTR #	Priority Pollutant	Governing Water Quality Objective (ug/L)	2014 Result (ug/L)	2015 Result (ug/L)	Significant Increase (Y/N)	Comment /Note
38	Tetrachloroethylene	8.85	ND	ND	N	
39	Toluene	200,000	ND	ND	N	
40	1,2-Trans-Dichloroethylene	140,000	ND	ND	N	
41	1,1,1-Trichloroethane	---	ND	ND	N	
42	1,1,2-Trichloroethane	42	ND	ND	N	
43	Trichloroethylene	81	ND	ND	N	
44	Vinyl Chloride	525	ND	ND	N	
45	2-Chlorophenol	400	ND	ND	N	
46	2,4-Dichlorophenol	790	ND	ND	N	
47	2,4-Dimethylphenol	2,300	ND	ND	N	
48	2-Methyl-4,6-Dinitrophenol	765	ND	ND	N	
49	2,4-Dinitrophenol	14,000	ND	ND	N	
50	2-Nitrophenol	---	ND	ND	N	
51	4-Nitrophenol	---	ND	ND	N	
52	3-Methyl 4-Chlorophenol	---	ND	ND	N	
53	Pentachlorophenol	7.9	ND	ND	N	
54	Phenol	4,600,000	ND	ND	N	
55	2,4,6-Trichlorophenol	7	ND	ND	N	
56	Acenaphthene	2,700	ND	ND	N	
57	Acenaphthylene	---	ND	ND	N	
58	Anthracene	110,000	ND	ND	N	
59	Benzidine	0	ND	ND	N	
60	Benzo(a)Anthracene	0	ND	ND	N	
61	Benzo(a)Pyrene	0.049	ND	ND	N	
62	Benzo(b)Fluoranthene	0.05	ND	ND	N	
63	Benzo(ghi)Perylene	---	ND	ND	N	
64	Benzo(k)Fluoranthene	0	ND	ND	N	
65	Bis(2-Chloroethoxy)Methane	---	ND	ND	N	
66	Bis(2-Chloroethyl)Ether	1.40	ND	ND	N	
67	Bis(2-Chloroisopropyl)Ether	170,000	ND	ND	N	
68	Bis(2-Ethylhexyl)Phthalate	5.9	ND	ND	N	
69	4-Bromophenyl Phenyl Ether	---	ND	ND	N	
70	Butylbenzyl Phthalate	5,200	ND	ND	N	
71	2-Chloronaphthalene	4,300	ND	ND	N	
72	4-Chlorophenyl Phenyl Ether	---	ND	ND	N	
73	Chrysene	0.049	ND	ND	N	
74	Dibenzo(a,h)Anthracene	0.05	ND	ND	N	
75	1,2-Dichlorobenzene	17,000	ND	ND	N	
76	1,3-Dichlorobenzene	2,600	ND	ND	N	
77	1,4-Dichlorobenzene	2,600	ND	ND	N	

CTR #	Priority Pollutant	Governing Water Quality Objective (ug/L)	2014 Result (ug/L)	2015 Result (ug/L)	Significant Increase (Y/N)	Comment /Note
78	3,3 Dichlorobenzidine	0.08	ND	ND	N	
79	Diethyl Phthalate	120,000	ND	ND	N	
80	Dimethyl Phthalate	2,900,000	ND	ND	N	
81	Di-n-Butyl Phthalate	12,000	ND	ND	N	
82	2,4- Dinitrotoluene	9.10	ND	ND	N	
83	2,6 - Dinitrotoluene	---	ND	ND	N	
84	Di-n-Octyl Phthalate	---	ND	0.835 DNQ	N	
85	1,2-Diphenyhydrazine	0.54	ND	ND	N	
86	Fluoranthene	370	ND	ND	N	
87	Fluorene	14,000	ND	ND	N	
88	Hexachlorobenzene	0	ND	ND	N	
89	Hexachlorobutadiene	50	ND	ND	N	
90	Hexachlorocyclopentadiene	17,000	ND	ND	N	
91	Hexachloroethane	9	ND	ND	N	
92	Indeno(1,2,3-cd)Pyrene	0	ND	ND	N	
93	Isophorone	600	ND	ND	N	
94	Naphthalene	---	ND	ND	N	
95	Nitrobenzene	1,900	ND	ND	N	
96	N-Nitrosodimethylamine	8	ND	ND	N	
97	N-Nitrosodi-n-Propylamine	1.4	ND	ND	N	
98	N-Nitrosodiphenyl	16.00	ND	ND	N	
99	Phenanthrene	---	ND	ND	N	
100	Pyrene	11,000	ND	ND	N	
101	1,2,4-Trichlorobenzene	---	ND	ND	N	
102	Aldrin	0.00	ND	ND	N	
103	Alpha-BHC	0	ND	ND	N	
104	Beta-BHC	0	ND	ND	N	
105	Gamma-BHC	0.063	ND	ND	N	
106	Delta-BHC	---	ND	ND	N	
107	Chlordane (303(d) listed)	0	ND	ND	N	
108	4,4'-DDT (303(d) listed)	0	ND	ND	N	
109	4,4'-DDE (linked to DDT)	0.00059	ND	ND	N	
110	4,4'-DDD	0	ND	ND	N	
111	Dieldrin (303d listed)	0	ND	ND	N	
112	Alpha-Endosulfan	0	ND	ND	N	
113	beta-Endosulfan	0.0087	ND	ND	N	
114	Endosulfan Sulfate	240	ND	ND	N	
115	Endrin	0	ND	ND	N	
116	Endrin Aldehyde	1	ND	ND	N	
117	Heptachlor	0.00021	ND	ND	N	

CTR #	Priority Pollutant	Governing Water Quality Objective (ug/L)	2014 Result (ug/L)	2015 Result (ug/L)	Significant Increase (Y/N)	Comment /Note
118	Heptachlor Epoxide	0	ND	ND	N	
119-125	PCBs sum (303(d) listed) [4]	---	ND	ND	N	
126	Toxaphene	0	ND	ND	N	
127	Tributyltin	0.0074	ND	NA	N	

Legend:
ND: "Non-detect" – analytical result was not detected above laboratory method detection limit.
DNQ: "Does not qualify" – analytical result is less than minimum limit or reporting limit but greater than or equal to the method detection limit.
---: Indicates no numeric criteria have been set for the criteria pollutant.