City of Sunnyvale | Environmental Services Department

Water Pollution Control Plant

Plant Compliance

Annual NPDES Report
R2-2014-0035

Sunnyvale

2017

2017 ANNUAL NPDES REPORT

City of Sunnyvale

Prepared for:

Mr. Bruce Wolfe

California Regional Water Quality Control Board

San Francisco Bay Region

1515 Clay Street, Suite #1400

Oakland, CA 94612

Prepared by:

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February 1, 2018

Sunnyvale

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February 1, 2018

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

Attn: NPDES Division

Re: 2017 Annual Self-Monitoring Report, City of Sunnyvale Water Pollution Control Plant

The attached 2017 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) 730-7268.

Sincerely,

Bhavani Yerrapotu
WPCP Division Manager

Attachment: 2017 Annual NPDES Report

TABLE OF CONTENTS

List of Figures

LIST OF TABLES

I. INTRODUCTION

1.0. BACKGROUND

The 2017 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, 2017, 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 made effective January 1, 2013, by the RWQCB under NPDES Permit No. CA0038849, Order No. R2-2012-0096. 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 2017 Annual NPDES Report with the reporting summarized in **Chapter II, Sections 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 issued July 1, 2014, by the RWQCB under NPDES Permit No. CA0038873, Order No. R2-2014-0014. Beginning in 2015, by September 1 of each year, the City provides its nutrient information in a separate annual report or state that it is participating in a group report submitted by BACWA. The 2017 Group Annual Report was prepared and submitted by BACWA on October 1, 2017. Nutrient data are also reported electronically in the California Integrated Water Quality System (CIWQS) via monthly Self-Monitoring Reports (SMRs).

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 Sunnyvale's population has grown to 149,831 (2017) 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 2** and are described in more detail in subsequent Sections.

Figure 1: WPCP Site Location Map

Figure 2: Aerial photo of the various WPCP treatment processes and outfall

The WPCP is one of 37 Publicly Owned Treatment Works (POTWs) that discharge to the San Francisco Bay (**Figure 3**). 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.

Figure 3: POTWs located in the Bay Area

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 4**. More detailed Liquids and Solids Process Flow Diagrams are presented in **Attachment A**.

The City is in the process of implementing a 20-year Capital Improvement Program (CIP) known as the *Sunnyvale Clean Water 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.**

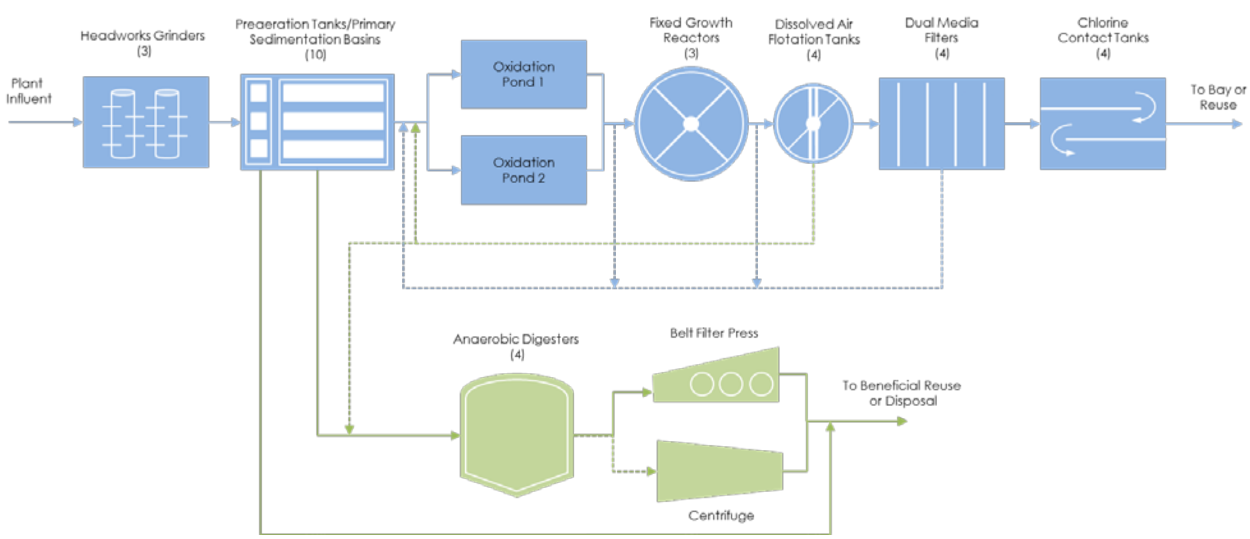

Figure 4: WPCP Process Flow Diagram. Blue corresponds to liquid and green to solids flows

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).

Figure 5: Preaeration Tanks and Primary Sedimentation Basins

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, 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 at the WPCP. The clarified wastewater (primary effluent) flows over weirs into a pipeline that leads to the Oxidation Ponds where it undergoes secondary treatment. Typically, only five of the ten Preaeration Tanks/Sedimentation Basins are operated on any given day.

If the Headworks is unable to handle the entire incoming wastewater flow due to mechanical failure or excessive flows, the APS is placed in service to pump the additional wastewater from the collection system into the Primary Treatment Facility. The APS consists of a vertical bar screen to collect trash and large debris, and an electric motor-driven centrifugal pump to convey screened wastewater into the Primary Treatment Facility.

Construction of new Primary Treatment Facilities, including a new influent pump station and Headworks, is currently underway with a projected completion year of 2020 (**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 2017, the City also continued 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 4.0**).

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 (biological 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.

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

Primary effluent discharged into the Oxidation Ponds is mixed by recirculating pond effluent back into the distribution channel at a 4:1 ratio, 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).

The City has been engaged in a long-term pond dredging project since late 2012 to remove solids that had accumulated in the Oxidation Ponds (**Chapter IV, Section 9.0**), 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 11.0**).

[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.

Initially, pond effluent is conveyed to Fixed Growth Reactors (FGRs), commonly known as trickling filters, which provide additional nitrification of ammonia. The FGRs are filled with plastic 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, and the FGRs provide the majority of nitrification needed to meet discharge limitations.

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

FGR effluent flows by gravity to the Dissolved Air Flotation Tanks (DAFTs), where compressed air and polymer are injected to coagulate and flocculate biological solids (algae and bacteria) generated during treatment in the Oxidation Ponds and FGRs. Flocs rise to the water surface, and are skimmed off and returned to the Oxidation Ponds (**Figure 8**).

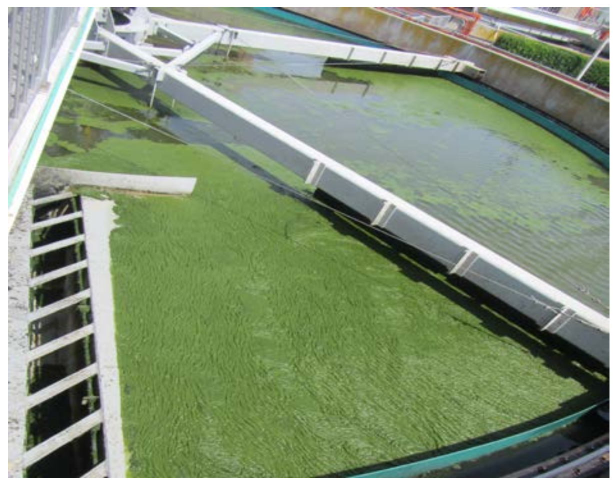

Figure 8: Algae being skimmed off the surface of wastewater in a Dissolved Air Flotation Tank

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 allow the flexibility to be 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 (**Section 2.4**).

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, and the backwash water is also 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 chlorine gas for at least one hour in a series of Chlorine Contact Tanks, prior to dechlorination with sodium bisulfite and discharge 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, which is discussed further in **Section 2.4** of this Chapter. Furthermore, a portion of the disinfected wastewater is partially dechlorinated and redistributed throughout the WPCP for filter backwashing, engine cooling, and other internal purposes.

The City is nearing completion of a project to improve its disinfection and recycled water production facilities, which includes replacement of gaseous chlorine with liquid sodium hypochlorite as well as other mechanical, electrical, and instrumentation and control improvements. As part of this project, the City will add 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**).

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**.

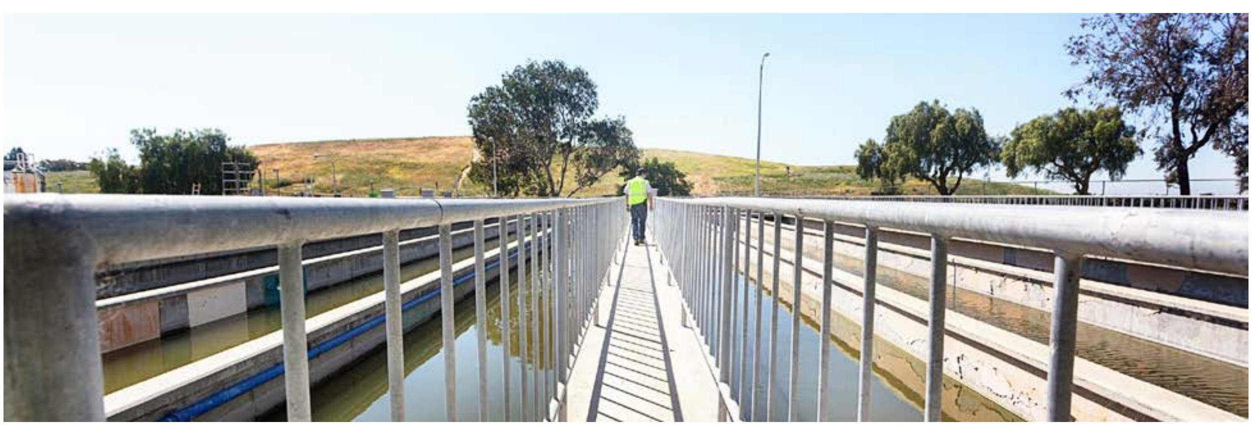

Figure 10: Wastewater being disinfected in the Chlorine Contact Tanks prior to discharge into Moffett Channel

The laboratory purchased a new Laboratory Information Management System (LIMS) in December 2015 to manage and integrate lab data from different instruments and other programs into one comprehensive system. The new LIMS went live in January 2017, and has 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 began in 2017, with construction expected to begin in 2019 and complete in 2021 (**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

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. In 2017, the City completed as series of digester improvements that began in 2008 and consisted of replacing the original floating covers with fixed covers, the conversion from a gas to pumped recirculation mixing systems, structural rehabilitation and repairs, and replacement of most mechanical and electrical equipment (**Chapter IV, Section 6.0**).

A portion of the biogas produced in the anaerobic digesters powers three main influent pump engines. Each engine drives a 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 adjusted its solids handling location (**Figure 11**) and operation to accommodate construction of the new Primary

Figure 11: Solids dewatering operation

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

Treatment Facilities (**Chapter IV, Section 9.0**), 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 or the Sunnyvale Biosolids Monofill (SBM). 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 SBM was created to periodically receive biosolids produced when an anaerobic digester is cleaned-out, the frequency of which can vary depending on the feed rate and composition of the raw sludge, but on average occurs every 3 to 4 years.

During the 2017 reporting period, the WPCP produced 2,586 dry tons of biosolids. Of the total, 2,104 dry tons were dredged from the Oxidation Ponds and 482 dry tons were removed from the anaerobic digesters, which includes 57 dry tons of digester cleanings. The majority of the biosolids produced (2562 dry tons) were land applied in Sacramento and Merced counties, with the remaining 24 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 2017, scheduled for submittal by February 19, 2018, per Provision VI.C.4.b of Order No. R2-2014-0035.

2.4. Recycled Water Production

The WPCP can operate in two different treatment modes: 1) San Francisco Bay discharge, or 2) recycled water production. In its current configuration, the WPCP does not simultaneously produce and distribute recycled water and discharge to San Francisco Bay. During periods of recycled water production, a portion of the treated wastewater from the DMFs is further treated 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 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.

Figure 12: WPCP Recycled Water distribution

Recycled water is distributed through "purple pipes" (**Figure 12**) for use 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. Recycled water is also available for construction use at remote locations. Historically, up to 10% 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.

On average, the WPCP produces roughly 250 MG of recycled water in a given year. Due to the heavy amount of construction in 2017, the WPCP produced a minimal amount (11 MG) of recycled water relative to previous years, with the exception of 2012 and 2013 when other facility upgrades also impacted production. The WPCP anticipates restarting production in 2018 upon completion of facility upgrades described below. For additional information on recycled water production at the WPCP, refer to the *Recycled Water Annual Report* for 2017, scheduled for submittal to the RWQCB by March 15, 2018.

As part of the Hypochlorite Conversion and Continuous Recycled Water Production Facility project, WPCP facilities are currently being modified to allow for simultaneous recycled water production and discharge to the San Francisco Bay. This project is anticipated to significantly improve the reliability and efficiency of recycled water production (**Chapter IV, Section 7.0**).

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

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 2017, the WPCP performed a comprehensive assessment of the existing conditions of critical equipment and structures within the secondary and tertiary process areas. The findings are being used to support the development, prioritization and timeline of planned improvements. 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

WPCP Flow Rates

Flow Type (MGD)	Influent	Effluent
Daily	13.1	11.7
Peak-Hourly	44.5	---
Instantaneous	47.2	---
Dry Weather	12.2	9.4
Wet Weather	13.7	13.5
Total Treated (MG)	4,771	---

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 flow rates shown in **Figure 13A** ranged from 10.6 to 26.8 MGD. The annual average influent and effluent flow rates for this reporting period were 13.1 MGD and 11.7 MGD, respectively. The maximum daily average flow rate of 26.8 MGD occurred on February 21, 2017, following a storm event where more than 2.5-inches of rain fell over a 3-day period from February 19 to 21, 2017. The WPCP experienced an influent peak hourly flow rate of 44.5 MGD and an instantaneous flow rate of 47.2 MGD during the storm event. Throughout the duration of this storm event, the WPCP successfully conveyed all wastewater through the various treatment processes and maintained compliance with effluent discharge requirements. Annual average dry weather flows (May 1-Sept 30) were approximately 12.2 MGD for influent and 9.4 MGD for effluent. Conversely, annual average wet weather flows (Oct 1-Apr 30) were approximately 13.7 MGD for influent and 13.5 MGD for effluent. Overall, the WPCP treated 4,771 MG of influent wastewater during this reporting period at an average rate of 13.1 MGD.

Daily influent and effluent flow rates recorded from 2008-2017 are shown in **Figure 13A** and reveal a slight increase from the previous two years (2015-2016) but remain relatively low compared with historical data. The daily flows are captured on an annual average basis in **Figure 13B**. As shown, annual average influent flows have steadily decreased by approximately 20% over the last ten years, with the exception of the 2017 reporting period where a significant increase of more than 1 MGD was observed despite a modest population increase of approximately 0.6%. Excessive rainfall during the end of 2016 and beginning of 2017 likely contributed to the overall increase in flow rates. Potable water use also increased during the 2017 reporting period (**Figure 14**) as compared with previous years. 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

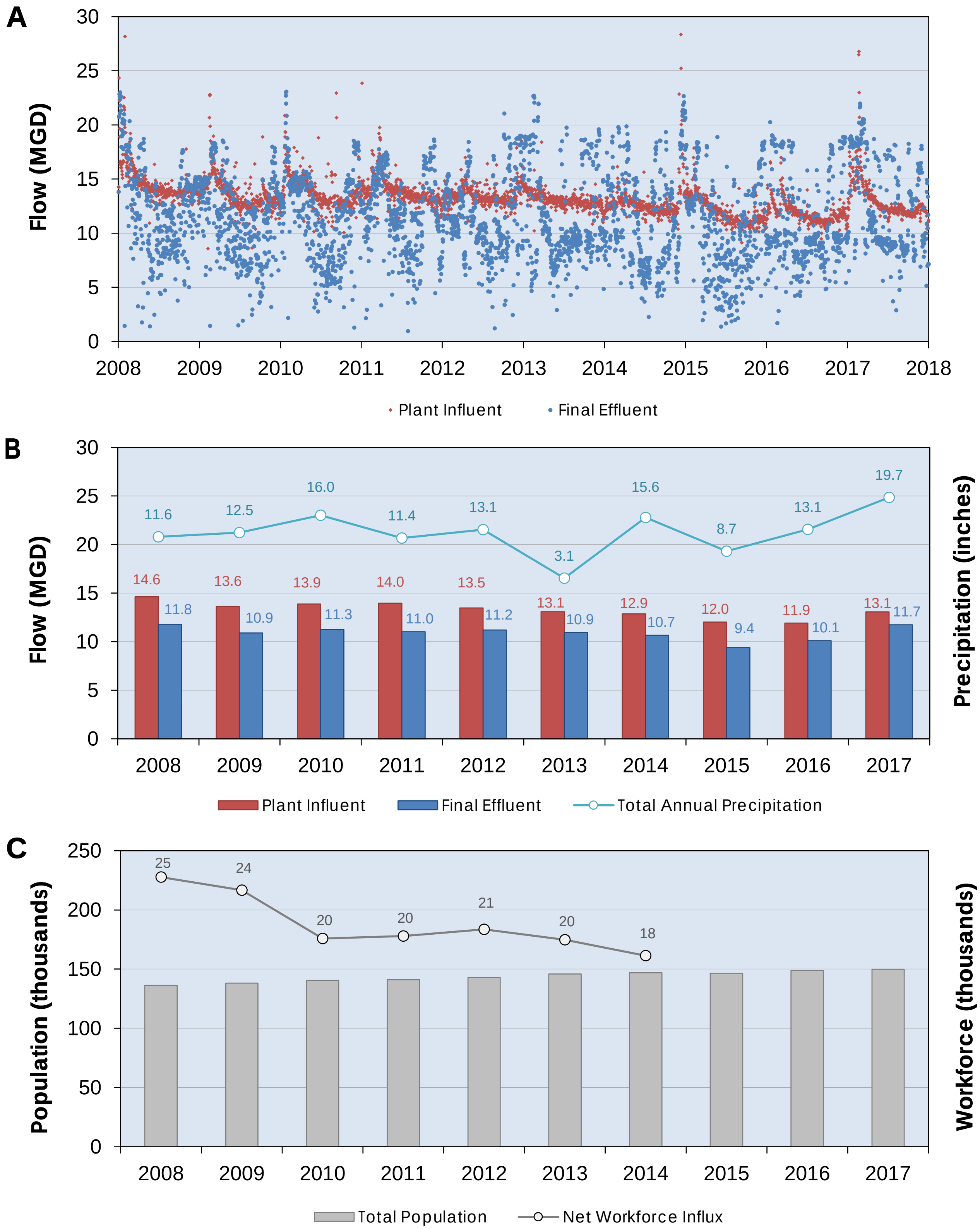

Figure 13: WPCP Wastewater Flow Rate Trends from 2008-2017. A) Daily and B) Annual Average Influent and Effluent Wastewater Flows through the WPCP from 2008-2017. C) Total Population and Net Workforce Influx (thousands) in Sunnyvale from 2008-2017 (net workforce influx data not yet available for 2015-2017)

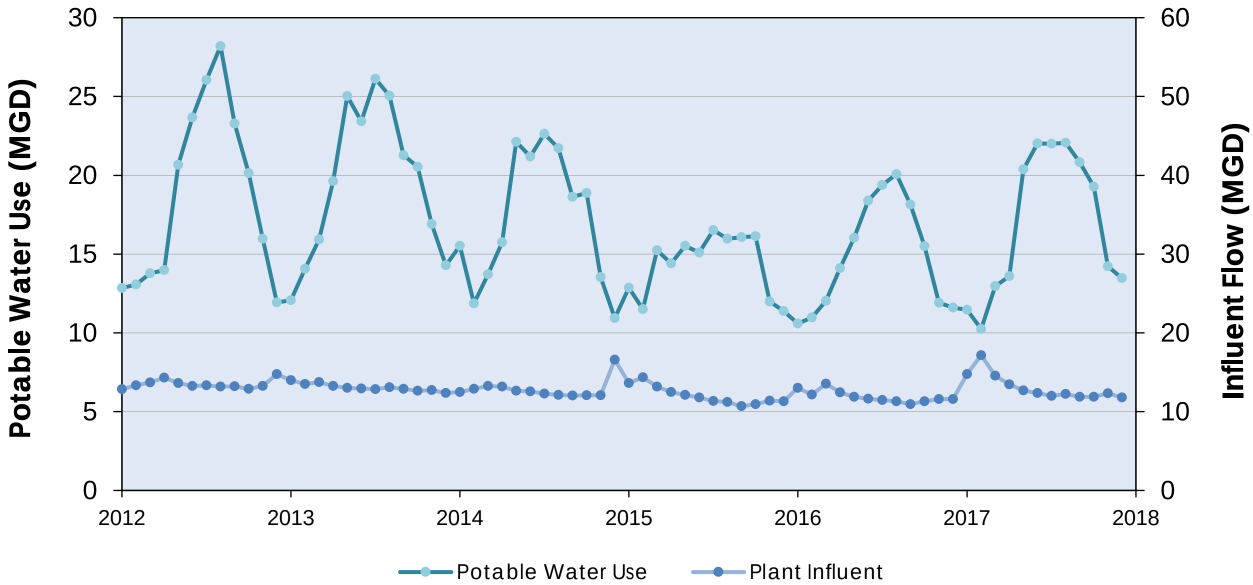

Figure 14: Monthly Average Citywide Potable Water Use and WPCP Influent Flows from 2012-2017

(15%) non-resident workers[3] during those respective reporting periods (**Figure 13C**). This significant flow reduction was the result of reductions in water use in response to the drought and State mandated restrictions.[4] By the end of 2017, the City had achieved a total annual reduction of 19%, which meets the 15% minimum reduction goal set by the Stage 1 Water Reduction Target.

Daily effluent flow rates shown in **Figure 13A** mimic the pattern observed in influent flow rates observed over the ten-year period presented 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, and from recycled water production.[5] In 2016, the WPCP produced a relatively large volume of recycled water (227 MG) as compared with previous years due to a higher demand from ongoing drought conditions. However, recycled water production was largely reduced during the 2017 reporting period due to construction interference associated with process and infrastructure improvements. The resultant 11 MG of recycled water produced in 2017, as well as the exceptional precipitation (**Figure 13B**), contributed to the increase in effluent flow rates and potable water use (**Figure 14**) as compared with previous years. Similar construction interferences during the 2012 and

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[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 2015-2017 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.

2013 reporting periods resulted in no recycled water production and showed evidence of higher potable water use.

The annual average effluent flow rate shown in **Figure 13B** has 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.

Average monthly flow rates during this reporting period are shown in **Figure 15**. A comparison between influent and effluent monthly average flow rates reveals the seasonal effects of recycled water production and evaporation from the Oxidation Ponds on the flow rates. 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

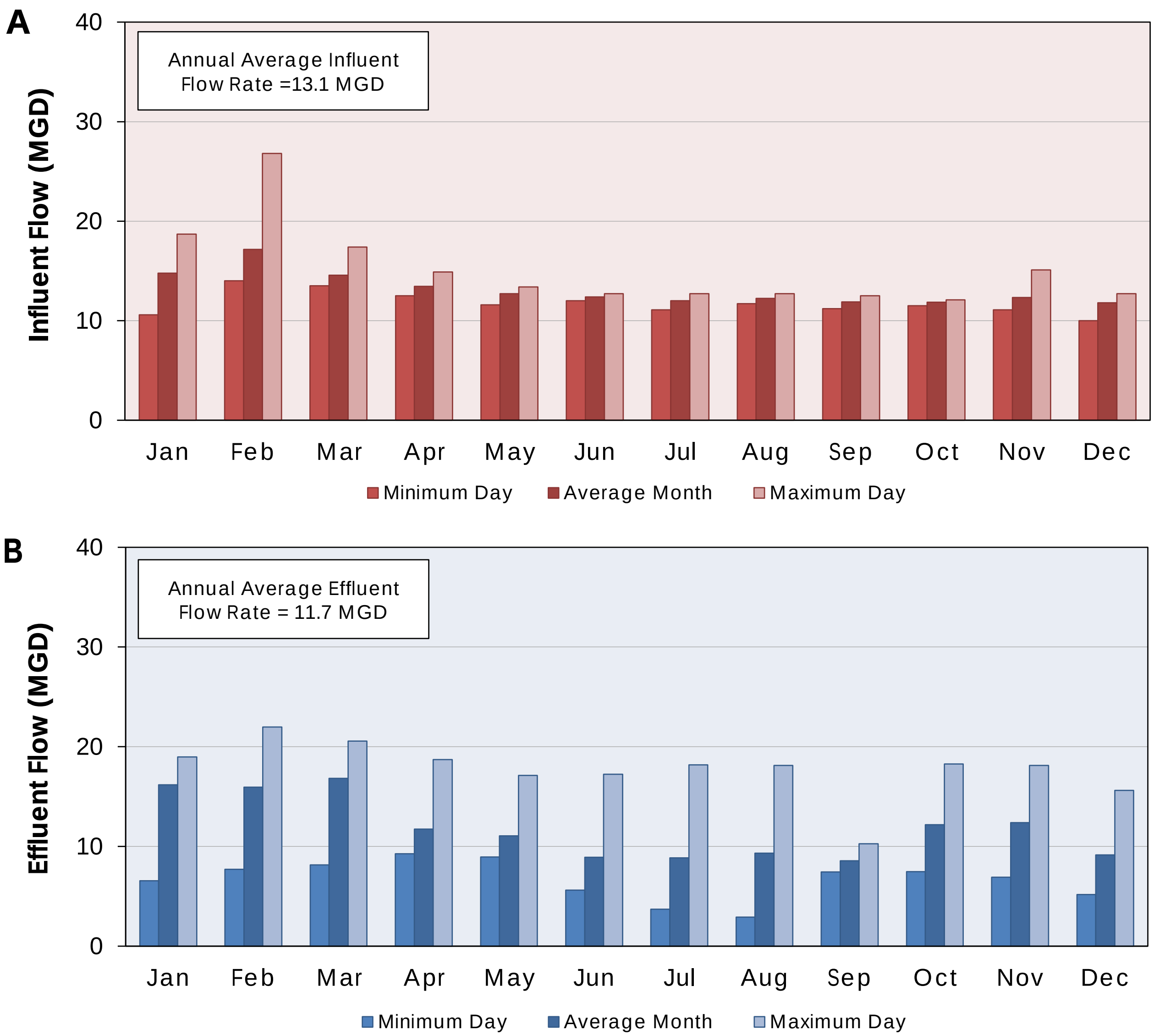

Figure 15: Monthly and Annual Average A) Influent and B) Effluent Wastewater Flow Rates through the WPCP during 2017

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 the beginning of 2017 caused an increase in influent flow rates (**Figure 15A**) and contributed a significant volume of rain water directly to 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 WPCPs Flow Management Strategy described below. Consequently, the early shoulder months (January-March) for final effluent depicted in **Figure 15B** were higher than normal.

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. WPCP staff is currently working on a process to quantify and correct for the return flows.

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

	Limit	Performance
% Removal:	85%	97%
Daily (MDEL):	20 mg/L	2.4 – 12.3 mg/L
Monthly (AMEL):	10 mg/L	4.1 – 9.1 mg/L

Figure 16 summarizes CBOD concentration data and removal performance from 2013 to 2017. Influent and effluent CBOD samples are collected as flow-weighted composites over a 24-hour period. In general, CBOD influent concentrations trended higher in 2014 and 2016 as compared with previous years. This trend is attributed to the City's population growth and average daytime non-resident workforce influx, coupled with lower water usage through water conservation efforts and a decrease in influent flows as a result of the drought, as the same amounts of pollutants are concentrated in a smaller volume of water. In contrast, during the 2017 reporting period, CBOD concentrations seem to be trending back to 2013 levels of around 250 mg/L.

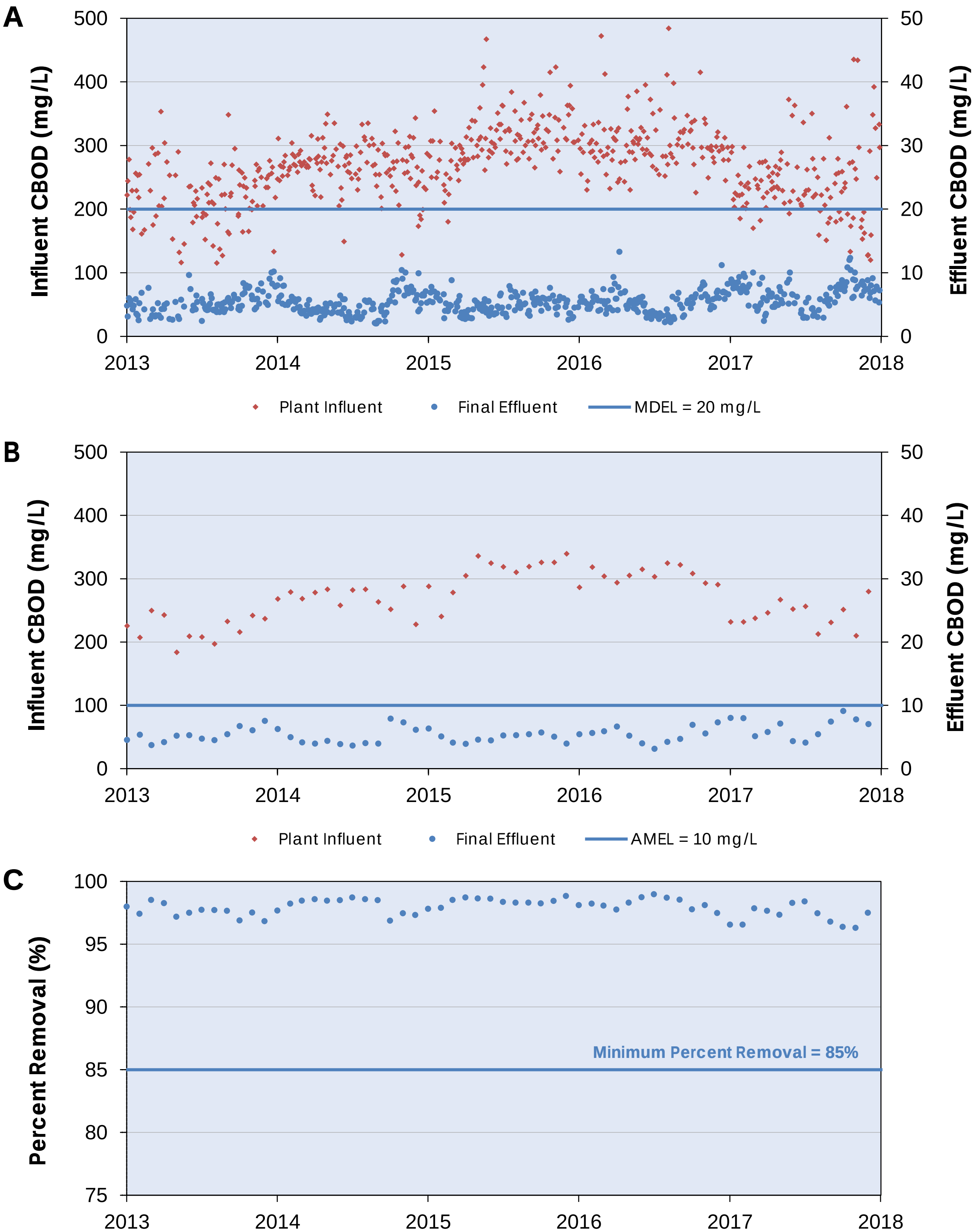

Figure 16: CBOD Trends through the WPCP from 2013-2017. A) Daily and B) Average Monthly Influent and Effluent CBOD (mg/L) through the WPCP from 2013-2017. C) Average Monthly Effluent Percent Removal of CBOD from 2013-2017

As shown in **Figure 16A** and **Figure 16B**, effluent daily composite and average monthly effluent CBOD concentrations remained below their respective permit limits during the reporting period. Daily values ranged from 2.4 to 12.3 mg/L while average monthly values ranged from 4.1 to 9.1 mg/L. 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 97% (**Figure 16C**). 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. Nevertheless, data collected during the 2017 reporting period indicate a high level of performance at the WPCP.

Figure 17 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 2013 to 2017. Influent CBOD loading rates trended

Figure 17: Average A) Daily and B) Annual CBOD Loading Rates and Total Effluent Discharged from 2013-2017

slightly upwards starting in 2014 before declining in 2017, mirroring the influent CBOD concentration data trend shown in **Figure 16**. Despite the higher influent flow rates observed in 2017, the CBOD loading rate showed an annual decline when compared with 2014 through 2016 levels. This is partially explained by the decrease in influent CBOD concentrations during 2017 as compared with previous years. In contrast, effluent CBOD loading rates increased slightly, which is primarily attributed to a sharp reduction in recycled water production and to a lesser extent the exceptional precipitation during 2017.

1.3. Total Suspended Solids

TSS Removal

	Limit	Performance
% Removal:	85%	97%
Daily (MDEL):	30 mg/L	3.8 – 15.7 mg/L
Monthly (AMEL):	20 mg/L	5.0 – 12.6 mg/L

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.

Figure 18 summarizes TSS concentration data and removal performance from 2013 to 2017. Influent TSS trends mirrored those of CBOD with higher concentrations observed in 2014 through 2016 that dropped in 2017 to around 250 mg/L. As shown in **Figure 18A** and **Figure 18B**, effluent daily and average monthly TSS concentrations remained below their respective permit limits. Daily values ranged from 3.8 to 15.7 mg/L, while average monthly values ranged from 5.0 to 12.6 mg/L. The percent removal of TSS, as measured by the difference in influent and effluent concentrations, remained well above the permit's minimum removal rate of 85%, with an average of 97% over the reporting period (**Figure 18C**), indicating a high level of performance.

Effluent TSS concentration data from 2013 to 2017 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.

In September 2013, the influent compliance sample location was slightly adjusted in an effort to improve mixing and capture the most representative sample during subsequent reporting periods. At this time, lab personnel instituted a bimonthly cleaning regiment for the sampler intake tubing with replacement of the tubing as needed. Consequently, influent TSS concentration data from October 2013 through December 2016 show less variability.

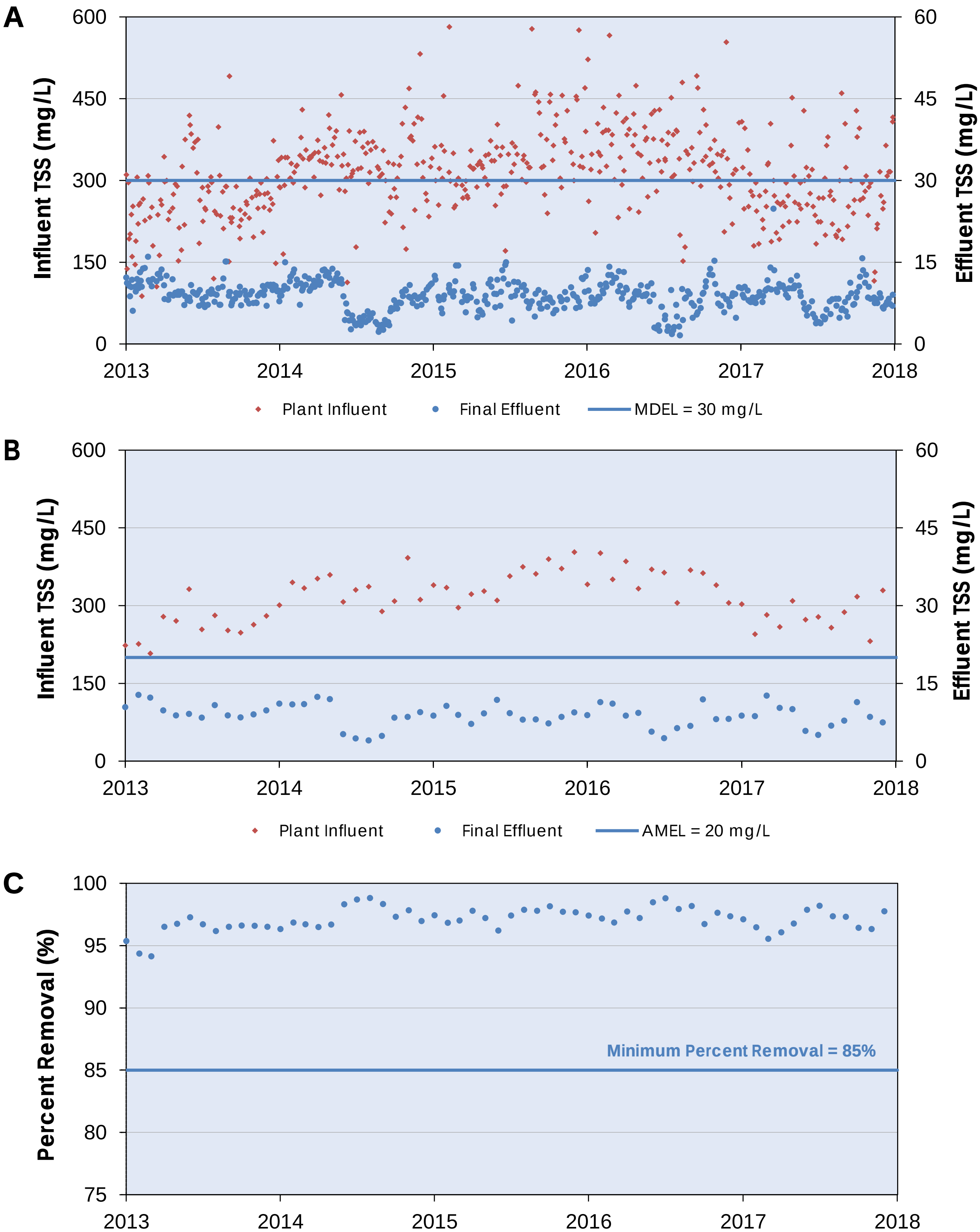

Figure 18: TSS Trends through the WPCP from 2013-2017. A) Daily and B) Average Monthly Influent and Effluent TSS (mg/L) through the WPCP from 2013-2017. C) Average Monthly Effluent Percent Removal of TSS from 2013-2017

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 19 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 2013 to 2017. Influent loading rates showed an upward trend during 2014 to 2016 before declining in 2017, mirroring the influent TSS concentration data trend shown in **Figure 18.** The decline in influent loading rates occurred despite the more than 1 MGD increase in flow rates as compared with the previous years. This is partially explained by the decrease in influent TSS concentrations during 2017 as compared with previous years. In contrast, effluent TSS loading rates increased slightly, which is primarily attributed to a sharp reduction in recycled water production and, to a lesser extent, the exceptional precipitation during 2017.

Figure 19: Average A) Daily and B) Annual TSS Loading Rates and Total Effluent Discharged from 2013-2017

1.4. Total Ammonia

Ammonia Removal

Freq	Limit	Performance
Daily (MDEL):	26 mg/L (Oct-May) 5 mg/L (Jun-Sept)	0.02 – 14.8 mg/L 0.05 – 3.1 mg/L
Monthly (AMEL):	18 mg/L (Oct-May) 2 mg/L (Jun-Sept)	0.2 – 11.5 mg/L 0.6 – 1.3 mg/L

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. The WPCP's NPDES permit includes seasonal performance limits for ammonia that reflect the variability in the performance of the two processes.

1.4.1. *Data Review*

Figure 20 summarizes ammonia concentration data and removal performance trends. **Figure 20A** depicts removal performance of the Oxidation Ponds and FGRs during the 2017 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 2017. FGR performance was impacted by the need to postpone a snail abatement event toward the end of 2017, resulting in higher than normal effluent ammonia concentrations that is discussed in more detail in the *Strategies to Enhance Performance* section below.

As shown in **Figure 20B** and **Figure 20C**, daily and average monthly effluent ammonia in 2017 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 in 2017 rather than decline. A record 10-year daily max of 58.4 mg/L was measured on December 27, 2016 (**Figure 20B**) but no such spikes were detected in 2017. The upward trend in influent ammonia concentrations is likely due to enhanced water conservation efforts in response to the drought coupled with population increases and a net influx of a roughly 20,000 non-resident workers (**Figure 13C**).

Figure 21 summarizes average daily (kg/day) and annual (kg/yr) influent and effluent ammonia loading rates from 2013 to 2017. 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 20**. Unlike CBOD and TSS, influent flows had less of an impact on ammonia loading rates than concentrations. Effluent ammonia loading rates are scattered with the higher values generally occurring during the winter season and lower values generally occurring during the summer season, reflecting the seasonal nature of

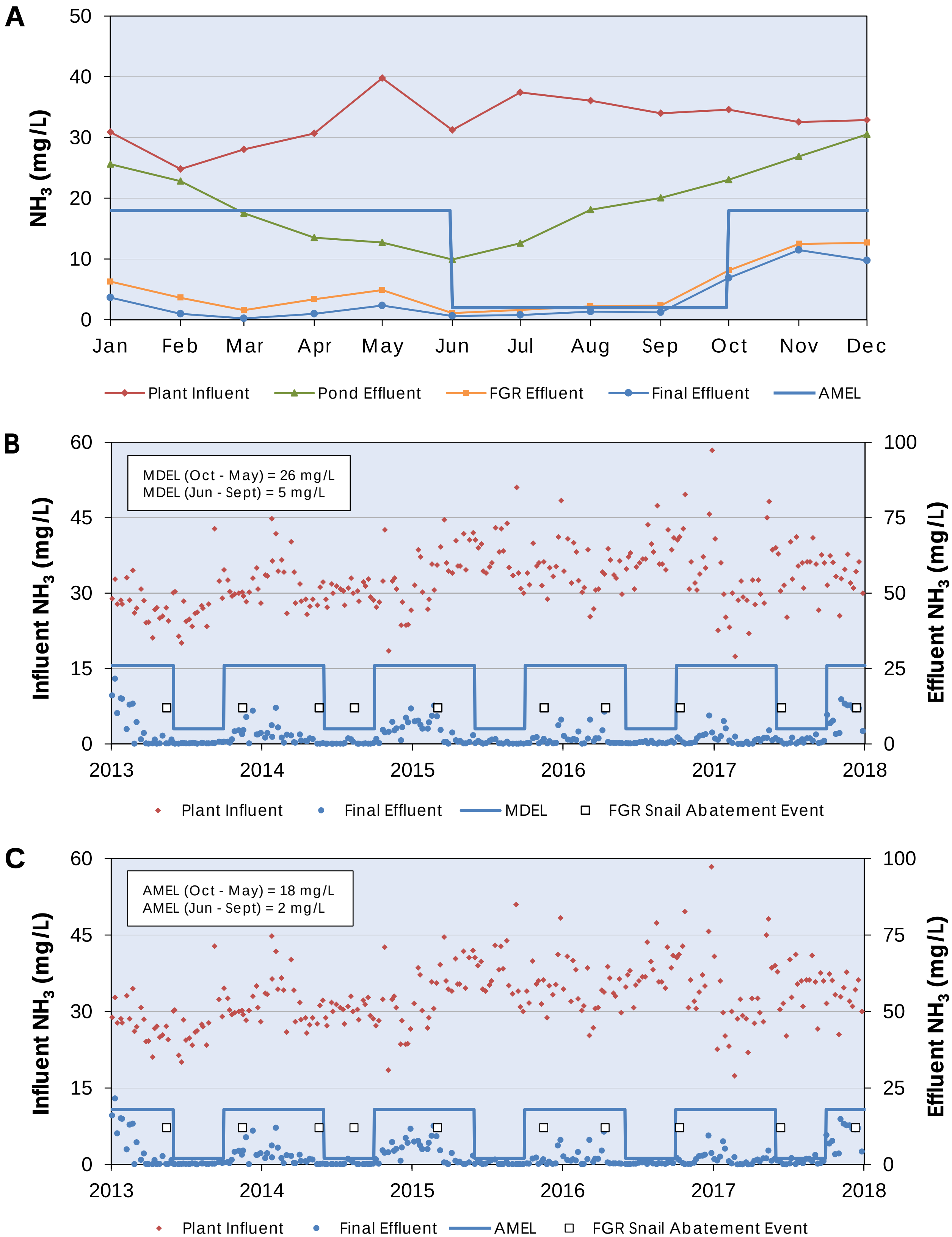

Figure 20: Ammonia Trends at the WPCP from 2013-2017. A) Monthly Average Total Ammonia from Pond, FGR, and Final Effluent during 2017. B) Daily and C) Monthly Average Influent and Effluent Total Ammonia from 2013-2017.

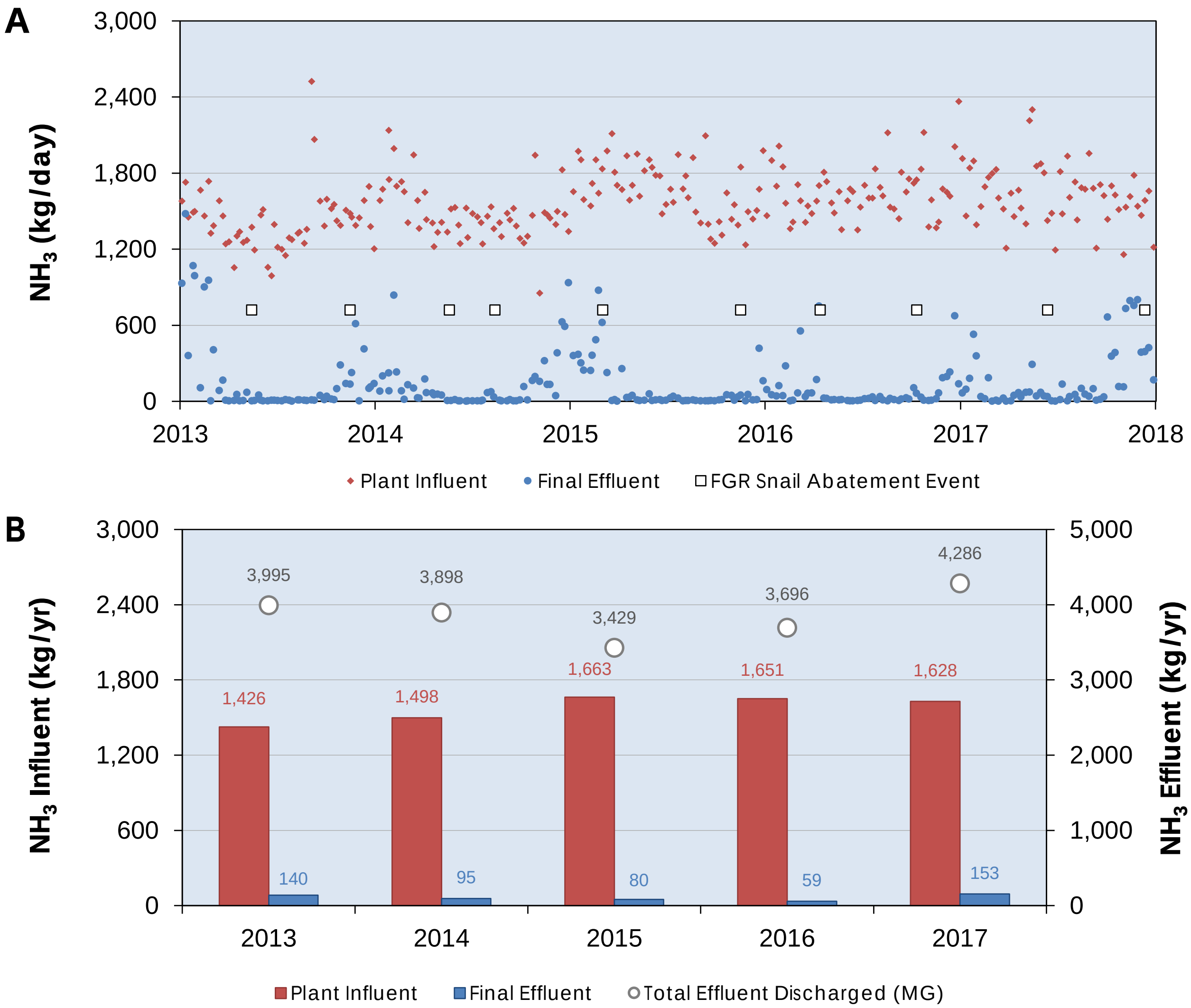

Figure 21: Average A) Daily and B) Annual Ammonia Loading Rates and Total Effluent Discharged from 2013-2017

the Oxidation Ponds and FGRs performance. Similar to CBOD and TSS, effluent ammonia loading rates increased in 2017 primarily due to a sharp reduction in recycled water production and exceptional precipitation experienced over the 440 acres of Oxidation Ponds, translating into increased effluent flows. Additional information pertaining to ammonia and other nutrient trends is presented in **Section 1.5** of this Chapter and is available in the 2017 *Nutrient Watershed Permit Annual Report* submitted by BACWA.

1.4.2. Performance Optimization Strategies

<u>Oxidation Pond Dredging</u>

Historically, ammonia removal in the Oxidation Ponds has been highly variable and seasonal in nature. Although variability in weather patterns plays a significant role, the loss of volume due to solids deposition 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 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 9.0**). Dredging continued during this reporting period, but was restricted to the wet weather season to avoid generating ammonia in excess of what the FGRs could process. A total of 2,104 dry tons of biosolids were removed from the Oxidation Ponds in 2017 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 as a result 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 and sodium hydroxide 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. Two snail control events were performed during this reporting period on June 13 and December 12, 2017, and are depicted on **Figure 20B** and **Figure 20C**. Approximately 8-9 tons of liquid ammonium sulfate (40% solution) were used in each control event.

Typically, the second control event occurs in October or early November during the seasonal shift and subsequent decline in Oxidation Pond performance. Sodium hydroxide from the chlorine gas abatement system (TGO Scrubber) that would otherwise have to be hauled off-site for disposal is beneficially reused in the batch process. During the 2017 reporting period, the second snail control event was postponed until mid-December due to construction and demolition work associated with the conversion of the chlorine gas disinfection system to a less hazardous system of liquid sodium hypochlorite. As such, effluent ammonia concentrations measured between October through December were higher than normal due to declining performance in the FGRs. However, these concentrations dropped swiftly following the December event as shown in **Figure 20B** and **Figure 20C**.

The WPCP plans to continue performing these control events as long as the FGRs are required to provide nitrification during the seasonal transition months. With the replacement of the gaseous chlorine disinfection system, including the TGO Scrubber abatement device, the WPCP is assessing new strategies for dosing sodium hydroxide into the batch process.

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), 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 emerging 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 22**) and phosphorus (**Figure 23**) 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	22 mg/L
Annual Total Load	415 tons
% Removal	63%

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.

[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.

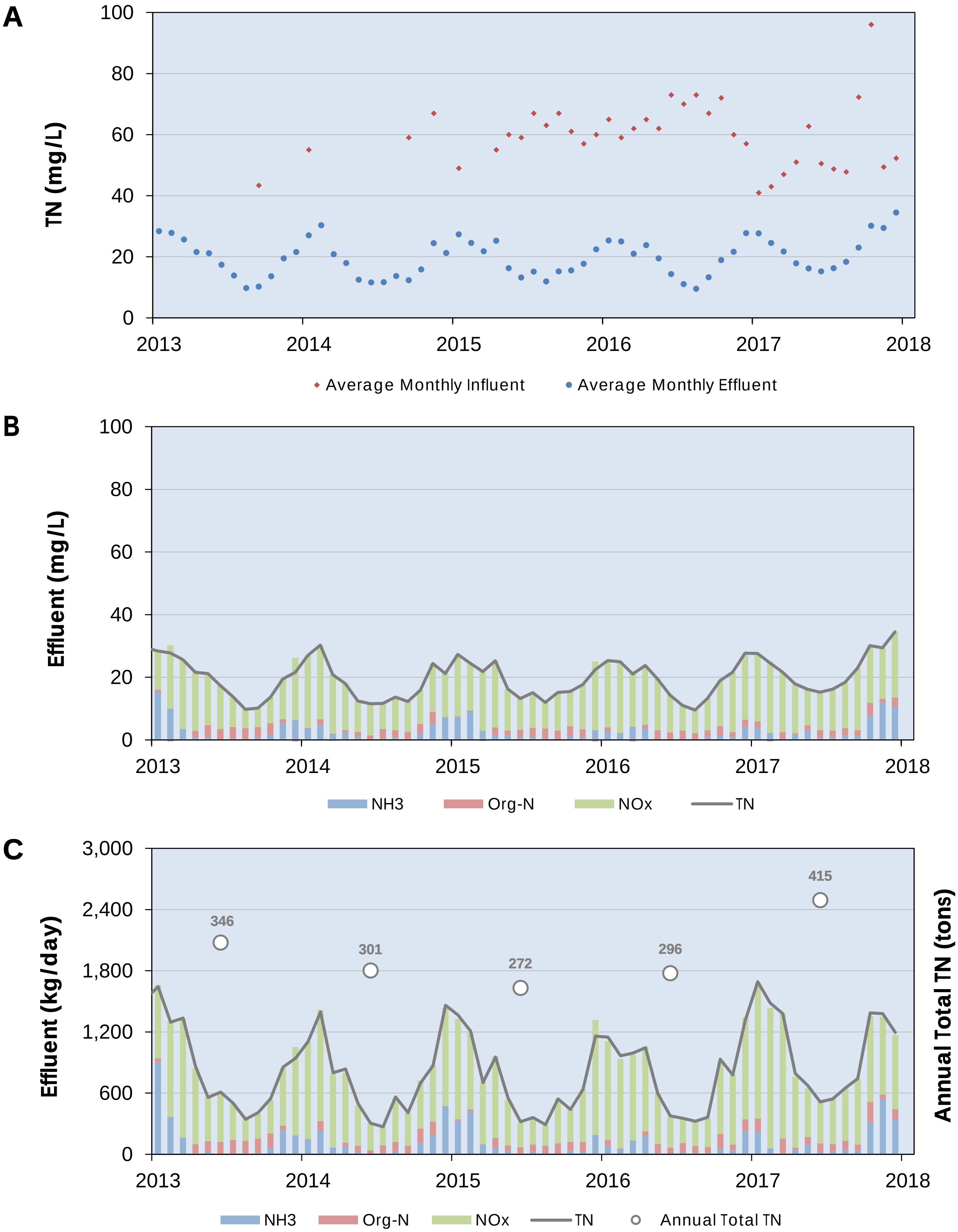

Figure 22: Nitrogen Trends at the WPCP from 2013-2017. A) Monthly Average Influent and Effluent TN Concentrations. B) Speciated Monthly Average Effluent Nitrogen Concentrations and C) Effluent Loading Rates with Annual Total TN Loads

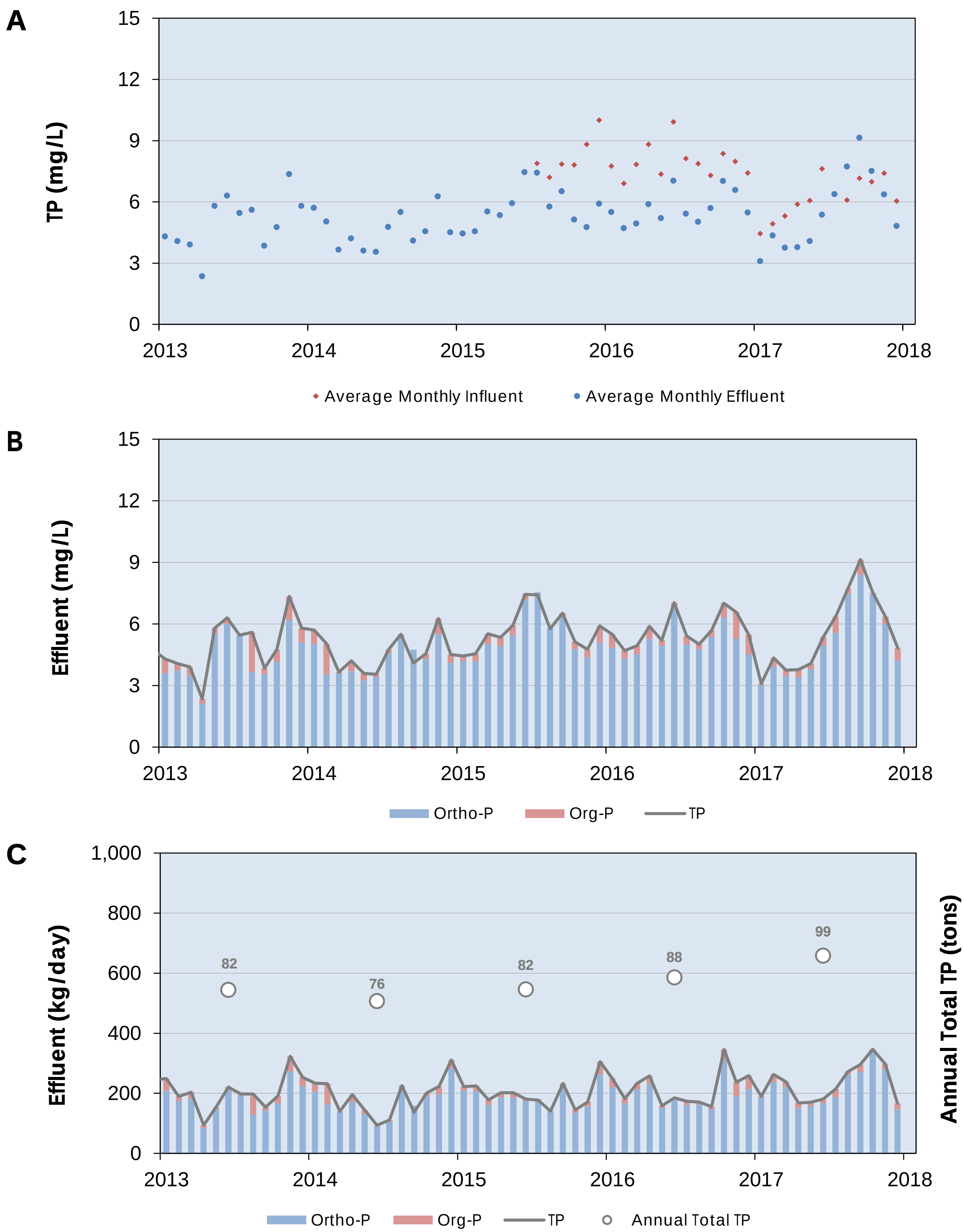

Figure 23: Phosphorous Trends at the WPCP from 2013-2017. A) Monthly Average Influent and Effluent TP Concentrations. B) Speciated Monthly Average Effluent Phosphorous Concentrations and C) Loading Rates with Annual Total TP Loads

Figure 22A shows average monthly influent and effluent TN concentrations collected as flow-weighted composite samples over a 24-hour period. As compared with 2014 to 2016, influent TN concentrations declined slightly during the 2017 reporting period to an annual average of 59 mg/L despite repeated spikes in October and November. Several weekly influent samples collected during these months contained elevated TN concentrations ranging from 89 to 120 mg/L. Ammonia concentrations in the samples remained relatively consistent with historical values for that season, indicating a large Org-N driver behind the measured results. The City investigated potential causes, both internal and external to the WPCP, but did not identify any concrete source(s). In December, influent Org-N concentrations declined and TN concentrations returned to levels more consistent with historical data.

Monthly average effluent TN concentrations are separated into the dominant forms of nitrogen (ammonia, Org-N, and NOx) in **Figure 22B**. 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. 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. Though not shown graphically in this report, the majority of denitrification occurs in the Oxidation Ponds during the summer months. Effluent TN concentrations during the 2017 reporting period appeared relatively consistent as compared with historical data, with an annual average of 22 mg/L. However, effluent TN concentrations toward the end of 2017 were slightly higher than in previous years due to higher ammonia concentrations resulting from a decline in Oxidation Pond and FGR performance.

Average monthly effluent nitrogen loading rates and annual total TN loads are shown in **Figure 22C** and depict seasonal nitrification/denitrification variations experienced at the WPCP similar to those shown in **Figure 22B**. 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 deeper troughs in the summer months when recycled water production is in high demand. Effluent TN loadings during the 2017 reporting period were higher than observed in previous years (415 tons) as a result of a sharp reduction in recycled water production, coupled with a reduction in nitrification/denitrification rates in the Oxidation Ponds. Nevertheless, TN removal efficiency, as measured by the difference between annual average influent and effluent concentrations, remained high at approximately 63%.

Phosphorous

Total Phosphorous	
Annual Average	5.3 mg/L
Annual Total Load	99 Tons
% Removal	27%

Average monthly influent and effluent total phosphorous (TP) concentrations are shown in **Figure 23A**. The WPCP began analyzing for influent TP during 2015 to complement TN data and support nutrient discussions with a more complete dataset. As such, trends are not discernible at this time due to the limited data. However, effluent TP concentrations have been routinely collected and analytical results indicate relatively consistent concentrations that are less influenced by seasonal variation as compared to nitrogen. The approximate 27% reduction in TP between influent and effluent levels observed during this reporting period is reflective of incidental removal of phosphorus at various stages throughout the treatment process, rather than a single process specifically designed for phosphorous removal.

Figure 23B 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 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 23C**. Overall, average TP loading rates have remained fairly consistent since 2013, with approximately 99 tons of TP being discharged to the SF Bay during the 2017 reporting period.

1.6. Plant Performance Summary

The WPCP maintained a high degree of pollutant removal efficiency during the 2017 reporting period without any exceedance of its effluent permit limitations. As shown in **Figure 24**, 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.

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. CBOD data scatter during 2017 was similar in magnitude as compared with 2015 and 2016 and the City is investigating other contributing factors.

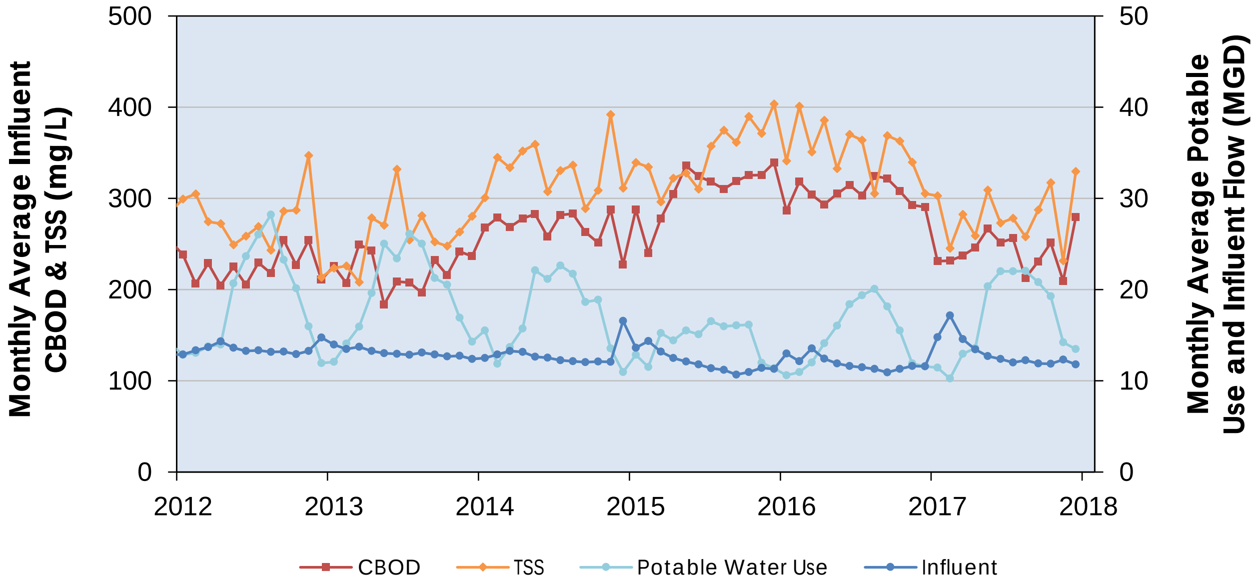

Figure 24: Monthly Average CBOD and TSS Influent Concentrations, Citywide Potable Water Use, and WPCP Influent Flows from 2012-2017

With the exception of ammonia, increases in pollutant concentrations and loading rates that began in 2013 appeared to have reversed to a downward trend for the duration of the 2017 reporting period despite a 0.6% population increase between 2016 and 2017 and a large daily net workforce influx of approximately 20,000 (15%) non-resident workers. The observed increase in influent flow rates by more than 1 MGD correlates with exceptional precipitation during the end of 2016 and beginning of 2017. Increases in effluent loading rates are primarily attributed to a sharp reduction in recycled water production that was driven primarily by construction related enhancements to critical process areas. The decline in performance observed in the Oxidation Ponds during this reporting period, as well as the postponement of the snail control event, also appear to have contributed to higher ammonia loads than observed in recent years. Nevertheless, the WPCP maintained a high TN removal rate around 63%.

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 2017, including regulatory limits, the range of sample results, and the number of samples collected and exceedances. During 2017, the WPCP maintained a high degree of performance with no exceedances of regulatory limits.

Table 1: Effluent Monitoring Sample Results for Standard Parameters in 2017

Parameter Class	Parameter	Parameter Limit Type	Parameter Limit	2017 Final Effluent			Number of Samples[1] / Exceedance
				Min	Avg	Max	
Standard	CBOD	MDEL (mg/L)	20	2.4	6.6	12.3	118 / 0
		AMEL (mg/L)	10	3.1	6.6	9.1	12 / 0
		Percent Removal (%)	85	96	97	98	12 / 0
	TSS	MDEL (mg/L)	30	3.8	8.7	24.8	100 / 0
		AMEL (mg/L)	20	5.0	8.7	12.6	12 / 0
		Percent Removal (%)	85	96	97	98	12 / 0
	Ammonia (as N)	MDEL [Oct-May] (mg/L)	26	<0.02	4.6	14.8	35 / 0
		AMEL [Oct-May] (mg/L)	18	0.2	4.6	11.5	8 / 0
		MDEL [Jun-Sept] (mg/L)	5	0.05	1.0	3.1	17 / 0
		AMEL [Jun-Sept] (mg/L)	2	0.6	1.0	1.3	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	3.5	7.0	8.8	53 / 0
	pH[1]	Max / Min	8.5 / 6.5	6.5	7.1	7.5	342 / 0
	Chlorine Residual[1]	IMEL (mg/L)	0	0	0	0	342 / 0
	Enterococci	Geo Mean (month) (MPN/100mL)	35	7.4	7.6	7.7	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	2.1	5.0	12 / 0
		AMEL (ug/L)	7.5	<1.40	2.1	5.0	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	1.6	3.0	4.7	12 / 0
		AMEL (ug/L)	10	1.6	3.0	4.7	12 / 0
	Mercury	AWEL (ug/L)	0.027	0.00076	0.0012	0.0018	12 / 0
		AMEL (ug/L)	0.025	0.00076	0.0012	0.0018	12 / 0
		AAEL (kg/yr)	0.120	---	---	0.020	1 / 0
	Nickel	MDEL (ug/L)	35	3.0	3.7	4.5	12 / 0
		AMEL (ug/L)	24	3.0	3.7	4.5	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

2.1.1. *Constituent Removal*

Figure 25 through **Figure 29** 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 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 directly from 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 Provision 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 2017 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 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 28 shows data from common physical parameters collected as grab samples at the WPCP, of which only turbidity (**Figure 28A**) and pH (**Figure 28B**) have effluent limits. Influent and effluent temperature data (**Figure 28C**) are included for informational purposes only. The variability in turbidity data shown on **Figure 28A** from 2014 through 2016 is the result of recycled water production at the WPCP. During the production of recycled water, DAFTs and DMFs are operated to produce a lower turbidity (2 NTU) effluent, and the filtered water from the DMFs is subjected to additional treatment in the Chlorine Contact Tanks in order to meet the more stringent Title 22 requirements for tertiary disinfected wastewater. By comparison, turbidity limits in the final effluent is 10 NTU. Since the WPCP does not currently produce both SF Bay discharge and recycled water simultaneously, the turbidity can vary significantly if the sample was collected close to the transition into or from recycled water production. Effluent turbidity data from 2012 and 2013 were less variable as no recycled water was produced.

Effluent pH values occasionally approach the lower discharge limit of 6.5 as shown in **Figure 28B**. The minor depression in pH is primarily attributed to the more rigorous Title 22 water quality requirements associated with recycled water production at the WPCP. As previously described, recycled water is currently produced in batch mode and does not occur simultaneously with discharge to the SF Bay. Higher doses of chlorine and increased chlorine contact time are required to meet Title 22 requirements. Some amount of recycled water with higher chlorine residuals required under Title 22 may be carried over when the discharge mode switches from recycled water production back to SF Bay discharge.

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

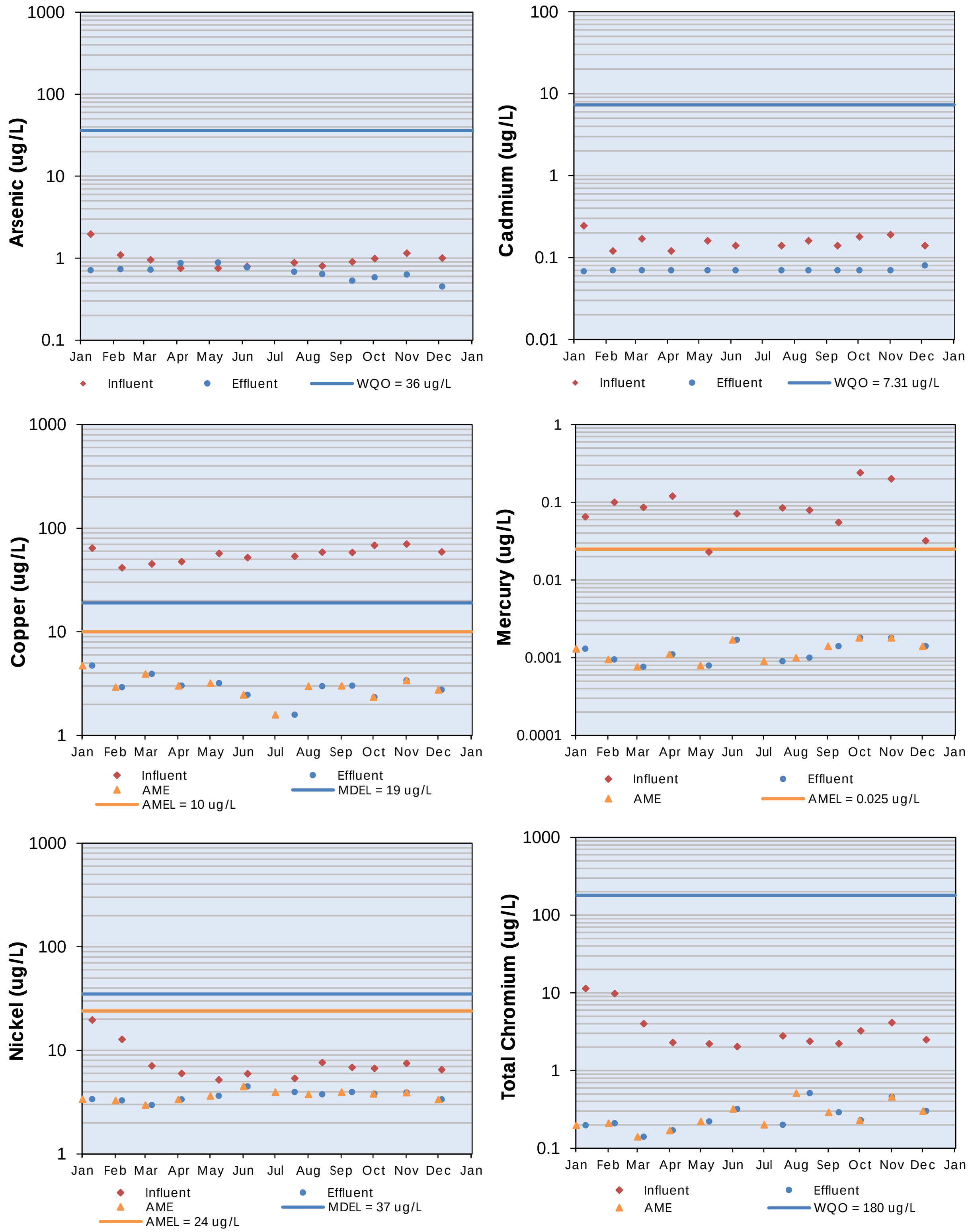

Figure 25: Concentrations of Common Metal Pollutants at the WPCP during 2017

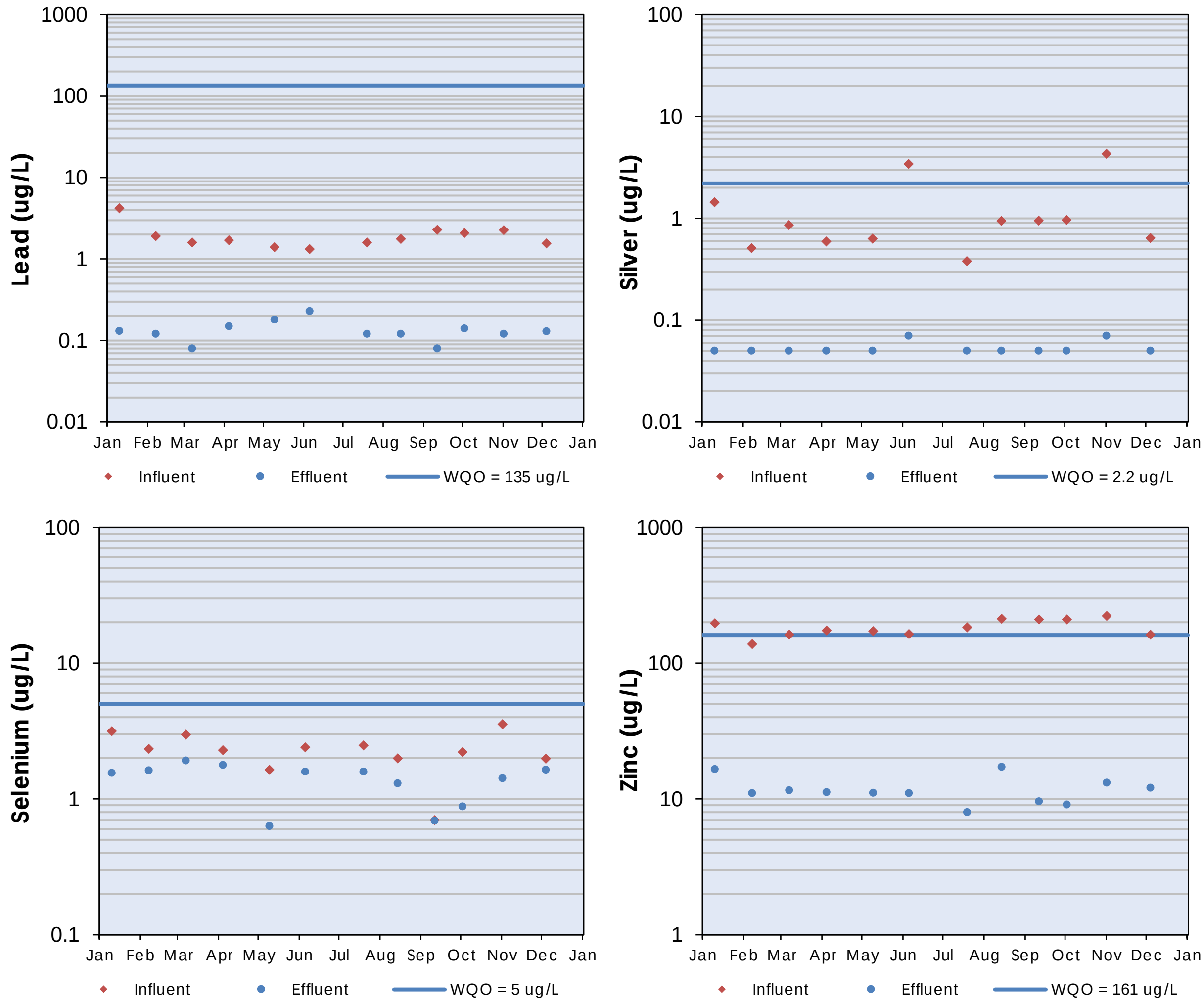

Figure 26: Concentrations of Common Metal Pollutants at the WPCP during 2017

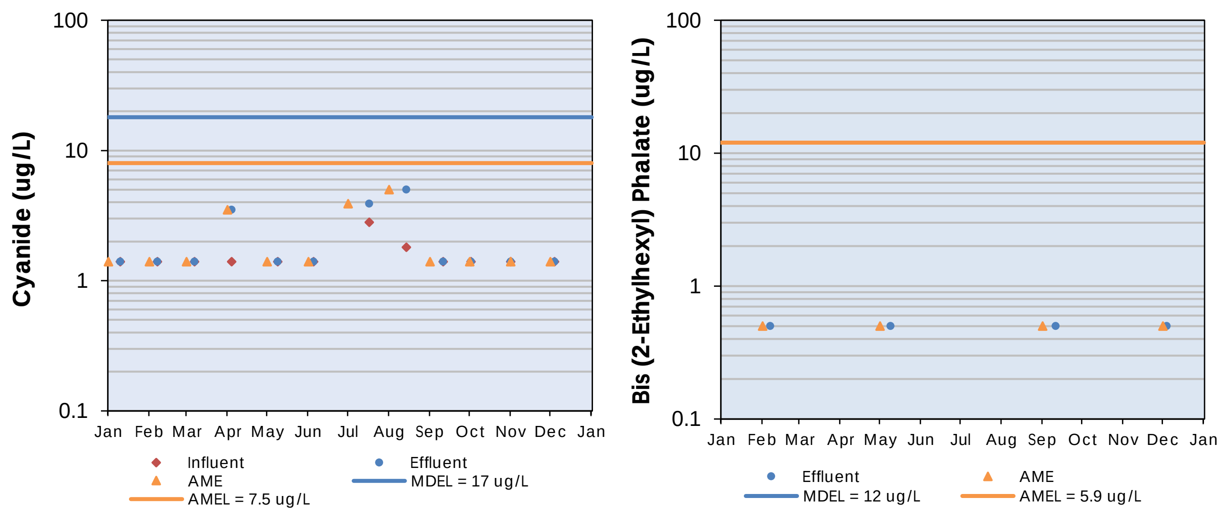

Figure 27: Concentrations of Common Organic Pollutants at the WPCP during 2017

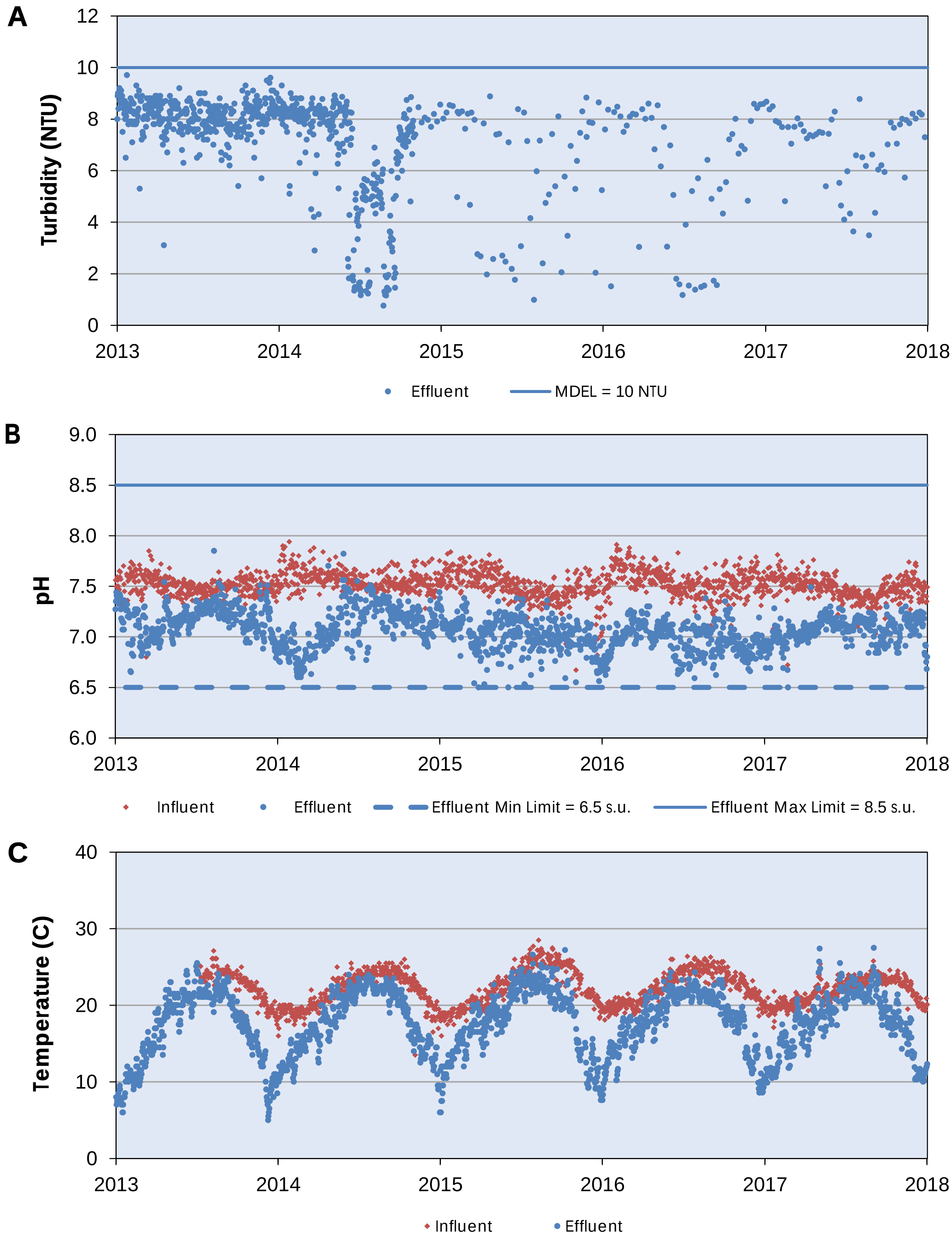

Figure 28: Common Physical Parameters at the WPCP from 2013-2017

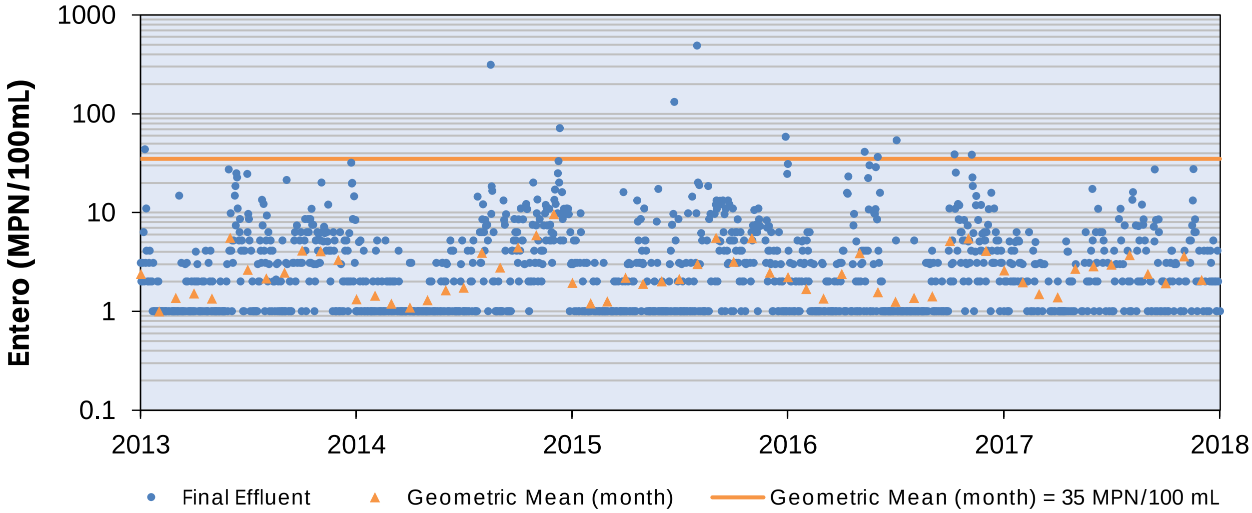

Figure 29: Effluent Enterococcus Measurements at the WPCP from 2013-2017

Consequently, a higher dose of sodium bisulfite (SBS) is required to ensure complete dechlorination of effluent. The reaction of free chlorine (Cl_2) with SBS ($NaHSO_3$) produces sulfuric acid ($NaHSO_4$) and hydrochloric acid (HCl) according to the reaction $NaHSO_3 + Cl_2 + H_2O \leftrightarrow NaHSO_4 + 2HCl$, resulting in acidification of discharge water. The high volume of recycled water produced during the 2016 reporting period (227 MG) relative to previous years placed additional operational challenges on meeting discharge requirements for both pH and residual chlorine, and on occasion the pH approached, but never exceeded, the lower discharge limit. In response, WPCP staff developed *SOP #3042A Effluent Chlorine Residual Monitoring and Reporting* to establish the procedures required to ensure that pH values remain in compliance during the transition from recycled water production to Bay discharge.

Influent and effluent temperatures at the WPCP vary seasonally but follow the same general pattern (**Figure 28C**). The significant difference between the influent and effluent temperatures is the result of the storage capacity of the Oxidation Ponds. On average, primary effluent is held in the Oxidation Ponds for an average of 30-45 days. In contrast, raw wastewater passes through primary treatment and reaches secondary treatment in the Oxidation Ponds within 1-2 hours on average. As a result, the influence of ambient temperatures on the wastewater undergoing secondary treatment is experienced more strongly and carried through to 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 30**). 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

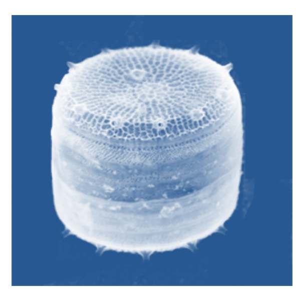

Figure 30: ***Thalassiosira pseudonana***

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.

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 and forms the basis of event-specific TRE Workplans. The basic approach is to start simple at Tier 1 and progressively eliminate the most likely possible 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 2017 reporting period, the single sample maximum of 2 TUc and three-sample median of 1 TUc were exceeded in April and August (**Table 2**). At no point during the 2017 reporting period was the TRE workplan trigger of 1.25 exceeded.

Table 2: Summary of Chronic Toxicity Testing Results for WPCP Effluent during 2017

Test #	Sample Date	Growth TU_c	3-Sample Median (Growth TU_c)
1	1/18/2017	<1	<1
2	2/8/2017	<1	<1
3	3/8/2017	<1	<1
4	4/5/2017	3.1	<1
5	4/19/2017	2.3	2.3
6	5/9/2017	<1	2.3
7	5/24/2017	<1	<1
8	6/6/2017	<1	<1
9	7/18/2017	<1	<1
10	8/15/2017	3.2	<1
11	8/29/2017	<1	<1
12	9/12/2017	<1	<1
13	10/10/2017	<1	<1
14	11/2/2017	<1	<1
15	12/5/2017	<1	<1

Analytical results from an effluent sample collected on April 5, 2017, indicated and algal growth IC_{25} of 31.9% effluent, resulting in 3.1 TUc and the exceedance of the permit trigger for a single sample maximum of 2 TUc. Consequently, the City initiated accelerated monitoring (twice-per-month) and developed an event-specific TRE Workplan within 30-days of detecting toxicity. The accelerated monitoring test for the effluent sample collected on April 19 confirmed toxicity at 2.3 TUc with an algal growth IC_{25} of 43.6% effluent. Results from both tests were statistically significant, yet confounding as each demonstrated a flat concentration-response curve at all test concentrations. Such a flat concentration response curve can be due to: 1) extremely low variability in the control; 2) an unusually high control response; 3) inappropriate dilution water and improper use of dilution water controls; 4) inappropriate test dilution series; 5) potential pathogen effects in the effluent; and 6) an unusual effluent-dilution water interaction[8]. The contract lab confirmed that none of these factors were present during either of the tests.

The City continued to conduct accelerated chronic toxicity compliance monitoring in May in response to the exceedance of permit triggers in April. Results from the May 9, 2017, sample showed an algal growth IC_{25} >100% effluent resulting in <1.0 TUc. Although the first test in May did not detect toxicity in the effluent, the three-sample median exceeded the permit trigger of >1.0 TUc, requiring the City to conduct a second chronic toxicity test in the same month. Results from the second sample collected on May 24 indicated an algal growth IC_{25} of >100% effluent and a <1.0 TUc. Based on these results, the City resumed routine monitoring of once-per-month in June as toxicity dropped below permit triggers in May and the appropriate elements of the TRE workplan were implemented as described below.

The City submitted a TRE workplan on May 11, 2017, in response to the chronic toxicity test results from April. The City implemented Tier 1 and Tier 2 actions of the TRE workplan and reviewed and evaluated available data, operational records, sampling procedures, chemical usage and any potential unusual conditions at the WPCP that may have contributed to the observed toxicity. No unusual conditions were noted at the WPCP in April. Effluent data did not demonstrate any trends that would indicate contributions to effluent toxicity and chemical usage was within normal ranges.

As discussed in the workplan, the City also reviewed its sampling collection and handling practices to evaluate the potential for sample contamination and sampling errors. It was noted that the tubing in the effluent compliance sampler had been replaced with new PVC tubing a week prior to the April 4, 2017, effluent toxicity test in which toxicity was first detected. A review of the installation procedures indicated that the tubing may not have been sufficiently rinsed out prior to sample collection to prevent leaching of the toxic vinyl chloride and plasticizers into the sample. In response, the PVC tubing in the effluent sampler was replaced with Teflon tubing and thoroughly rinsed out prior to collecting effluent samples in May. Chronic toxicity was not detected in any of the May samples.

Toxicity was again detected in an effluent sample collected on August 15, 2017. Analytical results indicated an algal growth IC_{25} of 31.5% effluent, resulting in a toxicity of 3.2 TUc and the exceedance of the permit trigger for a single sample maximum value of 2 TUc. The City conducted the required accelerated monitoring for August in addition to conducting some early specific (focused) TIE analyses on the effluent

[8] *EPA's Method Guidance and Recommendations for Whole Effluent Toxicity (WET) testing (40 CFR Part 136)*

sample collected on August 29. The focused TIE tests were conducted to identify the class of toxicant responsible for causing the observed toxicity. The follow-up test did not detect toxicity (<1.0 TUc) and the focused TIE test results were therefore inconclusive.

In response to the August sample result, the City submitted a TRE workplan on September 22, 2017, and proactively implemented Tier 1 and Tier 2 actions to review and evaluate available data, operational records, sampling procedures, chemical usage and any potential unusual conditions at the WPCP that may have contributed to the observed toxicity. Effluent data did not demonstrate any significant trends that would indicate contributions to effluent toxicity and chemical usage at the WPCP was within normal ranges.

As part of the TRE Workplan, a review of recent maintenance activities at the WPCP was conducted for the period in question. During the review, it was identified that the WPCP ceased discharge from August 8 to 11, 2017, to accommodate scheduled maintenance activities at the WPCP. During this time, all primary effluent flow was held in the Oxidation Ponds until the shutdown ended. The WPCP resumed discharge on August 12, at which time higher than normal flows were sent to tertiary treatment in order to maintain storage capacity in the Oxidation Ponds. The August 15 effluent sample that detected toxicity at 3.2 TUc was collected during this time period. It is not clear whether the shutdown and subsequent higher flows from the Oxidation Ponds or transient conditions contributed to the toxicity in the August test. The accelerated monitoring test conducted on the August 29 effluent sample, when the WPCP resumed normal operations did not confirm toxicity, and so formal implementation of the TRE workplan was not required. In September, the City resumed routine monitoring as accelerated monitoring test did not confirm toxicity and levels dropped below permit triggers. No additional toxicity was detected for the remainder of the 2017 reporting period.

2.1.3. Effluent Residual Chlorine

During the 2017 reporting period, the WPCP experienced one off-hour and no on-hour residual chlorine excursions.

On February 4, 2017, the WPCP experienced a power failure due to a low voltage condition that resulted in a complete loss of tertiary process and effluent flow. In response to the power outage, Operations took immediate corrective measures per standard operating procedures to secure specific equipment before restoring power and resuming discharge. During this time, a chlorine feed pump was not properly secured resulting in a disproportionate dose of chlorine into the influent channel. When discharge resumed, the sodium bisulfite dechlorination system was unable to respond in time, resulting in an off-hour residual chlorine excursion. A maximum chlorine residual of 3.8 mg/L was measured during the four-minute discharge window, resulting in approximately 1.1 lbs of chlorine into Moffett Channel. Corrective actions included updating Operations' emergency response procedures in addition to staff training. A more detailed account of this event is documented in February's 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 annual effluent mercury loading for the City was 0.020 kg/yr, which is well below the permit limit of 0.12 kg/yr (**Figure 31**) and represents an approximate 30% reduction compared with 2013 (0.0297 kg/yr) and 2014 (0.0289 kg/yr) loading rates. This decrease correlates well with those observed in CBOD (**Figure 17**) and TSS (**Figure 19**) loading rates.

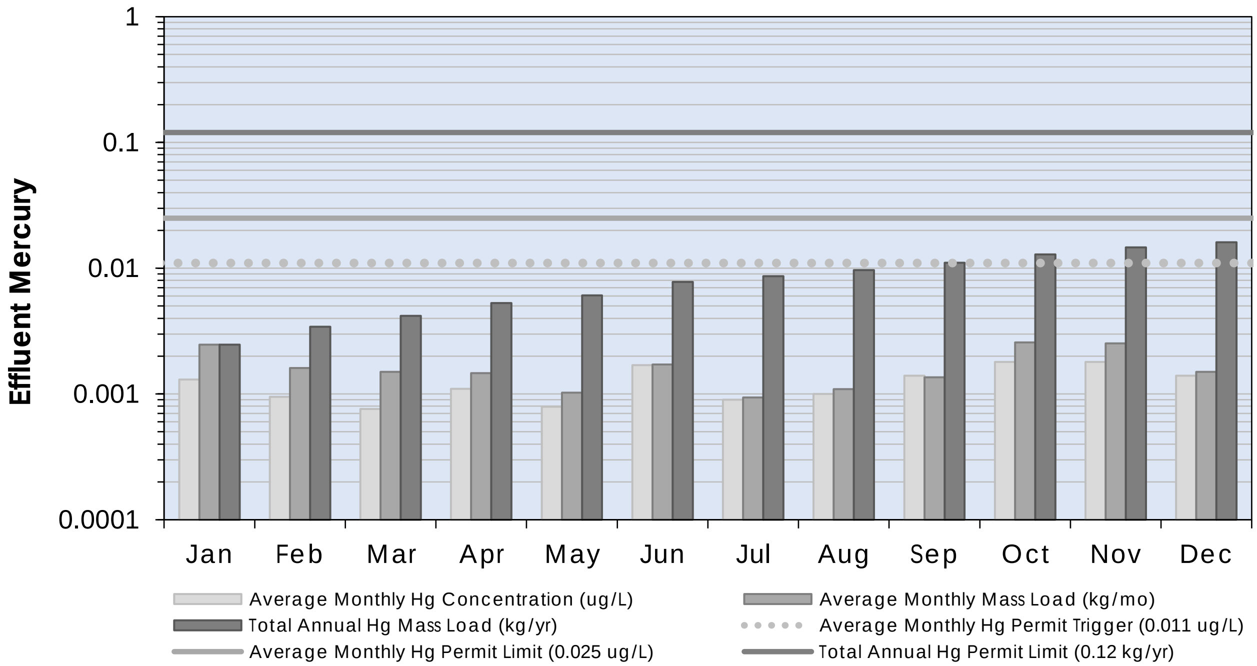

Figure 31: Effluent Mercury Concentrations and Loading Rates during 2017

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. 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. PCBs were not detected using this method during the current reporting period (**Table 1**).

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 discharge. On January 6, 2017, the WPCP experienced a power failure due to a low voltage condition that resulted in a power loss to the entire facility, including communication with pumps and level controls on the tertiary side if the WPCP. Approximately 250 gallons of substantially treated, non-chlorinated wastewater overflowed from the Filtered Water Pump Station, of which only a small portion (25 gallons) discharged into a storm drain inlet on the south side of Carl Road. The remaining volume was captured by a catch basin on the north side of Carl Road, which is connected to the WPCP's Headworks. The WPCP was in the process of installing a curb-to-curb sanitary sewer catch basin (strip drain) within the WPCP's fence line when this event occurred. Construction of the strip drain was completed in December 2017. Details from the overflow event are documented in the January 2017 SMR transmittal letter. Notification of the construction progress for the strip drain was included in the November 2017 SMR transmittal letter, as well as the **Section 2.3** of this Chapter.

2.3. NPDES Compliance Evaluation Inspection

On June 23, 2017, representatives from the RWQCB performed the annual NPDES Compliance Evaluation Inspection (CEI) at the WPCP. A report of their inspection findings was transmitted to the WPCP on August 17, 2017. Section XI of the CEI report listed the following finding that required corrective action on the part of the WPCP:

- Several spills have entered the stormwater collection system via the south-side of Carl Road. In a December 2016 report, the City proposed to construct a curb-to-curb grated catch basin (strip drain) along that segment of road in order to capture fugitive discharges and redirect them to the plant's headworks before reaching the storm drain. An update on the project, including photographs, should be submitted to the Regional Board by January 1, 2018.

On December 22, 2017, the WPCP submitted the SMR for the month of November 2017. Included in this report was an update on the status of the strip drain, the construction of which was completed in December 2017, thereby fulfilling the requirement from the CEI report.

2.4. 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 2017 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 2017 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 2017 and have been added to both the electronic and hard copy versions:

WPCP Overview Chapter	This chapter was revised to reflect changes in staffing and Operator certification levels, addition of an updated organization chart, and updates to the Primary Treatment, Solids Handling, Power Generation, and Recycled Water sections resulting from various construction projects completed or near completion in 2017. A description of the WPCP's new Asset Management System was added to the Maintenance section, and a description of the laboratory's new LIMS system was added to laboratory section.
Chapter III-28 *Emergency Generator*	A draft version of a new O&M Manual Chapter was developed for the WPCP's Emergency Generator, the core component of the WPCP's *Emergency Flow Management Improvements Project,* completed in 2017. The draft will be reviewed by WPCP Operations and Maintenance staff and finalized in 2018.
Chapter II *Electrical One-Lines*	This section's narrative and the Plant Electrical System Overview (Figure II-1) were revised to reflect the new 1 MW emergency diesel generator and changes related to the sodium hypochlorite feed system, and three additional one-line drawings associated with those projects were added. Figure II-17 (Dewatering MCC) and Figure II-12 (Digester MCC) were deleted, as these areas were demolished in 2016.
Chapter III-6, -1 *Primary Sedimentation Basins*	Minor updated and correction to Figure III-6-1.
Chapter III-5 *Preaeration*	Added auxiliary preaeration blowers #1 & #2 to Instrumentation and Control section and revised Emergency Operation paragraph.

As of the end of 2017, the Hypochlorite Feed Project and the Continuous Recycled Water Production Project were approaching completion. Several O&M Manual Chapters are impacted by these projects. Updating of the following sections was initiated in 2017 and will be completed in 2018:

Chapter III-17 *Chlorine Storage and Feed System*	Major revisions to reflect switch from chlorine gas to sodium to hypochlorite.
Chapter III-23 *Recycled Water Production*	Major revisions to reflect change from batch to continuous (parallel) production.
Chapter III-18 *Sodium Bisulfite Storage and Feed System*	Minor revisions to reflect new SBS injection point.
Chapter III-9 *Air Flotation Tanks*	Minor revisions for continuous recycled water production.
Chapter III-10 *Dual Media Filters*	Minor revisions for continuous recycled water production.
Chapter III-11 *Chlorination/Dechlorination*	Minor revisions for continuous recycled water production, switch to sodium hypochlorite, and new SBS injection point.
Chapter II *Electrical One-lines*	Revisions to one-line drawings associated with each of the above areas.

The WPCP has also initiated a project to evaluate alternatives for development of an all-electronic O&M Manual. The project will continue in 2018.

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 2017 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 loading or unloading of one-ton chlorine cylinders. 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. The following is a list of SOPs that were updated, created new, or approved from 2016 revisions during this reporting period:

Edits/Updates

- SOP #1023C: Used Oil, Oily Waste, and Oil Filter Accumulation, Labeling & Recycling
- SOP #2020G: Emergency Evacuation of Sunnyvale Water Pollution Control Plant
- SOP #3004G: Chlorine Gas Leak Emergency Response
- SOP #3027C: Lighting of Waste Gas Burners
- SOP #3037D: Evacuation, Purge and Leak Testing of the Chlorine Liquid Supply Piping
- SOP #4005E: Sedimentation Basin PM

SOPs Added/Created

- SOP #2027A: Construction Zone Safety

Approved from Edits/Updates in 2016

- SOP #1010E: Grit Pick-Up Procedure
- SOP #3002E: Chlorine Gas System Status Definition
- SOP #3003G: Procedures for Handling the Chlorine Gas System
- SOP #3010B: Use of High-Pressure Spray Washer
- SOP #3032F: Chlorine One-Ton Tank Delivery Procedure
- SOP #3036C: Operation, Calibration & Maintenance of Ventis MX4 Multi-Gas Monitors
- SOP #3050A: Effluent Chlorine Residual Monitoring and Reporting

Electronic versions of the WPCP SOPs are kept at J:\ESD\WPCP\WPCPData\SOPs\SOP - signed PDF.

2.0. PLANT MAINTENANCE PROGRAM

The WPCP continues to use the Maximo computerized maintenance management system (CMMS) software as the core data management tool for its maintenance program. Electronic versions of Maximo report documents can be accessed by using the Crystal Reports program.

Maintenance staff can use DataSplice handheld computing units and software to interface with the Maximo system. The DataSplice handhelds provide a field interface to work orders for corrective maintenance and preventative maintenance (PM) procedures, preventative operations procedures (POPs)[9], equipment information (via a bar-code reader) and expedited data entry for work orders and other maintenance/process control measurements. The Maintenance section is considering supplementing the DataSplice units with laptop computers or tablets, whose larger screens would provide a more convenient interface for certain maintenance functions.

In 2017, WPCP Operations and Maintenance staff continued the ongoing process of updating (and where necessary, developing) PMs and POPs. In addition, the WPCP continued upgrades to its OPTO SCADA system screens and programming. The WPCP places a strong emphasis on preventative maintenance as a

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

means to achieve high mechanical reliability. Staff members from both Operations and Maintenance sections perform preventative maintenance functions.

An outside consultant provides ongoing support for use and improvement of the Maximo CMMS. There are currently 3,382 pieces of equipment identified in the Maximo equipment database. The system has improved the efficiency of the WPCP's Maintenance Program, and contributes to WPCP reliability through more timely access to maintenance information and work order status, better inventory control, and advanced features such as predictive maintenance. In a given year, the Maximo CMMS generates and tracks about 900 PMs that are performed by Maintenance staff, and about 12,000 POPs that are performed by Operations staff.

During the 2017 reporting period, the WPCP generated approximately 1,159 maintenance related work orders, of which 1,123 were completed in the same year (97%). The remaining work orders will be carried over into 2018 and completed according to schedule. In addition, the WPCP generated and completed all 12,000 POPs.

The WPCP 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 2017 included:

- Repairs to Air Floatation Tanks #2 and #3
- Rehabilitation of the Pond Aerators
- Major off-frame overhaul of the #1 Power Generator Unit
- Rehabilitation of #2 Pond Circulation Pump
- LED lighting upgrades

During the 2017 reporting period, the WPCP continued the process of transitioning its computerized maintenance management system (CMMS) from the current 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.

The City issued a request for proposals in May 2016. An evaluation team consisting of Environmental Services Department (ESD) and City IT staff identified the four most qualitied proposers, eventually selecting the Infor EAM Enterprise cloud-based application. The City Council approved the vendor recommendation on March 28, 2017, and a notice to proceed was issued to the selected vendor on April 17, 2017. The resulting contract included system implementation and four years of licensing, maintenance and support. Throughout 2017, the City worked with the vendor on data migration from Maximo to the new system, with concomitant filtering and removal of obsolete data. The City anticipates project completion and full implementation of the system in early 2018 (**Chapter IV, Section 10.0**).

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. A description or summary of review and evaluation procedures, and applicable wastewater facility programs or CIP projects is included in each annual SMR.

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 effort. 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.

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 20, 2017, approving a 10% increase in the rate for sewer service for Fiscal Year 2017/2018. The increase reflects needed improvements to the City's aging infrastructure and increases in operating and regulatory compliance costs. This translates into a monthly increase of $4.29 for an average single-family residence and $2.77 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 2017. 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 Chief Plant Operator and WPCP Maintenance Manager report to the WPCP Division Manager. The Lab Manager reports to the Regulatory Programs Division Manager.
Operations Staff	25 full-time Operators, including two Principal Operators, four Senior Operators, and 19 Operators. In addition, there is one Utility Worker 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 Staff	One Senior Inspector, four Environmental Compliance Inspectors, and two Lab/Field Technicians.
Compliance and Technical Support Staff	Two Environmental Engineering Coordinators.

Operations

WPCP operations are performed by a highly skilled group of State Water Board-certified Operators organized into five shifts (Day, Swing, Grave, Relief 1 and Relief 2). 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 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 Maximo CMMS, as described under the Plant Maintenance Program, but is in the process of transitioning to a new system expected to be fully functional in early 2018 (**Section 2.0**).

The Wastewater Collections Section utilizes the staffing described above for maintenance of the wastewater and stormwater 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 (City Attorney's Office, Purchasing, Finance, Human Resources). The City also has contracts with various consultant firms for technical and regulatory support, planning studies, engineering design for CIP projects, and other needs. The City believes that current staff allocation and supervision are sufficient to perform its mission and meet the requirements listed in the introduction to this section. 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 and sanitary sewer collection systems, and shares responsibility with the WPCP Division Manager over 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.
Maintenance Staff	One Senior Mechanic, eight Mechanics, and one Senior Storekeeper.

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 begin construction of the Storm Pump Station No. 1 upgrade project. In addition, the City will complete the design and begin construction of the Lawrence Sanitary Sewer Trunk Main Rehabilitation Phase 1 project addressing the immediate needs identified in the earlier condition assessment project. The City runs 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 2017 annual review, the "Emergency Only" Telephone Notification List was updated and attached to the existing Plan.

Several projects underway at the WPCP will impact contingency operations as discussed below. These include the Emergency Flow Management Evaluation and Project, the Primary Treatment Facilities Project, and the Sodium Hypochlorite Conversion and Continuous Recycled Water Project. The WPCP is planning to update the Contingency Plan in 2018, following the completion of several of the projects.

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 will address a potential failure of the primary effluent pipeline under the WPCP Primary Treatment Facility reconstruction project. This project will provide two key infrastructure components - a new primary effluent junction structure and 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 remain 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. The contractor has completed all training on the generator and, following some additional electrical work, the project is expected to be completed in early 2018 (**Chapter IV, Section 8.0**).

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.

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 100% of plant 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 2020. Refer to **Chapter IV, Section 8.0** for more information.

Sodium Hypochlorite Conversion and Continuous Recycled Water Project

This project will replace the existing chlorine gas system used for wastewater and recycled water disinfection with one that utilizes liquid sodium hypochlorite. As a result of this change, the existing Toxic Gas Scrubber facility will also be decommissioned, and a formal Risk Management Plan will no longer be 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 will impact 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 also elements of Section 3.5 (Chlorination/Dechlorination). New information regarding sodium hypochlorite storage, spill prevention, and emergency response will be added. This project is nearing completion and is expected to be operational in early 2018. Refer to **Chapter IV, Section 3.0** for more information.

Updating the Contingency Plan

This status report will be appended to the Contingency Plan and will serve as the 2017 update. During 2018, the WPCP plans to incorporate the above information, plus additional detailed information regarding changes to emergency power operations that will occur when the above-referenced 1 MW backup generator is installed and fully functional. At that time, the Contingency Plan will be reprinted.

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 to this document, the SPCC Plan 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 Clean Water Program* (SCWP). With an estimated cost of approximately $456 million[10], the SCWP will serve as a long-term guide for replacing the WPCP’s aging infrastructure and operation. **Table 3** lists all the projects within the CIP, including several from the SCVWP. Key projects currently underway are highlighted in the table and presented in Fact Sheets in the preceding sections[11]. During fiscal year 2016-2017, the City expended approximately $13.7 million on select CIP projects.

Figure 32: View of WPCP looking east

[10] Budgeted amount for Phases 1-3 of the Master Plan. Phases 4-5 are not included.
[11] CIP information gathered from the *Adopted Budget and Resource Allocation Plan for the City of Sunnyvale Fiscal Year 2016-2017, Volume III – Project Budget*.

Table 3: 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
Facility Condition Assessment	$ 953,177	C	2017			X	X		
Primary Treatment Facilities Design and Construction	$ 125,731,237	A	2020	X	X				
Administration and Laboratory Building	$ 22,870,000	A	2021	X	X			X	
Caribbean Drive Parking and Bay Trail Access Enhancements	$ 1,270,000	A	2019				X		
Anaerobic Digester Rehabilitation	$ 13,622,000	C	2017					X	X
Hypochlorite Conversion & Continuous Recycled Water Production Facilities	$ 7,261,210	A	2018				X		
Emergency Flow Management	$ 2,883,001	A	2018		X				
Biosolids Processing	$ 28,925,933	A	2025			X			
Asset Management Program	$450,000	A	2018	X	X	X	X	X	X
Oxidation Pond Levee Rehabilitation	$ 3,893,119	A	2027			X			
Master Plan	$ 8,100,400	C	2016	X	X	X	X	X	X
Laboratory Information Management System (LIMS)	$ 250,000	C	2016	X	X	X	X	X	
Dual Media Filter Rehabilitation	$ 347,672	C	2016				X		
Construction of New WPCP	$ 151,554,685	P	2024	X	X	X	X	X	X
WPCP Program Management	$ 54,884,020	P	2027	X	X	X	X	X	X
WPCP Construction Management	$35,887,318	P	2027	X	X				
Primary Process Repairs	$ 954,000	P	2017		X				
Secondary Process Repairs	$ 925,000	P	2020			X			
Tertiary Process Repairs	$ 2,426,080	P	2022				X		
PGF Repairs	$2,450,000	P	2026						X
Solids/Dewatering Repairs	$ 100,000	P	2017						X
Support Facilities Repairs	$ 584,000	P	2020	X	X	X	X	X	X
CIP Total	***$ 466,322,852***								

Notes:

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

2.0. FACILITY CONDITION ASSESSMENT

SUNNYVALE
CLEANWATER
PROGRAM

PROJECT TITLE
Facility Condition Assessment

CONTRACTOR
AECOM

START DATE
May 2017

PROJECT STATUS
In Progress

Sunnyvale

Condition Assessment

WHAT IS IT?

Under the Condition Assessment project, the contractor performed physical assessments of the existing condition of critical equipment and structures within the secondary and tertiary process areas of the WPCP, including the Oxidation Ponds and influent sewer piping. Their findings and recommendations are being used to support the development, prioritization and timeline of planned improvements, on-going asset management efforts, and planning-level improvement costs.

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 procuring 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
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.

PROJECT AREAS

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?

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 westbound travel on Caribbean Drive to a minimum of 15 parking parallel parking spaces; installing curbside bioretention cells between the parking spaces to treat stormwater; modifying the existing bicycle lane and adding a sidewalk; and striping modifications for transitioning from three lanes to two and back to three lanes.

Rendering of possible parking enhancements

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. ANAEROBIC DIGESTER REHABILITATION

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Anaerobic Digester Rehabilitation

CONTRACTOR
AZTEC Construction

START DATE
January 2014

PROJECT STATUS
Completed — 2017

Sunnyvale

Anaerobic Digester Rehabilitation

WHAT IS IT?

The Digester Rehabilitation project focuses on the design and construction to renovate digesters #1 & 2. This includes replacement of lids, rehabilitation and seismic retrofit of the digester tanks themselves, the sludge mixing equipment, and related peripheral equipment. The structural integrity of the digester lids must be maintained to prevent releases of potentially hazardous methane gas that could pose the potential for explosion and/or result in air district violations.

Contractors working on a digester lid

WHY?

Digesters #1 and #2 were built in 1955. The digester lids have deteriorated, and methane gas has been found between the structural layers of the lids. Spot repairs extended their useful life, but were insufficient in securing long-term reliability. As such, the lids and other equipment required replacement to prevent failure and extend the life of the digesters by 30 years.

7.0. HYPOCHLORITE CONVERSION AND CONTINUOUS RECYCLED WATER

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Hypochlorite Conversion and Continuous Recycled Water Production Facilities

CONTRACTOR
Anderson Pacific

START DATE
May/July 2015

PROJECT STATUS
In progress

Sunnyvale

Sodium Hypochlorite Conversion & Continuous Recycled Water

WHAT IS IT?

SODIUM HYPOCHLORITE: This project provides for the design and construction of a liquid chlorine disinfection system to replace the existing gaseous chlorine system.

RECYCLED WATER: The Recycled Water project provides the design and construction of a separate process for enhanced parallel production of recycled water at the WPCP.

New sodium hypochlorite tank farm

WHY?

SODIUM HYPOCHLORITE: Chlorine gas is extremely hazardous and most POTWs have transitioned away from its use for effluent disinfection. The WPCP plans to use the less hazardous liquid sodium hypochlorite.

RECYCLED WATER: Recycled Water is currently produced at the WPCP through a labor intensive batch process that incurs high chemical costs. Having a separate and continuously operating process will reduce chemical and operating costs, and improve process reliability.

PROJECT AREAS

8.0. EMERGENCY FLOW MANAGEMENT

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Emergency Flow Management

CONTRACTOR
Anderson Pacific

START DATE
February 2016

PROJECT STATUS
In progress

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

Sunnyvale

9.0. 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?

New Synagro Dewatering Area

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

WHY?

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

10.0. ASSET MANAGEMENT PROGRAM

SUNNYVALE
CAPITAL IMPROVEMENT
PROGRAM

PROJECT TITLE
Asset Management Program

CONTRACTOR
The Arcanum Group

START DATE
May 2017

PROJECT STATUS
In Progress

Sunnyvale

Asset Management Program

WHAT IS IT?

WPCP infrastructure consists of approximately 3,400 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 Computerized Maintenance Management System (CMMS) that will better align with the needs of the new Plant being built as part of the Clean Water Program.

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

11.0. 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
In Progress

Sunnyvale

Levee Maintenance Program

WHAT IS IT?


Oxidation Pond Levees

The Levee Maintenance Program will include the development of an Oxidation Pond Operation and Maintenance (O&M) Implementation Plan to assist the City in managing repairs and maintenance efforts for the existing levees surrounding the 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 performed a comprehensive condition assessment of the city roads and bridges, which included the pond levees. The City has used the results to complete a corresponding digital GIS mapping and will develop a plan 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.

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 2017 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 above, 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 2017, the City continued to collect influent and effluent samples for analysis of nutrients in accordance with the RWQCB's April 2014 regional NPDES Permit for nutrients, Order R2-2014-0014. As required by that Order, results from the WPCP's ongoing monitoring are submitted electronically to CIWQS in monthly SMRs. These results are compiled by BACWA into a group annual report and submitted to the RWQCB. In addition, the WPCP has elected to include nutrient data in **Chapter II, Section 1.5** of this report.

3.0. 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. Subsequently, a numeric model used to estimate dilution was developed. Results from these efforts were not needed for the 2014 permit reissuance, but are available for future use.

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 sensitive 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, which can be found 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 to monitor its receiving waters at or between RMP monitoring station C-1-3 and Sunnyvale station C-2-0 (**Figure 33**) 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

Figure 33: RMP monitoring stations in Guadalupe Slough and the NASA/Ames Boat Ramp

in R2-2014-0035, and to provide data 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.

The City elected to conduct the required monitoring using its own personnel and resources, and in August 2017 implemented its Receiving Water Monitoring Program (**Figure 34**). Under the Receiving Water Monitoring Program, and in accordance with Provision VI of Attachment E, monitoring of the receiving water will occur monthly over a contiguous 12-month period during the term of the current NPDES permit. Monitoring events will occur on days when compliance samples are collected from the final effluent sampling point (EFF-001). In addition to field observations, water quality samples will be collected within one-foot of the surface water and analyzed for salinity, temperature, pH, and total ammonia as nitrogen. Un-ionized ammonia concentrations will be calculated from these measurements. All pertinent data collected under the Receiving Water Monitoring Program will be submitted with the City's application for permit reissuance on or before February 1, 2019.

Figure 34: 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 2.4**). 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 has 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.

ATTACHMENTS

ATTACHMENT A

Wastewater Treatment Process Schematic

Solids Treatment Process Schematic

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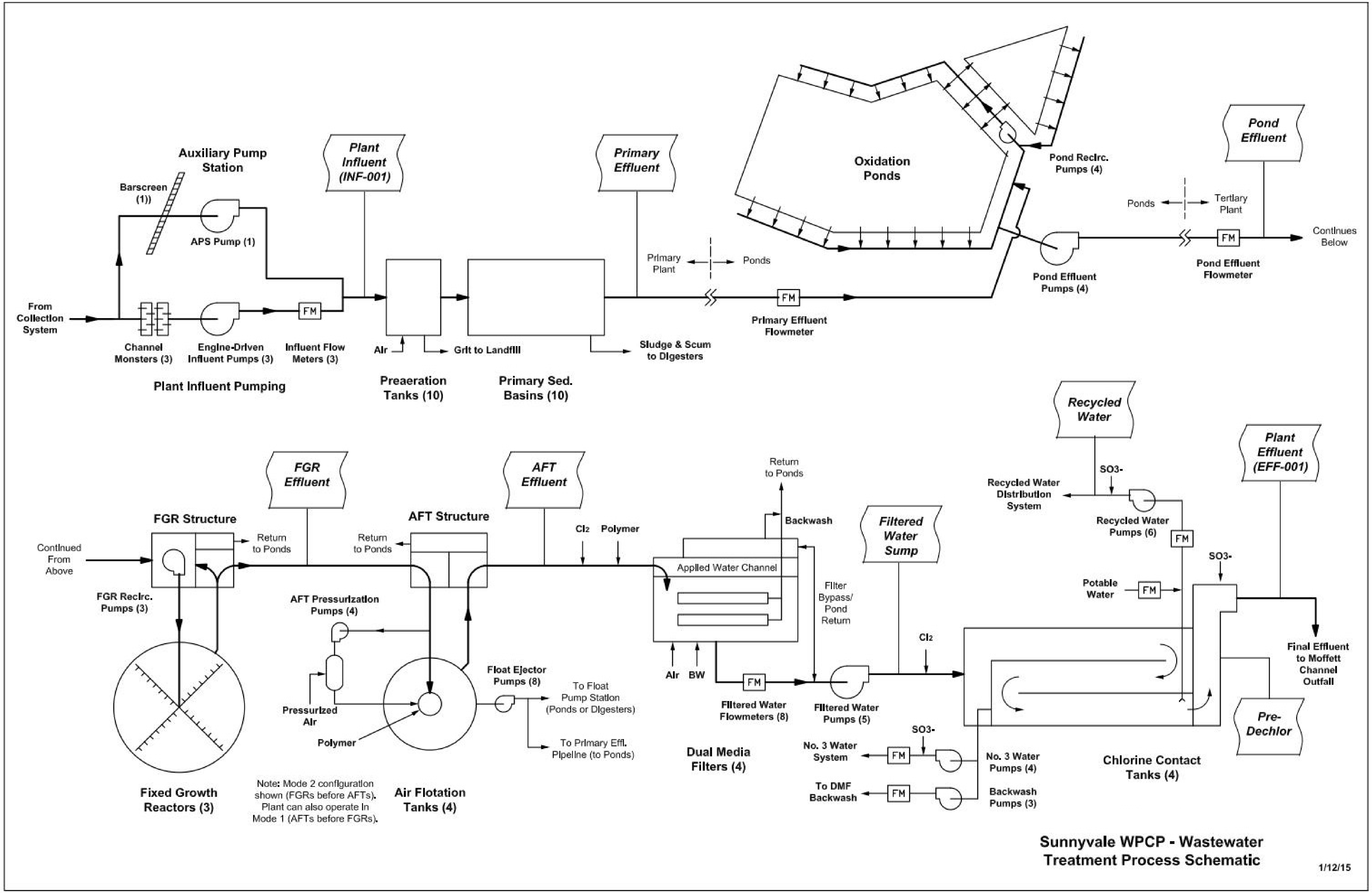
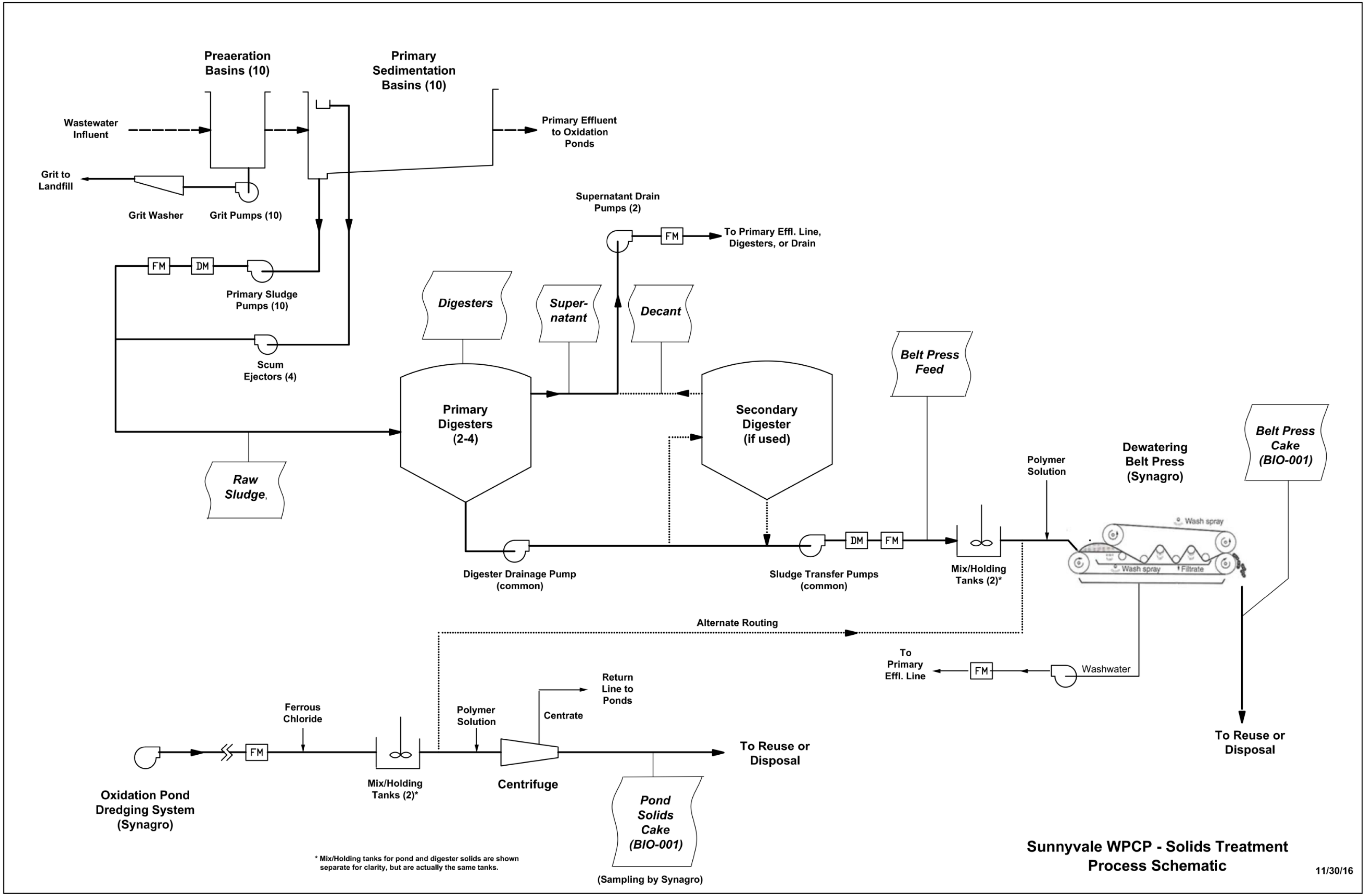

Auxiliary Pump Station
Barscreen (1))
APS Pump (1)
Plant Influent (INF-001)
Primary Effluent
Oxidation Ponds
Pond Recirc. Pumps (4)
Pond Effluent
Ponds
Tertiary Plant
Continues Below
Pond Effluent Flowmeter
Pond Effluent Pumps (4)
Primary Plant
Ponds
FM
Primary Effluent Flowmeter
From Collection System
Channel Monsters (3)
Engine-Driven Influent Pumps (3)
Influent Flow Meters (3)
Air
Grit to Landfill
Sludge & Scum to Digesters
Plant Influent Pumping
Preaeration Tanks (10)
Primary Sed. Basins (10)
Recycled Water
Plant Effluent (EFF-001)
FGR Effluent
AFT Effluent
Return to Ponds
SO3-
Recycled Water Distribution System
Recycled Water Pumps (6)
FGR Structure
AFT Structure
Cl2
Polymer
Backwash
Filtered Water Sump
Continued From Above
Return to Ponds
Return to Ponds
Applied Water Channel
Filter Bypass/ Pond Return
Potable Water
SO3-
FGR Recirc. Pumps (3)
AFT Pressurization Pumps (4)
Cl2
Final Effluent to Moffett Channel Outfall
Float Ejector Pumps (8)
To Float Pump Station (Ponds or Digesters)
Air
BW
Pressurized Air
Polymer
To Primary Effl. Pipeline (to Ponds)
Filtered Water Flowmeters (8)
Filtered Water Pumps (5)
Pre-Dechlor
SO3-
No. 3 Water System
No. 3 Water Pumps (4)
Dual Media Filters (4)
Chlorine Contact Tanks (4)
To DMF Backwash
Backwash Pumps (3)
Fixed Growth Reactors (3)
Note: Mode 2 configuration shown (FGRs before AFTs). Plant can also operate in Mode 1 (AFTs before FGRs).
Air Flotation Tanks (4)
Sunnyvale WPCP - Wastewater Treatment Process Schematic
1/12/15


Preaeration Basins (10)
Primary Sedimentation Basins (10)
Wastewater Influent
Primary Effluent to Oxidation Ponds
Grit to Landfill
Grit Washer
Grit Pumps (10)
Supernatant Drain Pumps (2)
FM
To Primary Effl. Line, Digesters, or Drain
DM
Primary Sludge Pumps (10)
Digesters
Super-natant
Decant
Belt Press Feed
Scum Ejectors (4)
Primary Digesters (2-4)
Secondary Digester (if used)
Raw Sludge,
Polymer Solution
Dewatering Belt Press (Synagro)
Belt Press Cake (BIO-001)
Wash spray
Filtrate
Digester Drainage Pump (common)
Sludge Transfer Pumps (common)
Mix/Holding Tanks (2)*
Alternate Routing
To Primary Effl. Line
Washwater
Return Line to Ponds
Ferrous Chloride
Centrate
To Reuse or Disposal
Centrifuge
Oxidation Pond Dredging System (Synagro)
Pond Solids Cake (BIO-001)
(Sampling by Synagro)
* Mix/Holding tanks for pond and digester solids are shown separate for clarity, but are actually the same tanks.
Sunnyvale WPCP - Solids Treatment Process Schematic
11/30/16

ATTACHMENT B

WPCP Certificate of Environmental Accreditation

WPCP Approved Analyses

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

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

City of Sunnyvale Environmental Laboratory

Environmental Services Dept. - Regulatory Programs Division

1444 Borregas Avenue

Sunnyvale, CA 94088

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

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

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

Certificate No.: **1340**

Expiration Date: **10/31/2018**

Effective Date: **11/1/2016**

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 Division
1444 Borregas Avenue
Sunnyvale, CA 94088
Phone: (408) 730-7260

Certificate No. **1340**
Expiration Date **10/31/2018**

Field of Testing: 101 - Microbiology of Drinking Water

101.010	001	Heterotrophic Bacteria	SM9215B	
101.010	002	Heterotrophic Bacteria	SimPlate	
101.050	001	Total Coliform P/A	SM9223B (Colilert)	
101.050	002	E. coli P/A	SM9223B (Colilert)	
101.050	003	Total Coliform (Enumeration)	SM9223B (Colilert/Quanti-Tray)	Interim
101.050	004	E. coli (Enumeration)	SM9223B (Colilert/Quanti-Tray)	Interim

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-1997
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	011	Mercury	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8

As of 11/8/2017 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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	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	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	1,1,1,2-Tetrachloroethane	EPA 524.2
104.040	044	1,1,2,2-Tetrachloroethane	EPA 524.2
104.040	045	Tetrachloroethene	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

107.020	002	Total Coliform (Enumeration)	SM9221B-2006	
107.242	001	Enterococci	Enterolert	

Field of Testing: 108 - Inorganic Chemistry of Wastewater

108.020	001	Conductivity	EPA 120.1	
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	
108.502	002	Ammonia (as N)	SM4500-NH3 B,E-1997	
108.514	001	Nitrite (as N)	SM4500-NO2- B-2000	
108.532	001	Oxygen, dissolved	SM4500-O C-2001	Interim
108.536	001	Oxygen, dissolved	SM4500-O G-2001	Interim
108.540	001	Phosphate, Ortho (as P)	SM4500-P E-1999	
108.541	001	Phosphorus, Total	SM4500-P E-1999	
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	

As of 11/8/2017 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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		
126.010	001	Total Coliform (Enumeration)	SM9221B,C-2006
126.050	002	E. coli (Enumeration)	SM9223B (Colilert/Quanti-Tray)
126.080	001	Enterococci	Enterolert

As of 11/8/2017 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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ATTACHMENT C

Effluent Characterization Study and Report Monitoring Results 2014 - 2015

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Table 4: 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.