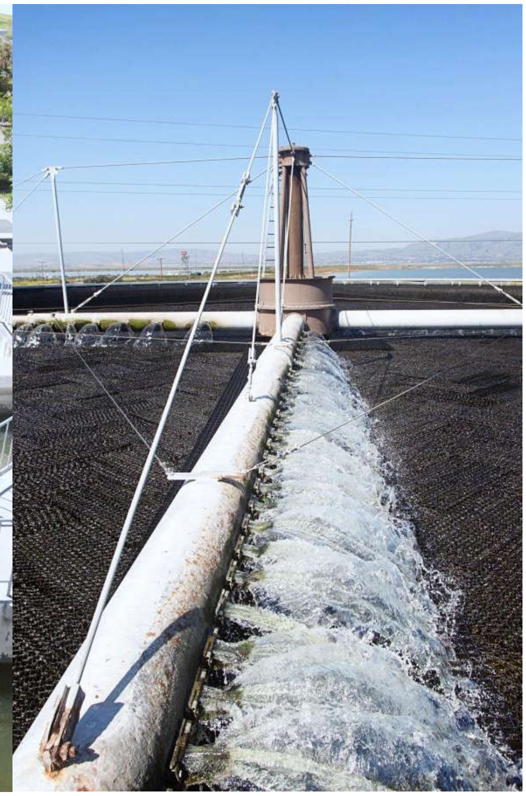
City of Sunnyvale | Environmental Services Department





Sunnyvale Water Pollution Control Plant

Plant Compliance

Annual NPDES Report
R2-2014-0035

2016

2016 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

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February 1, 2017

February 1, 2017

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

Attn: NPDES Division

Subject: 2016 Annual Self-Monitoring Report, City of Sunnyvale Water Pollution Control Plant

The attached 2016 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) 730-7260.

Sincerely,

Bhavani Yerrapotu
WPCP Division Manager

Attachment: 2016 NPDES Annual Report

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I. INTRODUCTION

1.0. BACKGROUND

The 2016 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, 2016, 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 2016 Annual NPDES Report with the reporting summarized in **Chapter II, Sections 2.1.3** and **Section 2.1.4**.

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 will provide its nutrient information in a separate annual report or state that it is participating in a group report submitted by BACWA. The 2016 Group Annual Report was prepared and submitted by BACWA on October 1, 2016. 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, and the City has periodically increased treatment capacity as the City's population has grown to 148,372 (2016) 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. Spatial 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.

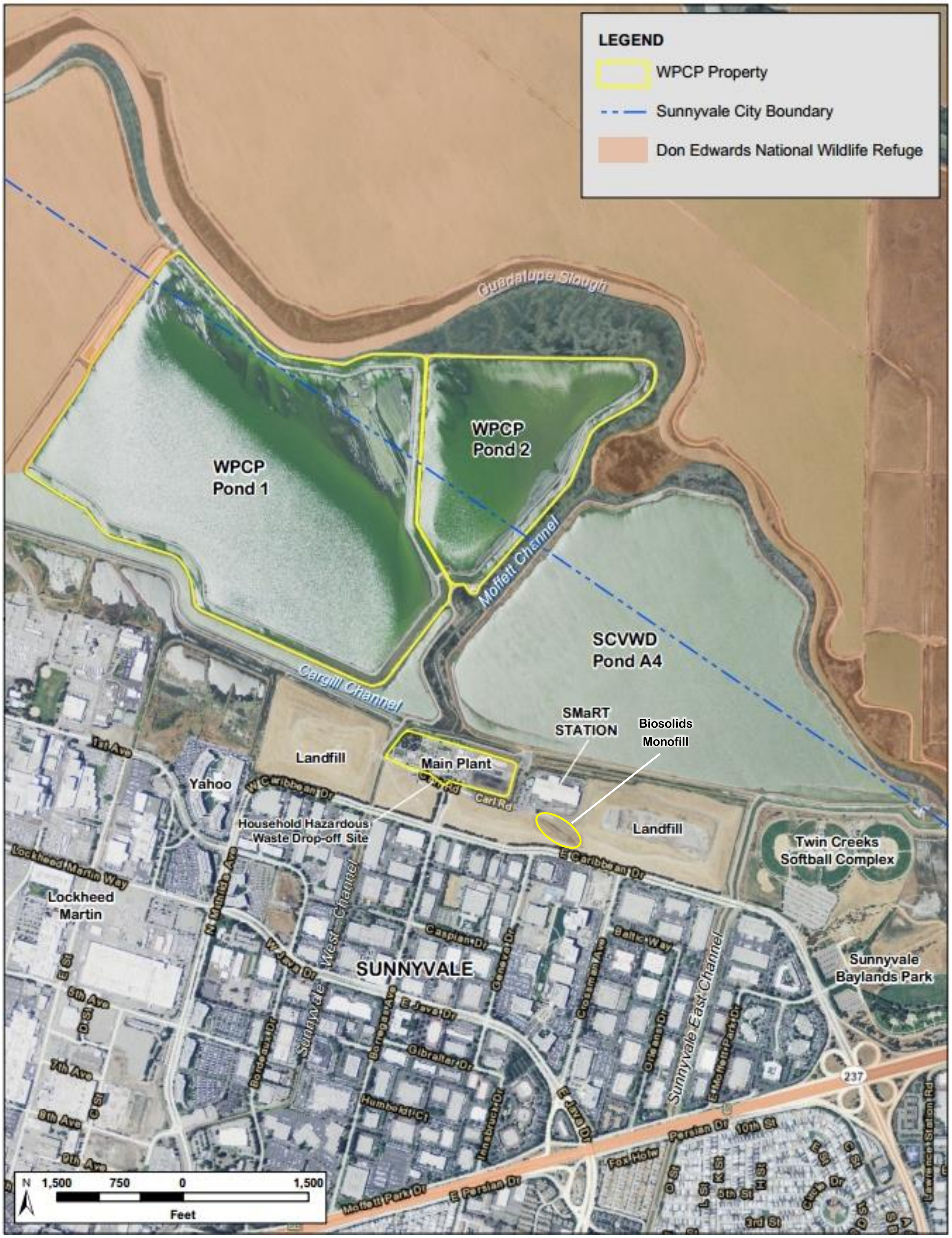


Figure 1: WPCP Site Location Map

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 at the WPCP is 29.5 million gallons per day (MGD), which also corresponds to the permitted capacity. Peak wet weather design capacity is 40 MGD. Over the past 10 years (January 1, 2006 to present), the WPCP's highest daily dry weather discharge was 22.9 MGD, which occurred on September 9, 2010, and the highest wet weather discharge 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) and Master Plan that will 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 as they pertain to the various processes described and are described in more detail in **Chapter IV.**

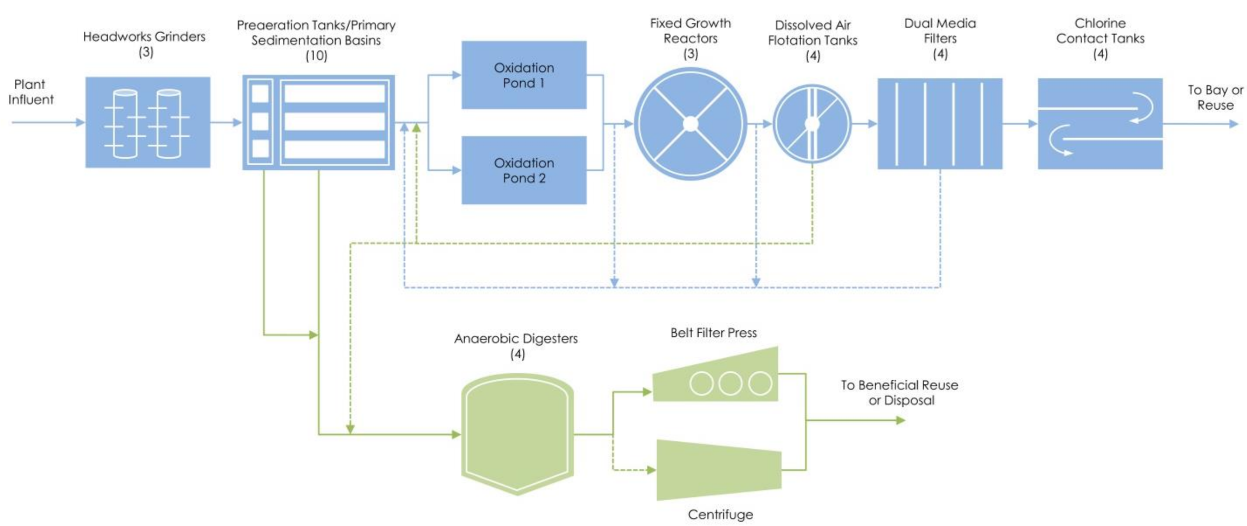


Figure 4: WPCP Process Flow Diagram. Blue corresponds to liquid and green to solids flows

2.1.1. Headworks and Primary Treatment

The Headworks and Primary Treatment Facilities were initially 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. 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 carry screened wastewater into the Primary Treatment Facility.

Construction of new Primary Treatment Facilities, including a new influent pump station, is currently underway with a projected completion year of 2019 (**Chapter IV, Section 7.0**). 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 addition, the City is embarking on an Emergency Flow Management Project that will provide a 1 MW trailer-mounted backup diesel generator that can be used to power specific areas of the plant that experience power outages, or with sufficient shedding of non-critical loads, the entire plant (**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 provide supplemental aeration.

Figure 6: Aerial photo of the Oxidation Ponds

Primary effluent discharged into the ponds is mixed by recirculation of pond effluent back into the distribution channel at a 4:1 ratio, which in effect creates a single large pond. Ammonia and organic material present in the primary effluent are readily degraded in the Oxidation Ponds by aerobic and anaerobic bacteria[1]. The average detention time of the ponds is 30-45 days and is dependent on flows, operating depth, and other factors. In addition, the ponds provide the added benefit of flow equalization for primary effluent so that downstream processes can be operated at a constant flow rate. Flow equalization capacity is a function of pond depth but typically ranges from 50-100 million gallons (MG), equivalent to a 0.4 – 0.8-foot change in surface elevation.

The City has been engaged in a long-term pond dredging project since late 2012 to remove accumulated solids (**Chapter IV, Section 6.0**), thereby recovering lost volume and improving overall treatment efficacy. Solids removed from this project are processed on-site before being hauled off-site. Refer to **Section 2.3** of this Chapter for more information on solids handling.

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

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

[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 is less susceptible to the same seasonal fluctuations.

winter months, the nitrification efficacy of the Oxidation Ponds is reduced and the FGRs provide the majority of nitrification needed to meet discharge limitations.

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 (**Chapter IV, Section 2.1.0**). Additional repairs and improvements are schedule for 2017 as well to extend their useful life by at least 10 years.

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 1990's to facilitate the production of recycled water (**Section 2.4**).

As a final polishing step, 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 (**Chapter IV, Section 4.0**).

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 and engine cooling.

The City is in the construction phase for disinfection and recycled water improvements, which include replacing 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 4.0**).

2.2. WPCP Laboratory

The WPCP operates an on-site laboratory that analyzes samples collected for regulatory compliance and process reporting, 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, as well as a current environmental certification, is included in **Attachment B**.

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 is expected to improve 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 is anticipated to begin in early 2017, with construction expected to begin in 2019 and complete by 2021.

2.3. Sludge and Biosolids Management

Solids removed during primary treatment are fed into primary anaerobic digesters and detained for approximately 35-40 days at a temperature of 96-103^{o}F. Primary digestion is typically followed by additional treatment in a secondary digester for 12-15 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 2016, the City completed as series of digester improvements that began in 2008 and consisted of replacing the original floating covers with fixed covers,

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

the conversion from a gas to a pumped recirculation mixing system, structural rehabilitation and repair, and replacement of most mechanical and electrical equipment (**Chapter IV, Section 3.0**).

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. 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, which form the backbone of the WPCP's Power Generation Facility (PGF). The PGF on average produces 1.2 megawatts (MW) of power, which provides the majority of power used by the WPCP, offsetting the majority PG&E power purchases. 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.

Historically, anaerobically digested sludge (biosolids) was conditioned with polymer and dewatered on gravity drainage tiles (Dewatering Beds) to approximately 15-20% solids and then solar dried to approximately 25-50% solids prior to disposal. Beginning in February 2016, the WPCP adjusted its solids handling location and operation to accommodate construction of the new Primary Treatment Facilities (**Chapter IV, Section 7.0**), which are being placed in the same area as the former Dewatering Beds. Though the goal of 25-50% solids remains unchanged, biosolids are now sent to a new location at the WPCP and mechanically dewatered using a belt filter press (**Figure 11**). Filtrate and wash water from the belt filter press are returned to the Oxidation Ponds for additional treatment. Processing of dredged biosolids[2] from the Oxidation Ponds remains the same in the new location, wherein biosolids are chemically conditioned and dewatered using a centrifuge to approximately 20-25% solids. Centrate is also returned to the Oxidation Ponds for additional treatment. A solids process flow diagram is included in **Attachment A**.

Figure 11: Solids dewatering operation

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 vast 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 requirements for resale as compost. The SBM was created to periodically receive biosolids produced when an anaerobic digester is cleaned-out, the

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

frequency of which can vary depending on the feed rate and composition of the raw sludge but on average occurs every 3-4 years. During the 2016 reporting period, all 2,280 dry tons of biosolids produced were land applied in Sacramento County. Of the total, 1,766 dry tons were dredged from the Oxidation Ponds and 514 dry tons were removed from the anaerobic digesters. For additional information on biosolids management at the WPCP, refer to the *Biosolids Management Annual Report* for 2016, scheduled for submittal by February 21, 2017, 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) SF Bay discharge, or 2) recycled water production. In its current configuration, the WPCP does not have the ability to simultaneously produce and distribute recycled water and discharge to the SF 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 Title 22 of the California Code of Regulations. 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.

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 about 10% of the daily wastewater flow has been diverted for recycled water. All water recycling is accomplished in accordance with water reclamation requirements in Regional Water Board Order No. 94-069. For additional information on recycled water production at the WPCP, refer to the *Recycled Water Annual Report* for 2016, scheduled for submittal to the RWQCB by March 15, 2017.

Figure 12: WPCP Recycled Water distribution piping

In addition, disinfected secondary recycled water (No. 3 Water) is partially dechlorinated and reused internally for filter backwashing and engine cooling. Use of No. 3 Water is relatively constant throughout the year with an average annual use around 300 MG.

In 2016, the WPCP produced approximately 227 MG of disinfected tertiary recycled water, with the highest production rates between May and September when irrigation demands are greatest (**Figure 13**). As part of the Hypochlorite Conversion and Continuous Recycled Water Production Facility project, WPCP

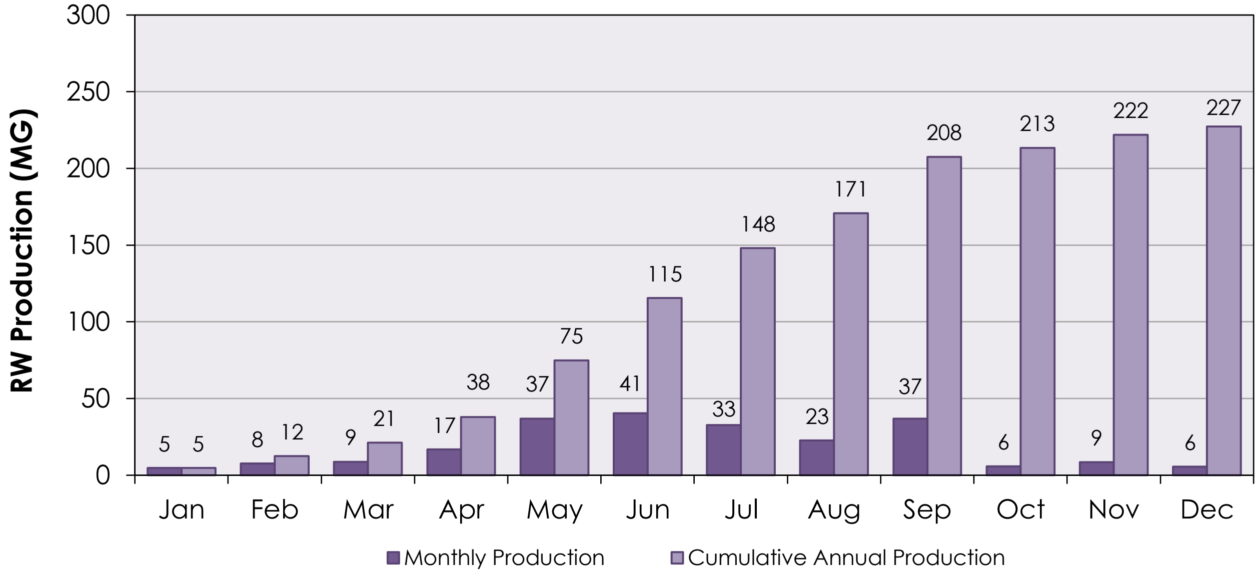


Figure 13: Recycled Water Production at the WPCP during 2016

facilities are 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 4.0**).

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.

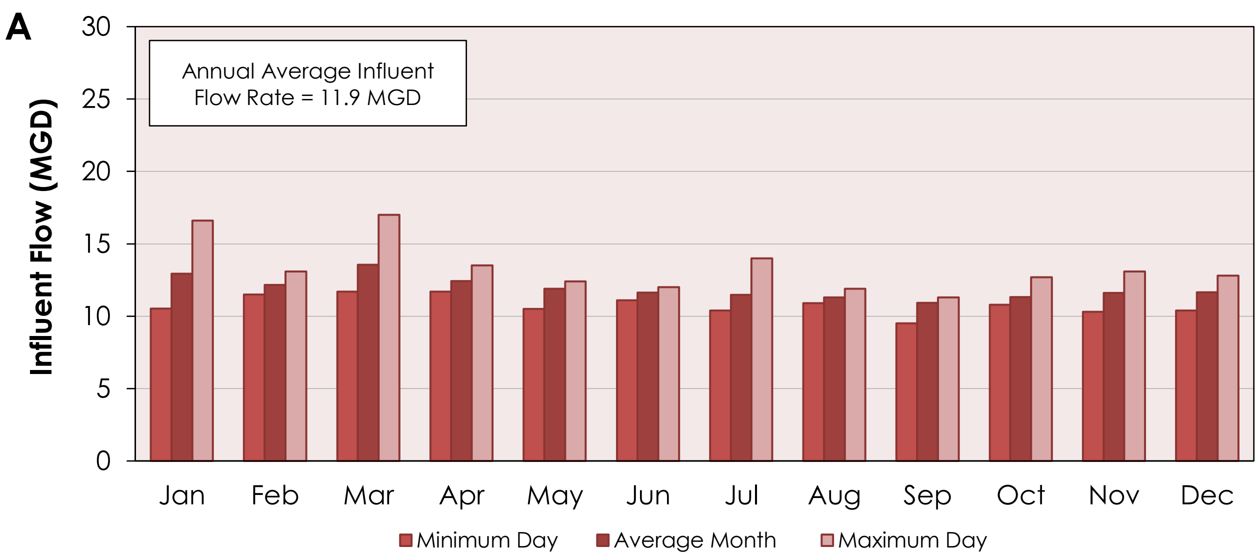
II. PLANT PERFORMANCE AND COMPLIANCE

1.0. PLANT PERFORMANCE

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

1.1. WPCP Wastewater Flows

The WPCP is designed and permitted for a daily average dry weather effluent flow of 29.5 MGD, and has a peak wet weather flow design capacity of 40.0 MGD. The annual average influent and effluent flow rates for this reporting period were 11.9 MGD and 10.1 MGD, respectively (**Figure 14**).



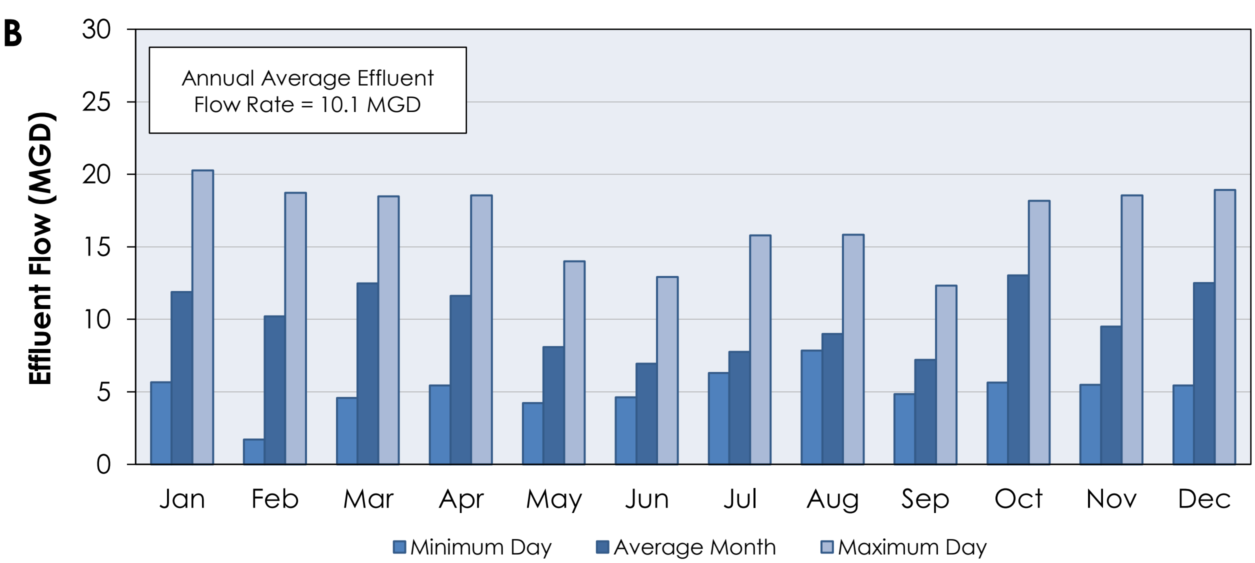


Figure 14: Monthly and Annual Average A) Influent and B) Effluent Wastewater Flow Rates through the WPCP during 2016

Average monthly influent flow rates during this reporting period are shown in **Figure 14A**. Average daily influent flow rates shown in **Figure 15A** ranged from 9.5 to 17.0 MGD. A maximum daily average flow rate of 17.0 MGD occurred on February 7, 2016, following a storm event where approximately 2-inches of rain fell over a 3-day period from February 5-7, 2016. The WPCP experienced an influent peak hourly flow rate of 28.0 MGD and an instantaneous flow rate of 28.9 MGD during the storm event. Throughout the duration of this storm event, the WPCP was conveyed all wastewater and maintained effluent discharge requirements. Annual average dry weather flows (May 1 – Sept 30) were approximately 11.4 MGD for influent and 7.8 MGD for effluent. Annual average wet weather flows (Oct 1 – Apr 30) were approximately 12.2 MGD for influent and 11.6 MGD for effluent. Overall, the WPCP treated 4,358 MG of influent wastewater during this reporting period at an average rate of 11.9 MGD.

WPCP Flow Rates

Flow Type (MGD)	Influent	Effluent
Daily	11.9	10.1
Peak-Hourly	28.0	---
Instantaneous	29.8	---
Dry Weather	11.4	7.8
Wet Weather	12.2	11.6
Total Treated (MG)	4,358	---

The City manages a pretreatment program that routinely monitors discharge wastewater from more than 40 significant industrial users (SIUs) and levees sanitary fees accordingly. On average, SIUs constitute approximately 10% of the sanitary influent flow recorded at the WPCP.

Daily influent and effluent flow rates recorded from 2007-2016 are shown in **Figure 15A** and reveal a downward trend, which is captured on an annual average basis in **Figure 15B**. As shown, annual average influent flows have steadily decreased by approximately 20% over the last ten years, with the largest observed drop of approximately 1.0 MGD between 2014 and 2015. Influent flow rates during 2016 continued to be some of the lowest on record, comparable to those observed in 2015, despite an approximate 1.2% population increase and a large daily net workforce influx of approximately 20,000 (15%) non-resident workers[3] (**Figure 15C**).

The observed decrease in influent flows is consistent with the City's sewer repair program aimed at reducing infiltration into the collection system, as well as water conservation efforts in response to the ongoing drought and statewide executive order. By the end of 2016, the City had achieved a total annual reduction of 24%, which is within the 15% minimum reduction set by the Stage 1 Water Reduction Target (**Figure 16**).[4]

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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/).
[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 to ensure the set 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.

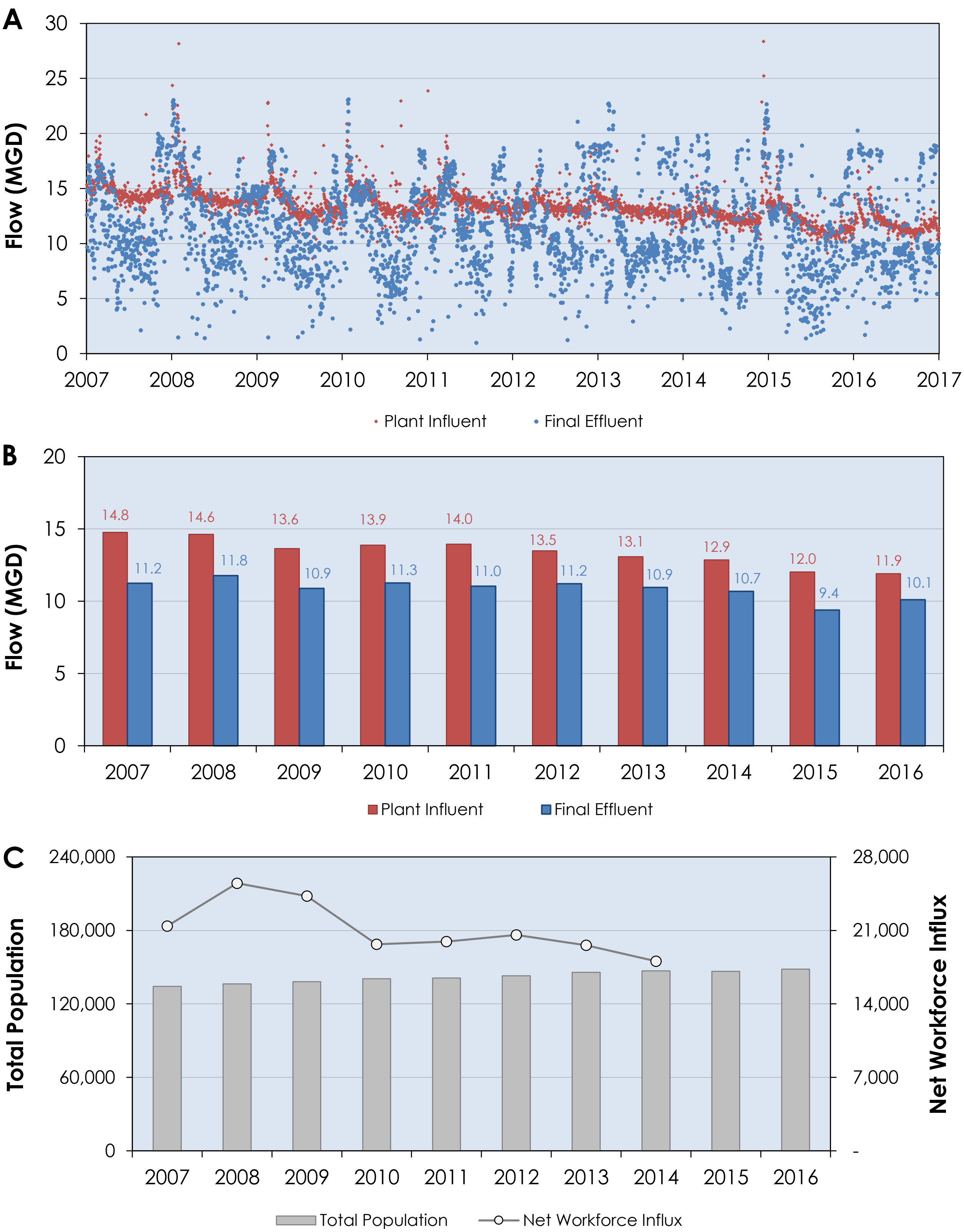


Figure 15: WPCP Wastewater Flow Rate Trends from 2007-2016. A) Daily and B) Annual Average Influent and Effluent Wastewater Flows through the WPCP from 2007-2016. C) Total Population and Net Workforce Influx in Sunnyvale from 2007-2016 (some data not yet available for 2015 and 2016)

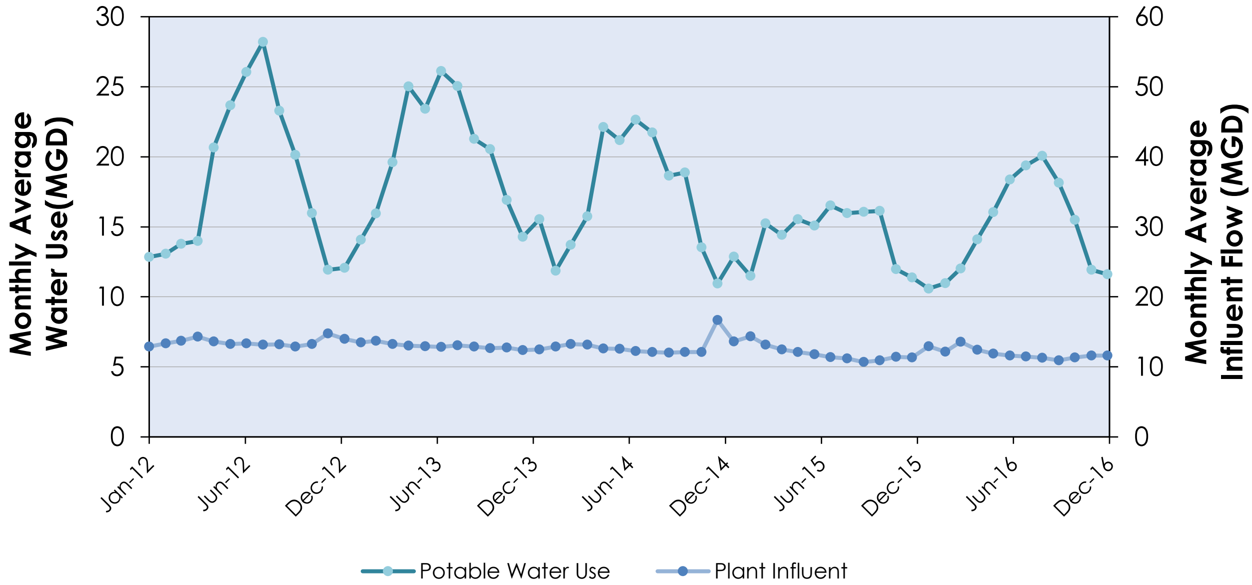


Figure 16: Monthly Average Citywide Potable Water Use and WPCP Influent Flows from 2012-2016

Monthly average effluent flow rates during this reporting period are shown in **Figure 14B**. The drop in effluent flow rates in the summer months is due to increased recycled water production. Daily effluent flow rates are shown in **Figure 15A** and ranged from 1.7 to 20.3 MGD. [5] The annual average effluent flow rate (**Figure 15B**) 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.

Daily effluent flow rates mimic the downward trend observed in influent flow rates. The large variation and difference between influent and effluent flow rates is primarily attributed to the storage capacity[6] of, and evaporation (estimated at 2 MGD on average) from, the Oxidation Ponds, and from recycled water production. In 2016, the WPCP produced a relatively large volume of recycled water (227 MG) as compared with previous years as a result of higher demand from ongoing drought conditions. No recycled water was produced by the WPCP in 2012 or 2013 due to operational challenges, resulting in higher effluent flow rates for those years.

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 rates (**Figure 14**). The opposite is true during the fall and winter months (September-January), where recycled water production and evaporation rates are generally at their lowest.

[5] Effluent flow rates below approximately 8 MGD correspond to the WPCP's Flow Management Strategy discussed below.
[6] The storage capacity of the Oxidation Ponds is estimated at >550 MG. The use of the Oxidation Ponds for temporary storage can have a large impact on the difference between daily influent and effluent flows.

The Oxidation Ponds have an available storage capacity of 50-100 MG depending on the initial pond depth. This storage capacity is employed as part of the WPCP's Flow Management Strategy, which provides Operations staff with the following strategies:

- Maintain water elevation for optimal treatment and required storage
- Operate Tertiary Treatment Facilities at a constant flow rate (flow equalization)
- Maintain flexibility to repair and rehabilitate aging Tertiary Treatment Facilities

Toward the end of this 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 pollution in wastewater and is used by the RWQCB as one of the parameters for evaluating and regulating WPCP performance. The WPCP's NPDES permit includes the following limits for CBOD:

- *Maximum Daily Effluent Limit (MDEL) concentration = 20 mg/L*
- *Average Monthly Effluent Limit (AMEL) concentration = 10 mg/L*
- *Average monthly minimum percent removal = 85%*

Figure 17 summarizes CBOD concentration data and removal performance from 2012-2016. In general, CBOD influent concentrations trended higher in 2015-2016 as compared with previous years, though they appear to have leveled-off around 300 mg\L. 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, as the same amounts of pollutants are concentrated in a smaller volume of water. Beginning in 2015, there was a noticeable increase in influent CBOD concentrations and data scatter that carried into 2016. WPCP staff is currently investigating several potential causes for the scatter.

CBOD Removal

	Limit	Performance
% Removal:	85%	98%
Daily (MDEL):	20 mg/L	2.2 – 13.3 mg/L
Monthly (AMEL):	10 mg/L	3.1 – 7.3 mg/L

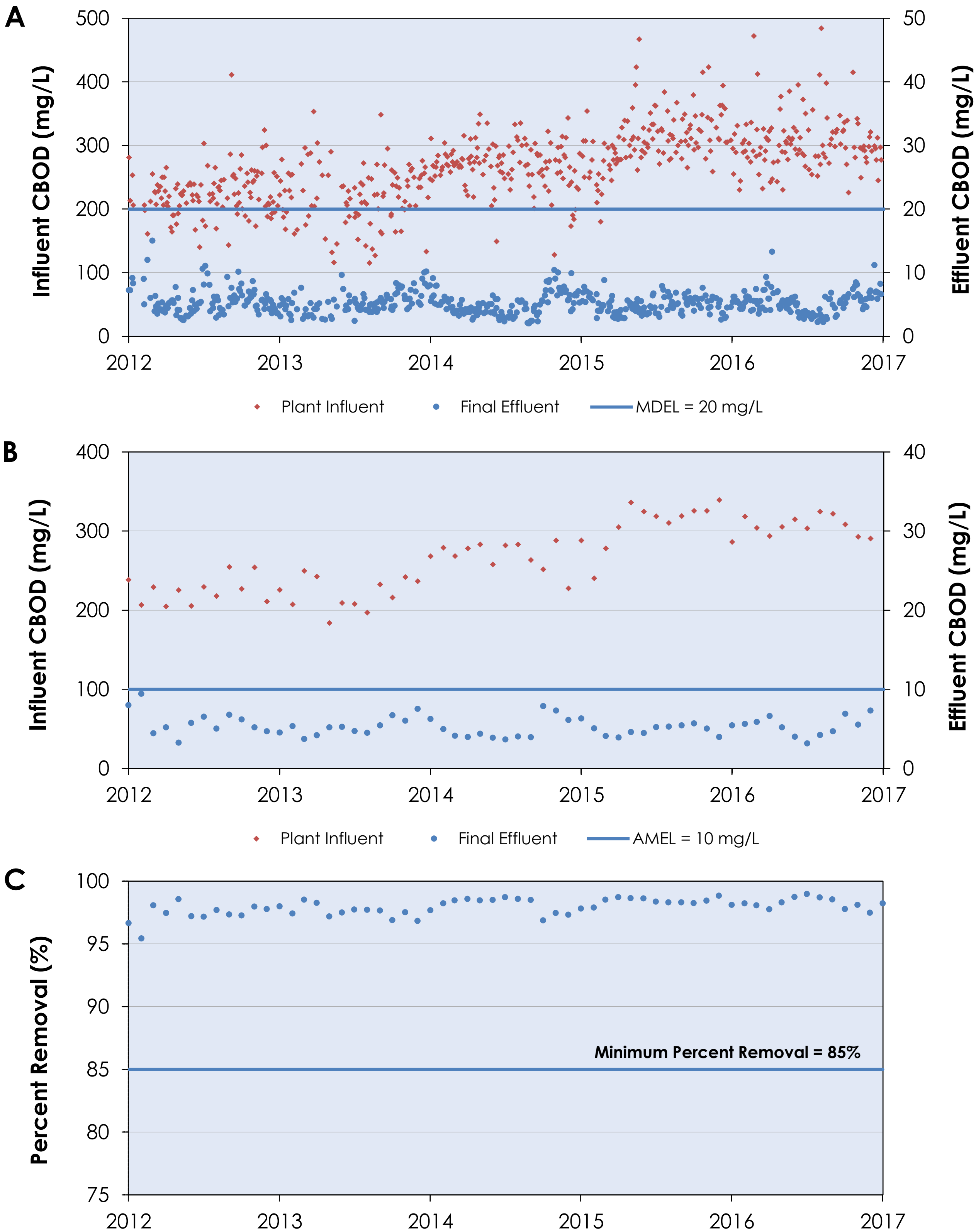
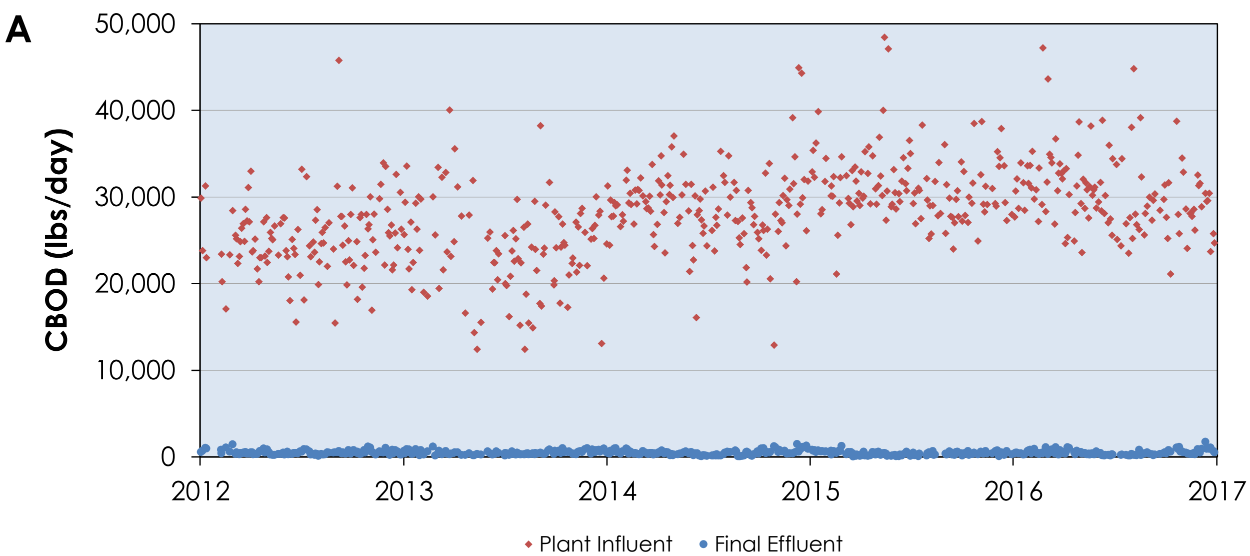


Figure 17: CBOD Trends through the WPCP from 2012-2016. A) Daily and B) Average Monthly Influent and Effluent CBOD (mg/L) through the WPCP from 2012-2016. C) Average Monthly Effluent Percent Removal of CBOD from 2012-2016

As shown in **Figure 17A** and **Figure** 17**B**, effluent daily composite and average monthly effluent CBOD concentrations remained below their respective permit limits during the reporting period. Daily values ranged from 2.2-13.3 mg/L while average monthly values ranged from 3.1-7.3 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 98% (**Figure 17C**). Collectively, this indicates a high level of performance, considering influent concentrations are trending upwards and represent some of the highest on record over the past 10-years at 305 mg/L. Effluent concentrations demonstrated a general trend of lower removal during the colder months and higher removal during the warmer months, which is attributed to the Oxidation Ponds whose CBOD removal performance is temperature dependent.

Figure 18 summarizes daily and annual influent and effluent CBOD loading rates as measured in pounds per day (lbs/day) and pounds per year (lbs/yr) from 2012-2016. Influent CBOD loading rates trended



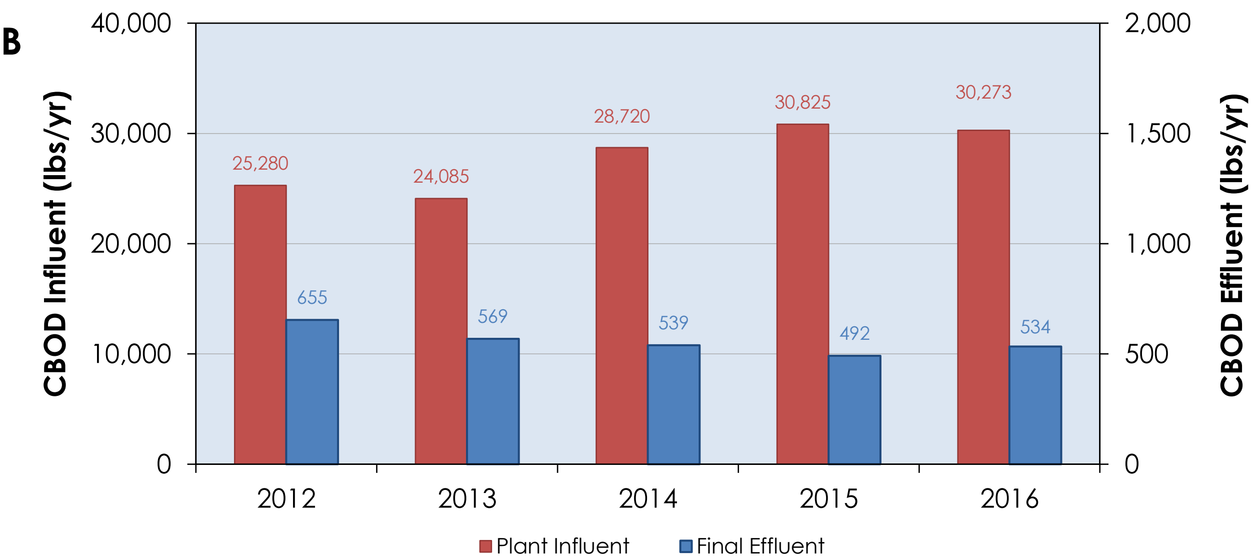


Figure 18: Average A) Daily and B) Annual CBOD Loading Rates at the WPCP from 2012-2016

slightly upwards in 2015-2016 before appearing to level-off, mirroring the influent CBOD concentration data trend shown in **Figure 17**. This is plausible given the City's population growth and daytime work force influx that will increase pollutant loads to the wastewater collection system. Annual effluent CBOD loading rates on the other hand are trending downward, reflecting the WPCP's ability to reduce CBOD loads to the San Francisco Bay through effective treatment and increased recycled water production.

1.3. Total Suspended Solids

Total suspended solids (TSS) is a measure of the suspended solids content of wastewater which 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. The WPCP's NPDES permit includes the following limits for TSS:

- *Maximum Daily Effluent Limit (MDEL) concentration = 30 mg/L*
- *Average Monthly Effluent Limit (AMEL) concentration = 20 mg/L*
- *Average monthly minimum percent removal = 85%*

Figure 19 summarizes TSS concentration data and removal performance from 2012-2016. Influent TSS trends mirrored those of CBOD with higher concentrations observed in 2015-2016 that appear to have leveled-off around 350 mg\L. As shown in **Figure 19A** and **Figure 19B**, effluent daily composite and average monthly TSS concentrations remained below their respective permit limits. Daily values ranged from 1.6-15.3 mg/L and average monthly values ranged from 4.4-11.9 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 98% over the reporting period (**Figure 19C**). This indicates a high degree of performance, considering influent concentrations are trending upwards and are the highest on record over the last 10-years at 353 mg/L.

TSS Removal

	Limit	Performance
% Removal:	85%	98%
Daily (MDEL):	30 mg/L	1.6 – 15.3 mg/L
Monthly (AMEL):	20 mg/L	4.4 – 11.9 mg/L

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. Additionally, lab personnel instituted a bimonthly cleaning regiment for the sampler intake line with replacement of the line as needed. Consequently, influent TSS concentration data from October 2013 through December 2016 show less variability and a more consistent and stable upward trend. The variability towards the end of 2015-2016 is likely due to an increase in precipitation as compared with 2014. The increasing TSS concentration trend is attributed to the City's population growth and daytime workforce influx, coupled with lower water usage during this time period. Effluent TSS concentration data from 2012–2016 show a relatively consistent seasonal trend, with the exception of 2014 data. The significant decrease in effluent TSS concentrations in mid-2014 occurred during a pilot study that

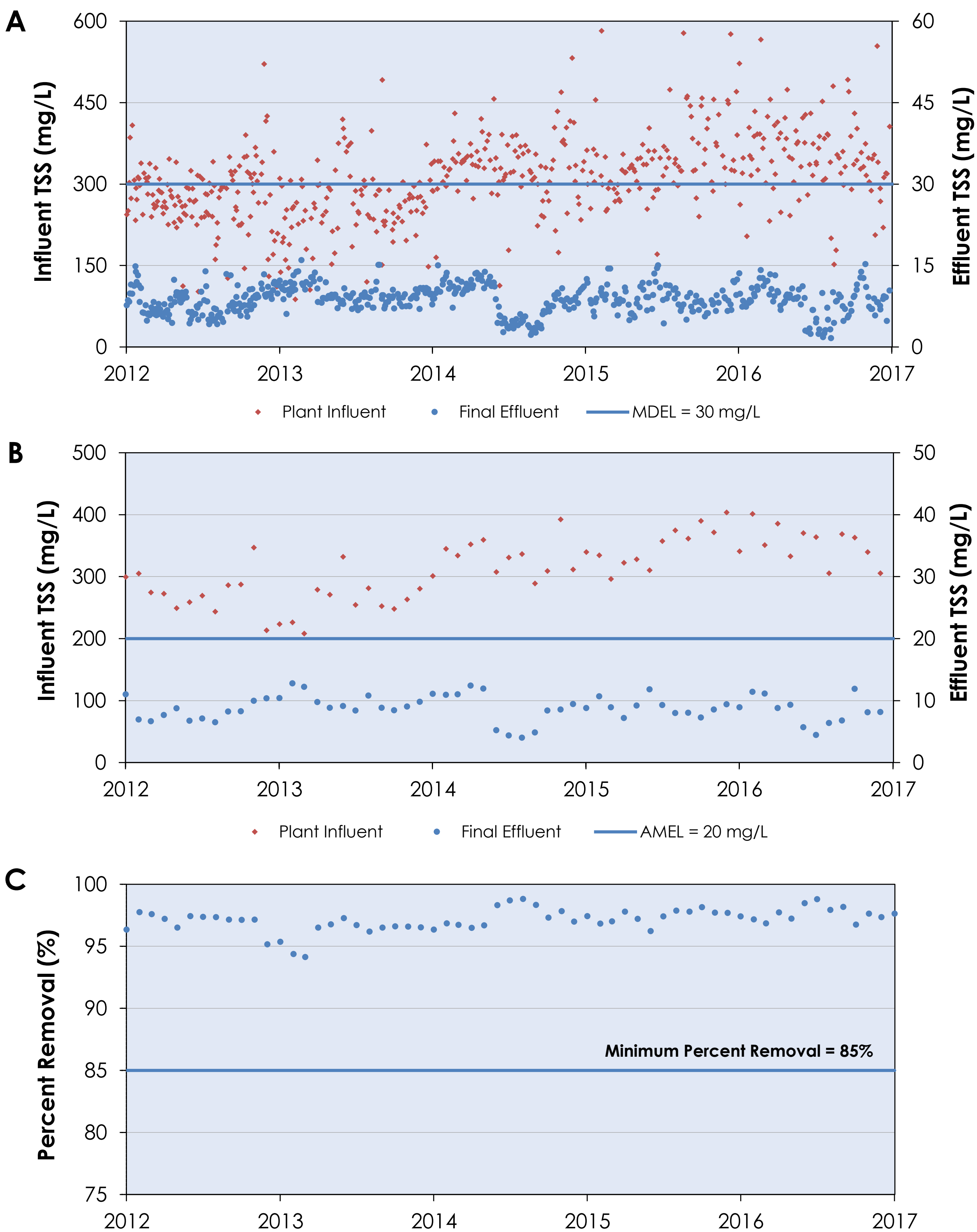


Figure 19: TSS Trends through the WPCP from 2012-2016. A) Daily and B) Average Monthly Influent and Effluent TSS (mg/L) through the WPCP from 2012-2016. C) Average Monthly Effluent Percent Removal of TSS from 2012-2016

assessed an alternate operational strategy for recycled water production, wherein the entire effluent was treated to 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 not selected as an alternate operational mode.

Figure 20 summarizes daily (lbs/day) and annual (lbs/yr) average influent and effluent TSS loading rates from 2012-2016. Influent loading rates show an upward trend in comparison with 2011-2013 data that mirror the influent TSS concentration data trend shown in **Figure 19**. These trends are similar to the influent CBOD concentration and loading rates trends. As with the CBOD trends, the similarity of the influent TSS concentration and TSS loading rates trending is plausible, given the City's population growth and daytime work force influx which increase pollutant loads to the wastewater system. The effluent TSS loading rates are trending in a relatively consistent pattern and reflect the WPCP's ability to treat and minimize effluent loadings despite an upward trend in influent loading.

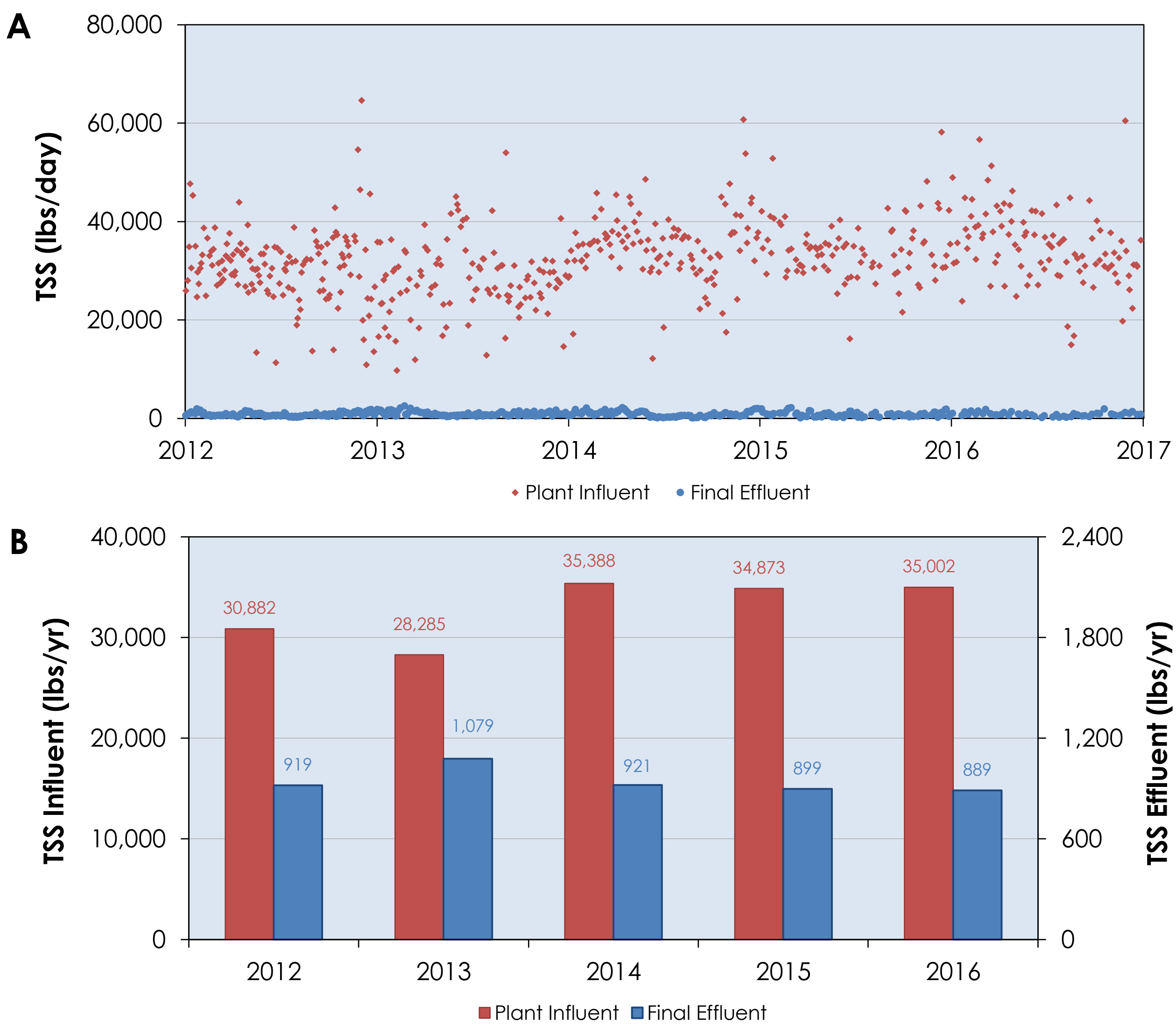


Figure 20: Average A) Daily and B) Annual TSS Loading Rates at the WPCP from 2012-2016

1.4. Total Ammonia

Overview and Permit Limits

Ammonia removal occurs in both the Oxidation Ponds and the FGRs. Ammonia removal in the Oxidation Ponds (as a result of biological nitrification and uptake by algae) is highly seasonal. Low removal rates are typically observed during the fall and winter (Oct-May) when ambient temperatures are low and daytime is shorter. In contrast, higher removal rates occur during the summer (May-Sept) when ambient temperatures are high and daytime is longer. Consequently, from October to May, nitrification in the FGRs is the primary process of ammonia removal from wastewater. The WPCP's NPDES permit includes seasonal performance limits for ammonia that reflect the variability in the performance of the two processes. The NPDES ammonia effluent limits are as follows:

- *Maximum Daily Effluent Limit (MDEL) concentration: Oct-May = 26 mg/L; Jun-Sept = 5 mg/L*
- *Average Monthly Effluent Limit (AMEL) concentration: Oct-May = 18 mg/L; Jun-Sept = 2 mg/L*

Data Review

Ammonia Removal

Freq	Limit	Performance
Daily (MDEL):	26 mg/L (Oct-May) 5 mg/L (Jun-Sept)	0.1 – 10.7 mg/L 0.1 – 1.0 mg/L
Monthly (AMEL):	18 mg/L (Oct-May) 2 mg/L (Jun-Sept)	0.3 – 4.8 mg/L 0.2 – 0.6 mg/L

Figure 21 summarizes ammonia concentration data and removal performance. **Figure 21A** shows removal performance of the Oxidation Ponds and FGRs. Seasonal removal rates are clearly apparent, with the Oxidation Ponds demonstrating ammonia removal from April 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 November and December 2016. Daily and average monthly effluent ammonia in 2016 remained below their respective seasonal permit limits as shown in **Figure 21B** and **Figure 21C**. Moreover, effluent ammonia concentrations are trending downward as a result of the optimization strategies discussed in more detail below. Influent ammonia concentrations, on the other hand, appear to be trending upward and reached a record 10-year daily max of 58.4 mg/L on December 27, 2016 (**Figure 21B**). Similar to CBOD and TSS, this upward trend is likely due to enhanced water conservation efforts in response to the drought and resulting decreases in influent flows.

Figure 22 summarizes average daily (lbs/day) and annual (lbs/yr) influent and effluent ammonia loading rates from 2012-2016. The influent ammonia loads remained stable from 2010-2014, with a slight increase during 2015-2016. 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 the Oxidation Ponds and FGRs performance. As shown, effluent loading rates have decreased significantly from 2012-2013 levels, a clear indication of the success of optimization efforts as well as the increase in recycled water production. Additional information pertaining to ammonia

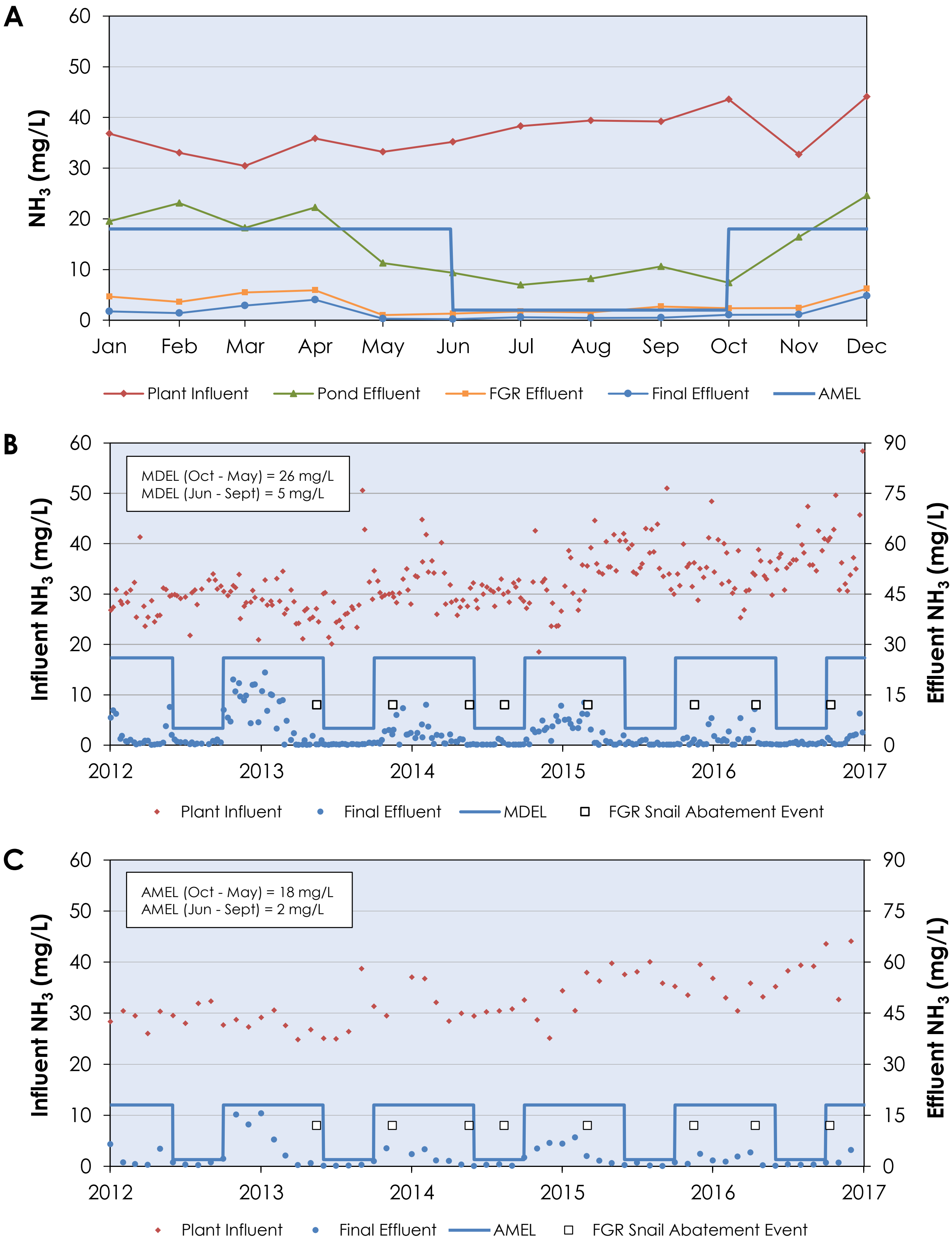


Figure 21: Ammonia Trends at the WPCP from 2012-2016. A) Monthly Average Total Ammonia from Pond, FGR, and Final Effluent during 2016. B) Daily and C) Monthly Average Influent and Effluent Total Ammonia from 2012-2016.

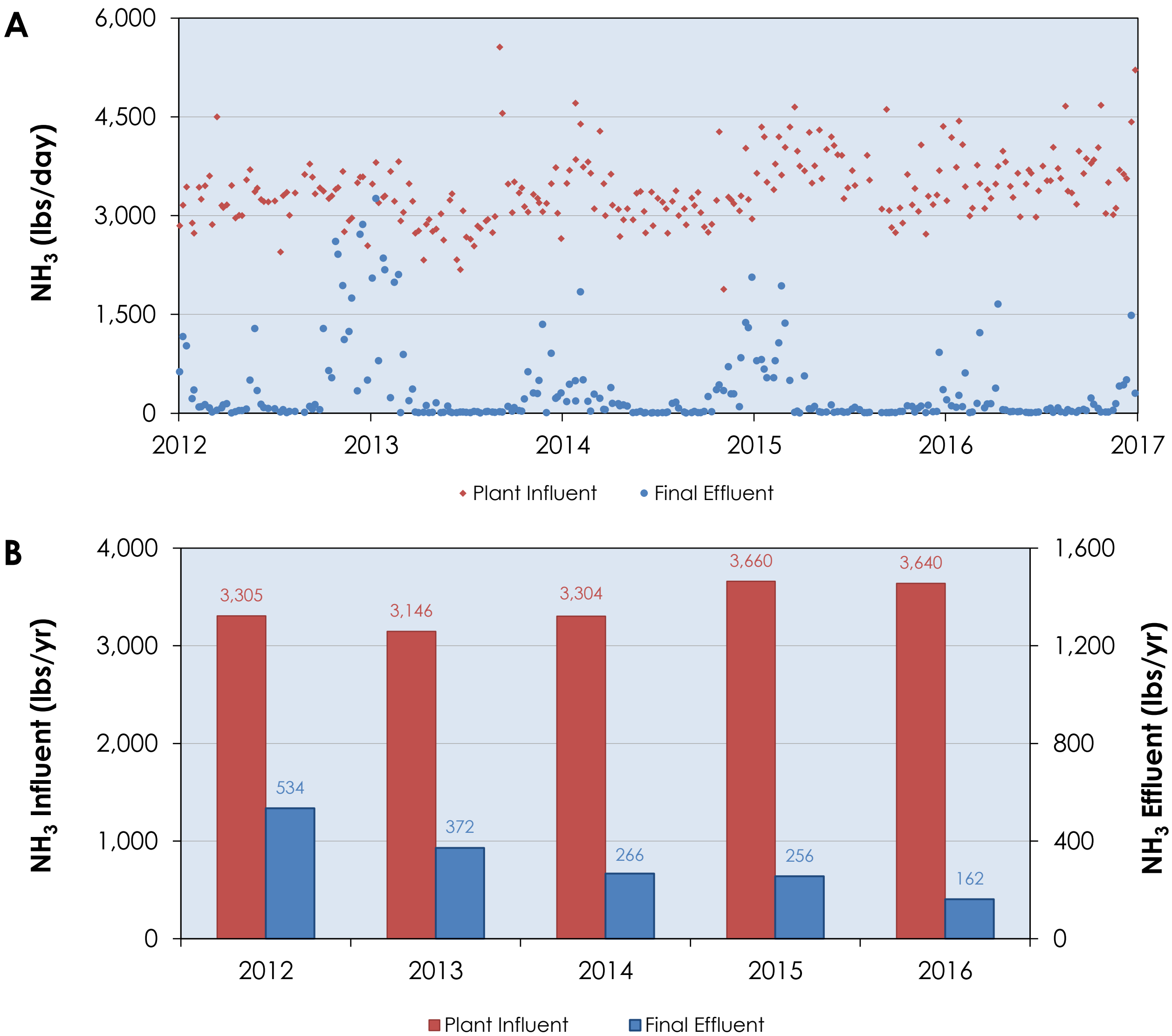


Figure 22: Average A) Daily and B) Annual Ammonia Loading Rates at the WPCP from 2012-2016

and other nutrient trends is discussed in **Section 1.5** of this Chapter and available in the *Nutrient Watershed Permit Annual Report* submitted by BACWA.

Strategies to Optimize Performance

Historically, ammonia removal via 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 ponds. Consequently, the City began a long-term dredging project in 2012 to restore the pond capacity (**Chapter IV, Section 6.0**). Dredging continued during this reporting period and was restricted to the wet weather season to avoid generating ammonia in excess of what the FGRs could process. A total of 1,728 dry tons of biosolids were removed from the Oxidation Ponds in 2016 and re-used for agricultural land application.

In 2013, the City instituted a periodic FGR 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. The chemical treatment process instituted at the WPCP doses effluent from the Oxidation Ponds 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 April 13 and October 11, 2016, and are noted in **Figure 21B** and **Figure 21C**. Approximately 8-9 tons of liquid ammonium sulfate (40% solution) were used in each control event.

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 efficacy is enhanced.

1.5. Nutrient Summary

In addition to the current NPDES permit (CA0037621), 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 23**) and phosphorus (**Figure 24**) 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 so as 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. Both nitrogen and phosphorous are discussed separately below as the overall treatment process influences them differently.

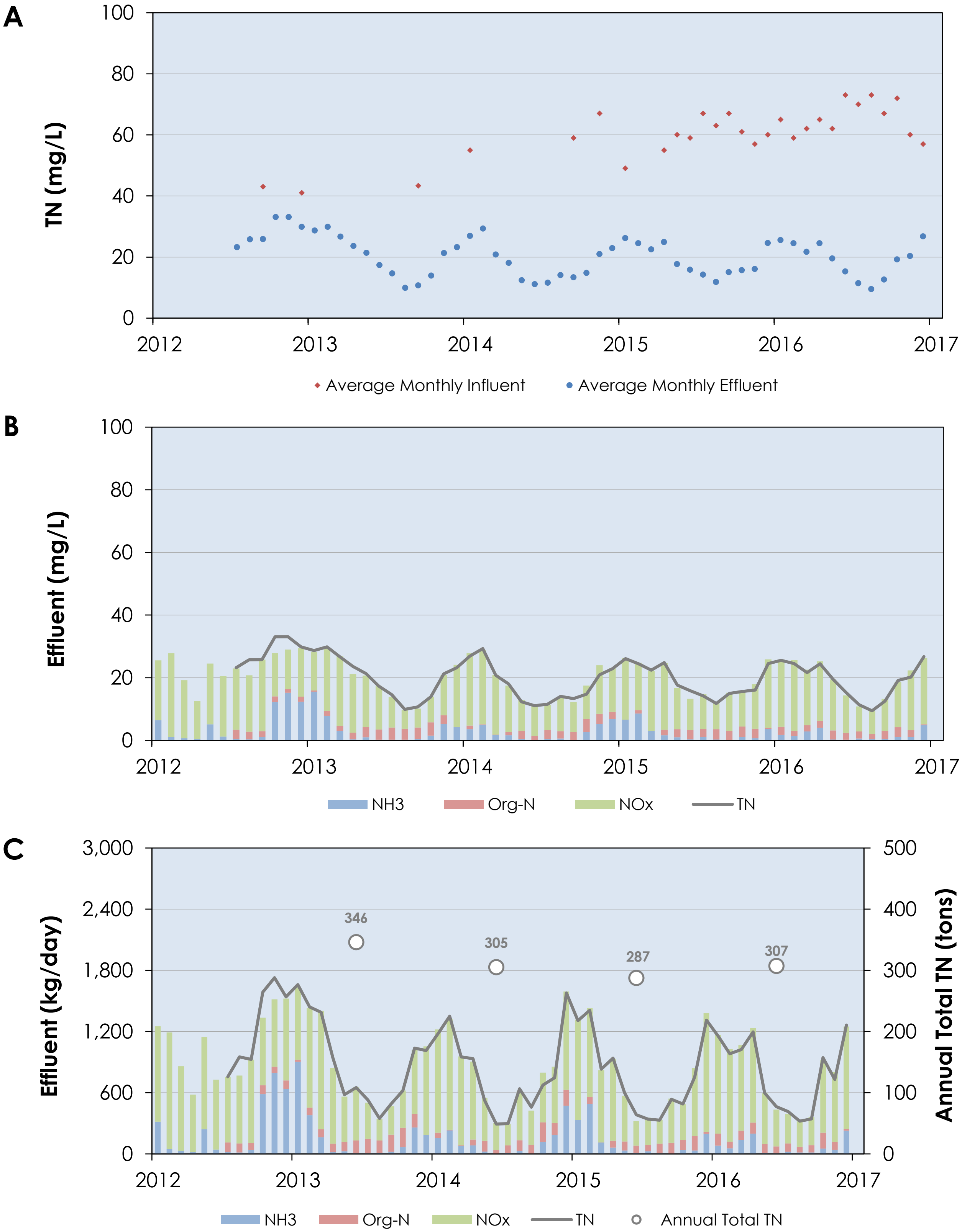


Figure 23: Nitrogen Trends at the WPCP from 2012-2016. A) Monthly Average Influent and Effluent TN Concentrations. B) Speciated Monthly Average Effluent Nitrogen Concentrations and C) Loading Rates with Annual Total TN Loads

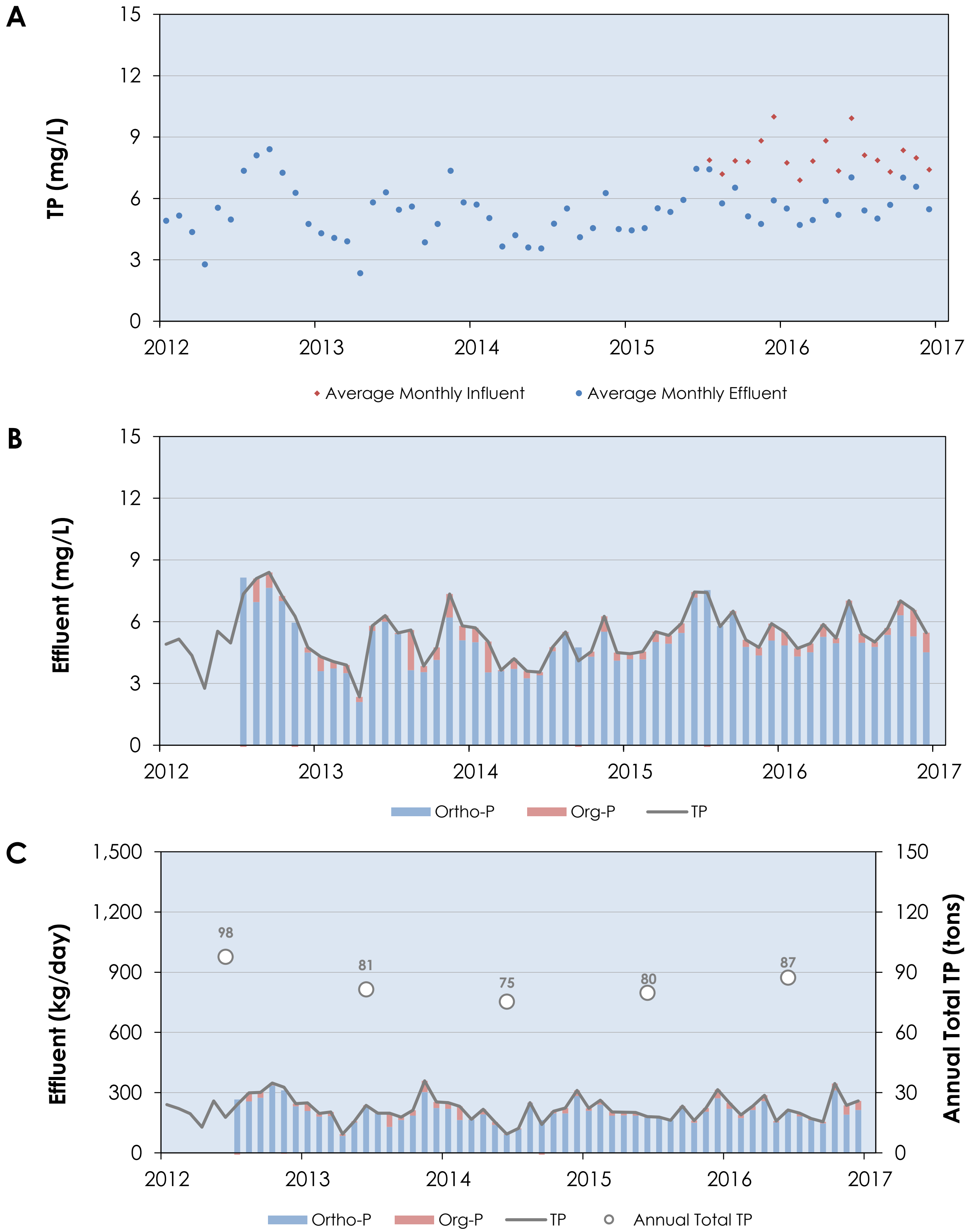


Figure 24: Phosphorous Trends at the WPCP from 2012-2016. A) Monthly Average Influent and Effluent TP Concentrations. B) Speciated Monthly Average Effluent Phosphorous Concentrations and C) Loading Rates with Annual Total TP Loads

Nitrogen

Total Nitrogen	
Annual Average	19 mg/L
Annual Total Load	307 tons
% Removal	70%

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

Figure 23A shows average monthly influent and effluent TN concentrations. As shown, effluent TN concentrations have declined slightly to an annual average of 19 mg/L despite the increasing trend observed in influent TN concentrations to an annual average of 65 mg/L. The increase in influent TN is consistent with the increases in ammonia concentrations shown in **Figure 21B**.

Monthly average effluent TN concentrations are separated into the dominant forms of nitrogen (ammonia, Org-N, and NOx) in **Figure 23B**. 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 receding 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 compressed 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 nitrification and denitrification occurs in the Oxidation Ponds in the summer months. With the exception of 2012-2013, where pond dredging of biosolids is believed to have released excess ammonia, effluent TN concentrations appear to be on a slight declining trend. Moreover, during the 2015-2016 wet-weather season the broadening and flattening of the TN curve and increase in NOx concentrations reflects a higher degree of treatment efficacy in comparison to previous years.

Average monthly effluent nitrogen loading rates and annual total TN loads are shown in **Figure 23C** and depict seasonal nitrification variations experienced at the WPCP similar to those shown in **Figure 23B**. The loading rates are also influenced by nutrient diversion through recycled water production in the summer months and higher effluent flows in the winter months due to rainfall into the Oxidation Ponds and

[7] 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.

inflow/infiltration into the collection system. Consequently, the loading rate curve displays peaks in the winter months when excess water needs to be discharged in order to maintain water levels in the Oxidation Ponds and deeper troughs in the summer months when recycled water production is in high demand. Effluent TN loadings show a slight declining trend over the last five years, likely as a result of nutrient diversion from increased recycled water production. During this reporting period, approximately 307 tons of TN were discharged to SF Bay.

Phosphorous

Total Phosphorous	
Annual Average	5.7 mg/L
Annual Total Load	87 Tons
% Removal	28%

Average monthly influent and effluent total phosphorous (TP) concentrations are shown in **Figure 24A**. 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. As with nitrogen, excess TP in the effluent was likely released in 2012-2013 when the pond dredging project was first initiated but has since stabilized. The approximate 28% 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 24B 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 mid-2012, 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 24C**. The higher annual total of TP discharged in 2012 was the result of pond dredging and does not reflect ongoing operations. Overall, average TP loading rates have remained fairly consistent since 2013, as also reflected in the consistency of effluent TP concentrations and flow rates. During the current reporting period, approximately 87 tons of TP were discharged to the SF Bay.

1.6. Plant Performance Summary

The WPCP maintained a high degree of pollutant removal efficiency during the 2016 reporting period without any exceedance of its effluent permit limitations and despite an increase in influent concentrations and loads. The observed increase in influent concentrations and loading rates are attributed to a 1.2% population increase between 2015 and 2016 and a large daily net workforce influx of approximately 20,000 (15%) non-resident workers. As shown in **Figure 25**, around June 2013 both CBOD

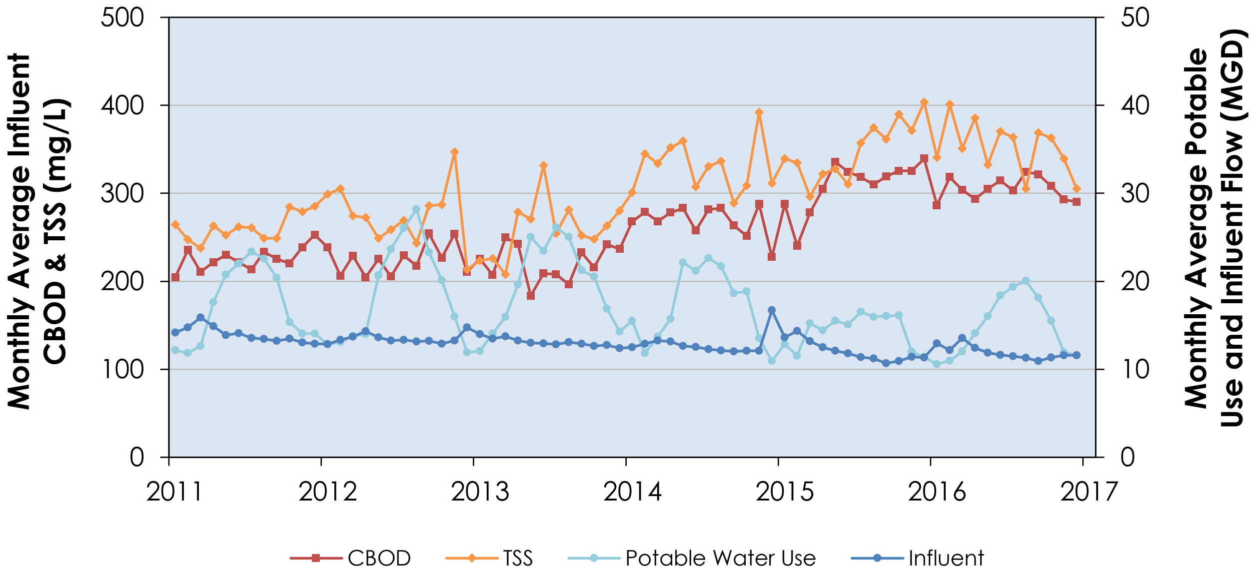


Figure 25: Monthly Average CBOD and TSS Influent Concentrations, Citywide Potable Water Use, and WPCP Influent Flows from 2011-2016

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 reached record annual average lows of 11.9 MGD and 10.1 MGD, respectively. The decrease in effluent loading rates is attributed to WPCP performance optimizations and the diversion of wastewater to recycled water production.

2.0. PERMIT COMPLIANCE

Table 1 summarizes effluent compliance sampling conducted during 2016, including regulatory limits, the range of sample results, and the number of samples collected and exceedances. During 2016, the WPCP maintained a high degree of performance with no exceedances of regulatory limits.

2.1. Effluent Limitations

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.

2.1.1. Constituent Removal

Figure 26 through **Figure 30** 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. Whereas; effluent limitations apply to the actual discharge from the WPCP, WQOs are designed to protect water quality, aquatic life, and human health in the receiving water and carry no immediate regulatory action.

Table 1: Effluent Monitoring Sample Results for Standard Parameters in 2016

Parameter Class	Parameter	Parameter Limit Type	Parameter Limit	2016 Final Effluent			Number of Samples[1] / Exceedance
				Min	*Avg*	*Max*	
Standard	CBOD	MDEL (mg/L)	20	2.2	5.4	13.3	121 / 0
		AMEL (mg/L)	10	3.1	5.4	7.3	12 / 0
		Percent Removal (%)	85	97	98	99	12 / 0
	TSS	MDEL (mg/L)	30	1.6	8.4	15.3	100 / 0
		AMEL (mg/L)	20	4.4	8.4	11.9	12 / 0
		Percent Removal (%)	85	97	98	99	12 / 0
	Ammonia (as N)	MDEL [Oct-May](mg/L)	26	<0.1	2.2	10.7	34 / 0
		AMEL [Oct-May] (mg/L)	18	0.3	2.2	4.8	8 / 0
		MDEL [Jun-Sept] (mg/L)	5	<0.1	0.4	1.0	18 / 0
		AMEL [Jun-Sept] (mg/L)	2	0.2	0.4	0.6	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	1.2	5.9	8.6	52 / 0
	pH[1]	Max / Min	8.5 / 6.5	6.6	7.0	7.4	344 / 0
	Chlorine Residual[1]	IMEL (mg/L)	0	0	0	0	344 / 0
	Enterococci	Geo Mean (month) (MPN/100mL)	35	7.4	7.6	7.71	12 / 0
Toxicity	Acute Toxicity	90th% (% Survival)	70	100	100	100	4 / 0
		Moving Median (% Survival)	90	100	100	100	4 / 0
Organics	Cyanide	MDEL (ug/L)	17	<1.40	1.85	6.8	12 / 0
		AMEL (ug/L)	7.5	<1.40	1.85	6.8	12 / 0
	TCDD-TEQ	AMEL (ug/L)	1.4×10^{-8}	ND	ND	ND	2 / 0
		MDEL (ug/L)	2.8×10^{-8}	ND	ND	ND	2 / 0
	Bis (2-Ethylhexyl) Phthalate	MDEL (mg/L)	12	<0.5	<0.6	<0.6	4 / 0
		AMEL (mg/L)	5.9	<0.5	<0.6	<0.6	4 / 0
Metals	Copper	MDEL (ug/L)	19	1.5	2.6	3.8	12 / 0
		AMEL (ug/L)	10	1.5	2.6	3.8	12 / 0
	Mercury	AWEL (ug/L)	0.027	0.00023	0.0013	0.0039	12 / 0
		AMEL (ug/L)	0.025	0.00023	0.0013	0.0039	12 / 0
		ALEL (kg/yr)	0.150	---	---	0.020	1 / 0
	Nickel	MDEL (ug/L)	35	3.1	3.8	4.8	12 / 0
		AMEL (ug/L)	24	3.1	3.8	4.8	12 / 0

Legend:
1: Sample collection required only during active discharge – sample count below 365 indicates periods of zero discharge to SF Bay
ALEL: Average loading 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

Therefore, WQOs presented in the following figures, which are taken directly from the current NPDES permit, are included solely for informational purposes.[8] 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 data were collected in 2016 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. Consequently, the WPCP will not collect 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.

As shown in **Figure 28**, effluent cyanide concentrations spiked in July and approached, but did not exceed, the maximum daily or monthly average effluent limits before returning to typical levels observed throughout the reporting period. Cyanide is known to be created during the chlorine disinfection process and by sample preservation. Over the years, the WPCP has observed periodic cyanide spikes of comparable magnitudes with rare exceedances of effluent limits.

Figure 29 shows data from common physical parameters collected at the WPCP, of which only turbidity (**Figure 29A**) and pH (**Figure 29B**) have effluent limits. Influent and effluent temperature data (**Figure 29C**) are included for informational purposes only.

The scatter in turbidity data shown on **Figure 29A** from 2014 through 2016 is the result of recycled water production at the WPCP. During the production of recycled water, the filtered water from the DMFs is subjected to additional treatment in the Chlorine Contact Tanks in order meet the more stringent Title 22 requirements for tertiary disinfected wastewater, including a turbidity limit of 2 NTU. By comparison, turbidity limits in the final effluent is 10 NTU. Since the WPCP does not currently have the option to produce both SF Bay discharge and recycled water simultaneously, the turbidity can vary significantly depending on what stage in the transition process (SF Bay discharge to recycled water, or vice versa) the weekly grab sample was collected from. Effluent turbidity data from 2012 and 2013 were less variable as no recycled water was produced.

On several occasions, effluent pH values approached the lower discharge limit of 6.5 as shown in **Figure 29B**. 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. Higher doses of chlorine and increased chlorine contact time are required to meet Title 22 requirements. Recycled water is currently produced in batch mode and does not occur simultaneously with discharge to the SF Bay. However, 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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[8] The WQO listed in the chart for total chromium is the effluent limit for chromium (VI). As such, it is conservatively applied to total chromium detected in the effluent.

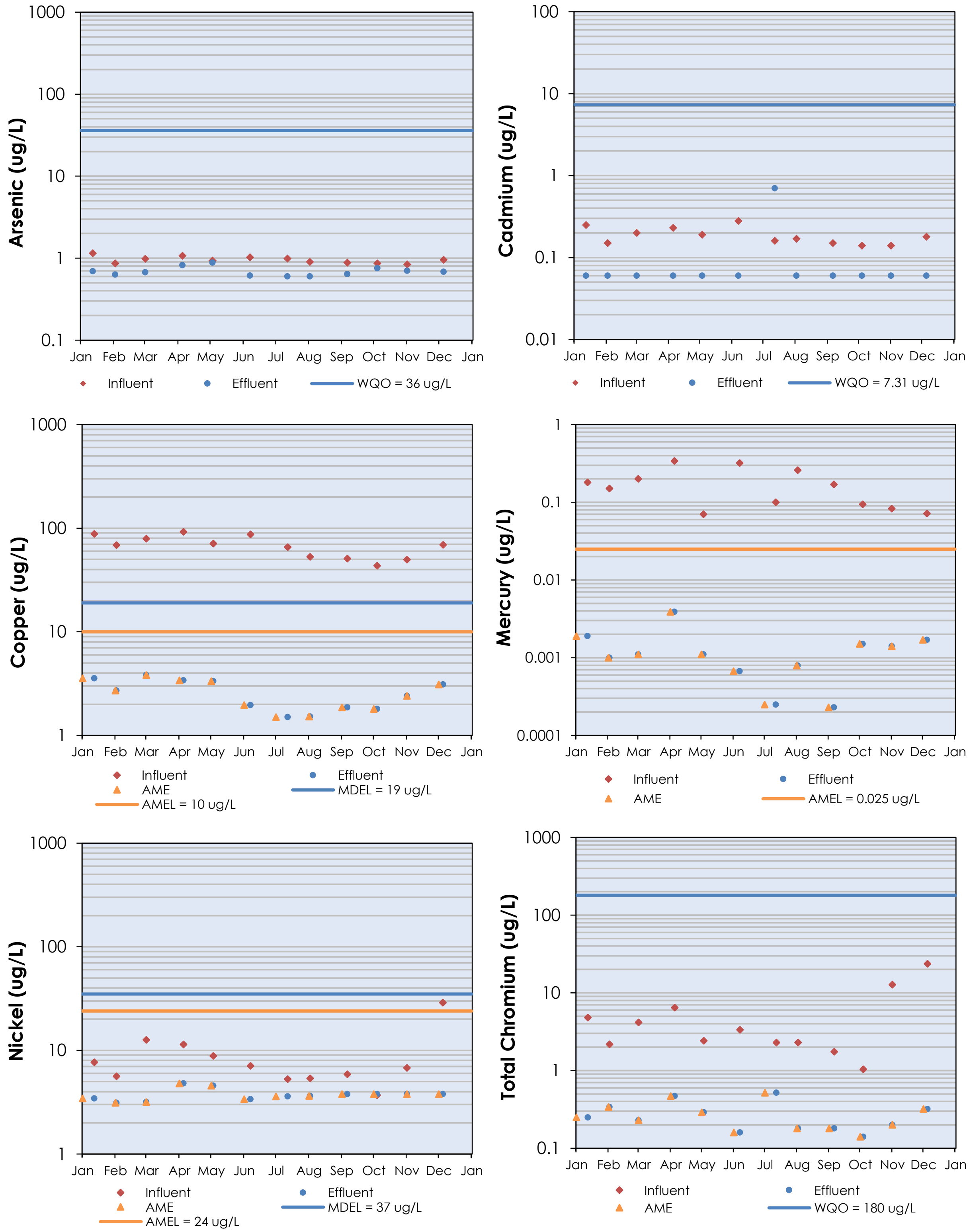


Figure 26: Concentrations of Common Metal Pollutants at the WPCP during 2016

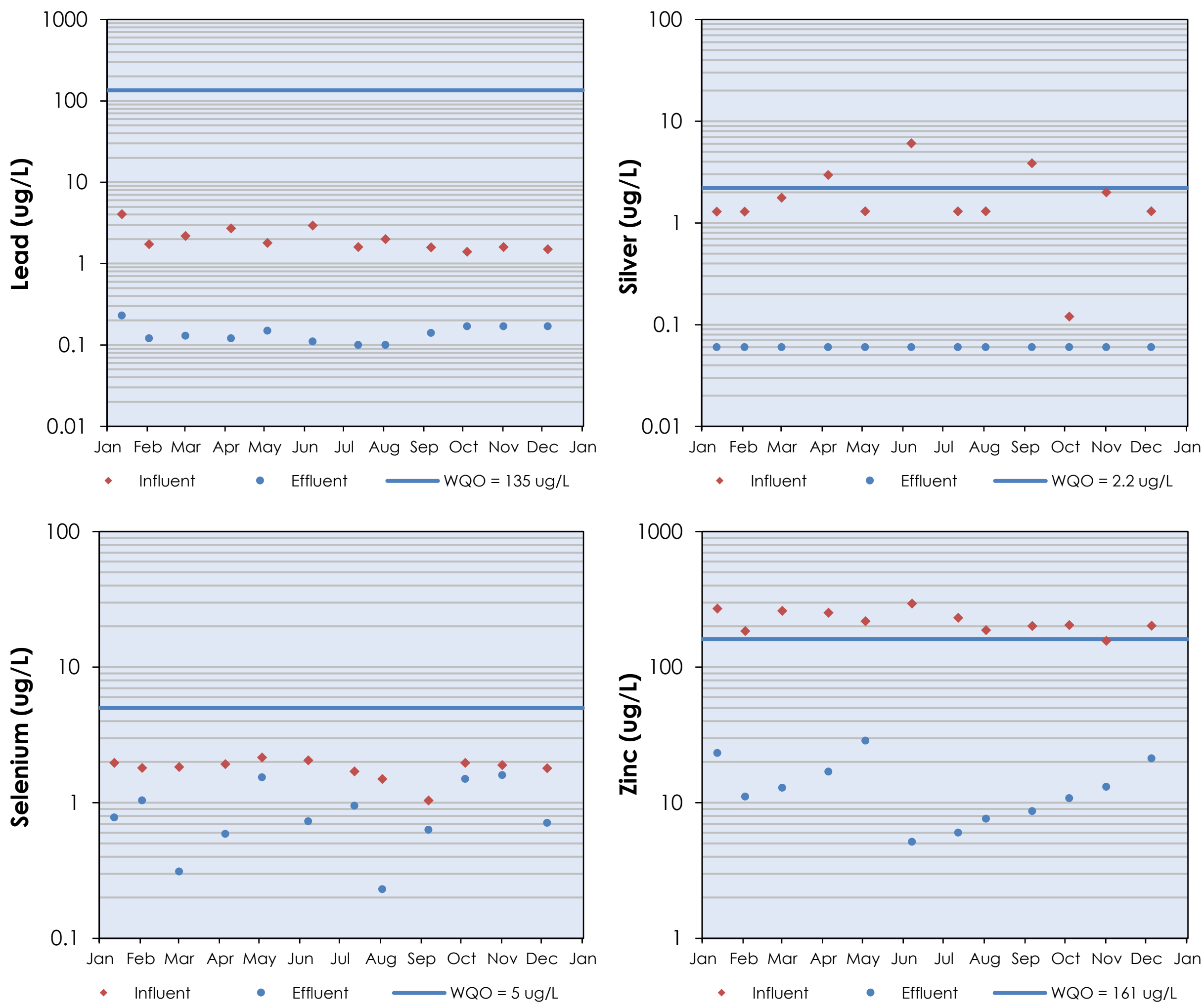


Figure 27: Concentrations of Common Metal Pollutants at the WPCP during 2016

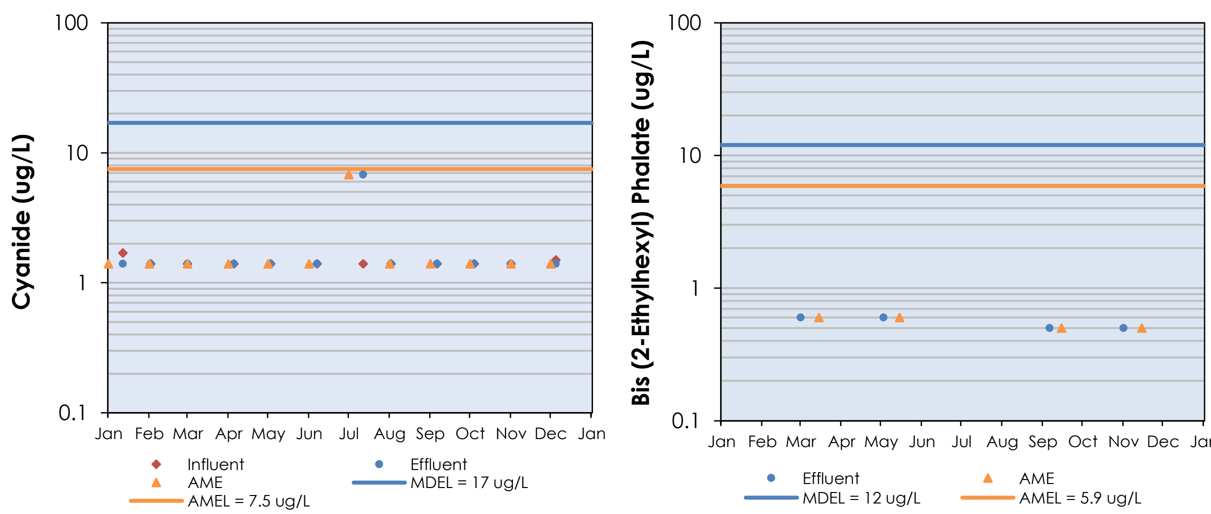


Figure 28: Concentrations of Common Organic Pollutants at the WPCP during 2016

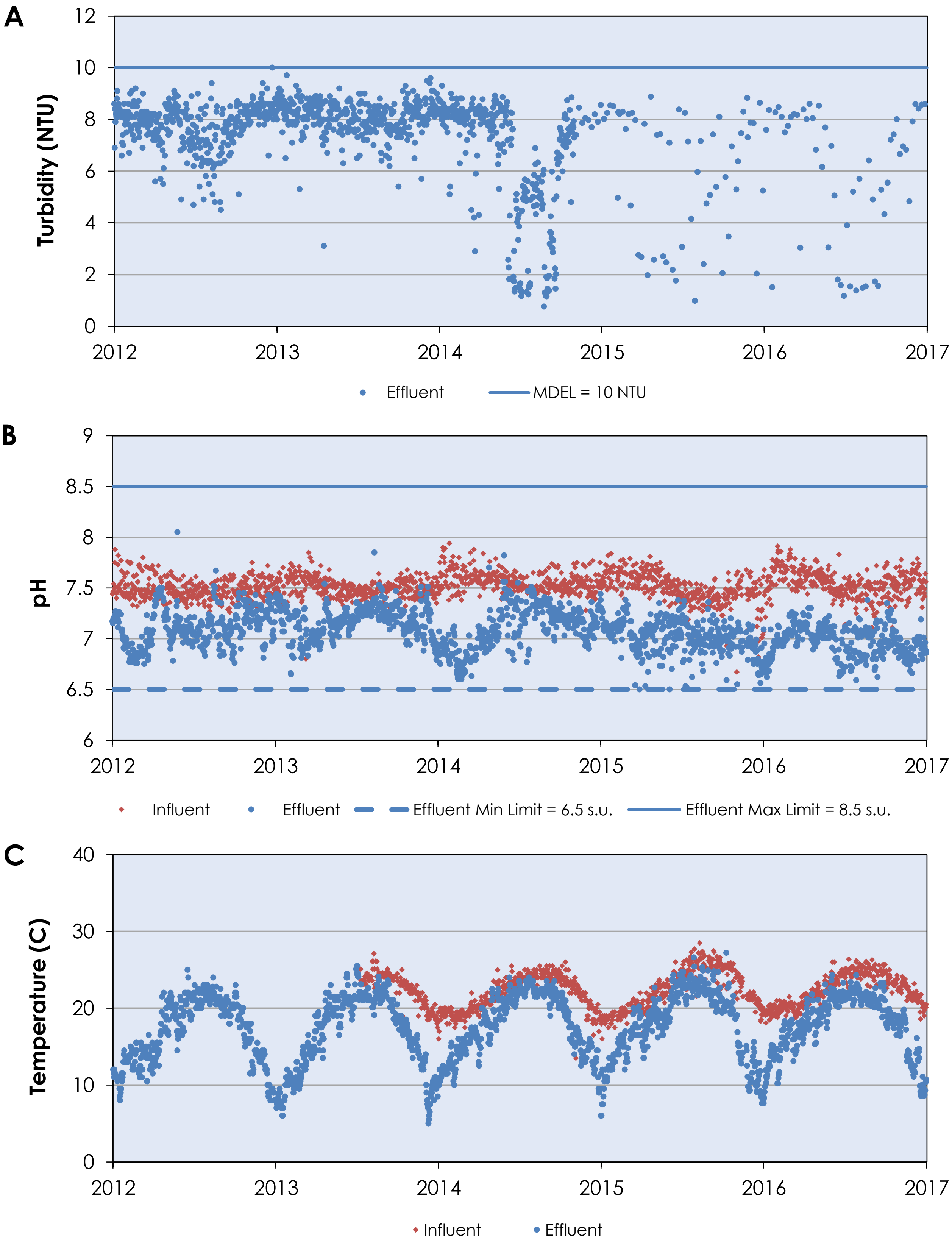


Figure 29: Common Physical Parameters at the WPCP from 2012-2016

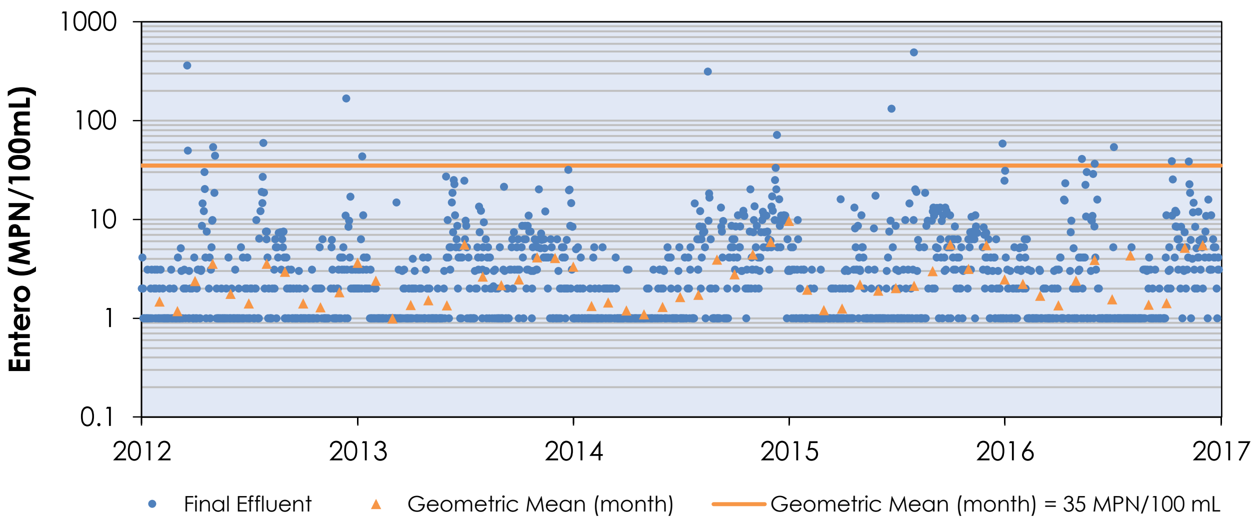


Figure 30: Effluent Enterococcus Measurements at the WPCP from 2012-2016

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 29C**). 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

The current NPDES permit requires the use of the diatom *Thalassiosira pseudonana* (**Figure 31**) for monthly chronic toxicity compliance testing. The permit contains effluent triggers if the single test maximum exceeds 2.0 toxicity units (TUc) or the three-sample median exceeds 1.0 TUc. **Table 2** lists results for the monthly testing and indicates that no chronic toxicity was identified during the 2016 reporting period.

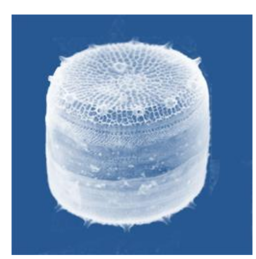


Figure 31: *Thalassiosira pseudonana*

Table 2: Summary of Chronic Toxicity Testing Results for WPCP Effluent during 2016

Test #	Sample Dates	Growth TU_c	3-Sample Median (Growth TU_c)
1	1/13/16	<1	<1
2	2/3/2016	<1	<1
3	3/2/16	<1	<1
4	4/6/16	<1	<1
5	5/4/16	<1	<1
6	6/8/16	<1	<1
7	7/13/16	<1	<1
8	8/3/16	<1	<1
9	9/7/16	<1	<1
10	10/5/16	<1	<1
11	11/2/2016	<1	<1
12	12/5/2016	<1	<1

2.1.3. 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 0.018 kg/yr, which is well below the permit limit of 0.12 kg/yr (**Figure 32**) and is an approximate 50% reduction compared with 2013 (0.0372 kg/yr) and 2014 (0.0361 kg/yr) loading rates. This decrease correlates well with those observed in CBOD (**Figure 18**) and TSS (**Figure 20**) loading rates, and is in part due to increased recycled water production and the consequent diversion of treated wastewater from SF Bay discharge.

2.1.4. PCB Effluent Limitations

The WPCP also participates in the annual submittal of water quality data pertaining to discharges of PCBs. In accordance with the Mercury and PCBs Watershed Permit, Permit CA0038849, Order R2-2012-0096, PCB concentrations are measured semi-annually as total aroclors using EPA Method 608 for regulatory compliance. PCBs were not detected using this method during the current reporting period (**Table 1**). In addition to the regulatory compliance monitoring, the WPCP is also required to measure total PCBs as congeners using EPA Proposed Method 1668c on a quarterly basis.

2.2. 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

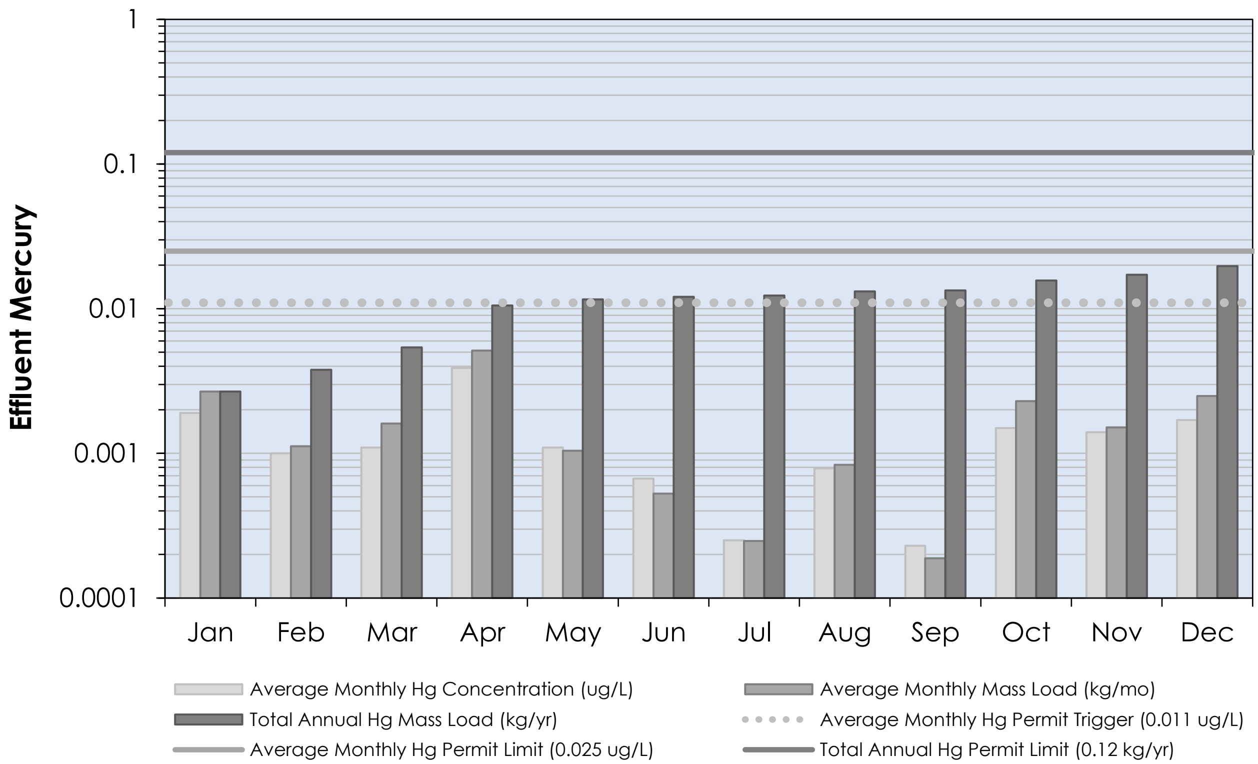


Figure 32: Effluent Mercury Concentrations and Loading Rates during 2016

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 2016 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 2016 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 office, Maintenance Manager office, Seniors' office, Training Room, and Tertiary Control Room.

The following sections of the O&M Manual were revised or updated during 2016 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, and planned or completed changes to the processes for Sludge Dewatering (see below), Recycled Water Production (in design), Power Generation (in construction), and laboratory data management. The solids flow schematic drawing was updated to reflect changes in the location and process of the dewatering operation (**Attachments A**).

- *Anaerobic Digestion Chapter*: The chapter (test and figures) was revised to reflect substantial completion of the Digester #1 and #2 rehabilitation project, which concludes a 10-year phased project to rehabilitate all four anaerobic digesters. The rehabilitation process included structural repairs, conversion from floating to fixed covers, replacement of virtually all piping, mechanical and electrical equipment and controls, and construction of the new Digester Motor Control Center Building. The document "Synagro Sludge Dewatering," which describes the process for transferring solids from the anaerobic digesters to the dewatering contract operator's (Synagro) holding tank, was attached to this chapter.

- *Sludge Dewatering Chapter:* This chapter was removed following the demolition of the existing dewatering process and solids drying area to make space for the new Primary Treatment Facilities. The chapter was replaced with a brief description of dewatering operations now being conducted by Synagro until new dewatering facilities are constructed.

- *Electrical One-Line Drawings*: Deleted MCC-E (Dewatering MCC) from the Overview drawing (Fig II-1. Deleted Fig II-17 (Dewatering MCC detail) and Figure II-12 (Digester MCC), as these areas were demolished in 2016.

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 2016 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. A number 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 2015 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 2015

- 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], and equipment information (via a bar-code reader) and also expedite data entry for work orders and other maintenance/process control measurements. The Maintenance section is considering

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

supplementing the DataSplice units with laptop computers or tablets, whose larger screens would provide a more convenient interface for certain 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.

In 2016, WPCP Operations and Maintenance staff continued the ongoing process of updating (and where necessary, developing) PMs and POPs. The WPCP places a strong emphasis on preventative maintenance as a means to achieve high mechanical reliability. Staff members from both Operations and Maintenance sections perform preventative maintenance functions.

In 2016, the WPCP initiated a project to select a new, more robust Enterprise Asset Management System (EAMS) to replace the current Maximo CMMS. A Request for Proposals (RFP) was advertised and several responses were evaluated by a committee comprised of staff from the WPCP and the IT department. Award of the contract to the recommended vendor is scheduled for the January 31, 2017, City Council meeting. Once awarded, the WPCP anticipates having the new system on-line and fully operational within two years.

Some of the more significant non-CIP maintenance and upgrades to WPCP equipment in 2016 included:

- Rehabilitation of Dual Media Filters #1 and #2
- Rehabilitation of the #2 Main Influent Pump Gearbox
- Rehabilitation of the #1 Filter Water Pump including discharge and check valves
- Rehabilitation of the Primary Sedimentation by-pass channel slide gates
- Replacement of the #4 Polymer Feed Unit
- Replacement of the #1, #2, & #3 Main Engine Heat Exchangers
- Replacement of the DMF Backwash flow rate control valve
- Installation of new Safety Railings on the new Digester MCC and Maintenance wing roofs
- Installation of new electrical vault lids at the new Synagro dewatering site
- Installation of new electrical conductors at the new Synagro dewatering site

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.).

In addition, the WPCP continued upgrades to its OPTO SCADA system screens and programming.

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 Environmental Services Department (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 are currently in progress as described above under **Section IV**. Also described in this section is the City's current Master Plan for the WPCP rebuild.

Financing

The WPCP and associated collection system are financed by revenues generated from fees collected from users of the 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 21, 2016, approving an 8% increase in the rate for sewer service for Fiscal Year 2016/2017. 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 $3.18 for an average single-family residence and $2.05 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 2016. City budgets also provide for ongoing rehabilitation of the sewer system.

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. Staffing is as follows (wastewater-related positions only):

- Managers: Water and Sewer Services Division Manager, Wastewater Operations Manager.
- Operations & Maintenance Staff: twelve full-time workers, including a wastewater collections supervisor, two wastewater collections crew leaders, two senior wastewater collections workers, four utility workers, and three maintenance workers.

WPCP and Water and Sewer Services operations are supported by local administrative staff at the WPCP and Corporation Yard, the ESD Director, 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.

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 2016, the City completed a condition assessment project to clean and evaluate the Lawrence Sanitary Sewer Trunk Main. In addition, the City began construction of Baylands Storm Pump Station No. 2 Rehabilitation Project.

In 2017, the City will begin construction for the 2016-17 Sanitary Sewer Main Replacement Phase 4 project and the Storm Pump Station No. 1 upgrade project, which will include seismic upgrades, the replacement of discharge piping and inlet grate to protect wet well. Both projects are currently under design and projected to start construction in mid-2017. The City has also scheduled an upgrade to its GIS system and CCTV software and equipment to improve condition assessment capabilities. The City runs its own construction crews and does point repairs regularly, as well as manhole and lateral repairs.

Staffing and Supervision

The WPCP is operated and maintained by the ESD, WPCP Division, with offices at the WPCP. Staffing is as follows:

- *Division Managers*: The WPCP Division Manager is responsible for overall operation and maintenance of the WPCP. The Regulatory Programs Division Manager provides support to 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 five senior Operators, 19 Operators, one Principal Design and Construction Operator, and one WPCP Control Systems Integrator.
- *Maintenance staff*: One Senior Mechanic, seven Mechanics, and one Senior Storekeeper.

- *Laboratory staff*: Two Senior Environmental Chemists, three Chemists, and three Lab/Field Technicians.
- *Industrial Pretreatment Program*: One Senior Inspector, four Environmental Compliance Inspectors, and two Lab/Field Technicians.
- *Compliance and Technical Support*: 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 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 seven Maintenance Mechanics under the direction of the WPCP Maintenance Manager and the one Senior Mechanic. Maintenance staff members are responsible for most preventive and corrective maintenance tasks, with certain specialty maintenance functions (such as PGF engine overhauls) performed by outside contractors. Maintenance staff members also have mandatory training requirements and have opportunities for elective training. The Maintenance section uses the Maximo CMMS, as described under the Plant Maintenance Program (**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.

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 2016 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 2017, 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 situation where some or all of the facility is disabled. In addition, the WPCP evaluated an 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 (see below and **Chapter IV, Section 7.0**). 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.

In addition, the Emergency Flow Management Project will provide a 1 MW trailer-mounted backup diesel generator that can be used to power specific areas of the plant that experience power outages, or with sufficient shedding of non-critical loads, the entire plant. The project includes equipment needed to connect the mobile generator to the electrical distribution system at various locations throughout the WPCP. The project is underway and expected to be completed in mid-2017.

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 backup 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 is currently under construction, with an expected completion date of 2019.

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 2017.

Updating the Contingency Plan

This status report will be appended to the Contingency Plan and will serve as the 2016 update. During 2017, 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 WPCP's SPCC Plan addresses spill response for non-wastewater spills at the WPCP.

IV. 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 also 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 (PEIR).

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 estimated to cost around $456 million dollars. The CIP, also known as the *Sunnyvale Clean Water Program,* will serve as a long-term guide for replacing the WPCP aging infrastructure and operations. **Table 3** lists all the projects included in the CIP. Key projects currently underway are highlighted in the table and presented in CIP Fact Sheets in the preceding sections[10]. During fiscal year 2015-2016, the City expended approximately $13.0 million on select CIP projects.

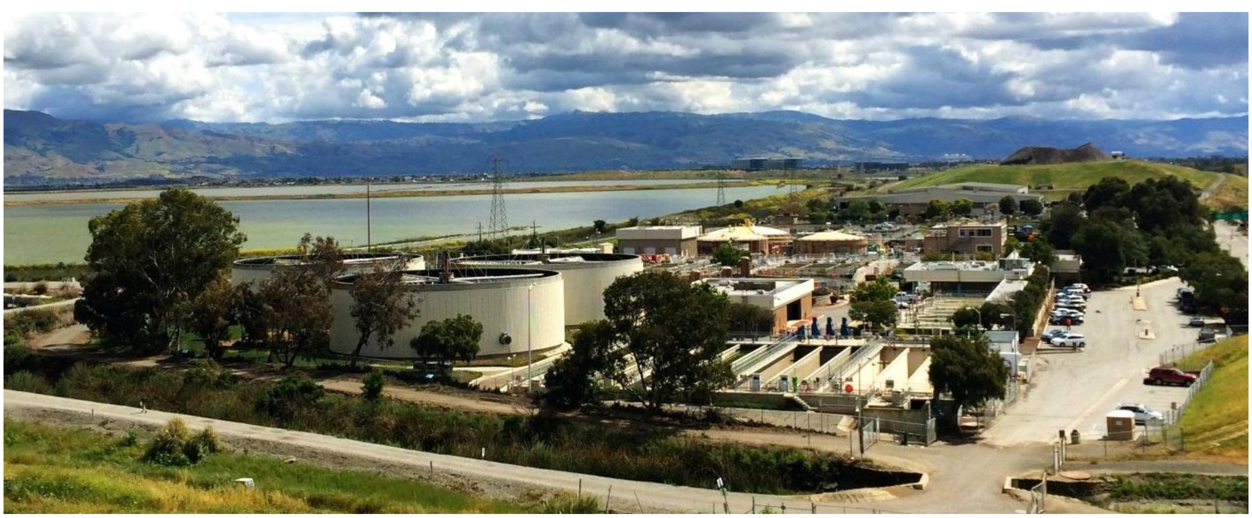


Figure 33: View of WPCP looking east

[10] CIP information gathered from the *Adopted Budget and Resource Allocation Plan for the City of Sunnyvale Fiscal Year 2015-2016, Volume III – Project Budget*.

Table 3: Summary of CIP Projects, Estimated Costs and Completion Dates

CIP Project Name	Estimated Project Life Total Cost	Estimated Completion Date	Treatment Process Improvements					
			Headworks	Primary	Secondary	Tertiary	Solids Handling	PGF
Emergency Flow Management	$ 2,883,001	2016		X				
Anaerobic Digester Rehabilitation	$ 13,622,000	2016					X	X
Dual Media Filter Rehabilitation	$ 347,672	2016				X		
Hypochlorite Conversion & Continuous Recycled Water Production Facilities	$ 7,261,210	2016				X		
Oxidation Ponds and Digester Solids Dewatering	$ 23,514,210	2023			X			
Primary Treatment Facilities Design and Construction	$ 120,899,541	2019	X	X				
Master Plan	$ 8,100,400	2016	X	X	X	X	X	X
Construction of New WPCP	$ 151,554,685	2024	X	X	X	X	X	X
WPCP Program Management	$ 28,521,787	2024	X	X	X	X	X	X
WPCP Construction Management	$8,856,232	2021	X	X				
WPCP Asset Condition Assessment	$ 356,751	2024				X		
Primary Process Repairs	$ 954,000	2016		X				
Secondary Process Repairs	$ 550,000	2016			X			
Oxidation Pond Levee Rehabilitation	$ 150,000	2016			X		X	
Tertiary Process Repairs	$ 1,310,000	2016				X		
PGF Repairs	$2,450,000	2024						X
Solids/Dewatering Repairs	$ 100,000	2016						X
Laboratory Information Management System (LIMS)	$ 250,000	2016	X	X	X	X	X	
Support Facilities Repairs	$ 702,404	2020	X	X	X	X	X	X
CIP Total	***$ 372,383,893***							

Notes:

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

2) All values reported in current dollars.

2.0. EMERGENCY FLOW MANAGEMENT

WPCP
CIP Fact Sheet

PROJECT TITLE:

EMERGENCY FLOW MANAGEMENT

CONSTRUCTION FIRM:

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

3.0. ANAEROBIC DIGESTER REHABILITATION

WPCP
CIP Fact Sheet

PROJECT TITLE:

DIGESTER REHABILITATION

CONSTRUCTION FIRM:

AZTEC CONSTRUCTION

START DATE:

January 2014

PROJECT STATUS:

COMPLETED — October 2016

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.

PROJECT AREAS

4.0. DUAL MEDIA FILTER REHABILITATION

WPCP CIP Fact Sheet

PROJECT TITLE:

DMF REHABILITATION

CONSTRUCTION FIRM:

ERS

START DATE:

August 2016

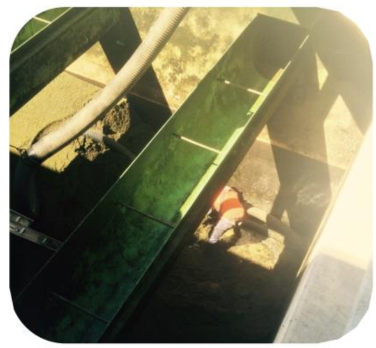
PROJECT STATUS:

COMPLETED — October 2016

Dual Media Filter Rehabilitation

WHAT IS IT?

The Dual Media Filters (DMFS) provide essential filtration of suspended solids in order for the WPCP to produce a final effluent that meets turbidity requirements for discharge or recycled water. Filtration also improves the efficiency of the disinfection process by reducing the amount of organic material present and by eliminating particles that can shield bacteria from the chlorine disinfectant. The advantage of the dual media filter bed is that the majority of the solids are removed throughout the upper, coarser layer of anthracite with the lower sand layer serving as a barrier to solids that pass through the upper layer.



Contractors removing old filter media

WHY?

The DMFs have been in service for over 30 years and the filter media, as well as the air diffuser nozzles, have shown signs of failure. The project included the replacement of the nozzles, support gravel, and filter media along with providing corrosion protection. These repairs constitute the last two of the four filters and are estimated to prolong the useful life of the DMFs by 30 years. Repair of the other two DMFs were completed in 2013.

PROJECT AREAS

5.0. HYPOCHLORITE CONVERSION & CONTINUOUS RECYCLED WATER

WPCP
CIP Fact Sheet

PROJECT TITLE:

HYPOCHLORITE & RECYCLED WATER CONSTRUCTION

CONSTRUCTION FIRM:

ANDERSON PACIFIC

START DATE:

May/July 2015

PROJECT STATUS:

IN PROGRESS

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 and does not allow for simultaneous discharge to the SF Bay. Having a separate and continuously operating process will reduce chemical and operating costs, and improve process reliability.

6.0. OXIDATION POND AND DIGESTER SOLIDS DEWATERING

WPCP CIP Fact Sheet

PROJECT TITLE:

POND AND DIGESTER SOLIDS DEWATERING

CONSTRUCTION FIRM:

SYNAGRO

START DATE:

JANUARY 2014

PROJECT STATUS:

IN PROGRESS

Synagro 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.

PROJECT AREAS

7.0. PRIMARY TREATMENT FACILITIES DESIGN AND CONSTRUCTION

WPCP CIP Fact Sheet

PROJECT TITLE:

PRIMARY TREATMENT FACILITIES DESIGN AND CONSTRUCTION

DESIGN FIRM:

CAROLLO ENGINEERS

CONSTRUCTION FIRM:

ANDERSON PACIFIC

START DATE:

July 2016

PROJECT STATUS:

IN PROGRESS

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.

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.

8.0. MASTER PLAN

WPCP CIP Fact Sheet

PROJECT TITLE:

MASTER PLAN

DESIGN FIRM:

CAROLLO ENGINEERS

START DATE:

2013

PROJECT STATUS:

COMPLETED — August 2016

WPCP Master Plan

WHAT IS IT?

The WPCP Master Plan identifies a series of essential improvements that will occur over the next 20-plus years as part of a massive reconstruction program also known as the *Sunnyvale Clean Water Program*. In order to identify potentially significant environmental impacts caused by the Master Plan and engage the public, the City developed a Programmatic Environmental Impact Report (PEIR) pursuant to the CEQA, which analyzed the potentially significant environmental impacts caused by the proposed improvements, mitigation measures to reduce those impacts, and an alternatives analysis for options that may result in fewer impacts. As part of the Master Plan process, Carollo Engineers was responsible for taking each of the program's design elements to the 10% design stage, developing program-wide design standards, and defining all the necessary design and construction packages. In August 2016, Sunnyvale's City Council voted to approve the Master Plan and PEIR, thereby authorizing the City to begin implementing the design and construction of the various components necessary to reconstruct the WPCP.

WHY?

The Master Plan will serve as a long-term guide for replacing the WPCP's aging facilities and operations. The purpose of the Master Plan is to ensure that the WPCP can meet stringent and evolving regulations, reliably treat existing and projected wastewater flows and loadings in a safe and cost-effective manner, and increase recycled water production.

PROJECT AREAS

V. PERMIT SPECIAL STUDIES

Under Provision VI.C of the previous Order (R2-2009-0061), the City was required to perform several special studies, including 1) Chronic Toxicity Identification and Toxicity Reduction Study; 2) Receiving Water Ammonia Characterization Study; and 3) Total Suspended Solids Removal Study. All of these special studies were completed and reported prior to 2015. The current Order (R2-2014-0035) does not contain any special study provisions.

VI. OTHER STUDIES AND PROGRAMS

1.0. EFFLUENT CHARACTERIZATION STUDY AND REPORT

The WPCP is required under Provision VI.C.2 of its current NPDES permit to continue to characterize and evaluate the final effluent to verify that the reasonable potential analysis conclusions of the current Order remain valid and to inform the next permit issuance. The results of the effluent monitoring for priority pollutants are included in **Attachment C**. No pollutants were identified as having reasonable potential based on the 2015 results, and no significant increases were observed between the datasets where analytical results were above detection limits.

No data were collected in 2016 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. Consequently, the WPCP will not collect priority pollutant data until the next permit renewal, as data collected in 2015 satisfy the once-per-permit-cycle requirement established Provision VI.C.1 of the Order.

2.0. NUTRIENT MONITORING FOR REGIONAL NUTRIENT PERMIT

In 2016, 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 NPDRES 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 and is currently under review.

4.0. REGIONAL WATER MONITORING PROGRAM AND RECEIVING WATER MONITORING REQUIREMENTS

Provision VI in Attachment E requires the City to continue its participation in the Regional Water Monitoring Program (RMP), which was formally established in 1993. This monitoring is necessary to characterize the receiving water and the effects of the discharges authorized in R2-2014-0035. The City's RMP participation is documented in a letter issued by BACWA annually, which can be found at https://bacwa.org/document/2017-npdes-compliance-rmp-support-letters/

The City is also required to monitor receiving waters at or between RMP monitoring station C-1-3 and Sunnyvale station C-2-0 (**Figure 34**) near the confluence of Guadalupe Slough and Moffett Channel to provide data necessary for reasonable potential analyses for unionized ammonia. This is the area where the highest un-ionized ammonia would be expected based on the *Receiving Water Ammonia Characterization Study – Final Report*, dated April 15, 2012. The parameters to sampling include salinity, temperature, pH, and total ammonia as nitrogen.

This sampling needs to occur over a 12-month, contiguous period during the term of the Permit. The permit provides two alternatives for meeting this requirement:

- The City may conduct this receiving water monitoring on its own or
- Rely upon equivalent data obtained following another alternative approach through the RMP or in coordination with others.

Before pursuing an alternative approach, the City will first obtain written concurrence from the RWQCB's Executive Officer that the alternative approach is equivalent to the monitoring described above. The City will then submit the data in a report with its application for permit reissuance. The City is evaluating how it will meet this monitoring requirement, but anticipates that the monitoring will be conducted during the third quarter of 2017.

Figure 34: RMP monitoring station locations along Guadalupe Slough

ATTACHMENTS

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Attachment A

Wastewater Treatment Process:

Liquids and Solids Handling Process Schematics

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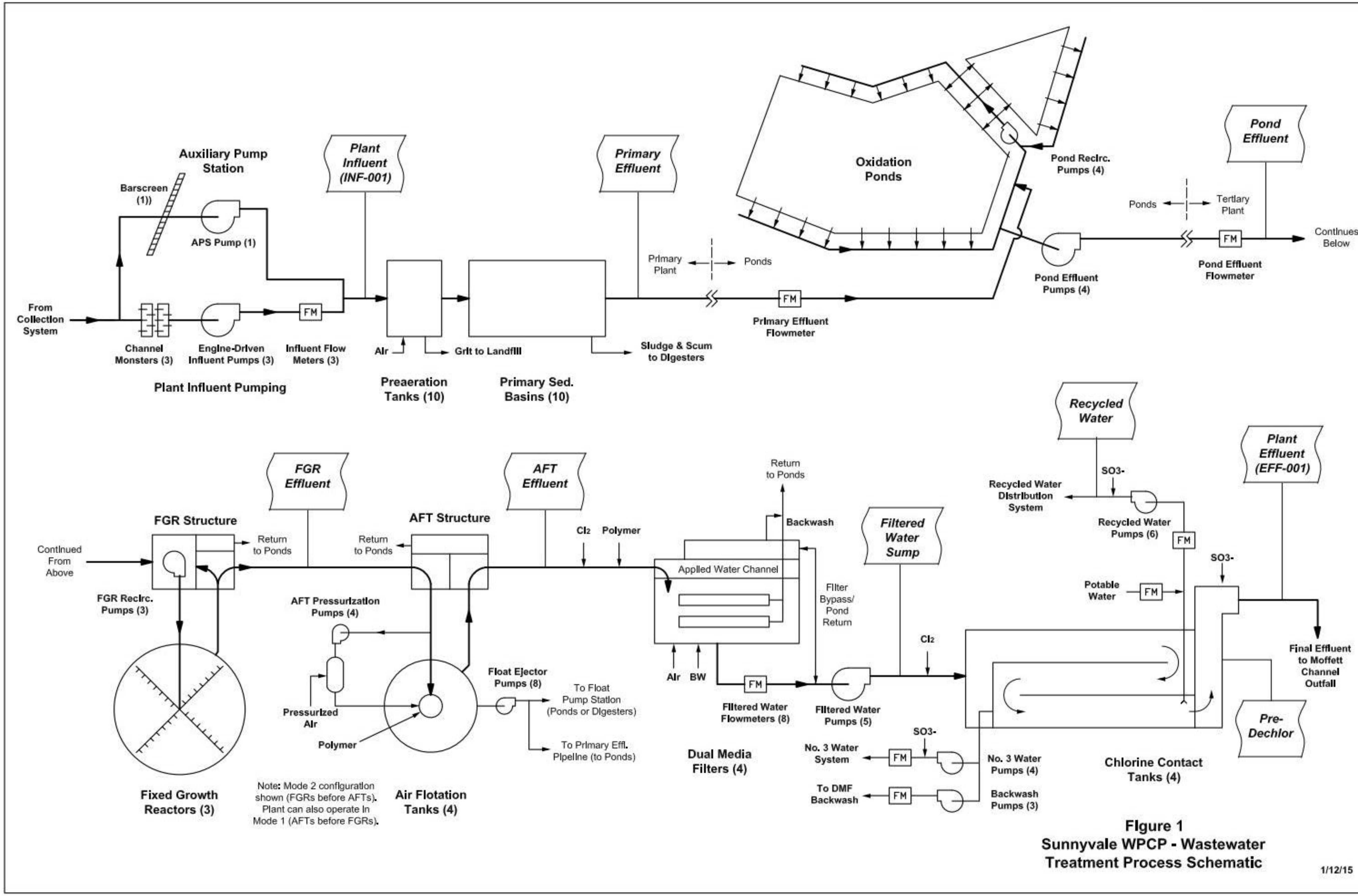
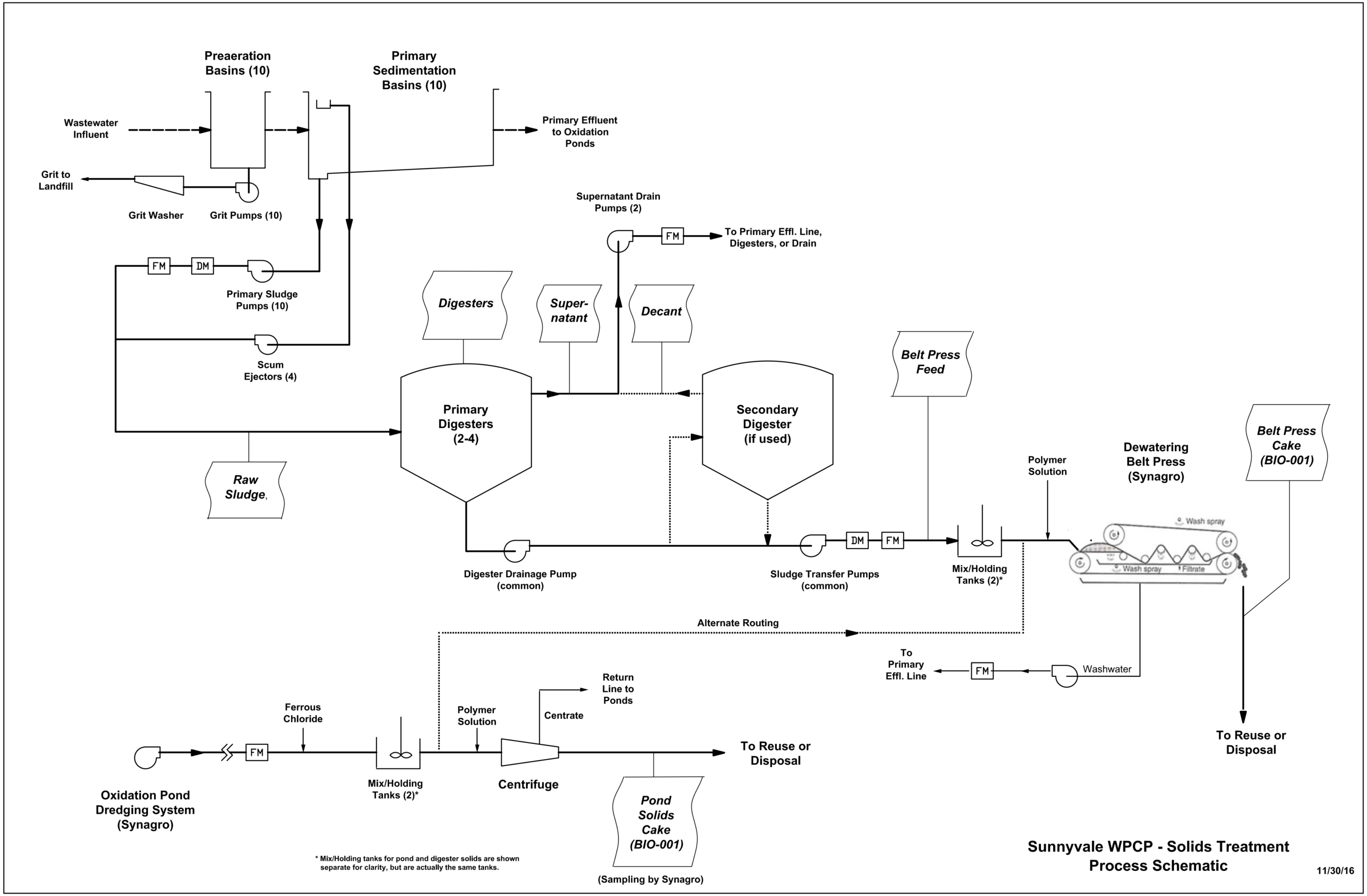


Figure 1
Sunnyvale WPCP - Wastewater Treatment Process Schematic



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
FM
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
DM
FM
Digester Drainage Pump
(common)
Sludge Transfer Pumps
(common)
Mix/Holding
Tanks (2)*
Alternate Routing
To
Primary
Effl. Line
FM
Washwater
Return
Line to
Ponds
Ferrous
Chloride
Polymer
Solution
Centrate
FM
To Reuse or
Disposal
To Reuse or
Disposal
Oxidation Pond
Dredging System
(Synagro)
Mix/Holding
Tanks (2)*
Centrifuge
Pond
Solids
Cake
(BIO-001)
* Mix/Holding tanks for pond and digester solids are shown
separate for clarity, but are actually the same tanks.
(Sampling by Synagro)
Sunnyvale WPCP - Solids Treatment
Process Schematic
11/30/16

ATTACHMENT B

WPCP Certificate of Environmental Accreditation

WPCP Approved Analyses

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

Interim

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

City of Sunnyvale WPCP 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: **10/31/2017**

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

Certificate No. 1340
Expiration Date 10/31/2017
INTERIM

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)
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
103.140	016	Zinc	EPA 200.8
103.140	017	Boron	EPA 200.8

As of 10/31/2016 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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

As of 10/31/2016 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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,E-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
108.540	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
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

As of 10/31/2016 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

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 10/31/2016, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

ATTACHMENT C

Effluent Characterization Study and Report Monitoring Results 2014 - 2015

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	
	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.