County of San Diego McClellan-Palomar Airport Water Quality Treatment Facility 2022-2023 Long-Term Effectiveness Monitoring Memorandum

Final

Prepared For:

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Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

Airport	McClellan-Palomar Airport
BMP	best management practice
$CaCO_3$	calcium carbonate
HCl	hydrochloric acid
HDPE	high density polyethylene
HNO_3	Nitric acid
LTMP	Long-Term Effectiveness Monitoring Program
MBAS	methylene blue active substances
MDL	method detection limit
NA	not calculated
ND	not detected
NPDES	National Pollutant Discharge Elimination System
pH	hydrogen ion concentration
QA/QC	quality assurance/quality control
RL	reporting limit
SM	Standard Method
SUSMP	Standard Urban Stormwater Mitigation Plan
TDS	total dissolved solids
TSS	total suspended solids
WQTF	Water Quality Treatment Facility
WESTON	Weston Solutions, Inc.

Units of Measure

cfs	cubic feet per second
ºC	degrees Celsius
FNU	Formazin Nephelometric Unit
ft	feet
in	inch
L	liter
lb	pound
mg/L	milligrams per liter
mL	milliliter
µg/L	micrograms per liter
µS/cm	microSiemens per centimeter
NTU	Nephelometric turbidity unit

1 OVERVIEW

A Water Quality Treatment Facility (WQTF) for the McClellan-Palomar Airport (Airport) was designed and installed by the County of San Diego in 2006 to treat urban runoff. The WQTF is located on the north side of the existing runway, beneath the airplane parking/storage tarmac (Figure 1-1). The drainage area of this site is characterized by a large quantity of impervious surface (airport runway, taxiway, and ground transportation access roads). Storm flows from this area are conveyed to the project site via an underground storm drain system that ultimately exits the site on the northern side of the Airport. From here, flow is directed through a series of underground storm drains, open channels, and culverts before discharging into Agua Hedionda Creek just upstream of its confluence with the Agua Hedionda Lagoon. A Long-term Monitoring Plan prepared by Weston Solutions, Inc. (WESTON) in 2007 recommended wet season monitoring of inlet and outlet flows during at least two storm events per year for five years (WESTON, 2007a and 2007b). Data collected during the monitored events were used to estimate flow, measure water quality analyte concentrations, calculate loads, and ultimately provide an assessment of how well the WQTF was functioning toward its goal of improving water quality through load reductions to the receiving water. Wet season sampling was initially conducted from 2006-2007 through 2012-2013, and more recently in 2016-2017, 2018-2019, 2020-2021, and 2021-2022. Sampling was not conducted during 2017-2018 due to dry conditions in the region.

This memorandum provides data from the events monitored during the 2022-2023 season.

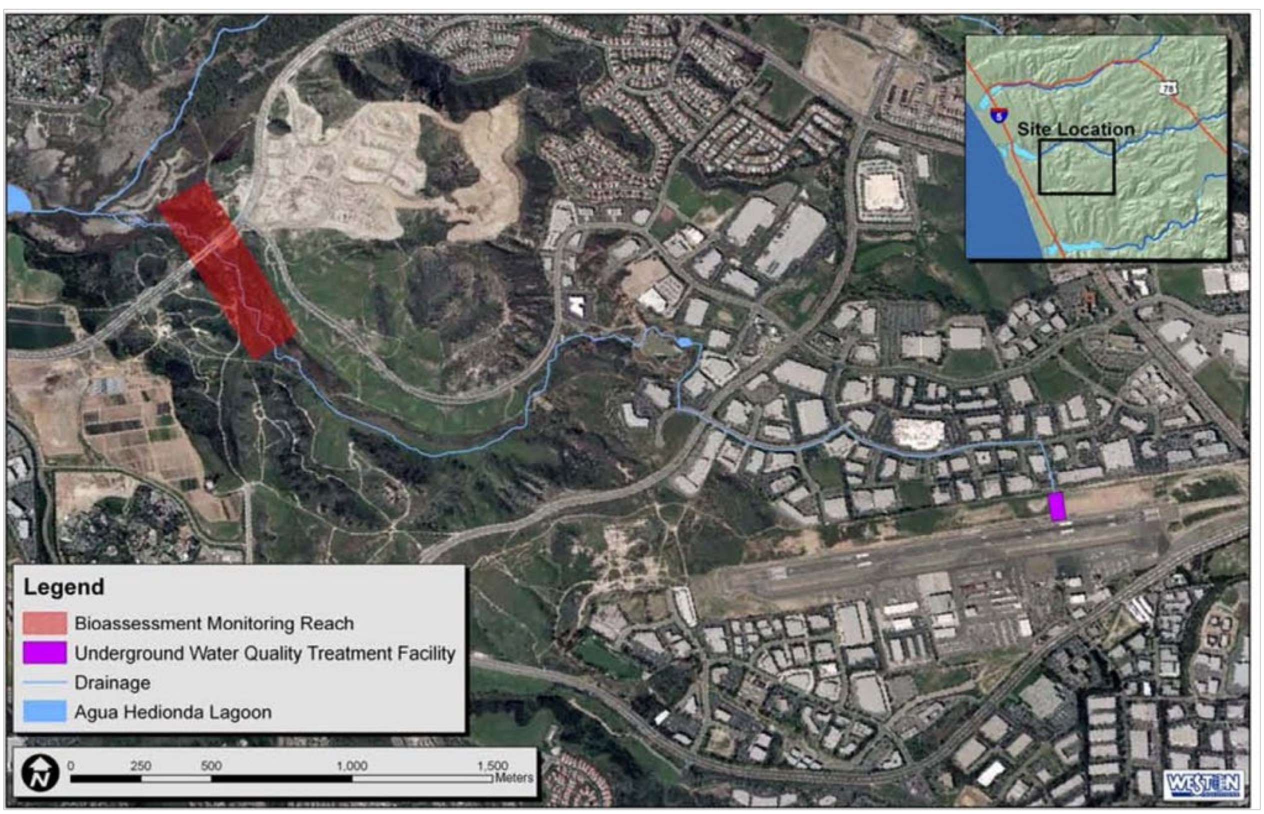

Figure 1-1. Location of the McClellan-Palomar Airport Water Quality Treatment Facility

1.1 Design of the Water Treatment Facility

The WQTF was designed to provide water quality treatment for low storm flows and nuisance urban runoff flows passing through the site before entering Agua Hedionda Creek and the Agua Hedionda Lagoon. As shown in Figure 1-2, the WQTF was constructed to allow runoff to flow from the influent conveyances through a hydrodynamic separator and a detention vault, and discharge at a controlled flow rate to allow for extended detention of the storm water runoff. The hydrodynamic separator was designed to centrifugally remove debris and gross pollutants and then direct the flow into the detention vault where additional pollutants are removed through settlement during low flows. In low flow storm situations, the flow builds up behind the weir in which the low flow effluent discharge point is located. Storm volumes up to the County of San Diego Standard Urban Stormwater Mitigation Plan (SUSMP) manual design storm are retained to allow for additional settlement of smaller particles, thereby reducing the concentrations of pollutants in the effluent that may be associated with these particles. Flows greater than the design storm bypass the WQTF and enter the adjacent 36" storm drain.

Sections within the WQTF are identified as:

- Hydrodynamic separator: the structure where water first enters the WQTF and possesses the greatest potential for larger sediment accumulation.
- Detention Vault: the structure where water is detained in a large impervious area where finer particles settle before discharging through the low flow effluent opening.

The design of the WQTF is discussed in detail in the "Final Design Report for Underground Water Quality Detention Basin at Palomar Airport," dated October 10, 2006 (Rick Engineering Company, 2007).

1.2 Long-term Effectiveness Monitoring Program

The goals of the Long-Term Effectiveness Monitoring Program (LTMP) include:

- Load Reduction Monitoring – Determination of the estimated annual pollutant load reductions achieved by the WQTF for National Pollutant Discharge Elimination System (NPDES) Stormwater Permit reporting.
- Long-Term Effectiveness Assessment – Evaluation of the long-term effectiveness of the WQTF based on a statistical assessment of the data.
- Performance and Maintenance Monitoring – Assessment of the WQTF to determine maintenance needs in order to maintain performance as designed.

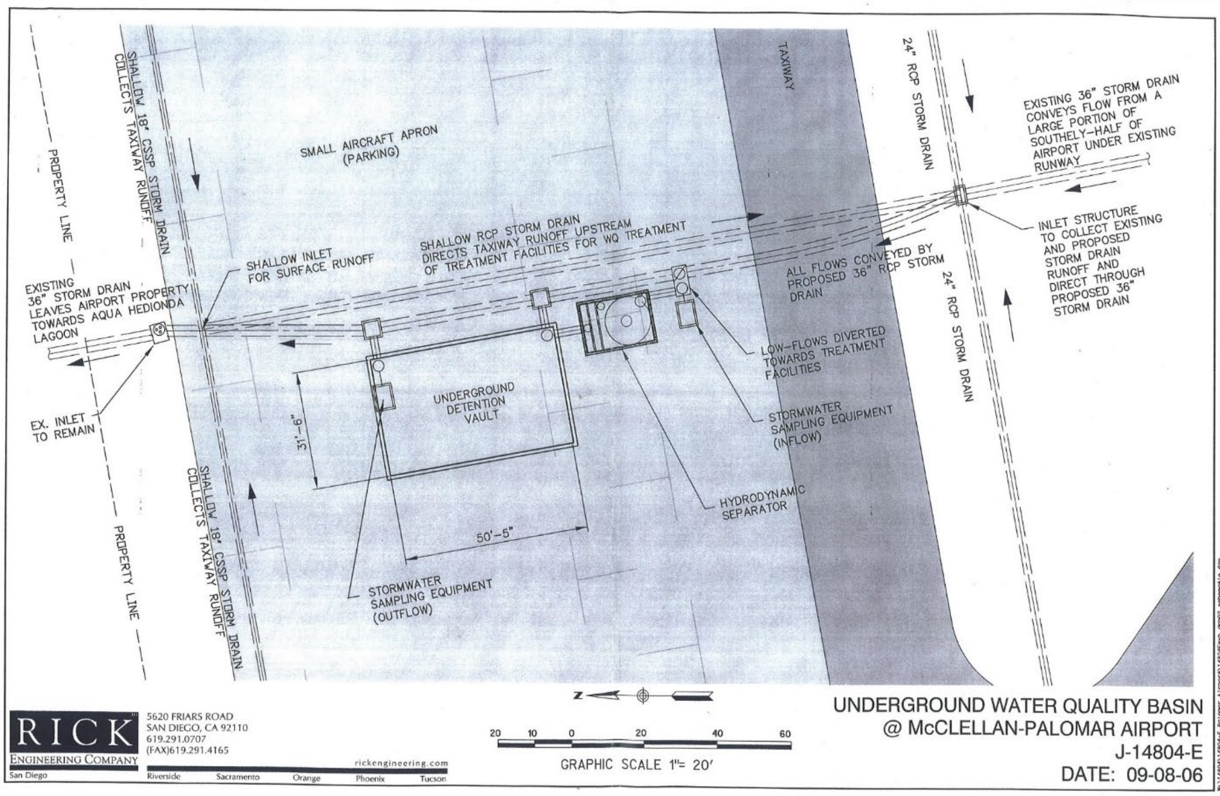

Figure 1-2. Underground Water Quality Treatment Facility Design

Long-term WQTF monitoring was continued in 2022-2023 and consisted of water quality and flow monitoring to meet the effectiveness assessment goals stated above. The inlet and outlet monitoring sites located at McClellan-Palomar Airport were monitored two times during the 2022-2023 wet weather season, on January 30, 2023 and February 23, 2023.

2 MATERIALS AND METHODS

The monitoring program was comprised of the following components:

- Instantaneous flow was measured at the influent and effluent conveyance access manholes three times during each monitored storm event;
- One wet weather grab sample was collected at both the influent and effluent sample locations. Samples were analyzed for the following constituents: total suspended solids (TSS), total dissolved solids (TDS), dissolved metals (cadmium, copper, lead, and zinc), nitrate, total phosphorus, dissolved orthophosphate, methylene blue active substances (MBAS), oil and grease, total zinc, and the organophosphorus pesticides diazinon and chlorpyrifos. Flow measurements were coordinated with collection of the grab samples;
- One field blank and one field duplicate were collected for the program;
- Field measurements were collected for pH, conductivity, temperature, dissolved oxygen, and turbidity;
- Chemistry results, monitoring activities, and evaluation of the data at the influent and effluent were evaluated to assess WQTF effectiveness and summarized for the 2021-2022 monitoring year.

Sampling was conducted only during storm events that met the following requirements:

- Predicted to deliver greater than 0.1 inch of rainfall in a six-hour period; and
- At least 72 hours of dry weather preceding the forecasted rainfall.

Water quality samples were collected on January 30, 2023 and February 23, 2023. WESTON personnel received an escort by airport staff to allow sampling to occur on airport grounds. One set of grab samples was collected at each sampling site (influent and effluent) at the same time flow measurements were collected during each sampling event. Grab samples were collected in pre-cleaned containers and transferred to appropriate laboratory-supplied sampling bottles. Grab samples were collected by lowering a pre-cleaned transfer container from the designated manhole access at the influent and effluent sampling points to avoid personnel having to enter the WQTF. Grab samples were analyzed for the constituents listed in Table 2-1.

Table 2-1. Analytical Laboratory Water Quality Parameters

Analytical Parameter	Analytical Method	Sample Volume	Containers #, size, type	Preservation (chemical, temperature, light protected)	Maximum Holding Time: Preparation/ analysis
Total Suspended Solids (TSS)	SM 2540-D	250 mL	Plastic	Store Cool at <4ºC	6 Months
Total Dissolved Solids (TDS)	SM 2540-C	1L	Plastic	Store Cool at <4ºC	7 Days
Total Hardness	SM 2340B	350mL	Plastic	HNO_3	6 Months
Dissolved Cadmium	EPA 200.8	1L	Plastic	Store Cool at <4ºC	6 Months
Dissolved Copper	EPA 200.8	1L	Plastic	Store Cool at <4ºC	6 Months
Dissolved Lead	EPA 200.8	1L	Plastic	Store Cool at <4ºC	6 Months
Dissolved Zinc	EPA 200.8	1L	Plastic	Store Cool at <4ºC	6 Months
Nitrate - N	EPA 353.2	100mL	Plastic or Glass	Store Cool at <4ºC	48 Hours
Total Phosphorus	EPA 200.7	350 mL	HDPE Plastic	H_3SO_4	28 Days
Dissolved Ortho-Phosphate	EPA 365.1	250 mL	HDPE Plastic	Store Cool at <4ºC	28 Days
Diazinon	EPA 625.1M	1 L	Amber Glass	Store Cool at <4ºC	Extraction 7 days; Analysis 40 days
Chlorpyrifos	EPA 625.1M	1 L	Amber Glass	Store Cool at <4ºC	Extraction 7 days; Analysis 40 days
Surfactants (MBAS)	SM 5540 C	500 mL	Plastic	Store Cool at <4ºC	48 Hours
Oil and Grease	EPA 1664B	1 L	Amber Glass	Store Cool at <4ºC, Add HCl to pH<2	28 Days
Total Zinc	EPA 200.8	350 mL	Plastic	HNO_3	6 Months

MBAS – methylene blue active substances; SM – Standard Method; EPA – Environmental Protection Agency; L- liter; mL – milliliter; HDPE - high-density polyethylene; ºC – degrees Celsius; HCl – hydrochloric acid; HNO_3 – nitric acid

2.1 Flow Measurements

The WQTF is designed to temporarily detain storm water flow. During a storm event, stage height increases and remains high at the influent, while the effluent flow velocity is relatively low and constant until empty. Since the WQTF is not designed to permanently retain storm water, the influent and effluent volumes should be approximately the same for a given storm event, except during bypass conditions. Factors that may reduce total effluent volume include the potentially negligible amount of sludge and water that may remain in the WQTF, potential exfiltration, evaporation, and other means of volume reduction.

Water depth measurements used to calculate flows and loads for the 2022–2023 wet season monitoring events are presented in Section 3.0. Instantaneous water depth measurements were recorded at approximately the beginning, middle, and end of each sampling event. All monitoring and sampling activities were performed above ground, through the access manholes above the WQTF. Water depth within the WQTF was estimated by measuring distances from the rims of the influent and effluent access manholes to the water level. The distances were measured three times: at the beginning, middle, and end of sampling; then the measurements were averaged. These measurements represent the reverse of true stage height. To obtain the stage height, the average distance to the water was subtracted from the invert (26.5 feet [ft] for the influent, 28.0 ft for the effluent). The stage heights were then converted to instantaneous flow values using Table 5-2 of the LTMP, reproduced below as Table 2-2.

Table 2-2. Calculated Flow Values Based on Stage Height within WQTF

Head (in)	Influent Flow (cfs)	Effluent Flow (cfs)
0	0.46	0.07
1	3.07	0.08
2	5.5	0.09
3	7.75	0.09
4	9.83	0.10
5	11.7	0.11
6	13.4	0.11
7	15.0	0.12
8	16.4	0.13
9	17.0	0.14
10	18.6	0.15
11	19.4	0.15
12	20.1	0.16
13	20.6	0.17
14	20.9	0.17
15	21.3	0.18
16	21.7	0.18
17	21.8	0.19
18	21.9	0.20
19	22.0	0.20
20	22.1	0.21
21	22.1	0.22
22	21.9	0.22
23	21.4	0.23
24	20.2	0.24
25		0.25
26		0.25
27		0.26
28		0.27
29		0.28
30		0.29
31		0.29
32		0.30
33		0.31
34		0.32
35		0.33
36		0.33
37		0.34
38		0.35
39		0.36
40		0.36
41		0.37
42		0.38
43		0.39

Table 2-2. Calculated Flow Values Based on Stage Height within WQTF

Head (in)	Influent Flow (cfs)	Effluent Flow (cfs)
44		0.39
45		0.40
46		0.41
47		0.41
48		0.42
49		0.44
50		0.44
51		0.45
52		0.45
53		0.46
54		0.46
55		0.47
56		0.47
57		0.47
58		0.48
59		0.48
60		0.48

cfs - cubic feet per second; in - inch(es)

3 RESULTS

3.1 January 30, 2023 Storm Event

WESTON successfully sampled a storm event on January 30, 2023. The storm began at approximately 18:30 on January 29, 2023 and ended at approximately 17:00 on January 30, 2023 with a total of 0.61 inches of precipitation. Rainfall totals were collected from the San Diego County Flood Control District OneRain Carlsbad (27046) weather station, located at the McClellan-Palomar Airport (https://sandiego.onerain.com/site/?site_id=37). Inlet, outlet, duplicate, and field blank samples were successfully collected during this event between 13:00 and 13:20 on January 30, 2023.

Results of physical and chemical analyses are presented in Table 3-1 for the samples collected during the January 30, 2023 storm event at the inlet and outlet. Results are also included in Appendix A along with field quality assurance/quality control (QA/QC) sample results.

Table 3-1. Analytical Results from January 30, 2023 Storm Event

Analyte	Units	Inlet	Outlet
		1/30/2023	1/30/2023
Physical Chemistry			
Dissolved Oxygen	mg/L	10.17	10.30
pH	pH Units	7.99	8.07
Specific Conductivity	µS/cm	117.8	116.5
Water Temperature	Celsius	14.37	13.79
Turbidity	FNU	12.89	12.45
General Chemistry			
MBAS	mg/L	0.12	0.13
Oil & Grease	mg/L	1.1J	1.6J
Total Dissolved Solids	mg/L	74	74
Total Hardness	mg/L	16.8	18.2
Total Suspended Solids	mg/L	18	12
Nutrients			
Nitrate as N	mg/L	0.41	0.39
OrthoPhosphate as P	mg/L	0.088	0.090
Total Phosphorus	mg/L	0.29	0.30
Total Metals			
Zinc	mg/L	0.053	0.051
Dissolved Metals			
Cadmium	mg/L	0.00012J	0.00010J
Copper	mg/L	0.0095	0.0093
Lead	mg/L	0.00025	0.00022
Zinc	mg/L	0.038	0.036
Organophosphorus Pesticides			
Chlorpyrifos	µg/L	ND	ND
Diazinon	µg/L	ND	ND

J – Analyte was detected at a concentration below the reporting limit and above the method detection limit. Reported value is estimated.

ND – Results not detected above the Method Detection Limit (MDL); mg/L – milligrams per liter; µg/L – micrograms per liter; CaCO3 – calcium carbonate; µS/cm – micro Siemens per centimeter; FNU – Formazin Nephelometric Unit

Physical and general chemistry, nutrient, and total and dissolved metals measurements were similar at both stations except TSS, which was lower in the outlet. Oil and grease and dissolved cadmium were detected at estimated concentrations below the reporting limit (RL) at both stations. Chlorpyrifos and diazinon were not detected above the method detection limit (MDL) at either station.

Water levels in the WQTF during the sampling event are summarized in Table 3-2. Flow calculations used a head or stage height value of 7.33 inches at the inlet, which was the average value of the three depth measurements. Instantaneous flow rates of 15.46 cfs and 0.10 cfs for the inlet and outlet sampling sites, respectively, was found using the head-flow table from the LTMP (Table 2-2).

Table 3-2. Stage Height Measurements During January 30, 2023 Storm Event

Inlet		Outlet	
Time	**Water Depth (inches)**	**Time**	**Water Depth (inches)**
08:00	4.0	08:00	2.0
12:55	10.0	12:55	7.0
14:30	8.0	14:30	4.0
Average	7.33		4.33

3.2 February 23, 2023 Storm Event

WESTON successfully sampled a storm event on February 23, 2023. The storm began at approximately 12:15 on February 22, 2023 and ended at approximately 06:00 on February 23, 2023 with a total of 0.23 inches of precipitation. Rainfall totals were collected from the San Diego County Flood Control District OneRain Carlsbad (27046) weather station, located at the McClellan-Palomar Airport (https://sandiego.onerain.com/site/?site_id=37). Inlet and outlet samples were successfully collected during this event between 06:30 and 06:40 on February 23, 2023.

Results of physical and chemical analyses for the samples collected during the February 23, 2023 storm event at the inlet and outlet are presented in Table 3-3.

Table 3-3. Analytical Results from February 23, 2023 Storm Event

Analyte	Units	Inlet	Outlet
		2/23/2023	2/23/2023
Physical Chemistry			
Dissolved Oxygen	mg/L	11.25	11.00
pH	pH Units	8.03	8.31
Specific Conductivity	µS/cm	102.6	107.0
Water Temperature	Celsius	9.91	10.94
Turbidity	FNU	15.85	21.59
General Chemistry			
MBAS	mg/L	0.064	0.079
Oil & Grease	mg/L	5.5	1.1J
Total Dissolved Solids	mg/L	53	69
Total Hardness	mg/L	18.8	19.8
Total Suspended Solids	mg/L	33	41
Nutrients			
Nitrate as N	mg/L	0.42	0.43
OrthoPhosphate as P	mg/L	0.071	0.065
Total Phosphorus	mg/L	0.22	0.16
Total Metals			
Zinc	mg/L	0.036	0.054
Dissolved Metals			
Cadmium	mg/L	0.000063J	0.000079J
Copper	mg/L	0.0053	0.0053
Lead	mg/L	0.00011J	0.00014J
Zinc	mg/L	0.014	0.022
Organophosphorus Pesticides			
Chlorpyrifos	µg/L	ND	ND
Diazinon	µg/L	ND	ND

J – Analyte was detected at a concentration below the reporting limit and above the method detection limit. Reported value is estimated.

ND – Results not detected above the Method Detection Limit (MDL); mg/L – milligrams per liter; µg/L – micrograms per liter; CaCO3 – calcium carbonate; µS/cm – micro Siemens per centimeter; FNU – Formazin Nephelometric Unit

Physical chemistry measurements were generally similar at both stations. Water temperature and turbidity were higher at the outlet compared to the inlet. Among the general chemistry parameters, oil & grease was lower at the outlet MBAS, TDS, TSS, and total hardness were higher at the outlet. Nutrient concentrations were similar at the inlet and outlet for nitrate as N, while orthophosphate as P and total phosphorus were lower at the outlet. Metals concentrations were higher at the outlet for total and dissolved zinc. The dissolved copper concentration was the same at the inlet and outlet. Dissolved copper and dissolved lead were detected at estimated concentrations below the RL at both stations. Chlorpyrifos and diazinon were not detected above the MDL at either station.

The WQTF was estimated to have an average influent water depth of 7.0 inches based on the stage height measurements collected during the storm (Table 3-4). Instantaneous flow rates of 15.0 cfs and 0.11 cfs for the inlet and outlet sampling sites, respectively, was found using the head-flow table from the LTMP (Table 2-2).

Table 3-4. Stage Height Measurements during February 23, 2023 Storm Event

Inlet		Outlet	
Time	**Water Depth (inches)**	**Time**	**Water Depth (inches)**
06:15	5.0	06:15	3.0
06:35	14.0	06:35	10.0
08:00	2.0	08:00	1.0
Average	7.0		4.67

3.3 Load Estimation

Instantaneous loading rates were calculated by multiplying the analyte concentration in milligrams per Liter (mg/L) by the influent flow rate as cubic feet per second (cfs) (based on the stage height conversion to flow rate presented in Table 2-2). Calculations of outlet loads were based on inlet flows, since the WQTF does not retain water. The flow rate-analyte concentration product was then converted to pounds per day (lbs/day) using the following equation:

$$\frac{cubic\ feet}{second} \times \frac{Liters}{cubic\ foot} \times \frac{milligrams}{Liter} \times \frac{Pounds}{milligram} \times \frac{seconds}{day} = Pounds\ per\ day$$

Table 3-5 and Table 3-6 present the concentrations and loads (lbs/day) for the January 30, 2023 and February 23, 2023, respectively. Loads are not presented for values that were not detected above the MDL.

Load reductions between the inlet and outlet of the WQTF were also calculated and are included in Table 3-5 and Table 3-6. The following equation was used to calculate the percent load reduction:

$$\%\ Load\ Reduction = \frac{Inlet\ Load - Outlet\ Load}{Inlet\ Load}$$

The load reductions are directly proportional to the differences in concentrations between the influent and effluent based on the assumption that effluent volume equaled influent volume. For analytes that were not detected above the MDL, a value of one half of the MDL was used to calculate the load reduction percentages.

Table 3-5. WQTF Inlet and Outlet Analyte Concentrations, Estimated Loads, and Estimated Load Reductions for January 30, 2023 Storm Event

Analyte Class	Units	Concentration		Load (lbs/day)		Load Reduction (%)**
		Inlet	Outlet	Inlet	Outlet*	
Flow	cfs	15.46	0.10	NA	NA	99%
General Chemistry						
Oil & Grease	mg/L	1.1J	1.6J	91.7	133	-45%
Surfactants (MBAS)	mg/L	0.12	0.13	10.0	10.8	-8.3%
Total Dissolved Solids	mg/L	74	74	6,171	6,171	0%
Total Suspended Solids	mg/L	18	12	1,501	1,001	33%
Nutrients						
Nitrate as N	mg/L	0.41	0.39	34.2	32.5	4.9%
Dissolved Orthophosphate as P	mg/L	0.088	0.090	7.34	7.50	-2.3%
Total Phosphorus	mg/L	0.29	0.30	24.2	25.0	-3.4%
Total Metals						
Zinc	mg/L	0.053	0.051	4.42	4.25	3.8%
Dissolved Metals						
Cadmium	mg/L	0.00012J	0.00010J	0.01	0.01	17%
Copper	mg/L	0.0095	0.0093	0.79	0.78	2.1%
Lead	mg/L	0.00025	0.00022	0.02	0.02	12%
Zinc	mg/L	0.038	0.036	3.17	3.00	5.3%
Organophosphorus Pesticides						
Chlorpyrifos	µg/L	ND	ND	ND	ND	NA
Diazinon	µg/L	ND	ND	ND	ND	NA

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit. Reported value is estimated.
ND - Analyte not detected above reporting method detection limit, load not presented.
NA - Load reduction not calculated due to non-detect results for both samples.
*Load reductions are based on influent flow rates because the WQTF is designed to temporarily detain storm water flow, thus effluent volume is assumed to equal influent volume
** Negative values indicate an increase in pollutant load. Positive values indicate a pollutant load reduction. Where loads are NA, value represents change in concentration or measurement value

Table 3-6. WQTF Inlet and Outlet Analyte Concentrations, Estimated Loads, and Estimated Load Reductions for February 23, 2023 Storm Event

Analyte Class	Units	Concentration		Load (lbs/day)		Load Reduction (%)**
		Inlet	Outlet	Inlet	Outlet*	
Flow	cfs	15.0	0.11	NA	NA	99%
General Chemistry						
Oil & Grease	mg/L	5.5	1.1J	445	89.0	80%
Surfactants (MBAS)	mg/L	0.064	0.079	5.18	6.39	-23%
Total Dissolved Solids	mg/L	53	69	4,288	5,583	-30%
Total Suspended Solids	mg/L	33	41	2,670	3,317	-24%
Nutrients						
Nitrate as N	mg/L	0.42	0.43	34.0	34.8	-2.4%
Dissolved Orthophosphate as P	mg/L	0.071	0.065	5.74	5.26	8.5%
Total Phosphorus	mg/L	0.22	0.16	17.8	13.0	27%
Total Metals						
Zinc	mg/L	0.036	0.054	2.91	4.37	-50%
Dissolved Metals						
Cadmium	mg/L	0.000063J	0.000079J	0.01	0.01	-25%
Copper	mg/L	0.0053	0.0053	0.43	0.43	0%
Lead	mg/L	0.00011J	0.00014J	0.01	0.01	-27%
Zinc	mg/L	0.014	0.022	1.13	1.78	-57%
Organophosphorus Pesticides						
Chlorpyrifos	µg/L	ND	ND	ND	ND	NA
Diazinon	µg/L	ND	ND	ND	ND	NA

J - Analyte was detected at a concentration below the reporting limit and above the method detection limit. Reported value is estimated.
ND- Analyte not detected above reporting method detection limit, load not presented. For purposes of calculating load reduction percentages. ½ the MDL used.
NA - Load reduction not calculated due to non-detect results for both samples.
*Load reductions are based on influent flow rates because the WQTF is designed to temporarily detain storm water flow, thus effluent volume is assumed to equal influent volume
** Negative values indicate an increase in pollutant load. Positive values indicate a pollutant load reduction. Where loads are NA, value represents change in concentration or measurement value.

3.4 Long-Term Analyte Concentrations

Long-term wet weather monitoring has been performed at McClellan-Palomar Airport since the 2006-2007 wet weather season. Analyte concentrations of WQTF influent and effluent are provided for each of the monitored constituents in Figure 3-1 through Figure 3-13. The differences between the influent and effluent concentrations are directly proportional to load reductions, based on the assumption that effluent volume equals influent volume. Diazinon and chlorpyrifos were analyzed in all samples except during the 2013 monitoring events. All samples analyzed for chlorpyrifos and diazinon were not detected above the MDL; therefore, graphs for these two analytes are not presented below.

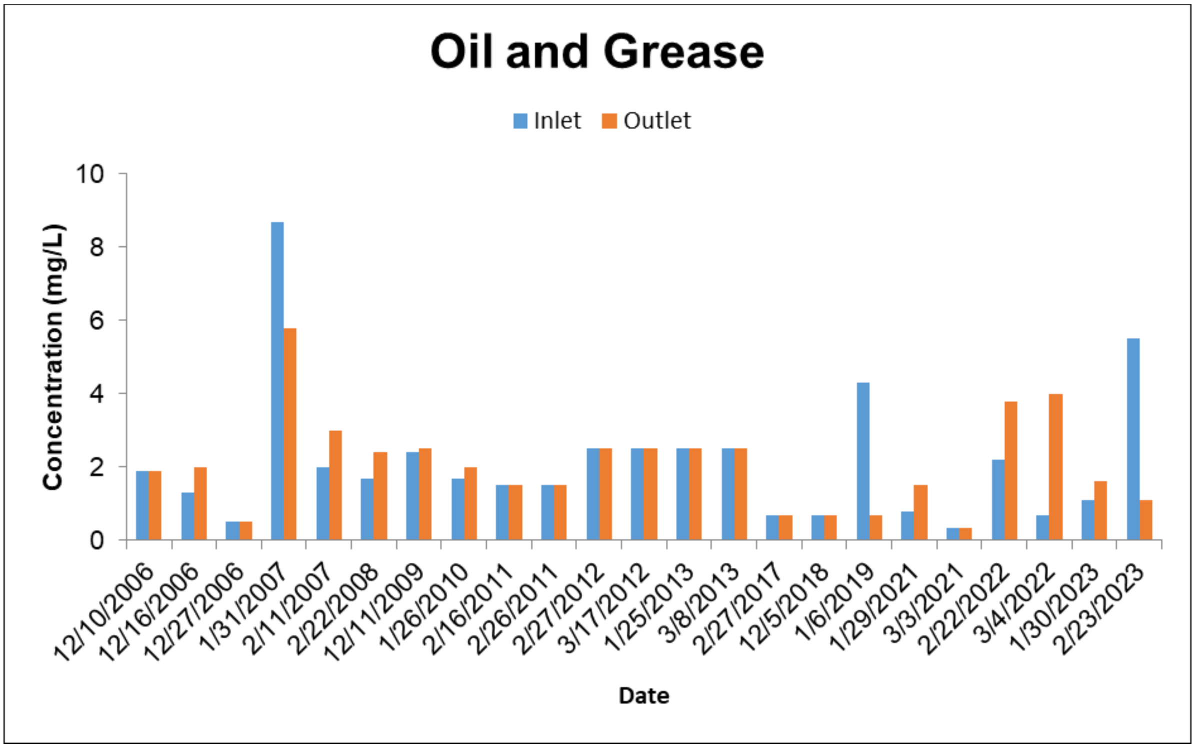

Figure 3-1. Oil and Grease Concentrations

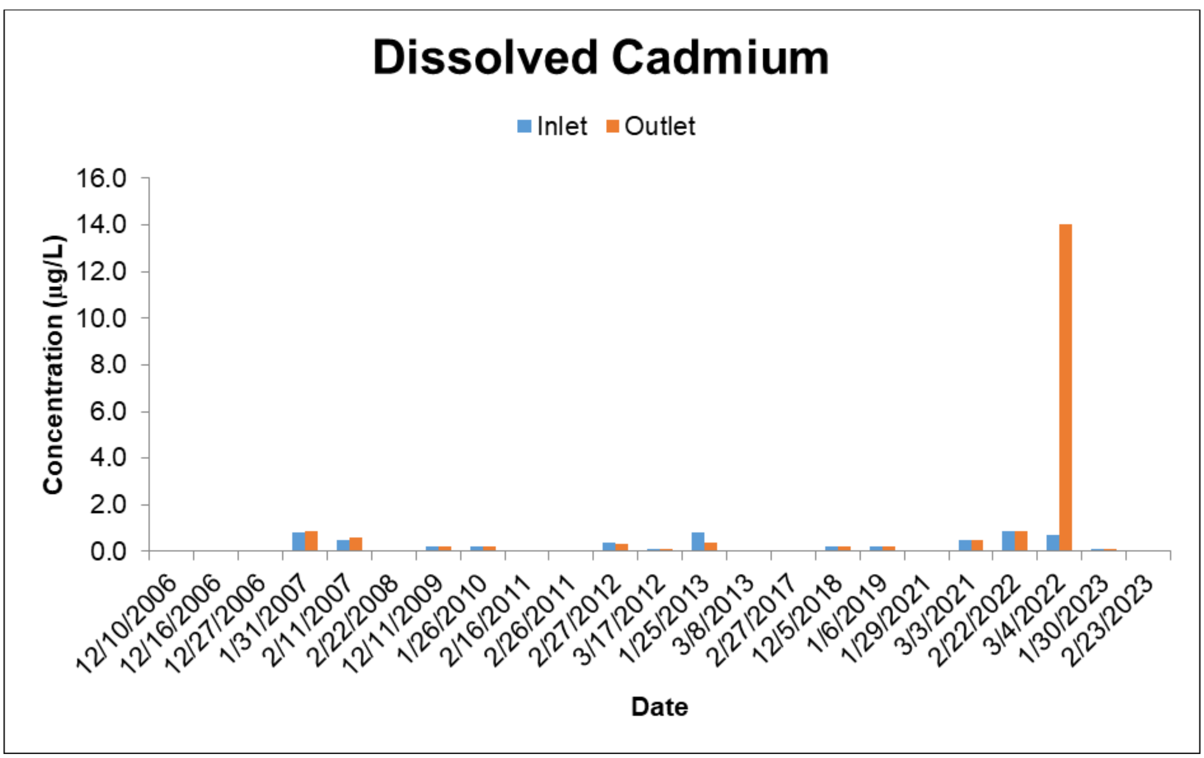

Figure 3-2. Dissolved Cadmium Concentrations[1]

[1] Dixon's Outlier Test was used to evaluate dissolved cadmium results from the outlet, and the result from March 4, 2022 was determined to be a statistical outlier.

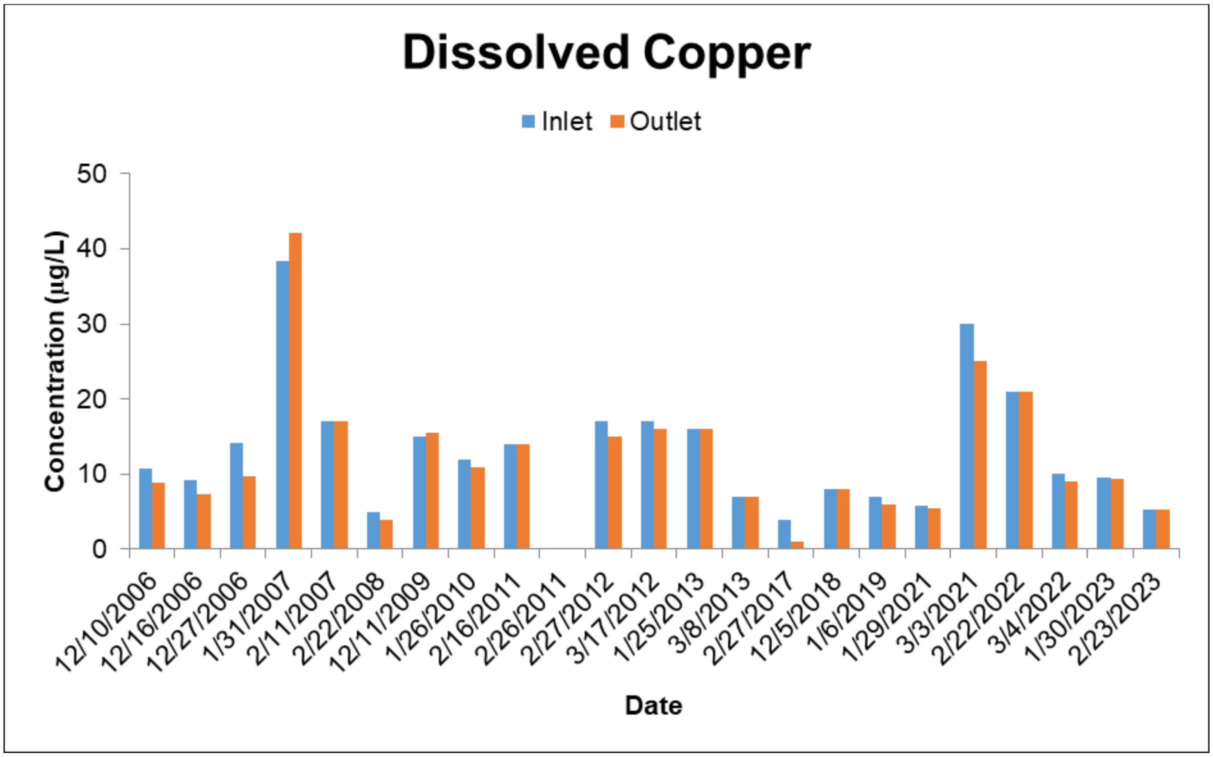

Figure 3-3. Dissolved Copper Concentrations

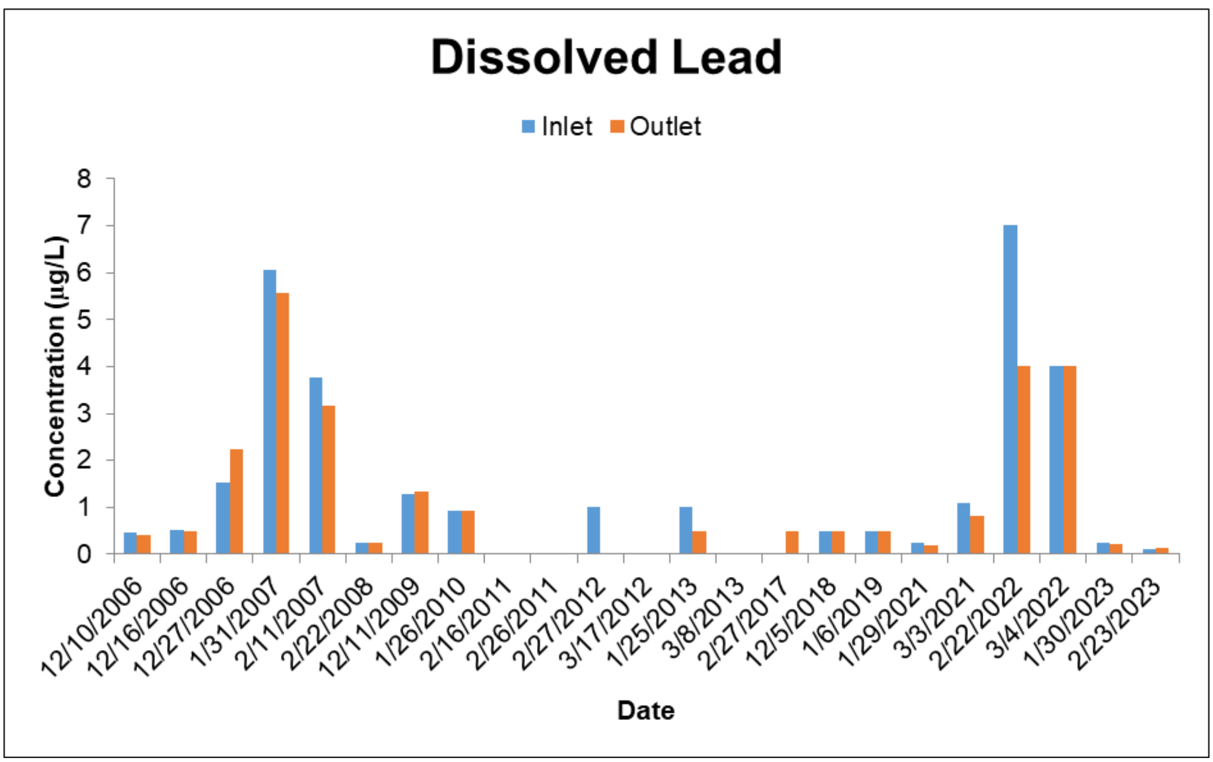

Figure 3-4. Dissolved Lead Concentrations

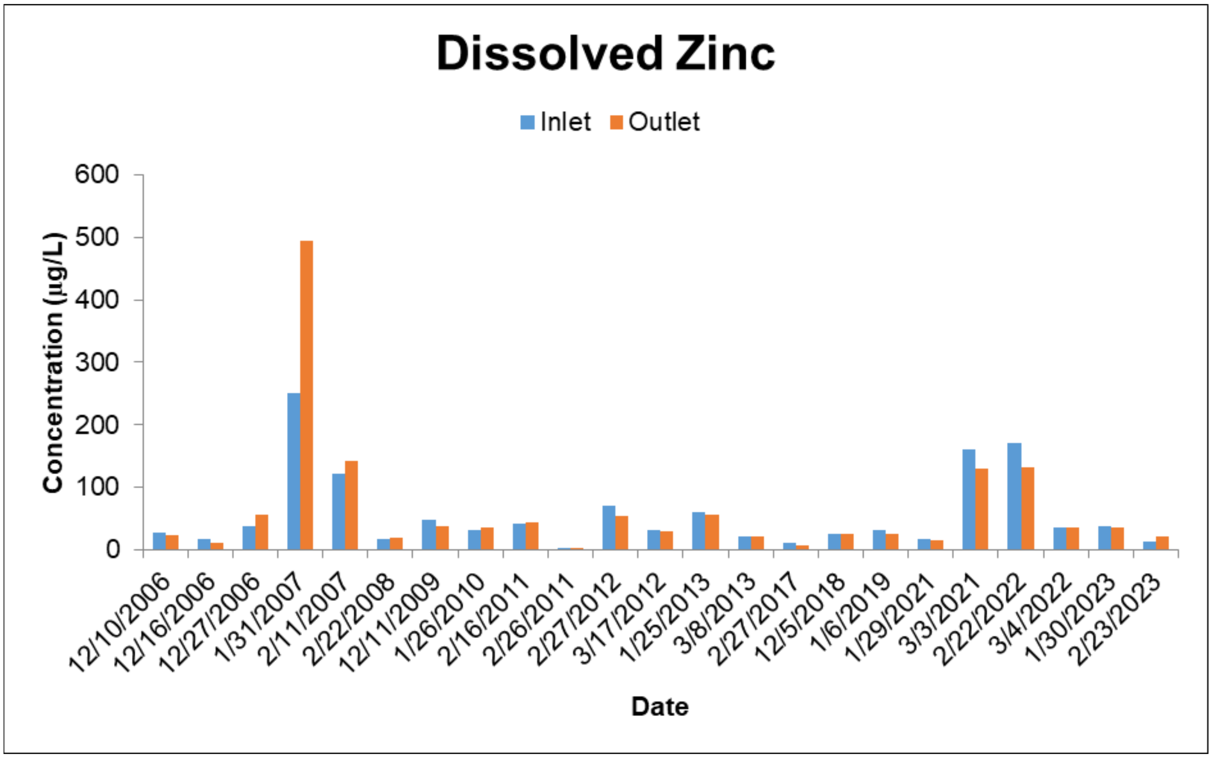

Figure 3-5. Dissolved Zinc Concentrations

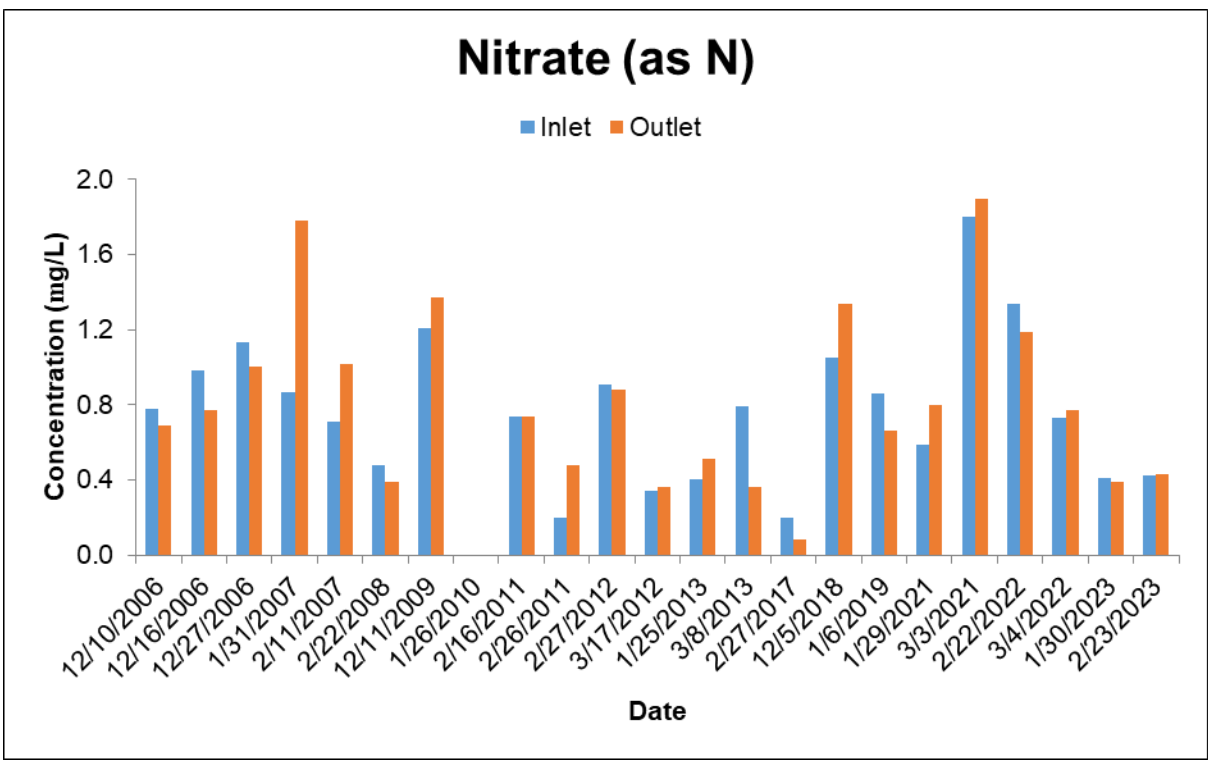

Figure 3-6. Nitrate Concentrations

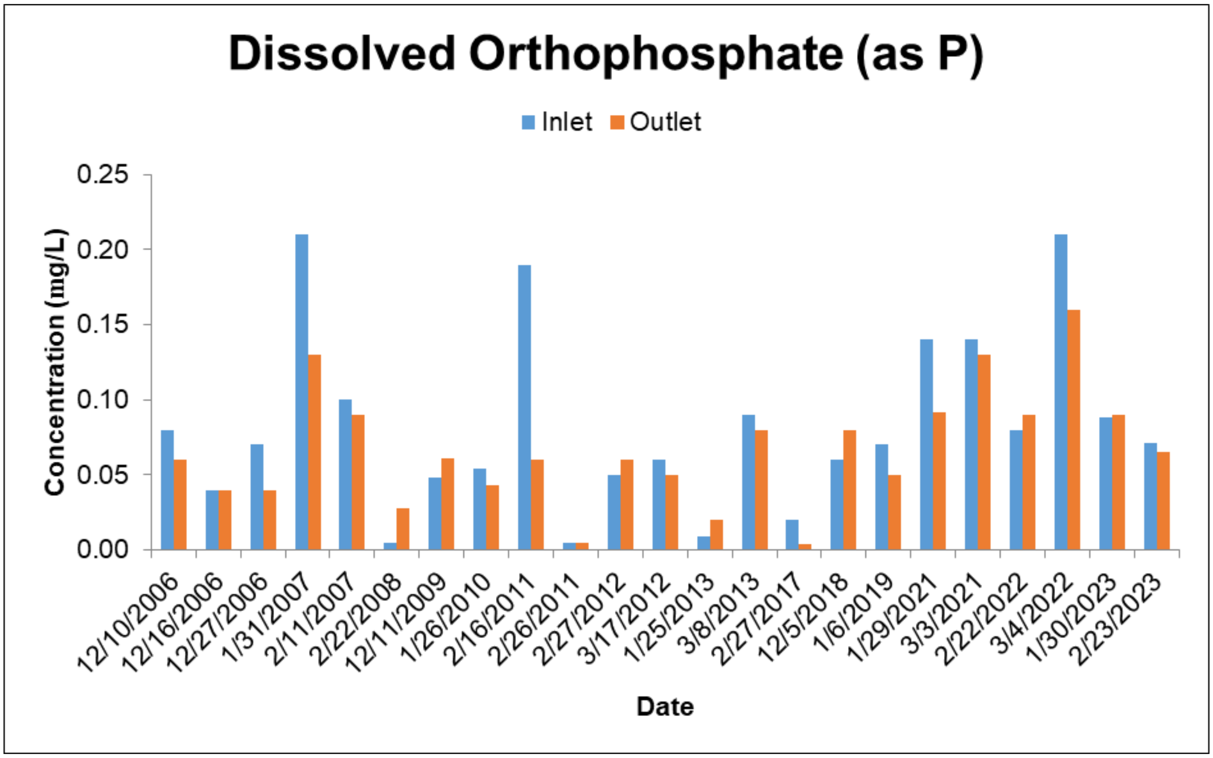

Figure 3-7. Dissolved Orthophosphate Concentrations

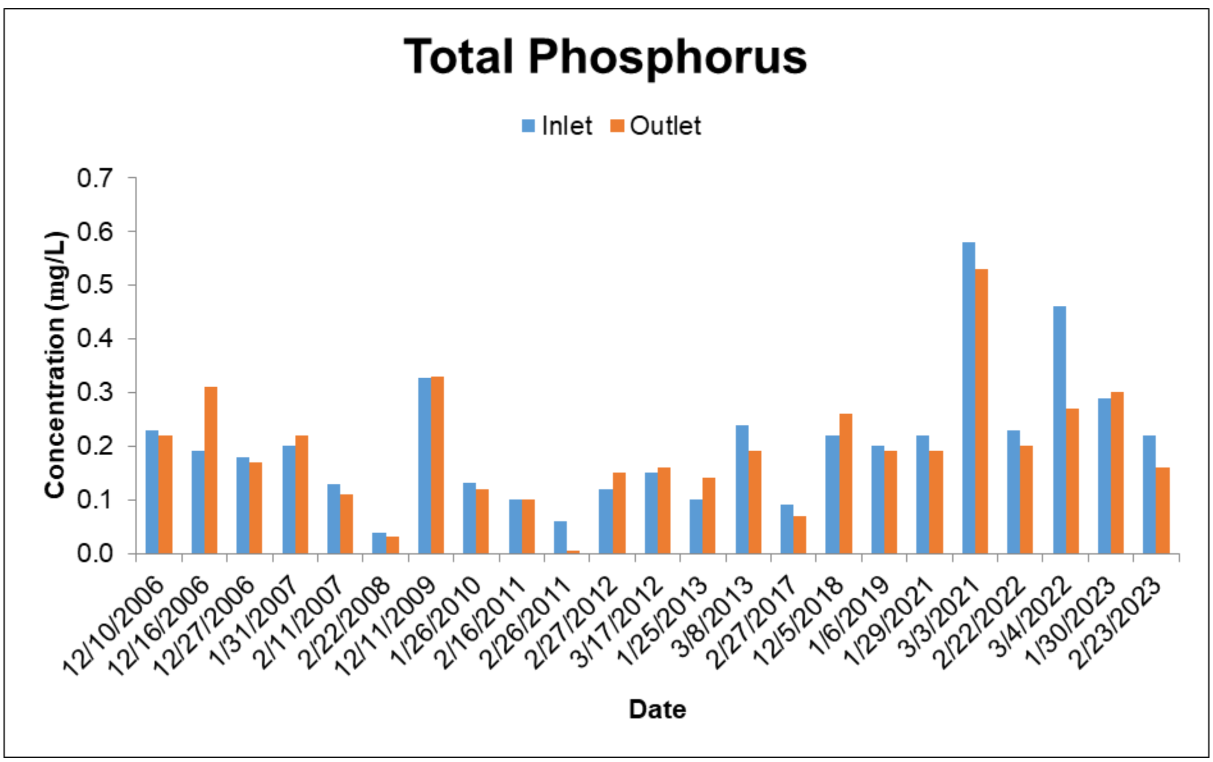

Figure 3-8. Total Phosphorus Concentrations

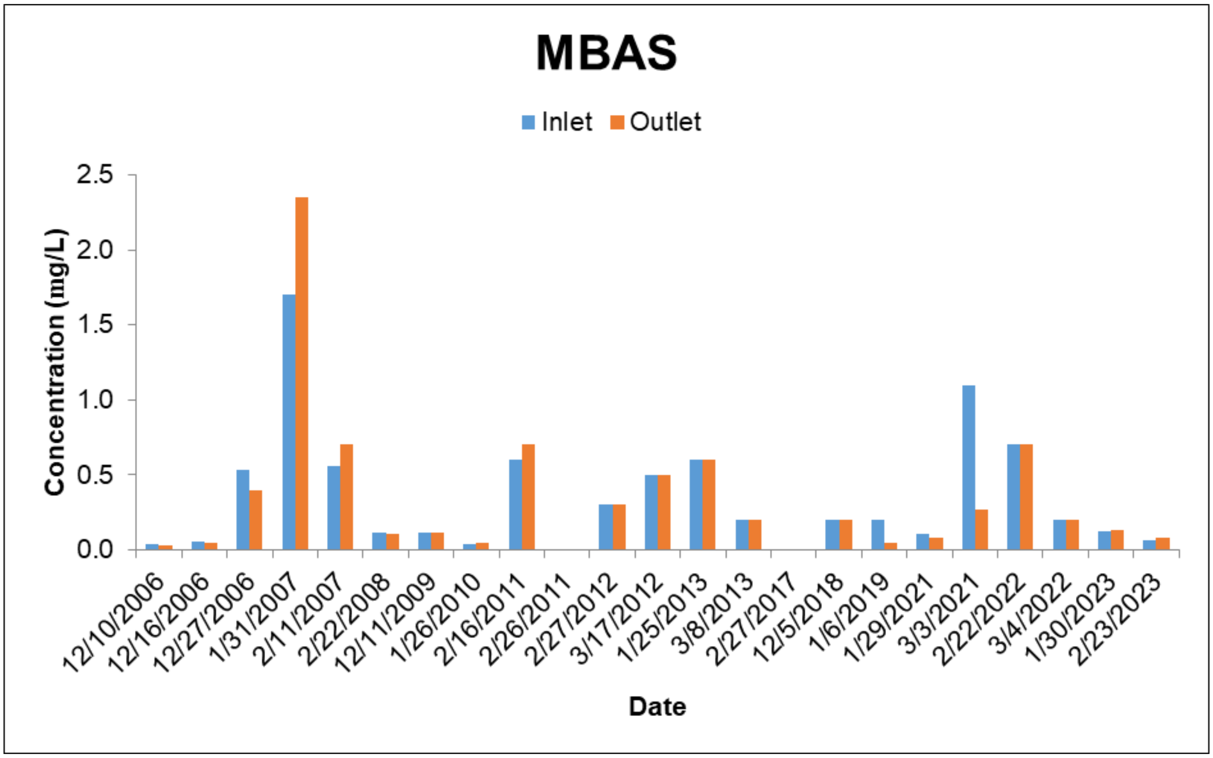

Figure 3-9. MBAS (Surfactant) Concentrations

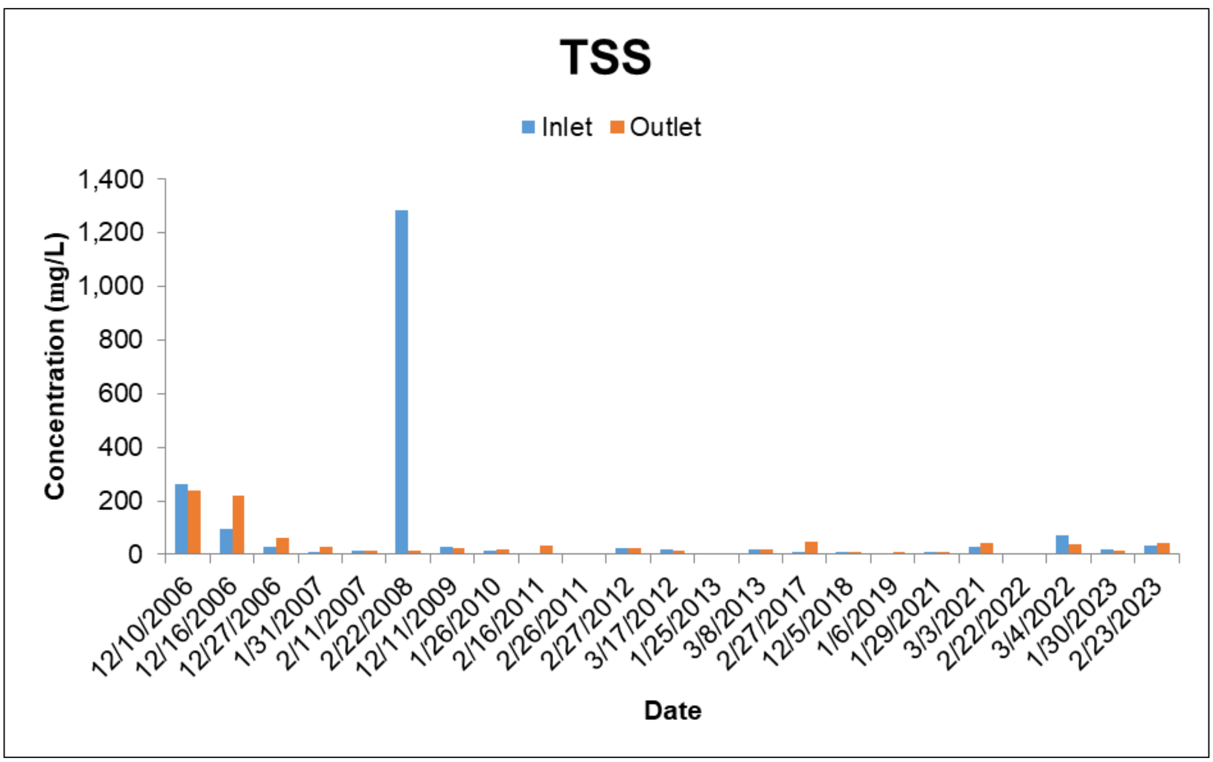

Figure 3-10. TSS Concentrations

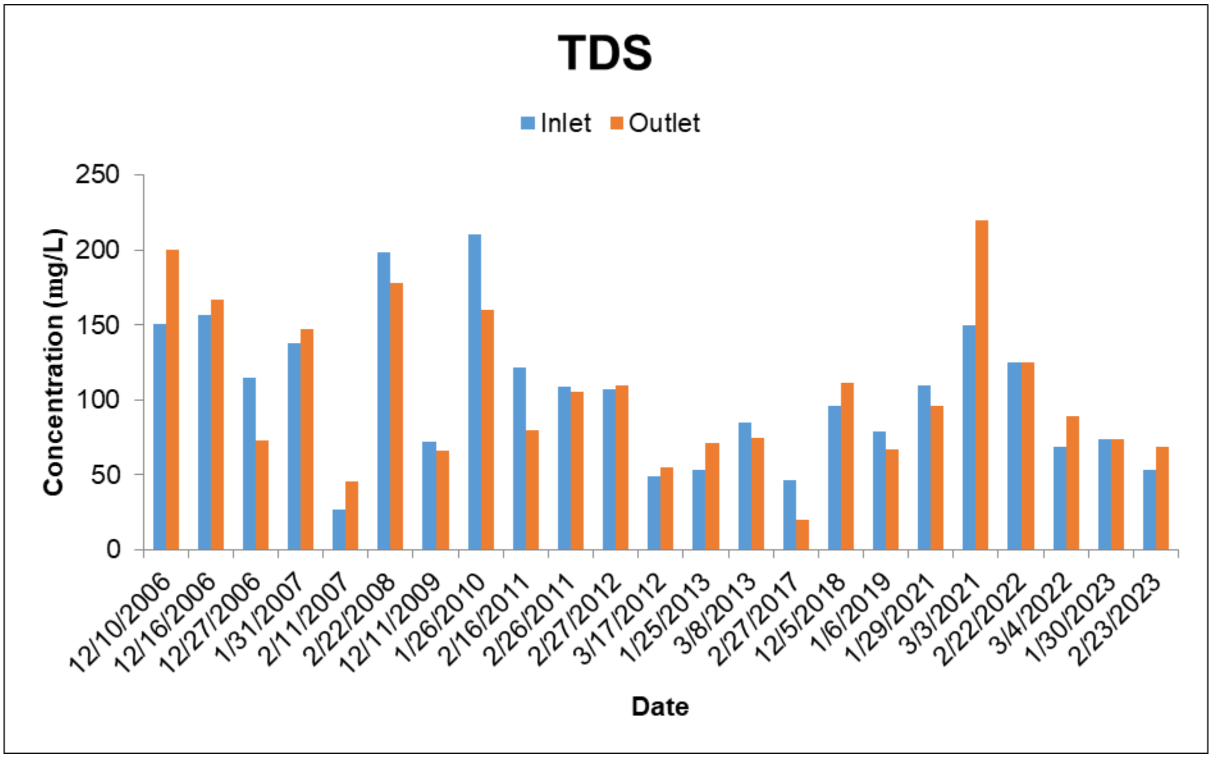

Figure 3-11. TDS Concentrations

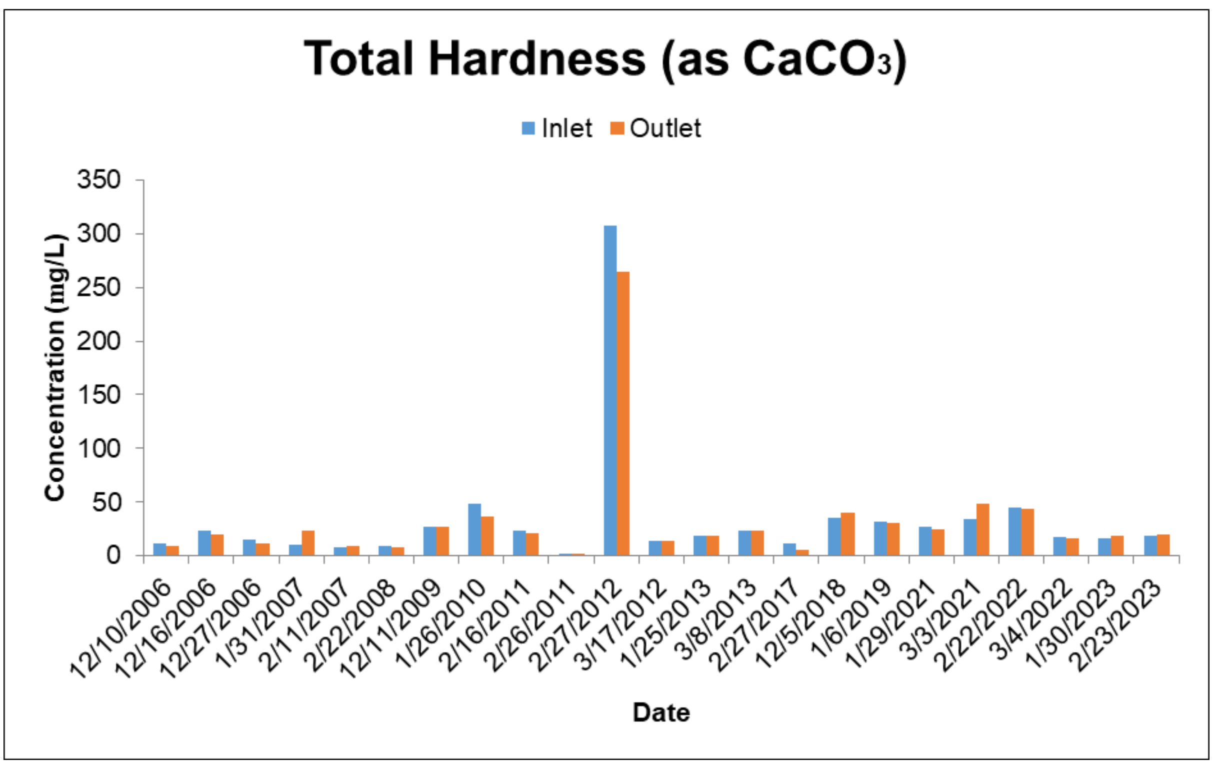

Figure 3-12. Total Hardness Concentrations

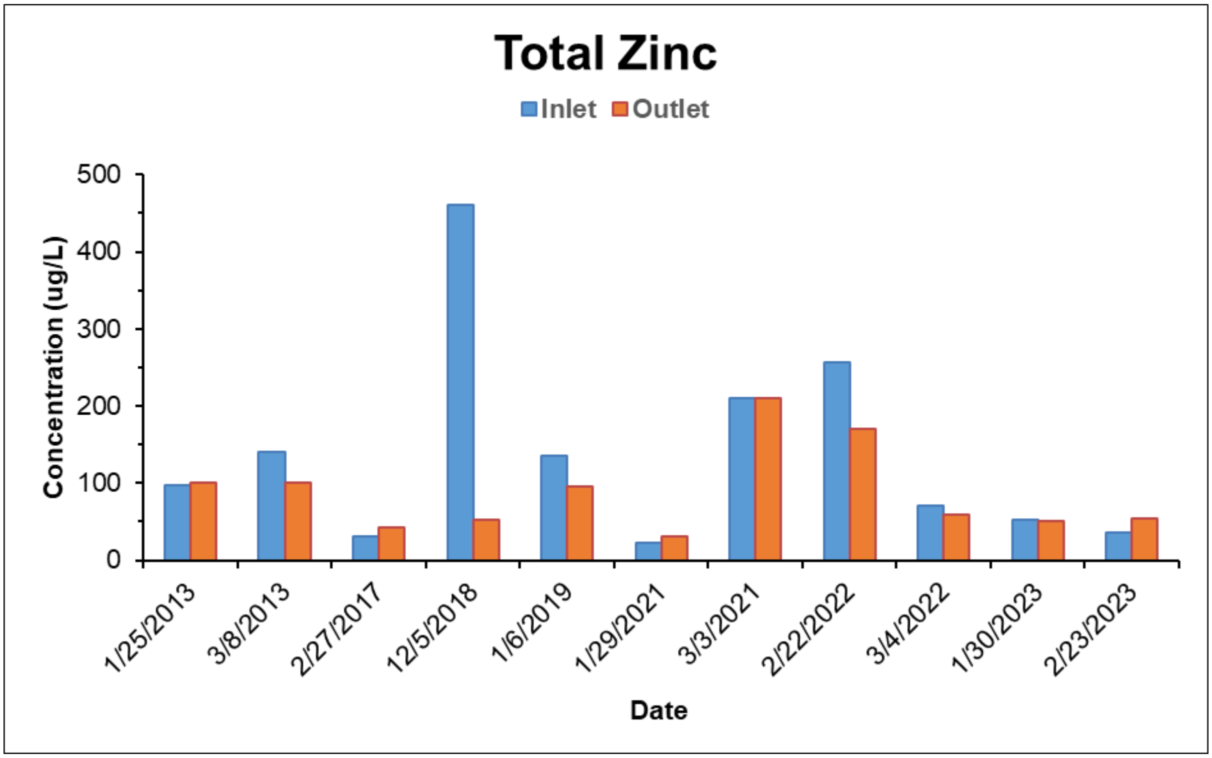

Figure 3-13. Total Zinc Concentrations

4 EFFECTIVENESS ASSESSMENT

During the 2022-2023 monitoring events, flow was attenuated by an average of 99% in the WQTF. As previously discussed, loads were calculated for the influent and effluent using the flow for the influent, as the best management practice (BMP) is designed to only temporarily store the water. The average 2022-2023 calculated loads decreased from the inlet to the outlet stations for six of the twelve detected analytes (chlorpyrifos and diazinon were not detected). Based on an average of the 2022-2023 events, average loads decreased by 17% for oil and grease, 12% for total phosphorus, 4.6% for TSS, 3.1% for dissolved orthophosphate, 1.3% for nitrate as N, and 1.1% for dissolved copper. Average loads increased by 26% for dissolved zinc, 23% for total zinc, 16% for MBAS, 15% for TDS, 7.6% for dissolved lead, and 4.4% for dissolved cadmium.

A total of 23 storm events have been monitored at the WQTF from December 2006 through February 2023. During the 23 monitored storm events, flow through the WQTF had a median attenuation rate of 98%. As previously mentioned, the BMP is designed to only temporarily store the water, therefore loads were calculated for the influent and effluent using the influent flow. Median percent load reductions for each constituent were determined using the median value of the load reductions during each monitored storm event (Table 4-1). Load reductions were calculated for events with at least one detection above the MDL at either the inlet or the outlet.

Median load reductions from the 23 storm events for metals ranged from 0% for dissolved cadmium and total zinc to 10% for dissolved lead. Median load reductions for nutrients showed a 1.2% increase for nitrate, a 5.6% reduction for total phosphorus, and a 11% reduction for dissolved orthophosphate. The median load reduction for TDS and TSS were 0%. The number of storm events with detections of a constituent above the MDL in at least one of the samples (inlet or outlet) was calculated as well as the percent of these storm events with load reductions (Table 4-1, Figure 4-1). Dissolved orthophosphate (64%) and dissolved lead (63%) were the constituents with the greatest percentage of storms with load reductions, while oil and grease (23%) and dissolved cadmium (21%) had the lowest percentage of storms with load reductions.

Table 4-1. Percent Load Reduction

Analyte	No. of Monitored Events	No. of Monitored Events with Detections (Above the MDL)[1]	No. of Load Reductions	Percent of Storms (with Detections) with Load Reductions	Median % Load Reduction[2]
Oil and Grease	23	13	3	23%	-41%
Cadmium, Dissolved	23	14	3	21%	0%
Copper, Dissolved	23	22	13	59%	6.4%
Lead, Dissolved	23	16	10	63%	10%
Zinc, Dissolved	23	22	13	59%	5.6%
Zinc, Total[3]	11	11	5	45%	0%
Nitrate as N	22	22	10	45%	-1.2%
Dissolved Orthophosphate as P	23	22	14	64%	10.6%
Phosphorus	23	23	14	61%	5.6%
Chlorpyrifos	21	0	0	0%	0%
Diazinon	20	0	0	0%	0%
MBAS	23	21	8	38%	0%
Total Suspended Solids	23	21	10	48%	0%
Total Dissolved Solids	23	23	10	43%	0%

Notes:

1. Detection in either inlet or outlet above the method detection limit
2. Median % load reduction was calculated by compiling all percent load reduction values for storms from 2006 to 2023 and taking the median value. A positive number indicates a reduction in load.
3. Added to monitoring program in 2013.

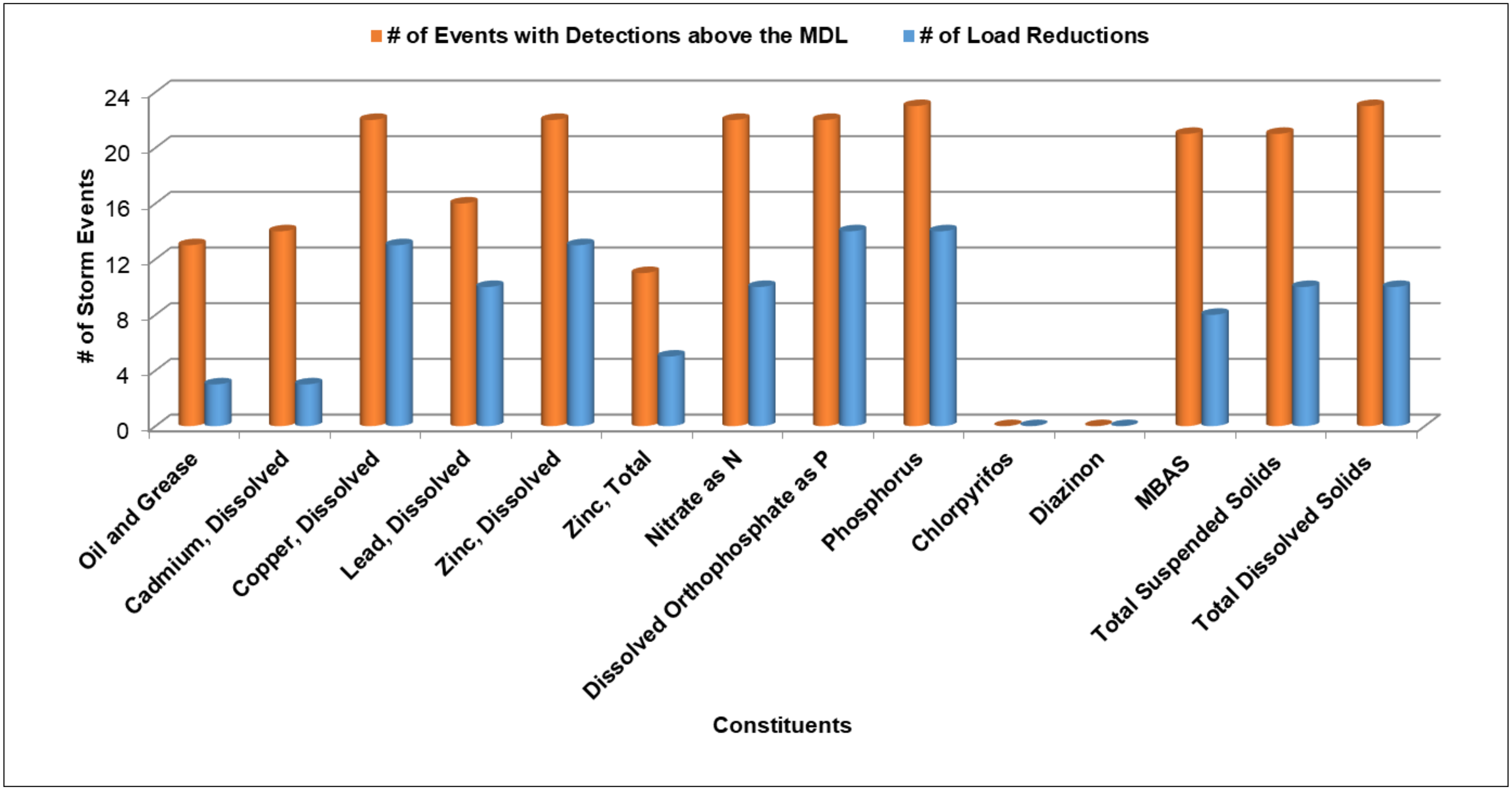

Figure 4-1. Water Quality Treatment Facility Load Reductions

5 CONCLUSIONS

The WQTF was installed at McClellan-Palomar Airport in 2006 to help reduce pollutant loads in storm water runoff prior to the runoff entering Agua Hedionda Creek. Following its installation, long-term monitoring of the WQTF was implemented to assess the facility's effectiveness at pollutant removal during low-flow storm events and to comply with Proposition 13 Grant requirements. Monitoring of the WQTF during the 2022-2023 wet weather season, though not required by the Prop. 13 Grant, was performed by the County of San Diego to provide additional information regarding pollutant load reductions and BMP effectiveness.

6 REFERENCES

Rick Engineering. 2007. *McClellan–Palomar Airport Water Quality Treatment Facility Effectiveness Assessment Monitoring Final Report.* Prepared by Weston Solutions, Inc.

Weston Solutions, Inc. 2007a. *County of San Diego McClellan–Palomar Airport Water Quality Treatment Facility Long-Term Monitoring and Maintenance Plan Water Quality Control Board Grant Agreement No. 04-201-559-0*.

Weston Solutions, Inc. 2007b. Palomar Airport Addendum Report.