Annual Industrial Stormwater Monitoring Report

Seattle-Tacoma International Airport

For the Period July 1, 2023 through June 30, 2024

September 24, 2024

Prepared by

Aviation Environmental Programs

Port of Seattle

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1.0 INTRODUCTION

The Port of Seattle's (Port) National Pollutant Discharge Elimination System (NPDES) permit WA0024651 is broken down into three sections: Part 1: Industrial Wastewater, Part 2: Industrial Stormwater and Part 3: Construction Stormwater. NPDES Permit Part 2 Special Condition 2S1.G requires an annual summary of industrial stormwater monitoring results. The twelve-month period is defined as July 1, 2023 through June 30, 2024. This report provides a summary of industrial monitoring and permit compliance results for the stormwater drainage system outfalls identified in Part 2 of the NPDES permit during this period.

Outfall sampling results summarized in this report include data previously submitted to Washington State Department of Ecology (ECY) in the NPDES permit Part 2 Discharge Monitoring Reports (DMRs), plus additional stormwater sample data such as quality assurance sampling and samples that were analyzed for additional parameters not required by the Permit. Toxicity monitoring as required by Part 2 of the NPDES permit is discussed but results are found in separate toxicity report submittals to ECY.

The Port met all required sampling collection and reporting requirements in the NPDES permit for the 2023-2024 data collection period. Stormwater samples are collected from eleven (11) outfalls which discharge to five (5) different receiving waters; Lake Reba, Miller Creek, Walker Creek, Northwest Ponds, and Des Moines Creek. A total of forty-one (41) grab and forty-one (41) composite stormwater samples from 10 storm events were collected in the past year with results reported on quarterly DMRs. There were zero instances of permit limit exceedances associated with 246 individual constituent analyses from eighty-two (82) collected samples.

This report is organized into four sections following the introduction. Section 2 describes background conditions at the Seattle-Tacoma International Airport including descriptions of each drainage subbasin and outfall sampling location. Section 3 presents all the DMR related grab sample and composite sample analytical data collected during the reporting period and the rainfall totals for the period. Additional monitoring for compliance related reasons in also included. Section 4 provides a summary of the effluent limit compliance and best management practices (BMP) implementation during the monitoring period. A summary and conclusion are provided in Section 5.

2.0 BACKGROUND

2.1 Seattle-Tacoma International Airport Drainage

Located mid-way between the cities of Seattle and Tacoma, Washington, The Seattle-Tacoma International Airport (SEA) was built in the 1940s and is owned and operated by the Port. According to the Port's 2023 Key Facts and Figures, SEA handled 417,124 metric tons of air cargo, and 51 million passengers. SEA is ranked the eleventh busiest U.S. passenger airports and has a regional impact of more than $22.5 billion in business revenue, generating more than 151,400 jobs.

Stormwater drainage at SEA is separated into two different collection systems, the Industrial Wastewater System (IWS) and the Storm Drainage System (SDS). The IWS receives stormwater runoff from the ramp and other areas involved with aircraft servicing and maintenance, providing treatment before discharge to Puget Sound through a separate outfall. SEA also has the ability to discharge through an outfall to King County's South Treatment Plant for additional treatment when required. This outfall is regulated by Industrial Wastewater Discharge Permit #7810-05 issued by King County. Approximately 372 acres are diverted to the IWS.

The SDS drains over 1,200 acres. Half of this area is impervious and primarily associated with airport runways, taxiways, parking lots, roads and roof tops.The remainder is pervious which consists of landscaped or fallow open spaces and areas associated with stormwater treatment best management practices (BMPs) such as runway filter strips. About 25 percent of the area drained by the SDS flows to Miller Creek. This drainage area represents about 7 percent of Miller Creek's watershed. Approximately 71 percent of the total SDS area drains to the Northwest Ponds and Des Moines Creek, which represents about 21 percent of the creek's watershed.

2.2 SEA Storm Drainage Subbasins, Activities, and Outfall Descriptions

The Airport's SDS is segregated into separate stormwater subbasins that each drain to individual outfall locations. The NPDES permit lists a total of thirteen (13) outfalls in two categories: Existing & New Outfalls and Subbasins, and Future Outfalls to be activated during future development. As of June 30, 2024, eleven (11) of the thirteen (13) outfalls are active and discharge stormwater related to industrial activity.

SEA stormwater subbasins are categorized according to their dominant activities: landside or airfield. These categories group subbasins together by similar land use and other characteristics. In general, passenger vehicle operations are absent from the airfield drainage subbasins while aircraft operations are absent from the landside subbasins. SDE4/S1 subbasin is an exception in that it includes both airfield and landside activities. Previous reports found that concentrations of total petroleum (TPH), total suspended solids (TSS) and other constituent concentrations were

different for the landside and airfield categories (POS 1996a, 1997a.). **Table 1**, *SEA Subbasin Characteristics*, describes each active subbasin, receiving water, activities within each subbasin, stormwater management BMPs, and total pervious and impervious surface areas. The physical location of the outfalls listed in **Table 1** are shown on **Figure 1** along with additional receiving water monitoring locations used for sublethal toxicity and *in situ* toxicity testing.

2.3 Permit Effluent Limits

The 2021 NPDES permit specifies effluent limits for turbidity, pH, oil and grease, total copper, and total zinc (see **Table 2**). The major changes from the previous permit effluent limits are the removal of lead analysis and an adjusted pH range for outfalls SDN3A, SDW1A, SDW1B, and SDW2. The pH range for these listed outfalls was widened to 6.3-9.0 with concurrent receiving water monitoring after a study showed discharge within this range would not cause a violation of water quality standards in the receiving water. Lead was removed from the sampling effort for this permit based on Port studies that identified lead exceedances as extremely unlikely.

Effluent limits for industrial stormwater became effective several permits ago on December 31, 2007. The site-specific study and subsequent derivation of site-specific water quality based effluent limits for copper and zinc are described in the 2016 NPDES Permit fact sheet. A 25 NTU effluent limit for turbidity was added in the April 1, 2009 permit as a replacement for an earlier TSS benchmark.

The permit specifies effluent limits for ammonia and nitrates/nitrites; however monitoring for these parameters is only required if urea is applied as an anti-icing agent. Urea was not applied in this reporting year and has not been utilized at the Airport since 1996.

Table 1. SEA Subbasins Characteristics

Outfall Name	Receiving Water	General Category	Industrial Activity	Non-Industrial Activity	Pervious Area[b] (acres)	Impervious Area[b] (acres)	Total Area[b, c] (acres)
SDE4/S1	Des Moines Creek (East Branch)	Landside	Limited portions of the airfield taxiways.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo) and landscaped areas.	41.5	138.1	179.6
SDD-06A	Des Moines Creek (East Branch)	Landside	Loading docks, vehicle maintenance, vehicle washing, equipment parking and maintenance.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo) and landscaped areas.	18.2	27.2	45.3
SDN1	Miller Creek via Lake Reba	Landside	Flight service kitchen.	Public roads, building rooftops and vehicle parking.	3.8	14.8	18.6
SDS3/5	NW Ponds and Des Moines Creek West	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, open areas and building rooftops.	206.3	250.6	456.8

Table 1. SEA Subbasins Characteristics

Outfall Name	Receiving Water	General Category	Industrial Activity	Non-Industrial Activity	Pervious Area[b] (acres)	Impervious Area[b] (acres)	Total Area[b, c] (acres)
SDS4	NW Ponds and Des Moines Creek West	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Runway infield and open areas.	40.5	25.9	66.3
SDS6/7	NW Ponds and Des Moines Creek West	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Access roads, runway infield and open areas.	63.9	45.7	109.6
SDN2/3/4[a]	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, access road, taxiway infield and open areas.	71.3	44.6	115.9
SDN3A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	23.1	8.1	31.2
SDW1A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	44.1	26.0	70.1

Table 1. SEA Subbasins Characteristics

Outfall Name	Receiving Water	General Category	Industrial Activity	Non-Industrial Activity	Pervious Area[b] (acres)	Impervious Area[b] (acres)	Total Area[b, c] (acres)
SDW1B	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	59.5	25.0	84.5
SDW2	Walker Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	30.9	10.8	41.7
Note:				**Total Area**	**584.9**	**639.3**	**1224.1**

a) The SDN2 runoff is pumped to IWS for all flows up to the 6 month /24-hour event. The SDN2 subbasin comprises approximately 46.5 acres, 36.6 of which are impervious. This area is included in acreages reported to the IWS.
b) Subbasin areas as described in the 2020 NPDES permit renewal application. Based on 2018 GIS analysis completed by Aspect consulting predominantly using a 2017 aerial.
c) Stormwater pond areas were not included in total acres. It is anticipated that ongoing changes resulting from planned construction will alter subbasin totals in the future.

Figure 1. Sampling Locations

3.0 SAMPLING RESULTS AND DISCUSSION

This section of the Annual Report summarizes the results of SDS outfall monitoring. All data summarized in this section has been reported to ECY on quarterly DMRs and is included in **Appendix A**. Data generated from grab and composite samples are presented and discussed. These types of samples employ different protocols that represent different temporal periods of the particular stormwater discharge event and are therefore evaluated separately. Grab samples represent an instantaneous or short duration sampling period, while composites are collected over the storm event hydrograph to provide an event mean concentration (EMC).

In addition to the DMR data, this report summarizes other data collected at the outfalls listed in Part 2, 2S1 of the NPDES permit. These other data consist of field equipment blank samples, field duplicate samples, and other parameters collected during the monitoring period. These other data are presented in **Appendix B**. Section 3.2 of this report summarizes *in situ* toxicity testing at receiving water sites downstream of SEA outfalls, and Section 3.3 provides a summary of additional monitoring completed for compliance related issues.

3.1 Monitoring of Industrial Stormwater Discharges

3.1.1 Sampling Objectives and Procedures

Sampling protocols and locations have been selected to provide data consistent with the requirements of the NPDES permit and the representativeness criteria set forth in the *Quality Assurance Program Plan for Seattle-Tacoma International Airport Industrial Stormwater Discharge Monitoring Program* (QAPP) (Aspect Consulting, Inc. 2021). The monitoring locations were selected to represent stormwater downstream of the last Best Management Practice (BMP) within each subbasin.

The QAPP describes the criteria for sampling storm events and describes all relevant sampling, programming, and handling necessary to satisfy the monitoring requirements of the permit. **Table 2** lists the current constituents measured or analyzed, methods used, and detection limits. The Port reports results on DMRs from storms and samples that were considered representative according to criteria specified in the QAPP.

The Port uses telemetry-based automatic samplers to collect a grab sample followed by a flow-weighted composite sample during rainstorms of 0.10 inches or greater that are preceded by less than 0.10 inch of rainfall in the previous 24 hours. These rainfall and antecedent sampling conditions are specified in the NPDES permit, Part 2, 2S2.B. Each grab or composite sample is analyzed for the constituents listed in **Table 2** based on sample type as specified in the NPDES permit.

Table 2. Constituents, Methods and Detection Limits

Constituent	Method	Detection limit (MDL)	Sample Type	Effluent Limits
pH	150.1[(1)]	0.01 S.U.	Grab	6.5 – 8.5 S.U.[3]
Oil & Grease - TPH (by GC)	NWTPH-Dx[(2)]	0.75 mg/l	Grab	15 mg/L – no sheen
Turbidity	180.1[(1)]	0.05 NTU	Grab	25 NTUs
Total Recoverable Copper	200.8[(1)]	0.5 µg/l	flow-wt comp.	25.6 to 59.2 µg/l
Total Recoverable Zinc	200.8[(1)]	4.0 µg/l	flow-wt comp.	71.4 to 117 µg/l

1. Method refers to EPA-600/4-79-020 (U.S. EPA 1983 and updates).
2. Method reports both a motor oil fraction and diesel fraction. TPH-Dx is the sum of these two fractions.
3. Approved limits for pH at stations SDN3A, SDW1A, SDW1B, SDW2 are 6.3 to 9.0 S.U.

3.1.2 Field Quality Control Samples

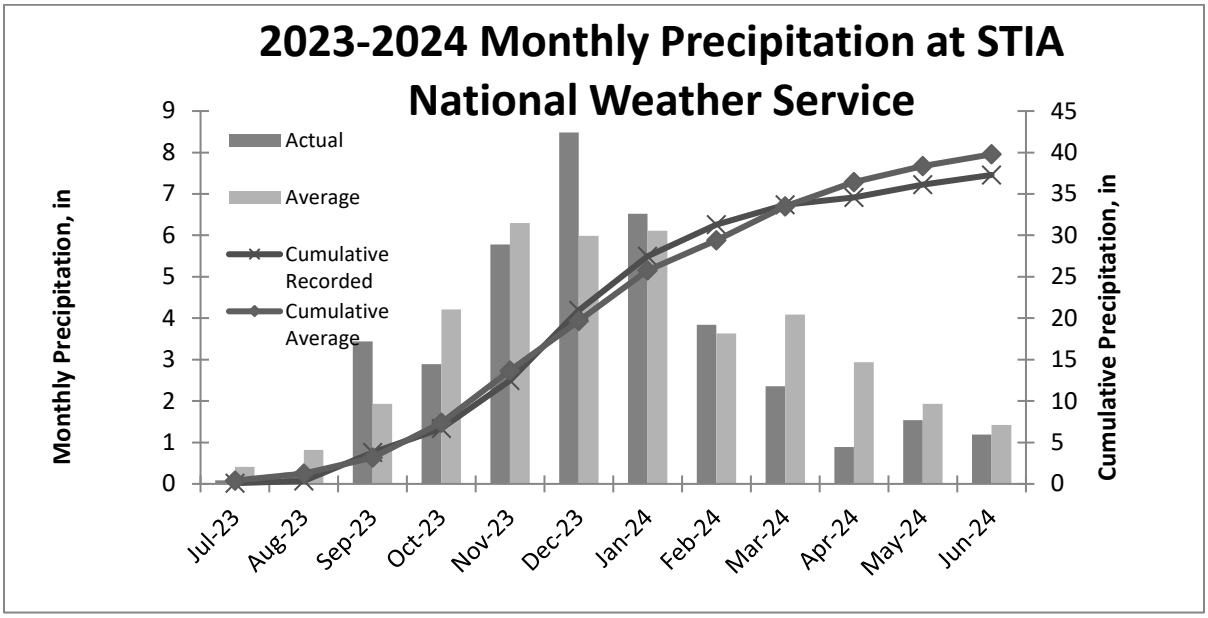
The Port routinely collects field duplicate and equipment blank samples during NPDES sampling events in accordance with the QAPP. **Appendix B** summarizes these results. The results reflect on the efficacy of the Port's "clean" sampling methods developed for stormwater monitoring relative to metals (POS 1999). Eight (8) Field Quality Control samples were collected in the 2023 – 2024 reporting period. There were no anomalies associated with samples collected during these same storm events.

3.1.3 Storm Events and Precipitation

During this reporting period, the Port sampled ten (10) precipitation events with precipitation ranging from 0.13 to 1.25 inches. Dry weather preceding these sampling events ranged from 13 hours (October 10, 2023) to 5.5 days (September 18, 2023). The tabular sample data in **Appendix A** includes storm event data such as precipitation depth, antecedent precipitation amounts, and length of antecedent dry period.

During the current permit's annual reporting schedule, 37.29 inches of precipitation fell at SEA; 2.49 inches less than the historical (2002-2024) average of 39.78 inches and 7.26 inches more than the previous monitoring year of 30.03 inches. Monthly precipitation totals were below average for all months other than September, December, January, and February (**Figure 2**).

Figure 2. Precipitation Summary



3.1.4 Grab Sample Results and Discussion

The following discussion includes results from 41 grab samples collected in the past year. Grab samples are analyzed for pH, TPH, and turbidity per current permit requirements. Tabular results are presented at the end of this section and summary statistics are contained in **Appendix A**.

3.1.4.1 pH

The median pH value from all outfalls was 7.3 Standard Units (S.U.). Sample results fell within the effluent limit range of 6.5 to 8.5 S.U. (6.3-9.0 at SDN3A, SDW1A, SDW1B and SDW2)..

The Port has designed, and begun installation of projects to retrofit and address depressed pH values in the SDE4/S1 and SDD06A basins during this reporting period. The swale for the SDS1 basin will receive a forebay of oyster shells and the pond at SDD06A will have vegetation removed at the pipe inlet and a forebay of limestone quarry spall and oyster shells will be installed. The final project design will be submitted at a later date.

3.1.4.2 Total Petroleum Hydrocarbons (TPH)

Total Petroleum Hydrocarbons is determined by the ECY method NWTPH-Dx; the summation of the diesel and motor oil range TPH quantified by this method resembles the concentration of oil & grease. TPH ranged from 0.27 mg/L to 1.76 mg/L. The estimated median TPH concentration at all outfalls was 0.40 mg/L. However, the actual median TPH concentration may have been lower since TPH was only detected in 9 of the 41 samples. All sample results were well below the TPH effluent limit of 15 mg/L.

3.1.4.3 Turbidity

The median turbidity for all outfalls was 3.5 NTU with a range from 0.4 NTU to 8.0 NTU. There were no permit limit exceedances for turbidity at any outfalls during the monitoring period.

Table 3. Grab Sample Data

								pH	Turbidity	TPH-D	TPH-Dx	TPH-MO	Sheen
								ph Units	NTU	mg/l	mg/l	mg/l	N/A
Outfall	StormDate	Depth, in.	Dur, hr.	Max Int, in/hr	24hrant, in.	48hrant, in.	Dryant, hr						
SDE4/S1	08/29/2023	0.21	9	0.06	0	0	95	7.2	5.4	0.705	1.36	0.655	No Sheen
SDE4/S1	10/10/2023	0.81	36	0.13	0.01	0.01	13	6.5	11.8	< 0.100	< 0.300	< 0.200	No Sheen
SDE4/S1	11/30/2023	1.25	39	0.14	0	0	78	7.7	3.2	0.109	0.447	0.338	No Sheen
SDE4/S1	01/24/2024	0.62	42	0.06	0	0.02	22	7.4	7.0	< 0.100	< 0.300	< 0.200	No Sheen
SDE4/S1	02/14/2024	0.3	16	0.07	0	0	55	7.4	11.7	< 0.100	< 0.300	< 0.200	No Sheen
SDE4/S1	04/25/2024	0.79	27	0.1	0	0	83	6.6	19.9	0.555	1.05	0.493	No Sheen
SDE4/S1	05/18/2024	0.36	11	0.18	0	0	56	6.9	5.9	0.187	0.287	< 0.200	No Sheen
SDS3/5	09/20/2023	0.47	6	0.21	0	0.13	45	6.8	3.9	< 0.100	< 0.300	< 0.200	No Sheen
SDS3/5	10/10/2023	0.81	36	0.13	0.01	0.01	13	6.9	2.1	< 0.100	< 0.300	< 0.200	No Sheen
SDS3/5	02/14/2024	0.3	16	0.07	0	0	55	7.7	2.0	0.107	0.321	0.214	No Sheen
SDS3/5	04/25/2024	0.79	27	0.1	0	0	83	7.2	9.3	< 0.100	< 0.300	< 0.200	No Sheen
SDS4	08/29/2023	0.21	9	0.06	0	0	95	6.5	2.9	< 0.100	< 0.300	< 0.200	No Sheen
SDS4	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.1	1.2	< 0.100	< 0.300	< 0.200	No Sheen
SDS4	02/14/2024	0.3	16	0.07	0	0	55	7.2	0.4	< 0.100	< 0.300	< 0.200	No Sheen
SDS4	04/25/2024	0.79	27	0.1	0	0	83	6.8	2.1	< 0.100	< 0.300	< 0.200	No Sheen
SDS6/7	09/18/2023	0.13	2	0.08	0	0	133	7.4	6.2	0.929	1.76	0.828	No Sheen
SDS6/7	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	5.8	< 0.100	< 0.300	< 0.200	No Sheen
SDS6/7	01/24/2024	0.62	42	0.06	0	0.02	22	7.8	6.2	< 0.100	< 0.300	< 0.200	No Sheen
SDS6/7	05/18/2024	0.36	11	0.18	0	0	56	6.9	1.4	< 0.100	< 0.300	< 0.200	No Sheen
SDN1	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.6	8.0	0.182	0.587	0.405	No Sheen
SDN1	01/24/2024	0.62	42	0.06	0	0.02	22	7.2	12.1	< 0.100	0.274	0.224	No Sheen
SDN1	04/25/2024	0.79	27	0.1	0	0	83	8.3	9.0	0.171	0.743	0.572	No Sheen
SDW2	10/10/2023	0.81	36	0.13	0.01	0.01	13	8.6	3.4	< 0.100	< 0.300	< 0.200	No Sheen
SDW2	01/24/2024	0.62	42	0.06	0	0.02	22	7.3	5.3	< 0.100	< 0.300	< 0.200	No Sheen
SDW2	04/25/2024	0.79	27	0.1	0	0	83	8.5	2.3	< 0.100	< 0.300	< 0.200	No Sheen
SDW1B	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	1.4	< 0.100	< 0.300	< 0.200	No Sheen
SDW1B	01/24/2024	0.62	42	0.06	0	0.02	22	7.0	18.2	< 0.100	< 0.300	< 0.200	No Sheen
SDW1B	04/25/2024	0.79	27	0.1	0	0	83	7.1	1.9	< 0.100	< 0.300	< 0.200	No Sheen
SDW1A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	2.3	< 0.100	< 0.300	< 0.200	No Sheen
SDW1A	02/14/2024	0.3	16	0.07	0	0	55	7.3	3.7	< 0.100	< 0.300	< 0.200	No Sheen
SDW1A	04/25/2024	0.79	27	0.1	0	0	83	7.2	1.0	< 0.100	< 0.300	< 0.200	No Sheen
SDN3A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	3.4	< 0.100	< 0.300	< 0.200	No Sheen
SDN3A	01/24/2024	0.62	42	0.06	0	0.02	22	7.4	3.8	< 0.100	< 0.300	< 0.200	No Sheen
SDN3A	04/25/2024	0.79	27	0.1	0	0	83	7.0	5.3	< 0.100	< 0.300	< 0.200	No Sheen
SDN2/3/4	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	2.8	< 0.100	< 0.300	< 0.200	No Sheen
SDN2/3/4	01/24/2024	0.62	42	0.06	0	0.02	22	7.6	6.4	< 0.100	< 0.300	< 0.200	No Sheen
SDN2/3/4	04/25/2024	0.79	27	0.1	0	0	83	7.4	3.0	< 0.100	< 0.300	< 0.200	No Sheen
SDD06A	09/20/2023	0.47	6	0.21	0	0.13	45	7.4	3.1	< 0.100	< 0.300	< 0.200	No Sheen
SDD06A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.2	1.9	< 0.100	< 0.300	< 0.200	No Sheen
SDD06A	02/19/2024	0.64	57	0.1	0	0	97	7.9	2.5	< 0.100	< 0.300	< 0.200	No Sheen
SDD06A	04/25/2024	0.79	27	0.1	0	0	83	6.7	3.6	< 0.100	< 0.300	< 0.200	No Sheen

3.1.5 Composite Sample Results and Discussion

For the 2023-2024 sampling period, the Port collected a total of 41 flow-weighted composite samples. Composite sample results are described separately from grab samples because grab samples represent an isolated segment of the storm event runoff. Composite sample results represent a flow-weighted average value over a longer time period. All composite sample data contained within this report and on the DMRs met the representativeness criteria of the Port's QAPP, which provides samples comparable with EPA methods (U.S. EPA 1992). Tabular results are presented at the end of this section and summary statistics are contained in **Appendix A**.

3.1.5.1 Copper

All data reported below are for total recoverable copper. The median copper concentration for all outfalls was 7.58 µg/L, with individual storm sample concentrations ranging from 0.672 µg/L to 24.0 µg/L. The permit effluent limit for copper at each outfall is variable based on a site-specific study and ranges from 25.6 µg/L to 59.2 µg/L depending on receiving water location.

3.1.5.2 Zinc

All data reported are for total recoverable zinc. The median zinc concentration at all outfalls was 9.78 µg/L. Zinc concentrations ranged from 6 µg/L to 68.5 µg/L. The permit effluent limit for zinc at each outfall is variable based on a site-specific study and ranges from 71.4 µg/L at SDE4 to 117 µg/L at all other stations.There were no permit limit exceedances for zinc during the monitoring period.

Table 4. Composite Sample Data

								Copper	Copper	Zinc	Zinc
Location ID	StormDate	Depth, in.	Dur, hr	Max Int, in/hr	24hrant, in	48hrant, in	Dryant, hr	Total ug/l	Permit Limit ug/l	Total ug/l	Permit Limit ug/L
SDE4/S1	08/29/2023	0.21	9	0.06	0	0	95	24	25.6	62.4	117
SDE4/S1	10/10/2023	0.81	36	0.13	0.01	0.01	13	10.5	25.6	37.6	117
SDE4/S1	11/30/2023	1.25	39	0.14	0	0	78	11.4	25.6	66.6	117
SDE4/S1	01/24/2024	0.62	42	0.06	0	0.02	22	8.67	25.6	47.5	117
SDE4/S1	02/14/2024	0.3	16	0.07	0	0	55	11.5	25.6	60.6	117
SDE4/S1	04/25/2024	0.79	27	0.1	0	0	83	16.3	25.6	51.2	117
SDE4/S1	05/18/2024	0.36	11	0.18	0	0	56	18.5	25.6	68.5	117
SDS3/5	09/20/2023	0.47	6	0.21	0	0.13	45	22.9	32.2	28.7	117
SDS3/5	10/10/2023	0.81	36	0.13	0.01	0.01	13	20.2	32.2	13.7	117
SDS3/5	02/14/2024	0.3	16	0.07	0	0	55	8.94	32.2	8.27	117
SDS3/5	04/25/2024	0.79	27	0.1	0	0	83	13.5	32.2	12.2	117
SDS4	08/29/2023	0.21	9	0.06	0	0	95	15.5	32.2	<6	71.4
SDS4	10/10/2023	0.81	36	0.13	0.01	0.01	13	8.83	32.2	13.5	71.4
SDS4	02/14/2024	0.3	16	0.07	0	0	55	4.7	32.2	<6	71.4
SDS4	04/25/2024	0.79	27	0.1	0	0	83	6.7	32.2	8.75	71.4
SDS6/7	09/18/2023	0.13	2	0.08	0	0	133	16.9	32.2	25.5	117
SDS6/7	10/10/2023	0.81	36	0.13	0.01	0.01	13	11.1	32.2	6.54	117
SDS6/7	01/24/2024	0.62	42	0.06	0	0.02	22	5.06	32.2	<6	117
SDS6/7	05/18/2024	0.36	11	0.18	0	0	56	5.44	32.2	<6	117
SDN1	10/10/2023	0.81	36	0.13	0.01	0.01	13	10.9	28.5	34.7	117
SDN1	01/24/2024	0.62	42	0.06	0	0.02	22	8.77	28.5	65.1	117
SDN1	04/25/2024	0.79	27	0.1	0	0	83	11.9	28.5	50.1	117
SDW2	10/10/2023	0.81	36	0.13	0.01	0.01	13	3.93	47.9	<6	117
SDW2	01/24/2024	0.62	42	0.06	0	0.02	22	4.76	47.9	11.6	117
SDW2	04/25/2024	0.79	27	0.1	0	0	83	3.83	47.9	<6	117
SDW1B	10/10/2023	0.81	36	0.13	0.01	0.01	13	5.81	59.2	<6	117
SDW1B	01/24/2024	0.62	42	0.06	0	0.02	22	5.28	59.2	<6	117
SDW1B	04/25/2024	0.79	27	0.1	0	0	83	4.45	59.2	9.46	117
SDW1A	10/10/2023	0.81	36	0.13	0.01	0.01	13	5.42	59.2	<6	117
SDW1A	02/14/2024	0.3	16	0.07	0	0	55	2.86	59.2	6.96	117
SDW1A	04/25/2024	0.79	27	0.1	0	0	83	2.15	59.2	8.11	117
SDN3A	10/10/2023	0.81	36	0.13	0.01	0.01	13	3.02	59.2	6.75	117
SDN3A	01/24/2024	0.62	42	0.06	0	0.02	22	2.83	59.2	15.3	117
SDN3A	04/25/2024	0.79	27	0.1	0	0	83	0.672	59.2	<6	117
SDN2/3/4	10/10/2023	0.81	36	0.13	0.01	0.01	13	2.79	28.5	6.35	117
SDN2/3/4	01/24/2024	0.62	42	0.06	0	0.02	22	7.58	28.5	6.92	117
SDN2/3/4	04/25/2024	0.79	27	0.1	0	0	83	7.2	28.5	7.66	117
SDD06A	09/20/2023	0.47	6	0.21	0	0.13	45	14.2	25.6	13.6	117
SDD06A	10/10/2023	0.81	36	0.13	0.01	0.01	13	9.45	25.6	9.78	117
SDD06A	02/19/2024	0.64	57	0.1	0	0	97	3.97	25.6	10.4	117
SDD06A	04/25/2024	0.79	27	0.1	0	0	83	6.71	25.6	13.4	117

3.2 In Situ Toxicity Monitoring

The following sections discusses stormwater monitoring data related to the *in situ* monitoring program that was completed during fall 2023 and spring 2024.

The in situ monitoring approach utilizes the early life stage (ELS) salmonid bioassay testing procedure using rainbow trout that can be applied in a laboratory or field (i.e., in situ) context. The test encompasses a number of developmental milestones (e.g., hatching, yolk-sac absorption, etc.), and provides a variety of biological endpoints, such as survival and growth, that can be used to assess water quality.

Results from the in situ bioassays and supporting analytical data are intended to provide an indication of attainment of receiving water quality standards and associated beneficial uses related to salmonid spawning and rearing. Initial Phase 1 testing conducted previously demonstrated that the Rainbow Trout in situ ELS bioassay is an effective instream biological monitoring tool for assessing the potential effects of stormwater discharges on the receiving environment.

The sampling events conducted during this reporting period were completed under the Port's Permit, WA0024651, Part 2. 2S9, and are required to be conducted biannually in the fall and spring, corresponding to the spawning regimes of local salmonid species. Sampling was performed using the revised *Quality Assurance Program Plan: Storm Drainage System Receiving Water In-Situ Toxicity Testing* (Aspect 2021).

For a full discussion on results of the sampling, please refer to *Rainbow Trout Early Life Stages In Situ Monitoring Testing, Fall 2023 and Spring 2024 Testing Events* (Nautilus, 2024, in production).

3.3 Additional Monitoring

There were no incidents requiring additional monitoring or source tracing during this reporting period. During the winter months, the Port completed several voluntary site walks at the pond control structures and along the receiving waters to confirm systems were operating correctly and there was no evidence of cross connections or pollutants.

4.0 BMP Implementation

As outlined in the Comprehensive Stormwater Management Plan (2000), the Port evaluated, designed and constructed stormwater flow control and treatment BMPs to retrofit the entire airport which were phased in over several years from 2000 to 2006. The purpose of these efforts were to improve flow regimes in the receiving waters and implement BMPs that would allow the Port to meet or exceed stormwater quality treatment standards.

As development and re-development of SEA continues, stormwater requirements are assessed on a project by project basis using the Port's Stormwater Management Manual to determine applicable minimum requirements. During the design process, opportunities to implement Low Impact Development technologies are explored.

During this reporting period, the Telecom Meet Me Room (U00336) capital project triggered stormwater treatment requirements in accordance with the Port's Stormwater Management Manual. This project is located along the west side of International Boulevard approximately 750 feet south of Arrivals Drive and drains to the City of SeaTac's MS4. A Biopod was implemented for this project in accordance with the City of Seatac's stormwater requirements. Installation of the Biopod was completed during the summer of 2024. This BMP will be added to the Port's Operations and Maintenance Manual and asset management program accordingly.

In response to the previously depressed pH results in the SDS1 and SDD06A subbasins, the Port is implementing retrofits to the BMPs in these subbasins with the goal of increasing the pH buffering capacity. The SDD06A swales received new oyster shells in December of 2022 and is currently undergoing a retrofit to the pond which will remove existing vegetation and add limestone spalls. The SDS1 swale is also being retrofitted to incorporate a bay of oyster shell media in a forebay.

5.0 SUMMARY AND CONCLUSIONS

During the reporting period from July 1, 2023 to June 30, 2024 the Port fulfilled all requirements for outfall monitoring under the current NPDES permit. The Port collected a total of 41 grab samples and 41 composite stormwater samples during 10 storm events. Outfalls were sampled quarterly for rain events that met the minimum rainfall criteria of 0.10 inches or greater that are preceded by less than 0.10 inch of rainfall in the previous 24 hours. There were zero (0) instances of permit limit exceedances associated with 82 samples and 246 individual constituent analyses that were tested to meet the monitoring requirements of the NPDES permit.

To address the previous year's low pH non-compliances, the Port is currently constructing retrofits to the SDD06A and SDS1 BMPs which will include the addition of oyster shell media or limestone spalls to increase the pH buffering capacity of these basins.

The Port has achieved a high level of compliance during this reporting period which is demonstrated by having zero (0) instances of non-compliance across the hundreds of parameters that are being monitored. The Port's robust monitoring, response and adaptive management programs at SEA continue to be effective at mitigating impacts from airport operations on the adjacent receiving waters.

REFERENCES

Aspect Consulting, 2021. Quality Assurance Program Plan: Storm Drainage System Receiving Water In-Situ Toxicity Testing. September 2021

Aspect Consulting, 2021. Quality Assurance Program Plan for Seattle-Tacoma International Airport Industrial Stormwater Discharge Monitoring Program. September 2021

Cardno TEC, Inc. 2012. Final Report – Stormwater pH Study for Seattle-Tacoma International Airport In Accordance with Agreed Order 8755. October 2012.

CH2MHILL 2008. Comprehensive Receiving Water and Stormwater Runoff Study. Port of Seattle, April 2008.

Nautilus Environmental, LLC. 2008a. Derivation of Site-Specific Water Quality Objectives and Effluent Limits for Copper in Stormwater, June 23, 2008.

Nautilus Environmental, LLC. 2008b. Derivation of Site-Specific Water Quality Objectives and Preliminary Effluent Limits for Zinc in Stormwater, June 23, 2008.

Snoeyink and Jenkins, 1980. Water Chemistry. John Wiley and Sons, Inc. 1980.

U.S. EPA 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-20, U.S. Environmental Protection Agency, Cincinnati, OH.

U.S. EPA 1992. NPDES Storm Water Sampling Guidance Document. U.S. EPA Office of Water. EPA 833-B-92-001. July 1992.

U.S. EPA 1993a. Stormwater discharges potentially addressed by Phase II of the NPDES program. Draft report to Congress. October 1993.

WDOE 2016. National Pollutant Discharge Elimination System permit No. WA0024651, effective January 1, 2016 by Washington Department of Ecology, Olympia, WA.

WDOE 2012. Agreed Order Docket No. 8755.

APPENDIX A

TABULAR NPDES SAMPLE DATA SUMMARIES and STATISTICS

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Storms Sampled

2023-2024 Storms Samples							
StormDate	**Depth, in.**	**Dur, hr**	**Max Int, in/hr**	**24hrant, in**	**48hrant, in**	**Dryant, hr**	**Dryant, Days**
05/18/2024	0.36	11.0	0.18	0.0	0.0	56.0	2.3
04/25/2024	0.79	27.0	0.1	0.0	0.0	83.0	3.5
02/19/2024	0.64	57.0	0.1	0.0	0.0	97.0	4.0
02/14/2024	0.3	16.0	0.07	0.0	0.0	55.0	2.3
01/24/2024	0.62	42.0	0.06	0.0	0.02	22.0	0.9
11/30/2023	1.25	39.0	0.14	0.0	0.0	78.0	3.3
10/10/2023	0.81	36.0	0.13	0.01	0.01	13.0	0.5
09/20/2023	0.47	6.0	0.21	0.0	0.13	45.0	1.9
09/18/2023	0.13	2.0	0.08	0.0	0.0	133.0	5.5
08/29/2023	0.21	9.0	0.06	0.0	0.0	95.0	4.0

Combined Sampling Statistics

Location Group Name	Parameter Name	Units	# Records	Maximum Reported Result	95th Percentile	Median	Minimum Result	Standard Deviation	# Nondetects	% Nondetects
IndSW Locations	Copper	ug/L	41	24	20.2	7.58	0.672	5.814467	0	0.0
IndSW Locations	Zinc	ug/L	41	68.5	65.1	9.78	6	20.785984	10	24.39
IndSW Locations	Diesel Range Organics	mg/L	41	0.929	0.555	0.1	0.1	0.170846	33	80.488
IndSW Locations	Phc as Motor Oil	mg/L	41	0.828	0.572	0.2	0.2	0.139367	33	80.488
IndSW Locations	Combined Diesel Motor Oil	mg/L	41	1.757	1.048	0.3	0.274	0.303836	32	78.049
IndSW Locations	pH	pH units	41	8.6	8.3	7.3	6.5	0.468404	0	0.0
IndSW Locations	Turbidity	ntu	41	19.9	12.1	3.6	0.4	4.374174	0	0.0

Individual Outfall Sampling Statistics

Location ID	Parameter Name	Units	# Records	Maximum Reported Result	95th Percentile	Median	Minimum Result	Standard Deviation	# Nondetects	% Nondetects
SDD06A	Copper	ug/L	4	14.2	13.4875	8.08	3.97	4.362349	0	0.0
SDD06A	Zinc	ug/L	4	13.6	13.57	11.9	9.78	1.986647	0	0.0
SDD06A	Diesel Range Organics	mg/L	4	0.1	0.1	0.1	0.1	0.0	4	100.0
SDD06A	Phc as Motor Oil	mg/L	4	0.2	0.2	0.2	0.2	0.0	4	100.0
SDD06A	Combined Diesel Motor Oil	mg/L	4	0.3	0.3	0.3	0.3	0.0	4	100.0
SDD06A	pH	pH units	4	7.9	7.825	7.3	6.7	0.496655	0	0.0
SDD06A	Turbidity	ntu	4	3.6	3.525	2.8	1.9	0.736546	0	0.0
SDE4/S1	pH	pH units	7	7.7	7.61	7.2	6.5	0.447214	0	0.0
SDE4/S1	Turbidity	ntu	7	19.9	17.469999999999995	7.0	3.2	5.680879	0	0.0
SDE4/S1	Copper	ug/L	7	24	22.35	11.5	8.67	5.447204	0	0.0
SDE4/S1	Zinc	ug/L	7	68.5	67.93	60.6	37.6	11.282414	0	0.0
SDE4/S1	Diesel Range Organics	mg/L	7	0.705	0.66	0.109	0.1	0.254884	3	42.857
SDE4/S1	Phc as Motor Oil	mg/L	7	0.655	0.6064	0.2	0.2	0.182472	4	57.143
SDE4/S1	Combined Diesel Motor Oil	mg/L	7	1.36	1.2663999999999997	0.3	0.287	0.440854	3	42.857
SDN1	Copper	ug/L	3	11.9	11.8	10.9	8.77	1.598635	0	0.0
SDN1	Zinc	ug/L	3	65.1	63.599999999999994	50.1	34.7	15.200439	0	0.0
SDN1	Diesel Range Organics	mg/L	3	0.182	0.1809	0.171	0.1	0.044508	1	33.333
SDN1	Phc as Motor Oil	mg/L	3	0.572	0.5552999999999999	0.405	0.224	0.174047	0	0.0
SDN1	Combined Diesel Motor Oil	mg/L	3	0.743	0.7274	0.587	0.274	0.23884	0	0.0
SDN1	pH	pH units	3	8.3	8.23	7.6	7.2	0.556776	0	0.0
SDN1	Turbidity	ntu	3	12.1	11.79	9.0	8	2.137756	0	0.0
SDN2/3/4	pH	pH units	3	7.6	7.58	7.4	7.4	0.11547	0	0.0
SDN2/3/4	Turbidity	ntu	3	6.4	6.0600000000000005	3.0	2.8	2.023199	0	0.0
SDN2/3/4	Copper	ug/L	3	7.58	7.542	7.2	2.79	2.662599	0	0.0
SDN2/3/4	Zinc	ug/L	3	7.66	7.586	6.92	6.35	0.656836	0	0.0
SDN2/3/4	Diesel Range Organics	mg/L	3	0.1	0.1	0.1	0.1	0.0	3	100.0
SDN2/3/4	Phc as Motor Oil	mg/L	3	0.2	0.2	0.2	0.2	0.0	3	100.0
SDN2/3/4	Combined Diesel Motor Oil	mg/L	3	0.3	0.3	0.3	0.3	0.0	3	100.0
SDN3A	Copper	ug/L	3	3.02	3.001	2.83	0.672	1.304235	0	0.0
SDN3A	Zinc	ug/L	3	15.3	14.445	6.75	6	5.166478	1	33.333
SDN3A	Diesel Range Organics	mg/L	3	0.1	0.1	0.1	0.1	0.0	3	100.0
SDN3A	pH	pH units	3	7.4	7.4	7.4	7	0.23094	0	0.0
SDN3A	Turbidity	ntu	3	5.3	5.15	3.8	3.4	1.001665	0	0.0
SDN3A	Phc as Motor Oil	mg/L	3	0.2	0.2	0.2	0.2	0.0	3	100.0
SDN3A	Combined Diesel Motor Oil	mg/L	3	0.3	0.3	0.3	0.3	0.0	3	100.0
SDS3/5	Copper	ug/L	4	22.9	22.495	16.85	8.94	6.344307	0	0.0
SDS3/5	Zinc	ug/L	4	28.7	26.45	12.95	8.27	8.952722	0	0.0
SDS3/5	Diesel Range Organics	mg/L	4	0.107	0.10595	0.1	0.1	0.0035	3	75.0
SDS3/5	Phc as Motor Oil	mg/L	4	0.214	0.2119	0.2	0.2	0.007	3	75.0
SDS3/5	Combined Diesel Motor Oil	mg/L	4	0.321	0.31784999999999997	0.3	0.3	0.0105	3	75.0
SDS3/5	pH	pH units	4	7.7	7.625	7.05	6.8	0.404145	0	0.0
SDS3/5	Turbidity	ntu	4	9.3	8.489999999999998	3.0	2	3.42965	0	0.0
SDS4	pH	pH units	4	7.2	7.185	6.949999999999999	6.5	0.316228	0	0.0
SDS4	Turbidity	ntu	4	2.9	2.78	1.65	0.4	1.084743	0	0.0
SDS4	Copper	ug/L	4	15.5	14.4995	7.765000000000001	4.7	4.691861	0	0.0
SDS4	Zinc	ug/L	4	13.5	12.7875	7.375	6	3.537743	2	50.0
SDS4	Diesel Range Organics	mg/L	4	0.1	0.1	0.1	0.1	0.0	4	100.0
SDS4	Phc as Motor Oil	mg/L	4	0.2	0.2	0.2	0.2	0.0	4	100.0
SDS4	Combined Diesel Motor Oil	mg/L	4	0.3	0.3	0.3	0.3	0.0	4	100.0
SDS6/7	pH	pH units	4	7.8	7.74	7.4	6.9	0.368556	0	0.0
SDS6/7	Turbidity	ntu	4	6.2	6.2	6.0	1.4	2.34094	0	0.0
SDS6/7	Copper	ug/L	4	16.9	16.03	8.27	5.06	5.581359	0	0.0
SDS6/7	Zinc	ug/L	4	25.5	22.656	6.27	6	9.663353	2	50.0
SDS6/7	Diesel Range Organics	mg/L	4	0.929	0.80465	0.1	0.1	0.4145	3	75.0
SDS6/7	Phc as Motor Oil	mg/L	4	0.828	0.7337999999999997	0.2	0.2	0.314	3	75.0
SDS6/7	Combined Diesel Motor Oil	mg/L	4	1.757	1.53845	0.3	0.3	0.7285	3	75.0
SDW1A	Copper	ug/L	3	5.42	5.164	2.86	2.15	1.72001	0	0.0
SDW1A	Zinc	ug/L	3	8.11	7.994999999999999	6.96	6	1.056425	1	33.333
SDW1A	Diesel Range Organics	mg/L	3	0.1	0.1	0.1	0.1	0.0	3	100.0
SDW1A	Phc as Motor Oil	mg/L	3	0.2	0.2	0.2	0.2	0.0	3	100.0
SDW1A	Combined Diesel Motor Oil	mg/L	3	0.3	0.3	0.3	0.3	0.0	3	100.0
SDW1A	pH	pH units	3	7.4	7.39	7.3	7.2	0.1	0	0.0

Location ID	Parameter Name	Units	# Records	Maximum Reported Result	95th Percentile	Median	Minimum Result	Standard Deviation	# Nondetects	% Nondetects
SDW1A	Turbidity	ntu	3	3.7	3.5599999999999996	2.3	1	1.350309	0	0.0
SDW1B	pH	pH units	3	7.4	7.37	7.1	7	0.208167	0	0.0
SDW1B	Turbidity	ntu	3	18.2	16.57	1.9	1.4	9.558417	0	0.0
SDW1B	Copper	ug/L	3	5.81	5.757	5.28	4.45	0.685493	0	0.0
SDW1B	Zinc	ug/L	3	9.46	9.114	6.0	6	1.997632	2	66.667
SDW1B	Diesel Range Organics	mg/L	3	0.1	0.1	0.1	0.1	0.0	3	100.0
SDW1B	Phc as Motor Oil	mg/L	3	0.2	0.2	0.2	0.2	0.0	3	100.0
SDW1B	Combined Diesel Motor Oil	mg/L	3	0.3	0.3	0.3	0.3	0.0	3	100.0
SDW2	Copper	ug/L	3	4.76	4.677	3.93	3.83	0.510523	0	0.0
SDW2	Zinc	ug/L	3	11.6	11.04	6.0	6	3.233162	2	66.667
SDW2	Diesel Range Organics	mg/L	3	0.1	0.1	0.1	0.1	0.0	3	100.0
SDW2	Phc as Motor Oil	mg/L	3	0.2	0.2	0.2	0.2	0.0	3	100.0
SDW2	Combined Diesel Motor Oil	mg/L	3	0.3	0.3	0.3	0.3	0.0	3	100.0
SDW2	pH	pH units	3	8.6	8.59	8.5	7.3	0.723418	0	0.0
SDW2	Turbidity	ntu	3	5.3	5.11	3.4	2.3	1.517674	0	0.0

Composite Samples

2023/2024 Composite Samples									
								Copper	Zinc
Location ID	StormDate	Depth, in.	Dur, hr	Max Int, in/hr	24hrant, in	48hrant, in	Dryant, hr	Total mg/l	Total mg/l
SDE4/S1	08/29/2023	0.21	9	0.06	0	0	95	24.0	62.4
SDE4/S1	10/10/2023	0.81	36	0.13	0.01	0.01	13	10.5	37.6
SDE4/S1	11/30/2023	1.25	39	0.14	0	0	78	11.4	66.6
SDE4/S1	01/24/2024	0.62	42	0.06	0	0.02	22	8.7	47.5
SDE4/S1	02/14/2024	0.3	16	0.07	0	0	55	11.5	60.6
SDE4/S1	04/25/2024	0.79	27	0.1	0	0	83	16.3	51.2
SDE4/S1	05/18/2024	0.36	11	0.18	0	0	56	18.5	68.5
SDS3/5	09/20/2023	0.47	6	0.21	0	0.13	45	22.9	28.7
SDS3/5	10/10/2023	0.81	36	0.13	0.01	0.01	13	20.2	13.7
SDS3/5	02/14/2024	0.3	16	0.07	0	0	55	8.9	8.3
SDS3/5	04/25/2024	0.79	27	0.1	0	0	83	13.5	12.2
SDS4	08/29/2023	0.21	9	0.06	0	0	95	15.5	<6
SDS4	10/10/2023	0.81	36	0.13	0.01	0.01	13	8.8	13.5
SDS4	02/14/2024	0.3	16	0.07	0	0	55	4.7	<6
SDS4	04/25/2024	0.79	27	0.1	0	0	83	6.7	8.8
SDS6/7	09/18/2023	0.13	2	0.08	0	0	133	16.9	25.5
SDS6/7	10/10/2023	0.81	36	0.13	0.01	0.01	13	11.1	6.5
SDS6/7	01/24/2024	0.62	42	0.06	0	0.02	22	5.1	<6
SDS6/7	05/18/2024	0.36	11	0.18	0	0	56	5.4	<6
SDN1	10/10/2023	0.81	36	0.13	0.01	0.01	13	10.9	34.7
SDN1	01/24/2024	0.62	42	0.06	0	0.02	22	8.8	65.1
SDN1	04/25/2024	0.79	27	0.1	0	0	83	11.9	50.1
SDW2	10/10/2023	0.81	36	0.13	0.01	0.01	13	3.9	<6
SDW2	01/24/2024	0.62	42	0.06	0	0.02	22	4.8	11.6
SDW2	04/25/2024	0.79	27	0.1	0	0	83	3.8	<6
SDW1B	10/10/2023	0.81	36	0.13	0.01	0.01	13	5.8	<6

SDW1B	01/24/2024	0.62	42	0.06	0	0.02	22	5.3	<6
SDW1B	04/25/2024	0.79	27	0.1	0	0	83	4.5	9.5
SDW1A	10/10/2023	0.81	36	0.13	0.01	0.01	13	5.4	<6
SDW1A	02/14/2024	0.3	16	0.07	0	0	55	2.9	7.0
SDW1A	04/25/2024	0.79	27	0.1	0	0	83	2.2	8.1
SDN3A	10/10/2023	0.81	36	0.13	0.01	0.01	13	3.0	6.8
SDN3A	01/24/2024	0.62	42	0.06	0	0.02	22	2.8	15.3
SDN3A	04/25/2024	0.79	27	0.1	0	0	83	0.7	<6
SDN2/3/4	10/10/2023	0.81	36	0.13	0.01	0.01	13	2.8	6.4
SDN2/3/4	01/24/2024	0.62	42	0.06	0	0.02	22	7.6	6.9
SDN2/3/4	04/25/2024	0.79	27	0.1	0	0	83	7.2	7.7
SDD06A	09/20/2023	0.47	6	0.21	0	0.13	45	14.2	13.6
SDD06A	10/10/2023	0.81	36	0.13	0.01	0.01	13	9.5	9.8
SDD06A	02/19/2024	0.64	57	0.1	0	0	97	4.0	10.4
SDD06A	04/25/2024	0.79	27	0.1	0	0	83	6.7	13.4

Grab Samples

2023-2024 Grab Samples									pH	Turbidity	TPH-D	TPH-Dx	TPH-MO	Sheen
									ph Units	NTU	mg/l	mg/l	mg/l	N/A
Sampling Event	Outfall	StormDate	Depth, in.	Dur, hr.	Max Int, in/hr	24hrant, in.	48hrant, in.	Dryant, hr						
Storm20230829	SDE4/S1	08/29/2023	0.21	9	0.06	0	0	95	7.2	5.4	0.705	1.36	0.655	No Sheen
Storm20231010	SDE4/S1	10/10/2023	0.81	36	0.13	0.01	0.01	13	6.5	11.8	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231130	SDE4/S1	11/30/2023	1.25	39	0.14	0	0	78	7.7	3.2	0.109	0.447	0.338	No Sheen
Storm20240124	SDE4/S1	01/24/2024	0.62	42	0.06	0	0.02	22	7.4	7.0	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240214	SDE4/S1	02/14/2024	0.3	16	0.07	0	0	55	7.4	11.7	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDE4/S1	04/25/2024	0.79	27	0.1	0	0	83	6.6	19.9	0.555	1.05	0.493	No Sheen
Storm20240518	SDE4/S1	05/18/2024	0.36	11	0.18	0	0	56	6.9	5.9	0.187	0.287	< 0.200	No Sheen
Storm20230920	SDS3/5	09/20/2023	0.47	6	0.21	0	0.13	45	6.8	3.9	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDS3/5	10/10/2023	0.81	36	0.13	0.01	0.01	13	6.9	2.1	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240214	SDS3/5	02/14/2024	0.3	16	0.07	0	0	55	7.7	2.0	0.107	0.321	0.214	No Sheen
Storm20240425	SDS3/5	04/25/2024	0.79	27	0.1	0	0	83	7.2	9.3	< 0.100	< 0.300	< 0.200	No Sheen
Storm20230829	SDS4	08/29/2023	0.21	9	0.06	0	0	95	6.5	2.9	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDS4	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.1	1.2	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240214	SDS4	02/14/2024	0.3	16	0.07	0	0	55	7.2	0.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDS4	04/25/2024	0.79	27	0.1	0	0	83	6.8	2.1	< 0.100	< 0.300	< 0.200	No Sheen
Storm20230918	SDS6/7	09/18/2023	0.13	2	0.08	0	0	133	7.4	6.2	0.929	1.76	0.828	No Sheen
Storm20231010	SDS6/7	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	5.8	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240124	SDS6/7	01/24/2024	0.62	42	0.06	0	0.02	22	7.8	6.2	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240518	SDS6/7	05/18/2024	0.36	11	0.18	0	0	56	6.9	1.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDN1	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.6	8.0	0.182	0.587	0.405	No Sheen
Storm20240124	SDN1	01/24/2024	0.62	42	0.06	0	0.02	22	7.2	12.1	< 0.100	0.274	0.224	No Sheen
Storm20240425	SDN1	04/25/2024	0.79	27	0.1	0	0	83	8.3	9.0	0.171	0.743	0.572	No Sheen
Storm20231010	SDW2	10/10/2023	0.81	36	0.13	0.01	0.01	13	8.6	3.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240124	SDW2	01/24/2024	0.62	42	0.06	0	0.02	22	7.3	5.3	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDW2	04/25/2024	0.79	27	0.1	0	0	83	8.5	2.3	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDW1B	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	1.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240124	SDW1B	01/24/2024	0.62	42	0.06	0	0.02	22	7.0	18.2	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDW1B	04/25/2024	0.79	27	0.1	0	0	83	7.1	1.9	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDW1A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	2.3	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240214	SDW1A	02/14/2024	0.3	16	0.07	0	0	55	7.3	3.7	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDW1A	04/25/2024	0.79	27	0.1	0	0	83	7.2	1.0	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDN3A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	3.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240124	SDN3A	01/24/2024	0.62	42	0.06	0	0.02	22	7.4	3.8	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDN3A	04/25/2024	0.79	27	0.1	0	0	83	7.0	5.3	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDN2/3/4	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.4	2.8	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240124	SDN2/3/4	01/24/2024	0.62	42	0.06	0	0.02	22	7.6	6.4	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDN2/3/4	04/25/2024	0.79	27	0.1	0	0	83	7.4	3.0	< 0.100	< 0.300	< 0.200	No Sheen
Storm20230920	SDD06A	09/20/2023	0.47	6	0.21	0	0.13	45	7.4	3.1	< 0.100	< 0.300	< 0.200	No Sheen
Storm20231010	SDD06A	10/10/2023	0.81	36	0.13	0.01	0.01	13	7.2	1.9	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240219	SDD06A	02/19/2024	0.64	57	0.1	0	0	97	7.9	2.5	< 0.100	< 0.300	< 0.200	No Sheen
Storm20240425	SDD06A	04/25/2024	0.79	27	0.1	0	0	83	6.7	3.6	< 0.100	< 0.300	< 0.200	No Sheen

APPENDIX B

Quality Control Samples

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2023-2024 QC Samples														Copper (ug/l)	Zinc (ug/l)
Outfall	Sample	StormDate	Depth, in.	Dur, hr	Max Int, in/hr	24hrant, in.	48hrant, in.	Dryant, hr	Event Type	Sub Type	Type	Purpose	Comments		
SDE4/S1	SDE4/S1051924DUPC	05/18/2024	0.36	11	0.18	0	0	56	NPDES-Part II	Flow-Wt Comp	FD	FldQC		17.1	61.8
SDE4/S1	SDE4/S1120123DUPC	11/30/2023	1.25	39	0.14	0	0	78	NPDES-Part II	Flow-Wt Comp	FD	FldQC		10.8	59.4
SDS3/5	SDS3/5021524DUPC	02/14/2024	0.3	16	0.07	0	0	55	NPDES-Part II	Flow-Wt Comp	FD	FldQC		8.9	8.6
SDN1	SDN1101123DUPC	10/10/2023	0.81	36	0.13	0.01	0.01	13	NPDES-Part II	Flow-Wt Comp	FD	FldQC		12.5	30.8
SDW1B	SDW1B101123DUPC	10/10/2023	0.81	36	0.13	0.01	0.01	13	NPDES-Part II	Flow-Wt Comp	FD	FldQC		5.6	<6
SDN8	SDN8021624COMP	02/14/2024	0.3	16	0.07	0	0	55	NPDES-Part II	Discreet Series Comp	EB			<.5	<6
SDN8	SDN8101123COMP	10/10/2023	0.81	36	0.13	0.01	0.01	13	NPDES-Part II	Discreet Series Comp	EB			<.5	<6
SDN8	SDN8120123COMP	11/30/2023	1.25	39	0.14	0	0	78	NPDES-Part II	Discreet Series Comp	EB			<.5	<6