Geosyntec consultants

engineers | scientists | innovators

STORMWATER EVALUATION REPORT

Terminal 4 Slip 3

Prepared for

Port of Portland
11040 N Lombard Street
Portland, OR 97203

Prepared by

Geosyntec Consultants, Inc.
920 SW Sixth Ave, Suite 600
Portland, OR 97204

Project PNW0319V

September 2021

STORMWATER EVALUATION REPORT

Terminal 4 Slip 3

Prepared for

Port of Portland
11040 N Lombard Street
Portland, OR 97203

Prepared by

Geosyntec Consultants, Inc.
920 SW Sixth Ave, Suite 600
Portland, OR 97204

Project Number: PNW0319V

September 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
City	City of Portland, Oregon
CPD	Commission of Public Docks
COC	Constituent of Concern
DEQ	Oregon Department of Environmental Quality
DMR	Discharge Monitoring Report
ECSI	Environmental Cleanup Site Information
EPA	U.S. Environmental Protection Agency
Geosyntec	Geosyntec Consultants, Inc.
IRM	International Raw Materials
JSCS	Joint Source Control Strategy
KM	Kinder Morgan
MS4	Municipal Separate Storm Sewer System
PAHs	Polycyclic Aromatic Hydrocarbons
PHSS	Portland Harbor Superfund Site
Port	Port of Portland
ROD	Record of Decision
SCE	Source Control Evaluation
SCM	Source Control Measure
SLV	Screening Level Value
SWPCP	Stormwater Pollution Control Plan
T4	Terminal 4
TSS	Total Suspended Solids
VCP	Voluntary Cleanup Program

1. INTRODUCTION

1.1 Purpose

This stormwater evaluation report summarizes and documents stormwater monitoring and control efforts executed at the Terminal 4 (T4) Slip 3 Upland Facility (Site; ECSI No. 272) in 2020 – 2021 (evaluation period). The Site is located at 11040 N Lombard St in Portland, Oregon, and is within the boundary of the Portland Harbor Superfund Site (PHSS). Slip 3 is a channel inlet off the main Willamette River between Piers 4 and 5 where large cargo vessels dock. Stormwater outfalls at the Site either discharge to Slip 3 or directly to the river. Stormwater monitoring was conducted in accordance with a stormwater sampling work plan approved by the Oregon Department of Environmental Quality (DEQ) in November 2019 (Work Plan; Geosyntec, 2019).

Due to the long history of the cleanup program at T4, for which a voluntary agreement was signed in 2003 (DEQ, 2003), not all stormwater basins had been evaluated within the past decade. Some basins were previously represented by other basins and so have never been sampled. As such, this evaluation is meant to fill data gaps and establish the current status of the monitored stormwater basins. This report presents and evaluates the observations documented in accordance with the Work Plan by stormwater basin, as well as recommends appropriate next steps for the Site.

1.2 Source Control Objective

The ultimate objective of stormwater monitoring and sampling at the Site is to establish all basins as sufficiently controlled such that a final source control evaluation and decision for the stormwater pathway can be reached. The objective of this effort is to determine which stormwater outfalls remain active, and which, if any, require additional evaluation or control measures before a source control decision may be issued for the Site.

1.3 Regulatory Framework

Data collection and evaluation for source control at the Site is being conducted as required by the Oregon Department of Environmental Quality (DEQ) pursuant to the following:

- Terminal 4 Slip 3 Upland Facility – Consent Judgement No. 0410-10234, Multnomah Circuit Court, October 7, 2004, Section 3.C.

1.4 Report Organization

This report loosely follows DEQ's *Template for a Stormwater Source Control Evaluation Report*, which is Appendix C of DEQ's *Guidance for Evaluating the Stormwater Pathway at Upland Sites* (DEQ, 2017).

- Section 1 introduces the purpose and objectives of this Stormwater Evaluation Report
- Section 2 presents a description of the Site and land uses
- Section 3 describes the Site's potential sources of contaminants of concern (COCs)
- Section 4 presents ongoing management measures at the Site

- Section 5 summarizes this stormwater monitoring effort and associated data
- Section 6 describes source control measures relevant to collected data
- Section 7 evaluates the collected data
- Section 8 presents the conclusions of this study
- Section 9 provides citations for other documents referenced by this report
- Appendix A provides hyetographs for the observation events
- Appendix B provides field documentation, including a photo log of observation events, field note forms, and a photo log of the Basin D Slip 3 outfalls

2. SITE BACKGROUND

2.1 Site Description

T4 occupies approximately 260 acres on the east bank of the lower Willamette River downstream from the St. Johns Bridge in north Portland, Oregon, between River Miles 4.2 and 5.5 (Figure 1). The land is zoned for industrial use. Surrounding areas are occupied by marine, industrial, and commercial operations, with a small residential zone of four tax lots located 200 feet east of the terminal. Larger residential zones are located 2,000 feet east and 1,000 feet southeast of the terminal.

The topography of T4 consists primarily of relatively flat areas close to the Willamette River with a steep hillside and bluff located on the east side of the Site. Lower portions of the Site are located approximately 35 feet above mean sea level (NAVD88 datum), while eastern portions of the terminal near Lombard Street are at an elevation of approximately 100 feet. The river water elevation is typically less than 10 feet, with a mean tidal range of about 2 feet. Depth to groundwater is around 15 to 20 feet. The land cover at T4 is a mixture of pervious open space, rail tracks, industrial buildings, and asphalt and concrete pavement.

For the purposes of DEQ oversight, the T4 upland area was divided into three sections: Terminal 4 Slip 1 (ECSI No. 2356), Terminal 4 Slip 3 (ECSI No. 272), and the Terminal 4 Auto Storage Area (ECSI No. 172). These areas encompass approximately 85 acres, 27 acres, and 125 acres, respectively. This stormwater evaluation report is for the T4 Slip 3 Upland Facility.

Slip 3 is bounded by the Terminal 4 Slip 1 Upland Facility to the north, the Union Pacific Railroad right-of-way to the east, the Terminal 4 Auto Storage Area to the south, and the ordinary high water line of the Willamette River at Slip 3 to the west. The Port also owns submerged lands below ordinary high water located in Slip 3.

Two water-related areas within or near T4 Slip 3 are:

- Slip 3 – This contains Pier 4 with Berths 410 and 411 that are the main site of active marine operations (80% occupancy) serving deep-draft, ocean-going vessels. Berths 410 and 411 are located along the north side of Slip 3. The south side of Slip 3 consists of Pier 5 with Former Berth 412, which was removed in 1997 (DEQ, 2003).
- Berth 414 – This is an active berth in the main river south (upriver) of Slip 3. It is used to unload automobiles from deep-draft, ocean-going vessels.

2.2 Stormwater Conveyance System

Nearly all stormwater at T4 either infiltrates or reaches a conveyance system via overland flow or subdrains and then discharges to the river through an outfall. The Site's stormwater conveyance system is shown in Figure **2**.

2.2.1 Drainage Basins

T4 Slip 3 contains four stormwater subbasins of various sizes and drainage characteristics (K1, K2, J, and D; Table 1). Basin D is the southernmost basin at T4 Slip 3 and encompasses Berth 414 on the Willamette River and Pier 5 along the southern portion of Slip 3. Basins J, K2, and K1 are located north of Basin D at the head of the slip, with Basin K1 being the Site's northernmost basin. Basin L, whose southern border lies along the north edge of Slip 3, is considered a part of the Slip 1 upland facility as its main outfall is to Wheeler Bay. Therefore, Basin L is not discussed in this report.

Table 1: T4 Slip 3 Upland Facility Drainage Basins

Drainage Basin	Total Area (ac)	Approximate Percent Impervious
J	2.72	8.7
K1	1.45	32
K2	1.54	5.6
D	19.1	63
Total	*24.8*	*51*

2.2.2 Outfalls

At the start of this effort, nine stormwater outfalls from the Slip 3 upland facility to the river existed: the main Basin D outfall, five minor outfalls from Basin D to Slip 3, and each of the Basin J, K2, and K1 outfalls (Figure **2**). Of these, only the main Basin D and Basin K1 outfalls were known to be active (Table 2).

Table 2: Pre-Work Plan Status of T4 Slip 3 Outfalls

Drainage Basin	Port Asset ID	Outfall Location	Status Before Monitoring or Source Control Measures
D	STSOUT265	Willamette River near Berth 414	Active
D	STSOUT001056	South side of Slip 3	Inactive (unverified)
D	STSOUT263	South side of Slip 3	Inactive (unverified)
D	STSOUT001057	South side of Slip 3	Inactive (unverified)
D	STSOUT262	South side of Slip 3	Inactive (unverified)
D	STSOUT261	South side of Slip 3	Inactive (unverified)
J	STSOUT259	Head of Slip 3	Inactive (unverified)
K2	STSOUT250	Head of Slip 3	Inactive (unverified)
K1	STSOUT260	Head of Slip 3	Active

2.3 Site Ownership and Operating History

An exhaustive description of Site ownership and historical land uses by stormwater basin was provided in the Work Plan. A summary is presented below, however, for more detailed information refer to the Work Plan associated with this report (Geosyntec, 2019) as well as the T4 Slip 3 Remedial Investigation Report (Hart Crowser, 2000).

Initial development of T4 began in 1907 by the Union Pacific Railroad (UPRR) for an oil supply dock; the Site was then purchased in 1917 by The City of Portland Commission of Public Docks (City CPD). Construction was completed in 1919.

The U.S. Army operated the terminal in the 1940s to serve as a port of embarkation and supply depot to support World War II. The Port of Portland (Port) acquired the terminal from the City CPD in 1971 and is the current owner of the Site. However, portions of the Site have been leased to various tenants since the early 1900s.

Historical operations at T4 as a whole have included loading, unloading, processing and storage of grain; cold storage; fumigation of cotton and food products; liquid storage (*e.g.,* fertilizer, molasses, tallow, urea, caustic soda, petroleum products, and fats); container food freight; a gasoline station; salvage yard; operation of a break-bulk berth; fire boat moorage; importing ore and ore concentrates, including alumina, bauxite, chromite, chrome ore, coal, copper ores/concentrates, ferro-phosphorous iron ore, manganese, lead concentrate, sulfur, tricaphos, and zinc; and importing other products, including pencil pitch, soda ash, talc, bentonite clay, coal, coke, and live sheep (Ash Creek Associates, 2009). Handling of pencil pitch was discontinued in 1998 (DEQ, 2003).

T4 is currently used as a marine facility. Operations at the Site consist of ship loading/unloading; bulk cargo, liquid, and grain handling and storage; and general equipment and operational maintenance. Portions of T4 Slip 3 are currently leased out to tenants Kinder Morgan (KM) Bulk Terminals for handling soda ash, and Toyota Motors USA Inc for automobiles (Toyota; Figure **3**).

In general, these cargos do not include chemicals that are constituents of concern (COC) in Portland Harbor sediments and are contained in such a manner that they have low risk of release. In addition, the cargo loading, unloading, and handling are conducted in accordance with Best Management Practices (BMPs) to reduce the risk of releases to the river.

Land uses at the Site have not substantially changed since the Site's original stormwater work plan was created in 2007 (2007 SW Work Plan; Ash Creek Associates, Inc./Newfields, 2007).

2.4 Regulatory History

For the Slip 3 upland area, the Port entered into a Voluntary Cleanup Program (VCP) Agreement for Feasibility Study and Source Control Measures with DEQ on June 27, 2002 (LQVC-NWR-02-11). DEQ issued a Record of Decision (ROD) for the Slip 3 upland area and on October 7, 2004 a Consent Judgment between DEQ and the Port was filed in the Circuit Court of Oregon for Multnomah County (No. 0410-10234). The bulk of the regulatory history at the Site is related to this VCP.

Stormwater discharges from T4 are permitted under the Port's Municipal Separate Storm Sewer System (MS4) Discharge Permit No. 101314 (for property and infrastructure owned by the Port), Toyota's 1200-Z Industrial Stormwater Permit File No. 113672 (for infrastructure on Toyota's leasehold), and KM's 1200-Z Industrial Stormwater Permit No. 100025 (for infrastructure on KM's leasehold).

Tenants are responsible for legal compliance under their operating agreements, including operational permits, implementation of a Spill Response Plan and a Stormwater Pollution Control Plan (SWPCP), and compliance with the Port's MS4 Discharge Permit. The tenants' permits authorize the release of stormwater to the river subject to specified terms and conditions and require the implementation of stormwater BMPs. As part of their SWPCPs, tenants are required to collect samples and provide discharge monitoring reports (DMRs) to DEQ.

2.5 Previous Investigations

A comprehensive summary of previous investigations was provided in the Work Plan. For reference purposes, completed milestone documents related to stormwater and stormwater source controls at T4 Slip 3 are as follows:

- Remedial Investigation (Hart Crowser, 2000)
- Stormwater Source Control Evaluation (Ash Creek Associates, 2009)
- Source Control Completion Report (Ash Creek Associates, 2011)
- Additional Stormwater Sampling Memo (Ash Creek Associates, 2013)
- Additional Source Control Measures Memo (Apex, 2014)
- Source Control Decision Support Data Collection (Geosyntec Consultants, 2016)
- Soil Infiltration Testing Report (Geosyntec Consultants, 2018)

Additional descriptions of the history of source controls activities and studies performed at the site were also provided to DEQ in the Terminal 4 Source Control Briefing Paper on August 31, 2018 (Apex, 2018).

Of the Site's four stormwater basins, stormwater has only previously been characterized for Basins D and K1, and stormwater solids have only been previously characterized for Basin D. The other basins (J and K2) have never been sampled as they were thought to produce very little stormwater due to their low imperviousness. However, the 2007 Stormwater Work Plan (Ash Creek Associates, 2007) suggests these basins could be conservatively represented by Basin L. As such, these basins were further investigated as part of this stormwater evaluation work plan (see Section 7 of the Work Plan).

3. POTENTIAL SOURCES AND CONTAMINANTS OF INTEREST

3.1 Potential Contaminant Sources

There are no known ongoing sources of contamination at the Site – all potential contaminant sources are from historical activities. The remaining COC at the Site as identified in the Work Plan is polycyclic aromatic hydrocarbons (PAHs), which, at the time of the VCP, were found in Slip 3 sediments at high concentrations likely due to historical spills of pencil pitch while offloading cargo vessels and petroleum seepage (including diesel and bunker C type fuels) associated with a former Union Pacific Railroad fuel pipeline. Since these historical releases occurred, numerous remedial actions have been completed within the upland and in-water portions of Slip 3. PAHs are known to be present in discharges from Basin K1.

Basin D, which is almost entirely paved and is used mostly for storage of new automobiles, has very little potential to release contaminants via current or historical sources.

4. ONGOING STORMWATER MANAGEMENT MEASURES

The Port has implemented numerous source control measures (SCMs) at the Site through various mechanisms, including tenant contracts, the Environmental Management System Program, continual improvement policy, and a Stormwater Master Plan. Non-structural BMP implementations include pavement sweeping, catch basin inserts, conveyance system cleaning, annual cleanout of catch basins, and regular inspections and maintenance of structures, catch basins, and treatment facilities. Currently, stormwater runoff entering the stormwater conveyance system for Basin D is treated by a Downstream Defender®, which was installed in 2004, and which removes sediment and floating solids via low-energy vortex motion.

The Downstream Defender was installed in conformance with the 2000 City of Portland Bureau of Environmental Services design manual. It is also approved as a Pretreatment device for removal of TSS through the Washington Department of Ecology's TAPE program. As stated in the TAPE approval document, the Downstream Defender will remove at least 80% of 125-micron particles at 583 gpm, 50% of 50-micron particles at 980 gpm, and 80% of 50-micron particles at 400 gpm. As the Downstream Defender in Basin D is a 6-ft diameter unit, the design flow rate of this unit is estimated at 450 gpm (Ecology, 2005).

A bioinfiltration basin for Basin K1 has been designed and is scheduled for construction in 2021. This system is designed to meet the 1200-Z Tier II Corrective Action Response Design Storm Criteria, which is to treat 50% of the 2-year, 24-hour design storm. The system pump station can divert stormwater flows to the bioinfiltration basin at maximum rate of 144 gpm (0.32 cfs) (Maul Foster & Alongi, 2021). Based on long-term modeling, this diversion flow rate is expected to capture and infiltrate greater than 90 percent of long-term average annual stormwater runoff in the basin (Geosyntec, 2020).

5. DATA COLLECTION AND INTERPRETATION

5.1 Monitoring

Stormwater monitoring was conducted in accordance with the DEQ-approved Work Plan (Geosyntec, 2019). Per Section 7 of the Work Plan, stormwater monitoring at the Site was to consist of field observations at the outfalls for Basins J and K2 conducted during four storm events during the 2019/2020 wet season. As discussed in the Work Plan, these outfalls appeared to have been dry for an extended period of time, indicating they no longer convey runoff to the Willamette River, or only do so during large events. As such, visual observations and photographic documentation of these outfalls during storm events was necessary to confirm their inactive status.

All stormwater observations called for in the Work Plan were obtained over the course of four qualifying storm events (Table 3). Observations in Basin K2 were taken from the end of the outfall pipe, while observations in Basin J were taken from a latched opening cut into the top of the pipe approximately 20 feet upstream of the outfall. This opening was created by Port maintenance at the start of the investigation for the safety of field personnel, as the end of the Basin J pipe is sometimes submerged and can only be reached by descending a steep slope. Observation locations are show in Figure 4. Hyetographs of the observed storm events are included as Appendix A.

Table 3: Summary of Observed Storm Events

Observation Date	Total Storm Depth (in)	Rainfall Duration (h)	24 h Antecedent Rain Depth (in)	Qualifying Storm?	Rainfall Depth Prior to Field Observation (in)
2/15/2020	0.80	23	0.00	Yes	0.22
10/10/2020	0.99	10	0.00	Yes	0.80
11/5/2020	0.83	24	0.01	Yes	0.48
11/12/2020	1.12	17	0.00	Yes	0.23
Target	**>0.20**	**>3**	**<0.10**	**-**	**-**

5.2 Data Summary

No stormwater discharges were observed through either the Basin J or K2 outfalls (Table 4). Pipes were entirely dry during all four observations; therefore, no grab samples were collected for these basins. Photographic and written documentation of these monitoring events is included as Appendix B.

Table 4: Summary of Observation Events in Slip 3

Observation Date	Discharge from Basin J?	Discharge from Basin K2?
2/15/2020	No	No
10/10/2020	No	No
11/5/2020	No	No
11/12/2020	No	No

5.3 Data Interpretation

The lack of discharge observed from either the Basin J or K2 outfall indicates these outfalls are not active and do not discharge stormwater runoff to Slip 3. The four observations made for these outfalls occurred during different size and intensity storms, with different pre-observation rainfall depths (Table 3). This indicates the outfalls do not discharge during a range of storm intensities, durations, and antecedant conditions.

In particular, the Basin K2 outfall pipe observations included bits of residual material at the bottom of the pipe that did not move over the course of the observation periods, which further confirms field observations (see photographs in Attachment B-1).

6. SOURCE CONTROL MEASURES (SCMS)

Catch basins in these stormwater basins were inspected and cleaned as necessary in June 2020 in accordance with standard Port maintenance protocols. Where applicable, catch basin inserts were also replaced. In addition, several investigations of the storm drain network were undertaken during the course of this study to better understand particular features and connectivity of the network.

6.1 Basin D Stormwater Investigation and Source Control Measures

As described in Section 2.2.2, Basin D contained a total of six outfalls at the start of this effort. Of these, only the main outfall from Basin D directly to the Willamette River was known to be active. The other five outfalls, all of which drain to Slip 3, were unverified. Of the five outfalls, Port records suggested that two were not currently connected to any catch basins (STSOUT001056 and STSOUT001057), two were connected to only one or two catch basins (STSOUT263 and STSOUT262), and one was possibly, though unlikely, connected to the main, active Basin D outfall (Figure 5).

On August 3rd, 2020, Geosyntec oversaw a stormwater investigation within Basin D to confirm connections from catch basins or other inlets to these five outfalls. The inspections consisted of Port maintenance personnel dispensing clean water from a water truck into catch basins or cleanouts located at the north edge of Basin D along Slip 3 to investigate potential connections to the outfalls. The Port's utility locator was on-site during the investigation. This investigation occurred on a dry day during summer to ensure any water observed discharging from the outfalls was water associated with the investigation. Water was dispensed into each inlet until it was observed discharging out of an outfall, or, if no water was observed to be discharging, until the inlet was nearly full.

Three of the five outfalls (STSOUT262, STSOUT001057, STSOUT263) were observed to be active, with each outfall draining a single, separate catch basin. Two of the three catch basins had only a single pipe straight to the outfall. The third catch basin (associated with STSOUT001057) contained a small, rusty, 4-inch iron pipe stub which was oriented to dispense water into the catch basin. However, no existing inlet connection to this pipe was located (Figure 5).

No flow was observed from any inlet to outfalls STSOUT001056 or STSOUT261. STSOUT001056 did not have any active connections according to Port records, and no present-day inlets were found to connect to the outfall, confirming that the outfall is and has been inactive for some time. Although no flow was observed discharging to outfall STSOUT261, the nearest upgradient catch basin was observed to have a single connection in the direction of the outfall. When water was deposited into this catch basin it filled up with water, and, as such, it is thought that this catch basin discharges to STSOUT261 but an obstruction in the line prevented discharge from exiting through the outfall. The next nearest catch basin was confirmed to flow towards the main Basin D outfall on the Willamette River (Figure 5).

Additional inspection and maintenance of the Basin D stormwater conveyance system occurred on November 10th, 2020, at which time most of the remaining catch basins, manholes, and storm lines

within Basin D but outside of Toyota's leasehold were investigated and cleaned. The main finding from this investigation was that Port records accurately portray these inlets and lines as draining to the main Basin D outfall, which discharges directly to the Willamette River (Figure 5).

Following these investigations the Port abandoned all five outfalls from Basin D to Slip 3. Given the small area drained, the lack of connectivity to impervious areas, and the lack of active land uses, the outfalls were deemed not necessary. All five outfalls were cut at the slip bulkhead wall and capped on January 20, 2021 (Attachment B-2), resulting in no discharge from these outfalls and a closure of the stormwater pathway in this area. These five outfalls and associated infrastructure are expected to be fully and permanently removed in conjunction with future redevelopment.

6.2 Basin K1 Source Control Measures

A vegetated bioinfiltration basin will be installed in 2021 to treat and infiltrate stormwater runoff from Basin K1. A pump station will be installed to divert nearly all stormwater from the Basin K1 outfall to this bioinfiltration basin, which is designed to infiltrate approximately 95% of average annual runoff volume. The 100% design plan set and Operations and Maintenance (O&M) Plan have been completed and were submitted to DEQ on April 16, 2021, incorporating previous DEQ comments on the design and O&M Plan. As such, Basin K1 is considered controlled pending effectiveness demonstration of the SCM. Discharge from this basin's outfall will continue to be monitored consistent with KM's 1200-Z permit and the O&M Plan.

7. SOURCE CONTROL EVALUATION

7.1 Data Evaluation

7.1.1 Basins J and K2

No stormwater discharge was observed from the Basin J and K2 outfalls (STSOUT259, STSOUT260). The observations, which were conducted during four different precipitation events during the evaluation period, confirmed that these outfalls are not active and do not discharge stormwater. Stormwater in these basins predominantly infiltrates through the mostly pervious cover. Therefore, the outfalls were capped on 31 August, 2021, as documented in Appendix B. Capped status will be verified over the next wet season, as mention in Section 9 The stormwater pathways from Basins J and K2 can be considered controlled and do not require further evaluation.

7.1.2 Basin K1

Stormwater from Basin K1 will be controlled via treatment and infiltration with a bioinfiltration basin. The Port and KM have been working with DEQ on the designs for this SCM, for which 100% designs are being finalized based on DEQ's comments. Following installation of the basin, stormwater discharges will not occur except during very large or high intensity storm events that exceed the design capacity of the pump station. Therefore, Basin K1 can be considered controlled pending effectiveness demonstration of the permanent SCM.

7.1.3 Basin D

7.1.3.1 Outfalls to Slip 3

All five minor outfalls from Basin D to Slip 3 were abandoned (cut and capped) during this evaluation period. The capped status will be verified over the next wet season, as mentioned in Section 9, and the remaining infrastructure associated with these outfalls will be removed as part of future redevelopment. As such, these outfalls no longer contribute stormwater to the slip, are considered controlled, and do not require further evaluation.

7.1.3.2 Main Outfall to the River

The 2009 stormwater source control evaluation report (2009 SW SCE) concluded that no further action was needed to control the stormwater pathway in Basin D; the basis for the conclusion was low TSS and COC concentrations observed, plus the presence of the Downstream Defender® treatment system (Ash Creek Associates, 2009). This conclusion is still valid, as land uses in this basin have not changed since the 2009 SW SCE was completed.

In addition, the Work Plan summarized recent stormwater data from adjacent basins collected by Toyota in accordance with its 1200Z permit, which provides a conservative estimate of COC discharges from the main Basin D outfall. Under Toyota's 1200Z permit, Basin D stormwater discharges do not need to be monitored because the basin does not contain industrial activities. Data from the adjacent basins show COCs, such as PAHs, remain well below the knee-of-the-curve for stormwater as compared to other Portland Harbor industrial sites (see Section 6.1 of the Work Plan).

8. FINDING AND CONCLUSIONS

Based on DEQ guidance for presenting findings and conclusions, the following is summarized based on this investigation study (DEQ, 2017).

1. Existing and potential facility-related contaminant sources have been identified and characterized.
    - Previous studies over the past 20+ years established potential sources of contaminants. This is discussed extensively in the Work Plan.
    - There have been no significant changes in land uses since investigations began at the Site 20+ years ago.
    - There are no known significant ongoing sources for COCs at the Site.
2. Contaminant sources are being controlled to the extent feasible.
    - Stormwater to Slip 3 from Basin K1 will be controlled with the installation of a bioinfiltration basin. This system will be designed to effectively eliminate nearly all stormwater discharge, with an estimated runoff capture efficiency of 95%.
    - No other basins have active stormwater discharges to Slip 3.
    - The main outfall from Basin D drains mostly paved area with little potential for contaminant accumulation, and is serviced by a Downstream Defender® treatment unit which minimizes TSS loading to the river. Previous investigations of this outfall have demonstrated it is controlled and no additional source control or performance monitoring is needed (see Section 6.1 of the Work Plan).
3. Adequate measures are in place to ensure source control and good stormwater management measures occur in the future.
    - Port outfalls are covered under the Port's MS4 permit. The Port will continue to follow the requirements of the permit and will continue to implement its maintenance and inspection program at the facility.
    - Toyota will continue to implement its operations and maintenance (O&M) program as required under their 1200-Z permit.
    - KM will maintain the future bioinfiltration basin servicing Basin K1 in accordance with the DEQ-approved O&M plan. Regular reporting will be required per KM's 1200-Z permit.
4. Contaminants in stormwater that continue to exceed SLVs in spite of SCMs and stormwater management measures are not likely to result in sediment contamination in the receiving waterbody or contribute to unacceptable risk.
    - All SCMs and stormwater management measures installed now or in the near future are anticipated to control the stormwater pathway within T4 Slip 3.

The status of the T4 Slip 3 upland basins is summarized in Figure 6.

9. NEXT STEPS

The Port will continue to confirm the inactive status of the recently capped outfalls to Basins J and K2, and the recently abandoned minor outfalls in Basin D, in accordance with the requirements of the Port's MS4 permit. Performance verification of the bioinfiltration SCM in Basin K1 will be completed after construction is complete following the procedures described in the approved Operations and Maintenance Plan (Maul Foster & Alongi, 2021).

During a Site vist with DEQ in July 2012, a possible additional outfall pipe was discovered in the vicinity of the abandoned minor Basin D outfalls. This pipe will be investigated, and, if found to be active, will be capped and inspected during the wet season

Following the aforementioned investigation and the effectiveness demonstration of the Basin K1 SCM, all stormwater pathways in the T4 Slip 3 Upland Area will be controlled, and the appropriate next step will be to issue a source control decision for this Site.

10. REFERENCES

Apex, 2014. Re: Preliminary Stormwater Sub-Basin Sampling Results and Next Steps Terminal 4 Slip 1 Upland Facility Portland, Oregon 1267-12. Memorandum from Michael Pickering and Herb Clough to Kelly Madalinski. September 25.

Apex, 2018. Subject: Terminal 4 Source Control Briefing Paper. Transmittal from Kelly Madalinski to Jeff K. Schatz. August 31.

Ash Creek Associates, Inc./Newfields, 2007. Storm Water Evaluation Work Plan Terminal 4 Slip 1 and Slip3 Upland Facilities. June.

Ash Creek Associates, Inc., 2009. Storm Water Source Control Evaluation Terminal 4 Slip 1 and Slip 3 Upland Facilities. Prepared for Port of Portland. September.

Ash Creek Associates, Inc., 2011. Storm Water Source Control Completion Report Terminal 4 Slip 1 and Slip 3 Upland Facilities. Prepared for Port of Portland. September 28.

Ash Creek Associates, 2013. Re: Storm Water Sampling Results Terminal 4 Slip 1 Upland Facility Portland Oregon 1267-12. Memorandum from Michael Pickering to Kelly Madalinski. April 18.

DEQ, 2003. Remedial Action Recommendation Staff Report for Port of Portland – Terminal 4, Slip 3 Upland Multnomah County, OR. January 2003. https://www.deq.state.or.us/Webdocs/Controls/Output/PdfHandler.ashx?p=8a77ea5a-c9e2-4aa2-8462-95c7d06c5435.pdf&s=No.272%20Staff%20Report.pdf

DEQ, 2017. Guidance for Evaluating the Stormwater Pathway at Upland Sites. Cleanup Program, originally published January 2009; updated October 2010; links updated July 2017. https://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/Stormwater-Guidance.aspx

Ecology, 2005. General Use Level Designation for Pretreatment (TSS) For Hydro International's Downstream Defender. February. Updated November 2007. https://www.hydro-int.com/sites/default/files/downstreamdefenderud_11_13_07.pdf

Geosyntec Consultants and Gresham Smith and Partners, 2016. Terminal 4 Source Control Decision Support Data Summary Report for Slips 1 and 3 Upland Facilities. Final. July 11.

Geosyntec Consultants, 2018. Terminal 4 Source Control for Slips 1 and 3 Upland Facilities Soil Infiltration Testing Report. Final. September 21.

Geosyntec, 2019. Terminal 4 Slip 1 and Slip 3 Stormwater Quality Assessment Work Plan, Final. Prepared for the Port of Portland. November.

Geosyntec, 2020. Design Standard Analysis in Response to DEQ Comments on Preliminary Engineer's Report, Vegetated Infiltration Basin Designs. Terminal 4 Slips 1 and 3 Uplands, ESCI No. 2356/272. April 23.

Maul Foster & Alongi, 2021. Operation & Maintenance Plan, Kinder Morgan Port of Portland Terminal 4 Owner-Initiated Stormwater Retrofit and Treatment System. February 11.

Roux Associates, 2017. Storm Water Pollution Control Plan NPDES General Permit 1200-Z. Toyota Logistics Services, Site I.D. 113672. Revision 7, December 27, 2017.

FIGURES

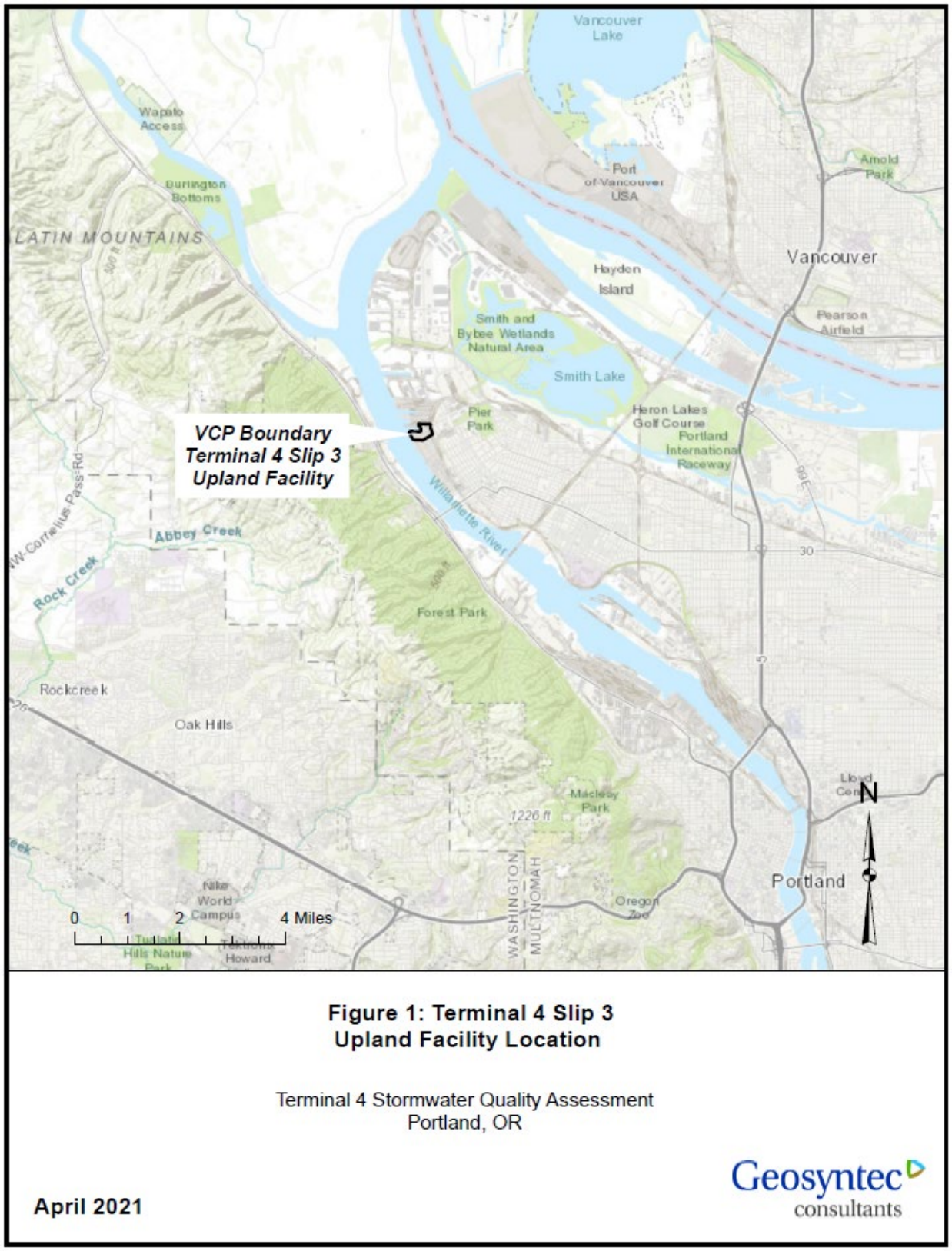

Figure 1: Terminal 4 Slip 3
Upland Facility Location

Terminal 4 Stormwater Quality Assessment
Portland, OR

April 2021

Geosyntec consultants

Figure 1: Terminal 4 Slip 3 Upland Facility Location

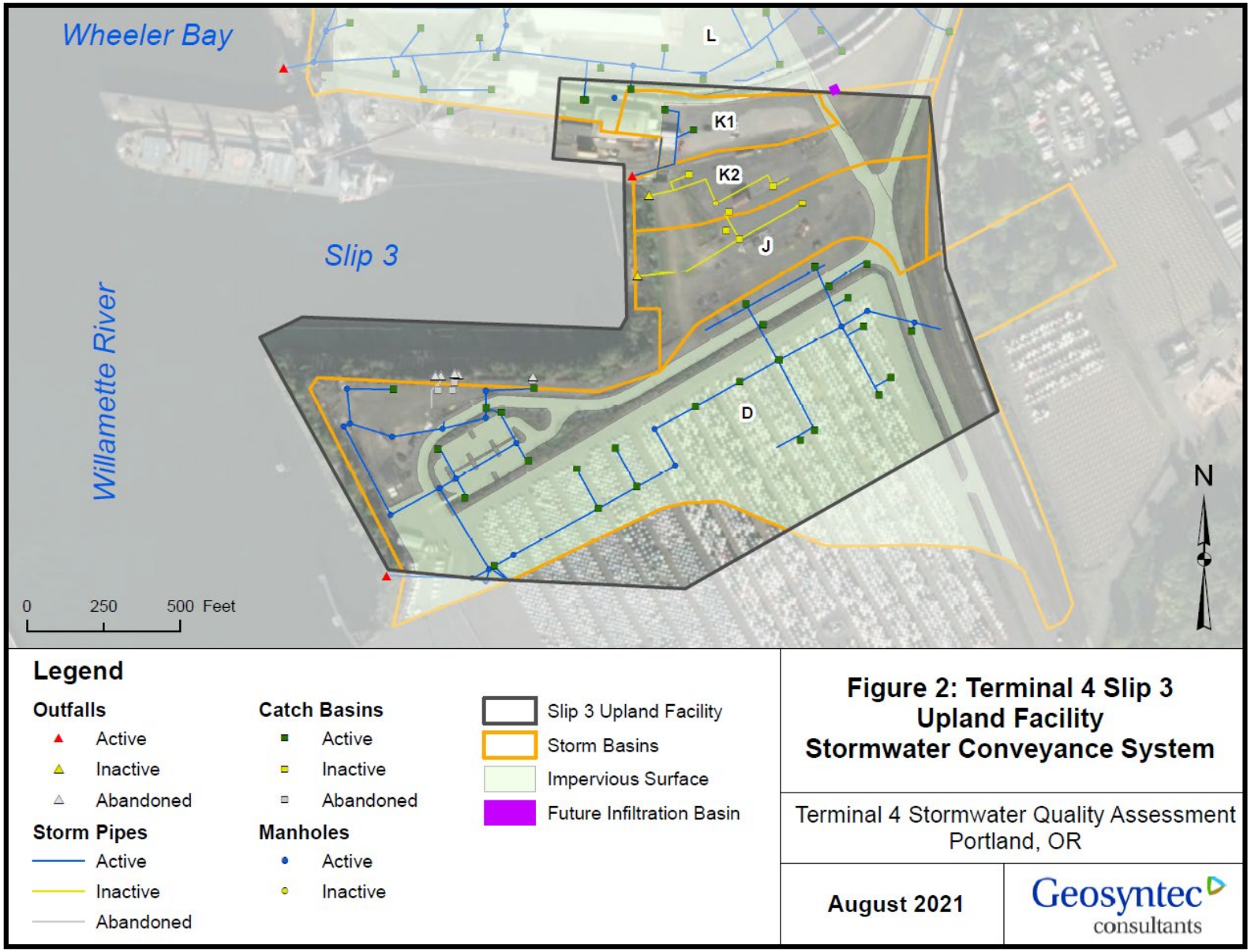

Figure 2: Terminal 4 Slip 3 Upland Facility Stormwater Conveyance System

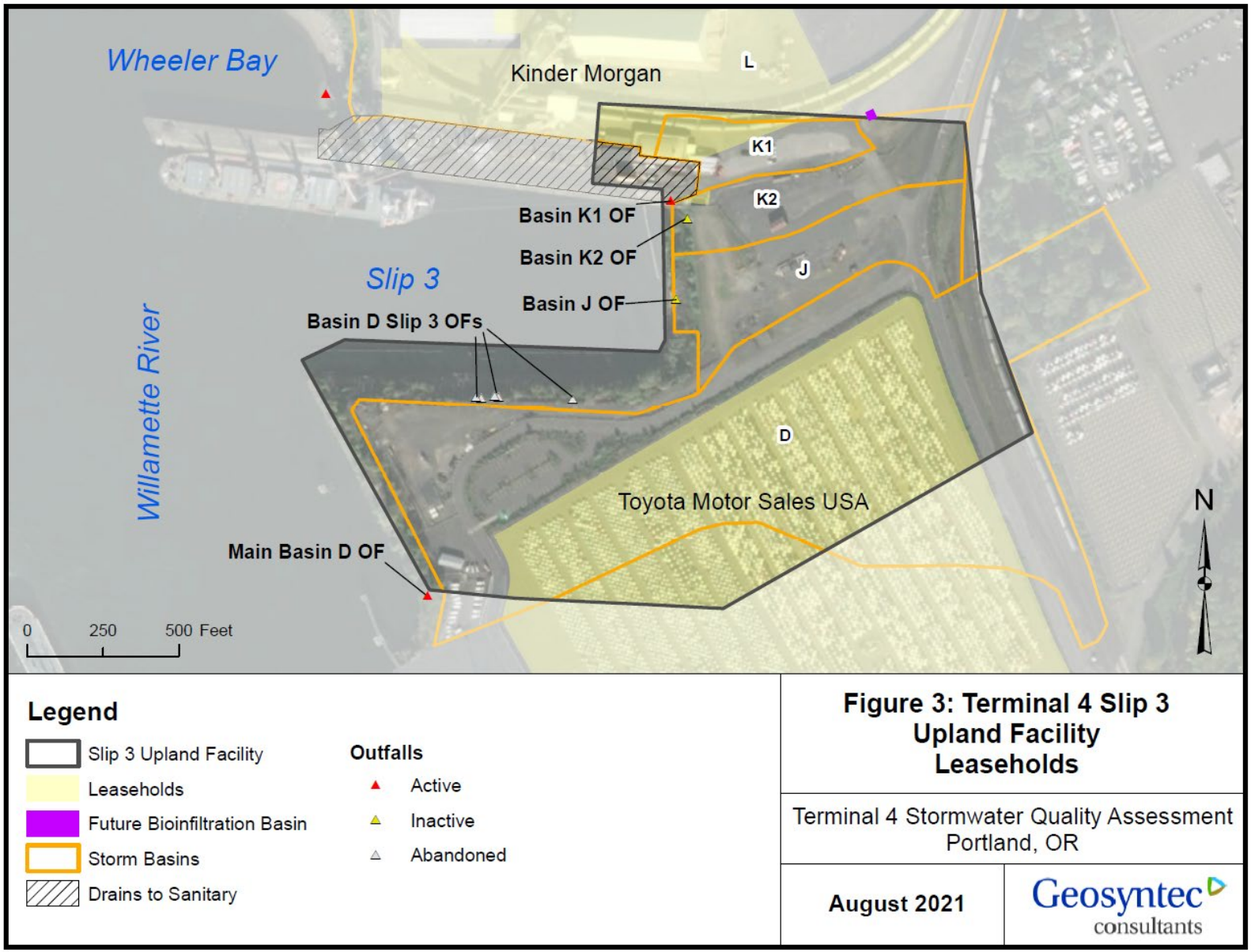

Figure 3: Terminal 4 Slip 3 Upland Facility Leaseholds

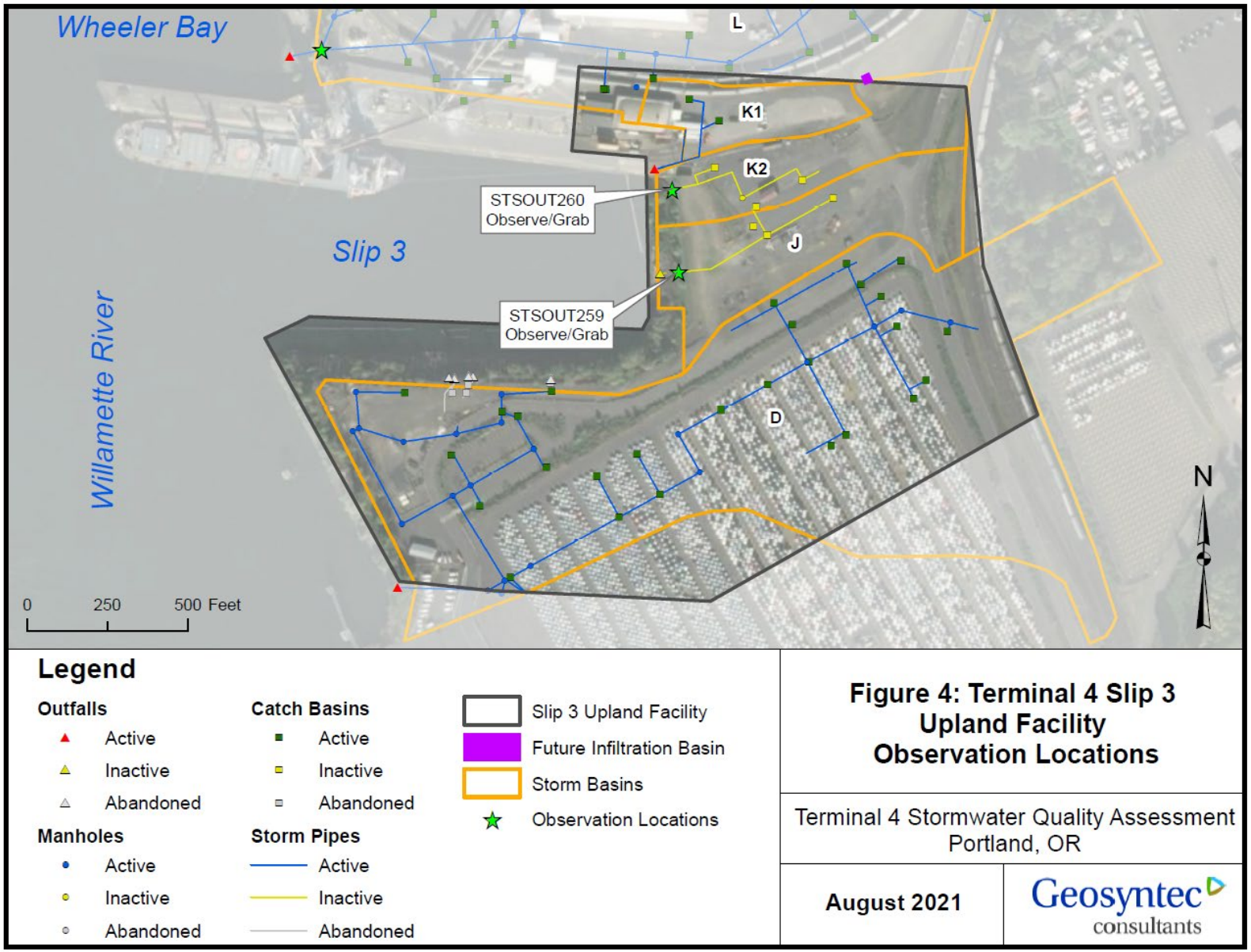

Figure 4: Terminal 4 Slip 3 Upland Faclity Observation Locations

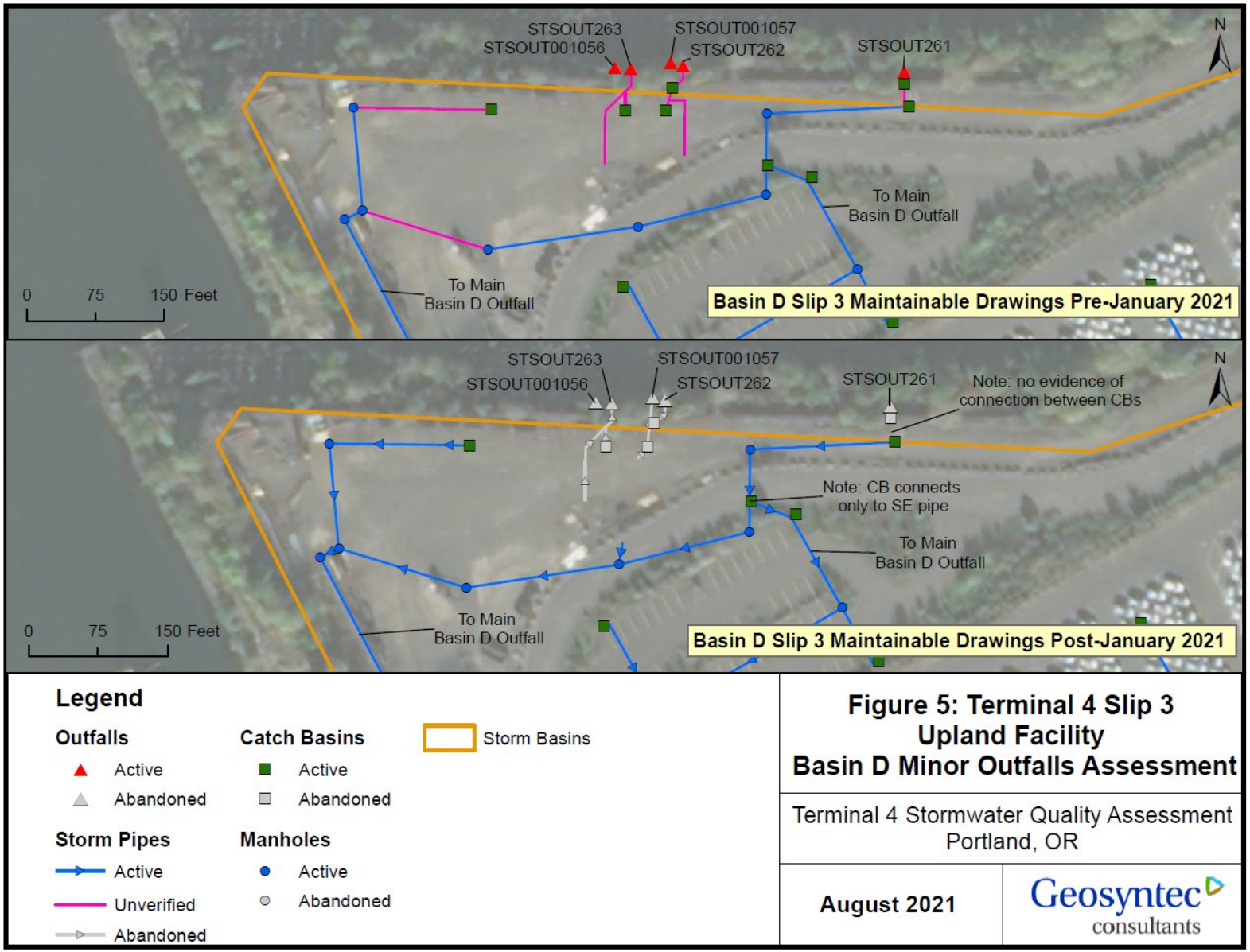

Figure 5: Terminal 4 Slip 3 Upland Facility Basin D Minor Outfalls Assessment

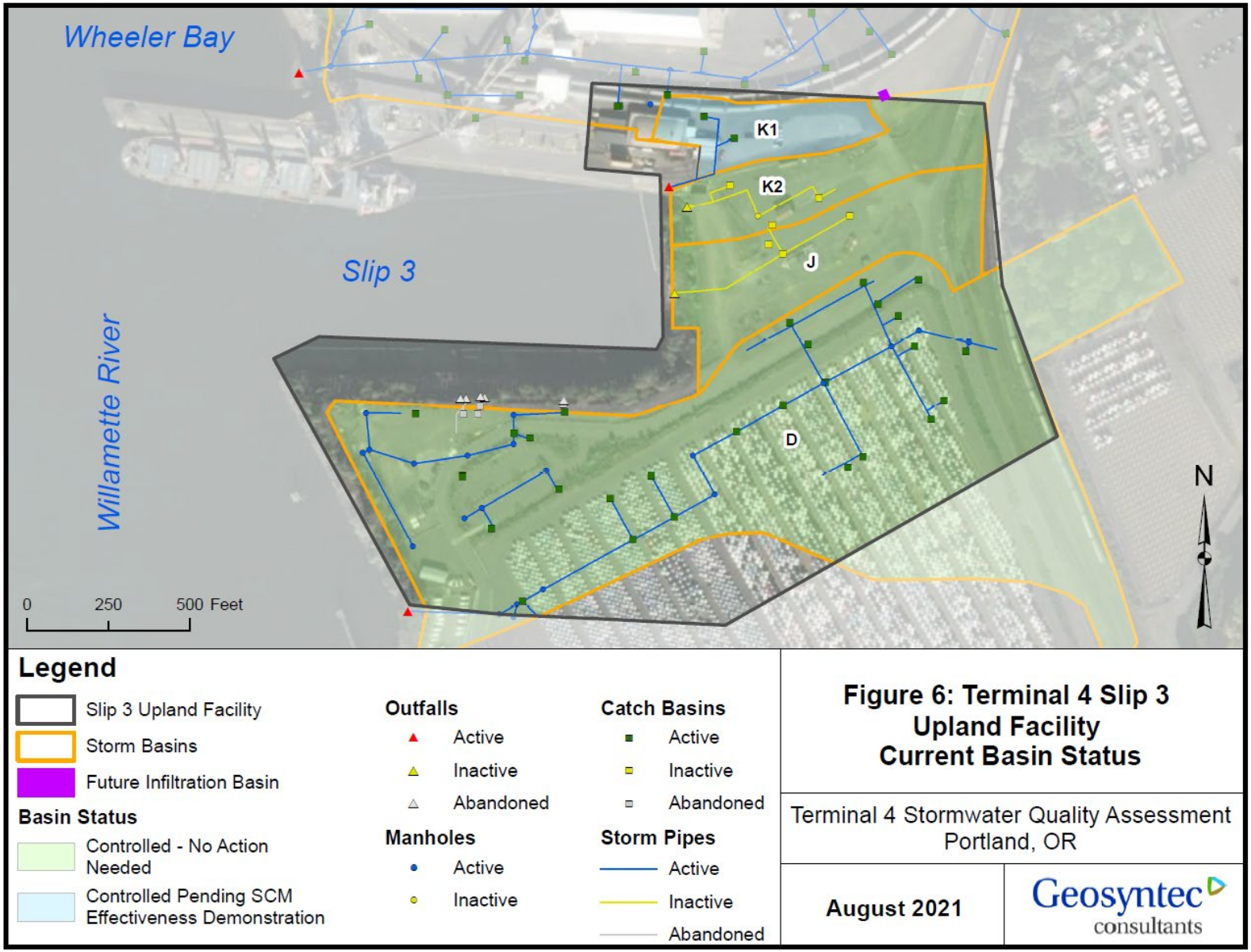

Figure 6: Terminal 4 Slip 3 Upland Facility Current Basin Status

APPENDIX A
Observation Event Hyetographs

The following figures present storm event hyetographs for the monitoring events completed for this report. Figures are presented in the format specified in Appendix C of DEQ's *Guidance for Evaluating the Stormwater Pathway at Upland Sites* (DEQ, 2017). Rainfall data is hourly data taken from the Portland HYDRA Shipyard Rain Gage (Station 82), which is the closest HYDRA rain gage to the Site. As no runoff was ever observed, the time that runoff began is not marked on the plots. Observation times are recorded as single solid lines. All observation events were during standard time, except for the October 2020 event, which was during daylight time. As such, the hyetograph for this event was converted to standard time such that all hyetographs in this appendix are shown in pacific standard time (PST).

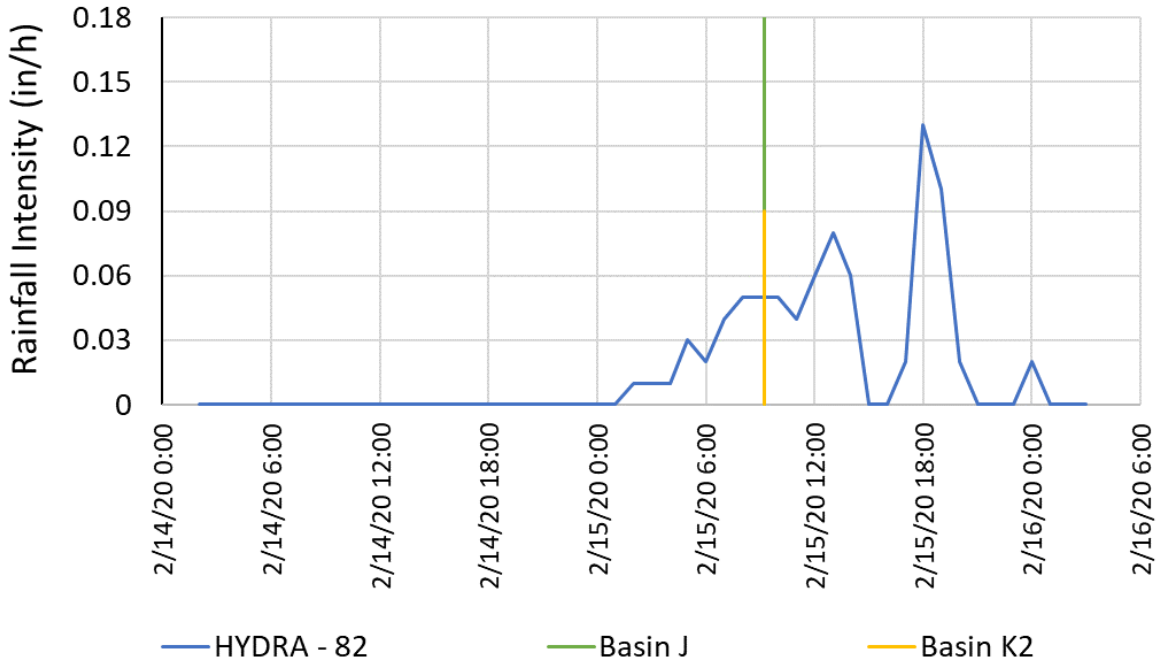

Figure A - 1: Storm Event Hyetograph and Observation Times 2-15-2020

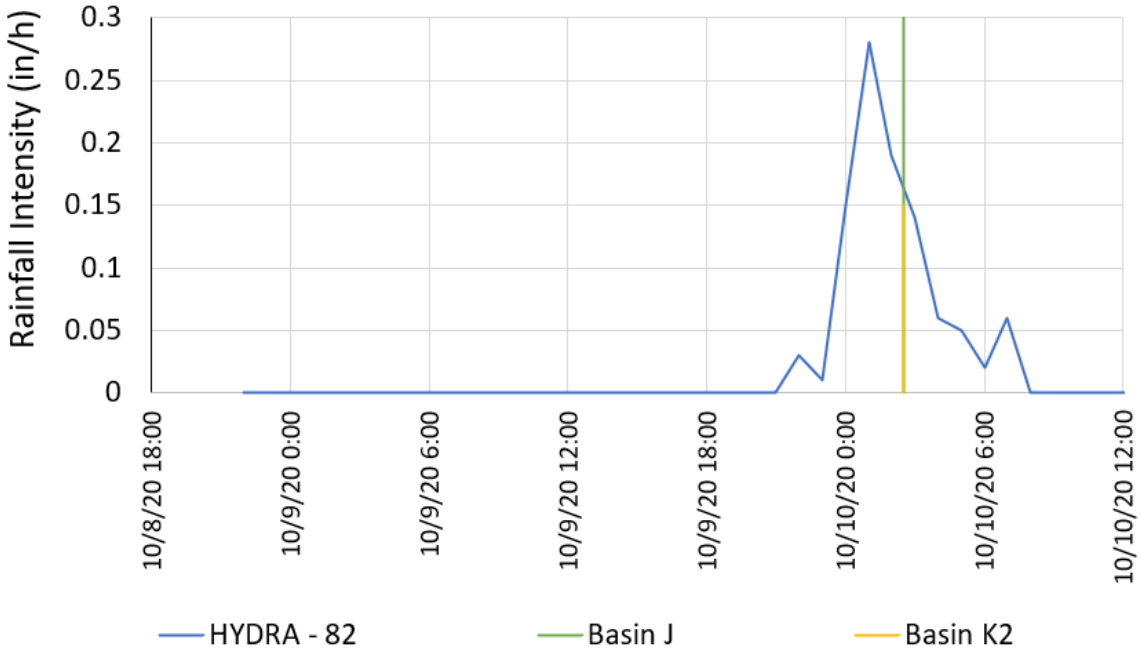

Figure A - 2: Storm Event Hyetograph and Observation Times 10-10-2020

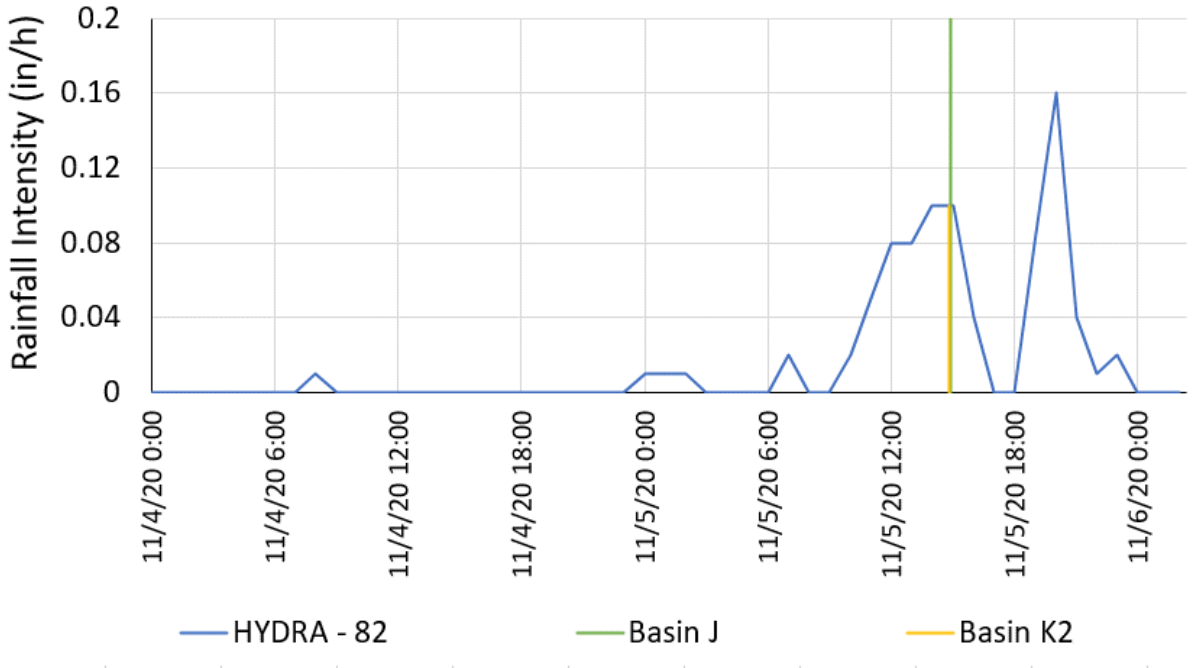

Figure A - 3: Storm Event Hyetograph and Observation Times 11-5-2020

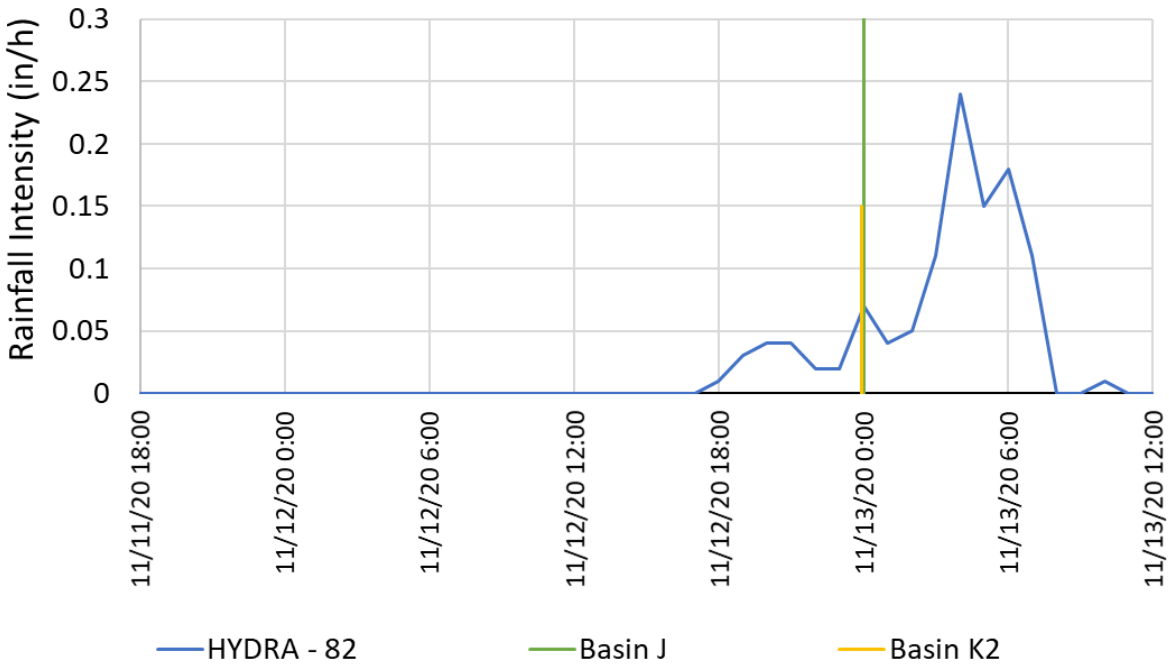

Figure A - 4: Storm Event Hyetograph and Observation Times 11-12-2020

APPENDIX B
Field Documentation

Attachment B-1
Observation Event Photo Log
(Basins J and K2)

Photo Log for 2020 Stormwater Monitoring of Terminal 4 Slip 3

Photo B-1 **Date:** 02/15/2020 **Direction:** West **Description:** Basin J observation point, facing downstream. Moisture is from rain seeping in through pipe window.	
Photo B-2 **Date:** 10/10/2020 **Direction:** West **Description:** Basin J observation point, facing downstream. Moisture is from rain seeping in through pipe window.	

Photo Log for 2020 Stormwater Monitoring of Terminal 4 Slip 3

Photo B-3 **Date:** 11/05/2020 **Direction:** North **Description:** Basin J observation point, facing upstream, and showing no flow during storm event.	
Photo B-4 **Date:** 11/12/2020 **Direction:** North **Description:** Basin J observation point, facing upstream, and showing no flow during storm event.	

Photo Log for 2020 Stormwater Monitoring of Terminal 4 Slip 3

Photo B-5 **Date:** 02/15/2020 **Direction:** East **Description:** Basin K2 outfall showing no flow during storm event.	
Photo B-6 **Date:** 10/10/2020 **Direction:** East **Description:** Basin K2 outfall showing no flow during storm event.	

Photo Log for 2020 Stormwater Monitoring of Terminal 4 Slip 3

Photo B-7 **Date:** 11/05/2020 **Direction:** East **Description:** Basin K2 outfall showing no flow during storm event.	
Photo B-8 **Date:** 11/12/2020 **Direction:** East **Description:** Basin K2 outfall showing no flow during storm event.	

Photo Log for 2020 Stormwater Monitoring of Terminal 4 Slip 3

Photo B-9 **Date:** 8/31/2021 **Direction:** Northeast **Description:** Basin J outfall cap.	
Photo B-10 **Date:** 8/31/2021 **Direction:** South **Description:** Basin K2 outfall cap.	

Attachment B-2
Observation Event Field Forms (Basins J and K2)

Basin J/K2 Field Observation Form

Date 2/15/20 Field Lead: Ariel Vij

Weather: rainy, 40° Sampling Partner: Jean Li

Basin K2

Time: 9:015 AM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J

Time: 9:15 AM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J/K2 Field Observation Form

Date 10/10/2020 Field Lead: AMM

Weather: 50-60° rain Sampling Partner: JL

Basin K2

Time: 3:36 AM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) JL No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J

Time: 3:30 AM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) JL No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J/K2 Field Observation Form

Date 11/05/2020 Field Lead: Ariel

Weather: Raining Sampling Partner: Jacle

Basin K2

Time: 2:50 PM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J

Time: 2:55 PM

Current rainfall (circle one): Mist Light (Moderate) Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No)

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J/K2 Field Observation Form

Date 11/12/2020 Field Lead: Ariel Mosbacher

Weather: light Rain Sampling Partner: Jack Lisin

Basin K2

Time: ~~12:00~~ 23:55

Current rainfall (circle one): Mist (Light) Moderate Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No) Dry

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Basin J

Time: 0:00 11/13/2020

Current rainfall (circle one): Mist (Light) Moderate Heavy Sporadic

Were pictures taken (circle one): (Yes) No

If no, why? _____

Is flow present (circle one)? Yes (No) Dry

If yes (if no, skip):

Were samples obtained (circle one)? Yes No

If no, explain: _____

What color is the discharge? _____

How turbid is the discharge? Low Moderate High

How much flow is there? Trickle Low Moderate Max

Attachment B-3
Basin D Slip 3 Outfalls Photo Log

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-1 **Date:** 01/19/2021 **Direction:** West **Description:** Pipe draining to outfall STSOUT261 prior to capping. Pipe passes through three bulkhead walls, with two steep drops in elevation.	
Photo D-2 **Date:** 01/19/2021 **Direction:** North **Description:** Outfall STSOUT262 (right) and outfall STSOUT001057 (left) prior to capping.	

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-3 **Date:** 01/19/2021 **Direction:** South **Description:** Outfall STSOUT262 prior to capping.	
Photo D-4 **Date:** 01/19/2021 **Direction:** South **Description:** Outfall STSOUT001057 prior to capping.	

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-5 **Date:** 01/19/2021 **Direction:** East **Description:** Outfall STSOUT263 (PVC pipe) and outfall STSOUT001056 (cast iron pipe) prior to capping.	
Photo D-6 **Date:** 01/19/2021 **Direction:** South **Description:** Outfall STSOUT001056 prior to capping.	

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-7 **Date:** 03/22/2021 **Direction:** West **Description:** Pipe draining to outfall STSOUT261 prior to capping. Pipe can be seen as cut and capped after passing through the second bulkhead wall.	
Photo D-8 **Date:** 03/22/2021 **Direction:** South **Description:** Close-up of location where pipe to outfall STSOUT261 was cut and capped.	

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-9 **Date:** 03/22/2021 **Direction:** South **Description:** Outfall STSOUT262 (left) and outfall STSOUT001057 (right) after capping.	
Photo D-10 **Date:** 03/22/2021 **Direction:** North **Description:** Outfall STSOUT263 (PVC pipe) and outfall STSOUT001056 (cast iron pipe) after cutting and capping.	

Photo Log for Terminal 4 Basin D Slip 3 Outfalls

Photo D-11 **Date:** 03/22/2021 **Direction:** Southeast **Description:** Close-up of outfall STSOUT263 (PVC pipe) and outfall STSOUT001056 (cast iron pipe) after capping.