Sampling and Analysis Plan
Long-Term Stormwater Treatment
North Boeing Field
Seattle, Washington

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Prepared for

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SAMPLING AND ANALYSIS PLAN
LONG-TERM STORMWATER TREATMENT

NORTH BOEING FIELD, SEATTLE, WASHINGTON

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1-1
1.1	PROJECT SITE DESCRIPTION	1-1
1.2	PROJECT BACKGROUND	1-2
1.3	COMPLIANCE MONITORING DURING STST OPERATION	1-3
1.4	SAMPLING APPROACH FOR LTST OPERATION	1-3
1.5	INTERIM GOALS FOR LTST SYSTEM OPERATION	1-5
2.0	FIELD SAMPLING PLAN	2-1
2.1	SAMPLING OBJECTIVES	2-1
2.2	SAMPLING LOCATIONS	2-1
2.3	LIFT STATION (LS431) SAMPLING	2-2
2.3.1	Sampling Frequency	2-3
2.3.2	Sampling Devices	2-3
2.3.3	Sample Collection Methods	2-5
2.3.4	Laboratory Analyses	2-6
2.3.5	Equipment Decontamination	2-7
2.4	LONG-TERM STORMWATER TREATMENT SYSTEM SAMPLING	2-7
2.4.1	Sampling Frequency	2-7
2.4.2	Sampling Devices	2-8
2.4.2.1	Whole Water	2-8
2.4.2.2	Filtered Solids	2-9
2.4.3	Sample Collection Methods	2-9
2.4.3.1	Whole Water	2-10
2.4.3.2	Filtered Solids	2-11
2.4.4	Laboratory Analyses	2-12
2.4.4.1	Whole Water	2-12
2.4.4.2	Filtered Solids	2-12
2.4.5	Equipment Decontamination	2-12
2.5	SEDIMENT TRAPS	2-13
2.5.1	Sample Collection	2-13
2.5.2	Laboratory Analysis	2-13
2.6	WEIR TANK, STORAGE TANK, AND SANDFILTER MEDIA SAMPLING	2-14
2.6.1	Sample Collection	2-15
2.6.1.1	Weir and Storage Tank Solids	2-15
2.6.1.2	Sand Filter Media	2-16
2.6.2	Laboratory Analysis	2-16
2.6.3	Equipment Decontamination	2-16
2.7	RE-ROUTED KING COUNTY STORMWATER	2-16

2.8 MEDIA BED PILOT STUDY 2-18
2.8.1 Sampling Frequency 2-18
2.8.2 Sampling Devices 2-18
2.8.3 Sample Collection Methods 2-19
2.8.4 Laboratory Analyses 2-19
2.8.5 Equipment Decontamination 2-19
2.9 SAMPLE LABELING AND HANDLING 2-20
2.9.1 Sample Identification and Labels 2-20
2.9.2 Sample Containers, Preservation, and Storage 2-20
2.9.3 Sample Packaging and Shipping 2-20
2.9.4 Sample Custody 2-21

3.0 QUALITY ASSURANCE PROJECT PLAN 3-1
3.1 QUALITY ASSURANCE OBJECTIVES 3-1
3.1.1 Decision Quality Objectives 3-1
3.1.1.1 Representativeness 3-1
3.1.1.2 Comparability 3-2
3.1.1.3 Completeness 3-2
3.2 MEASUREMENT QUALITY OBJECTIVES 3-2
3.2.1 Precision 3-2
3.2.2 Accuracy 3-3
3.2.3 Bias 3-3
3.2.4 Sensitivity 3-3
3.3 SPECIAL TRAINING/CERTIFICATION 3-4
3.3.1 Documents and Records 3-5
3.3.2 Document Distribution 3-5
3.3.3 Field Documentation 3-5
3.3.4 Analytical Data Records 3-6
3.3.5 Storage 3-6
3.4 DATA GENERATION AND ACQUISITION 3-6
3.4.1 Sampling Process Design 3-6
3.4.2 Sampling Methods 3-7
3.4.3 Sample Handling and Custody 3-7
3.4.4 Analytical Methods 3-7
3.4.5 Quality Control 3-8
3.4.5.1 Laboratory Control Samples 3-8
3.4.5.2 Laboratory Duplicates 3-8
3.4.5.3 Blind Field Duplicate 3-8
3.4.5.4 Field Equipment Rinsate Blanks 3-8
3.4.5.5 Laboratory Matrix Spike 3-9
3.4.5.6 Laboratory Matrix Spike Duplicate 3-9
3.4.5.7 Laboratory Method Blanks 3-9
3.4.6 Instrument/Equipment/Consumables 3-9
3.4.7 Data Management 3-9
3.5 ASSESSMENT AND OVERSIGHT 3-10
3.6 DATA VALIDATION AND USABILITY 3-11

4.0 DATA ANALYSIS AND REPORTING 4-1
4.1 DATA ANALYSIS 4-1
4.1.1 Calculation of the Annual Average Concentration of PCBs in Stormwater 4-1
4.1.2 Validation of Non-Detect Assumption 4-2
4.1.3 Total Annual Discharge 4-2
4.2 REPORTING 4-2
4.2.1 Monthly Progress Report 4-2
4.2.2 Media Bed Pilot Study Summary Report 4-4
4.2.3 Annual LTST Performance Evaluation Report 4-5

5.0 REFERENCES 5-1

FIGURES

Figure	Title
1	Vicinity Map
2	Schematic Diagram of LTST System Components
3	STST Sampling Locations and Pre-LTST Storm Drain Configuration
4	Whole Water PCB Concentrations vs. Precipitation
5	Filtered Solids PCB Concentrations vs. Precipitation
6	Updated Storm Drain System and LTST Sampling Locations
7	LTST Sampling Locations
8	Schematic - Media Bed Pilot Study

TABLES

Table	Title
1	LS431 and MH108 Stormwater Analytical Results
2	Long-Term Removal Action Sampling and Analysis Summary
3	Analytical Methods and Target Reporting Limits
4	Sample Containers, Preservatives, and Holding Time Requirements
5	Project Schedule 2011-2012
6	Example Sampling Program Summary

LIST OF ABBREVIATIONS AND ACRONYMS

µg/L	Micrograms per Liter
AKART	All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment
ARI	Analytical Resources, Inc.
ASAOC	Administrative Settlement Agreement and Order on Consent
Boeing	The Boeing Company
C	Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESF	Chitosan-Enhanced Sand Filtration
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CPR	Cardiopulmonary Resuscitation
CSV	Comma Separated Value
DI	Deionized
DQOs	Data Quality Objectives
EAA	Early Action Area
Ecology	Washington State Department of Ecology
EDD	Electronic Data Deliverable
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
FWAAC	Flow-Weighted Annual Average Concentration
gpm	Gallons per Minute
GTSP	Georgetown Steam Plant
HASP	Health and Safety Plan
KBFI	Seattle Boeing Field-King County International Airport Rain Gauge
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
LSIV	Lift Station Inlet Vault
LTST	Long-Term Stormwater Treatment
MBPS	Media Bed Pilot Study
mL	Milliliter
MQOs	Measurement Quality Objectives
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NBF	North Boeing Field
NELAC	National Environmental Lab Accreditation Conference
NOAA	National Oceanic and Atmospheric Agency
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PAHs	Polycylic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
ppb	Parts per Billion
PSD	Particle Size Distribution
PSDDA	Puget Sound Dredged Disposal Analysis
PSEP	Puget Sound Estuary Program
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
QA	Quality Assurance

LIST OF ABBREVIATIONS AND ACRONYMS
(Continued)

QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SAIC	Science Applications International Corporation
SIM	Selected Ion Monitoring
SM	Standard Method
STST	Short-Term Stormwater Treatment
SVOCs	Semivolatile Organic Compounds
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TSS	Total Suspended Solids
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

1.0 INTRODUCTION

This document presents a sampling and analysis plan (SAP) for the operation and maintenance of the long-term stormwater treatment (LTST) system installed as part of a removal action conducted by The Boeing Company (Boeing) at the North Boeing Field (NBF) site in Seattle, Washington (Figure 1). The purpose of the removal action is to control contaminant discharges from the NBF site to the Slip 4 Early Action Area (EAA) of the Lower Duwamish Waterway (LDW) Superfund Site. The removal action is being conducted under an Administrative Settlement Agreement and Order on Consent (ASAOC) for Removal Action [Docket No. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-10-2010-0242] between Boeing and the U.S. Environmental Protection Agency (EPA). The ASAOC requires that a SAP be prepared for collection and analysis of stormwater compliance monitoring samples and any other samples related to the removal action; this SAP was initially submitted as an appendix to the *100% Design Report, Long-Term Stormwater Treatment* (Landau Associates 2011a). This revised SAP was prepared to reflect as-built conditions of the LTST system and to incorporate changes to sampling and analysis procedures described in the January 10, 2012 memorandum to EPA from the NBF Stormwater Expert Panel (Panel), jointly with Geosyntec Consultants (Jones et al. 2012).

As defined in the *Action Memorandum for the Time-Critical Removal Action at North Boeing Field*, "stormwater" shall mean all liquids, including any particles dissolved therein, in the form of base flow, stormwater runoff, snow melt runoff, and surface runoff and drainage, as well as all solids that enter the storm drainage system. "System," when used in the context of storm drainage, shall mean the combination of all manholes, catch basins, pipes, and other drainage devices and conveyances designed, constructed, and used for the purpose of carrying stormwater from NBF to Slip 4 of the LDW, and the drainage basin associated with these devices and conveyances (EPA 2010).

This SAP is comprised of a Field Sampling Plan (FSP), a project-specific Quality Assurance Project Plan (QAPP), and a section on Data Analysis and Reporting. The FSP (Section 2.0) identifies the sampling objectives and describes the sampling and analysis procedures and methodologies to achieve the sampling objectives. The QAPP (Section 3.0) identifies data quality objectives (DQOs) for the project and describes the quality assurance (QA) and quality control (QC) protocols necessary to achieve the DQOs. The Data Analysis and Reporting Section (4.0) provides information on how the data generated by the sampling plan will be used.

1.1 PROJECT SITE DESCRIPTION

NBF is located east of East Marginal Way South, adjacent to the King County International Airport (KCIA) and the city of Seattle Georgetown Steam Plant (GTSP). The approximate street address is 7370 East Marginal Way South, Seattle, Washington. NBF is approximately 150 ft from the head of

Slip 4, which is an EAA at approximately River Mile 2.8 on the Duwamish Waterway within the LDW Superfund Site. The location of the site is shown on Figure 1.

A schematic diagram illustrating the site storm drain system, the components of the LTST system, and water quality sampling locations is provided as Figure 2. Greater detail on the LTST system components and design can be found in the *Completion Report* (Landau Associates 2012) and in Section 1.4 of this SAP.

1.2 PROJECT BACKGROUND

In 2001, the LDW was placed on the National Priorities List (NPL) pursuant to CERCLA. In 2003, the sediments and portions of the bank in Slip 4 were identified as an EAA due to the presence of polychlorinated biphenyls (PCBs) in the sediment. Prior to cleanup of Slip 4, the Washington State Department of Ecology (Ecology) determined that ongoing sources of PCBs discharges to Slip 4 should be controlled to reduce the likelihood of recontamination of the sediment following cleanup. Previous investigations at the NBF site identified the presence of PCBs in solids in manholes, catch basins, sediment traps, and water in the NBF storm drain system, which discharges to Slip 4 via the KCIA Storm Drain #3/PS44 Emergency Overflow (SD #3), as indicated on Figures 2 and 3.

As reported by Science Applications International Corporation (SAIC 2010a,b,c; SAIC 2009), the majority of PCBs discharging from NBF to Slip 4 via the NBF storm drain system are from the north lateral portion of the storm drain. Under the ASAOC, Boeing installed a short-term stormwater treatment (STST) facility to remove PCBs from stormwater from the north lateral of the NBF storm drain system prior to discharge to Slip 4. The STST facility, consisting of a chitosan-enhanced sand filtration (CESF) system that removed total suspended solids (TSS) and associated PCBs from stormwater, was placed into continuous operation on September 15, 2010 and operated under the oversight and direction of EPA until the LTST facility was installed and operating. The STST CESF system was initially designed to pump and treat 485 gallons per minute (gpm) and was later operated at an increased flow rate of approximately 540 gpm. During operation of the STST facility, samples of the storm drain system solids and stormwater were collected to monitor compliance with the interim goals established by EPA for the STST facility, to evaluate performance of the STST facility, and to support design of the LTST facility.

The STST facility demonstrated that CESF was very effective at reducing the mass of TSS and PCBs in stormwater. Therefore, the LTST facility was designed around a similar CESF system, although significantly larger in footprint and capacity. Greater detail on the design of the LTST facility can be found in the *Completion Report* (Landau Associates 2012) and in Section 1.4 below. Under the oversight and direction of EPA, the LTST facility was installed, and operation of the LTST CESF system officially began on October 28, 2011.

1.3 COMPLIANCE MONITORING DURING STST OPERATION

Site-wide monitoring performed under the STST Removal Action Work Plan (Landau Associates 2011b) consisted of weather forecast monitoring in order to target qualifying storm events and base-flow events, and collecting samples at multiple locations at the site when qualifying conditions were met. Sampling locations were at Lift Station 431 (LS431) and at Manhole 108 (MH108). These sampling locations, as well as the former location of the STST facility, are shown on Figure 3.

For sampling at LS431 and MH108, a qualifying storm event was defined as "a 24-hour period with 0.15 inch or more of rain over a period of at least 5 hours, preceded by at least 24 hours of no greater than a trace amount (0.04 inch) of precipitation" (Landau Associates 2011b). EPA later approved reduction of the amount of rainfall required to 0.10 inch and reduction of the antecedent dry period to at least 12 hours. In practice, sampling events under so strictly defined limits proved difficult. Many qualifying storms failed to produce sufficient rainfall, and many storms that would have qualified were not predicted. In addition, some samples from qualifying storms were not usable due to a large difference in the predicted compared to the actual amount of precipitation. Flow-weighted whole-water composite sampling requires predicting a volume interval (based on precipitation forecasts) on which to collect aliquots. When predicted flow does not match actual flow, the whole water sample carboy may be filled too early or the sampler may not take enough aliquots during the prescribed time period to have enough water for analysis.

Base-flow events were defined as two or more consecutive days of less than trace (0.04 inch) precipitation, preceded by at least 12 hours of less than trace (0.04 inch) precipitation. These events were also difficult to predict. Some events were underway, only to be disqualified by unexpected rainfall.

PCBs data for storm and base-flow events at LS431 and MH108 from November 2010 through March 2011 are presented in Table 1 and plotted against precipitation during the sampling period on Figure 4 (whole water) and Figure 5 (filtered solids). The data analysis presented was completed as part of the *100% Design Report* (Landau Associates 2011a); more sampling events were conducted by SAIC after March 2011 (SAIC 2011), but data from those events are not included in this revised SAP. The data do not show a correlation between precipitation and concentration of PCBs in whole water at either LS431 or MH108. The data also do not show a correlation between precipitation and concentration of PCBs in filtered solids at MH108, although there is a slight positive correlation for filtered solids at LS431.

1.4 SAMPLING APPROACH FOR LTST OPERATION

Targeting specific precipitation conditions for sampling as was done during STST operation may not give representative data on all discharge to Slip 4; it instead gives representative data for those specific conditions that are targeted. Based on the results from site-wide monitoring during STST system

operation, other sampling approaches were investigated. The main objective of compliance monitoring during LTST operation is to evaluate compliance with the interim goals (Section 1.5) for all discharge. To collect representative data for discharge to Slip 4 during all conditions, routine monthly sampling during LTST operation will not target specific 24-hour storm events or base-flow events. Instead, flow-weighted composite water sampling and concurrent filtered solids sampling over multiple days will be implemented on a pre-determined monthly interval, regardless of precipitation conditions. This will result in sampling during an array of precipitation conditions, will make sampling more straightforward to coordinate and perform, and will result in samples that are representative of overall stormwater discharge to Slip 4.

However, there is a potential for all scheduled monthly sampling events to coincide with relatively dry periods, and it is possible sampling may never take place during bypass of the LTST system (from larger or more intense precipitation events). For reference, a brief description of LTST system design and operation is presented here. The updated NBF storm drain system is shown on Figure 6. The LTST system includes a CESF system for removal of TSS and associated PCBs from stormwater, which preferentially treats a design flow rate of 500 gpm from a portion of the North Lateral pumped from MH130A directly to the LTST system. Stormwater from other laterals is routed to the Lift Station Inlet Vault (LSIV). The LSIV was sometimes referred to in prior LTST documents as OWS421, based on Boeing's identification number. The LSIV pump transfers water from the LSIV to the LTST system at a variable rate (up to the maximum design flow rate of 1,500 gpm), dependent on the flow rate from MH130A, to make up the available system capacity. The LTST system operates at full capacity (1,500 gpm design flow rate) whenever sufficient stormwater is present. Base flow has historically been less than 1,500 gpm, so the LTST system is expected to treat all dry weather base flows from MH130A and the LSIV. During larger or more intense precipitation events, the water level in the LSIV will rise, as inflow to the LSIV increases above the LTST capacity flow rate. If the level is raised enough, the King County pumps in lift station LS431 will pump water from the LSIV into SD #3 with flow onto Slip 4, bypassing the CESF system.

As the LTST facility is treating all dry weather base flow, with bypass of a portion of storm flow from onsite and offsite, it is important to include monitoring during periods of heavier rainfall and LTST system bypass, which may include greater concentrations of PCBs. Therefore, storm events will be targeted over the course of the sampling period in addition to the routine monthly events. Five of these events will be sampled between the start of LTST operation and October 31, 2012, provided there are enough storm events predicted (it may be the case that a storm that was not forecast unexpectedly materializes) and actual rainfall meets the requirements (adequate rainfall may be forecast, but not materialize). Strong effort will be made to collect samples during events that meet the precipitation requirements. The storm events that will be targeted will have a predicted rainfall of 0.5 inches or more

in a 24-hour period. These events will fulfill the requirements for storm event samples if rainfall during the sampling event (to be 24 hours or less) is greater than or equal to 0.5 inches and if the LTST system is bypassed at any time during the sampling event. Lower rainfall events (less than 0.5 inches) may be counted as fulfilling this requirement if there are insufficient numbers of large storm events to meet this five storm event sampling specification.

Consistent with the memorandum to EPA (Jones et al. 2012), the LTST sampling approach will not include sediment or sediment deposition monitoring in Slip 4, as there are a number of non-Boeing discharges to Slip 4 and it is not possible to attribute any PCB concentrations that may be found in the receiving waters or sediments directly to a specific discharge. Also, a separate program, the Slip 4 ASAOC remedial measure performance monitoring program, will be tracking Slip 4 sediment quality over time.

1.5 INTERIM GOALS FOR LTST SYSTEM OPERATION

Interim goals for the LTST facility were set by EPA in the Action Memorandum (EPA 2010) and are as follows:

- Water discharged to Slip 4 must be below the Aquatic Life – Marine/Chronic water quality standard of 0.030 micrograms per liter (µg/L) total PCBs. Boeing conducted (AMEC Geomatrix, Inc. 2011) and EPA approved (EPA 2011a) a salinity study in Slip 4 that demonstrates that use of the Marine/Chronic water quality standard for total PCBs is appropriate.
- In-line storm drain solids discharged to Slip 4 must be below 100 parts per billion (ppb) dry weight total PCBs. This interim goal shall be used as a point of departure in considering whether the long-term interim goal for in-line storm drain solids discharged to Slip 4 should be modified in accordance with the all known, available, and reasonable methods of prevention, control, and treatment (AKART).

An analysis of AKART was prepared to present the evaluation of stormwater treatment alternatives. In that AKART Analysis Report (Geosyntec 2011), it was described how the EPA interim goal for solids (100 ppb dry weight total PCBs) was not a reasonable or technically achievable goal. Following additional discussions with EPA on the interim goal for solids, Boeing brought the Stormwater Panel into the project to evaluate an alternative to the interim goal for solids that would be protective of Slip 4 sediment from recontamination. The expert Panel members consist of Jon Jones, P.E., of Wright Water Engineers; Dr. Michael Stenstrom from UCLA; and Dr. Robert Pitt from the University of Alabama.

The Panel, jointly with Geosyntec Consultants, conducted an analysis of the methodology used to establish EPA's solids interim goal of 100 ppb for PCBs identified in the ASAOC. As an alternative to the PCB solids interim goal and the SAIC sediment recontamination model, the Panel prepared a memorandum (Jones et al. 2011) to EPA that recommended:

1. A new mass load-based IG be considered for use in protecting Slip 4 sediments from recontamination due to NBF storm drain discharges
2. This mass load-based IG be developed through a static mass balance analysis that will be provided in an ensuing technical memorandum, and will consider PCB and solids mass loading to Slip 4 (following LTST CESF treatment at the lift station), particle settling distances in Slip 4, and PCB mixing in the top 10 cm of the sand cap (post-sediment dredging interim measure).

A seven-step approach was developed by the Panel to estimate a site-specific mass load-based IG that the Panel believes is protective of Slip 4 sediments from PCB recontamination due to storm drain discharges. The approach included:

1. The anticipated post-LTST loading of solids and associated PCBs from NBF to Slip 4 was estimated based on existing available monitoring data and calibrated hydrologic model output, assuming steady-state (average) conditions for NBF storm drain base flows and storm flows (both treated and bypassed).
2. The effect of varying settling distances in the Slip for different sized particles can be accounted for by inclusion of percentage (by mass) of solids settling in Slip 4 as a parameter.
3. A mass balance of PCB solids depositing in Slip 4 over the course of a year fully mixed in 10 cm of clean sand cap (to protect the benthos) was computed.
4. A time series plot of average surface sediment PCB concentrations in Slip 4 over a 50-year period was developed.
5. Computed Slip 4 average surface sediment PCB concentrations were then compared with the Washington Sediment Management Standards sediment quality standards (SQS). The SQS is 12 mg/kg organic carbon normalized; the dry weight criteria considered by Ecology to be equivalent to the SQS is 130 µg/kg total PCBs (1.08% total organic carbon). Using the time series plots, the number of years until the 130 µg/kg dry weight sediment criteria would be exceeded was determined for a number of different scenarios.
6. Use of the time series plots and estimates of the mass of solids that would exit Slip 4 based on particle size to establish an allowable average annual total filterable PCBs mass load (grams per year), such that State dry weight criteria is not exceeded within 50 years.
7. In order to avoid exceedances of this average annual PCB load during above-average rainfall years, this load was divided by average annual runoff volume to compute a mass load-based allowable concentration (µg/L total filterable PCBs). For compliance assessment purposes, this interim goal can be compared annually with a volume-weighted average of the lift station discharge concentrations.

The resulting recommended loading-based yearly average interim goal, or alternative interim goal, for total PCBs in water was based on the calculated "maximum allowable loading rate," or the average annual PCB mass that is expected to settle in the Slip (13.8 g) that is conservatively protective of the State sediment standard over a 50-year period (Jones et al. 2011). Applying a factor to account for the estimated 43% of discharged solids that is expected to exit the Slip, the maximum allowable PCB load that may be discharged into the Slip is 24 grams per year. The recommended loading-based yearly average alternative interim goal was then determined by dividing by the estimated average annual runoff volume at the lift station, or 1,080 acre-feet per year. EPA approved the alternate solids goal in a letter

dated December 15, 2011 (EPA 2011b). The result was a recommendation for monitoring an alternative interim goal presented in a subsequent memorandum, Amended Monitoring Approach Recommendations for North Boeing Field Long-Term Stormwater Treatment System (Jones et. al. 2012), as follows:

- A flow-weighted average annual concentration (FWAAC) for total PCBs in water of 0.018 µg/L is expected to prevent recontamination of Slip 4 sediments.

This solids loading-based interim goal is intended to accompany the water interim goal, or the 0.03 µg/L total PCBs Washington State marine chronic water quality criterion, which is for protection of aquatic life. It was recommended that a full year of monitoring be performed to collect lift station sample results for both wet and dry weather seasons in order to evaluate the sampling methodology, the assumptions used to develop the load-based interim goal and to compare the average annual value to the recommended load-based interim goal. EPA approved the amended monitoring approach for the alternative solids interim goal in a letter dated January 19, 2012 (EPA 2012).

2.0 FIELD SAMPLING PLAN

This FSP presents the sampling objectives related to the LTST removal action being conducted at the site; sample locations; and the sample collection methodologies, frequency, and laboratory analyses. Boeing is undergoing a transition in laboratory contracting from Analytical Resources, Inc. (ARI) located in Tukwila, Washington, to Lancaster Laboratories (Lancaster) located in Lancaster, Pennsylvania, both of which are EPA-approved and Ecology-certified labs. Laboratory analysis on samples as described in this SAP will be conducted by either ARI or Lancaster. ARI is currently performing all laboratory analysis as described in this SAP; Boeing will notify EPA if the laboratory work is transitioned from ARI to Lancaster. Selected split sampling will be conducted as part of the analysis of the laboratory transition.

2.1 SAMPLING OBJECTIVES

The objectives of the field sampling are to gather data to accomplish the following:

- Monitor stormwater discharges for comparison with the LTST interim goals (see Section 1.5)
- Evaluate the design assumptions for and performance of the LTST facility
- Confirm that the data used and the assumptions the Panel made to arrive at the alternate solids interim goal (Jones et al. 2011) are reasonably conservative and descriptive of site conditions, including the appropriateness of treating non-detect PCBs concentrations in water as zero when calculating the annual average PCB concentration
- Accurately characterize the offsite stream from the King County North Lateral re-route in order to evaluate this load contribution to the LSIV and the LTST system
- Evaluate individual lateral storm drain inputs, and monitor the effects of future source control actions
- Characterize solids for disposal.
- Evaluate the performance of the Media Bed Pilot Study (MBPS).

2.2 SAMPLING LOCATIONS

To meet the sampling objectives identified in Section 2.1, stormwater and solids samples will be collected from the NBF storm drain system at the following locations:

- **Lift Station (LS431) – Compliance Monitoring Point**. As discussed in the main text and in previous reports (Landau Associates 2011a), the point of compliance for the LTST interim goals (described in Section 1.5) is identified as just downstream of the King County lift station pumps. This point is also downstream of the LTST system effluent discharge. Compliance monitoring at this location will consist of collecting flow-weighted whole water samples for laboratory analysis, and comparing data to the interim goal for PCBs in water. In addition, continuous flow monitoring will take place at LS431, which will be used to quantify the annual amount of stormwater discharged, as well as to apportion flow volumes to various categories (e.g., CESF-treated storm flow vs. untreated bypass storm flow). This information is necessary to calculate the annual average for PCBs in water (alternate solids interim goal).

- **LTST System Influent and Effluent**. To monitor the performance of the LTST facility, whole water samples of the treatment facility influent and effluent, and filtered solids samples from the treatment facility influent and effluent, will be collected for laboratory analysis. The influent to the LTST facility from MH130A (the North Lateral) will be sampled independently from the influent to the LTST facility from the LSIV (all other laterals). When bypass of the LTST CESF system occurs, stormwater from LSIV is what is bypassed by the King County pumps. Collecting LSIV samples will provide characterization of bypass stormwater. Data from these sampling locations, shown on Figure 7, will also be used to calculate the annual average concentration of PCBs in water, and to determine the appropriateness of using zero for non-detect results in that calculation.
- **LTST Weir Tanks, Storage Tanks, and Sand Filters.** Samples will be collected of solids retained in the inlet weir and backflush settling tanks (both approximately 18,000-gallon capacity tanks) and storage tanks (each approximately 21,000-gallon capacity), as needed, to determine appropriate disposal options for the solids. The thickness of the solids in each tank will be checked monthly. If the average thickness of accumulated solids is above the trigger levels described in Section 2.6, a composite sample of the solids will be collected to allow for proper waste characterization and disposal. Composite samples of sand filter media will be collected for waste characterization prior to disposal as described in Section 2.6.
- **Sediment Traps.** To continue to evaluate individual lateral storm drain inputs, Boeing will continue the sediment trap monitoring program that began in 2005. This will consist of collecting solids from sediment traps at locations SL4-T1, SL4-T2, SL4-T3, SL4-T4, SL4-T5, SL4-T4A, and SL4-T5A(2). Since the King County water was re-routed from the North Lateral, the previous location of SL4-T5A in MH178 will now be the new wet well and will be renamed SL4-T5A(2) (Figure 6). It is expected that the city of Seattle will continue to monitor three other sediment traps outside of the NBF property boundary (SL4-T1A, SL4-T2A and SL4-T3A), two of which (SL4-T2A and SL4-T3A) are located on storm drain lines entering the NBF site.
- **Re-routed Storm Drain Pipe from King County.** In order to determine if the re-routed stormwater from King County is contributing to an inability of the LTST system to meet the EPA interim goals, flow-weighted water samples will be taken from one of the new manholes along the King County bypass re-route (shown as KCBYP on Figure 6, just west of the 3-365 building), and flow rate monitoring will be performed at the new wet well [shown as SL4 T5A(2) on Figure 6].
- **MBPS.** To evaluate the performance of the MBPS, whole water grab samples will be collected from the system influent and effluents for laboratory analysis.

The updated storm drain system (including improvements), sampling locations LS431 and KCBYP, sediment trap locations, and the MBPS location are shown on Figure 6. Figure 7 shows a more close-up plan view of the LTST system and the locations of the water sample ports and filtered solids housings for the LTST system influent (both MH130A and LSIV) and effluent.

2.3 LIFT STATION (LS431) SAMPLING

Sampling at LS431 will consist of collecting flow-weighted composite whole water samples from stormwater at the monitoring point of compliance (LS431 discharge outlet structure). This section

describes the sampling devices, sample collection methods, frequency of sample collection, and laboratory analyses.

2.3.1 SAMPLING FREQUENCY

To evaluate compliance with the LTST facility goals, stormwater and solids samples will initially be collected monthly from LS431 for one year starting November 2011. These twelve sampling events will take place over multiple days in order to obtain representative samples of water discharged to Slip 4 during a wide variety of precipitation conditions. Setup will take place and sampling will commence on the first Monday of the month. In order to collect composite samples over a time period that will include a variety of stormwater flow conditions, volume intervals for flow-weighted whole water sampling will be calculated based on weather forecasts for the period starting Monday and continuing through the following Thursday, a 3-day period. Actual precipitation will vary from the predicted amount used to calculate the volume interval, and some weeks sample collection may occur before Thursday due to earlier than anticipated filling of the 5-gallon glass carboy. Sample collection may also occur after Thursday due to drier than anticipated conditions. If enough water has been collected to run the required analysis, sample collection will occur on Friday in order to avoid after-hours laboratory coordination. Samples will not be collected earlier than the Thursday following setup, unless the sample carboy was filled prior to that time due to heavier than expected stormwater flow conditions. If the week of the month that includes the first Monday also includes a holiday, sampling will instead take place the following week. After the October 2012 sampling event, Boeing will propose to EPA a sampling frequency based on the results from the initial sampling events.

In addition, to ensure that at least some monitoring of LS431 discharge takes place during LTST system bypass conditions, 24-hour storm events with predicted rainfall of 0.5 inches or greater will be targeted to attempt to conduct sampling during a period when bypass of the LTST system is likely to occur. Five of these events, weather permitting, will be sampled by October 31, 2012. Requirements for these five events are precipitation of 0.5 inches or greater in the sampling event (24 hours or less), and indication that bypass of the LTST system occurred during the sampling event. Lower precipitation amounts may be counted if the sampling of five events of 0.5 inches of precipitation cannot be achieved.

A summary of the planned sampling at the LS431 during operation of the LTST facility is provided in Table 2.

2.3.2 SAMPLING DEVICES

This section describes the sampling devices that will be used to collect the whole water samples at LS431. The methodology for positioning these devices at the LS431 discharge outlet pipe is also

described. It should be noted that the installation and some potential maintenance of the stormwater sampling equipment will require confined space entry.

Whole water samples of the stormwater at LS431 will be collected using an ISCO 6712 automated sampler with a jumbo base, or similar equipment. Each whole water stormwater sample collected will be a flow-weighted composite collected in a 5-gallon laboratory-cleaned glass carboy located in the base of the ISCO unit. The sample collected in the carboy will consist of equal volume aliquots sampled at predetermined runoff volume intervals. When collecting a flow-weighted composite sample, aliquots will be collected more frequently at high flow rates and less frequently at low flow rates. The volume interval between aliquots for each sampling event will be calculated using the anticipated volume of runoff for the period to be sampled. For the 24-hour storm events, a regression line based on data from past sampling events that plots predicted inches of rainfall versus total runoff will be continually updated with the most recent data to estimate the runoff for the upcoming sampling event, based on the inches of predicted rainfall. For the routine monthly sampling events, the volume interval will be calculated using the same regression line if storms are predicted for the sampling period. Data on seasonal base flow rates will be used for predicted dry conditions to estimate an appropriate volume interval during predicted base flow conditions.

Flow measurements will be taken with a Marsh-McBirney FLO-DAR® Radar Area/Velocity Sensor, or similar equipment, mounted above the flow at the entrance to the 48-inch LS431 outlet pipe, downstream of the CESF effluent discharge. Flow will be measured continuously at 1-minute intervals. Data from the sensor will be collected and logged by a Hach FL900 Series Flow Logger, or similar equipment, and the ISCO unit will be programmed to collect aliquots of stormwater based on the predetermined volume interval programmed into the flow logger.

Once the flow logger has been programmed according to the predicted runoff for the sampling event, and the laboratory-cleaned glass carboy is in place in the base of the autosampler, the sampling program will be started. Specific details on installation and programming of the ISCO 6712 stormwater sampler, the FLO-DAR sensor, and the flow logger can be found in the 6712 Portable Samplers Installation and Operation Guide (Teledyne Isco 2010), the FLO-DAR Sensor User Manual (Hach 2011a), and the FL900 Series Flow Logger User Manual (Hach 2011b). All field personnel will be familiar with these documents.

The stormwater collected for laboratory analysis is drawn from a point at the entrance to the 48-inch LS431 outlet pipe, downstream of the King County lift station pumps and the LTST system discharge. A peristaltic pump (attached to the autosampler) and a Teflon®-lined suction line are used to draw water from this location. The intake of the suction line is connected to a stainless-steel strainer to remove any large debris. The strainer is attached to an aluminum plate bolted to the floor of the outlet

pipe entrance. The flow sensor is held in a mounting bracket bolted above the pipe entrance. The flow sensor was installed so that it is oriented in the center of the flow in the pipe. The strainer was positioned so that it is completely underwater during stormwater discharge, otherwise aliquots would not be able to be collected during lower discharge flow rates; if there is air in the suction line, the ISCO may reject the aliquot. The strainer is exposed to stormwater flow, but the suction line is housed in a rigid conduit for protection, and the conduit and sensor cords are secured to the existing manhole ladder rungs. The suction line was installed in a manner that does not allow loops to form, so that the peristaltic pump can work properly and bubbles do not form in the suction line. If it is necessary to shorten the suction line during future monitoring activities, the exact length of the line will be recorded in the field logbook and the sampler will be reprogrammed with the corrected length.

After the sensor and electrical cords were attached to the autosampler, the sampler was plugged into the nearest AC power source and the autosampler went through a self check process. The autosampler and flow logger were left in place in a weatherproof shed for flow data collection. Field personnel also calibrated the autosampler peristaltic pump to ensure the appropriate number of pump turns produces the desired aliquot volume. The autosampler is set to purge the suction line before and after collecting each aliquot. Following calibration of the pump, the suction line was connected to the pump and the autosampler.

2.3.3 SAMPLE COLLECTION METHODS

Whole water samples of stormwater will be collected at LS431. During each event, at least 8 aliquots of 500 milliliters (mL) each will be collected. The corresponding total volume of stormwater collected (4 liters) is planned to be sufficient to complete all chemical analyses required (see Section 2.3.4). It should be noted that this is the minimum required, but more aliquots are desired to achieve as representative a sample as possible. The maximum number of 500 mL aliquots the carboy can take is 37. Volume interval calculation using the regression line should use a target of 25 aliquots, to strike a balance between taking a sufficient number of aliquots and not filling the carboy too early. Necessary parameters for flow-weighted sampling include: predicted amount of precipitation, expected runoff volume, expected base flow volume, minimum volume required for analysis, minimum number of aliquots, sample aliquot size, and maximum bottle volume.

The sample collection process begins with precipitation forecast monitoring. The National Oceanic and Atmospheric Administration (NOAA) website offers a Quantitative Precipitation Forecast for 6-hour increments: http://www.wrh.noaa.gov/forecasts/graphical/sectors/sew.php#tabs. Boeing may also choose to retain the services of a consulting meteorologist to obtain more accurate and more location-specific forecasts; West Coast Weather, LLC has been used to help forecast storm events for LTST

sampling in 2011-2012. According to the sampling schedule and sampling event duration as described in Section 2.3.1, the sampling team will begin preparation for stormwater collection by programming the autosampler based on the precipitation forecast. Next, the decontaminated 5-gallon carboy will be installed in the sampler base and ice placed around the base of the carboy. The carboy will be kept on ice for the entire sampling event, and additional ice may need to be added to the ISCO base if the sampling event occurs during warm weather or over a long time period.

The sampling team will retrieve the carboy within 24 hours after the sampling event has concluded (i.e., the time the last aliquot was collected). The carboy will be capped with a Teflon®-lined cap, labeled as described in Section 2.9, and submitted to the laboratory for the analyses required. The filled carboy will be heavy and fragile. To avoid damage, a garbage can or tote with handles may be used to move the carboy. During transit, the carboy will be surrounded with ice. Chain-of-custody forms will be filled out onsite (Section 2.9.4), and custody of the carboy will be transferred to the laboratory upon delivery. Using a churn splitter or similar device, laboratory staff will distribute proper volumes of homogenized stormwater to bottles for preservation or immediate analysis. Should there be an event where sample volume is insufficient to perform all of the requested analyses, Landau Associates will direct the laboratory in the priority of analysis (described further in Section 2.3.4). If, during the planning phase, it seems likely a sampling event will end on a weekend or during non-business hours, arrangements will be made with laboratory staff to ensure that a technician is present to process the samples. Precipitation can be tracked online through the Seattle Boeing Field-King County International Airport rain gauge (identified as "KBFI") at: http://www.wrh.noaa.gov/mesowest/getobext.php?wfo=sew&sid=KBFI&num=48&raw=0&dbn=m. The KBFI rain gauge data will be recorded to determine how much precipitation fell during the sampling period.

The sample naming convention for LS431 samples will be LS431-W-(date).

2.3.4 LABORATORY ANALYSES

This section identifies the laboratory analyses for the whole water samples collected at LS431. A summary of the analyses to be performed is provided in Table 2. Whole water samples will be analyzed for PCBs using EPA Method 8082, for TSS using Standard Method (SM) 2540D, and for particle size distribution (PSD) using the Ecology TAPE Method.

In addition, to provide information for the remedial investigation being conducted by Ecology at NBF and the GTSP, samples will be analyzed for total and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) using EPA Methods 200.8 and 7470; semivolatile organic compounds (SVOCs) using EPA Method 8270D, and polycyclic aromatic hydrocarbons (PAHs) using EPA Selected Ion Monitoring (SIM) Method 8270D. If insufficient sample is available for all

analyses, the priority for analysis will be PCBs, TSS, PSD, total and dissolved metals, SVOCs, and PAHs. The target reporting limits for each analysis are summarized in Table 3.

2.3.5 EQUIPMENT DECONTAMINATION

Except for the glass carboys, the reusable equipment used to collect whole water samples at LS431 is dedicated and is not planned to be used at other locations; therefore, decontamination is not necessary for all equipment except the glass carboys. The laboratory decontaminates the sample carboys between sampling events. If the ISCO autosampler is used at another location, the only other piece of equipment that stormwater contacts is the flexible hose in the autosampler's peristaltic pump; one dedicated hose will be used for each separate sampling location.

2.4 LONG-TERM STORMWATER TREATMENT SYSTEM SAMPLING

Sampling at the LTST facility will consist of collecting whole water grab samples of the treatment facility effluent and influent from the MH130A line, flow-weighted composite water samples of the stormwater that bypasses the LTST system from the LSIV influent line, and samples of the solids entrained in the influent (both MH130A and LSIV) and effluent. This section describes the sampling devices, sample collection and handling methods, frequency of sample collection, and laboratory analyses.

2.4.1 SAMPLING FREQUENCY

To achieve the sampling objectives stated in Section 2.1, whole water samples and filtered solids samples (for PCBs only, see below for metals and PSD) will be collected from the treatment facility influent and effluent on a twice monthly basis through the end of 2011 and then monthly starting in 2012, as listed in Table 2. One of the monthly samples will coincide with the routine monthly events at LS431 as described in Section 2.3.1. In addition, five storm event samples at the LTST locations will also be taken concurrent with LS431 storm event sampling. If a storm event occurs in 2011, this event may count toward the second monthly LTST sampling event. After the October 2012 sampling event, Boeing will propose to EPA a sampling frequency based on the results from the initial sampling events.

Since a filter bag cannot be analyzed for other parameters when it is analyzed for PCBs (the entire bag is run for analysis), additional sampling events are required for filtered solids sampling for metals and PSD. This will be done on a monthly basis, and will only be done for MH130A and LSIV locations, as STST filtered solids samples showed that the effluent filter bags do not collect enough solids to remove for the metals and PSD analyses.

Whole water effluent samples will be collected on a twice-monthly basis by Clear Water for residual chitosan testing. This procedure is described in the Operation and Maintenance Manual, Appendix H of the Completion Report (Landau Associates 2012).

2.4.2 SAMPLING DEVICES

This section describes the sampling devices that will be used to collect the whole water and filtered solids samples at the LTST facility.

2.4.2.1 Whole Water

Whole water grab samples will be collected directly into laboratory bottles from sample ports on the MH130A influent line and the effluent line of the treatment system.

Composite whole water samples will be collected from the LSIV influent line. In November and December 2011, the LSIV whole water composite samples were generated from grab samples collected on a fixed time interval. Starting January 2012, LSIV whole water samples will be collected as a flow-weighted composite, using an ISCO 6712 automated sampler similar to the one described in Section 2.3.2, with the Teflon®-lined tube attached to the LSIV sample port. The ISCO sampler is able to collect samples from a pressurized line up to 15 pounds per square inch (psi). When the peristaltic pump is not running, the tubing inside the pump will be pinched closed, preventing water from entering the sample carboy even though the sample port valve will remain open.

The main objective of sampling the LSIV is to characterize water that bypasses the LTST system via the King County pumps in the lift station. Ideally, additional flow-monitoring would take place on the bypass stormwater that would trigger the LSIV ISCO. However, the complications of flow monitoring stormwater from the King County pumps (four separate pumps, housed in a locked pumphouse) have warranted a surrogate weighting method for this water. The LSIV ISCO sampler will be triggered from the flow logger used at LS431. Although LS431 flow monitoring includes treated water as well as bypass, triggering based on the LS431 flow logger will still result in more aliquots being taken during higher flow rates of bypass and less aliquots being taken during lower flow rates of bypass.

Since water samples will be taken from the LSIV influent line to the CESF treatment facility, there is often LSIV water available in the line, and a sample might be triggered from the LS431 flow logger when no bypass of the LTST system is occurring. To ensure LSIV aliquots are only taken during bypass conditions, additional equipment will support an enable trigger on the LSIV autosampler. An ISCO model 1640 Liquid Level Actuator that uses a conductivity switch will be placed in the lift station outlet structure (near where the LS431 Flo-Dar sensor is located) so that the probe tip will be underwater during times when one or more King County pumps are on. Precise placement of the probe tip is not

imperative since level data from the LS431 Flo-Dar sensor show there is about a 12-inch difference in level in the outlet structure between the full flow rate LTST operation (1,500 gpm) and bypass with one King County pump. With the actuator connected to the LSIV ISCO, the ISCO can use the actuator signal as an "enable", so the sampling program would be suspended unless the LTST system was being bypassed. Using a special "Y" cable, both the actuator cable and the cable from the LS431 Flo-Dar Flow Logger can be connected at the same port on the ISCO. The actuator and cables will be installed in March 2012. Until that time, LSIV samples will be flow-weighted from the LS431 flow logger, but may take aliquots during times when bypass of the LTST system is not occurring.

The actuator probe tip will likely require some maintenance, which would involve cleaning to ensure scaling or bacterial growth does not impede proper operation. If a probe fails, the probe can be replaced without needing to replace the entire actuator. Boeing or its contractor will keep an extra probe tip on hand to facilitate quick replacement. Turbulent flows and air bubbles in the lift station outlet structure during bypass may cause intermittent triggering of the actuator, so the probe tip will be housed in a slotted conduit.

2.4.2.2 Filtered Solids

To collect solids samples from the treatment facility influent and effluent, filtration systems will be installed on each influent pipeline (MH130A and LSIV) and on the effluent pipeline. These locations are shown on Figure 7. A submersible pump located in MH130A pumps influent water from the North Lateral through an underground force main that surfaces near the LTST system. A submersible pump located in the LSIV pumps influent water through an underground force main that also surfaces near the LTST system. Treated (effluent) water is pumped through above-ground pipe to the lift station outlet structure (where LS431 is located). A portion of each of the three streams will pass through a filter bag where solids will be captured.

At each filter system, one FSI model CBFP-11 carbon steel filter housing will be equipped with a 16-inch-long, 7-inch-diameter, 1 µm polypropylene felt filter bag with a Polyloc® seal (to prevent bypass) to collect influent or effluent solids. A flow totalizer will be placed downstream of each filter and will be used to measure the total volume of stormwater flowing through the filter bag. Filtered water from influent sampling will then be conveyed to overflow pipe that leads back to the LSIV, while filtered water from effluent sampling will rejoin the discharge flow prior to discharge to LS431.

2.4.3 SAMPLE COLLECTION METHODS

This section describes the methodology for collecting stormwater and stormwater solids samples from the LTST influent and effluent locations.

2.4.3.1 Whole Water

For MH130A and effluent water samples, the specific sample collection procedures are as follows:

- To monitor the LTST system performance under a variety of conditions, efforts should be taken to collect whole water grab samples from the MH130A influent and the effluent during both precipitation conditions and during base flow conditions. Reasonable efforts will be made to sample at various times during a precipitation event (i.e., at the beginning of a storm and toward the end of a storm) and during various intensities of storms. Precipitation data will be recorded in a table for both the hour prior to sample collection and the 12 hours prior to sample collection.
- Samples will be collected in laboratory-supplied sample bottles.
- Water will be allowed to purge from the sampling ports for a minimum of 20 seconds prior to collection of a sample. Purge water will be placed in the inlet weir tank.
- Samples will be collected by placing the appropriate sample bottles below the treatment system's sample ports and allowing the bottles to fill.
- Once a sample is collected, the bottle will be capped, sealed, and labeled.

The following items will be recorded at the time of sampling:

- Date and time of sampling
- Name of the sampler(s)
- Unusual circumstances that may affect the sample results.

Through 2011, LSIV samples will be taken by manually collecting equal-volume aliquots from the sample port approximately every 12 hours during a routine monthly event, and 6 hours during a storm event. Sampling duration should generally match that of LS431. Starting in January 2012, the LSIV autosampler will be programmed and calibrated in a similar fashion to the LS431 sampler (see Section 2.3.3). The main difference will be the placement of the sample collection tube. The tube will be connected to the sample port, and the sample port valve will be opened at the beginning of the sample period. When the ISCO sampler is triggered by the LS431 flow logger, the peristaltic pump in the ISCO will pull the aliquot.

Starting in March 2012, a liquid level actuator will be incorporated into the LSIV sampling equipment, and the ISCO will be programmed to enable the sampling program only when the actuator switch is closed (i.e., the water level rises in the lift station outlet structure indicating bypass is occurring). Only when the program is enabled will the LSIV ISCO pull an aliquot when triggered by the LS431 flow logger. When there is no bypass during a sample event, there will be no LSIV sample collected. As both the LSIV ISCO and the LS431 ISCO will be triggered by the LS431 flow logger, fewer aliquots will be taken by the LSIV ISCO as compared to the LS431, due to the additional trigger criterion. The volume of

each LSIV aliquot will be increased from 500 mL in March 2012, so there will be enough volume for laboratory analysis when only a small number of aliquots are taken. It is anticipated that events with a small amount of predicted precipitation will use a 3-L aliquot, and events with a large amount of predicted precipitation will use a 1-L aliquot. The exact aliquot volume will be determined on an event-by-event basis.

The sample naming convention for LTST water samples will be LTST-W-MH130A-(date), LTST-W-LSIV-(date), and LTST-W-EFF-(date).

2.4.3.2 Filtered Solids

The amount of filtration time for each filter bag will match the duration of the LS431 water sampling (up to 24 hours for storm events, approximately 3 days for routine monthly events). Each filter will be removed following successful completion of filtration and handled according to the procedures in Section 2.9.

The specific sampling procedure at each filtration system is as follows:

- Use only a clean, new filter.
- For bags being submitted for PCBs analysis, use a filter bag that has been pre-weighed and numbered.
- Filter bags for metals and PSD analysis do not need to be pre-weighed or numbered.
- Once a filter bag is removed, the filter will be placed in a clean Ziploc bag, sealed, and labeled.

The following items will be recorded at the time of sampling:

- Date and time filtration began.
- Date and time filtration ended.
- The laboratory-determined number and weight of the filter used (PCBs analysis only).
- Reading from the flow totalizer at start of filtering.
- Reading from the flow totalizer at end of filtering.
- Name of the sampler(s).
- Unusual circumstances that may affect the sample results.

The sample naming convention for LTST filtered solids samples will be LTST-F-MH130A-(date), LTST-F-LSIV-(date), and LTST-F-EFF-(date).

2.4.4 LABORATORY ANALYSES

This section identifies the laboratory analyses for the stormwater and solids samples collected at the LTST system. A summary of the analyses to be performed is provided in Table 2. The target reporting limits for each analysis are summarized in Table 3

2.4.4.1 Whole Water

Whole water samples of the treatment facility influent and effluent will be analyzed at the laboratory for PCBs using EPA Method 8082, for TSS using Method SM2540D, and for PSD using the Ecology TAPE Method. Discrete whole water samples of the effluent will also be analyzed for residual chitosan by Clear Water.

2.4.4.2 Filtered Solids

Filtered solids samples collected from the LTST facility influent and effluent will be analyzed for PCBs by EPA Method 8082, for metals by EPA Methods 6010/6020 and 7471, and for PSD by Puget Sound Estuary Program (PSEP)-PS. For the PCBs analyses, new filters will be weighed and numbered prior to sample collection, so that each sample can be matched to a unique, clean-filter weight. The used filter will be dried, weighed, and processed by the laboratory. For each filter, the entire filter (not including the hard plastic ring, but including whatever material was collected) will be extracted and the analytical results presented in units of total µg of PCBs. Knowing the full weight of the used dried filter (including collected material) and the pre-filtration weight, the estimated mass of PCBs per mass of total solids can be calculated.

For the metals and PSD analyses, solids will be scraped from the used filters for analysis.

2.4.5 EQUIPMENT DECONTAMINATION

Only dedicated sampling ports, dedicated pumps, and clean, new bottles and filters are planned to be used for sample collection, with the exception of the 5-gallon glass carboy used for LSIV water, which will be decontaminated at the laboratory between sampling events. In the event that any other equipment needs to be reused, the equipment will be cleaned by scrubbing all surfaces that will come into contact with the sample with brushes using an Alconox solution, rinsing and scrubbing with clean tap water, and rinsing a final time with distilled or de-ionized water to remove tap water impurities. Decontamination, if required, will be conducted between collection of each sample. If the LSIV ISCO autosampler is also used at a different location during LTST monitoring, only dedicated peristaltic pump flexible hose will be used at each location.

2.5 SEDIMENT TRAPS

The sediment trap monitoring program that began in 2005 at the NBF site will be continued during operation of the LTST facility to evaluate stormwater quality from the individual NBF lateral storm drains prior to combining at the LSIV and treatment at the LTST facility. This data will provide additional characterization of stormwater quality, and will aid in future remedial action decisions. Sediment traps will continue to be deployed [except for SL4-T5A, which will be moved to the new wet well on the re-routed King County line and renamed SL4-T5A(2)] at the locations shown on Figure 6. Instead of installing sediment traps at SL4-T5A(2), that location will be sampled by collecting solids from the bottom of the wet well, which collects solids behind a permanent weir. The sediment trap bottles were last collected and reinstalled on April 5, 2011, and sediment trap solids samples will be collected again in spring 2012. A summary of the sampling plan for the sediment traps is provided in Table 2. Sediment trap sampling will continue indefinitely until such time that additional data collection is no longer needed to support source control efforts. Sediment trap data will be evaluated and may result in additional sampling and analysis efforts to support source control activities.

2.5.1 SAMPLE COLLECTION

Each sediment trap [with the exception of SL4-T5A(2)] will consist of two stainless-steel brackets and housings that each holds a Teflon® sample container. Once the containers are securely placed on the bracket, the container lids will be removed and placed in a plastic sealable bag and labeled with the sample location. After the desired sample duration has elapsed, the lids will be placed back on the containers and the containers removed. The solids in SL4-T5A(2) will be collected from the bottom of the compartment of the wet well behind the weir using a new, clean, laboratory-supplied glass soil sampling jar affixed to the end of a decontaminated telescoping sampling pole. Water will be decanted from the jar, to the extent possible, and the solids from each "pass" (if there are multiple passes required to bring up enough solids) will be combined and homogenized in a clean stainless-steel bowl using a clean stainless-steel spoon, and placed into a separate sample jar. The sampler will remove material greater than about ¼-inch diameter prior to placing the soil in the sample container.

The containers will be labeled as described in Section 2.9.1. Samples will be stored on ice in a cooler for transportation to the laboratory. New laboratory-cleaned containers will be placed in the brackets [except at SL4-T5A(2)] for collection of the next round of samples.

2.5.2 LABORATORY ANALYSIS

This section identifies the laboratory analyses for the sediment trap samples collected at NBF. A summary of the analyses to be performed is provided in Table 2.

Analysis of the sediment trap solids samples will include PCBs using EPA Method 8082; SVOCs using Puget Sound Dredged Disposal Analysis (PSDDA) SW8270D; total metals (arsenic, copper, lead, mercury, and zinc) using Methods 6010 and 7471; diesel-range and motor oil-range petroleum hydrocarbons using Ecology Method NWTPH-Dx; total organic carbons (TOC) using the method described in Plumb (1981), and PSD using PSEP-PS. Depending on the quantity of solids collected, the laboratory may not be able to analyze all parameters, in which case, the analysis of parameters will be prioritized in the order listed above. The target reporting limits for each analysis are summarized in Table 3; however, depending on the quantity of solids collected and possible interferences, actual reporting limits may be higher than those listed.

Prior to field mobilization, all sampling equipment and utensils will be thoroughly decontaminated. The laboratory will be responsible for decontamination of the Teflon® sample container.

2.6 WEIR TANK, STORAGE TANK, AND SANDFILTER MEDIA SAMPLING

Grab samples of the residual solids at the bottom of the LTST facility inlet weir tank, backflush settling tank, and storage tanks will be collected to determine appropriate disposal of the solids. The solids level in the inlet weir tank, each storage tank, and the backflush settling tank will be inspected at least once per month. For the inlet weir tank and the storage tanks, if the solids level at the bottom of the tank is greater than 12 inches, a sample of the solids will be collected for waste profiling purposes and the solids will be cleaned out from the tank. The flow rate through the backflush settling tank will be low enough that re-entrainment of solids is less likely than at the other tanks, and a deeper blanket of solids could accumulate without negative effects. Additionally, a deeper blanket of solids may allow for sludge thickening, which would limit the amount of liquid that would need to be removed and disposed of during tank cleanout. Therefore, the depth of solids in the backflush settling tank may be allowed to reach up to 24 inches prior to waste profiling and cleanout.

Monitoring of accumulated solids will be performed with a Sludge Judge® or similar device inserted from the top of the tank to the tank floor. The device collects a sample that can be retrieved and visually inspected. The thickness of accumulated solids in the sampler is observed and recorded. Three or more readings, spread approximately equally along the length of the tank (for the weir tanks, the readings will be taken between the weir and the inlet end of the tank), will be averaged and used to determine if the solids level exceeds the aforementioned depths and requires solids testing and tank cleanout.

The allowable depth of sludge blanket in each tank may be adjusted if monitoring suggests that the optimum sludge blanket depth is greater or less than the aforementioned depths. For example, if

turbidity monitoring shows enhanced flocculation at the Inlet Weir Tank due a depth of solids greater than 12 inches, the depth at which cleanout is triggered may be modified.

Tank cleanout will consist of pumping as much water as possible from the tank for treatment in the LTST system, then vactor removal of the solids and liquid that remains. The vactor truck will deposit the sludge at the onsite Sweeper Decant Station for dewatering. The liquid will be batch treated at the Decant Station and (when it meets water quality limits) discharged to the King County sewer under an Industrial Wastewater Permit. The solids will be disposed of offsite, using the waste characterization laboratory data provided by tank sampling as described in Section 2.6.1.1.

Disposal characterization sampling will also be conducted for the sand media in the three sand filter units. It is expected that sand filter media will last for approximately 20 million gallons before needing to be replaced. It is possible that, if reduced sand filtration performance is observed during the course of operation, the used sand media would be replaced earlier than expected. A composite sample of the used sand filter media (three or more grab samples) will be collected prior to its disposal into the waste solids bins associated with the Sweeper Decant Station. The spent media will be disposed of offsite, using the waste characterization laboratory data provided by vessel sampling as described in Section 2.6.1.2. Sampling of spent sand filter media for waste characterization will be conducted for the first media replacement, and this data will be used for all subsequent media disposal unless there is reason to believe that contaminant concentrations at the LTST influent have changed significantly (outside the range for influent treated with first batch of sand filter media), in which case another round of waste characterization sampling will be conducted.

2.6.1 SAMPLE COLLECTION

This section describes the methodology for collecting solids samples from the LTST weir and storage tanks, and from the sand filter units.

2.6.1.1 Weir and Storage Tank Solids

If tank solids are to be removed, a minimum of three grab samples will be collected from equally-spaced discrete locations (similar to procedure for checking sludge thickness described above) at the bottom of the tank, using clean laboratory-supplied glass soil sampling jars affixed to the end of a telescoping sampling pole. Water will be decanted from each jar, to the extent possible, and the solids from each jar will be combined and homogenized in a clean stainless-steel bowl using a clean stainless-steel spoon, placed into a separate sample jar, labeled, and stored in a cooler on ice. The sampler will remove material greater than about ¼-inch diameter prior to placing the soil in the sample container. A new clean sample jar will be affixed to the telescoping sample pole at each new location.

2.6.1.2 Sand Filter Media

When sand filter media is to be removed and replaced, a composite sample of the media, composed of a minimum of three grab samples from each individual sand filter vessel to be emptied, will be collected using a stainless steel spoon. Locations of the grab samples will be taken from different vertical positions in the vessel so as to result in a representative sample of spent media. All grab samples (12 or more, assuming media from all four vessels in a unit is being removed) will be homogenized in a clean stainless-steel bowl using a clean stainless-steel spoon, placed into a laboratory-supplied soil sample jars, labeled, and stored in a cooler on ice.

2.6.2 LABORATORY ANALYSIS

This section identifies the laboratory analyses for the tank solids and used media samples collected from the LTST system. A summary of the analyses to be performed is provided in Table 2. The target reporting limits for each analysis are summarized in Table 3.

Each solids sample will be analyzed for PCBs using EPA Method 8082; SVOCs using EPA Method 8270D (full scan); metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) using EPA Method 1311 [the toxicity characteristic leaching procedure (TCLP)], EPA Method 6010 for metals except mercury, and EPA Method 7471 for mercury; diesel-range and motor oil-range petroleum hydrocarbons using Ecology Method NWTPH-Dx; and gasoline-range petroleum hydrocarbons using Ecology Method NWTPH-Gx.

2.6.3 EQUIPMENT DECONTAMINATION

All non-disposable sampling equipment (e.g., stainless-steel bowls and spoons), or other equipment used to collect the solids samples, will be decontaminated as follows:

- Potable water rinse
- Alconox/Liquinox detergent wash
- Potable water rinse
- Deionized (DI) or distilled water rinse
- Air dry.

2.7 RE-ROUTED KING COUNTY STORMWATER

In order to determine if the re-routed stormwater from King County is contributing to an inability of the LTST system to meet the EPA interim goals, flow rate monitoring will be performed and flow-weighted whole water samples will be collected from this re-routed storm drain line.

Flow rate monitoring will take place at the new wet well near the LTST, as discussed in the Completion Report (Landau Associates 2012), using a weir and pressure transducer. The wet well is not in an appropriate location to stage sampling equipment; to conduct flow-weighted whole water composite sampling, an ISCO 6712 automated sampler will be used at an upstream location, shown on Figure 6 as KCBYP.

Because there is interest to compare data from King County re-routed stormwater to the overall stormwater discharge at LS431, whole water composite sampling will be conducted at KCBYP concurrent with LS431 sampling for half of the routine monthly sampling events and two of the storm events in the first year of sampling (ending October 31, 2012).

Equipment and setup will be similar to that described for LS431 in Section 2.3, with some exceptions. The sampler will be equipped with an ISCO Model 750 Area Velocity Flow Module instead of the FLO-DAR Sensor and FL900 Flow Logger. Specific details on installation and programming of the ISCO 6712 stormwater sampler and flow module can be found in the 6712 Portable Samplers Installation and Operation Guide (Teledyne Isco 2010) and the 750 Area Velocity Module Installation and Operation Guide (Teledyne Isco 2009). All field personnel will be familiar with these documents.

The stormwater collected will be drawn from the upstream 24-inch pipe at the KCBYP manhole. The strainer will be attached to an expanding scissors ring with a diameter matching the outlet pipe dimensions. An ISCO low profile area/velocity flow sensor will be attached to the same scissors ring. The scissors ring holding the sensor and intake strainer/tube will be placed at least one pipe diameter (24 inches) upstream in the pipe. Installation will require confined space entry. The flow sensor will be installed so that it faces upstream and is oriented at the bottom of the pipe. The strainer will also be installed facing upstream and situated so that the intake screen is near, but not touching, the surface of the pipe to avoid excess sediment accumulation. The strainer will be positioned near the bottom of the pipe so that it is completely underwater during stormwater discharge, otherwise aliquots will not be able to be collected during lower discharge flow rates; if there is air in the suction line, the ISCO may reject the aliquot. The suction line and sensor cord will be secured to the scissors ring and to the manhole ladder. The sensor cable and suction tubing will be capped and coiled for storage in the manhole in between sample events so the manhole lid can be in place except when sampling. Care will be taken to keep moisture out of the sensor cable and foreign liquid or solids out of the suction line when stored.

Laboratory analyses for KCBYP will be the same as for LS431, described in Section 2.3.4, with the exception that SVOCs and PAHs will not be analyzed at this location. The sample naming convention will be KCBYP-W-(date).

2.8 MEDIA BED PILOT STUDY

Sampling at the MBPS will consist of collecting discrete whole water samples from influent and effluent locations (one effluent sample for each of the two media filter test beds). Bed "A" contains a media mix that includes rhyolite sand, zeolite, and granular activated carbon (GAC), while bed "B" contains a media mix that includes rhyolite sand, zeolite, and walnut shells. Figure 6 shows the location of the MBPS, and Figure 8 shows the major components of the MBPS including the sampling port locations. Note that a 150-gallon surge tank was added to the MBPS to facilitate representative influent and effluent sampling and ensure at least one pore volume (two beds at approximately 225 gallons each) could be diverted to the media beds during each MH130A pump cycle. The remainder of this section describes the sampling devices, sample collection and handling methods, frequency of sample collection, and laboratory analyses related to the MBPS.

2.8.1 SAMPLING FREQUENCY

To evaluate the effectiveness of the two media filters, a single set of stormwater samples will be collected from three sampling points (shown on Figure 8) in the MBPS for a minimum of five storm events with precipitation greater than 0.2-inches. When possible, this sampling will be conducted concurrent with LS431 sampling events. Storm event samples should be collected after the first hour of rainfall and when runoff or surface ponding on impervious surfaces is observed.

Additionally, during dry weather conditions a minimum of five sets of samples will be collected from each sampling point. Wet and dry weather samples may be collected at any time during an active MH130A pump cycle. However, collection of media bed effluent samples shall lag the influent sample. The minimum recommended lag time for collecting effluent samples is 20 minutes after collecting the influent sample. The maximum recommended lag time is 3 hours.

While sampling was originally scheduled to begin in late January 2012, unanticipated issues arose (e.g., backflows from the LTST storage tanks and biofouling of the in-line strainer) that caused a delay in sample collection. The first samples are currently scheduled to be taken in late February 2012.

2.8.2 SAMPLING DEVICES

Sampling at the MBPS consists of whole water grab samples of stormwater only; no automated sampling equipment is required. Flow volume will be measured continuously using an in-line turbine flow totalizer. This flow meter records the cumulative volume of flow to the media beds. Each media bed receives approximately 50 percent of the total volume. Flow totalizer readings will be recorded twice during each sampling event (one reading at influent sampling and a second reading at effluent sampling), and weekly if no sampling event takes place that week, until the MBPS sampling program is complete.

2.8.3 SAMPLE COLLECTION METHODS

Whole water samples of MBPS stormwater will be collected as discrete manual grab samples from each of the three sampling ports shown on Figure 8 during a sampling event. The stormwater collected for laboratory analysis is drawn from the influent to the MBPS at the sample port immediately downstream of the flow totalizer, and from each of the two effluent sampling ports on the discharge header from the filter media beds. The sample naming convention shall be MBPS-INF-(date) for the influent, MBPS-EFF-GAC-(date) for the effluent from bed "A", and MBPS-EFF-SHELLS-(date) for the effluent from bed "B". To collect a sample, the valve is opened and the bottle is filled with the required sample volume, then the valve is closed. Each sampling port is equipped with a ¼-inch turn hand-operated valve. The specific sample collection procedures are as follows:

- Samples will be collected in new, clean, laboratory-supplied sample bottles.
- Water will be allowed to purge from the sampling ports for a minimum of 10 seconds prior to collection of a sample. Purge water will be gently poured into one of the media beds.
- Samples will be collected by placing the appropriate sample bottles below the sample ports and allowing the bottles to fill.
- Once a sample is collected, the bottle will be capped, sealed, and labeled.

The following items will be recorded at the time of sampling:

- Date and time of sampling
- Flow totalizer volume reading
- Name of the sampler(s)
- Unusual circumstances that may affect the sample results.

2.8.4 LABORATORY ANALYSES

This section identifies the laboratory analyses for the whole water samples collected at the MBPS. A summary of the analyses to be performed is provided in Table 2. The target reporting limits for each analysis are summarized in Table 3. Whole water samples will be analyzed for PCBs using EPA Method 8082, for TSS using Standard Method (SM) 2540D, for PSD using the Ecology TAPE Method, and for Total and Dissolved Organic Carbon using Standard Method 5310B or 5310C.

2.8.5 EQUIPMENT DECONTAMINATION

Only dedicated sampling ports and clean, new laboratory-supplied bottles are planned to be used for sample collection. In the event that any other equipment needs to be reused, the equipment will be cleaned by scrubbing all surfaces that will come into contact with the sample with brushes using an

Alconox solution, rinsing and scrubbing with clean tap water, and rinsing a final time with distilled or de-ionized water to remove tap water impurities. Decontamination, if required, will be conducted between collection of each sample.

2.9 SAMPLE LABELING AND HANDLING

This section describes the sample labeling and handling procedures that will be used during the stormwater and stormwater solids sampling that will be conducted while the LTST facility is operating.

2.9.1 SAMPLE IDENTIFICATION AND LABELS

Sample container labels will be completed immediately before or immediately following sample collection. Container labels will include the project name (NBF); the project number (0025082.212.004); the sample ID; the initials of the person collecting the sample; the date and time of collection; and the analysis required. Date and time of collection for LS431 and re-routed King County whole water samples will coincide with the time the last aliquot was collected, not the date and time that field personnel removed the carboy from the ISCO sampler. All samples collected during the investigation will be labeled clearly and legibly. Sample labels will be self-adhering, waterproof material. An indelible pen will be used to fill out each label.

2.9.2 SAMPLE CONTAINERS, PRESERVATION, AND STORAGE

Samples submitted to the analytical laboratory for analysis will be collected in the appropriate sample container provided by the analytical laboratory appropriate for the matrix being analyzed and the requested analytes with the following exceptions. Pre-purchased sediment trap containers and 5-gallon glass carboys will be reused at each sediment trap location and at LS431/LSIV/KCBYP locations, respectively. These containers will be cleaned by the laboratory between uses. New filters will be purchased for each filtered solids sample. Each filter will be pre-weighed and numbered prior to use, with the exception of the filter bags to be analyzed for metals and PSD. All samples will be preserved by cooling to a temperature of 6° Celsius (C) and as required by the analytical method. Maximum holding and extraction times until analysis will be strictly adhered to by field personnel and the analytical laboratory. Sample containers, preservatives, and holding times for each chemical analysis to be performed are presented in Table 4.

2.9.3 SAMPLE PACKAGING AND SHIPPING

The transportation and handling of samples will be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to the possible

hazardous nature of samples. Regulations for packing, marking, labeling, and shipping of hazardous materials are promulgated by the U.S. Department of Transportation in the Code of Federal Regulations (CFR), 49 CFR 173.6 and 173.24.

Prior to transportation to the laboratory, samples will be placed on ice in coolers following collection, with the exception of 5-gallon carboys, which will be surrounded by loose ice in a rigid plastic garbage can or tote. At the end of the day, samples sent to the analytical laboratory will be inventoried. Each cooler will be secured with signed custody seals.

Samples will be transported to the laboratory to meet the holding times listed in Table 4.

2.9.4 SAMPLE CUSTODY

The primary objective of sample custody is to create an accurate, written record that can be used to trace the possession and handling of samples so that their quality and integrity can be maintained from sample collection until completion of all required analyses. Adequate sample custody will be achieved by means of approved field and analytical documentation. Such documentation includes the chain-of-custody record, which is initially completed by the sampler and is, thereafter, signed by those individuals who accept custody of the sample.

3.0 QUALITY ASSURANCE PROJECT PLAN

This QAPP presents the QA and QC plan for the field sampling and laboratory analyses associated with the NBF LTST removal action. The purpose of this plan is to ensure that all necessary actions or protocols are implemented to acquire data of the type and quality needed to meet the project goals.

This QAPP was prepared in accordance with EPA *Requirements for Quality Assurance Project Plans* (QA/R-5; EPA/240/B-01/003, March 2001a) and the following EPA guidance documents: *Guidance for Quality Assurance Project Plans* (QA/G-5; EPA/240/R-02/009, December 2002) and *Quality Assurance/Quality Control Guidance for Removal Activities* (EPA/540/G-90/004, April 1990).

3.1 QUALITY ASSURANCE OBJECTIVES

The QA objectives for this project are to develop and implement procedures that will ensure collection of representative data of known, acceptable, and defensible quality. The data quality parameters used to assess the acceptability of the data are precision, accuracy, representativeness, comparability, and completeness. These parameters are discussed in the following sections.

3.1.1 DECISION QUALITY OBJECTIVES

The decision quality objectives define the type, quality, and quantity of data necessary to support project decisions. As presented in Section 1.5, the project goal is to reduce PCBs concentrations in stormwater discharging to the Slip 4 EAA of the LDW Superfund site to below 0.030 µg/L and to reduce annual average concentrations of PCBs in water to below 0.018 µg/L. The sampling objectives are described in Section 2.1. To support these objectives, samples of stormwater and stormwater solids must be representative of conditions during a variety of stormwater flows, the results must be comparable to the long-term interim goals, and the data must be complete to ensure sufficient data is collected to support project decisions. Representativeness, comparability, and completeness are discussed further below.

3.1.1.1 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an actual condition or characteristic of a population. Representativeness can be evaluated using replicate samples, representative sampling locations and conditions, and blanks. The FSP (Section 2.0) specifies the types and number of samples to collect and the appropriate sampling locations. As described in the FSP, stormwater and stormwater solids samples will be collected from the storm drain system prior to and following treatment. In some cases, samples will be collected over the course of multiple days during

varying precipitation conditions, other samples will be instantaneous grab samples collected twice a month during various precipitation conditions, and other information will be collected on a continuous basis. This range of sampling frequency will provide data that is representative of a variety of stormwater flow conditions at the site. Additionally, to determine that the analytical results are representative of the sampled item and not influenced by cross-contamination, method blanks will be analyzed with each analysis as described in Section 3.4.5.7.

3.1.1.2 Comparability

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this work, comparability of data will be established through the use of consistent sampling procedures and the use of EPA-approved analytical methods with target reporting limits that can meet the compliance criteria set for this project. Analytical methods to be used for analysis of stormwater and stormwater solids samples are discussed in Section 3.4.4.

3.1.1.3 Completeness

Completeness is a measure of the proportion of data obtained from the requested analytical method that is determined to be valid. It is calculated as the number of valid data points divided by the total number of data points requested. The QA objective for completeness during this project will be 95 percent. Completeness will be routinely determined and compared to this control criterion.

3.2 MEASUREMENT QUALITY OBJECTIVES

The measurement quality objectives (MQOs) for the project specify how good the data must be in order to meet the objectives of the project and are based on data precision, accuracy, bias, and sensitivity, as described below.

3.2.1 PRECISION

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values.

Analytical precision can be measured through laboratory control samples and duplicates. Laboratory control samples and duplicates will be collected as described in Sections 3.4.5.1 and 3.4.5.2. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria provided by the laboratory.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as RPD) increases. The equation used to

$$RPD = \left| \frac{D_1 - D_2}{(D_1 + D_2)/2} \right| x\,100$$

express precision is as follows:

where: D1 = first sample value

D2 = second sample value (duplicate).

3.2.2 ACCURACY

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Field accuracy is controlled by adherence to sample collection procedures as outlined in the FSP (Section 2.0).

Analytical accuracy may be assessed by analyzing "spiked" samples with known standards [surrogates, laboratory control samples, and/or matrix spike MS)] and measuring the percent recovery. Laboratory control samples and duplicates will be collected as described in Sections 3.4.5.1 and 3.4.5.2.

Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\begin{matrix} Percent \\ Recovery \end{matrix} = \frac{(Spiked\ Sample\ Result - Unspiked\ Sample\ Result)}{Amount\ of\ Spike\ Added}\ x\ 100$$

Control limits for percent recovery for water and solid samples will be laboratory acceptance limits generated according to EPA guidelines.

3.2.3 BIAS

Bias is the systematic or persistent distortion of a measured process that causes errors in one direction. Bias of the laboratory results will be evaluated based on analysis of method blanks as described in Section 3.4.5.7.

3.2.4 SENSITIVITY

Sensitivity is the ability to discern the difference between very small amounts of a substance. For the purposes of this project, sensitivity is the lowest concentration that can be accurately detected by the

analytical method. The analytical method will be considered sufficiently sensitive if the reporting limits are below the compliance criteria discussed in Section 1.4. Proposed method and target reporting limits are discussed in Section 3.4.4.

3.3 SPECIAL TRAINING/CERTIFICATION

All personnel performing sampling activities onsite will have completed formal 40-hour HAZWOPER health and safety training, in compliance with 29 CFR 1910.120 and Washington Administrative Code (WAC) Chapter 296 (certificates of successful completion of training will be maintained in personnel health and safety files), and will verify on-the-job training for those activities they are assigned to perform. At least one member of each field team and the designated site safety officer will be trained in cardiopulmonary resuscitation (CPR) and first aid.

The laboratory performing the analysis of the samples will be ARI, Lancaster, and/or other EPA-approved lab. ARI and Lancaster are certified by the State of Washington and the National Environmental Lab Accreditation Conference (NELAC) to perform the methods listed in this QAPP. These laboratories are not in the Contract Laboratory Program (CLP), but follows methods and QA/QC procedures that have been submitted and approved by EPA. Lancaster has a documented Quality Assurance Program that complies with ISO 17025: 2005(E), "General Requirements for the Competence of Testing and Calibration Laboratories", and the "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01-002, March 2001b). ARI has a documented Quality Assurance Program that complies with American National Standard (ANSI)/ASQC E-4 1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, (ANSI 1995) and EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01-002, March 2001b).

Work in confined spaces (WAC 296-62-Part M) may be necessary for this project. Entering confined spaces requires specialized training and procedures outlined by the Occupational Safety and Health Administration (OSHA). OSHA issued a general industry standard (29 CFR 1910.146; the standard) to require protection for employees who enter permit-required confined spaces. The corresponding Labor and Industries [Washington Industrial Safety and Health Act (WISHA)] regulation is found at Chapter 296-809 WAC. All personnel entering a confined space will be trained and certified in accordance with OSHA and WISHA. Confined space entry will also be conducted in accordance with Boeing requirements.

3.3.1 DOCUMENTS AND RECORDS

This section describes the production, distribution, and storage of documents and records associated with sampling activities related to the LTST facility.

3.3.2 DOCUMENT DISTRIBUTION

Prior to beginning any field activities, field staff will receive and have a chance to review all project documents pertinent to the field activities including the SAP and a Health and Safety Plan (HASP). Project managers will meet with field staff prior to field activities to review the SAP. The HASP will be reviewed by all staff collecting samples.

3.3.3 FIELD DOCUMENTATION

All field equipment (e.g., automated stormwater samplers) will have reference manuals that will be kept available during sampling or maintenance activities. In addition, equipment that requires calibration will be accompanied by a calibration logbook. Field staff will record the calibration process in the logbook every time a calibration is performed.

A complete record of all field activities will be maintained for 10 years after notification by EPA of completion of the work under the ASAOC. Documentation necessary to meet QA objectives for this project include daily field notes, sampling forms, and sample chain-of-custody forms. All original documentation will be kept in the Landau Associates' project files. The documentation and other project records will be safeguarded to prevent loss, damage, or alteration.

If an error is made on a document, corrections will be made by drawing a single line through the error and entering the correct information. The erroneous information will not be obliterated. Corrections will be initialed and dated, and, if necessary, a footnote explaining the correction will be added. Errors will be corrected by the person who made the entry, whenever possible. Documentation will include field notes and associated documents.

The field notes will provide a description of all sampling activities, sampling personnel, weather conditions, and a record of all modifications to the procedures and plans identified in the SAP. The field notes are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period.

Field notes will be supplemented by sample collection forms completed by field staff. Sample possession and handling will also be documented with chain-of-custody records so that the samples are traceable from the time of sample collection to arrival at the laboratory and to sample analysis. Sample handling and chain-of-custody procedures are described in Section 2.9.

3.3.4 ANALYTICAL DATA RECORDS

Analytical data reports consisting of a case narrative, field sample results, method blank, laboratory control sample, surrogate recovery, and MS results will be provided by the laboratory. The reports will be submitted in hard copy and electronically as PDF files. All of the analytical data, including the laboratory QC results, will be submitted as an electronic data deliverable (EDD) in the laboratory's standard Excel format.

3.3.5 STORAGE

Documents and records associated with the project will be stored in electronic form in project files on Landau Associates' servers, and in hard copy in Landau Associates' files for the duration of the project. After completion of the project, hard copy files will be stored at Iron Mountain storage facility for at least 10 years after notification by EPA of completion of the ASAOC requirements.

3.4 DATA GENERATION AND ACQUISITION

This section provides an overview of the data collecting and handling procedures that will be implemented to ensure the integrity of the samples and quality of the resulting data. More details about these processes are included in the FSP (Section 2.0).

3.4.1 SAMPLING PROCESS DESIGN

The sampling design includes collection of whole water stormwater samples samples at LS431 to monitor compliance with the LTST interim goals identified in Section 1.5, and whole water and filtered solids samples from the LTST facility influent and effluent to evaluate the effectiveness of the treatment facility in removing PCBs and solids from the stormwater. These samples will be collected during varying precipitation conditions to evaluate the effectiveness of the LTST facility under a variety of storm flows. Solids samples from sediment traps located throughout the NBF storm drain system will provide data to continue stormwater characterization from individual storm drain laterals and from offsite flows. Solids samples from weir tanks, storage tanks, and sand filter vessels will provide data to be used for waste characterization and disposal procedures. Whole water samples from the re-routed King County stormwater line will provide data to be used to determine whether contaminant concentrations in King County water are adversely affecting the ability of the LTST system to meet interim goals at LS431, and to influence decisions on whether to re-route the water away from the LTST system. Whole water samples from the MBPS will provide data on the effectiveness of media filtration of stormwater, and will influence future treatment options at NBF.

3.4.2 SAMPLING METHODS

Whole water samples from LS431, KCBYP, and LSIV will be collected using an automated sampler. This automated sampler will allow collection of flow-weighted composite whole water samples by collecting aliquots of the stormwater more frequently at high flow rates and less frequently at low flow rates. The flow-weighted composite samples will be more representative of stormwater quality than discrete samples. Samples submitted to the analytical laboratory for analysis will be collected in the appropriate sample containers. Sample containers for the LTST facility whole water influent and effluent grab samples, and the weir tank, storage tank, and sand filter solid samples, will be provided by the laboratory. Whole water samples collected at LS431, from the re-routed King County line, and from the LSIV line will be submitted to the analytical laboratory in a pre-purchased 5-gallon glass carboy that is used in conjunction with the whole water automated sampling device. Carboys will be cleaned between sampling uses by the analytical laboratory. Sediment trap solids will be submitted to the laboratory in the Teflon® containers used to trap sediment, or in laboratory-supplied glass sample jars in the case of SL4-T5A(2). The Teflon® containers will be cleaned between sampling uses by the analytical laboratory. Filtered solids samples will be submitted to the laboratory in the filter placed inside a sealable plastic bag. New filters will be used for each sample and will be pre-weighed and numbered (when submitted for PCBs analysis) prior to use.

Any non-dedicated sampling equipment that will be reused will be decontaminated to avoid cross contamination between samples. Decontamination procedures are described in the FSP (Section 2.0)

3.4.3 SAMPLE HANDLING AND CUSTODY

The transportation and handling of samples will be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to accidental release of samples. Samples will be logged on a chain-of-custody form and will be kept on ice until delivery to the analytical laboratory. The chain-of-custody will accompany each shipment of samples to the laboratory. The storage temperatures and maximum holding times for physical/chemical analyses, presented in Table 4, will be strictly adhered to during each sampling event. Procedures for sample handling and transportation are described in greater detail in the FSP (Section 2.0).

3.4.4 ANALYTICAL METHODS

The results for the stormwater and solids sampling will be compared to the LTST interim goals [0.030 µg/L PCBs in stormwater, annual average of 0.018 µg/L PCBs in stormwater]; therefore, the methods used to analyze the samples must be able to detect analyte concentrations equal to or less than

the LTST interim goals. Laboratory methods and target reporting limits for the analysis of stormwater and stormwater solids that meet that meet these criteria are summarized in Table 3.

3.4.5 QUALITY CONTROL

Analytical laboratory control samples will be collected and/or analyzed to evaluate data precision, accuracy, representativeness, completeness, and comparability of the analytical results. A summary of the QC samples and the frequency at which they will be collected and/or analyzed is described in the following subsections.

3.4.5.1 Laboratory Control Samples

Laboratory control samples will be performed on whole water samples. A minimum of one laboratory control sample per 20 samples, not including QC samples, or one laboratory control sample per sample batch if fewer than 20 samples are obtained, will be analyzed for PCBs.

3.4.5.2 Laboratory Duplicates

Laboratory duplicates will be performed on whole water samples. A minimum of one laboratory duplicate per 20 samples, not including QC samples, or one laboratory duplicate sample per batch of samples if fewer than 20 samples are obtained, will be analyzed for PCBs. Laboratory duplicates will be performed using project samples. These analyses will be performed to provide information on the precision of chemical analyses. The laboratory duplicate will follow EPA guidance in the method.

3.4.5.3 Blind Field Duplicate

No blind field duplicate samples are planned.

3.4.5.4 Field Equipment Rinsate Blanks

Field equipment rinsate blanks consist of deionized water passed over decontaminated sampling equipment and transferred to sample containers for analysis at the laboratory. Except for the residual solids sampling at the weir and storage tanks and from the sand filter vessels, all stormwater and solids sampling will be conducted using disposable and/or dedicated equipment, thereby eliminating potential cross contamination between samples or sampling events via sample equipment. No field equipment rinsate blank samples will be collected. Because the residual solids samples are being collected for disposal characterization and are not being collected to meet the sampling objectives, no equipment rinsate blanks will be collected in conjunction with these samples.

3.4.5.5 Laboratory Matrix Spike

No laboratory MS samples are planned.

3.4.5.6 Laboratory Matrix Spike Duplicate

No laboratory matrix spike duplicate (MSD) samples are planned.

3.4.5.7 Laboratory Method Blanks

A minimum of 1 laboratory method blank per 20 samples, 1 every 12 hours, or 1 per batch of samples analyzed (if fewer than 20 samples are analyzed) will be analyzed for all parameters (except particle size and total solids) to assess possible laboratory contamination. Dilution water will be used whenever possible. Method blanks will contain all reagents used for analysis. The generation and analysis of additional method, reagent, and glassware blanks may be necessary to verify that laboratory procedures do not contaminate samples.

3.4.6 INSTRUMENT/EQUIPMENT/CONSUMABLES

All field equipment used for this project will be maintained and operated by Boeing or their consultant/contractor. Maintenance and calibration of the equipment is discussed in the FSP (Section 2.0). The analytical laboratory project manager is responsible for maintaining laboratory instruments in proper working order including routine maintenance and calibration, and training of personnel in maintenance and calibration procedures. Laboratory instruments will be properly calibrated with appropriate check standards and calibration blanks for each parameter before beginning each analysis. Instrument performance check standards, where required, and calibration blank results will be recorded in a laboratory logbook dedicated to each instrument. At a minimum, the preventive maintenance schedules contained in the EPA methods and in the equipment manufacturer's instructions will be followed.

3.4.7 DATA MANAGEMENT

All laboratory analytical results, including QC data, will be submitted in hard copy and electronically. Electronic format will include comma separated value (CSV) files that will be downloaded directly to an Access database. Following validation of the data, any qualifiers will be added to the database.

Hard copies of the laboratory chemical analytical reports will include the following:

- Case narrative, including adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies
- Sample analytical results
- Surrogate recoveries
- MS/MSD spike duplicate results
- Blank spike/blank spike duplicate results
- Laboratory duplicates
- Blank results
- Sample receipt forms (including signed, original chain-of-custody records)
- Analytical responsibility.

As described below in Section 4.2.1, Boeing will continue to prepare monthly progress reports and submit those reports to EPA by the fifth day of the following month (or the first subsequent work day if the fifth day of the month falls on a weekend or holiday). Monthly progress reports will continue to include information related to stormwater treatment system operation (e.g., total gallons of stormwater treated, rainfall data, any significant operational problems or system shutdowns) and will contain summary data tables of all validated stormwater analytical testing results that were received from the laboratory by the 24th of the month. Results of the Stage 2A data validation (described below in Section 3.6) will be documented in a technical memorandum, which will include a disk with electronic copies of chain of custody forms and laboratory data packages, and submitted to EPA with project monthly reports.

3.5 ASSESSMENT AND OVERSIGHT

Assessments used during implementation of the project will include daily communication and updates during field work and data quality review by the Landau Associates' project and task managers. Response actions to assess issues will be coordinated between these managers; the field manager; the project managers for Boeing and EPA; and involved subcontractors, as appropriate.

Although not planned, the EPA QA officer or designee may conduct an audit of the field activities for this project. The auditor will have the authority to stop work upon finding a significant condition that would adversely affect the quality and usability of the data. The Landau Associates' project manager will then have the responsibility for initiating and implementing response actions to address these deficiencies identified by the site audit. Once the response action(s) have been implemented, the EPA QA officer or designee may perform a follow-up audit.

If a QA/QC audit detects unacceptable conditions or data, the Landau Associates' project manager will be responsible for developing and initiating corrective action. Corrective action may include the following:

- Reanalyzing the samples, if holding times can be met
- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data and acknowledging the level of uncertainty or inaccuracy by flagging the data.

All corrective actions will be documented in writing and will be signed by the project manager and implementing manager.

3.6 DATA VALIDATION AND USABILITY

All stormwater and solids data will be verified and validated to determine the results are acceptable and meet the quality objectives described in Section 3.1 Prior to submitting a laboratory report, the laboratory will verify that all the data are consistent, correct, and complete, with no errors or omissions.

A Stage 2A validation, as defined in EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009), will be conducted for all of the data. The Stage 2A validation of the data will be performed by Landau Associates following the guidelines in the appropriate sections of the EPA *Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review* (EPA 1999 and 2004) and will include evaluations of the following:

- Chain-of-custody records
- Sample conditions upon receipt at the laboratory (including preservation, pH, and temperature
- Holding times
- Laboratory method blanks
- Surrogate recoveries
- Laboratory MSs and MSDs
- Blank spikes/laboratory control samples
- Blind field duplicates
- Laboratory duplicates
- Frequency of QC samples
- Corrective action records
- Completeness

- Overall assessment of data quality.

In the event that a portion of the data is outside the specified control limits, or sample collection and/or documentation practices are deficient, corrective action(s) will be initiated. Corrective action, as described in Section 3.5, will be determined by the field coordinator and Landau Associates' QA Officer in consultation with the Landau Associates' project and task managers and may include any of the following:

- Rejection of the data and resampling
- Qualification of the data
- Modified field and/or laboratory procedures.

The results of the data validation will be documented in a technical memorandum and submitted to EPA with monthly progress reports. Data qualification arising from data validation activities will be described in a data validation technical memorandum, rather than in an individual corrective action report, and included in the data base and any tables summarizing the data. The data validation technical memorandum will include a disk with electronic copies of chain of custody forms and laboratory data packages. This monthly reporting requirement is in effect until such time that EPA approves of alternate reporting requirements.

4.0 DATA ANALYSIS AND REPORTING

This section provides information on how the data generated by the sampling plan will be used, including analysis of laboratory data, comparing data to interim goals, analysis of flow monitoring data, calculation of the FWAAC of PCBs in stormwater discharge to Slip 4, and reporting requirements to EPA.

4.1 DATA ANALYSIS

Laboratory data from LS431 for each sampling event will be compared to the interim goal of 0.030 µg/L PCBs for discharge to Slip 4 as stated in the ASAOC and in this document. LTST influent and effluent data will be compared to determine CESF system performance and will influence any operational changes to the system, if necessary.

Sediment trap data will be used to continue evaluation of individual storm drain line inputs, and may influence the priority and locations of future source investigation and control activities and remedial actions. Weir tank, storage tank, and sand filter media sampling results will be used for waste characterization and will affect disposal procedures.

Flow data and sampling results from the re-routed King County stormwater line will be used to determine whether flow volumes and contaminant concentrations in King County water are adversely affecting the ability of the LTST system to meet interim goals at LS431. Those data will influence decisions on whether to bypass King County stormwater away from the NBF LTST system and re-route that stormwater directly to Slip 4.

Laboratory data from MBPS sampling will be used to evaluate the effectiveness of media filtration of stormwater. This data will influence future stormwater treatment options at NBF.

4.1.1 CALCULATION OF THE ANNUAL AVERAGE CONCENTRATION OF PCBS IN STORMWATER

The LTST sampling program discussed in this SAP and summarized in Table 2 will be conducted for the one-year period from November 2011 through October 2012. The data generated from those 12 months of sampling will be evaluated to calculate the estimated FWAAC of PCBs in stormwater discharged from NBF to Slip 4. That estimate will then be compared against the alternative solids interim goal of 0.018 µg/L (Jones et al. 2011). The method for performing that comparison calculation is summarized in the addendum to the Panel technical memorandum regarding monitoring recommendations (Jones et al. 2012). The annual average PCBs concentration will be calculated using that method.

4.1.2 VALIDATION OF NON-DETECT ASSUMPTION

As discussed in the Panel technical memorandum regarding monitoring recommendations (Jones et al. 2012), for the purpose of the flow-weighted annual average concentration calculation for PCBs, non-detect results at the CESF discharge will be treated as zero (0 µg/L). This assumption will be validated using filtered solids PCBs data and TSS data collected at the CESF discharge. The filtered solids PCBs data along with TSS data and measurements of the volume of water passing through the CESF effluent filter can provide an estimate of total PCBs concentrations in treated effluent stormwater:

If it appears that the non-detect assumption results in a significant overestimate or underestimate of PCBs concentrations in the CESF discharge, this assumption will be re-evaluated.

4.1.3 TOTAL ANNUAL DISCHARGE

The LTST design was, in small part, based on a calculation of annual discharge from the lift station of 1,080 acre-ft per year (Jones et al. 2011) during average annual local climate conditions of approximately 36 inches of precipitation. Continuous 1-minute interval flow data from the LS431 flow logger compiled over a one-year-long period and the measured annual precipitation will be compared to the estimated average annual discharge volume and average annual precipitation to determine the appropriateness of this volume, as well as the percentage of stormwater flow treated, for the LTST design basis. The purpose of this assessment is to evaluate design assumptions; we do not anticipate or propose that this data be used to recalibrate the runoff model used in the initial annual discharge calculation.

4.2 REPORTING

There will be two primary methods of reporting the sampling results and LTST system performance to EPA. Those two reporting methods will be the monthly progress report and the annual LTST evaluation report. In addition, performance monitoring results of the MBPS will be summarized in a final summary report. A project schedule that includes due dates for these documents can be found in Table 5.

4.2.1 MONTHLY PROGRESS REPORT

As indicated above in Section 3.4.7, Boeing will continue to prepare monthly progress reports and submit those reports to EPA by the 5th day of the following month (or the first subsequent work day if the 5th day of the month falls on a weekend or holiday). Monthly progress reports will continue to include information related to stormwater treatment system operation (e.g., total gallons of stormwater treated, rainfall data, any significant operational problems or system shutdowns) and will contain summary data tables of all validated stormwater analytical testing results that were received from the

laboratory by the 24th of the month. Results of the Stage 2A data validation will be documented in a technical memorandum, which will include a disk with electronic copies of chain of custody forms and laboratory data packages, and submitted to EPA with project monthly reports.

Boeing will continue to provide monthly progress reports to EPA for the remainder of 2011 and for 2012. A new summary table will be added to the front of the progress report in response to EPA's request to have an "executive summary/evaluation" of information on PCBs concentrations and flow and to be able to more quickly assess the LTST performance versus design expectations. An example of this summary table to be provided at the beginning of each monthly progress is provided below.

EXAMPLE MONTHLY PROGRESS REPORT SUMMARY TABLE (a)

Average Annual Design Estimates and Applicable Water Quality Criteria for North Boeing Field:		
Precipitation (b)	36	inches
Amount of Stormwater Discharged (b)	352	million gallons
Percentage of Stormwater Treated (b)	59	percent
Marine chronic water quality criterion, PCBs	0.03	µg/L
Alternative solids interim goal (annual average), PCBs (c)	0.018	µg/L
This Month (1/1 through 1/31/12):		
Precipitation Measured	5.61	inches
Amount of Stormwater Treated (d)	17.20	million gallons
Amount of Stormwater Discharged to Slip 4 (d)	29.55	million gallons
Percentage of Stormwater Treated (d)	58	percent
Most Recent PCB Compliance Point Testing Validated Results:		
Total PCBs in routine LS431 composite sample (12/08/11)	< 0.010	µg/L
Total PCBs in LS431 storm event composite sample (12/28/11)	< 0.010	µg/L
Since November 1, 2011 (e):		
Precipitation Measured	12.96	inches
Amount of Stormwater Treated (f)	50.53	million gallons
Amount of Stormwater Discharged to Slip 4 (f)	68.79	million gallons
Percentage of Stormwater Treated (f)	73	Percent
Most Recent Media Bed Pilot Study (MBPS) Validated Results:		
Total PCBs in Media Bed influent grab sample (12/28/11)	0.040	µg/L
Total PCBs in Bed A (GAC mix) effluent grab sample (12/28/11)	<0.010	µg/L
Total PCBs in Bed B (walnut shell mix) effluent grab sample (12/28/11)	<0.010	µg/L

(a) The word "stormwater" in this table refers to all liquids, including any particles dissolved therein, in the form of base flow, stormwater runoff, snow melt runoff, and surface runoff and drainage, as well as all solids that enter the storm drainage system.

(b) Average annual precipitation from National Climatic Data Center (NCDC) rain gauge data from the Seattle-Tacoma International Airport (SeaTac) over the period of record October 1968 through October 2008. Rainfall and stormwater runoff estimates are described in the Final Pre-Design Technical Memorandum (Geosyntec/Landau Associates, April 2011)

(c) The basis for the alternative solids interim goal is described in the technical memorandum, *Alternative Interim Goal Recommendations for Protection of Slip 4 Sediment Recontamination, North Boeing Field, Seattle, Washington*, prepared for The Boeing Company by Jones et al., dated December 12, 2011. The monitoring approach overview for the alternative goal of 0.018 µg/L total PCBs in water, including how whole water PCB concentrations data and continuous flow measurements will be used to calculate the flow-weighted annual average concentrations, is described in the technical memorandum, *Amended Monitoring Approach Recommendations for North Boeing Field Long-Term Stormwater Treatment System, North Boeing Field, Seattle, Washington*, prepared for The Boeing Company by Jones et al., dated January 10, 2012.

(d) See description later in this report regarding the need to correct volume measurements due to loss of data during transfer using the programmable logic controller (PLC).

(e) The LTST system began operating on October 28, 2011; however, for ease of monthly tracking purposes, cumulative reporting of the system began on November 1, 2011.

(f) The estimated values for total amount of stormwater treated and discharged since startup are based on flow totalizer readings that are manually collected (e.g., prior to being recorded and transferred electronically using the PLC); therefore, the totals are expected to be reasonably accurate. The estimated total stormwater flow during the first few days of operation, October 28-31, 2011, (estimated by Clear Water) was not included in this volume estimate.

In addition, monthly progress reports will include a Sampling Progress Summary Table that summarizes required sampling and the dates sampling has been completed, to facilitate tracking of LTST sampling progress. An example of this monthly progress report table is included as Table 6 in this SAP. Other than the additions described above, the monthly progress reports will continue to follow the same general format as that of previous monthly progress reports submitted to EPA. The table of contents of these reports is as follows:

- Summary Table
- Actions Completed
  - Construction Activities
  - Ongoing Stormwater Treatment and System Monitoring
  - Compliance with Performance Standards
  - Source Control Activities
  - Document Submittals/Review
  - Problems Encountered
- Analytical Data Received
- Schedule of Actions to be Performed
- Anticipated Problems
- Planned Resolutions of Past or Anticipated Problems.

At the end of 2012, Boeing will propose a reporting frequency that could range from continued monthly progress reports, to reduction in frequency of progress reports to quarterly, to discontinuance of progress reports entirely with preparation of annual performance evaluation reports. The recommendation for future reporting will depend on the results of the Year 1 annual stormwater monitoring data.

4.2.2 MEDIA BED PILOT STUDY SUMMARY REPORT

Boeing will prepare and submit to EPA a written summary report of the performance monitoring results from the MBPS. The revised pilot study completion date is estimated to be July 1, 2012 with the final study report to be completed within 30 days from the receipt of final lab results. Assuming a 4-week lab processing period and data QA/QC, it is estimated that the final MBPS performance evaluation summary report would be submitted to EPA by August 15, 2012. If the minimum number of stormwater sampling events (five) is not met by the estimated completion date, the study will be extended into the early part of the 2012-2013 wet season. If this occurs, a

revised schedule for the completion of the MBPS performance evaluation report will be prepared and submitted to EPA. The schedule for this report is also listed in Table 5.

4.2.3 ANNUAL LTST PERFORMANCE EVALUATION REPORT

Boeing will prepare a written annual LTST performance evaluation report to submit to EPA that provides a summary and evaluation of all applicable flow and analytical data. LTST data will be evaluated consistent with the approach detailed in the technical memorandum to EPA regarding monitoring recommendations (Jones et al. 2012). The annual LTST performance evaluation report will present the results of the annual calculations, from November 2011 through October 2012, including:

- Total volume of stormwater discharged to Slip 4 from NBF
- Total precipitation for the 12-month period
- Total volume of stormwater treated by the LTST CESF system
- The overall percentage of the stormwater discharged to Slip 4 from NBF that was treated, and comparison to original design basis of an average 59 percent stormwater volume capture
- A summary of the point of compliance PCBs sampling results and compliance with the 0.030 µg/L marine chronic water quality criterion interim goal
- Presentation of the calculations of the FWAAC for total PCBs in stormwater discharged from NBF to Slip 4, as detailed in the technical memorandum to EPA regarding monitoring recommendations (Jones et al. 2012), and comparison against the 0.018 µg/L alternative solids interim goal.

The annual LTST performance evaluation report will also provide recommendations for modifications to the compliance monitoring program and methodology. The report will also clarify whether there are monitoring parameters, such as flow/volume from the King County line, and/or flow/volume from the Lift Station, that would be recommended for continued annual monitoring into the future. Boeing has purchased the FLO-DAR sensor and flow logger installed at the compliance point; ISCO composite sampling units for LS431, KCBYP, and LSIV; and the weir and transducer/datalogger for King County bypass line flow monitoring, so that equipment will be available for future long-term use at NBF. It is possible that there could be recommendations for the need to continue monitoring that equipment or possible benefits of redeploying that equipment to other locations.

A draft version of the annual LTST performance evaluation report will be submitted by Boeing to EPA by December 3, 2012 for review, which allows for approximately one month for final October 2012 data to be received from the laboratory and to perform the annual evaluation calculations described above in Section 4.1. Boeing, EPA, and their respective consultants will attend a meeting the following week on December 10, 2012, to discuss the results of the annual performance evaluation and the recommendations for future stormwater monitoring so that resolution of stormwater sampling parameters and frequency

(see Table 2) can be agreed upon prior to January 2013. A final version of the annual LTST performance evaluation report will be submitted by Boeing to EPA by December 17, 2012. These dates are also included in Table 5.

* * * * * * *

This document has been prepared under the supervision and direction of the following key staff.

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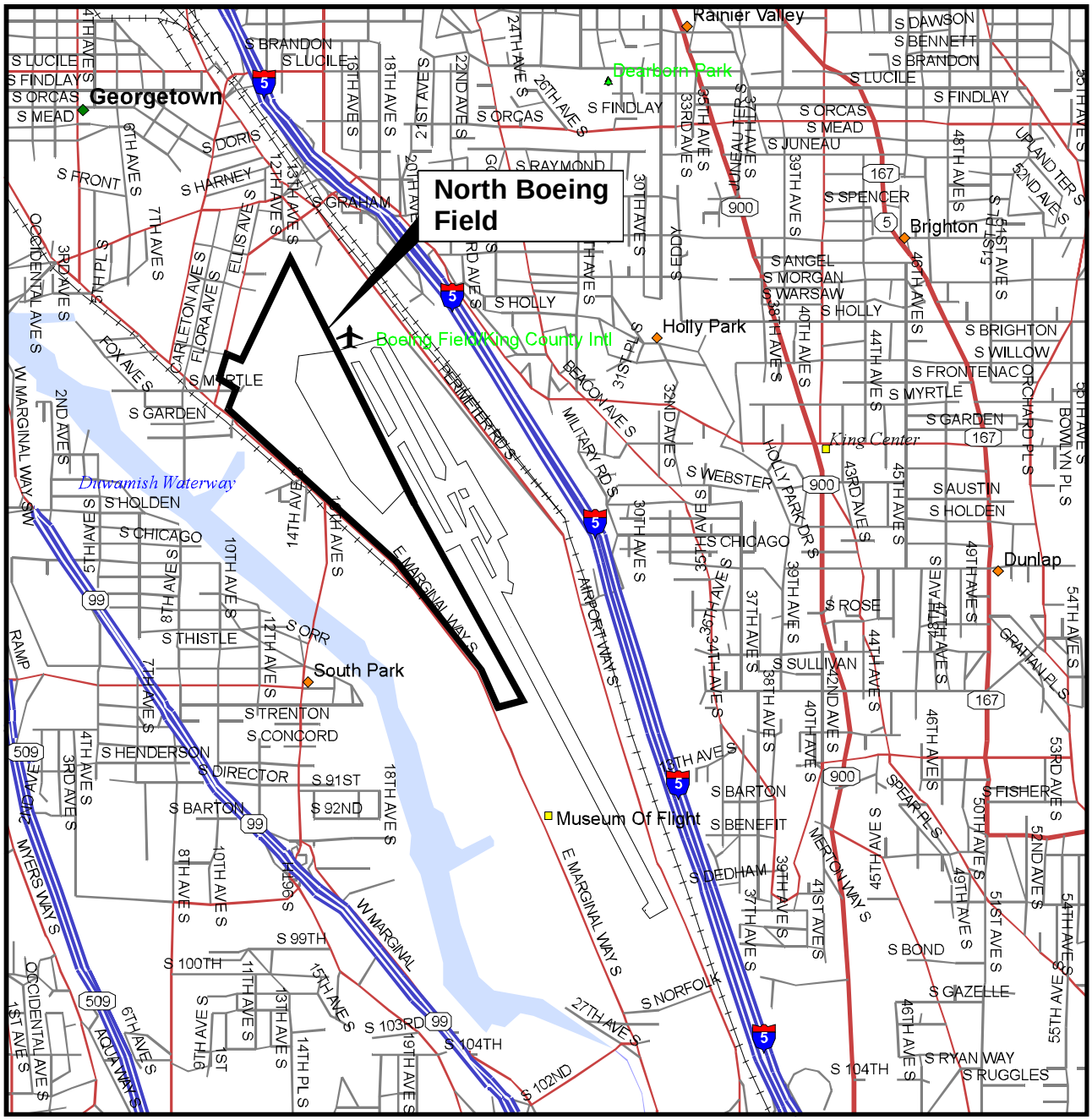

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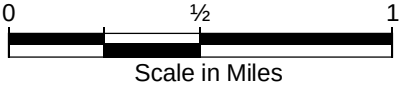

Flume Realignment| V:\025\082\099\SD Structure & Surface Solids Investigation\Figure 1.cdr 8/29/2009

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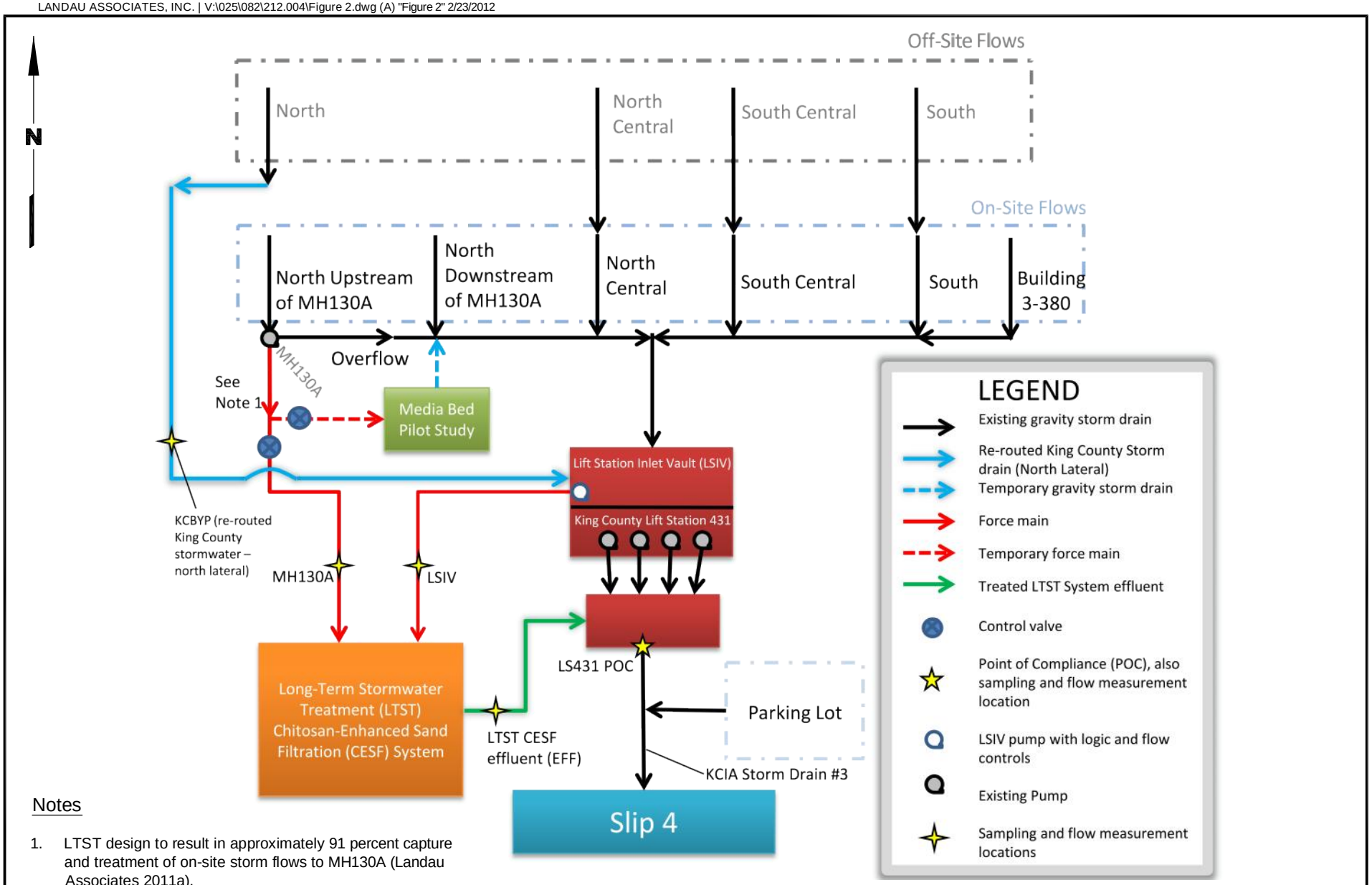
North Boeing Field Seattle, Washington	**Vicinity Map**	Figure 1



Notes

1. LTST design to result in approximately 91 percent capture and treatment of on-site storm flows to MH130A (Landau Associates 2011a).

2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Adapted from Figure 1 (Jones et. al 2012)

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North Boeing Field Seattle, Washington	**Schematic Diagram of LTST System Components**	Figure 2

Y:\Projects\025082\212.004\Figure 3.mxd 2/23/2012 NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Sediment Trap
- Flow-weighted Water Sampling Location (using an ISCO autosampler)
- NBF Storm Drain Structures
- Short-Term Stormwater Treatment Facility
- North Lateral Drain Line
- North-Central Lateral Drain Line
- South-Central Lateral Drain Line
- South Lateral Drain Line
- Drainage from Building 3-380 Area
- Drainage from parking lot area

0 160 320

Scale in Feet

Storm Drain System Data Source: SAIC

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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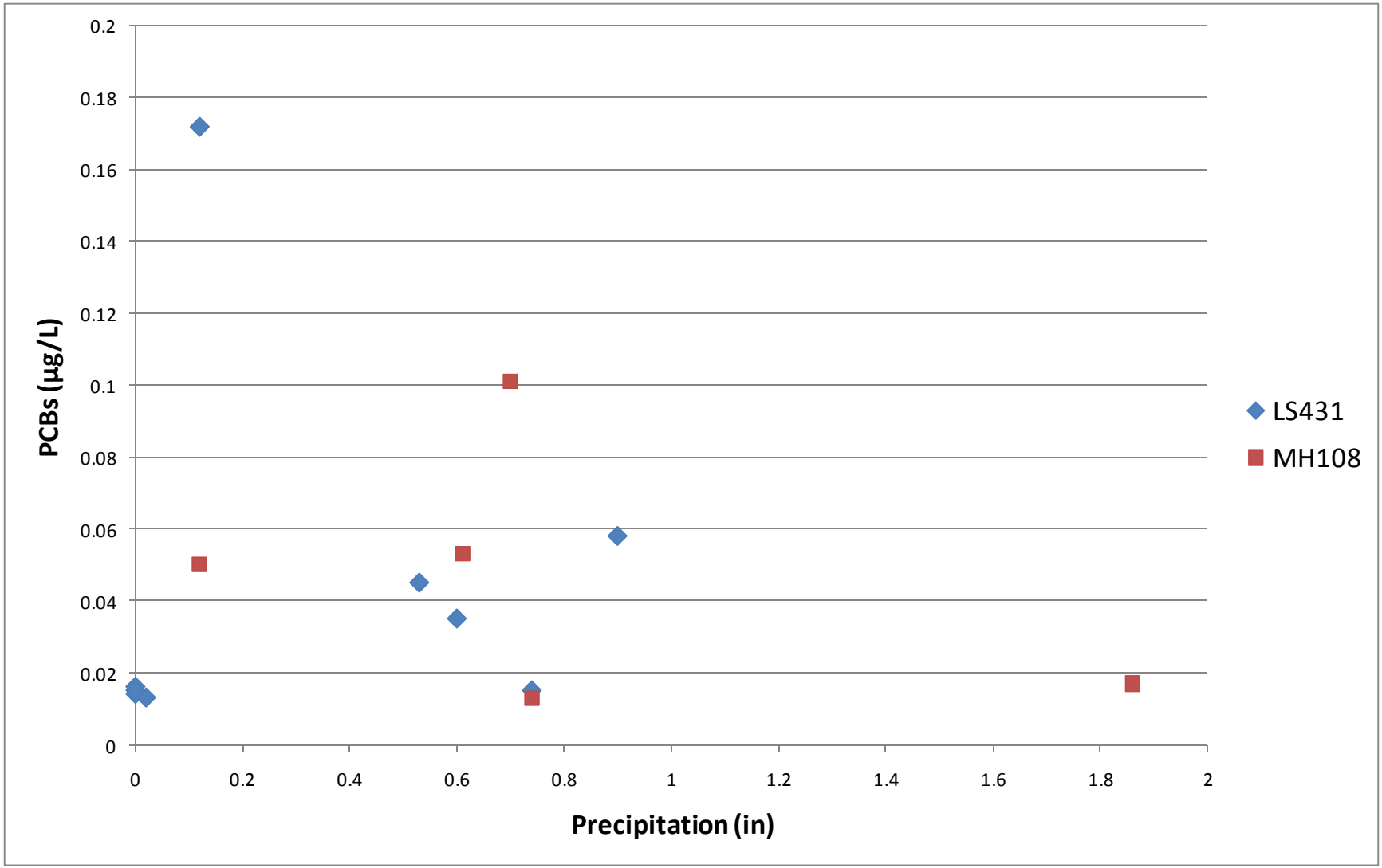
North Boeing Field
Seattle, Washington

STST Sampling Locations and Pre-LTST Storm Drain Configuration

Figure 3



Note: Data Presented is From Sampling Events Conducted From November 2010 to March 2011.

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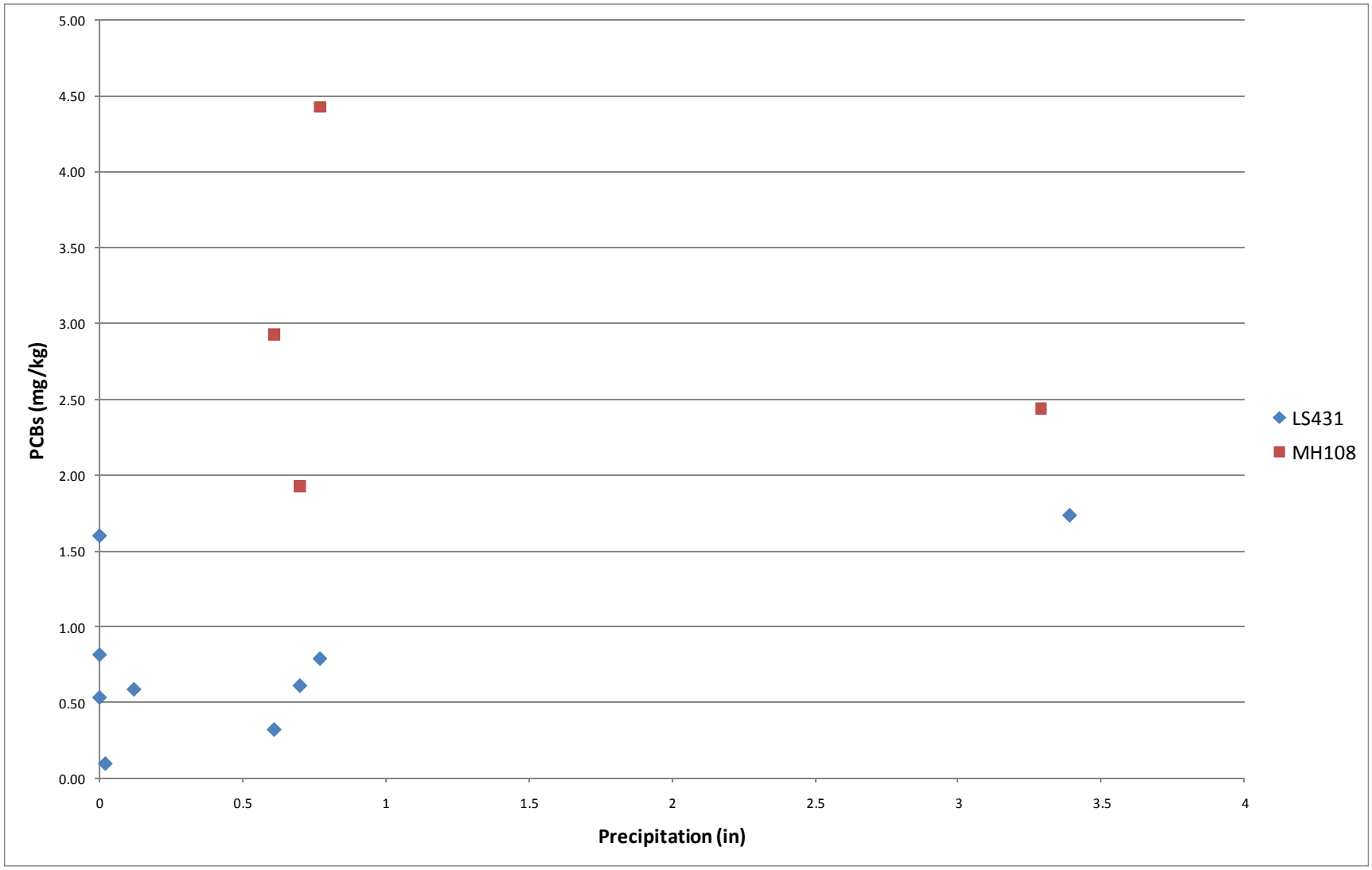
North Boeing Field Seattle, Washington	**Whole Water PCB Concentrations vs. Precipitation**	Figure 4



Note: Data Presented is From Sampling Events Conducted From November 2010 to March 2011.

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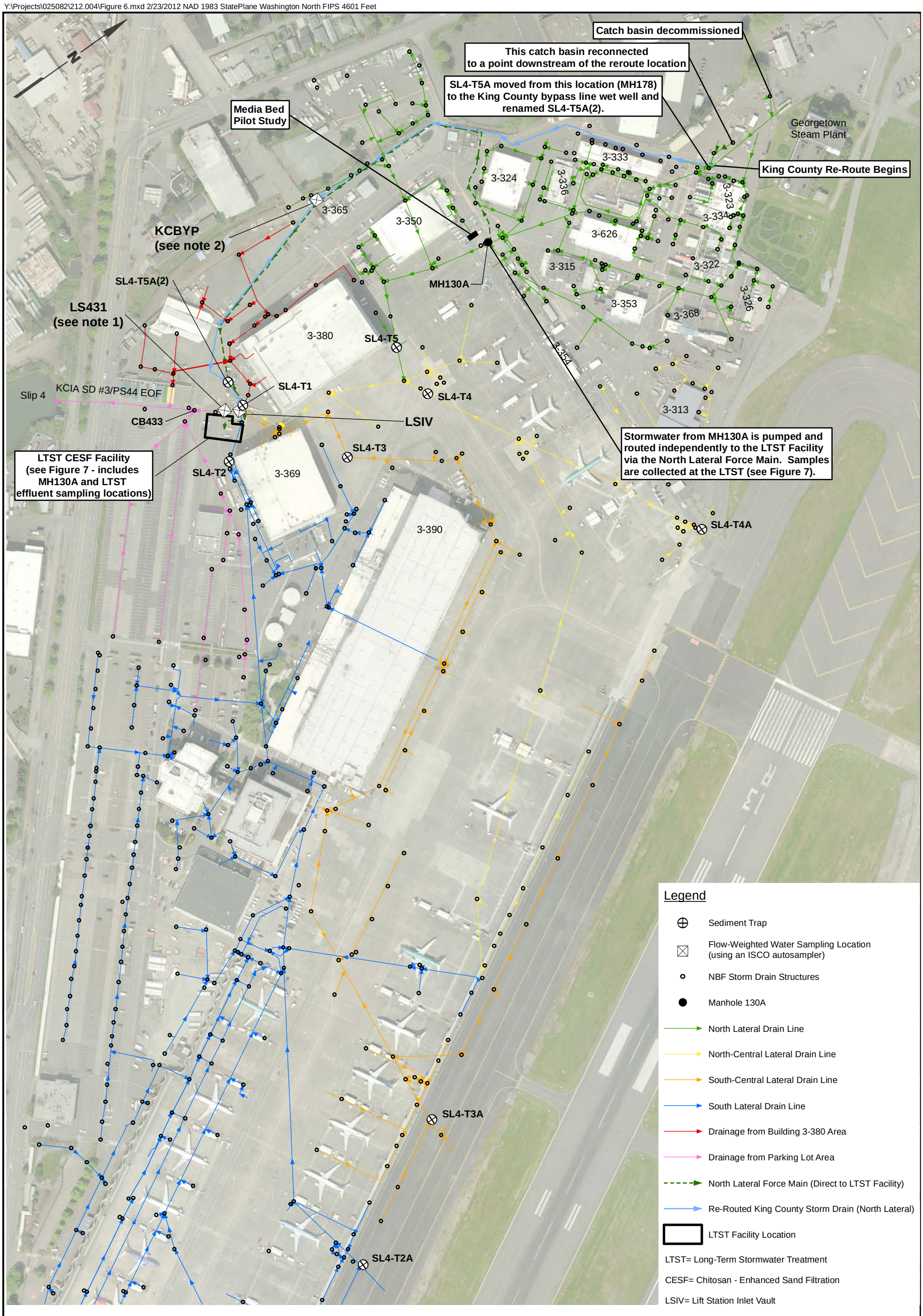
North Boeing Field
Seattle, Washington

Filtered Solids PCB Concentrations vs. Precipitation

Figure
5

Y:\Projects\025082\212.004\Figure 6.mxd 2/23/2012 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Notes:

1. LS431 is the Point of Compliance (POC).
2. KCBYP is the sampling location for re-routed King County stormwater - north lateral.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Storm Drain System Data Source: SAIC

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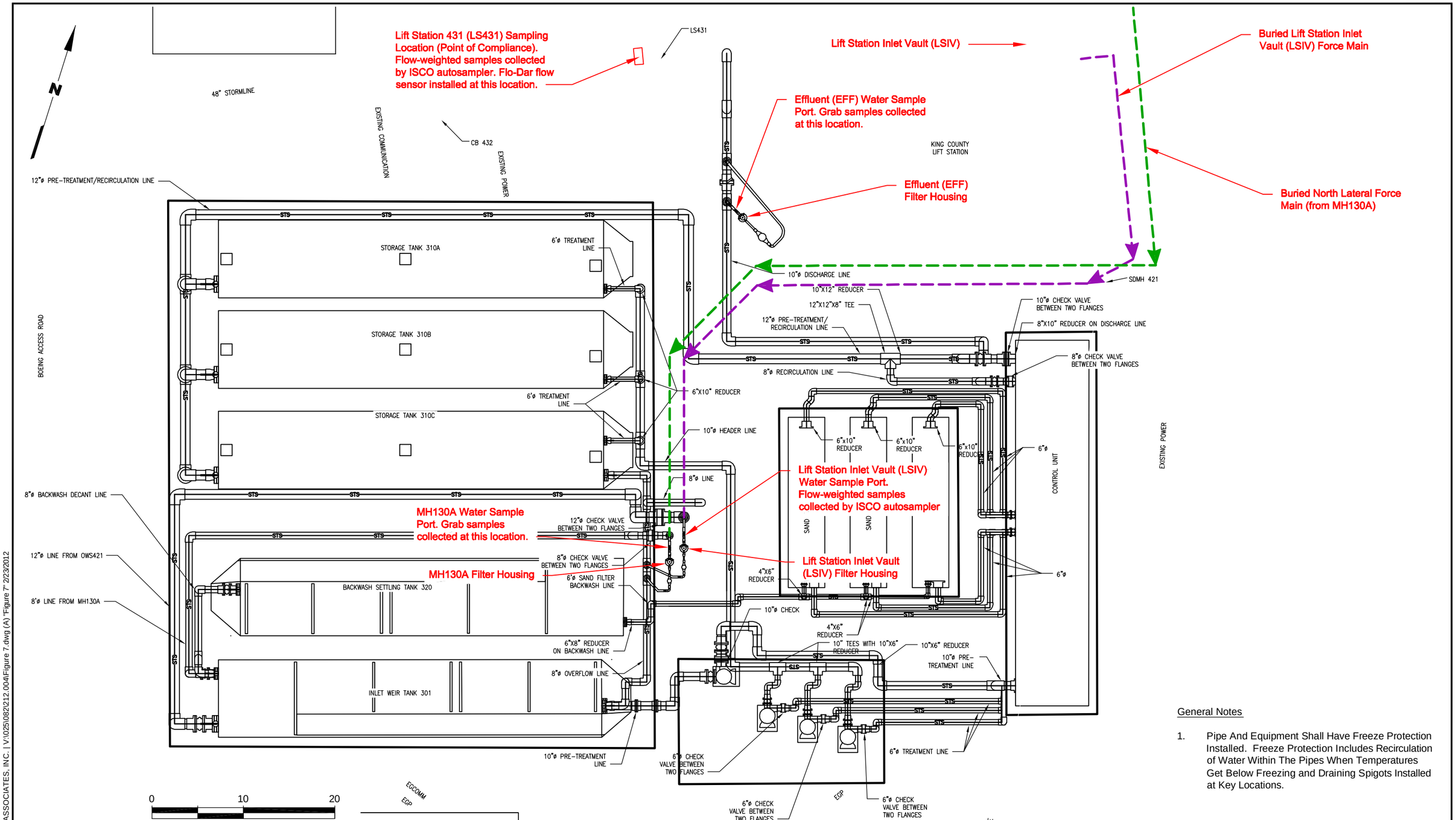
North Boeing Field Seattle, Washington	**Updated Storm Drain System and LTST Sampling Locations**	Figure 6



Source: Boeing Treatment System Piping Layout Plan M502 Record Drawing Dated 12/08/11

General Notes

1. Pipe And Equipment Shall Have Freeze Protection Installed. Freeze Protection Includes Recirculation of Water Within The Pipes When Temperatures Get Below Freezing and Draining Spigots Installed at Key Locations.

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

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North Boeing Field Seattle, Washington	**LTST Sampling Locations**	Figure 7

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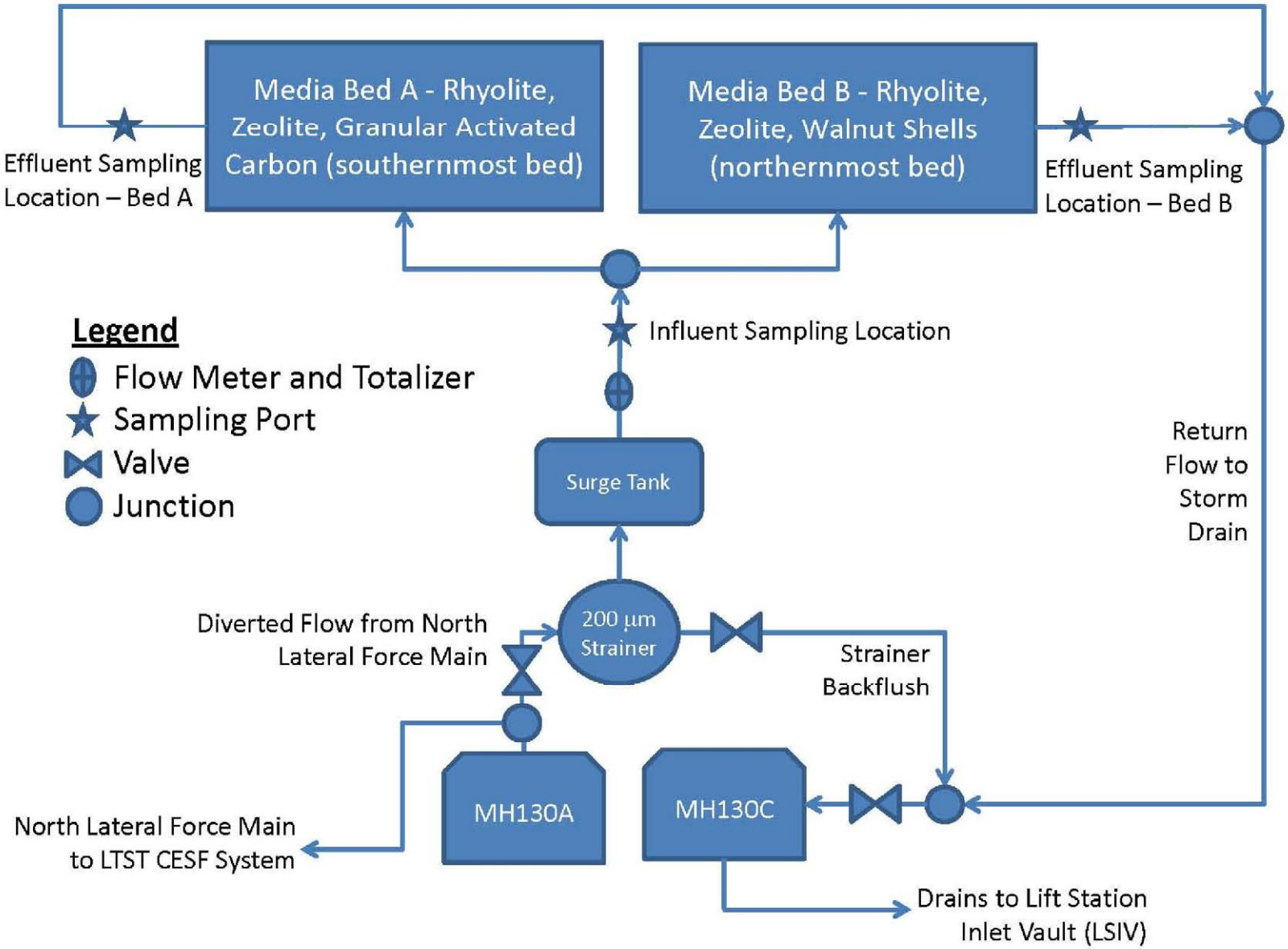

Source: Geosyntec Consultants

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North Boeing Field Seattle, Washington	**Schematic** **Media Bed Pilot Study**	Figure 8

TABLE 1
LS431 AND MH108 STORMWATER ANALYTICAL RESULTS
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Sample Location ID	NBF-LS431-111710-W	NBF-LS431-113010-W	NBF-LS431-121110-W	NBF-LS431-012111-W	NBF-LS431-012811-W	NBF-LS431-030911-W	NBF-LS431-032111-W	NBF-MH108-111710-W	NBF-MH108-113010-W	NBF-MH108-121210-W	NBF-MH108-012111-W	NBF-MH108-030911-W
Sample Collection Date	**11/17/10**	**11/30/2010**	**12/11/2010**	**01/21/2011**	**01/28/2011**	**03/09/2011**	**03/21/2011**	**11/17/10**	**11/30/2010**	**12/12/2010**	**01/21/2011**	**03/09/2011**
PCBs in Whole Water (a)												
Total PCBs (µg/L)	**0.172**	**0.015**	**0.058**	**0.035**	0.015 U	**0.045**	**0.013**	**0.050**	**0.013**	**0.017**	**0.053**	**0.101**
PRECIPITATION (b)												
Amount During Test (inches)	0.12	0.74	0.90	0.60	0	0.53	0.02	0.12	0.74	1.86	0.61	0.70

Sample Location ID	NBF-LS431A-111710-S	NBF-LS431A-113010-S	NBF-LS431A-121210-S	NBF-LS431A-012111-S	NBF-LS431A-012811-S	NBF-LS431A-030911-S	NBF-LS431A-032111-S	NBF-MH108A-111710-S	NBF-MH108A-113010-S	NBF-MH108A-121210-S	NBF-MH108A-012111-S	NBF-MH108A-030911-S
Sample Collection Date	**11/17/10**	**11/30/10**	**12/12/10**	**01/21/2011**	**01/28/2011**	**03/09/2011**	**03/21/2011**	**11/17/10**	**11/30/10**	**12/12/10**	**01/21/2011**	**03/09/2011**
PCBs in Filtered Solids												
Calculated Concentration of Total PCBs in Filtered Solids, Dry Weight (mg/kg)	**0.58**	**0.79**	**1.7**	**0.32**	**0.81**	**0.61**	**0.09**	NA	**4.4**	**2.4**	**2.9**	**1.9**
PRECIPITATION (b)												
Amount During Test (inches)	0.12	0.77	3.39	0.61	0	0.70	0.02	0.12	0.77	3.29	0.61	0.70

NA = Not Analyzed.
Bold = Detected compound.
U = Indicates the compound was undetected at the reported concentration.

(a) Total PCBs is the sum of detected aroclors or, if no aroclors are detected, is the largest reporting limit.
(b) Precipitation data is from the NOAA Quality Controlled Local Climatological Data for Station 24234/BFI - SEATTLE: BOEING FIELD/KING COUNTY INTERNATIONAL AIRPORT.

TABLE 2
LONG-TERM REMOVAL ACTION SAMPLING AND ANALYSIS SUMMARY
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Location	Sample Type	Sample Media	Frequency (a)	Parameters	Analytical Methods
Lift Station (LS431) (Compliance Monitoring Point)	Whole Water (flow-weighted composite)	Stormwater (b)	Monthly routine sampling (multiple day sampling period), November 2011 - December 2012; Five additional 24-hour storm events of ≥0.5 inch precipitation, November 1, 2011 - October 31, 2012	PCBs	EPA Method 8082
				TSS	SM 2540D
				Total & Dissolved Metals (k)	EPA Methods 200.8, 7470 for Hg
				SVOCs (k)	EPA Method 8270D
				PAHs (k)	EPA SIM Method 8270D
				PSD	Ecology TAPE Method (m)
			To be determined (c), starting January 2013	PCBs	EPA Method 8082
				TSS	SM 2540D
				Total & Dissolved Metals (k)	EPA Methods 200.8, 7470 for Hg
				SVOCs (k)	EPA Method 8270D
				PAHs (k)	EPA SIM Method 8270D
				PSD	Ecology TAPE Method (m)
Long-Term Stormwater Treatment System	Whole Water Influent from MH130A (grab)	Stormwater (b)	Twice monthly in 2011, monthly in 2012 (d); To be determined (c) starting January 2013	PCBs	EPA Method 8082
				TSS	SM 2540D
				PSD	Ecology TAPE Method (m)
	Whole Water Influent from Lift Station Inlet Vault (composite)		Twice monthly in 2011, monthly in 2012 (d); To be determined (c) starting January 2013	PCBs	EPA Method 8082
				TSS	SM 2540D
				PSD	Ecology TAPE Method (m)
	Whole Water Effluent (grab)		Twice monthly in 2011, monthly in 2012 (d); To be determined (c) starting January 2013	PCBs	EPA Method 8082
				TSS	SM 2540D
				PSD	Ecology TAPE Method (m)
	Whole Water Effluent (grab) (e)		Twice monthly (f)	Residual Chitosan	Ecology approved procedure (g)
	Filtered Solids Influent from MH130A	Stormwater Solids	Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (c) starting January 2013	PCBs	EPA Method 8082
			Monthly through December 2012; To be determined (c) starting January 2013	PSD	PSEP-PS (j)
				Metals (l)	EPA Methods 6010/6020, 7471 for Hg
	Filtered Solids Influent from Lift Station Inlet Vault		Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (c) starting January 2013	PCBs	EPA Method 8082
			Monthly through December 2012; To be determined (c) starting January 2013	PSD	PSEP-PS (j)
				Metals (l)	EPA Methods 6010/6020, 7471 for Hg
	Filtered Solids Effluent (n)		Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (c) starting January 2013	PCBs	EPA Method 8082
Media Bed Pilot Study: Influent, Effluent from Cell A, and Effluent from Cell B	Whole Water (grab)	Stormwater (b)	Five storm events of >0.2 inch precipitation and five dry weather events by July 1, 2012	PCBs	EPA Method 8082
				TSS	SM 2540D
				PSD	Ecology TAPE Method (m)
				Total Organic Carbon	SM 5310B or SM 5310C
				Dissolved Organic Carbon	SM 5310B or SM 5310C

TABLE 2
LONG-TERM REMOVAL ACTION SAMPLING AND ANALYSIS SUMMARY
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Location	Sample Type	Sample Media	Frequency (a)	Parameters	Analytical Methods
Sediment Traps [SL4-T1, SL4-T2, SL4-T3, SL4-T4, SL4-T4A, SL4-T5, SL4-T5A(2) (q)] (SL4-T5A to be moved from MH178 to King County bypass line wet well)	Annual Composite, Homogenized	Stormwater Solids	Annually (h)	PCBs	PSDDA Method 8082
				SVOCs	PSDDA SVOCS SW8270D
				Total Metals	Method 6000-7000
				NWTPH-Dx	NWTPH-Dx (with acid silica gel cleanup)
				Total Organic Carbon	Plumb 1981
				Percent Total Solids	EPA 160.3 (modified for solids)
				PSD	PSEP-PS (j)
Weir and Storage Tanks, Sand Filter Media	Composite from 3 or More Grab Samples from Tank or Filter Vessel (grab locations to result in both horizontal and vertical compositing)	Settled Solids	As Needed (i)	PCBs	EPA Method 8082
				SVOCs	EPA Method 8270D
				Metals	TCLP and/or Method 6000-7000
				Petroleum Hydrocarbons	NWTPH-Dx and NWTPH-Gx
Re-routed King County Stormwater - North Lateral (KCBYP) (manhole west of 3-365 building)	Whole Water (flow-weighted composite)	Stormwater (b)	Parallel w/ LS431 sampling: half of the routine monthly events, November 1, 2011 - December 31, 2012, and two storm events, November 1, 2011 - October 31, 2012	PCBs	EPA Method 8082
				TSS	SM 2540D
				Total & Dissolved Metals (k)	EPA Methods 200.8, 7470 for Hg
				PSD	Ecology TAPE Method (m)
			To be determined (c), starting January 2013	PCBs	EPA Method 8082
				TSS	SM 2540D
				Total & Dissolved Metals (k)	EPA Methods 200.8, 7470 for Hg
				PSD	Ecology TAPE Method (m)
Contingency (o): Offsite Stormwater - Other Laterals (SL4-T2A, SL4-T3A, SL4-T4A)	Whole Water (flow-weighted composite)	Stormwater (b)	Two events per location (p), parallel w/ LS431 sampling	PCBs	EPA Method 8082
				TSS	SM 2540D
				Total & Dissolved Metals (k)	EPA Methods 200.8, 7470 for Hg
				PSD	Ecology TAPE Method (m)

(a) Monitoring plan beginning November 2011. All sampling and analysis will be performed by Boeing/Landau Associates and Boeing's contract laboratory, unless otherwise noted.
(b) Stormwater is defined as all liquids, including any particles dissolved therein, in the form of base flow, storm water runoff, snow melt runoff, and drainage, as well as all solids which enter the storm drain system.
(c) For sampling in 2013, Boeing will propose to EPA a sampling frequency and sampling parameters based on the results from the November 2011 - October 2012 sampling events.
(d) One LTST system influent/effluent sampling event per month will be performed during the monthly lift station (LS431) sampling event.
(e) Whole water effluent grab samples for Residual Chitosan testing will be collected from the treatment facility effluent sample port by Clear Water Compliance Services.
(f) Residual chitosan was never detected in weekly effluent samples from the STST facility, and there is extremely low probability of chitosan being able to pass through the sand filters.
(g) Per CESF system O&M Manual, Ecology approves procedures for residual chitosan testing for each chitosan distributor. Testing will be conducted in accordance with distributor's approved procedures.
(h) Depending on the quantity of solids collected in the sediment traps, the laboratory may not be able to analyze all parameters. Laboratory will weigh and report total mass of solids collected per sample location. Analysis of parameters will be prioritized in the order listed. Sediment trap sampling will continue indefinitely until such time that additional data collection is no longer needed to support source control efforts.
(i) The thickness of accumulated solids (sludge) in the weir tank will be checked at least once per month to determine if solids should be removed. Prior to solids removal, a composite sample of the solids will be collected and analyzed for waste characterization purposes. Composite sampling will also be done for used sand filter media prior to disposal. Subsequent waste characterization will not be necessary unless contaminant concentrations in the LTST influent change significantly.
(j) Grain size fractionation/particle size distribution for solids samples will be conducted using Puget Sound Estuary Protocols (PSEP) method. When low volumes of sample are collected, grain size fractionation will be accomplished using sedigraph for material less than 62.5 µm.
(k) If sufficient volume is available, LS431 whole water samples will be analyzed for total and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), SVOCs, and PAHs to support Ecology's NBF-GTSP remedial investigation activities.
(l) When sufficient volume is available, LTST filtered solids samples will be analyzed for metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) to support Ecology's NBF-GTSP remedial investigation activities.
(m) The preferred method for particle size distribution (PSD) will continue to be evaluated as the results are received.
(n) From experience with STST filtered solids collection, there will not be enough solids collected in the LTST effluent filter for metals or PSD analysis. Therefore, we do not propose to filter for metals or PSD analysis at the LTST effluent.
(o) Sampling of stormwater from offsite KCIA sources may be performed to assess KCIA stormwater impact on compliance with EPA Interim Goals.
(p) Sampling of some or all events at these locations may not be feasible, as the locations are on the flightline and safety concerns and regulations may interfere with sampling activities.
(q) Location SL4-T5A(2) does not have a bracket and Teflon container like the other sediment trap locations; SL4-T5A(2) shall be sampled by collecting solids from the bottom of the wet well, which collects solids behind a permanent weir.

TABLE 3
ANALYTICAL METHODS AND TARGET REPORTING LIMITS
LONG-TERM STORMWATER TREATMENT SAMPLING
NORTH BOEING FIELD - SEATTLE, WASHINGTON

		Target Reporting Limits (b)							
		Water		Filtered Solids		Unfiltered Solids			
	Analytical	ARI	Lancaster	ARI	Lancaster	Sediment Traps		Residual Solids	
Analyte	Method (a)	RL (c)	LOQ (d)	RL (c)	LOQ (d)	ARI RL (c)	Lancaster LOQ (d)	ARI RL (c)	Lancaster LOQ (d)
PCBs									
Aroclor 1016	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1221	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1232	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1242	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1248	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1254	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1260	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	10 µg/kg	10 µg/kg	33 µg/kg	17 µg/kg
Aroclor 1262	EPA Method 8082 (e)	0.01 µg/L	0.01 µg/L	0.5 µg	0.5 µg	--	--	--	--
CONVENTIONALS									
Total Suspended Solids	SM 2540	1 mg/L	3 mg/L	--	--	--	--	--	--
Total Organic Carbon	SM 5310B / SM 5310C / Plumb 1981	0.6 mg/L	1 mg/L	--	--	0.02 percent	0.03 percent	--	--
Dissolved Organic Carbon	SM 5310B / SM 5310C	0.6 mg/L	1 mg/L	--	--	--	--	--	--
PARTICLE SIZE DISTRIBUTION									
Particle Size Distribution	PSEP-PS/Ecology TAPE Method	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons									
Diesel-Range	NWTPH-Dx (f,g)	--	--	--	--	5.0 mg/kg	7.0 mg/kg	5.0 mg/kg	7.0 mg/kg
Motor Oil-Range	NWTPH-Dx (f,g)	--	--	--	--	10.0 mg/kg	30 mg/kg	10.0 mg/kg	30.0 mg/kg
Gasoline-Range	NWTPH-Gx (f)	--	--	--	--	--	--	5.0 mg/kg	5.0 mg/kg
METALS									
Arsenic	EPA Method 200.8/6010 or 6020	0.5 µg/L	2 µg/L	5.0 mg/kg	2.0 mg/kg	5.0 mg/kg	2.0 mg/kg	5.0 mg/kg	2.0 mg/kg
Barium	EPA Method 200.8/6010 or 6020	--	--	--	--	--	--	0.3 mg/kg	0.5 mg/kg
Cadmium	EPA Method 200.8/6010 or 6020	0.1 µg/L	0.5 µg/L	0.2 mg/kg	0.1 mg/kg	--	--	0.2 mg/kg	0.1 mg/kg
Chromium	EPA Method 200.8/6010 or 6020	0.5 µg/L	2 µg/L	0.5 mg/kg	0.4 mg/kg	--	--	0.5 mg/kg	0.4 mg/kg
Copper	EPA Method 200.8/6010 or 6020	0.5 µg/L	2 µg/L	0.2 mg/kg	0.4 mg/kg	0.2 mg/kg	0.4 mg/kg	--	--
Lead	EPA Method 200.8/6010 or 6020	0.1 µg/L	1 µg/L	2.0 mg/kg	0.2 mg/kg	2.0 mg/kg	0.2 mg/kg	2.0 mg/kg	0.2 mg/kg
Mercury (total)	EPA Method 7470/7471	0.1 µg/L	0.2 µg/L	0.025 mg/kg	0.1 mg/kg	0.025 mg/kg	0.1 mg/kg	0.025 mg/kg	0.1 mg/kg
Mercury (dissovled)	EPA Method 7470/7471	0.02 µg/L	0.2 µg/L	--	--	--	--	--	--
Nickel	EPA Method 200.8/6010 or 6020	0.5 µg/L	2 µg/L	1.0 mg/kg	0.4 mg/kg	--	--	--	--
Selenium	EPA Method 200.8/6010 or 6020	--	--	--	--	--	--	5.0 mg/kg	2.0 mg/kg
Silver	EPA Method 200.8/6010 or 6020	--	--	--	--	--	--	0.3 mg/kg	0.5 mg/kg
Zinc	EPA Method 200.8/6010 or 6020	4.0 µg/L	15 µg/L	1.0 mg/kg	2.0 mg/kg	1.0 mg/kg	2.0 mg/kg	--	--
TCLP METALS									
Arsenic	EPA Method 1311/6010	--	--	--	--	--	--	0.2 mg/L	0.02 mg/L
Barium	EPA Method 1311/6010	--	--	--	--	--	--	0.2 mg/L	0.005 mg/L
Cadmium	EPA Method 1311/6010	--	--	--	--	--	--	0.01 mg/L	0.005 mg/L
Chromium	EPA Method 1311/6010	--	--	--	--	--	--	0.02 mg/L	0.015 mg/L
Lead	EPA Method 1311/6010	--	--	--	--	--	--	0.1 mg/L	0.015 mg/L
Mercury	EPA Method 1311/7471	--	--	--	--	--	--	0.0002 mg/L	0.0002 mg/L
Selenium	EPA Method 1311/6010	--	--	--	--	--	--	0.2 mg/L	0.02 mg/L
Silver	EPA Method 1311/6010	--	--	--	--	--	--	0.02 mg/L	0.005 mg/L
SEMIVOLATILES									
Phenol	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
Bis-(2-Chloroethyl) Ether	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
2-Chlorophenol	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
1,3-Dichlorobenzene	SW 8270D (h)	--	--	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
1,4-Dichlorobenzene	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
Benzyl Alcohol	SW 8270D (h)	5.0 µg/L	15 µg/L	--	--	20 µg/kg	500 µg/kg	330 µg/kg	500 µg/kg
1,2-Dichlorobenzene	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
2-Methylphenol	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
2,2'-Oxybis(1-Chloropropane)	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
4-Methylphenol	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
N-Nitroso-Di-N-Propylamine	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
Hexachloroethane	SW 8270D (h)	--	--	--	--	20 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
Nitrobenzene	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
Isophorone	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
2-Nitrophenol	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
2,4-Dimethylphenol	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
Benzoic Acid	SW 8270D (h)	10.0 µg/L	15 µg/L	--	--	100 µg/kg	500 µg/kg	670 µg/kg	500 µg/kg
bis(2-Chloroethoxy) Methane	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
2,4-Dichlorophenol	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
1,2,4-Trichlorobenzene	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	100 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
Naphthalene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
4-Chloroaniline	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
Hexachlorobutadiene	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
4-Chloro-3-methylphenol	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
1-Methylnaphthalene	SW 8270D (h)	--	--	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
2-Methylnaphthalene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	100 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Hexachlorocyclopentadiene	SW 8270D	--	--	--	--	--	--	330 µg/kg	500 µg/kg
2,4,6-Trichlorophenol	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
2,4,5-Trichlorophenol	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
2-Chloronaphthalene	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
2-Nitroaniline	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
Dimethylphthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	100 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
Acenaphthylene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg

TABLE 3
ANALYTICAL METHODS AND TARGET REPORTING LIMITS
LONG-TERM STORMWATER TREATMENT SAMPLING
NORTH BOEING FIELD - SEATTLE, WASHINGTON

		Target Reporting Limits (b)							
		Water		Filtered Solids		Unfiltered Solids			
	Analytical	ARI	Lancaster	ARI	Lancaster	Sediment Traps		Residual Solids	
Analyte	Method (a)	RL (c)	LOQ (d)	RL (c)	LOQ (d)	ARI RL (c)	Lancaster LOQ (d)	ARI RL (c)	Lancaster LOQ (d)
SEMIVOLATILES (continued)									
3-Nitroaniline	SW 8270D	--	--	--	--	--	--	330 µg/kg	167 µg/kg
Acenaphthene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	100 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
2,4-Dinitrophenol	SW 8270D	--	--	--	--	--	--	670 µg/kg	1000 µg/kg
4-Nitrophenol	SW 8270D	--	--	--	--	--	--	330 µg/kg	500 µg/kg
Dibenzofuran	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	100 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
2,6-Dinitrotoluene	SW 8270D	--	--	--	--	--	--	330 µg/kg	33 µg/kg
2,4-Dinitrotoluene	SW 8270D	--	--	--	--	--	--	330 µg/kg	167 µg/kg
Diethylphthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	100 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
4-Chlorophenyl-phenylether	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
Fluorene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
4-Nitroaniline	SW 8270D	--	--	--	--	--	--	330 µg/kg	167 µg/kg
4,6-Dinitro-2-Methylphenol	SW 8270D	--	--	--	--	--	--	670 µg/kg	500 µg/kg
N-Nitrosodiphenylamine	SW 8270D (h)	1.0 µg/L	1 µg/L	--	--	20 µg/kg	33 µg/kg	67 µg/kg	33 µg/kg
4-Bromophenyl-phenylether	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
Hexachlorobenzene	SW 8270D (h)	1.0 µg/L	0.5 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Pentachlorophenol	SW 8270D (h)	5.0 µg/L	5 µg/L	--	--	20 µg/kg	170 µg/kg	330 µg/kg	170 µg/kg
Phenanthrene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Carbazole	SW 8270D	--	--	--	--	--	--	67 µg/kg	33 µg/kg
Anthracene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Di-n-Butylphthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	20 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
Fluoranthene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Pyrene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	100 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Butylbenzylphthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	20 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
3,3'-Dichlorobenzidine	SW 8270D	--	--	--	--	--	--	330 µg/kg	333 µg/kg
Benzo(a)anthracene	SW 8270D (h,i)	0.01 µg/L	0.01 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
bis(2-Ethylhexyl)phthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	20 µg/kg	170 µg/kg	67 µg/kg	170 µg/kg
Chrysene	SW 8270D (h,i)	0.01 µg/L	0.01 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Total benzofluoranthenes	SW 8270D (h,i)	0.02 µg/L	--	--	--	20 µg/kg	--	67 µg/kg	--
Benzo(b)fluoranthene	SW 8270D (h,i)	--	0.01 µg/L	--	--	--	17 µg/kg	--	17 µg/kg
Benzo(k)fluoranthene	SW 8270D (h,i)	--	0.01 µg/L	--	--	--	17 µg/kg	--	17 µg/kg
Di-n-Octyl phthalate	SW 8270D (h)	1.0 µg/L	5 µg/L	--	--	20 µg/kg	167 µg/kg	67 µg/kg	167 µg/kg
Benzo(a)pyrene	SW 8270D (h,i)	0.01 µg/L	0.01 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Indeno(1,2,3-cd)pyrene	SW 8270D (h,i)	0.01 µg/L	0.01 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Dibenz(a,h)anthracene	SW 8270D (h,i)	0.01 µg/L	0.01 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg
Benzo(g,h,i)perylene	SW 8270D (h,i)	0.01 µg/L	0.05 µg/L	--	--	20 µg/kg	17 µg/kg	67 µg/kg	17 µg/kg

ARI = Analytical Resources, Inc. Lancaster = Lancaster Laboratories, Inc. RL = Reporting Limit LOQ = Limit of Quantification SM = Standard Method

(a) Analytical methods are from SW-846 (EPA 1986) and updates unless otherwise noted.
(b) Reporting limits goals are based on current laboratory data and may be modified during the transition to the new laboratory, Lancaster Laboratories. Instances may arise where high sample concentrations, nonhomogeneity of samples, total solids (percent of sample that is solids), or matrix interferences, preclude achieving the desired reporting limits.
(c) ARI reporting will be based on the lowest standard on the calibration curve.
(d) The lowest standard on Lancaster's calibration curve will be at or below the LOQ.
(e) Sediment trap solids will be analyzed by PSDDA Method 8082.
(f) Methods NWTPH-Dx and NWTPH-Gx as described in *Analytical Methods for Petroleum Hydrocarbons,* Washington State Department of Ecology, Publication ECY97-602, June 1997 (Ecology 1997)
(g) For NWTPH-Dx analyses, an acid silica gel cleanup will be performed for sediment trap solids, but not for residual solids.
(h) Sediment trap samples will be analyzed by PSDDA Method 8270D.
(i) Water samples will be analyzed by SW 8270D Selective Ion Monitoring (SIM).

TABLE 4
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIRMENTS
LONG-TERM STORMWATER TREATMENT SAMPLING
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Analyte	Analytical Method	LS431 Whole Water Stormwater Samples				LTST Facility Whole Water MH130A/Effluent Samples				LTST Facility Influent/Effluent Filtered Solids				Sediment Traps			
		Volume Required	Container	Preservation	Holding Time	Volume Required	Container	Preservation	Holding Time	Volume Required	Container	Preservation	Holding Time	Volume Required	Container	Preservation	Holding Time
PCBs	EPA 8082/ PSDAA 8082	2 Liters	5-gallon glass carboy	Store cool at 6°C	7 days to extraction, 40 days to analysis	2 Liters	(2) 1 Liter Amber Glass	Store cool at 6°C	7 days to extraction, 40 days to analysis	N/A (2)	Filter Bag	Store cool at 6°C	14 days to extraction, 40 days to analysis	8 oz. (3)	Teflon Bottle	Store cool at 6°C	14 days to extraction, 40 days to analysis
TSS	SM 2540 D-97	1 Liter		Store cool at 6°C	7 days	1 Liter	1 Liter HDPE	Store cool at 6°C	7 Days	--	--	--	--	--	--	--	--
Total and Dissolved Metals	EPA 200.8	1 Liter		Store cool at 6°C, Nitric Acid in lab	6 months (28 days for Hg) after filtering for dissolved metals and preservation in lab	--	--	--	--	--	--	--	--	--	--	--	--
Total and Dissolved Mercury	EPA 7470					--	--	--	--	--	--	--	--	--	--	--	--
Particle Size Distribution	Ecology TAPE	1 Liter		Store cool at 6°C	7 days	1 Liter	1 Liter Polyethylene	Store cool at 6°C	7 days	--	--	--	--	--	--	--	--
	PSEP-PS	--	--	--	--	--	--	--	--	8 oz.	Filter Bag	Store cool at 6°C	7 days	8 oz. (3)	Teflon Bottle	Store cool at 6°C	7 days
SVOCs	EPA 8270D (PAHs 8270D SIM)/ PSDDA SW8270D	1 Liter	5-gallon glass carboy	Store cool at 6°C	7 days to extraction, 40 days to analysis	--	--	--	--	--	--	--	--	8 oz. (3)	Teflon Bottle	Store cool at 6°C	14 days
Diesel-range and motor-oil range petroleum hydrocarbons	NWTPH-Dx	--	--	--	--	--	--	--	--	--	--	--	--	8 oz. (3)	Teflon Bottle	Store cool at 6°C	14 days to extraction, 40 days to analysis
Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	EPA 6010/6020	--	--	--	--	--	--	--	--	4 oz.	Filter Bag	Store cool at 6°C	6 months	4 oz. (3)	Teflon Bottle	Store cool at 6°C	6 months
Mercury	EPA 7471	--	--	--	--	--	--	--	--		Filter Bag	Store cool at 6°C	28 days		Teflon Bottle	Store cool at 6°C	28 days
Total Organic Carbon	Plumb 1981	--	--	--	--	--	--	--	--	--	--	--	--	4 oz. (3)	Teflon Bottle	Store cool at 4°C	14 days to extraction, 40 days to analysis
	SM 5310B / SM 5310C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	SM 5310B / SM 5310C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TCLP Metals	EPA 6010/7470	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 4
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIRMENTS
LONG-TERM STORMWATER TREATMENT SAMPLING
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Analyte	Analytical Method	Weir Tank, Backflush Tank, and Sand Filtration Units Residual Solids				Re-routed King County (KCBYP) and LTST LSIV Whole Water Stormwater Samples				Media Bed Pilot Study Samples			
		Volume Required	Container	Preservation	Holding Time	Volume Required	Container	Preservation	Holding Time	Volume Required	Container	Preservation	Holding Time
PCBs	EPA 8082/ PSDAA 8082	8 oz.	8 oz. WMG	Store cool at 6°C	14 days to extraction, 40 days to analysis	2 Liters	5-gallon glass carboy	Store cool at 6°C	7 days to extraction, 40 days to analysis	2 Liters	(2) 1 Liter Amber Glass	Store cool at 6°C	7 days to extraction, 40 days to analysis
TSS	SM 2540 D-97	--	--	--	--	1 Liter		Store cool at 6°C	7 days	1 Liter	1 Liter HDPE	Store cool at 6°C	7 days
Total and Dissolved Metals	EPA 200.8	--	--	--	--	1 Liter		Store cool at 6°C, Nitric Acid in lab	6 months 28 days for Hg	--	--	--	--
Total and Dissolved Mercury	EPA 7470	--	--	--	--					--	--	--	--
Particle Size Distribution	Ecology TAPE	--	--	--	--	1 Liter		Store cool at 6°C	7 days	1 Liter	1 Liter Polyethylene	Store cool at 6°C	7 days
	PSEP-PS	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	EPA 8270D (PAHs 8270D SIM)/ PSDDA SW8270D	8 oz.	8 oz. WMG	Store cool at 6°C	14 days	--	--	--	--	--	--	--	--
Diesel-range and motor-oil range petroleum hydrocarbons	NWTPH-Dx	8 oz.	8 oz. WMG	Store cool at 6°C	14 days to extraction, 40 days to analysis	--	--	--	--	--	--	--	--
Gasoline-Range Petroleum Hydrocarbons	NWTPH-Gx	2 oz.	2 oz. WMGS (1)	Store cool at 6°C	14 days to extraction, 40 days to analysis	--	--	--	--	--	--	--	--
Metals	EPA 6010/6020	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	EPA 7471	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	Plumb 1981	--	--	--	--	--	--	--	--	--	--	--	--
	SM 5310B / SM 5310C	--	--	--	--	--	--	--	--	250 mL / 40 mL	250mL Amber Glass / glass vial	Store cool at 6°C / 4°C, Sulfuric Acid in bottle	28 days
Dissolved Organic Carbon	SM 5310B / SM 5310C	--	--	--	--	--	--	--	--	250 mL / 40 mL	250mL Amber Glass / glass vial	Store cool at 6°C / 4°C, Sulfuric Acid in bottle	28 days after filtering and preservation in lab
TCLP Metals	EPA 6010/7470	8 oz	8 oz. WMG	Store cool at 6°C	28/180 days to TCLP extraction, 28/180 days to analysis (Hg/all other metals)	--	--	--	--	--	--	--	--

TCLP = Toxicity Characteristic Leachate Procedure
PCB = Polychlorinated biphenyl
SVOC = Semivolatile organic compound
oz. = ounce

AG = amber glass boston round bottle
HDPE = High Density Polypropylene
WMG = wide mouth glass jar
WMGS = wide mouth glass jar with septa lid

Notes:
1. No headspace.
2. The entire filter bag (filter material and collected material) is analyzed for PCBs, regardless of the volume of solids collected in the bag.
3. Amount of settled solids collected in Teflon bottle is not anticipated to meet required sample volumes. Laboratory will pre-screen samples and cut back on volumes required based on pre-screens. Analysis is prioritized due to limited volume.

TABLE 5
PROJECT SCHEDULE 2011-2012
LONG-TERM STORMWATER TREATMENT
NORTH BOEING FIELD, SEATTLE, WASHINGTON

Event/Document	Date / Due Date (submittal to EPA)
Operation of LTST CESF System Begins	October 28, 2011
Monthly Progress Reports	5th day of the following month, or first business day after
Media Bed Pilot Study Sampling Program Completed	July 1, 2012
Media Bed Pilot Study Summary Report (final)	August 17, 2012
Year 1 of LTST Monitoring Completed	October 31, 2012
Annual LTST Performance Evaluation Report (draft)	December 3, 2012
Meeting to discuss results of Annual Report and recommendations for future monitoring	December 10, 2012
Annual LTST Performance Evaluation Report (final)	December 17, 2012 (or 14 days following written EPA comments)

TABLE 6
EXAMPLE SAMPLING PROGRAM SUMMARY
LONG-TERM STORMWATER TREATMENT
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Location	Sample Type	Sample Media	Frequency (a)	Parameters	Dates Sampled
Lift Station (LS431) (Compliance Monitoring Point)	Whole Water (flow-weighted composite)	Stormwater (b)	Monthly routine sampling (multiple day sampling period), November 2011 - December 2012; Five additional 24-hour storm events of ≥0.5 inch precipitation, November 1, 2011 - October 31, 2012	PCBs	Monthly Events: 11/11/11, 12/8/11 Storm Events: 11/17/11, 11/23/11, 12/28/11
				TSS	
				Total & Dissolved Metals (c)	
				SVOCs (c)	
				PAHs (c)	
				PSD	
			To be determined (d), starting January 2013	PCBs	
				TSS	
				Total & Dissolved Metals (c)	
				SVOCs (c)	
				PAHs (c)	
				PSD	
Long-Term Stormwater Treatment System	Whole Water Influent from MH130A (grab)	Stormwater (b)	Twice monthly in 2011, monthly in 2012 (e); To be determined (d) starting January 2013	PCBs	Monthly Events: 11/08/11, 12/05/11, 12/21/11 Storm Events: 11/16/11, 11/22/11, 12/27/11
				TSS	
				PSD	
	Whole Water Influent from Lift Station Inlet Vault (composite)		Twice monthly in 2011, monthly in 2012 (e); To be determined (d) starting January 2013	PCBs	Monthly Events: 11/11/11, 12/8/11, 12/21/11 Storm Events: 11/17/11, 11/23/11, 12/28/11
				TSS	
				PSD	
	Whole Water Effluent (grab)		Twice monthly in 2011, monthly in 2012 (e); To be determined (d) starting January 2013	PCBs	Monthly Events: 11/08/11, 12/05/11, 12/20/11 Storm Events: 11/16/11, 11/22/11, 12/27/11
				TSS	
				PSD	
	Whole Water Effluent (grab) (f)		Twice monthly (g)	Residual Chitosan	
	Filtered Solids Influent from MH130A	Stormwater Solids	Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (d) starting January 2013	PCBs	Monthly Events: 11/11/11, 12/8/11 Storm Events: 11/17/11, 11/23/11, 12/28/11
			Monthly through December 2012; To be determined (d) starting January 2013	PSD	Interim Events: 11/16/11, 12/15/11
				Metals (h,i)	
	Filtered Solids Influent from Lift Station Inlet Vault		Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (d) starting January 2013	PCBs	Monthly Events: 11/11/11, 12/8/11, 12/21/11 Storm Events: 11/17/11, 11/23/11, 12/28/11
			Monthly through December 2012; To be determined (d) starting January 2013	PSD	Interim Events: 11/16/11, 12/15/11
				Metals (h,i)	
	Filtered Solids Effluent (j)		Monthly through December 2012, including during the five 24-hr storm sampling events; To be determined (d) starting January 2013	PCBs	Monthly Events: 11/11/11, 12/8/11 Storm Events: 11/17/11, 11/23/11, 12/28/11
Media Bed Pilot Study: Influent, Effluent from Cell A, and Effluent from Cell B	Whole Water (grab)	Stormwater (b)	Five storm events of >0.2 inch precipitation and five dry weather events by July 1, 2012	PCBs	
				TSS	
				PSD	
				Total Organic Carbon	
				Dissolved Organic Carbon	

TABLE 6
EXAMPLE SAMPLING PROGRAM SUMMARY
LONG-TERM STORMWATER TREATMENT
NORTH BOEING FIELD - SEATTLE, WASHINGTON

Location	Sample Type	Sample Media	Frequency (a)	Parameters	Dates Sampled
Sediment Traps [SL4-T1, SL4-T2, SL4-T3, SL4-T4, SL4-T4A, SL4-T5, SL4-T5A(2)] (SL4-T5A to be moved from MH178 to King County bypass line wet well)	Annual Composite, Homogenized	Stormwater Solids	Annually (k)	PCBs	
				Semivolatiles	
				Total Metals	
				NWTPH-Dx	
				Total Organic Carbon	
				Percent Total Solids	
				PSD	
Weir and Storage Tanks, Sand Filter Media	Composite from 3 or More Grab Samples from Tank or Filter Vessel (grab locations to result in both horizontal and vertical compositing)	Settled Solids	As Needed (l)	PCBs	
				SVOCs	
				Metals	
				Petroleum Hydrocarbons	
Re-routed King County Stormwater - North Lateral (KCBYP) (manhole west of 3-365 building)	Whole Water (flow-weighted composite)	Stormwater (b)	Parallel w/ LS431 sampling: half of the routine monthly events, November 1, 2011 - December 31, 2012, and two storm events, November 1, 2011 - October 31, 2012	PCBs	Monthly Events: 12/5/11 Storm Events: 11/17/11, 11/22/11, 12/28/11
				TSS	
				Total & Dissolved Metals (c)	
				PSD	
			To be determined (d), starting January 2013	PCBs	
				TSS	
				Total & Dissolved Metals (c)	
				PSD	
Contingency (m): Offsite Stormwater - Other Laterals (SL4-T2A, SL4-T3A, SL4-T4A)	Whole Water (flow-weighted composite)	Stormwater (b)	Two events per location (n), parallel w/LS431 sampling	PCBs	
				TSS	
				Total & Dissolved Metals (c)	
				PSD	

(a) Monitoring plan beginning November 2011. All sampling and analysis will be performed by Boeing/Landau Associates and Boeing's contract laboratory, unless otherwise noted.
(b) Stormwater is defined as all liquids, including any particles dissolved therein, in the form of base flow, storm water runoff, snow melt runoff, and drainage, as well as all solids which enter the storm drain system.
(c) If sufficient volume is available, LS431 whole water samples will be analyzed for total and dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc); SVOCs; and PAHs to support Ecology's NBF-GTSP remedial investigation activities.
(d) For sampling in 2013, Boeing will propose to EPA a sampling frequency and sampling parameters based on the results from the November 2011 - October 2012 sampling events.
(e) One LTST system influent/effluent sampling event per month will be performed during the monthly lift station (LS431) sampling event.
(f) Whole water effluent grab samples for Residual Chitosan testing will be collected from the treatment facility effluent sample port by Clear Water Compliance Services.
(g) Residual chitosan was never detected in weekly effluent samples from the STST facility, and there is extremely low probability of chitosan being able to pass through the sand filters.
(h) When sufficient volume is available, LTST filtered solids samples will be analyzed for metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) to support Ecology's NBF-GTSP remedial investigation activities.
(i) Interim sampling events are required for collecting samples when analyzing for metals and PSD, because PCBs analysis cannot be combined with metals and PSD analysis.
(j) From experience with STST filtered solids collection, there will not be enough solids collected in the LTST effluent filter for metals or PSD analysis. Therefore, we do not propose to filter for metals or PSD analysis at the LTST effluent.
(k) Depending on the quantity of solids collected in the sediment traps, the laboratory may not be able to analyze all parameters. Laboratory will weigh and report total mass of solids collected per sample location. Analysis of parameters will be prioritized in the order listed. Sediment trap sampling will continue indefinitely until such time that additional data collection is no longer needed to support source control efforts.
(l) The thickness of accumulated solids (sludge) in the weir and backflush settling tanks will be checked at least once per month to determine if solids should be removed. Prior to solids removal, a composite sample of the solids will be collected and analyzed for waste characterization purposes. Composite sampling will also be done for used sand filter media prior to disposal. Subsequent waste characterization will not be necessary unless contaminant concentrations in the LTST influent change significantly.
(m) Sampling of stormwater from offsite KCIA sources may be performed to assess KCIA stormwater impact on compliance with EPA Interim Goals.
(n) Sampling of some or all events at these locations may not be feasible, as the locations are on the flightline and safety concerns and regulations may interfere with sampling activities.