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MEMORANDUM

To:	Allison Crowley, Seattle City Light
From:	Shannon Ashurst, Integral Consulting Inc.
Date:	June 16, 2023
Subject:	Georgetown Flume Off-Leash Area and Trail Supplemental Design Memorandum
Project No.:	CF1408-0106

Integral Consulting Inc. (Integral) is assisting Seattle City Light (SCL) in preparing an Interim Action Work Plan (IAWP) for a proposed off-leash area and trail intended for the southern portion of the former Georgetown Steam Plant (GTSP) flume (Proposed Park Site) (Figure 1). The Proposed Park Site is part of the North Boeing Field/Georgetown Steam Plant (NBF/GTSP) site that is subject to an ongoing remedial investigation and feasibility study (RI/FS) under Agreed Order No. DE 5685 (Ecology 2008) between the Washington State Department of Ecology (Ecology), The Boeing Company (Boeing), the City of Seattle (City), and King County.

The excavation extent for the Proposed Park Site presented in the public review draft IAWP[1] was developed based on samples collected from the Proposed Park Site in September 2021 and March 2022 that were analyzed for site chemicals of concern (COCs)—polychlorinated biphenyls (PCBs) and carcinogenic polycyclic aromatic hydrocarbons (cPAH) (Integral 2021, 2022a). Soil analytical results were screened against interim action screening levels (IASLs) that were developed from Model Toxics Control Act (MTCA) Method B cleanup levels.

At the time of the IAWP public review period, Ecology requested additional chemical analyses be conducted to refine the excavation depth within the Proposed Park Site. Ecology requested:

- Inclusion of arsenic in the evaluation because it is a COC for the NBF/GTSP site Area of Concern (AOC) 10, which includes the Proposed Park Site

[1] The public review draft IAWP was dated September 30, 2022. Ecology presented it for public review and comment on November 7, 2022, with comments due December 21, 2022.

- Further consideration of four historical sample locations[2] with subsurface soil cPAH or PCB MTCA Method B or arsenic natural background exceedances and uncertain excavation status (Herrera 2007, 2010; Dube 2022) in the sampling design.

These changes necessitated the collection of additional soil confirmation samples and analysis of select archived samples (within sample hold times) to verify (or alternatively modify) the depth of excavation proposed in the IAWP. Ecology approved the City's proposed additional sampling plan (Integral 2022b) on December 5, 2022. This technical memorandum presents a summary of the additional sampling and soil analytical results and evaluates the impact on the existing excavation plan in the draft IAWP.

FIELD INVESTIGATION

This section provides a summary of the December 2022 field event, investigation-derived waste (IDW) handling, and field sampling deviations.

Field Event Summary

Additional soil sampling was conducted on December 14 and 15, 2022. Samples were collected in accordance with the sampling and analysis plan (SAP; Integral 2021), the SAP addendum (Integral 2022a), and the additional sampling plan (Integral 2022b). Borings were completed at 12 locations. A field duplicate sample was collected at location GTF_S25 (no further than 6 in. from the parent boring), for a total of 13 boring locations. Each boring location was sampled using a direct push drill rig by a driller licensed in the State of Washington. Samples were collected from starting depths specified in the additional sampling plan, up to 4.5 ft below ground surface (bgs). Target boring recovery was 75 percent (i.e., 1.5 ft of recovery on a 2.0-ft drive); this requirement was satisfied for all boring locations. Soil samples were delivered under chain-of-custody protocols to Analytical Resources, LLC, a Washington State-accredited laboratory, for analysis. Actual sample locations are shown in Figure 2.

Table 1 summarizes the samples submitted for chemical analysis. Samples collected in half-foot intervals deeper than the initially submitted samples (up to 4.5 ft bgs) were archived frozen.

Equipment rinse blank samples for a sampling spoon, sampling bowl, and drill head were collected during both field events as described in the SAP and SAP addendum.

[2] Locations MS02SS, W2T18, W2, and W1.

Attachment 1 includes the field notes, boring logs, and chains of custody for the field event.

Investigation-Derived Waste

Solid and liquid IDW was collected into waste drums (segregated by medium) that were stored at the nearby, secure GTSP property pending disposal. This IDW has since been disposed of in accordance with all applicable regulations and guidelines.

Field Event Deviations

Target sample locations were adjusted from the proposed coordinates at 5 of the 13 locations during the field event. No locations were moved more than 8 ft. Due to utility locate markings near proposed sampling location GTF_S13_B, the actual sampling location was stepped out 2.8 ft to avoid any utility lines and/or pipes. Ecology blocks located on the north end of the site required stepping out 4.1 to 4.9 ft for the drilling rig to safely acquire a boring sample at GTF_S25 (and the corresponding field duplicate) and GTF_S26. Location GTF_S27 required four attempts to acquire a usable sample. The first two attempts met refusal at 2 ft. The material-type of the obstruction at 2 ft is unknown. The third attempt (stepped out 6 in.) hit wood with petroleum-like odor at 2 ft. The fourth attempt was sampled 7.3 ft from proposed location.

SAMPLE ANALYSIS AND VALIDATION

Laboratory analysis for new and archived samples was performed by Analytical Resources, LLC. Samples were analyzed according to the methods specified in the SAP and additional sampling plan. Laboratory reports are available upon request. Unused archived samples will be stored for 6 months for potential future analysis if deemed necessary.

Integral validated all laboratory data. The data underwent Stage 2b validation as described in the U.S. Environmental Protection Agency's (EPA's) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (USEPA 2009).

The data were validated using procedures described in the following EPA guidance documents for data validation:

- *Guidance on Environmental Data Verification and Data Validation* (USEPA 2002)
- *National Functional Guidelines for Organic Superfund Methods Data Review* (USEPA 2020a)

- *National Functional Guidelines for Inorganic Superfund Methods Data Review* (USEPA 2020b).

The accuracy and completeness of the database were verified at the laboratory when the electronic data deliverables were prepared and again as part of data validation. In addition to verification of field and laboratory data and information, final validation data qualifier entries into the database were verified. Any discrepancies were resolved before the final database was released for use. The validation report is provided in Attachment 2.

A total of 524 results were reported. A total of 154 results (29 percent) at 11 locations were qualified as estimated or not detected. A total of 51 results were rejected as do-not-report because a more appropriate result was available. These rejected results were not used in the completeness calculations.

The data meet the criteria set forth in the method and referenced quality assurance documents, with the exceptions noted in the data validation report. All other results are acceptable for their intended use, as qualified. Completeness was 100 percent.

RESULTS

The results of the original and supplemental soil samples are provided in Table 2 and discussed below.

PCBs and cPAHs

Proposed Park Site COCs (PCBs and cPAHs) were analyzed in samples from new locations GTF_S25, GTF_S26, and GTF_S27. PCBs were analyzed at revisited location GTF_S2 (identified as GTF_S2_B). All results were below the respective IASLs except for PCBs at location GTF_S25 from 1.5–2.0 ft bgs and cPAHs at locations GTF_S25 and GTF_S27 from 1.5–2.0 ft bgs. Both locations are in the northwest corner of the Proposed Park Site (Figure 2). As a result, archived samples for both GTF_S25 and GTF_S27 were analyzed in deeper intervals, as needed, for the analytes that exceeded IASLs in the 1.5–2.0 ft interval. GTF_S25 PCB and cPAH concentrations were below IASLs at 3.0–3.5 ft bgs. GTF_S27 PCB concentrations were below IASLs at 2.5–3.0 ft bgs. However, cPAH concentrations were above IASLs in all samples down to 4.5 ft bgs.

Arsenic

Arsenic was analyzed in samples collected at the 12 supplemental sampling locations, as well as in frozen archived samples at locations GFT_S22, GTF_S23, and GTF_S24. Four

locations (GTF_S25, GTF_S26, GTF_S3_B, and GTF_S11_B) had arsenic concentrations just above the IASL in the sample intervals originally submitted for analysis (Table 2). The remaining arsenic soil results were below the IASL. Arsenic was further analyzed in deeper archived samples at location GTF_S25.[3] Arsenic concentrations at GTF_S25 were below the IASL at 2.5–3.0 ft and 3.0–3.5 ft bgs.

DISCUSSION AND RECOMMENDATION

This section summarizes the proposed modifications to the excavation depths based on the results of the additional PCB, cPAH, and arsenic analyses.

PCBs and cPAHs

As shown in Figure 3-2 of the IAWP, locations GTF_S25 and GTF_S27 are located in an area originally slated for a 1.5-ft excavation depth. However, given the IASL exceedances in the supplemental samples at these locations (Table 2), the proposed excavation depth in the northwest corner of the site is now adjusted as follows (Figure 3):

- Soil at locations GTF_S2 (and revisited location GTF_S2_B) and GTF_S5 met COC IASLs in the 1.5–2.0 ft interval, so the existing 1.5-ft excavation depth in these areas is appropriate and unchanged. Because location GTF_S27 had IASL exceedances deeper than 2.0 ft bgs, the midpoint between locations GTF_S27 and GTF_S2/GTF_S2_B was used to demarcate the northwest corner excavation area from the 1.5-ft depth excavation area to the south.
- Location GTF_S25 had COC IASL exceedances to a depth of 3.0 ft bgs, whereas location GTF_S27 had cPAH IASL exceedances at 4.5 ft bgs. Location GTF_S1, which is situated between GTF_S25 and GTF_S27, met COC IASLs at 1.5 ft bgs. Consequently, the northwest corner was further split into two areas, divided at the midpoint between locations GTF_S1 and GTF_S27, with proposed excavation depths as follows: 3.0 ft for the northern portion of the northwest corner, and 4.5 ft for the southern portion of the northwest corner.

Location GTF_S27 was situated proximal to an historical sample (W2S18) that also had subsurface cPAH in soil, for which the removal status of the associated soil was unclear. As noted in "Field Event Deviations," the drillers encountered a subsurface obstruction at GTF_S27 (approximately 2 ft bgs) that included wood with a petroleum-like odor. While Herrera (2010) indicated complete removal of the former wood flume, it is suspected based

[3] For completeness, arsenic was also analyzed in the deeper archive samples analyzed at location GTF_S27. All arsenic results at this location were below the IASL.

on available information that some residual wood flume material may have been missed, and that the soil cPAH concentrations in this area are locally elevated as a result. When the construction crew is on site excavating the GTF_S27 area as part of the interim action, care will be taken to identify and remove any contaminated subsurface debris (e.g., treated wood) in addition to the soil to a depth of 4.5 ft bgs. The intent is to remove all contaminated debris and soil encountered in the GTF_S27 area; however, if it is determined in the field that excavation activities could undermine the storm drain installed to replace the flume, the City will consult with Ecology prior to completing the work. A soil confirmation sample will be collected at the final GTF_S27 excavation depth and submitted for cPAH analysis. Backfilling within the GTF_S27 area will not occur until receipt of the soil sample analytical results that confirm cPAH concentrations do not exceed the IASLs at the final excavation depth.

Arsenic

There are no known historical uses of arsenic on the Proposed Park Site; arsenic is a naturally occurring inorganic soil chemical. MTCA requires statistical evaluation of compliance samples where direct comparison is not eligible (i.e., an unknown source). Under MTCA, there are three parts to demonstrating compliance through a statistical evaluation.

- The 95 percent upper confidence limit (UCL) on the mean concentration at the site must be less than the soil cleanup level.
- Fewer than 10 percent of the samples can exceed the soil cleanup level.
- No single sample can be greater than 2 times the soil cleanup level.

The statistical analysis was completed on the available Proposed Park Site arsenic data. Sample results for soil that is recommended for excavation, as discussed in the PCBs and cPAHs section above, were removed from the arsenic background evaluation because these data no longer represent soil to be left onsite.

No post-excavation soil will have arsenic concentrations that exceed 2 times the IASL. Three of 14 soil samples (i.e., 21 percent) exceed the arsenic IASL; however, evaluation of false positive probabilities for exceeding the IASL indicates 0.044 probability of 4 or more results exceeding, which is close to the targeted 0.05 level. Therefore, three results exceeding the IASL is acceptable based on the *Statistical Guidance for Ecology Site Managers* (Technical Attachment 1 to Figure 12, Ecology 1992).

The remaining criterion for the statistical evaluation compares the UCL with the IASL. EPA's ProUCL,[4] software version 5.2, was used to evaluate the distribution of arsenic concentrations and to recommend a representative UCL based on the results as shown in Table 3 and Attachment 3. The 14 results pass as lognormally distributed based on both goodness-of-fit tests reported by ProUCL. The recommended UCL[5] concentration is 6.3 mg/kg, which does not exceed the 7.3 mg/kg IASL.

Based on these findings, the soil that remains onsite after the interim action will be in compliance with MTCA using the statistical evaluation methodology. Integral recommends no further adjustment to the vertical excavation boundary, shown on Figure 3, based on arsenic soil concentrations.

NEXT STEPS

With Ecology concurrence, the proposed excavation depths in the draft IAWP will be replaced with those indicated in Figure 3 and project plans and specifications will be updated accordingly.

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[4] Information about this software and free download is available at: https://www.epa.gov/land-research/proucl-software

[5] Kaplan-Meier Land's H-statistic UCL for lognormal data.

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Figures

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Figure 1.
Proposed Park Site Vicinity Map

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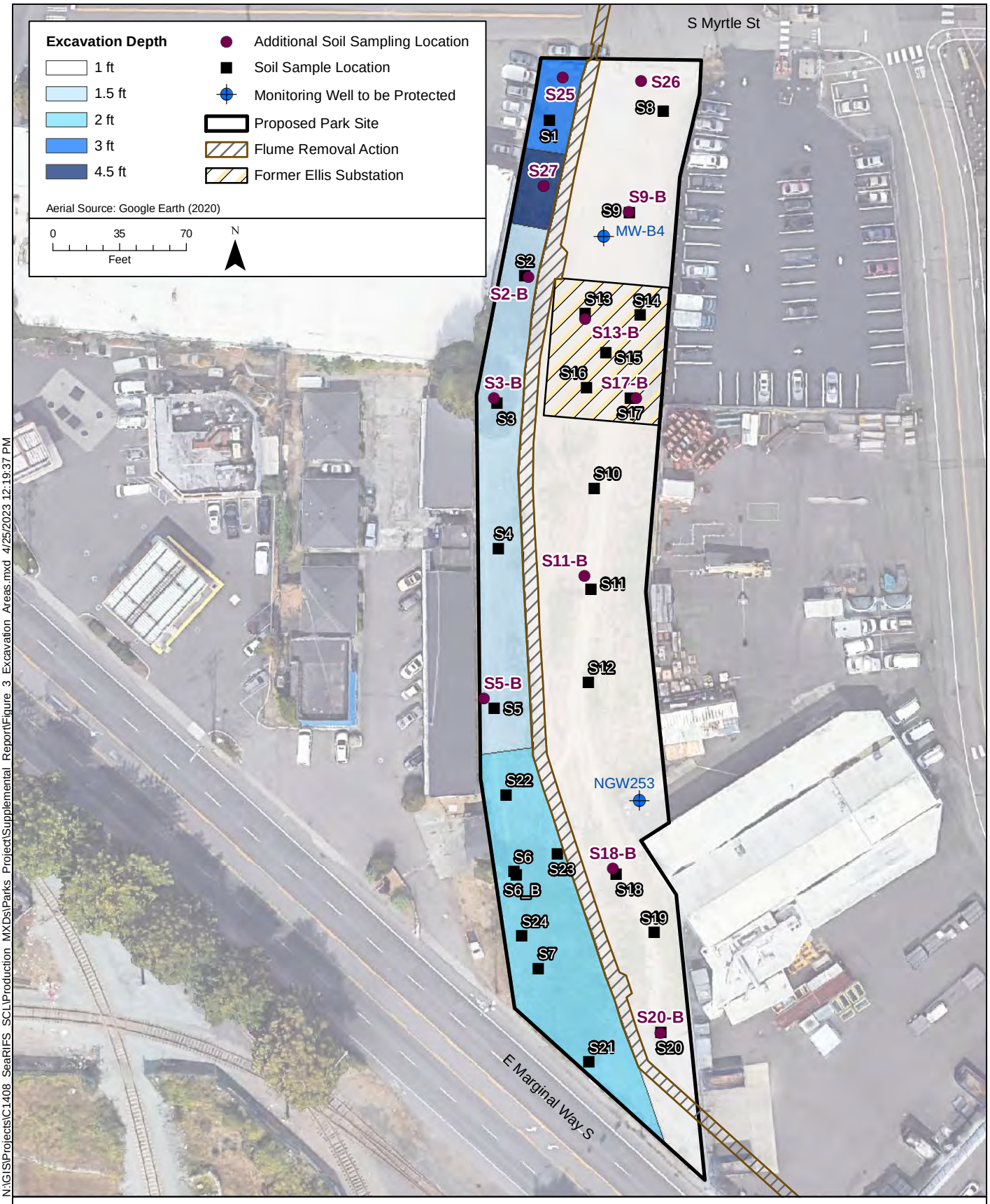
Figure 2.
Additional Sampling Locations



N:\GIS\Projects\C1408 SeaRIFS SCL\Production MXDs\Parks Project\Supplemental Report\Figure 3 Excavation Areas.mxd 4/25/2023 12:19:37 PM

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Figure 3.
Revised Excavation Areas

Tables

Table 1. Proposed Park Site Additional Confirmation Soil Sampling and Analysis

Proposed Excavation Depth (ft) [a]	Sample Location [b]	Depth Interval (ft bgs) of Confirmation Sample, by Analyte		
		cPAH	PCBs	Arsenic
1.0	GTF_S8	—	—	—
	GTF_S9_B	—	—	1.0–1.5
	GTF_S10	—	—	—
	GTF_S11_B	—	—	1.0–1.5
	GTF_S12	—	—	—
	GTF_S13_B	—	—	1.0–1.5
	GTF_S14	—	—	—
	GTF_S15	—	—	—
	GTF_S16	—	—	—
	GTF_S17_B	—	—	1.0–1.5
	GTF_S18_B	—	—	1.0–1.5
	GTF_S19	—	—	—
	GTF_S20_B	—	—	1.0–1.5
	GTF_S26 * [c]	1.0–1.5	1.0–1.5	1.0–1.5
1.5	GTF_S1	—	—	—
	GTF_S2_B [d]	—	1.5–2.0	1.5–2.0
	GTF_S3_B	—	—	1.5–2.0
	GTF_S4	—	—	—
	GTF_S5_B	—	—	1.5–2.0
	GTF_S25 * [c]	1.5–2.0	1.5–2.0	1.5–2.0
	GTF_S27 * [e]	1.5–2.0	—	1.5–2.0
2.0	GTF_S6	—	—	—
	GTF_S6_B	—	—	—
	GTF_S7	—	—	—
	GTF_S21	—	—	—
	GTF_S22	—	—	2.0–2.5 [h]
	GTF_S23 [f,g]	—	—	2.0–2.5 [h] 2.5–3.0 [h]
	GTF_S24	—	—	2.0–2.5 [h]

Notes:

* = New sample location
— = no sample or analysis
bgs = below ground surface
cPAH = carcinogenic polycyclic aromatic hydrocarbon
IASL = interim action screening level
MTCA = Model Toxics Control Act
PCB = polychlorinated biphenyl

[a] Public Review Draft Georgetown Flume Off-Leash Area and Trail Interim Action Work Plan (September 30, 2022).

[b] Suffix "_B" added to signify reoccupied locations; the new borings were collected no more than 8 ft from the original location.

[c] Sampled for all three chemicals of concern based on historical sample W2T18.

[d] PCB confirmation sample needed with change to MTCA Method B as the IASL.

[e] Location situated near historical sample location W2, at which sample W2S18 was collected.

[f] Location situated near historical sample location W1, at which sample W1S18 was collected.

[g] 2.5–3.0 ft interval added based on historical sample W1S18.

[h] Sample was analyzed from March 2022 archive sample.

Table 2. Proposed Park Site: Analytical Results for Discrete Soil Samples (2021-2022)

Revised Proposed Excavation Depth:				1 ft bgs											
Location ID				GTF_S26	GTF_S8	GTF_S9		GTF_S10	GTF_S11		GTF_S12	GTF_S13			
Sample ID				GTF_S26_1-1.5ft	GTF_S8_1-1.5ft	GTF_S9_1-1.5ft	GTF_S9_B_1-1.5ft	GTF_S10_1-1.5ft	GTF_S11_1-1.5ft	GTF_S11_B_1-1.5ft	GTF_S12_1-1.5ft	GTF_S13_1-1.5ft	GTF_S13_1-1.5ft_DUP	GTF_S13_B_1-1.5ft	
Sample Number				GTF-SL156	GTF-SL019	GTF-SL021	GTF-SL108	GTF-SL023	GTF-SL025	GTF-SL115	GTF-SL027	GTF-SL029	GTF-SL047	GTF-SL122	
Sample Date				12/14/22	09/29/21	09/29/21	12/14/22	09/29/21	09/29/21	12/14/22	09/29/21	09/29/21	09/29/21	12/14/22	
Sample Type				N	N	N	N	N	N	N	N	N	FD	N	
		IASLs													
Analyte	Units	MTCA Method B Cancer (Eq. 740-2)	Natural Background	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Polychlorinated Biphenyls															
Aroclor 1016	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1221	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1232	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1242	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1248	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1254	mg/kg			0.020 *U*	0.020 *U*	0.012 *J*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1260	mg/kg			0.10	0.083	0.026	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1262	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Aroclor 1268	mg/kg			0.020 *U*	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Total PCB Aroclors	mg/kg	0.5		0.10	0.083	0.038 *J*	NA	0.020 *U*	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.020 *U*	NA	
Polycyclic Aromatic Hydrocarbons															
1-Methylnaphthalene	mg/kg			0.0022 *J*	0.0018 *UJ*	0.0050 *U*	NA	0.00098 *UJ*	0.0050 *U*	NA	0.0050 *U*	0.00076 *UJ*	0.0050 *U*	NA	
2-Methylnaphthalene	mg/kg			0.015 *U*	0.0031 *UJ*	0.0050 *U*	NA	0.0011 *UJ*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Acenaphthene	mg/kg			0.015 *U*	0.0019 *UJ*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	0.00074 *UJ*	0.0050 *U*	NA	
Acenaphthylene	mg/kg			0.0052 *J*	0.0043 *J*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Anthracene	mg/kg			0.0050 *J*	0.0028 *J*	0.0050 *U*	NA	0.0050 *U*	0.0025 *J*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Benzo(a)anthracene	mg/kg			0.021	0.012	0.0045 *J*	NA	0.0029 *J*	0.0050 *U*	NA	0.0012 *J*	0.0050 *U*	0.0015 *J*	NA	
Benzo(a)pyrene	mg/kg			0.034	0.021	0.0069	NA	0.0048 *J*	0.0050 *U*	NA	0.0021 *J*	0.0050 *U*	0.0014 *J*	NA	
Benzo(b)fluoranthene	mg/kg			0.030	0.027	0.0098	NA	0.0056	0.0050 *U*	NA	0.0024 *J*	0.0050 *U*	0.0050 *U*	NA	
Benzo(g,h,i)perylene	mg/kg			0.042	0.024	0.0092	NA	0.012	0.0050 *U*	NA	0.0046 *J*	0.0050 *U*	0.0017 *J*	NA	
Benzo(j)fluoranthene	mg/kg			0.016	0.0084	0.0033 *J*	NA	0.0021 *J*	0.0050 *U*	NA	0.00096 *J*	0.0050 *U*	0.0050 *U*	NA	
Benzo(k)fluoranthene	mg/kg			0.016	0.0097	0.0047 *J*	NA	0.0026 *J*	0.0050 *U*	NA	0.0014 *J*	0.0050 *U*	0.0050 *U*	NA	
Benzofluoranthenes	mg/kg			0.064	0.041	0.016	NA	0.0092 *J*	0.010 *U*	NA	0.0044 *J*	0.0100 *U*	0.0100 *U*	NA	
Chrysene	mg/kg			0.031	0.025	0.0080	NA	0.0052	0.0050 *U*	NA	0.0026 *J*	0.0050 *U*	0.0016 *J*	NA	
Dibenzo(a,h)anthracene	mg/kg			0.0091 *J*	0.0053	0.0024 *J*	NA	0.0012 *J*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Dibenzofuran	mg/kg			0.015 *U*	0.0015 *J*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Fluoranthene	mg/kg			0.035	0.020	0.0072	NA	0.0048 *J*	0.00063 *J*	NA	0.0021 *J*	0.00062 *UJ*	0.0026 *J*	NA	
Fluorene	mg/kg			0.015 *U*	0.00092 *UJ*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Indeno(1,2,3-cd)pyrene	mg/kg			0.033	0.018	0.0065	NA	0.0065	0.0050 *U*	NA	0.0027 *J*	0.0050 *U*	0.0011 *J*	NA	
Naphthalene	mg/kg			0.015 *U*	0.0039 *UJ*	0.0050 *U*	NA	0.0015 *UJ*	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Phenanthrene	mg/kg			0.013 *J*	0.013	0.0032 *UJ*	NA	0.0039 *UJ*	0.0025 *UJ*	NA	0.0019 *UJ*	0.00097 *J*	0.0025 *J*	NA	
Pyrene	mg/kg			0.037	0.027	0.0087	NA	0.0069	0.00075 *J*	NA	0.0028 *J*	0.00067 *J*	0.0025 *J*	NA	
cPAH TEQ	mg/kg	0.19		0.045 *J*	0.028	0.0097 *J*	NA	0.0067 *J*	0.0050 *U*	NA	0.0032 *J*	0.0050 *U*	0.0024 *J*	NA	
Metals															
Arsenic	mg/kg		7.3	**8.5**	NA	NA	2.6	NA	NA	**13**	NA	NA	NA	2.2	

Table 2. Proposed Park Site: Analytical Results for Discrete Soil Samples (2021-2022)

		Revised Proposed Excavation Depth:		1 ft bgs										
		Location ID		GTF_S16	GTF_S17		GTF_S18		GTF_S19		GTF_S20			
		Sample ID		GTF_S16_1-1.5ft	GTF_S17_1-1.5ft	GTF_S17_B_1-1.5ft	GTF_S18_1-1.5ft	GTF_S18_B_1-1.5ft	GTF_S19_1-1.5ft	GTF_S19_1-1.5ft_DUP	GTF_S20_1-1.5ft	GTF_S20_B_1-1.5ft		
		Sample Number		GTF-SL035	GTF-SL037	GTF-SL129	GTF-SL039	GTF-SL136	GTF-SL041	GTF-SL049	GTF-SL043	GTF-SL143		
		Sample Date		09/29/21	09/29/21	12/14/22	09/29/21	12/14/22	09/29/21	09/29/21	09/29/21	12/14/22		
		Sample Type		N	N	N	N	N	N	FD	N	N		
		IASLs												
Analyte	Units	MTCA Method B Cancer (Eq. 740-2)	Natural Background	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Polychlorinated Biphenyls														
Aroclor 1016	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1221	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1232	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1242	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1248	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1254	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.021	0.020 *U*	0.099 *U*	NA		
Aroclor 1260	mg/kg			0.020 *U*	0.034	NA	0.018 *J*	NA	0.044	0.020 *U*	0.11	NA		
Aroclor 1262	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Aroclor 1268	mg/kg			0.020 *U*	0.020 *U*	NA	0.020 *U*	NA	0.020 *U*	0.020 *U*	0.099 *U*	NA		
Total PCB Aroclors	mg/kg	0.5		0.020 *U*	0.034	NA	0.018 *J*	NA	0.064	0.020 *U*	0.11	NA		
Polycyclic Aromatic Hydrocarbons														
1-Methylnaphthalene	mg/kg			0.00084 *UJ*	0.0011 *UJ*	NA	0.00081 *UJ*	NA	0.0013 *UJ*	0.0012 *UJ*	0.0015 *UJ*	NA		
2-Methylnaphthalene	mg/kg			0.0012 *UJ*	0.0015 *UJ*	NA	0.0050 *U*	NA	0.0024 *UJ*	0.0018 *UJ*	0.0029 *UJ*	NA		
Acenaphthene	mg/kg			0.0050 *U*	0.00098 *UJ*	NA	0.0050 *U*	NA	0.0050 *U*	0.00086 *UJ*	0.00096 *UJ*	NA		
Acenaphthylene	mg/kg			0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA		
Anthracene	mg/kg			0.0050 *U*	0.0011 *J*	NA	0.0050 *U*	NA	0.0014 *J*	0.00088 *J*	0.0016 *J*	NA		
Benzo(a)anthracene	mg/kg			0.0012 *J*	0.0049 *J*	NA	0.0041 *J*	NA	0.0082	0.0051	0.015	NA		
Benzo(a)pyrene	mg/kg			0.0022 *J*	0.0059	NA	0.0064	NA	0.011 *J*	0.0066 *J*	0.019	NA		
Benzo(b)fluoranthene	mg/kg			0.0024 *J*	0.0078	NA	0.0078	NA	0.017 *J*	0.0075 *J*	0.028	NA		
Benzo(g,h,i)perylene	mg/kg			0.0030 *J*	0.0080 *J*	NA	0.0099 *J*	NA	0.021 *J*	0.013 *J*	0.026 *J*	NA		
Benzo(j)fluoranthene	mg/kg			0.00098 *J*	0.0027 *J*	NA	0.0034 *J*	NA	0.0059	0.0026 *J*	0.0068	NA		
Benzo(k)fluoranthene	mg/kg			0.0016 *J*	0.0039 *J*	NA	0.0045 *J*	NA	0.0073	0.0035 *J*	0.0080	NA		
Benzofluoranthenes	mg/kg			0.0048 *J*	0.014	NA	0.016	NA	0.030 *J*	0.013 *J*	0.050	NA		
Chrysene	mg/kg			0.0020 *J*	0.0071	NA	0.0063	NA	0.015 *J*	0.0073 *J*	0.057	NA		
Dibenzo(a,h)anthracene	mg/kg			0.0050 *U*	0.0018 *J*	NA	0.0019 *J*	NA	0.0031 *J*	0.0016 *J*	0.0041 *J*	NA		
Dibenzofuran	mg/kg			0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	NA	0.0050 *U*	0.0050 *U*	0.0015 *J*	NA		
Fluoranthene	mg/kg			0.0023 *UJ*	0.0088	NA	0.0074	NA	0.017	0.010	0.021	NA		
Fluorene	mg/kg			0.0050 *U*	0.0050 *U*	NA	0.0050 *U*	NA	0.00073 *J*	0.0050 *U*	0.00080 *J*	NA		
Indeno(1,2,3-cd)pyrene	mg/kg			0.0021 *J*	0.0059	NA	0.0061	NA	0.013 *J*	0.0076 *J*	0.0093	NA		
Naphthalene	mg/kg			0.0050 *U*	0.0014 *UJ*	NA	0.0050 *U*	NA	0.0021 *UJ*	0.0050 *U*	0.0023 *UJ*	NA		
Phenanthrene	mg/kg			0.0016 *J*	0.0046 *J*	NA	0.0036 *J*	NA	0.0087	0.0066	0.011	NA		
Pyrene	mg/kg			0.0024 *J*	0.0082 *J*	NA	0.0073 *J*	NA	0.016 *J*	0.0098 *J*	0.019 *J*	NA		
cPAH TEQ	mg/kg	0.19		0.0032 *J*	0.0084 *J*	NA	0.0089 *J*	NA	0.016 *J*	0.0092 *J*	0.026 *J*	NA		
Metals														
Arsenic	mg/kg		7.3	NA	NA	3.7	NA	3.1	NA	NA	NA	2.7		

Table 2. Proposed Park Site: Analytical Results for Discrete Soil Samples (2021-2022)

Revised Proposed Excavation Depth:				1.5 ft bgs											
Location ID				GTF_S2			GTF_S3			GTF_S4		GTF_S5			
Sample ID				GTF_S2_1-1.5ft	GTF_S2_1.5-2ft	GTF_S2_B_1.5-2ft	GTF_S3_1-1.5ft	GTF_S3_1.5-2ft	GTF_S3_B_1.5-2ft	GTF_S4_1-1.5ft	GTF_S4_1.5-2ft	GTF_S5_1-1.5ft	GTF_S5_1.5-2ft	GTF_S5_B_1.5-2ft	
Sample Number				GTF-SL007	GTF-SL008	GTF-SL090	GTF-SL009	GTF-SL010	GTF-SL096	GTF-SL011	GTF-SL012	GTF-SL013	GTF-SL014	GTF-SL102	
Sample Date				09/29/21	09/29/21	12/14/22	09/29/21	09/29/21	12/14/22	09/29/21	09/29/21	09/29/21	09/29/21	12/14/22	
Sample Type				N	N	N	N	N	N	N	N	N	N	N	
		IASLs													
Analyte	Units	MTCA Method B Cancer (Eq. 740-2)	Natural Background	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Polychlorinated Biphenyls															
Aroclor 1016	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1221	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1232	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1242	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1248	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1254	mg/kg			0.14 *J*	NA	0.020 *U*	0.041	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1260	mg/kg			0.89	NA	0.28	0.093	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1262	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Aroclor 1268	mg/kg			0.10 *U*	NA	0.020 *U*	0.020 *U*	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Total PCB Aroclors	mg/kg	0.5		**1.0** ***J***	NA *	0.28	0.13	NA	NA	0.020 *U*	NA	0.020 *U*	NA	NA	
Polycyclic Aromatic Hydrocarbons															
1-Methylnaphthalene	mg/kg			0.0048 *UJ*	0.0020 *UJ*	NA	0.0015 *UJ*	0.00044 *UJ*	NA	0.0045 *UJ*	0.0037 *UJ*	0.0050 *U*	0.0050 *U*	NA	
2-Methylnaphthalene	mg/kg			0.0064	0.0020 *J*	NA	0.0027 *UJ*	0.0050 *U*	NA	0.0055	0.0042 *J*	0.0050 *U*	0.0050 *U*	NA	
Acenaphthene	mg/kg			0.012	0.0050 *U*	NA	0.0011 *UJ*	0.0050 *U*	NA	0.0012 *UJ*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Acenaphthylene	mg/kg			0.014	0.0050 *U*	NA	0.0023 *J*	0.0050 *U*	NA	0.0022 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Anthracene	mg/kg			0.044	0.0014 *J*	NA	0.0041 *J*	0.0050 *U*	NA	0.0051	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Benzo(a)anthracene	mg/kg			0.38	0.0044 *J*	NA	0.036	0.0020 *J*	NA	0.19	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Benzo(a)pyrene	mg/kg			0.39	0.0052	NA	0.056	0.0030 *J*	NA	0.39	0.00081 *J*	0.0014 *J*	0.0050 *U*	NA	
Benzo(b)fluoranthene	mg/kg			0.44	0.0052	NA	0.091	0.0036 *J*	NA	0.40	0.0050 *U*	0.0021 *J*	0.0050 *U*	NA	
Benzo(g,h,i)perylene	mg/kg			0.31	0.0044 *J*	NA	0.080	0.0049 *J*	NA	0.33	0.0050 *U*	0.0022 *J*	0.0050 *U*	NA	
Benzo(j)fluoranthene	mg/kg			0.17	0.0024 *J*	NA	0.032	0.0014 *J*	NA	0.14	0.0050 *U*	0.00081 *J*	0.0050 *U*	NA	
Benzo(k)fluoranthene	mg/kg			0.21	0.0030 *J*	NA	0.039	0.0022 *J*	NA	0.19	0.0050 *U*	0.00084 *J*	0.0050 *U*	NA	
Benzofluoranthenes	mg/kg			0.73	0.011	NA	0.15	0.0070 *J*	NA	0.65	0.0100 *U*	0.0033 *J*	0.010 *U*	NA	
Chrysene	mg/kg			0.44	0.0054	NA	0.074	0.0028 *J*	NA	0.16	0.0050 *U*	0.0011 *J*	0.0050 *U*	NA	
Dibenzo(a,h)anthracene	mg/kg			0.086	0.0010 *J*	NA	0.017	0.00099 *J*	NA	0.067	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Dibenzofuran	mg/kg			0.0061	0.0050 *U*	NA	0.0018 *J*	0.0050 *U*	NA	0.0016 *J*	0.0016 *J*	0.0050 *U*	0.0050 *U*	NA	
Fluoranthene	mg/kg			0.60	0.0080	NA	0.050	0.0030 *J*	NA	0.034	0.00085 *UJ*	0.0013 *J*	0.0050 *U*	NA	
Fluorene	mg/kg			0.011	0.0050 *U*	NA	0.00069 *UJ*	0.00099 *UJ*	NA	0.0050 *U*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	
Indeno(1,2,3-cd)pyrene	mg/kg			0.26	0.0035 *J*	NA	0.055	0.0028 *J*	NA	0.24	0.0050 *U*	0.0019 *J*	0.0050 *U*	NA	
Naphthalene	mg/kg			0.010	0.0016 *UJ*	NA	0.0039 *UJ*	0.0050 *U*	NA	0.0047 *UJ*	0.0029 *UJ*	0.0050 *U*	0.0050 *U*	NA	
Phenanthrene	mg/kg			0.22	0.0063	NA	0.020	0.0020 *J*	NA	0.0077	0.0026 *J*	0.0019 *UJ*	0.0012 *J*	NA	
Pyrene	mg/kg			0.59	0.0085	NA	0.068	0.0031 *J*	NA	0.081	0.0010 *J*	0.0011 *J*	0.0050 *U*	NA	
cPAH TEQ	mg/kg	0.19		**0.53**	0.0070 *J*	NA	0.081	0.0042 *J*	NA	**0.50**	0.0021 *J*	0.0024 *J*	0.0050 *U*	NA	
Metals															
Arsenic	mg/kg		7.3	NA	NA	6.9	NA	NA	**8.1**	NA	NA	NA	NA	3.9	

Table 2. Proposed Park Site: Analytical Results for Discrete Soil Samples (2021-2022)

Revised Proposed Excavation Depth:				2 ft bgs														
Location ID				GTF_S22		GTF_S23				GTF_S6				GTF_S7		GTF_S21		
Sample ID				GTF_S22_1.5-2ft	GTF_S22_2-2.5ft	GTF_S23_1.5-2ft	GTF_S23_1.5-2ft_DUP	GTF_S23_2-2.5ft	GTF_S23_2.5-3ft	GTF_S6_1-1.5ft	GTF_S6_1.5-2ft	GTF_S6_B_2-2.5ft	GTF_S6_B_2-2.5ft_DUP	GTF_S7_1-1.5ft	GTF_S7_1.5-2ft	GTF_S21_1-1.5ft	GTF_S21_1.5-2ft	
Sample Number				GTF-SL061	GTF-SL062	GTF-SL067	GTF-SL083	GTF-SL068	GTF-SL069	GTF-SL015	GTF-SL016	GTF-SL056	GTF-SL084	GTF-SL017	GTF-SL018	GTF-SL045	GTF-SL046	
Sample Date				03/09/22	03/09/22	03/09/22	03/09/22	03/09/22	03/09/22	09/29/21	09/29/21	03/09/22	03/09/22	09/29/21	09/29/21	09/29/21	09/29/21	
Sample Type				N	N	N	FD	N	N	N	N	N	FD	N	N	N	N	
		IASLs																
Analyte	Units	MTCA Method B Cancer (Eq. 740-2)	Natural Background	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Polychlorinated Biphenyls																		
Aroclor 1016	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1221	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1232	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1242	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1248	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1254	mg/kg			NA	NA	NA	NA	NA	NA	0.048	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1260	mg/kg			NA	NA	NA	NA	NA	NA	0.082	NA	NA	NA	0.018 *J*	NA	0.10 *U*	NA	
Aroclor 1262	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Aroclor 1268	mg/kg			NA	NA	NA	NA	NA	NA	0.020 *U*	NA	NA	NA	0.020 *U*	NA	0.10 *U*	NA	
Total PCB Aroclors	mg/kg	0.5		NA	NA	NA	NA	NA	NA	0.13	NA	NA	NA	0.018 *J*	NA	0.10 *U*	NA	
Polycyclic Aromatic Hydrocarbons																		
1-Methylnaphthalene	mg/kg			0.0019 *UJ*	0.0015 *UJ*	0.0050 *U*	0.0050 *U*	0.00046 *UJ*	NA	0.0099	0.0035 *UJ*	0.00095 *UJ*	0.0010 *UJ*	0.028	0.0031 *UJ*	0.13	0.0027 *UJ*	
2-Methylnaphthalene	mg/kg			0.0025 *J*	0.0015 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.011	0.0055	0.0050 *U*	0.0050 *U*	0.029	0.0033 *J*	0.092	0.0035 *J*	
Acenaphthene	mg/kg			0.0047 *UJ*	0.0012 *UJ*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.048	0.0068	0.00059 *UJ*	0.0050 *U*	0.16	0.0021 *UJ*	0.59	0.0016 *UJ*	
Acenaphthylene	mg/kg			0.0021 *J*	0.0013 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.0061	0.0036 *J*	0.0050 *U*	0.0050 *U*	0.0032 *J*	0.0015 *J*	0.040	0.0050 *U*	
Anthracene	mg/kg			0.012	0.0015 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.080	0.021	0.0050 *U*	0.0050 *U*	0.29	0.0021 *J*	0.99	0.0010 *J*	
Benzo(a)anthracene	mg/kg			0.066	0.0065	0.0050 *U*	0.0050 *U*	0.0015 *J*	NA	0.44	0.13	0.0022 *J*	0.0026 *J*	0.75	0.0057	3.9	0.0026 *J*	
Benzo(a)pyrene	mg/kg			0.077	0.029	0.00072 *J*	0.0008 *J*	0.0015 *J*	NA	0.44	0.17	0.0043 *J*	0.0056	0.63	0.0069	3.7	0.0027 *J*	
Benzo(b)fluoranthene	mg/kg			0.069	0.026	0.0050 *U*	0.0050 *U*	0.0020 *J*	NA	0.41	0.15	0.0045 *J*	0.0051	0.67	0.0075	2.8	0.0028 *J*	
Benzo(g,h,i)perylene	mg/kg			0.070	0.029	0.0050 *U*	0.0012 *J*	0.0024 *J*	NA	0.43	0.16	0.0048 *J*	0.0063	0.45	0.0078	2.1 *J*	0.0028 *J*	
Benzo(j)fluoranthene	mg/kg			0.029	0.0087	0.0050 *U*	0.0050 *U*	0.00079 *J*	NA	0.23	0.072	0.0017 *J*	0.0023 *J*	0.35	0.0029 *J*	1.1	0.0014 *J*	
Benzo(k)fluoranthene	mg/kg			0.035	0.011	0.0050 *U*	0.0050 *U*	0.00084 *J*	NA	0.30	0.092	0.0017 *J*	0.0028 *J*	0.47	0.0035 *J*	1.4	0.0016 *J*	
Benzofluoranthenes	mg/kg			0.13	0.044	0.010 *U*	0.0100 *U*	0.0036 *J*	NA	0.95	0.31	0.0083 *J*	0.0099 *J*	1.1	0.014	5.6	0.0059 *J*	
Chrysene	mg/kg			0.076	0.0091	0.0014 *J*	0.0015 *J*	0.0026 *J*	NA	0.50	0.16	0.0033 *J*	0.0036 *J*	0.85	0.0081	3.7	0.0033 *J*	
Dibenzo(a,h)anthracene	mg/kg			0.014	0.0053	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.13	0.036	0.0011 *J*	0.0012 *J*	0.20	0.0014 *J*	0.66	0.0012 *J*	
Dibenzofuran	mg/kg			0.0026 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.021	0.0050	0.0050 *U*	0.0050 *U*	0.11	0.0022 *J*	0.18	0.0016 *J*	
Fluoranthene	mg/kg			0.12	0.0047 *J*	0.00099 *J*	0.0011 *J*	0.0035 *J*	NA	0.87	0.21	0.0022 *J*	0.0023 *J*	2.0	0.013	6.5	0.0043 *UJ*	
Fluorene	mg/kg			0.0040 *J*	0.00079 *J*	0.0050 *U*	0.0007 *J*	0.0050 *U*	NA	0.039	0.0062	0.0050 *U*	0.0050 *U*	0.19	0.0013 *J*	0.46	0.00087 *J*	
Indeno(1,2,3-cd)pyrene	mg/kg			0.052	0.020	0.0050 *U*	0.0050 *U*	0.0015 *J*	NA	0.39	0.14	0.0027 *J*	0.0040 *J*	0.45	0.0054	2.0	0.0024 *J*	
Naphthalene	mg/kg			0.0039 *J*	0.0017 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	NA	0.013	0.0087	0.0050 *U*	0.0013 *J*	0.042	0.0032 *UJ*	0.11	0.0032 *UJ*	
Phenanthrene	mg/kg			0.071	0.0029 *J*	0.00087 *J*	0.0013 *J*	0.0027 *J*	NA	0.58	0.11	0.0024 *J*	0.0028 *J*	1.9	0.014	5.3	0.0047 *J*	
Pyrene	mg/kg			0.13	0.0059	0.00099 *J*	0.0012 *J*	0.0033 *J*	NA	0.90	0.27	0.0024 *J*	0.0027 *J*	1.5	0.011	6.1 *J*	0.0042 *J*	
cPAH TEQ	mg/kg	0.19		0.10	0.036	0.0020 *J*	0.0021 *J*	0.0024 *J*	NA	**0.61**	**0.23**	0.0055 *J*	0.0072 *J*	**0.89**	0.0093 *J*	**4.8**	0.0038 *J*	
Metals																		
Arsenic	mg/kg		7.3	NA	5.4 *U*	NA	NA	5.4 *U*	2.4	NA	NA	NA	NA	NA	NA	NA	NA	

Table 2. Proposed Park Site: Analytical Results for Discrete Soil Samples (2021-2022)

Revised Proposed Excavation Depth:				3 ft bgs							4.5 ft bgs							
Location ID				GTF_S25					GTF_S1		GTF_S27							
Sample ID				GTF_S25_1.5-2ft	GTF_S25_1.5-2ft	GTF_S25_2-2.5ft	GTF_S25_2.5-3ft	GTF_S25_3-3.5ft	GTF_S1_1-1.5ft	GTF_S1_1.5-2ft	GTF_S27_1.5-2ft	GTF_S27_2-2.5ft	GTF_S27_2.5-3ft	GTF_S27_3-3.5ft	GTF_S27_3.5-4ft	GTF_S27_4-4.5ft		
Sample Number				GTF-SL150	GTF-SL169	GTF-SL151	GTF-SL152	GTF_SL153	GTF-SL005	GTF-SL006	GTF-SL163	GTF-SL164	GTF-SL165	GTF-SL166	GTF-SL167	GTF-SL168		
Sample Date				12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	09/29/21	09/29/21	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22		
Sample Type				N	FD	N	N	N	N	N	N	N	N	N	N	N		
		IASLs																
Analyte	Units	MTCA Method B Cancer (Eq. 740-2)	Natural Background	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Polychlorinated Biphenyls																		
Aroclor 1016	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1221	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1232	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1242	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1248	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1254	mg/kg			0.10 *U*	0.10 *U*	0.47 *J*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1260	mg/kg			2.2 *J*	1.3 *J*	2.7	0.69 *J*	0.11 *J*	0.020 *U*	NA	NA	NA	0.042 *J*	0.037 *J*	0.020 *U*	0.020 *UJ*		
Aroclor 1262	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Aroclor 1268	mg/kg			0.10 *U*	0.10 *U*	0.20 *U*	0.020 *U*	0.020 *U*	0.020 *U*	NA	NA	NA	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*		
Total PCB Aroclors	mg/kg	0.5		**2.2 *J***	**1.3 *J***	**3.2 *J***	**0.69 *J***	0.11 *J*	0.020 *U*	NA	NA	NA	0.042 *J*	0.037 *J*	0.020 *U*	0.020 *U*		
Polycyclic Aromatic Hydrocarbons																		
1-Methylnaphthalene	mg/kg			0.0069 *J*	0.0059 *J*	0.027 *J*	0.0059 *UJ*	0.0015 *UJ*	0.0016 *UJ*	0.0018 *UJ*	0.0016 *J*	0.0067	0.0023 *UJ*	0.0055 *UJ*	0.0053 *J*	0.021		
2-Methylnaphthalene	mg/kg			0.0090 *J*	0.010 *J*	0.059 *J*	0.011 *UJ*	0.0016 *J*	0.0019 *UJ*	0.0019 *J*	0.015 *U*	0.0054	0.0040 *UJ*	0.015 *U*	0.0065 *J*	0.051		
Acenaphthene	mg/kg			0.027 *J*	0.0042 *J*	0.015 *J*	0.0048 *UJ*	0.0015 *UJ*	0.0011 *UJ*	0.0013 *UJ*	0.015 *U*	0.0018 *J*	0.015 *U*	0.0086 *UJ*	0.0026 *J*	0.031		
Acenaphthylene	mg/kg			0.0049 *J*	0.011 *J*	0.039 *J*	0.013 *UJ*	0.0014 *J*	0.0050 *U*	0.0012 *J*	0.0049 *J*	0.0032 *J*	0.0038 *UJ*	0.0095 *J*	0.0061 *J*	0.039		
Anthracene	mg/kg			0.053 *J*	0.016 *J*	0.045 *J*	0.020 *J*	0.0016 *J*	0.0050 *U*	0.0050 *U*	0.013 *J*	0.0072	0.014 *J*	0.024 *J*	0.024	0.21		
Benzo(a)anthracene	mg/kg			0.17 *J*	0.061 *J*	0.21 *J*	0.15 *J*	0.0037 *J*	0.0050 *U*	0.0050 *U*	0.27	0.060	0.069 *J*	0.34 *J*	0.12	0.51		
Benzo(a)pyrene	mg/kg			0.16 *J*	0.11 *J*	0.35 *J*	0.42 *J*	0.021 *J*	0.00071 *J*	0.0050 *U*	0.70	0.26	0.52 *J*	1.5 *J*	0.72	3.2		
Benzo(b)fluoranthene	mg/kg			0.15 *J*	0.12 *J*	0.44 *J*	0.41 *J*	0.027 *J*	0.0014 *J*	0.0050 *U*	0.63	0.28	0.50 *J*	1.4 *J*	0.66	2.3		
Benzo(g,h,i)perylene	mg/kg			0.17 *J*	0.16	0.57 *J*	0.49 *J*	0.028 *J*	0.0012 *J*	0.0050 *U*	0.65	0.30	0.49 *J*	1.3 *J*	0.76 *J*	4.8		
Benzo(j)fluoranthene	mg/kg			0.087 *J*	0.058	0.20 *J*	0.18 *J*	0.012 *J*	0.0050 *U*	0.0050 *U*	0.32	0.12	0.22 *J*	0.73 *J*	0.29	0.94		
Benzo(k)fluoranthene	mg/kg			0.084 *J*	0.055	0.18 *J*	0.17 *J*	0.011 *J*	0.0050 *U*	0.0050 *U*	0.30	0.11	0.21 *J*	0.67 *J*	0.28	0.92		
Benzofluoranthenes	mg/kg			0.32 *J*	0.23 *J*	0.84 *J*	0.76 *J*	0.053 *J*	0.0100 *U*	0.010 *U*	1.3	0.53	0.94 *J*	3.0 *J*	1.2	4.2		
Chrysene	mg/kg			0.20 *J*	0.10 *J*	0.39 *J*	0.21 *J*	0.0073 *J*	0.0011 *J*	0.0050 *U*	0.30	0.078	0.13 *J*	0.42 *J*	0.22	1.3		
Dibenzo(a,h)anthracene	mg/kg			0.035 *J*	0.026	0.087 *J*	0.075 *J*	0.0044 *J*	0.0050 *U*	0.0050 *U*	0.12	0.049	0.080 *J*	0.23 *J*	0.13	0.57		
Dibenzofuran	mg/kg			0.010 *J*	0.0047 *J*	0.036 *J*	0.0074 *J*	0.0050 *U*	0.0050 *U*	0.0050 *U*	0.015 *U*	0.0028 *J*	0.015 *U*	0.015 *U*	0.0043 *J*	0.034 *J*		
Fluoranthene	mg/kg			0.37 *J*	0.099 *J*	0.32 *J*	0.13 *J*	0.0044 *J*	0.0013 *J*	0.00088 *J*	0.091	0.030	0.031 *J*	0.097 *J*	0.069	0.27		
Fluorene	mg/kg			0.023 *J*	0.0036 *J*	0.013 *J*	0.0048 *UJ*	0.0010 *J*	0.00090 *UJ*	0.0011 *UJ*	0.015 *U*	0.00093 *J*	0.0027 *UJ*	0.015 *U*	0.015 *U*	0.026		
Indeno(1,2,3-cd)pyrene	mg/kg			0.13 *J*	0.11 *J*	0.38 *J*	0.30 *J*	0.016 *J*	0.0012 *J*	0.0050 *U*	0.46	0.18	0.32 *J*	1.0 *J*	0.50 *J*	2.9		
Naphthalene	mg/kg			0.014 *J*	0.018	0.14 *J*	0.023 *J*	0.0019 *J*	0.0019 *UJ*	0.0017 *J*	0.015 *U*	0.0030 *J*	0.013 *J*	0.015 *U*	0.0076 *J*	0.13		
Phenanthrene	mg/kg			0.27 *J*	0.049 *J*	0.24 *J*	0.066 *J*	0.0024 *J*	0.0018 *UJ*	0.0018 *J*	0.0089 *J*	0.018	0.018 *J*	0.013 *J*	0.034	0.17		
Pyrene	mg/kg			0.28 *J*	0.10 *J*	0.57 *J*	0.23 *J*	0.0068 *J*	0.0013 *J*	0.00092 *J*	0.19	0.048	0.068 *J*	0.27 *J*	0.12	0.36		
cPAH TEQ	mg/kg	0.19		**0.21**	0.15	**0.48 *J***	**0.53 *J***	0.027 *J*	0.0017 *J*	0.0050 *U*	**0.88**	**0.33**	**0.64 *J***	**1.9 *J***	**0.89** *J*	**3.9**		
Metals																		
Arsenic	mg/kg		7.3	**11**	**14**	**19.4**	5.41	2.52	NA	NA	4.2	NA	2.44	2.75	2.43	2.75		

Notes:
cPAH TEQs were calculated in accordance with Washington Department of Ecology Implementation Memorandum #10 (April 20, 2015).
bold = *detected exceedance of IASL*
* Original comparison made to MTCA Method A. Additional soil sampling will be undertaken to address data gaps.

bgs = below ground surface
cPAH = carcinogenic PAH
FD = field duplicate
IASL = interim action screening level
MTCA = Model Toxics Control Act
N = normal sample
NA = not analyzed / not applicable
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TEQ = toxicity equivalence

Qualifiers:
J = The reported value was an estimate.
U = The analyte was not detected. The associated numerical value is the reporting limit.

Table 3. Arsenic Concentrations in Proposed Postexcavation Remaining Soil at the Proposed Park Site

Sample Location	Depth (ft bgs)	Sample Date	Arsenic (mg/kg)
S2_B	1.5–2.0	12/14/22	6.9
S3_B	1.5–2.0	12/14/22	8.1
S5_B	1.5–2.0	12/14/22	3.9
S9_B	1.0–1.5	12/14/22	2.6
S11_B	1.0–1.5	12/14/22	13
S13_B	1.0–1.5	12/14/22	2.2
S17_B	1.0–1.5	12/14/22	3.7
S18_B	1.0–1.5	12/14/22	3.1
S20_B	1.0–1.5	12/14/22	2.7
S22	2.0–2.5	03/09/22	5.4 *U*
S23	2.0–2.5 *	03/09/22	5.4 *U*
S24	2.0–2.5	03/09/22	5.4 *U*
S25	3.0–3.5	12/14/22	2.5
S26	1.0–1.5	12/14/22	8.5
IASL for the Proposed Park Site			7.3
95% upper confidence limit on the mean[a]			6.3

Notes:

Concentrations shown are rounded to two significant figures.

[*] Concentration for 2.5–3.0 ft bgs is 2.4 mg/kg.

[a] Kaplan-Meier Land's H-statistic UCL for lognormal data recommended based on EPA ProUCL software version 5.2.

bgs = below ground surface

IASL = interim action screening level

UCL = upper confidence limit

U = The analyte was not detected. The associated numerical value is the reporting limit.

Attachment 1

Field Notes, Boring Logs, Chain-of-Custody for Field Event

2 12/13/2022 Former Georgetown Steam plant transfer CF1408-0106

7934

Weather: Cloudy ~44°F

Integral personel: Mauri F&S.D
onsite @1410

Flagging & Marking all 12 proposed sampling locations in preparation for tomorrow's fieldwork

offsite @1505

MF

Scale: 1 square = _____

12/14/2022 Former Georgetown Steam plant CF1408-0106

weather ~42°F cloudy

Integral: Mauri F&S.D & Kelsey Oakland
Cascade: Jim Watson
APS Locate

onsite @0715
HSS Meeting @0830
- Starting to drill at S25 S25 Dup @0850
↳ 7/little bit of clear glass. @1.5ft.
↳by ecology block needed to ~~step~~ Step out a few feet. See photo
- Starting to drill at S27 @0920
↳ ~~No deviation~~ Rock @ 2ft. moved over ½ ft. (1st & 2nd Attempt) 3rd Attempt hit wood - w/ Strong @ 2ft petroleum-like odor (See photo)
↳ 4th Attempt. Accepted no odor
- Starting to drill at S26 @ 1018
↳ Moved a few feet b/c ecology blocks
- Starting to drill at S9-B @1030
↳ no deviations
- Starting to drill at S2-B @1046
↳ no deviations

Scale: 1 square = _____

Rain in the Rain

12/14/22 GTF CF1408-0106

- Starting to drill at S13-B @1117
  ↳ ~~no deviations~~ stepped out a few feet due to ADS marking
- Starting to drill at S17-B@1127
  ↳ no deviations
- Starting to drill at S3-B @1227
  ↳ no deviations
- Starting to drill at S11-B@1237
  ↳ no deviation
- Starting to drill at S5-B @1255
  ↳ no deviations
- Starting to drill at S18-B @1307
  ↳ No deviations
- Starting to drill at S20-B@1320
  ↳ No deviations

- Breaking down the processing station, labeling Drums, cleaning @1400

- Gathering GPS coordinates of Actual Sampling locations @1445

offsite @ 1505

12/15/22 GTF CF1408-0106

weather ~ Sunny 33°F

Integral: M. Fabio, K. Kirkland

Performing EBs
GTF-SLEB-910S @0930
GTF-SLEB-911C @0940
QAd Samples @1010

Deliver samples to Lab @1100
Drive back to Portland, OR @1130

Scale: 1 square = _____

GTF_S27, 12/14/22 - wood encountered during 3rd attempt

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S2-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location / ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S2-B							5	95	0.5		0.0 - 1.0 ft: brown, soft grades to medium stiff, moist, SILT (ML), 95% fines, 5% fine to medium sand, few organics (leaves @ surface, rootlets throughout)
				10			15	75	1.0	ML	
									1.5		1.0 - 2.0 ft: brown, medium stiff, moist, SILT w/ SAND (ML), 75% fines, 15% fine sand, 10% subrounded fine to coarse gravel up to 1"
									2.0		
									2.5		
									3.0	SP-SM	2.0 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90% fine sand, 10% fines, trace organics (rootlets)
		None					90	10	3.5		
									4.0		@ 3.3 ft: 1 mm layer of yellow-brown clay
									4.5		
									5.0		End of core @ 4.5 ft

KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct push
Sampling Equipment: Macrocore Sampler
Start/End Time: 10:40 / 10:45
Latitude: -
Longitude: -
Notes: No deviations; no odor noted
0 - 4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S3-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location / Sample ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S3-B		None	20				95	80	0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5	ML, SP	0.0 - 1.9 ft: brown, soft grades to medium stiff, moist, SILT w/ GRAVEL (ML), 80% fines, 20% subangular to rounded fine to coarse gravel up to 2", few organics (large woody debris up to 2"), organics @ surface (leaves) 1.9 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND (SP), 95% fine sand, 5% fines, trace organics (rootlets). @ 4.0 - 4.5 ft: large chunks of woody debris up to 3.5" in length @ 3.4 - 3.9 ft: piece of woody debris End of core @ 4.5 ft KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 12:22 / 12:25
Latitude: –
Longitude: –
Notes: NO deviations; no odor noted
0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-SS-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-SS-B		None					60	40	0.5	SM	0.0 - 1.9 ft: brown, loose, moist, SILTY SAND (SM), 60 % fine sand, 40 % fines, organics @ surface
									1.0		
									1.5		1.9 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90 % fine sands, 10 % fines to medium
									2.0		
									2.5		End of core @ 4.5 ft
							90	10	3.0	SP-SM	
									3.5		
									4.0		
									4.5		

KK

Location Sketch

Drilling Contractor: Cascade Environmental
Drilling Method: Direct push
Sampling Equipment: Macrocore sampler
Start/End Time: 12:55 / 13:00
Latitude: -
Longitude: -
Notes: No deviations; no odor noted 0 - 4.5 ft

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF_SG-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location / Sample ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF_SG-B			5%					5%	0.5	GM	0.0 - 0.5 ft: brown, loose, moist, SILTY GRAVEL (GM), 50% subrounded to subangular fine to coarse gravel up to 1.5", trace organics (rootlets), 50% fines
									1.0		
									1.5		0.5 - 4.5 ft: brown, loose, moist, SILTY SAND (SM), 80% fine sand, 20% fines.
							80	20	2.0		
									2.5	SM	@ 4.0 - 4.5 ft: trace organics (woody debris)
		None							3.0		
									3.5		End of core @ 4.5 ft
									4.0		
									4.5		

KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macro core sampler
Start/End Time: 10:30 / 10:35
Latitude:
Longitude:
Notes: No deviations; no odor noted
0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S11-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location / ~~Sample ID~~	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S11-B									0.5		0.0 - 1.9 ft: brown, medium stiff, moist, SILT (ML), 100% fines, trace subangular gravel up to 1", trace organics (rootlets)
								100	1.0	ML	
									1.5		
									2.0		1.9 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90% fine sand, 10% fines
									2.5		
							90	10	3.0	SP-SM	End of core @ 4.5 ft
		None							3.5		
									4.0		
									4.5		

KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 12:37 / 12:40
Latitude: –
Longitude: –
Notes: No deviations; no odor noted
0 - 4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S13-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S13-B									0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5	SP-SM	0.0 - 3.4 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90 % fine Sand, 10 % fines, trace ~~roots~~ KK (rootlets), organics @ surface
							90	10			3.4 - 4.5 ft: brown, medium stiff, moist, SANDY SILT (ML), 60 % fines, 40 % very fine sand, alternating laminated layers of light and dark reddish brown SANDY SILT (ML)
							40	60			END OF core @ 4.5 ft

KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: MacroCore Sampler
Start/End Time: 11:17 / 11:20
Latitude: -
Longitude: -
Notes: core location stepped out few feet due to utility locate markings; no odor noted 0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF_S17_B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

Location / ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF_S17_B							60	40	0.5	SM	0.0 - 1.2 ft: brown, loose, moist, SILTY SAND (SM), 60% fine sand, 40% fines, trace organics (rootlets), organics @ surface, one piece of gravel (subrounded) 2"
									1.0		
									1.5		
									2.0		1.2 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND (SP), 95% fine sand, 5% fines, alternating laminated mm layers of light and dark reddish-brown SANDY SILT (ML) @ 4.3 - 4.5 ft
							95	5	2.5		
									3.0	SP	
		Yes							3.5		
									4.0		End of core @ 4.5 ft
									4.5	ML	KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 11:37 / 11:40
Latitude: -
Longitude: -
Notes: No deviations; no odor noted
0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S18-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/19/22

SAMPLE INFORMATION

Location / ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S18-B		None		5				95	0.5 – 1.0 – 1.5 – 2.0 – 2.5 – 3.0 – 3.5 – 4.0 – 4.5	ML / SP	0.0 - 1.9 ft: yellow-brown, stiff, moist, SILT (ML), 95% fines, 5% subrounded fine to coarse gravel up to 2", trace organics (rootlets) 1.9 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND (SP), 95% fine sand, 5% fines. @ 3.3 - 3.5 ft: black silt lens with 0.5" brick-like substance (reddish-orange) End of core @ 4.5 ft KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 13:07 / 13:10
Latitude: –
Longitude: –
Notes: No deviations; no odor noted
0 - 4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S20-B
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

Location / ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S20-B							70	30	0.5	SM	0.0 - 1.0 ft: brown, loose, moist, SILTY SAND (SM), 70% fine sand, 30% fines, broken asphalt pieces @ surface
									1.0		
									1.5		1.0 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90% fine sand, 10% fines
									2.0		
							90	10	2.5	SP-SM	@ 4.0 - 4.5 ft: interbedded SILT (ML), 1mm layers
									3.0		
		Sheen							3.5		@ 3.5 - 4.0 ft: trace subrounded fine gravel
									4.0		
									4.5		End of core @ 4.5 ft

Drilling Contractor: Cascade Environmental
Drilling Method: Direct push
Sampling Equipment: Macro core Sampler
Start/End Time: 13:20 / 13:25
Latitude: -
Longitude: -
Notes: No dewatering; no odor noted 0 - 4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S2S
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22
Page 1 of 1

SAMPLE INFORMATION

Location / ~~Sample ID~~	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S2S		None		5			1	95	0.5	ML	0.0 - 1.0 ft: brown, soft grades to medium STIFF, moist, SILT (ML), 95 % fines, 5% subrounded to rounded fine gravel, trace organics (rootlets), organics @ surface.
							20	80	1.0		
									1.5	---	
							80	20	2.0	SM	1.0 - 1.5 ft: brown, medium STIFF, moist, ~~SILT w/ SAND~~ SILTY SAND 80 % fines, 20 % fine sand (SM), trace subrounded to rounded fine gravel, trace organics, (rootlets)
									2.5		
									3.0	---	1.5 - 2.8 ft: brown, moist, SILTY SAND (SM), 80 % fine sand, 20 % fines, trace organics (rootlets, woody debris)

End of core @ 2.8 ft

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macro core sampler
Start/End Time: 08:50 / 09:05
Latitude: —
Longitude: —
Notes: Field Duplicate; stepped out from Ecology Blocks (see photo); no odor noted 0-2.8 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S2S
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location ~~Sample~~ ID	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S2S			30					70	0.5	ML	0.0 - 0.5 ft: brown, soft, moist, GRAVELY SILT (ML), 70% fines, 30% subrounded fine to coarse gravel, trace organics (rootlets)
							80	20	1.5	SM	0.5 - 1.1 ft: brown, medium stiff, moist, SILT (ML), 100% fines, trace fine sand, trace organics
							10	90	2.0	ML	1.1 - 1.4 ft: brown, loose, moist, SILTY SAND (SM), 80% fine sand, 20% fines, trace organics (rootlets)
		None					90	10	3.5	SP-SM	@ 1.5 ft piece of glass (see photo)
									4.5		1.4 - 2.3 ft: brown, medium stiff, moist, SILT (ML), 90% fines, 10% fine sand, trace organics (rootlets)
											2.3 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90% fine sand, 10% fines, trace organics (rootlets)
											End of core @ 4.5ft

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macro core Sampler
Start/End Time: 08:50 / 09:05
Latitude: —
Longitude: —
Notes: MS/MSD; stepped out from Ecology blocks (see photo); no odor noted 0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S26
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location / ~~Sample ID~~	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S26		None	45				50	25	0.5	GM	0.0 - 1.1 ft: gray-brown, loose, moist SILTY GRAVEL (GM), 85% subangular to angular fine to coarse gravel/aggregate up to 2", 15% fines, organics @ surface
									1.0	SM	1.1 - 1.5 ft: brown, loose, moist, SILTY SAND (SM), 80% fine sand, 20% fines
							95	5	1.5	SP	1.5 - 4.5 ft: brown, loose, moist, POORLY GRADED SAND (SP), 95% fine sand, 5% fines
									2.0		
									2.5		
									3.0		
									3.5		
									4.0		
									4.5		End of core @ 4.5 ft

KK

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 10:18 / 10:22
Latitude: -
Longitude: -
Notes: Stepped out from Ecology blocks (see photo); no odor noted 0-4.5 ft

Location Sketch

integral

719 2nd Ave, Suite #1450
Seattle, WA 98104
(206) 957-0373

Log of Boring: GTF-S27
Project Name: Fromer Georgetown Steam Plant Flume Property Transfer
Project Number: CF1408
Logged by: MF & KK
Date: 12/14/22

SAMPLE INFORMATION

Location ~~Sample ID~~	% Recovery	Sheen	FIELD-ESTIMATED % Gravel Coarse	Gravel Fine	Sand Coarse	Sand Medium	Sand Fine	Fines	Depth (Feet)	Symbol	Soil Description (USCS group name, minor components, color, moisture, additional descriptions)
GTF-S27		None					10	90	0.5	ML	0.0-1.5 ft: brown, soft, moist, SILT (ML), 90% fines, 10% fine sand, trace organics (rootlets), organics @ surface
									1.0		
									1.5		1.5-4.5 ft: brown, loose, moist, POORLY GRADED SAND w/ SILT (SP-SM), 90% fine sand, 10% fines
									2.0		
									2.5		@ 1.5-2.1 ft: trace organics (rootlets)
							90	10	3.0	SP-SM	
									3.5		End of core @ 4.5 ft
									4.0		
									4.5		

Drilling Contractor: Cascade Environmental
Drilling Method: Direct Push
Sampling Equipment: Macrocore Sampler
Start/End Time: 09:35 / 09:45
Latitude: -
Longitude: -
Notes: Refusal @ 2 FT for first 2 attempts; 3rd attempt stepped over 6" and hit wood w/ petroleum-like odor (see photo); 4th attempt a few feet from proposed location

Location Sketch

CHAIN OF CUSTODY FORM

Project: CF1408 - Fromer Georgetown Steam Plant Flume Property Transfer

Samplers: Mauri Fabio & Kelsey Kirkland

integral consulting inc.

Integral Contact: Glenn Esler (gesler@integral-corp.com)
Phone (503) 943-3617

Ship to: Lab Name Analytical Resources, Inc.
Address 4611 S 134th Pl #100
Tukwila, WA 9818

Contact Sue Dunnihoo
Phone (206) 695-6207

Sample No.	Tag #	Date	Time	Matrix	ANALYSES REQUESTED: Frozen Archive	Percent Solids (SM 2540G)	Arsenic (EPA 6020B)	PAHs (EPA 8270E SIM)	PCBs (EPA 8082A)	~~PCBs~~			Extra Container	Archive	Comments
F_SL091 ~~GTF-SL-B-1.5-2FT~~		12/14/22	11:15	SL		X	X		X						
F_SL091 ~~GTF-SL-B-2-2.5FT~~			11:20		X										
F_SL092 ~~GTF-SL-B-2.5-3FT~~			11:25		X										
F_SL093 ~~GTF-SL-B-3-3.5FT~~			11:30		X										
F_SL094 ~~GTF-SL-B-3.5-4FT~~			11:35		X										
F_SL095 ~~GTF-SL-B-4-4.5FT~~			11:40		X										
GTF-SL096			12:55			X	X								
GTF-SL097			13:00		X										
GTF-SL098			13:05		X										
GTF-SL099			13:10		X										
F_SL100 ~~GTF-SL-B-4.5-5FT~~			13:15		X										
GTF-SL101			13:20		X										
GTF-SL102			14:00			X	X								
GTF-SL103			14:05		X										
GTF-SL104			14:10		X										
GTF-SL105			14:15		X										
GTF-SL106			14:20		X										
GTF-SL107			14:25		X										
GTF-SL108			10:40			X	X								
GTF-SL109			10:45		X										

Analysis Turn Time: (Normal) Rush **Rush Results Needed By:**

Shipped by: **Shipping Tracking No.**

Condition of Samples Upon Receipt: **Custody Seal Intact?**

Relinquished by: _____ (signature) **Date/Time:** 12/15/22 1100 **Received by:** _____ (signature) **Date/Time:** _____

Relinquished by: _____ (signature) **Date/Time:** 12/15/22 **Received by:** Jacob Walter (signature) **Date/Time:** 12/15/22 1144

Matrix Code:	
GW - Groundwater	
SL - Soil	SW - Surface water
SD -Sediment	Other:

Special Instructions:
Equipment blank bottles delivered w/o preservative. Lab to add upon receipt of samples
*No temperature blanks provided by lab

CHAIN OF CUSTODY FORM

Project: CF1408 - Fromer Georgetown Steam Plant Flume Property Transfer

Samplers: Mauri Fabio & Kelsey Kirkland

integral consulting inc.

Integral Contact: Glenn Esler (gesler@integral-corp.com)
Phone (503) 943-3617

Ship to: Lab Name Analytical Resources, Inc.
Address 4611 S 134th Pl #100
Tukwila, WA 9818

Contact Sue Dunnihoo
Phone (206) 695-6207

Sample No.	Tag #	Date	Time	Matrix	ANALYSES REQUESTED: Frozen Archive	Percent Solids (SM 2540 G)	Arsenic (EPA 6020B)	PAHs (EPA 8270E SIM)	PCBs (EPA 8082A)				Extra Container	Archive	Comments
GTF-SL110		12/14/22	10:50	SL	X										
GTF-SL111			10:55		X										
GTF-SL112			11:00		X										
GTF-SL113			11:05		X										
GTF-SL114			11:10		X										
GTF-SL115			13:25			X	X								
GTF-SL116			13:30		X										
GTF-SL117			13:35		X										
GTF-SL118			13:40		X										
GTF-SL119			13:45		X										
GTF-SL120			13:50		X										
GTF-SL121			13:55		X										
GTF-SL122			11:45			X	X								
GTF-SL123			11:50		X										
GTF-SL124			11:55		X										
GTF-SL125			12:00		X										
GTF-SL126			12:05		X										
GTF-SL127			12:10		X										
GTF-SL128			12:15		X										
GTF-SL129			12:20			X	X								

Analysis Turn Time: (Normal) Rush **Rush Results Needed By:**

Matrix Code: GW - Groundwater; SL - Soil; SW - Surface water; SD -Sediment; Other:

Shipped by: **Shipping Tracking No.**

Condition of Samples Upon Receipt: **Custody Seal Intact?**

Relinquished by: _____ (signature) **Date/Time:** 12/15/22 1100 **Received by:** _____ (signature) **Date/Time:** _____

Relinquished by: _____ (signature) **Date/Time:** _____ **Received by:** Jacob Leith (signature) **Date/Time:** 12/15/22 1100

Special Instructions:
Equipment blank bottles delivered w/o preservative. Lab to add upon receipt of samples. * No temperature blanks provided by lab

CHAIN OF CUSTODY FORM

Project: CF1408 - Fromer Georgetown Steam Plant Flume Property Transfer

Samplers: Mauri Fabio & Kelsey Kirkland

integral consulting inc.

Integral Contact: Glenn Esler (gesler@integral-corp.com)
Phone (503) 943-3617

Ship to:
Lab Name Analytical Resources, Inc.
Address 4611 S 134th Pl #100
Tukwila, WA 9818

Contact Sue Dunnihoo
Phone (206) 695-6207

Sample No.	Tag #	Date	Time	Matrix	ANALYSES REQUESTED: Frozen Archive	Percent Solids (SM 2540 G)	Arsenic (EPA 6020 B)	PAHs (EPA 8270E SIM)	PLBs (EPA 8082A)				Extra Container	Archive	Comments
GTF-SL130		12/14/12	12:25	SL	X										
GTF-SL131			12:30		X										
GTF-SL132			12:35		X										
GTF-SL133			12:40		X										
GTF-SL134			12:45		X										
GTF-SL135			12:50		X										
GTF-SL136			14:30			X	X								
GTF-SL137			14:35		X										
GTF-SL138			14:40		X										
GTF-SL139			14:45		X										
GTF-SL140			14:50		X										
GTF-SL141			14:55		X										
GTF-SL142			15:00		X										
GTF-SL143			15:05			X	X								
GTF-SL144			15:10		X										
GTF-SL145			15:15		X										
GTF-SL146			15:20		X										
GTF-SL147			15:25		X										
GTF-SL148			15:30		X										
GTF-SL149		↓	15:35	↓	X										

Analysis Turn Time: (Normal) Rush **Rush Results Needed By:**

Shipped by: **Shipping Tracking No.**

Condition of Samples Upon Receipt: **Custody Seal Intact?**

Matrix Code: GW - Groundwater; SL - Soil; SW - Surface water; SD -Sediment; Other:

Relinquished by: _____ (signature) **Date/Time:** 12/13/12/1100 **Received by:** Jacobsen (signature) **Date/Time:** 12/15/12

Relinquished by: _____ (signature) **Date/Time:** _____ **Received by:** _____ (signature) **Date/Time:** 1100

Special Instructions:
Equipment blank bottles delivered w/o preservative. Lab to add upon receipt of samples & NO temperature blanks provided by lab

CHAIN OF CUSTODY FORM

Project: CF1408 - Fromer Georgetown Steam Plant Flume Property Transfer

Samplers: Mauri Fabio & Kelsey Kirkland

integral consulting inc.

Integral Contact: Glenn Esler (gesler@integral-corp.com)
Phone (503) 943-3617

Ship to: Lab Name Analytical Resources, Inc.
Address 4611 S 134th Pl #100
Tukwila, WA 9818

Contact Sue Dunnihoo
Phone (206) 695-6207

Sample No.	Tag #	Date	Time	Matrix	Fraction Arsenic	Percent Solids (SM 2540G)	Arsenic (EPA 6020B)	PAHs (EPA 8270E SIM)	PLBs (EPA 8082A)				Extra Container	Archive	Comments
GTF-SL150		12/14/22	08:50	SL		X	X	X	X						
GTF-SL150 MS			08:55				X	X	X						
GTF-SL150 MSD			09:00				X	X	X						
GTF-SL151			09:05		X	~~XXX~~									
GTF-SL152			09:10		X										
GTF-SL153			09:15		X										
GTF-SL154			~~10:05~~	09:20	X										
GTF-SL155			~~10:10~~	09:25	X										
GTF-SL156			10:05			X	X	X	X						
GTF-SL157			10:10		X										
GTF-SL158			10:15		X										
GTF-SL159			10:20		X										
GTF-~~SL160~~ SL160			10:25		X										
GTF-SL161			10:30		X										
GTF-SL162			10:35		X										
GTF-SL163			09:35			X	X	X							
GTF-SL164			09:40		X										
GTF-SL165			09:45		X										
GTF-SL166			09:50		X										
GTF-SL167		↓	09:55	↓	X										

Analysis Turn Time: Normal Rush **Rush Results Needed By:**

Shipped by: **Shipping Tracking No.**

Condition of Samples Upon Receipt: **Custody Seal Intact?**

Matrix Code:
GW - Groundwater
SL - Soil
SW - Surface water
SD -Sediment
Other:

Relinquished by: _____ (signature) **Date/Time:** 12/15/22/1100 **Received by:** Jacob Haltz (signature) **Date/Time:** 12/15/22

Relinquished by: _____ (signature) **Date/Time:** _____ **Received by:** _____ (signature) **Date/Time:** 1100

Special Instructions:
Equipment blank bottles delivered w/o preservative. Lab to add upon receipt of samples * No temperature blanks provided by lab

CHAIN OF CUSTODY FORM

Project: CF1408 - Fromer Georgetown Steam Plant Flume Property Transfer

Samplers: Mauri Fabio & Kelsey Kirkland

integral consulting inc.

Integral Contact: Glenn Esler (gesler@integral-corp.com)
Phone (503) 943-3617

Ship to: Lab Name Analytical Resources, Inc.
Address 4611 S 134th Pl #100
Tukwila, WA 9818

Contact Sue Dunnihoo
Phone (206) 695-6207

Sample No.	Tag #	Date	Time	Matrix	ANALYSES REQUESTED: Frozen Archive	Percent Solids (SM 2540G)	Arsenic (EPA 6020B)	PAHs (EPA 8270E SIM)	PLBs (EPA 8082A)				Extra Container	Archive	Comments
GTF-SL16B		12/14/22	10:00	SL	X										
GTF-SL16A		↓	09:20	↓		X	X	X	X						Field Duplicate
~~GTF-SL6B~~ GTF-SL17A		~~12/15/22~~	09:30	SLEB			X	X	X						Equip. Blank
GTF-SL17-1		↓	09:35	SLEB			X	X	X						Equip. Blank

Analysis Turn Time: Normal Rush **Rush Results Needed By:**

Matrix Code: GW - Groundwater; SL - Soil; SW - Surface water; SD -Sediment; Other:

Shipped by: **Shipping Tracking No.**

Condition of Samples Upon Receipt: **Custody Seal Intact?**

Relinquished by: _____ (signature) **Date/Time:** 12/15/22/1100 **Received by:** _____ (signature) **Date/Time:** 12/15/22

Relinquished by: _____ (signature) **Date/Time:** _____ **Received by:** Jacobsen (signature) **Date/Time:** 1100

Special Instructions:

Arsenic 250 mL bottles did not have preservative, lab instructions were to deliver samples and lab to add preservative *No temp. blanks provided by lab

Attachment 2

Data Validation Report

DATA VALIDATION REPORT

Former Georgetown Steam Plant Flume Property Transfer
December 2022 Sampling

Prepared for
Seattle City Light

Prepared by

319 SW Washington Street
Suite 1150
Portland, OR 97204

May 8, 2023

CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

CCV	continuing calibration verification
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatograph/mass spectrometer
ICV	initial calibration verification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MRL	method reporting limit
MS/MSD	matrix spike and matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA/QC	quality assurance and quality control
RPD	relative percent difference
SDG	sample delivery group

1 INTRODUCTION

This report presents the findings of the data validation of soil samples and associated quality control samples analyzed for polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and total solids. The sample delivery groups (SDGs) reviewed are summarized in Table 1-1, and the laboratory, parameters, and analytical methods are listed in Table 1-2.

The samples received a Stage 2B validation, which included a review of all laboratory summary forms of quality control and instrument performance data. The data validation was based upon criteria described in the U.S. Environmental Protection Agency (EPA) National Functional Guidelines for Organic Superfund Methods Data Review (USEPA 2020a), National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA 2020b), and the referenced analytical methods.

The quality assurance and quality control (QA/QC) parameters reviewed are discussed in Section 2. The electronic data deliverables were compared to the hard copy data packages, and 10 percent of the results were verified. Qualifiers resulting from the validation process were entered into the project database. A reason code indicating the reason for qualification was also entered into the database. The definitions of the data qualifiers used are provided in Table 1-3, and descriptions of the reason codes used are provided in Table 1-4. For example, if a data point was estimated due to a surrogate issue, the qualifier "J" and the reason code "SSR" were entered into the database, indicated as J-SSR in the discussion of findings in Section 2.

2 FINDINGS

The data validation findings are provided in this section. Details of the QA/QC parameters reviewed are discussed below and listed in Table 2-1.

2.1 SAMPLE RECEIPT AND HOLDING TIMES

Samples were received with complete chain-of-custody forms and in good condition, with the following exceptions.

- For one sample, the laboratory noted an identification discrepancy between the bottle (GTF_SII136) and the chain-of-custody forms (GTF_SL136) submitted with SDG 22L0416. The laboratory logged in this sample according to chain-of-custody forms.
- The bottles provided by the laboratory for Samples GTF-SL170 and GTF-SL171 submitted with SDG 22L0416 were not preserved for arsenic analysis. The laboratory preserved the bottles upon receipt.

The following archived samples were requested for PAH, PCB, and arsenic:

Samples	SDG
GTF_SL151 GTF_SL164	23A0556
GTF_SL152 GTF_SL165	23B0314
GTF-SL153 GTF-SL166	23C0177
GTF_SL167 GTF_SL168	23D0027

2.2 BLANKS

All results from the laboratory method blanks and equipment blanks were reported as less than the laboratory method detection limits with the following exceptions:

- 1-Methylnaphthalene, indeno[1,2,3-*cd*] pyrene, dibenz[*a,h*]anthracene, and benzo[*ghi*]perylene were detected at concentrations less than the reporting limit in the

method blank submitted with SDG 23A0556. The results for these analytes in the associated samples were greater than the reporting limit, and no qualifiers were assigned.

- 2-Methylnaphthalene, 1-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and fluoranthene were detected at concentrations less than the reporting limit in the method blank submitted with SDG 23B0314.
  - The detected 2-methylnaphthalene, 1-methylnaphthalene, acenaphthylene, acenaphthene results in Samples GTF_SL152 and GTF_SL165 were qualified as not detected (U-LB).
  - The phenanthrene and fluoranthene concentrations in the associated samples were greater than the reporting limits, and no qualifiers were assigned.
- 1-Methylnaphthalene and acenaphthene were detected at concentrations less than the reporting limit in the method blank submitted with SDG 23C0177. The results for these analytes in Samples GTF-SL153 and GTF-SL166 were qualified as not detected (U-LB).

2.3 SURROGATE RECOVERY

Surrogates were added to all samples for analysis of PAHs and PCBs. All surrogate percent recoveries were within the laboratory control limits with the following exceptions:

- The percent recovery value for the PAH surrogate fluoranthene-d10 was less than the laboratory control limits for Sample GTF-SL150 submitted with SDG 22L0416. The PAH results for this sample were qualified as estimated (J-SSR).
- The percent recovery value for the PCB surrogate tetrachloro-*m*-xylene was less than the laboratory control limits for Sample GTF-SL170 submitted with SDG 22L0416. The PCB results for this sample were qualified as estimated (UJ-SSR).
- The percent recovery values for the PAH surrogate dibenzo[*a,h*]anthracene-d14 were greater than the laboratory control limits for Samples GTF_SL151, BLA0738-BLK1, BLA0738-BS1, and BLA0738-MSD1 submitted with SDG 23A0556.
  - The detected PAH results in Sample GTF_SL151 were qualified as estimated (J-SSR).
  - No qualifiers were assigned to the quality control samples on the basis of the surrogate recoveries.
- The percent recovery values for the several PAH surrogates were greater than the laboratory control limits in the laboratory control sample and laboratory control sample duplicate (LCS/LCSD) and the matrix spike and matrix spike duplicate (MS/MSD) submitted with SDG 23B0314. No qualifiers were assigned based on the surrogate recoveries in these quality control samples.

- The percent recovery values for the PAH surrogate dibenzo[*a,h*]anthracene-d14 were greater than the laboratory control limits for Samples GTF_SL152 and GTF_SL165 submitted with SDG 23B0314. The detected PAH analytes in these samples were qualified as estimated (J-SSR).
- The percent recovery values for the PAH surrogates dibenzo[*a,h*]anthracene-d14 and fluoranthene-d10 were greater than the laboratory control limits for the LCS, MS, MSD, and Samples GTF-SL153 and GTF-SL166 submitted with SDG 23C0177.
  - The detected PCB results for Samples GTF-SL153 and GTF-SL166 were qualified as estimated (J-SSR).
  - No qualifiers were assigned to the quality control samples.
- The percent recovery values for the PAH surrogate dibenzo[*a,h*]anthracene-d14 were greater than the laboratory control limits in Samples BLD0060-BS1 and BLD0060-BSD1 submitted with SDG 23D0027. No qualifiers were assigned to the quality control samples on the basis of the surrogate recoveries.

2.4 LABORATORY CONTROL SAMPLES

The percent recoveries and relative percent difference (RPD) values of all laboratory control samples were within the laboratory control limits with the following exceptions:

- The percent recovery values for phenanthrene and pyrene for the LCS submitted with SDG 22L0416 were less than the laboratory control limits. The nondetected results for these analytes in associated Samples GTF-SL170 and GTF-SL171 were qualified as estimated (UJ-LCS).
- The percent recovery value for Aroclor 1260 in the LCSD submitted with SDG 23B0314 was greater than the laboratory control limits. Because the LCS percent recovery value was within the control limits and the LCSD percent recovery value was within 10 percentage points of the control limits, no qualifiers were assigned.

2.5 MATRIX SPIKES AND MATRIX SPIKE DUPLICATES

The percent recoveries and RPDs of all MS/MSDs were within the laboratory control limits, with the following exceptions.

- The percent recovery values for nine PAHs were less than the laboratory control limits in the MS/MSD submitted with SDG 22L0416. The results for the following analytes for Sample GTF-SL150 were qualified as estimated (J-MS): phenanthrene, fluoranthene, pyrene, benz[*a*]anthracene, chrysene, benzo[*b*]fluoranthene, total benzofluoranthenes, benzo[*a*]pyrene, and indeno[1,2,3-*cd*]pyrene.

- The percent recovery values for Aroclor 1260 were greater than the laboratory control limits in the MS/MSD submitted with SDG 23A0556. Because the Aroclor 1260 concentration in the unspiked sample was greater than 4 times the concentration of the spike added, no qualifiers were assigned.
- The percent recovery values for 10 PAHs were greater than the laboratory control limits in the MS/MSD submitted with SDG 23B0314. The results for the following analytes for Sample GTF_SL152 were qualified as estimated (J-MS): pyrene, benzo[*ghi*]perylene, indeno[1,2,3-*cd*]pyrene, benzo[*j*]fluoranthene, benzo[*b*]fluoranthene, benzo[*k*]fluoranthene, chrysene, benzo[*a*]pyrene, dibenz[*a,h*]anthracene, benzo[*a*]anthracene, and total benzofluoranthenes.
- The percent recovery values for Aroclor 1260 were less than the laboratory control limits in the MS/MSD submitted with SDG 23D0027. The Aroclor 1260 results in associated Sample GTF_SL168 were qualified as estimated (UJ-MS).
- The percent recovery values for benzo[*ghi*]perylene, indeno[1,2,3-*cd*]pyrene, benzo[*b*]fluoranthene, and benzo[*a*]pyrene than were less the laboratory control limits in the matrix spike submitted with SDG 23D0027.
  - The benzo[*ghi*]perylene and indeno[1,2,3-*cd*]pyrene results for Sample GTF_SL167 were qualified as estimated (UJ-MS).
  - Because the MSD percent recovery values for benzo[*b*]fluoranthene and benzo[*a*]pyrene were within the laboratory control limits and the matrix spike recovery values were within 10 percentage points of the limits, no qualifiers were assigned.

2.6 REPLICATES

One set of field replicates was submitted: Samples GTF-SL150 and GTF-SL169. EPA has not established control limits for field replicates. For this project, the target control limit for field replicates is an RPD less than 50 percent (for soils) for values greater than 5 times the method reporting limit (MRL). For values less than 5 times the MRL, the absolute difference should be less than 2 times the MRL for soils. The following results for the field duplicate pair were qualified as estimated (J-REP) because the precision control limits were not met.

Analyte	RPD
PAHs	
Anthracene	110
Pyrene	92.2
Fluoranthene	115
Chrysene	65.7
Benz[a]anthracene	95.8

Analyte	RPD
Acenaphthene	147
Phenanthrene	138
Fluorene	145
PCBs	
Aroclor 1260	52.6

The RPD values for all laboratory duplicate analyses were within laboratory control limits.

The RPD value between the dual-column Aroclor 1254 results for Sample GTF_SL151 submitted with SDG 23A00556 was greater than 40 percent, and this result was qualified as estimated (J-REP).

2.7 METHOD REPORTING LIMITS AND METHODOLOGY

The reporting limits specified in the SAP (Integral 2021) were met for all analyses except for the samples analyzed at dilutions. A reporting limit for arsenic is not specified in the sampling and analysis plan (Integral 2021).

All soil samples submitted for arsenic analysis were analyzed at 20- or 100-fold dilutions.

All soil samples submitted with SDGs 22L0416 and 23B0314 for PAH analysis were analyzed at 3-fold dilutions because of sample extract color.

Samples GTF-SL150 and GTF-SL169 submitted with SDG 22L0416 for PCB analysis were analyzed at 5-fold dilutions because of high target analyte concentrations.

Sample GTF_SL151 submitted with SDG 23A0556 was analyzed for PAH analysis at a 3-fold dilution and PCB analysis at a 10-fold dilution because of high target analyte concentrations.

In the electronic data deliverable submitted with 23A0556, the laboratory reported the PCB results from both analytical columns for Sample GTF-SL151. The results that matched the laboratory report were deemed reportable and the other results were qualified as do-not-report (R-DNR).

Sample GTF-SL166 submitted with SDG 23C0177 was analyzed at 3- and 15-fold dilutions for PAH analysis because of high concentrations of target compounds. The laboratory reported the PAH results from both dilutions for this sample. The highest concentration least qualified result was considered reportable, and the other results were qualified as do-not-report (R-DNR).

Sample GTF-SL168 submitted with SDG 23D0027 was analyzed at 3- and 15-fold dilutions for PAH analysis because of high concentrations of target compounds. The laboratory reported the PAH results from both dilutions for this sample. The highest concentration least qualified result was considered reportable, and the other results were qualified as do-not-report (R-DNR).

2.8 INSTRUMENT PERFORMANCE

The gas chromatograph/mass spectrometer (GC/MS) instrument performance checks ("tune") were analyzed before each initial calibration, and the method-specified acceptance criteria were met.

2.9 INITIAL CALIBRATION

Initial calibrations were analyzed on all instruments and met the acceptance criteria stated in the associated methods, with the following exceptions:

- The percent difference value for the PAH surrogate dibenzo[*a,h*]anthracene-d14 was greater than the acceptance limits in SKL0321-ICV1 submitted with SDG 22L0416. Because the surrogate recovery values were within limits in all associate samples, no qualifiers assigned.
- The percent difference values for the PCB surrogate decachlorobiphenyl were greater than the acceptance limits in ICV SLB0342-SCV6 submitted with SDGs 23A0566, 23B0314, 23C0177, and 23D0027. Samples GTF_SL151, GTF_SL152, GTF_SL165, GTF-SL153, GTF-SL166, GTF_SL167, and GTF_SL168 were associated with this initial calibration verification (ICV) sample. Because the decachlorobiphenyl recovery values were within the laboratory control limits in the samples, no qualifiers were assigned on the basis of the ICV percent differences.
- The percent difference values for Aroclor 1260 were greater than the acceptance limits in one ICV submitted with SDG 23B30314. The detected Aroclor 1260 results in Samples GTF_SL152 and GTF_SL165 were qualified as estimated (J-Ci).
- The percent difference values for the PCB surrogate decachlorobiphenyl and Aroclor 1260 were less than the acceptance limits on the primary column for SLC0316-ICV1 and SLC0316-ICV2 submitted with SDG 23C0177. Because the percent differences were within acceptance limits on the secondary column, no qualifiers were assigned.
- The percent difference values for the PCB surrogate tetrachloro-*meta*-xylene were greater than the acceptance limits on the secondary column for SLD0213-ICV1 and SLD0213-CCV3 submitted with SDG 23D0027. Because the percent differences were within acceptance limits on the primary column, no qualifiers were assigned.

- Percent difference values for Aroclor 1260 were greater than the acceptance limits on the primary column in SLD0213-ICV2 and SLD0213-CCV2 submitted with SDG 23D0027. Because the percent differences were within acceptance limits on the secondary column, no qualifiers were assigned.

2.10 CONTINUING CALIBRATION

Continuing calibrations were analyzed on all instruments and met the acceptance criteria stated in the associated methods, with the following exceptions:

- The percent difference value for PAH surrogate dibenzo[*a,h*]anthracene-d14 was greater than the acceptance limits in SLA0005-CCV1 submitted with SDG 22L0416. Because the surrogate recovery values were within limits in all associated samples, no qualifiers assigned.
- The percent difference value for Aroclor 1260 was greater than the acceptance limits in SLB0386-CCV6 submitted with SDG 23A0556. Because this continuing calibration verification (CCV) sample was only associated with quality control samples, no qualifiers were assigned.
- The percent difference values for Aroclor 1260 were greater than the acceptance limits in two CCVs submitted with SDG 23A0556. Because the CCV percent differences met the acceptance limits on the secondary column, no qualifiers were assigned.
- Percent difference values for Aroclor 1260 were greater than the acceptance limits in four CCVs submitted with SDG 23B30314. The detected Aroclor 1260 results in Samples and GTF_SL152 and GTF_SL165 were qualified as estimated (J-Cc).
- Percent difference values for PCB surrogate decachlorobiphenyl were less than the acceptance limits on the primary column for SLC0316-CCV1 and SLC0316-CCV2 submitted with SDG 23C0177. Because the percent differences were within acceptance limits on the secondary column, no qualifiers were assigned.

2.11 INTERNAL STANDARDS

Internal standards were added to all samples for PAH and PCB analysis, and the areas and retention times of all internal standards were within the method-specified control limits with the following exceptions.

- The recovery values for PCB internal standard hexabromobiphenyl were less than the method-specified control limits in the MS/MSD submitted with SDG 23A0556. No qualifiers were assigned on the basis of the internal standard recoveries in the quality control samples.

- The recovery values for PCB internal standards 1-bromo-2-nitrobenzene and hexabromobiphenyl were less than the method-specified control limits in the method blanks, LCS, and MS/MSD submitted with SDG 23C0177. No qualifiers were assigned on the basis of the internal standard recoveries in the quality control samples.
- The recovery values for PCB internal standards 1-bromo-2-nitrobenzene and hexabromobiphenyl were less than the method-specified control limits on the primary column for samples GTF-SL153 and GTF-SL166 submitted with SDG 23C0177.
  - The detected Aroclor 1260 results for these samples were reported from the primary column, and the results were qualified as estimated (J-IS).
  - Because the internal standard recovery values were within the method-specified limits on the secondary column, no qualifiers were assigned to the nondetected results on the basis of professional judgment.
- The recovery values for PCB internal standard hexabromobiphenyl were greater than the method-specified control limits in the LCS and LCSD submitted with SDG 23D0027. No qualifiers were assigned on the basis of the internal standard recoveries in the quality control samples.

2.12 INTERFERENCE CHECK

The interference check sample was analyzed at the beginning of each analytical sequence and met the acceptance criteria stated in EPA's functional guidelines for inorganic data review (USEPA 2020b) with the one exception. Arsenic was detected at a concentration greater than the MDL in two interference check samples A submitted with SDG 22L0416. Raw data were not reviewed as part of Stage 2B data validation; therefore, potential interferent analytes were not evaluated.

3 OVERALL ASSESSMENT

An overall assessment of the data is provided below.

3.1 DATA QUALIFICATION

A total of 524 results were reported. A total of 154 results (29 percent) were qualified as estimated or not detected; the number of results qualified is summarized by reason in Table 3-1. Some results were qualified for multiple reasons, so the total number of data points qualified is less than the sum of the number estimated and qualified not detected. A total of 51 results were rejected as do-not-report because a more appropriate result was available. These rejected results were not used in the completeness calculations and completeness was 100 percent. A summary of all qualified results is presented in Table 3-2.

3.2 DATA USABILITY

The data meet the criteria set forth in the method and referenced quality assurance documents, with the exceptions noted above. All results, except rejected results, are acceptable for their intended use, as qualified.

4 REFERENCES

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USEPA. 2020b. National functional guidelines for inorganic Superfund methods data review. OLEM 9240.1-66. EPA 542-R-20-006. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, Washington, DC. November.

Tables

Table 1-1. SDGs Reviewed, Number of Samples, and Validation Level

SDG	Number of Samples	Validation Level
22L0416	13 soils, 2 equipment blanks	Stage 2B
23A0556	2 soils	Stage 2B
23B0314	2 soils	Stage 2B
23C0177	2 soils	Stage 2B
23D0027	2 soils	Stage 2B

Notes:
SDG = sample delivery group

Table 1-2. Analytical Parameters and Methods

Laboratory	Analytical Parameter	Analytical Method	Reference
ARI	PAHs	EPA 8270E SIM	USEPA (2018)
	PCBs	EPA 8082A	USEPA (2007)
	Metals	EPA 6020B	USEPA (2014)
	Total Solids	SM 2540 G-97	APHA (1997)

Notes:
APHA = American Public Health Association
ARI = Analytical Resources, LLC
EPA = U.S. Environmental Protection Agency
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
SIM = selective ion monitoring

Table 1-3. Definition of Data Qualifiers

Data Qualifier	Definition
J	The result is an estimated quantity.
R	Rejected. The data are unusable.
U	The material was analyzed for, but was not detected.
UJ	Estimated and not detected. The analyte is considered not detected at the reported value, and the associated numerical value is an estimated value.

Table 1-4. Definition of Data Validation Reason Codes

Reason Code	Definition
Cc	Calibration (continuing)
Ci	Initial calibration verification
DNR	Do-not-report
IS	Internal standard
LB	Laboratory blank contamination
LCS	Laboratory control sample outliers
MS	Matrix spike outlier
REP	Imprecision
SSR	Surrogate outlier

Table 2-1. QA/QC Parameters Reviewed

QA/QC Parameter	Analysis			
	PAHs	PCBs	Metals	Total Solids
Sample Receipt and Holding Times	D	D	D	D
Blanks	Q	+	+	+
Surrogate Recovery	Q	Q	NA	NA
LCS	Q	D	+	NA
MS/MSD	Q	Q	+	NA
Replicates	Q	Q	+	+
Method Reporting Limits and Methodology	Q	Q	D	+
Instrument Performance	+	NA	NA	NA
ICAL	D	Q	+	NA
CCAL	D	Q	+	NA
Internal Standard	+	Q	NA	NA
Interference Check Standard	NA	NA	D	NA

Notes:
+ = All QA/QC criteria met
D = Data are discussed in the report. QA/QC criteria were not met; however no data were qualified.
Q = Data were qualified and are discussed in the report.

CCAL = continuing calibration
ICAL = initial calibration
LCS = laboratory control sample
MS/MSD = matrix spike and matrix spike duplicate
NA = not applicable
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
QA/QC = quality assurance and quality control

Table 3-1. Summary of Qualified Data Points by Reason

Data Qualification Reason	Number of Data Points Estimated	Number of Data Points Qualified Not Detected	Number of Data Points Rejected
Calibration (continuing)	2	--	--
Initial calibration verification	2	--	--
Do-not-report	--	--	51
Internal standard	2	--	--
Laboratory blank contamination	--	13	--
Laboratory control sample outliers	4	--	--
Matrix spike outlier	32	--	--
Imprecision	19	--	--
Surrogate outlier	124	--	--

Notes:
-- = none

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
22L0416	GTF-SL170	Aroclor 1016	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1221	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1232	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1242	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1248	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1254	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1260	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1262	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Aroclor 1268	0.1	0.1	U	UJ	SSR	µg/L
22L0416	GTF-SL170	Pyrene	0.1	0.1	U	UJ	LCS	µg/L
22L0416	GTF-SL170	Phenanthrene	0.1	0.1	U	UJ	LCS	µg/L
22L0416	GTF-SL171	Pyrene	0.1	0.1	U	UJ	LCS	µg/L
22L0416	GTF-SL171	Phenanthrene	0.1	0.1	U	UJ	LCS	µg/L
23A0556	GTF_SL151	Dibenzofuran	36.4	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Aroclor 1016	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1221	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1232	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1242	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1248	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1254	122	199	D J	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1254	470	199	D	J	REP	µg/kg
23A0556	GTF_SL151	Aroclor 1260	3050	199	D	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1262	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Aroclor 1268	199	199	D U	R	DNR	µg/kg
23A0556	GTF_SL151	Benzo[a]anthracene	214	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzo[a]pyrene	347	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzo[b]fluoranthene	443	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzo[ghi]perylene	570	15	B D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzo[j]fluoranthene	201	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzo[k]fluoranthene	180	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Benzofluoranthenes	837	29.9	D	J	SSR	µg/kg
23A0556	GTF_SL151	Chrysene	385	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Dibenzo[a,h]anthracene	87.3	15	B D	J	SSR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
23A0556	GTF_SL151	Fluoranthene	321	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Indeno[1,2,3-cd]pyrene	379	15	B D	J	SSR	µg/kg
23A0556	GTF_SL151	Pyrene	573	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Acenaphthene	14.6	15	D J	J	SSR	µg/kg
23A0556	GTF_SL151	Acenaphthylene	39	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Anthracene	45.3	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Fluorene	13.1	15	D J	J	SSR	µg/kg
23A0556	GTF_SL151	Naphthalene	142	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	Phenanthrene	237	15	D	J	SSR	µg/kg
23A0556	GTF_SL151	1-Methylnaphthalene	26.9	15	B D	J	SSR	µg/kg
23A0556	GTF_SL151	2-Methylnaphthalene	58.9	15	D	J	SSR	µg/kg
23B0314	GTF_SL152	Dibenzofuran	7.4	15	D J	J	SSR	µg/kg
23B0314	GTF_SL152	Aroclor 1260	687	19.9		J	Ci,Cc	µg/kg
23B0314	GTF_SL152	Benzo[a]anthracene	145	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzo[a]pyrene	419	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzo[b]fluoranthene	406	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzo[ghi]perylene	487	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzo[j]fluoranthene	184	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzo[k]fluoranthene	171	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Benzofluoranthenes	760	30	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Chrysene	207	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Dibenzo[a,h]anthracene	74.6	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Fluoranthene	126	15	B D	J	SSR	µg/kg
23B0314	GTF_SL152	Indeno[1,2,3-cd]pyrene	301	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Pyrene	227	15	D	J	SSR,MS	µg/kg
23B0314	GTF_SL152	Acenaphthene	4.76	4.76	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL152	Acenaphthylene	13	13	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL152	Anthracene	20.2	15	D	J	SSR	µg/kg
23B0314	GTF_SL152	Fluorene	4.75	4.75	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL152	Naphthalene	22.6	15	B D	J	SSR	µg/kg
23B0314	GTF_SL152	Phenanthrene	65.8	15	B D	J	SSR	µg/kg
23B0314	GTF_SL152	1-Methylnaphthalene	5.92	5.92	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL152	2-Methylnaphthalene	10.5	10.5	B D J	UJ	LB,SSR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
22L0416	GTF-SL150	Dibenzofuran	10.3	14.9	D J	J	SSR	µg/kg
22L0416	GTF-SL150	Aroclor 1260	2210	99.7	D	J	REP	µg/kg
22L0416	GTF-SL150	Benzo[a]anthracene	172	14.9	D	J	SSR,MS,REP	µg/kg
22L0416	GTF-SL150	Benzo[a]pyrene	155	14.9	D	J	SSR,MS	µg/kg
22L0416	GTF-SL150	Benzo[b]fluoranthene	153	14.9	D	J	SSR,MS	µg/kg
22L0416	GTF-SL150	Benzo[ghi]perylene	171	14.9	D	J	SSR	µg/kg
22L0416	GTF-SL150	Benzo[j]fluoranthene	87.1	14.9	D	J	SSR	µg/kg
22L0416	GTF-SL150	Benzo[k]fluoranthene	83.9	14.9	D	J	SSR	µg/kg
22L0416	GTF-SL150	Benzofluoranthenes	324	29.9	D	J	SSR,MS	µg/kg
22L0416	GTF-SL150	Chrysene	197	14.9	D	J	SSR,MS,REP	µg/kg
22L0416	GTF-SL150	Dibenzo[a,h]anthracene	34.8	14.9	D	J	SSR	µg/kg
22L0416	GTF-SL150	Fluoranthene	366	14.9	B D	J	SSR,MS,REP	µg/kg
22L0416	GTF-SL150	Indeno[1,2,3-cd]pyrene	131	14.9	D	J	SSR,MS	µg/kg
22L0416	GTF-SL150	Pyrene	282	14.9	B D	J	SSR,MS,REP	µg/kg
22L0416	GTF-SL150	Acenaphthene	27.3	14.9	B D	J	SSR,REP	µg/kg
22L0416	GTF-SL150	Acenaphthylene	4.92	14.9	D J	J	SSR	µg/kg
22L0416	GTF-SL150	Anthracene	53.3	14.9	D	J	SSR,REP	µg/kg
22L0416	GTF-SL150	Fluorene	23	14.9	B D	J	SSR,REP	µg/kg
22L0416	GTF-SL150	Naphthalene	14	14.9	B D J	J	SSR	µg/kg
22L0416	GTF-SL150	Phenanthrene	269	14.9	B D	J	SSR,MS,REP	µg/kg
22L0416	GTF-SL150	1-Methylnaphthalene	6.85	14.9	B D J	J	SSR	µg/kg
22L0416	GTF-SL150	2-Methylnaphthalene	8.96	14.9	B D J	J	SSR	µg/kg
23C0177	GTF-SL153	Aroclor 1260	107	20		J	IS	µg/kg
23C0177	GTF-SL153	Benzo[a]anthracene	3.73	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Benzo[a]pyrene	20.6	5		J	SSR	µg/kg
23C0177	GTF-SL153	Benzo[b]fluoranthene	27.3	5		J	SSR	µg/kg
23C0177	GTF-SL153	Benzo[ghi]perylene	27.7	5		J	SSR	µg/kg
23C0177	GTF-SL153	Benzo[j]fluoranthene	12.1	5		J	SSR	µg/kg
23C0177	GTF-SL153	Benzo[k]fluoranthene	11.2	5		J	SSR	µg/kg
23C0177	GTF-SL153	Benzofluoranthenes	52.8	10		J	SSR	µg/kg
23C0177	GTF-SL153	Chrysene	7.26	5		J	SSR	µg/kg
23C0177	GTF-SL153	Dibenzo[a,h]anthracene	4.42	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Fluoranthene	4.35	5	J	J	SSR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
23C0177	GTF-SL153	Indeno[1,2,3-cd]pyrene	16.2	5		J	SSR	µg/kg
23C0177	GTF-SL153	Pyrene	6.8	5		J	SSR	µg/kg
23C0177	GTF-SL153	Acenaphthene	1.46	1.46	B J	U	LB	µg/kg
23C0177	GTF-SL153	Acenaphthylene	1.4	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Anthracene	1.59	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Fluorene	1.03	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Naphthalene	1.88	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	Phenanthrene	2.36	5	J	J	SSR	µg/kg
23C0177	GTF-SL153	1-Methylnaphthalene	1.49	1.49	B J	U	LB	µg/kg
23C0177	GTF-SL153	2-Methylnaphthalene	1.61	5	J	J	SSR	µg/kg
22L0416	GTF-SL169	Aroclor 1260	1290	99.2	D	J	REP	µg/kg
22L0416	GTF-SL169	Benzo[a]anthracene	60.6	16.4	D	J	MS,REP	µg/kg
22L0416	GTF-SL169	Benzo[a]pyrene	112	16.4	D	J	MS	µg/kg
22L0416	GTF-SL169	Benzo[b]fluoranthene	116	16.4	D	J	MS	µg/kg
22L0416	GTF-SL169	Benzofluoranthenes	231	32.9	D	J	MS	µg/kg
22L0416	GTF-SL169	Chrysene	99.6	16.4	D	J	MS,REP	µg/kg
22L0416	GTF-SL169	Fluoranthene	98.8	16.4	B D	J	MS,REP	µg/kg
22L0416	GTF-SL169	Indeno[1,2,3-cd]pyrene	112	16.4	D	J	MS	µg/kg
22L0416	GTF-SL169	Pyrene	104	16.4	B D	J	MS,REP	µg/kg
22L0416	GTF-SL169	Acenaphthene	4.18	16.4	B D J	J	REP	µg/kg
22L0416	GTF-SL169	Anthracene	15.5	16.4	D J	J	REP	µg/kg
22L0416	GTF-SL169	Fluorene	3.64	16.4	B D J	J	REP	µg/kg
22L0416	GTF-SL169	Phenanthrene	48.9	16.4	B D	J	MS,REP	µg/kg
23B0314	GTF_SL165	Aroclor 1260	42	19.9		J	Ci,Cc	µg/kg
23B0314	GTF_SL165	Benzo[a]anthracene	69.3	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzo[a]pyrene	518	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzo[b]fluoranthene	503	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzo[ghi]perylene	486	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzo[j]fluoranthene	215	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzo[k]fluoranthene	213	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Benzofluoranthenes	940	30	D	J	SSR	µg/kg
23B0314	GTF_SL165	Chrysene	125	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Dibenzo[a,h]anthracene	80.2	15	D	J	SSR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
23B0314	GTF_SL165	Fluoranthene	30.9	15	B D	J	SSR	µg/kg
23B0314	GTF_SL165	Indeno[1,2,3-cd]pyrene	317	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Pyrene	68.4	15	D	J	SSR	µg/kg
23B0314	GTF_SL165	Acenaphthylene	3.8	3.8	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL165	Anthracene	13.6	15	D J	J	SSR	µg/kg
23B0314	GTF_SL165	Fluorene	2.65	2.65	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL165	Naphthalene	13.2	15	B D J	J	SSR	µg/kg
23B0314	GTF_SL165	Phenanthrene	17.5	15	B D	J	SSR	µg/kg
23B0314	GTF_SL165	1-Methylnaphthalene	2.34	2.34	B D J	UJ	LB,SSR	µg/kg
23B0314	GTF_SL165	2-Methylnaphthalene	3.99	3.99	B D J	UJ	LB,SSR	µg/kg
23D0027	GTF_SL167	Benzo[ghi]perylene	762	14.9	D	J	MS	µg/kg
23D0027	GTF_SL167	Indeno[1,2,3-cd]pyrene	503	14.9	D	J	MS	µg/kg
23D0027	GTF_SL168	Dibenzofuran	32.8	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	Aroclor 1260	19.9	19.9	U	UJ	MS	µg/kg
23D0027	GTF_SL168	Benzo[a]anthracene	501	74.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzo[a]pyrene	2920	15	E D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzo[b]fluoranthene	2200	15	E D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzo[ghi]perylene	4750	15	E D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzo[j]fluoranthene	845	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzo[k]fluoranthene	838	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	Benzofluoranthenes	3900	29.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Chrysene	1270	74.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Dibenzo[a,h]anthracene	557	74.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Fluoranthene	250	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	Indeno[1,2,3-cd]pyrene	2770	15	E D	R	DNR	µg/kg
23D0027	GTF_SL168	Pyrene	350	74.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Acenaphthene	26.7	74.9	D J	R	DNR	µg/kg
23D0027	GTF_SL168	Acenaphthylene	34.2	74.9	D J	R	DNR	µg/kg
23D0027	GTF_SL168	Anthracene	207	74.9	D	R	DNR	µg/kg
23D0027	GTF_SL168	Fluorene	24.5	74.9	D J	R	DNR	µg/kg
23D0027	GTF_SL168	Naphthalene	132	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	Phenanthrene	168	15	D	R	DNR	µg/kg
23D0027	GTF_SL168	1-Methylnaphthalene	20.2	74.9	D J	R	DNR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
23D0027	GTF_SL168	2-Methylnaphthalene	47.5	74.9	D J	R	DNR	µg/kg
23C0177	GTF-SL166	Dibenzofuran	74.9	74.9	D U	R	DNR	µg/kg
23C0177	GTF-SL166	Aroclor 1260	37.3	19.7		J	IS	µg/kg
23C0177	GTF-SL166	Benzo[a]anthracene	341	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[a]anthracene	332	15	D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzo[a]pyrene	1580	15	E D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzo[a]pyrene	1510	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[b]fluoranthene	1620	15	E D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzo[b]fluoranthene	1380	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[ghi]perylene	1330	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[ghi]perylene	1620	15	E D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzo[j]fluoranthene	626	74.9	D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzo[j]fluoranthene	727	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[k]fluoranthene	668	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzo[k]fluoranthene	586	74.9	D	R	DNR	µg/kg
23C0177	GTF-SL166	Benzofluoranthenes	3040	29.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Benzofluoranthenes	2630	150	D	R	DNR	µg/kg
23C0177	GTF-SL166	Chrysene	420	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Chrysene	382	15	D	R	DNR	µg/kg
23C0177	GTF-SL166	Dibenzo[a,h]anthracene	234	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Dibenzo[a,h]anthracene	213	74.9	D	R	DNR	µg/kg
23C0177	GTF-SL166	Fluoranthene	87.8	15	D	R	DNR	µg/kg
23C0177	GTF-SL166	Fluoranthene	96.7	74.9	D	J	SSR	µg/kg
23C0177	GTF-SL166	Indeno[1,2,3-cd]pyrene	886	74.9	D	R	DNR	µg/kg
23C0177	GTF-SL166	Indeno[1,2,3-cd]pyrene	1000	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Pyrene	273	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Pyrene	271	74.9	D	R	DNR	µg/kg
23C0177	GTF-SL166	Acenaphthene	8.61	8.61	B D J	U	LB	µg/kg
23C0177	GTF-SL166	Acenaphthene	74.9	74.9	D U	R	DNR	µg/kg
23C0177	GTF-SL166	Acenaphthylene	9.5	15	D J	J	SSR	µg/kg
23C0177	GTF-SL166	Acenaphthylene	74.9	74.9	D U	R	DNR	µg/kg
23C0177	GTF-SL166	Anthracene	23.7	15	D	J	SSR	µg/kg
23C0177	GTF-SL166	Anthracene	24.6	74.9	D J	R	DNR	µg/kg

Table 3-2. Summary of Qualified Data

SDG	Sample	Analyte	Result	Method Reporting Limit	Lab Qualifier	DV Qualifier	DV Qualifier Reason	Units
23C0177	GTF-SL166	Fluorene	74.9	74.9	D U	R	DNR	µg/kg
23C0177	GTF-SL166	Naphthalene	74.9	74.9	D U	R	DNR	µg/kg
23C0177	GTF-SL166	Phenanthrene	11.6	15	D J	R	DNR	µg/kg
23C0177	GTF-SL166	Phenanthrene	13.4	74.9	D J	J	SSR	µg/kg
23C0177	GTF-SL166	1-Methylnaphthalene	6.48	74.9	B D J	R	DNR	µg/kg
23C0177	GTF-SL166	1-Methylnaphthalene	5.45	5.45	B D J	U	LB	µg/kg
23C0177	GTF-SL166	2-Methylnaphthalene	74.9	74.9	D U	R	DNR	µg/kg

Notes:

Cc = continuing calibration outlier
Ci = initial calibration verification outlier
DNR = do-not-report
DV = data validation
IS = internal standard outlier
LB = laboratory blank outlier
LCS = laboratory control sample outlier
MS = matrix spike outlier
REP = imprecision
SSR = surrogate outlier

Qualifiers:

J = The associated numerical value is an estimated quantity.
R = Rejected, the data are unusable
U = The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
UJ = Estimated and not detected. The analyte is considered not detected at the reported value, and the associated numerical value is an estimated value.

Attachment 3

ProUCL Output

UCL Statistics for Data Sets with Non-Detects

Arsenic

General Statistics

Total Number of Observations	14	Number of Distinct Observations	12
Number of Detects	11	Number of Non-Detects	3
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	2.2	Minimum Non-Detect	5.4
Maximum Detect	13	Maximum Non-Detect	5.4
Variance Detects	12.07	Percent Non-Detects	21.43%
Mean Detects	5.2	SD Detects	3.474
Median Detects	3.7	CV Detects	0.668
Skewness Detects	1.298	Kurtosis Detects	1.052
Mean of Logged Detects	1.471	SD of Logged Detects	0.605

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.818	Shapiro Wilk GOF Test	
1% Shapiro Wilk Critical Value	0.792	Detected Data appear Normal at 1% Significance Level	
Lilliefors Test Statistic	0.282	Lilliefors GOF Test	
1% Lilliefors Critical Value	0.291	Detected Data appear Normal at 1% Significance Level	

Detected Data appear Normal at 1% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.719	KM Standard Error of Mean	0.871
90KM SD	3.089	95% KM (BCA) UCL	6.232
95% KM (t) UCL	6.261	95% KM (Percentile Bootstrap) UCL	6.177
95% KM (z) UCL	6.152	95% KM Bootstrap t UCL	7.126
90% KM Chebyshev UCL	7.331	95% KM Chebyshev UCL	8.515
97.5% KM Chebyshev UCL	10.16	99% KM Chebyshev UCL	13.38

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.674	Anderson-Darling GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.245	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.257	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.973	k star (bias corrected MLE)	2.223
Theta hat (MLE)	1.749	Theta star (bias corrected MLE)	2.339
nu hat (MLE)	65.4	nu star (bias corrected)	48.9
Mean (detects)	5.2		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.676	Mean	4.746
Maximum	13	Median	3.4
SD	3.225	CV	0.68
k hat (MLE)	2.981	k star (bias corrected MLE)	2.39
Theta hat (MLE)	1.592	Theta star (bias corrected MLE)	1.986
nu hat (MLE)	83.47	nu star (bias corrected)	66.92
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (66.92, α)	49.09	Adjusted Chi Square Value (66.92, β)	47.07
95% Gamma Approximate UCL	6.469	95% Gamma Adjusted UCL	6.747

Arsenic (*Cont.*)

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.719	SD (KM)	3.089
Variance (KM)	9.542	SE of Mean (KM)	0.871
k hat (KM)	2.334	k star (KM)	1.882
nu hat (KM)	65.36	nu star (KM)	52.69
theta hat (KM)	2.022	theta star (KM)	2.508
80% gamma percentile (KM)	7.116	90% gamma percentile (KM)	9.312
95% gamma percentile (KM)	11.41	99% gamma percentile (KM)	16.09

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (52.69, α)	37.01	Adjusted Chi Square Value (52.69, β)	35.28
95% KM Approximate Gamma UCL	6.718	95% KM Adjusted Gamma UCL	7.049

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.892	Shapiro Wilk GOF Test	
10% Shapiro Wilk Critical Value	0.876	Detected Data appear Lognormal at 10% Significance Level	
Lilliefors Test Statistic	0.209	Lilliefors GOF Test	
10% Lilliefors Critical Value	0.231	Detected Data appear Lognormal at 10% Significance Level	

Detected Data appear Lognormal at 10% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.773	Mean in Log Scale	1.398
SD in Original Scale	3.187	SD in Log Scale	0.564
95% t UCL (assumes normality of ROS data)	6.281	95% Percentile Bootstrap UCL	6.218
95% BCA Bootstrap UCL	6.519	95% Bootstrap t UCL	7.205
95% H-UCL (Log ROS)	6.611		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.384	KM Geo Mean	3.991
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	2.077
KM Standard Error of Mean (logged)	0.156	95% H-UCL (KM -Log)	6.342
KM SD (logged)	0.546	95% Critical H Value (KM-Log)	2.077
KM Standard Error of Mean (logged)	0.156		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.664	Mean in Log Scale	1.369
SD in Original Scale	3.227	SD in Log Scale	0.569
95% t UCL (Assumes normality)	6.192	95% H-Stat UCL	6.458

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 1% Significance Level

Suggested UCL to Use

95% KM (t) UCL	6.261

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.