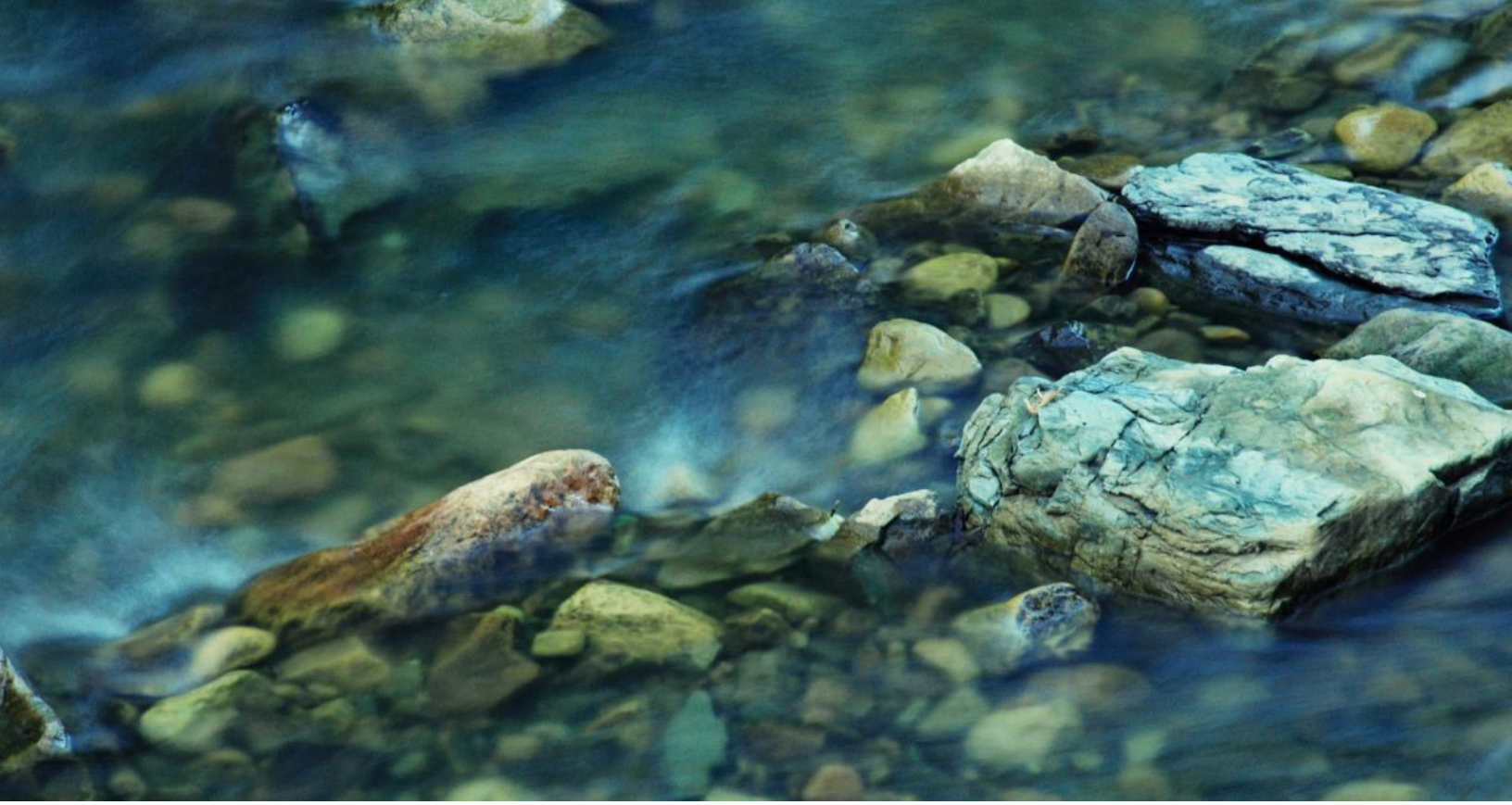

March 2025
Tru-Grit Site Data Gaps Field Investigation

ANCHOR QEA

Sampling and Quality Assurance Project Plan Addendum

Prepared for Port of Tacoma

March 2025
Tru-Grit Site Data Gaps Field Investigation

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Prepared for
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Project Number: 240092-03.06

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ABBREVIATIONS

CanAm	CanAm Minerals, Inc.
CSL	Cleanup Screening Level
Ecology	Washington State Department of Ecology
FNC	federal navigation channel
FS	feasibility study
H:V	horizontal to vertical
MLLW	mean lower low water
MSS	Marine Sampling Systems, LLC
PM	project manager
Port	Port of Tacoma
QA/QC	quality assurance/quality control
SCO	Sediment Cleanup Objective
Site	Tru-Grit site
SMS	Sediment Management Standards
SQAPP	Sampling and Quality Assurance Project Plan
Tru-Grit	Tru-Grit Abrasives, Inc.
USACE	U.S. Army Corps of Engineers

1 Introduction

On behalf of the Port of Tacoma (Port), Anchor QEA has prepared this Sampling and Quality Assurance Project Plan Addendum (SQAPP) that details sample collection methods and analytical protocols for additional subsurface sediment data collection in the Tru-Grit Abrasives, Inc. (Tru-Grit) site (Site) at 1110 East Alexander Avenue, Tacoma, Washington.

Investigation of the Site was conducted under an Agreed Order (No. DE-8978; Ecology 2012) executed between the Washington State Department of Ecology (Ecology) and CanAm Minerals, Inc. (CanAm; parent company of Tru-Grit). CanAm was identified by Ecology as a potentially liable party under the Washington State Model Toxics Control Act due to releases of an ore-derived grit material containing elevated concentrations of copper and zinc. Work completed to date by CanAm includes a remedial investigation (Landau 2021) and draft feasibility study (FS; Landau 2019). Cleanup of Site-related contaminated sediments has not yet been implemented.

The U.S. Army Corps of Engineers (USACE) is planning to deepen the federal navigation channel (FNC) in the Blair Waterway. In 2024, further sampling was conducted to delineate the extent of Site-associated contaminated sediments that could be impacted by the deepening project (Anchor QEA 2024). The Port plans to remove those contaminated sediments prior to the FNC deepening conducted by USACE. Based on review of the 2024 data and limited core penetration and associated sample recovery, further investigation is needed to evaluate the vertical extent of contamination and further delineate the eastern boundary of the Site. This SQAPP Addendum expands the objective of the original SQAPP (Anchor QEA 2024) and includes the reoccupation of six previous subsurface sediment sampling locations and the addition of two to four new locations near the eastern boundary of the Site, which will be tested in a tiered manner (Figure 1). Sampling is anticipated to occur in March 2025.

This SQAPP Addendum was prepared based on Anchor QEA's understanding of USACE's plan to deepen the FNC to -57 mean lower low water (MLLW), plus a 2-foot overdredge (final elevation to -59 feet MLLW). The side slopes for the dredging were calculated using a 10-foot buffer landward of the FNC boundary identified by USACE in the FS phase (feasibility boundary) and a 2 horizontal to 1 vertical (2H:1V) slope ratio.[1] Two cores are proposed to characterize material contained within the Lower Slope areas adjacent to the side slopes of the FNC deepening program—one reoccupation core at location TG-SC15RE, one new location at TG-SC26, and potentially one additional new location at TG-SCX28 that is contingent on results from TG-SC26 (Figure 1). Six cores will also be collected in the Upper Slope areas—five reoccupation locations (TG-SC05RE, TG-SC09RE, TG-SC10RE,

[1] The feasibility boundary is a conservative boundary that assumes a wider navigation channel closer to the Site, but the preliminary engineering and design evaluations by USACE may result in a narrower FNC boundary farther from the Site. The 2H:1V side slope line is also conservative because deepening the FNC is expected to result in side slopes outside the FNC that are steeper than 2H:1V.

TG-SC11RE, and TG-SC12RE), one new location (TG-SC25), and potentially one additional new location at TG-SC27 that is contingent on results from TG-SC25—to provide additional information useful to future final cleanup of those Site areas (Figure 1). The Upper Slope areas are not expected to be impacted by the FNC deepening program.

1.1 Site History

For a detailed summary of Site history, please see the original SQAPP (Anchor QEA 2024).

1.2 Document Organization

This SQAPP Addendum was prepared in accordance with Ecology guidance, as described in the *Sediment Cleanup User's Manual* (Ecology 2021). This SQAPP Addendum is organized into the following sections:

- Section 2: Existing Data and Data Gaps
- Section 3: Project Management
- Section 4: Sample Collection Modifications
- Section 5: Quality Assurance/Quality Control
- Section 6: Assessments and Response Actions
- Section 7: Data Validation, Usability, and Reporting
- Section 8: References

2 Existing Data and Data Gaps

Refer to the original SQAPP (Anchor QEA 2024) for a detailed summary of the previous in-water and upland investigations conducted at the Site.

3 Project Management

This section discusses updates from the original SQAPP (Anchor QEA 2024) to the proposed project team and team member responsibilities for conducting the field investigation. Refer to the original SQAPP (Anchor QEA 2024) for the training and certification requirements for sampling personnel and documentation and recordkeeping procedures.

3.1 Project and Task Organization

Quality Assurance/Quality Control (QA/QC) Manager Ali Judkins will provide QA/QC oversight for both the field sampling and laboratory programs, ensure samples are collected and documented appropriately, coordinate with the analytical laboratories, ensure data quality, oversee data validation, and supervise project QA coordination and data validation.

4 Sample Collection Modifications

The rationale for the sample collection modifications for the SQAPP Addendum is provided in this section. The original SQAPP (Anchor QEA 2024) includes design assumptions for locating and selecting samples, as well as methods and procedures for the collection of field samples. Sampling will be conducted following standard procedures documented in the original SQAPP (Anchor QEA 2024). In general, all sampling procedures will also comply with previously approved sample collection standards established for the study area. Sampling for this addendum will be conducted with Marine Sampling Systems, LLC (MSS).

4.1 Sampling Design Modifications

Preliminary Tier 1 data from the 2024 field investigation were screened against Washington State Sediment Management Standards Sediment Cleanup Objectives (SCOs) and Cleanup Screening Levels (CSLs; Ecology 2021). Based on screening results, additional sampling and testing are needed to delineate the extent of SCO and CSL exceedances. The sampling for this SQAPP Addendum includes the collection of subsurface sediment core samples using MSS's vibracorer, which is expected to have greater penetration and recovery compared to the previous collection equipment. In the Lower Slope, one location will be reoccupied (TG-SC15RE), one new location will be added (TG-SC26), and one additional location will potentially be added (TG-SC28), pending results of TG-SC26 (Figure 1). In the Upper Slope, five locations will be reoccupied (TG-SC05RE, TG-SC09RE, TG-SC10RE, TG-SC11RE, and TG-SC12RE), one new location will be added (TG-SC25), and one additional location will potentially be added (TG-SC27), pending results of TG-SC25 (Figure 1). Cores TG-SC27 and TG-SC28 will be collected as part of a later mobilization, if necessary, after results of TG-SC25 and TG-SC26 are received.

The target core penetration depth is 14 feet below the mudline, using 15-foot core tubes or until refusal. Core samples will be sectioned into 2-foot intervals to the bottom of the core. Tier 1 testing of metals and total solids with the collection of archives for potential Tier 2 testing and waste characterization will be conducted as described in the original SQAPP (Anchor QEA 2024). Table 1 summarizes the sample locations, coordinates, sample intervals, and planned analyses. Figure 1 shows target sample locations. Rationale for reoccupying or adding new locations is described in Section 4.1.1.

4.1.1 Reoccupied Locations

The following locations have SCO or CSL exceedances for metals that have not been bounded vertically due to refusal during core collection. Therefore, some locations sampled in 2024 will be reoccupied and tested based on the following rationale (Table 1):

- TG-SC05: Limited penetration resulted in one interval from 0 to 1.6 feet below the mudline. Intervals from 0 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC09: The deepest sampled interval (6 to 6.7 feet below the mudline) exceeds the SCO for zinc and CSL for arsenic. Intervals from 6 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC10: The deepest sampled interval (4 to 5.2 feet below the mudline) exceeds the SCO for arsenic and CSL for chromium and copper. Intervals from 4 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC11: The deepest sampled interval (2 to 4.4 feet below the mudline) did not exceed the SCO for metals; however, deeper SCO and CSL exceedances at neighboring locations, TG-SC10 and TG-SC12, warrant reoccupying this location to confirm the depth of contamination. Intervals from 4 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC12: The deepest sampled interval (2 to 4.5 feet below the mudline) exceeds the SCO for arsenic. Intervals from 4 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC15: The deepest sampled interval (2 to 3.2 feet below the mudline) exceeds the CSL for arsenic, copper, lead, and zinc. Intervals from 2 to 12 feet will be analyzed for Tier 1 analyses.

Sample intervals may be modified in the field based on lithology, total depth collected, native interval contact, or other factors. The field coordinator will consult with the project manager (PM) for sample interval modifications.

4.1.2 New Locations

Preliminary Tier 1 data from the 2024 field investigation indicate elevated concentrations for metals that have not been bounded on the eastern edge of the Site. Therefore, the following two new locations will be sampled and tested based on the following rationale (Table 1):

- TG-SC25: This location has been added to laterally delineate SCO exceedances at TG-SC12 from 0 to 4.5 feet below the mudline. All intervals from 0 to 12 feet will be analyzed for Tier 1 analyses.
- TG-SC26: This location has been added to laterally delineate elevated arsenic concentrations (31.9 milligrams per kilogram) at TG-SC18 from 2 to 4 feet below the mudline. All intervals from 0 to 12 feet will be analyzed for Tier 1 analyses.

If these locations contain elevated concentrations, additional cores will be collected as part of a separate coring effort to collect cores from TG-SC27 and TG-SC28. These two new contingent locations may be sampled and tested based on the results of TG-SC25 and TG-SC26 (Table 1):

- TG-SC27: If necessary, this location has been added to laterally delineate elevated concentrations measured in TG-SC25. All intervals from 0 to 12 feet will be analyzed for Tier 1 analyses, pending results of TG-SC25.
- TG-SC28: If necessary, this location has been added to laterally delineate elevated concentrations measured in TG-SC26. All intervals from 0 to 12 feet will be analyzed for Tier 1 analyses, pending results of TG-SC25.

4.2 Sampling Methods

This section describes updates to the sampling methods from the original SQAPP (Anchor QEA 2024) and includes sample identification and subsurface sediment collection. Refer to the original SQAPP (Anchor QEA 2024) for the methods related to station positioning, subsurface sediment processing, and archaeological observations.

4.2.1 Sample Identification

Each sediment and water sample will be assigned a unique alphanumeric identifier according to the following method:

- Each sample ID will be identified by the overall Site ("TG") and location within the Site, as well as the sample collection method.
  - The sample collection method will be identified by "SC" for subsurface sediment core samples.
  - Station numbers will be added after the collection method identifier and are listed in Table 1 and shown in Figure 1.
  - The depth of the sediment sample will be added using four digits separated by a dash to represent the upper and lower interval in feet.
  - The date in YYMMDD format will be appended to the end of the sample ID.
  - Reoccupation locations will have "RE" appended to the end of the station number.
- An example sample identification nomenclature is TG-SC05RE-02-04-250324, which designates a subsurface core sample collected from the 2- to 4-foot interval from reoccupation location SC05 on March 24, 2025. A field duplicate will be identified by the addition of "100" to the sample station number. A duplicate sample collected from this example would be TG-SC105RE-02-04-250324 collected on March 24, 2025.
- Rinsate blank samples will use the overall Site identifier and collection method, followed by "RB" and the date. The resulting nomenclature of a rinsate blank of the decontaminated core sample processing equipment collected on March 24, 2025, would be TG-SC-RB-250324.

4.2.2 Subsurface Sediment Collection

Subsurface sediment cores will be collected from a sufficiently outfitted marine sampling vessel. Core samples will be collected using a vibracore advanced to 14 feet or refusal depth. Samples will be collected from target locations shown in Figure 1. Refer to the original SQAPP (Anchor QEA 2024) for vibracore sediment sample collection methods.

Cores will be evaluated to determine whether they meet acceptability requirements for the project. Acceptance criteria for sediment core samples are as follows:

- Overlying water is present, and the surface is intact.
- The core tube appears intact without obstruction or blocking.
- Recovery is greater than 75% of the drive length.
- Penetration is deep enough to collect all target depth intervals, unless refusal is encountered based on substrate conditions that consistently limit penetration.

If sample acceptance criteria are not achieved, the sample will be rejected unless modified acceptance criteria (i.e., lower percent recovery after multiple attempts) are approved by the field coordinator in consultation with the PM. Locations may be adjusted within up to a 10-foot radius. If there is little to no penetration at a location, or recovery is less than 75% of the drive length, up to three attempts will be made before abandoning the sample location and selecting a new location in coordination with the PM.

Refer to the original SQAPP (Anchor QEA 2024) for field log procedures.

4.3 Sample Handling Requirements

Refer to the original SQAPP (Anchor QEA 2024) for sample handling requirements.

4.4 Laboratory Methods

Refer to the original SQAPP (Anchor QEA 2024) for laboratory methods. Table 2 is included in this SQAPP Addendum to correct data entry errors in method detection limits, reporting limits, and marine screening levels from the original SQAPP.

5 Quality Assurance/Quality Control

Refer to the original SQAPP (Anchor QEA 2024) for QA/QC procedures.

6 Assessments and Response Actions

Refer to the original SQAPP (Anchor QEA 2024) for assessments and response actions.

7 Data Validation, Usability, and Reporting

Refer to the original SQAPP (Anchor QEA 2024) for data validation, usability, and reporting. Data validation will be conducted either by Anchor QEA or Laboratory Data Consultants.

8 References

Anchor QEA, 2024. *Sampling and Quality Assurance Project Plan*. Tru-Grit Site Data Gaps Field Investigation. Prepared for Port of Tacoma. July 2024.

Ecology (Washington State Department of Ecology), 2012. Agreed Order No. DE-8978. May 2012.

Ecology, 2021. *Sediment Cleanup User's Manual (SCUM): Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards*, *Chapter 173–204 WAC*. Third Revision. Olympia, Washington: Washington State Department of Ecology.

Landau (Landau Associates, Inc.), 2019. *Agency Review Draft Feasibility Study, Tru-Grit Facility, Tacoma, Washington*. Prepared for CanAm Minerals, Inc. December 2019.

Landau, 2021. *Remedial Investigation Report, Tru-Grit Abrasives, Inc.* Prepared for CanAm Minerals, Inc. December 2021.

Tables

Table 1
Sample Locations, Coordinates, Intervals, and Analyses Summary

Location/Purpose	Location ID	Station Coordinates (Washington SP NAD83 South Zone) Easting (feet)	Station Coordinates (Washington SP NAD83 South Zone) Northing (feet)	Mudline Elevation (feet MLLW)	Sample[1] Upper Depth (feet)	Sample[1] Lower Depth (feet)	Sample ID[1]	Analyses[2,3]
Tier 1 Testing								
Upper Slope	TG-SC05RE	1168779.4	712462.1	-0.4*	00	02	TG-SC05RE-00-02-YYMMDD	Total solids, metals, archive
					02	04	TG-SC05RE-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC05RE-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC05RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC05RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC05RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC05RE-12-14-YYMMDD	Archive
	TG-SC09RE	1168553.5	712595.1	-26.7	00	02	TG-SC09RE-00-02-YYMMDD	Archive
					02	04	TG-SC09RE-02-04-YYMMDD	Archive
					04	06	TG-SC09RE-04-06-YYMMDD	Archive
					06	08	TG-SC09RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC09RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC09RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC09RE-12-14-YYMMDD	Archive
	TG-SC10RE	1168645.5	712506.7	-22.6	00	02	TG-SC10RE-00-02-YYMMDD	Archive
					02	04	TG-SC10RE-02-04-YYMMDD	Archive
					04	06	TG-SC10RE-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC10RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC10RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC10RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC10RE-12-14-YYMMDD	Archive
	TG-SC11RE	1168737.5	712418.4	-19.1	00	02	TG-SC11RE-00-02-YYMMDD	Archive
					02	04	TG-SC11RE-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC11RE-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC11RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC11RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC11RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC11RE-12-14-YYMMDD	Archive
	TG-SC12RE	1168829.5	712330.1	-20.2	00	02	TG-SC12RE-00-02-YYMMDD	Archive
					02	04	TG-SC12RE-02-04-YYMMDD	Archive
					04	06	TG-SC12RE-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC12RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC12RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC12RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC12RE-12-14-YYMMDD	Archive
	TG-SC25	1168921.5	712241.8	-19.7	00	02	TG-SC25-00-02-YYMMDD	Total solids, metals, archive
					02	04	TG-SC25-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC25-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC25-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC25-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC25-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC25-12-14-YYMMDD	Archive
	TG-SC27[4]	1169013.5	712153.5	-24.6	00	02	TG-SC27-00-02-YYMMDD	Total solids, metals, archive
					02	04	TG-SC27-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC27-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC27-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC27-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC27-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC27-12-14-YYMMDD	Archive
Lower Slope	TG-SC15RE	1168511.5	712551.4	-30.6	00	02	TG-SC15RE-00-02-YYMMDD	Archive
					02	04	TG-SC15RE-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC15RE-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC15RE-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC15RE-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC15RE-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC15RE-12-14-YYMMDD	Archive
	TG-SC26	1168879.5	712198.1	-36.2	00	02	TG-SC26-00-02-YYMMDD	Total solids, metals, archive
					02	04	TG-SC26-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC26-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC26-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC26-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC26-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC26-12-14-YYMMDD	Archive
	TG-SC28[4]	1168971.5	712109.8	-36.8	00	02	TG-SC28-00-02-YYMMDD	Total solids, metals, archive
					02	04	TG-SC28-02-04-YYMMDD	Total solids, metals, archive
					04	06	TG-SC28-04-06-YYMMDD	Total solids, metals, archive
					06	08	TG-SC28-06-08-YYMMDD	Total solids, metals, archive
					08	10	TG-SC28-08-10-YYMMDD	Total solids, metals, archive
					10	12	TG-SC28-10-12-YYMMDD	Total solids, metals, archive
					12	14	TG-SC28-12-14-YYMMDD	Archive
Tier 2 Testing								
TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]	SVOCs, pesticides, PCBs, butyltins, dioxin/furans, TOC, TVS
Waste Characterization								
TBD[3]	TBD[3]	TBD[3]	TBD[3]	TBD[3]	TBD[3]	TBD[3]	TBD[3]	TCLP metals, SPLP metals, fish toxicity bioassay

Notes:
1. Actual sample depths and IDs may vary based on evidence of contamination, observed depth to native alluvium, and sample recovery depth.
2. The shallowest-bounded interval sample from each core that does not exceed metals screening criteria will be triggered for Tier 2 analyses (SVOCs, pesticides, PCBs, butyltins, dioxin/furans, TOC, and TVS).
3. Up to five composites will be generated for waste characterization from archive material pending results of Tier 1 testing.
4. TG-SC27 and TG-SC28 will only be collected following receipt of sample test results from TG-SC25 and TG-SC26.
* Sample collection at this location should be targeted during high tide.
--: not applicable
ID: identification
MLLW: mean lower low water
PCB: polychlorinated biphenyl
SPLP: synthetic precipitation leaching procedure
SVOC: semivolatile organic compound
TBD: to be determined
TCLP: toxicity characteristic leaching procedure
TOC: total organic carbon
TVS: total volatile solids
Washington SP NAD83: Washington State Plane North American Datum 1983

Table 2
Parameters for Analysis, Methods, Screening Levels, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit	Reporting Limit	Marine DMMP Guidelines			SMS Marine Sediment		Marine SMS AET		RCRA	CLARC
				Screening Level	Bioaccumulation Trigger	Maximum Level	Sediment Cleanup Objective	Cleanup Screening Level	Sediment Cleanup Objective	Cleanup Screening Level	TCLP/SPLP Screening Criteria	Surface Water Cleanup Level
Tier 1 Analyses												
Conventional Parameters (%)												
Total solids	SM 2540G/PSEP	--	0.1	--	--	--	--	--	--	--	--	--
Metals (mg/kg dry weight)												
Antimony	EPA 6020B	0.10	0.20	150	--	200	--	--	--	--	--	--
Arsenic	EPA 6020B	0.038	0.20	57	507.1	700	57	93	57	93	--	--
Cadmium	EPA 6020B	0.040	0.10	5.1	--	14	5.1	6.7	5.1	6.7	--	--
Chromium (total)	EPA 6020B	0.26	0.50	260	--	--	260	270	260	270	--	--
Chromium (VI)[a]	EPA 7196A	0.40	0.40	--	--	--	--	--	--	--	--	--
Copper	EPA 6020B	0.35	0.50	390	--	1,300	390	390	390	390	--	--
Lead	EPA 6020B	0.052	0.10	450	975	1,200	450	530	450	530	--	--
Mercury	EPA 7471B	0.0053	0.025	0.41	1.5	2.3	0.41	0.59	0.41	0.59	--	--
Selenium[b]	EPA 6020B	0.18	0.50	--	3	--	--	--	--	--	--	--
Silver	EPA 6020B	0.022	0.20	6.1	--	8.4	6.1	6.1	6.1	6.1	--	--
Zinc	EPA 6020B	2.9	6.0	410	--	3,800	410	960	410	960	--	--
Tier 2 Analyses												
Conventional Parameters (%)												
Total volatile solids	SM 2540G/PSEP	--	0.1	--	--	--	--	--	--	--	--	--
Total organic carbon	EPA 9060A Mod	--	0.1	--	--	--	--	--	--	--	--	--
Butyltins (µg/kg dry weight)												
Tributyltin ion	Krone/8270E-SIM	0.5	3.9	--	73	--	--	--	--	--	--	--
Semivolatile Organic Compounds (µg/kg dry weight)												
Polycyclic Aromatic Hydrocarbons							**mg/kg OC**		**µg/kg dry weight**		--	--
1-methylnaphthalene	EPA 8270E	5.3	20	--	--	--	--	--	--	--	--	--
2-methylnaphthalene	EPA 8270E	4.5	20	670	--	1,900	38	64	670	670	--	--
Acenaphthene	EPA 8270E	5.2	20	500	--	2,000	16	57	500	500	--	--
Acenaphthylene	EPA 8270E	6.2	20	560	--	1,300	66	66	1,300	1,300	--	--
Anthracene	EPA 8270E	7.2	20	960	--	13,000	220	1,200	960	960	--	--
Benzo(a)anthracene	EPA 8270E	6.0	20	1300	--	5,100	110	270	1,300	1,600	--	--
Benzo(a)pyrene	EPA 8270E	4.2	20	1600	--	3,600	99	210	1,600	1,600	--	--
Benzo(b,j,k)fluoranthenes	EPA 8270E	10	40	3200	--	9,900	230	450	3,200	3,600	--	--
Benzo(g,h,i)perylene	EPA 8270E	14	20	670	--	3,200	31	78	670	720	--	--
Chrysene	EPA 8270E	6.1	20	1400	--	21,000	110	460	1,400	2,800	--	--
Dibenz(a,h)anthracene	EPA 8270E-SIM	0.91	5.0	230	--	1,900	12	33	230	230	--	--
Fluoranthene	EPA 8270E	6.1	20	1700	4,600	30,000	160	1,200	1,700	2,500	--	--
Fluorene	EPA 8270E	15	20	540	--	3,600	23	79	540	540	--	--
Indeno(1,2,3-cd)pyrene	EPA 8270E	15	20	600	--	4,400	34	88	600	690	--	--
Naphthalene	EPA 8270E	4.2	20	2100	--	2,400	99	170	2,100	2,100	--	--
Phenanthrene	EPA 8270E	8.7	20	1500	--	21,000	100	480	1,500	1,500	--	--
Pyrene	EPA 8270E	5.7	20	2600	11,980	16,000	1,000	1,400	2,600	3,300	--	--
Total LPAH (U = 0)[c]	EPA 8270E	--	--	5200	--	29,000	370	780	5,200	5,200	--	--
Total HPAHs (U = 0)[d]	EPA 8270E	--	--	12000	--	69000	960	5,300	12,000	17,000	--	--
Total PAHs (U = 0)[e]	Calculated	--	--	--	--	--	--	--	--	--	--	--

Table 2
Parameters for Analysis, Methods, Screening Levels, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit	Reporting Limit	Marine DMMP Guidelines			SMS Marine Sediment		Marine SMS AET		RCRA	CLARC
				Screening Level	Bioaccumulation Trigger	Maximum Level	Sediment Cleanup Objective	Cleanup Screening Level	Sediment Cleanup Objective	Cleanup Screening Level	TCLP/SPLP Screening Criteria	Surface Water Cleanup Level
Chlorinated Hydrocarbons							**mg/kg OC**		**µg/kg dry weight**		--	--
1,4-dichlorobenzene	EPA 8270E-SIM	0.6	5.0	110	--	120	3.1	9	110	110	--	--
1,2-dichlorobenzene	EPA 8270E-SIM	0.7	5.0	35	--	110	2.3	2.3	35	50	--	--
1,2,4-trichlorobenzene	EPA 8270E-SIM	2.7	5.0	31	--	64	0.81	1.8	31	51	--	--
Hexachlorobenzene	EPA 8270E-SIM	0.7	5.0	22	168	230	0.38	2.3	22	70	--	--
Phthalates							**mg/kg OC**		**µg/kg dry weight**		--	--
Dimethyl phthalate	EPA 8270E-SIM	1.0	5.0	71	--	1,400	53	53	71	160	--	--
Diethyl phthalate	EPA 8270E-SIM	4.8	20	200	--	1,200	61	110	200	>1,200	--	--
Di-n-butyl phthalate	EPA 8270E	5.6	20	1,400	--	5,100	220	1,700	1,400	1,400	--	--
Butyl benzyl phthalate	EPA 8270E-SIM	0.68	5.0	63	--	970	4.9	64	63	900	--	--
Bis(2-ethylhexyl) phthalate	EPA 8270E	5.5	50	1,300	--	8,300	47	78	1300	1900	--	--
Di-n-octyl phthalate	EPA 8270E	4.4	20	6,200	--	6,200	58	4,500	6,200	6,200	--	--
Phenols (µg/kg dry weight)							**µg/kg dry weight**		**µg/kg dry weight**			
Phenol	EPA 8270E-SIM	2.2	5.0	420	--	1,200	420	1,200	420	1,200	--	--
2-methylphenol	EPA 8270E-SIM	1.1	5.0	63	--	77	63	63	63	63	--	--
4-methylphenol	EPA 8270E-SIM	0.9	5.0	670	--	3,600	670	670	670	670	--	--
2,4-dimethylphenol	EPA 8270E-SIM	2.2	20	29	--	210	29	29	29	29	--	--
Pentachlorophenol	EPA 8270E-SIM	2.1	20	400	504	690	360	690	360	690	--	--
Miscellaneous Extractables (µg/kg dry weight)							**mg/kg OC (unless noted)**		**µg/kg dry weight**			--
Benzyl alcohol	EPA 8270E-SIM	2.5	20	57	--	870	57 dry weight	73 dry weight	57	73	--	--
Benzoic acid	EPA 8270E-SIM	13	100	650	--	760	650 dry weight	650 dry weight	650	650	--	--
Dibenzofuran	EPA 8270E	14	20	540	--	1,700	15	58	540	540	--	--
Hexachlorobutadiene	EPA 8270E-SIM	0.72	5.0	11	--	270	3.9	6.2	11	120	--	--
N-Nitrosodiphenylamine	EPA 8270E-SIM	1.3	5.0	28	--	--	11	11	28	40	--	--
Carbazole	EPA 8270E	4.3	20	--	--	--	--	--	--	--	--	--
Pesticides (µg/kg dry weight)												
2,4'-DDD	EPA 8081B	0.20	1.0	--	--	--	--	--	--	--	--	--
2,4'-DDE	EPA 8081B	0.25	1.0	--	--	--	--	--	--	--	--	--
2,4'-DDT	EPA 8081B	0.19	1.0	--	--	--	--	--	--	--	--	--
4,4'-DDD	EPA 8081B	0.32	1.0	16	--	--	--	--	--	--	--	--
4,4'-DDE	EPA 8081B	0.14	1.0	9	--	--	--	--	--	--	--	--
4,4'-DDT	EPA 8081B	0.32	1.0	12	--	--	--	--	--	--	--	--
2,4'-DDD and 4,4'-DDD	Calculated	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDE and 4,4'-DDE	Calculated	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDT and 4,4'-DDT	Calculated	--	--	--	--	--	--	--	--	--	--	--
Total DDT (U = 0)[f]	Calculated	--	--	--	50	69	--	--	--	--	--	--
Aldrin	EPA 8081B	--	--	9.5	--	--	--	--	--	--	--	--
beta-HCH	EPA 8081B	0.09	0.50	--	--	--	--	--	--	--	--	--
Dieldrin	EPA 8081B	0.12	1.0	1.9	--	1,700	--	--	--	--	--	--
Endrin ketone	EPA 8081B	0.28	1.0	--	--	--	--	--	--	--	--	--
Heptachlor	EPA 8081B	0.05	0.50	1.5	--	270	--	--	--	--	--	--
cis-chlordane	EPA 8081B	0.1	0.5	--	--	--	--	--	--	--	--	--
trans-chlordane	EPA 8081B	0.3	0.5	--	--	--	--	--	--	--	--	--
cis-nonachlor	EPA 8081B	0.2	0.5	--	--	--	--	--	--	--	--	--
trans-nonachlor	EPA 8081B	0.2	0.5	--	--	--	--	--	--	--	--	--
oxychlordane	EPA 8081B	0.1	0.5	--	--	--	--	--	--	--	--	--
Total chlordane (U = 0)[g]	EPA 8081B	--	--	2.8	37	--	--	--	--	--	--	--

Table 2

Parameters for Analysis, Methods, Screening Levels, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit	Reporting Limit	Marine DMMP Guidelines			SMS Marine Sediment		Marine SMS AET		RCRA	CLARC
				Screening Level	Bioaccumulation Trigger	Maximum Level	Sediment Cleanup Objective	Cleanup Screening Level	Sediment Cleanup Objective	Cleanup Screening Level	TCLP/SPLP Screening Criteria	Surface Water Cleanup Level
PCBs (µg/kg dry weight)							**mg/kg OC**		**µg/kg dry weight**			
Aroclor 1016	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1221	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1232	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1242	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1248	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1254	EPA 8082A	8.0	20	--	--	--	--	--	--	--	--	--
Aroclor 1260	EPA 8082A	9.3	20	--	--	--	--	--	--	--	--	--
Total Aroclor PCBs (U = 0)	EPA 8082A	9.3	20	130	38 mg/kg OC	3,100	12	65	130	1,000	--	--
Dioxin/Furans (ng/kg dry weight)[h]												
Dioxins												
2,3,7,8-TCDD	EPA 1613B	0.19	0.5	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PeCDD	EPA 1613B	0.784	2.5	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HxCDD	EPA 1613B	0.633	2.5	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HxCDD	EPA 1613B	0.64	2.5	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HxCDD	EPA 1613B	0.717	2.5	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HpCDD	EPA 1613B	0.706	2.5	--	--	--	--	--	--	--	--	--
OCDD	EPA 1613B	1.62	5.0	--	--	--	--	--	--	--	--	--
Furans												
2,3,7,8-TCDF	EPA 1613B	0.183	0.5	--	--	--	--	--	--	--	--	--
1,2,3,7,8-PeCDF	EPA 1613B	0.576	2.5	--	--	--	--	--	--	--	--	--
2,3,4,7,8-PeCDF	EPA 1613B	0.686	2.5	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-HxCDF	EPA 1613B	0.659	2.5	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-HxCDF	EPA 1613B	0.621	2.5	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-HxCDF	EPA 1613B	0.661	2.5	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-HxCDF	EPA 1613B	0.716	2.5	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-HpCDF	EPA 1613B	0.649	2.5	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-HpCDF	EPA 1613B	0.818	2.5	--	--	--	--	--	--	--	--	--
OCDF	EPA 1613B	3.84	5.0	--	--	--	--	--	--	--	--	--
Total TEQ (U = 0)	--	--	--	4.0	--	--	--	--	--	--	--	--
Total TEQ (U = 1/2 EDL)	--	--	--	4.0	--	--	--	--	--	--	--	--
Waste Characterization												
TCLP Metals (mg/L)												
Arsenic	EPA 1311/6010D	0.014	0.25	--	--	--	--	--	--	--	5.0	--
Barium	EPA 1311/6010D	0.0075	0.015	--	--	--	--	--	--	--	100	--
Cadmium	EPA 1311/6010D	0.0006	0.010	--	--	--	--	--	--	--	1.0	--
Chromium	EPA 1311/6010D	0.0024	0.025	--	--	--	--	--	--	--	8.0	--
Lead	EPA 1311/6010D	0.007	0.10	--	--	--	--	--	--	--	5.0	--
Mercury	EPA 1311/6010D	0.0000070	0.0001	--	--	--	--	--	--	--	0.20	--
Selenium	EPA 1311/6010D	0.041	0.25	--	--	--	--	--	--	--	1.0	--
Silver	EPA 1311/6010D	0.0022	0.015	--	--	--	--	--	--	--	5.0	--
SPLP Metals (mg/L)												
Antimony	EPA 1312/6020B	0.0005	0.00075	--	--	--	--	--	--	--	--	0.0900
Arsenic	EPA 1312/6020B	0.00019	0.0005	--	--	--	--	--	--	--	--	0.0080
Barium	EPA 1312/6020B	0.0006	0.001	--	--	--	--	--	--	--	--	--
Beryllium	EPA 1312/6020B	0.00009	0.0005	--	--	--	--	--	--	--	--	0.270
Cadmium	EPA 1312/6020B	0.0002	0.0002	--	--	--	--	--	--	--	--	0.0079
Chromium	EPA 1312/6020B	0.001	0.002	--	--	--	--	--	--	--	--	240[i]
Copper	EPA 1312/6020B	0.002	0.002	--	--	--	--	--	--	--	--	--

Table 2

Parameters for Analysis, Methods, Screening Levels, and Target Quantitation Limits

Parameter	Analytical Method	Method Detection Limit	Reporting Limit	Marine DMMP Guidelines			SMS Marine Sediment		Marine SMS AET		RCRA	CLARC
				Screening Level	Bioaccumulation Trigger	Maximum Level	Sediment Cleanup Objective	Cleanup Screening Level	Sediment Cleanup Objective	Cleanup Screening Level	TCLP/SPLP Screening Criteria	Surface Water Cleanup Level
Lead	EPA 1312/6020B	0.00026	0.00034	--	--	--	--	--	--	--	--	0.0081
Mercury	EPA 1312/7470A	0.000007	0.00005	--	--	--	--	--	--	--	--	0.000025
Nickel	EPA 1312/6020B	0.0004	0.001	--	--	--	--	--	--	--	--	0.0082
Selenium	EPA 1312/6020B	0.0009	0.002	--	--	--	--	--	--	--	--	0.0710
Silver	EPA 1312/6020B	0.0001	0.0005	--	--	--	--	--	--	--	--	0.0019
Thallium	EPA 1312/6020B	0.00012	0.0005	--	--	--	--	--	--	--	--	0.00022
Zinc	EPA 1312/6020B	0.015	0.022	--	--	--	--	--	--	--	--	0.0810

Notes:

Greater than (>) values indicate that the upper bound of toxicity level is unknown but is known to be above the concentration shown.

a. Chromium VI will be analyzed on a subset of 8 samples collected from known areas of grit. Actual sample locations and depths will be determined based on field observations.

b. Because no screening level value exists for toxicity testing, selenium will only be evaluated for its bioaccumulation potential.

c. Total LPAH consists of the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene.

d. Total HPAH consists of the sum of fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b,j,k)fluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

e. Total PAHs consists of the sum of all PAHs listed.

f. Total DDT consists of the sum of 4,4'-DDD; 4,4'-DDE; and 4,4'-DDT.

g. Chlordane includes cis-chlordane, trans-chlordane, cis-nonaclor, trans-nonaclor, and oxychlordane.

h. Dioxin/furan results will be reported to sample and analysis-specific estimated detection limits.

i. Value for chromium III

µg/kg: microgram per kilogram

AET: Apparent Effects Threshold

ASTM: ASTM International

CLARC: Ecology MTCA Cleanup Levels and Risk Calculation

Ecology: Washington State Department of Ecology

DDD: dichlorodiphenyldichloroethane

DDE: dichlorodiphenyldichloroethylene

DDT: dichlorodiphenyltrichloroethane

EDL: estimated detection limit

EPA: U.S. Environmental Protection Agency

HPAH: high-molecular-weight PAHs

LPAH: low-molecular-weight PAHs

MTCA: Model Toxics Control Act

mg/kg: milligram per kilogram

mg/L: milligram per liter

ng/kg: nanogram per kilogram

OC: organic carbon-normalized

OCDD: octachlorodibenzodioxin

OCDF: octachlorodibenzofuran

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated bipheynl

PSEP: Puget Sound Estuary Program

RCRA: Resource Conservation and Recovery Act

SM: Standard Method

SMS: Sediment Management Standards

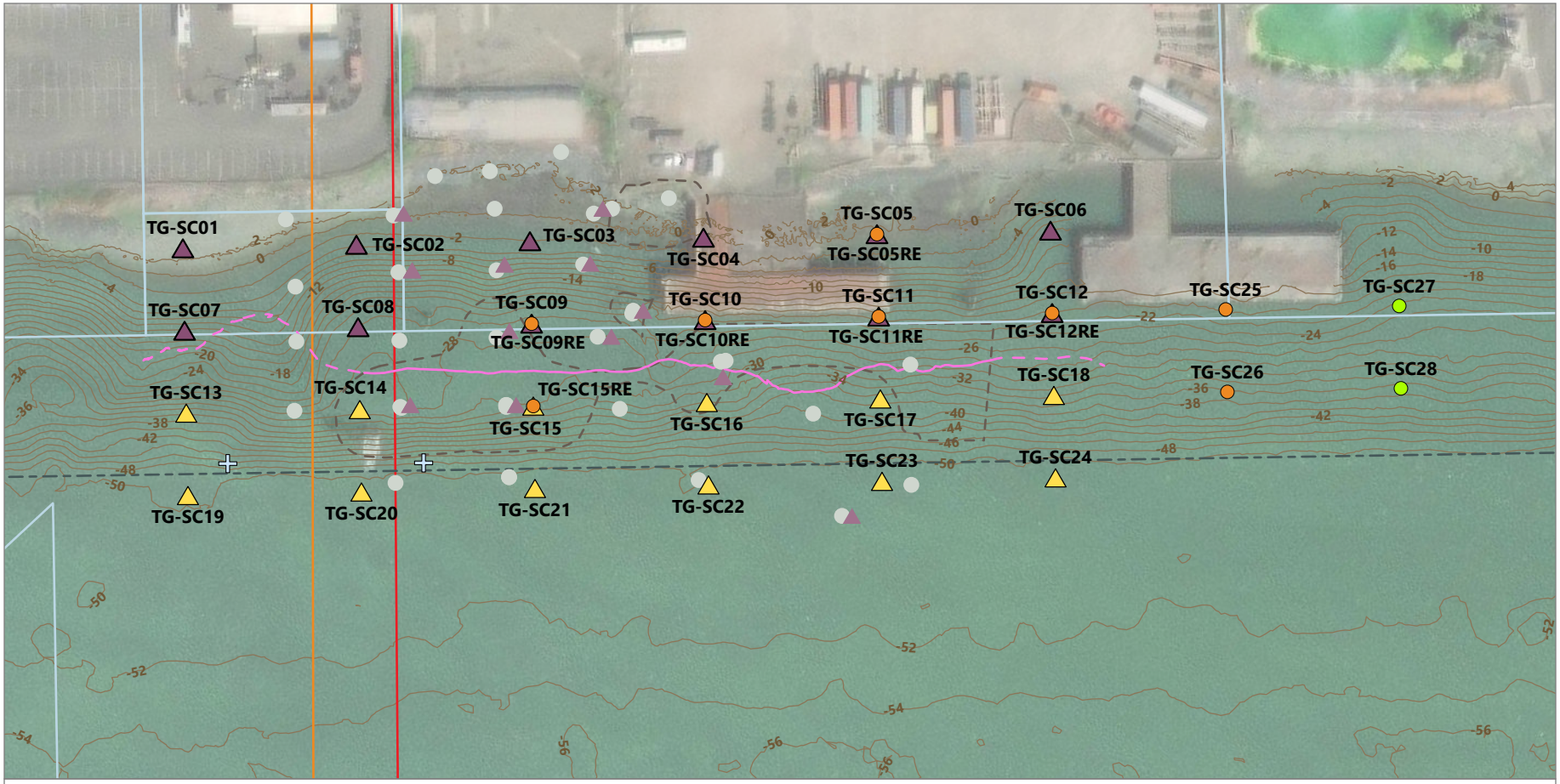
SPLP: Synthetic Precipitation Leaching Procedure

TCLP: toxicity characteristic leaching procedure

TEQ: toxic equivalency

U: undetected

Figure



LEGEND:

- Feasibility Study Navigation Channel Boundary
- Parcel Boundary
- Navigational Aid
- Existing Contour (USACE 2' Interval)
- >5% Grit Boundary
- Proposed Overdredge Daylight Extent (-59.0' MLLW)
- Underwater Communications Crossing
- Underwater Watermain Crossing

Previous Sample Location

- Surface Sediment
- Subsurface Sediment

Proposed Sample Location

- Previous Upper Slope Core Sample Location
- Previous Lower Slope Core Sample Location
- Reoccupation or New Sampling Locations (SQAPP Addendum)
- Contingency Sampling Locations (SQAPP Addendum)

NOTES:

1. Aerial imagery: Esri (2022)
2. Contour Source: Survey by USACE, dated October 27, 2021, and David Evans Associates Inc., dated May 27, 2022, with data gaps filled from survey by USACE dated November 14, 2022
3. Horizontal Datum: NAD83 State Plane Washington South, U.S. feet
4. Vertical Datum: MLLW, feet

MLLW: mean lower low water
NAD83: North American Datum of 1983
SQAPP: Sampling and Quality Assurance Project Plan
USACE: U.S. Army Corps of Engineers

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Feet

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ANCHOR QEA

Figure 1
Proposed Sampling Locations
Sampling and Quality Assurance Project Plan Addendum
Tru-Grit Site Data Gaps Field Investigation