Table 5-1
Laboratory Methods for Sediment Samples

Analyte	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Total solids	CAS Kelso	--	--	PSEP 1986	Balance
				EPA 160.3M	Balance
Grain size	CAS Kelso	--	--	PSEP 1986	Sieve and pipette
Total organic carbon	CAS Kelso	Plumb 1981	Acid pretreatment	Plumb 1981	Combustion;
Total sulfide	CAS Kelso	PSEP	Distillation	PSEP	Colorimetry
Ammonia as Nitrogen	CAS Kelso	Plumb 1981	KCl extraction	EPA 350.1	Colorimetry
Antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc	CAS Kelso	EPA 3050/PSEP 1997	Strong acid digestion	EPA 6020	ICP/MS
Aluminum, chromium, copper, lead, nickel, and zinc	CAS Kelso	EPA 3050/PSEP 1997	Strong acid digestion	EPA 6010B	ICP/AES
Selenium	CAS Kelso	EPA 3050/PSEP 1997	Strong acid digestion	EPA 7742	Borohydride reduction AAS
Mercury	CAS Kelso	EPA 7471A	Acid digestion/oxidation	EPA 7471A	CVAA
Butyltin ion, dibutyltin ion, tributyltin ion, total butyltins	CAS Kelso	Krone et al 1989	Solvent extraction and derivatization	Krone et al 1989	GC/FPD
Diesel- and residual-range organics (DRO/RRO)	CAS Kelso	NWTPH-Dx	Solvent extraction	NWTPH-Dx	GC/FID
			Silica gel cleanup		
Organochlorine Pesticides and Selected SVOCs	CAS Kelso	EPA 3541	Automated Soxhlet Extraction	EPA 8081A	GC/ECD
		EPA 3640A	Gel permeation chromatography		
		EPA 3660B	Sulfur cleanup		
Chlorinated Pesticides	CAS Kelso	EPA 3541	Automated Soxhlet Extraction	EPA 1699M	HRGC/HRMS
PCB Aroclors	CAS Kelso	EPA 3541	Automated Soxhlet Extraction	EPA 8082	GC/ECD
		EPA 3640A	Gel permeation chromatography		
		EPA 3665A	Sulfuric acid cleanup		
		EPA 3660B	Sulfur cleanup		
Polycyclic Aromatic Hydrocarbons and Alkylated PAHs	CAS Kelso	EPA 3541	Automated Soxhlet Extraction	EPA 8270C-SIM	GC/MS-SIM
		EPA 3640A	Gel permeation chromatography		
		EPA 3630C	Silica Gel cleanup		

Table 5-1
Laboratory Methods for Sediment Samples

Analyte	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Chlorinated Dioxins and Furans	CAS Houston	EPA 1613B	Soxhlet/Dean Stark extraction	EPA 1613B	HRGC/HRMS
			Sulfuric acid cleanup		
			Silica/carbon column cleanup		

Notes:
See Sampling and Analysis Plan Addendum (GSI, 2010) for laboratory methods for rinsate blanks.

-- = Not applicable.
AAS - Atomic absorption spectrometry
ARI - Analytical Resources, Inc.
CAS - Columbia Analytical Services
CVAA - cold vapor atomic absorption spectrometry
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/FID - gas chromatography/flame ionization detection
GC/FPD - gas chromatography/flame photometric detection
GC/MS - gas chromatography/mass spectrometry
HRGC/HRMS - high-resolution gas chromatography/high-resolution mass spectrometry
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma/mass spectrometry
TPH - total petroleum hydrocarbon
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
SVOC - semivolatile organic compound

Table 5-2
Data Validation Qualifiers and Definitions

Data Qualifier	Definition
U	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	The associated numerical value is an estimated quantity.
R	Rejected.
UJ	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
T	The associated numerical value was mathematically derived (e.g., from summing multiple analyte results such as Aroclors, or calculating the average of multiple results for a single analyte). Also indicates all results that are selected for reporting in preference to other available results (e.g., for parameters reported by multiple methods) for the DPSC data.

Table 5-3
Summary of Field and QC Samples

Sample Type and Analyte	Field Samples	Field Duplicates	Field Rinsate Blanks	Total Number of Field Samples
Surface Sediment - DPSC Phase II				
Conventionals [a]	23	3	2	28
Ammonia/Sulfide	9	2	2	13
Grain size	4	2		6
Metals	23	3	2	28
Butyltins	9	2	2	13
DRO/RRO	22	3	2	27
Pesticides - GC/ECD	23	3	2	28
PCB Aroclors	23	3	2	28
PAHs	22	3	2	27
Dioxins/Furans	7		1	8
Subsurface Sediment - DPSC Phase II				
Conventionals [a]	13	1	1	15
Ammonia/Sulfide	4	1		5
Grain size	4	1		5
Metals	13	1	1	15
Butyltins	5	1		6
Pesticides - GC/ECD	13	1	1	15
PCB Aroclors	13	1	1	15
DRO/RRO	13	1	1	15
PAHs	13	1	1	15
Dioxins/Furans	4			4
Surface Sediment - Archived DPSC Phase I				
Conventionals [a]	7			7
Pesticides - HR-GCMS	4			4
PCB Aroclors	2			2
Dioxins/Furans	3			3
Subsurface Sediment - Archived DPSC Phase I				
Conventionals [a]	15			15
Metals	5			5
PAHs	3			3
Pesticides - GC/ECD	8			8
Pesticides - HR-GCMS	1			1
PCB Aroclors	8			8
Dioxins/Furans	6			6

Table 5-3
Summary of Field and QC Samples

Notes:

[a] All sediment samples analyzed for total solids and total organic carbon.

The investigation derived waste (IDW) sample is not included on this table.

DRO/RRO = Diesel- and residual-range organics.
GC/ECD = Gas chromatograph/Electron capture detection
HR-GCMS = High resolution gas chromatograph/mass spectrometer
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls