QUALITY ASSURANCE PROJECT PLAN FOR THE PUGET SOUND SEDIMENT DIOXIN/FURAN AND PCB CONGENERS SURVEY - WASHINGTON

USEPA Region 10 Aquatic Resources Unit
Office of Ecosystems, Tribal and Public Affairs &
USEPA Ocean Survey Vessel BOLD
August 2008

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APPROVAL PAGE

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Michael Szerlog, Unit Manager Aquatic Resources Unit USEPA Region 10	Date
Dr. David Kendall, Principal Investigator US Army Corps of Engineers, Seattle District	Date

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Signature: Ginna Grepo-Grove, Project QA Manager	Date

Puget Sound Dioxin and PCB Survey OSV Bold Project

USEPA Region 10

Signature: Richard Parkin, Acting Director	Date

Office of Ecosystems, Tribal and Public Affairs

USEPA Region 10

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Name	Organization	Phone Number	QAPP	Data
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Erika Hoffman	USEPA-Region 10	360-753-9540	x	x
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David Fox	COE – Seattle Dist.	206-764-6083	x	x
John Wakeman	COE – Seattle Dist.	206-764-3430	x	x
Laura Inouye	WDOE	360-407-6165	x	x
David Bradley	WDOE	360-407-6907	x	x
Courtney Wasson	WDNR	360-902-1083	x	x
Teresa Michelsen	Avocet Consulting	253-222-1441	x	x

1. Introduction

The *Ocean Survey Vessel Bold* (*OSV Bold*) is EPA's only ocean and coastal monitoring vessel. It is scheduled to visit the Pacific Northwest to conduct a coastal survey and collect environmental samples from Puget Sound and the Oregon Coast from June to September, 2008. The vessel is 224 feet long, 43 feet wide, and has a 15-ft draft. It is a converted US Navy Tactical Auxiliary General Ocean Survey (T-AGOS) class vessel acquired by EPA in 2004. It is outfitted with state of the art equipment and instrumentation for water, sediment and biota sampling, GIS and sonar mapping, and analysis. It is operated and maintained by a crew of 19 people and can accommodate up to 20 scientists.

While in the Northwest, the *OSV Bold* will undertake four projects with the Region 10 Aquatic Resources Unit, under the Office of Ecosystems, Tribal and Public Affairs. The projects are tentatively scheduled are as follows: (1) Survey of Oregon Coast Ocean Dredge Material Disposal Sites (ODMDS) from June 1-19, 2008, (2) Puget Sound Sediment Dioxin/Furan and PCB Congener Survey from July 31-August 8, 2008, (3) Puget Sound Dissolved Oxygen, Nutrients and Phytoplankton Study from August 11-16, 2008 and (4) Phase II Oregon ODMDS Sediment and Water Quality Study from August 23 - 29.

This Quality Assurance Project Plan (hereafter called QAPP) is developed to document the Quality System and data quality needs of the second project scheduled to take place in early August 2008, i.e., "Puget Sound Sediment Dioxin/Furan and PCB Congeners Survey". This document is prepared in accordance with the "*EPA Requirements for Quality Assurance Project Plans*", EPA QA/R5, in compliance with the *EPA Order 5360.1 A2*. It provides details on the scope of work, including the field and laboratory standard operating procedures and the associated quality assurance and quality control (QA/QC) activities that will be implemented during the sediment sample collection, processing, storage and subsequent chemical analyses.

The technical specifications of this document will be followed and implemented in the field and laboratory. Any deviations from this document will be documented and approved by the Chief Scientist and the Project Managers.

Each of the EPA required QA elements in the QAPP are discussed in this document and grouped into 4 general categories:

- Project Management and Organization (Section 2)
- Measurement and Data Acquisition (Section 3)
- Assessment and Oversight (Section 4)
- Data Validation and Usability (Section 5)

2. Project Management and Organization

This section outlines the individuals involved in the project, their organization affiliation, contact information and roles and responsibilities:

2.1 General Information

Project Title: Puget Sound Sediment Dioxin/Furan and PCB Congeners Survey
Survey Title: Puget Sound Sediment Dioxin/Furan and PCB Congeners Survey
BOLD Requested By: Richard Parkin, Acting Director
Organization: Office of Ecosystems, Tribal and Public Affairs (ETPA), EPA Region 10
Project Managers: Michael Szerlog (Unit Manager) and Erika Hoffman (Biologist)
Organization: Aquatic Resources Unit, ETPA, R10
Organization Address: USEPA R10 (MS-083), 1200 Sixth Avenue, Suite 900, Seattle, WA 98101-3140
Organization Telephone No.: (206) 553- 0279 [MS], (360) 753-9540 [EH], (206) 553-1200 [switchboard] FAX No.: (206) 553-1775

Survey Chief Scientist: Matthew Liebman
Organization: U.S. EPA Region 1
Organization Address: One Congress Street
Suite 1100 (COP), Boston, MA 02114-2023
Organization Telephone No.: (617) 918-1626
FAX No.: (617) 918-0626

Support Organization: USACE Seattle District
Contact: Dr. David Kendall
Organization Phone: (206) 764-3768

Support Organization: WA Department of Ecology
Contact: Dr. Laura Inouye
Organization Phone: (360) 407-6165

2.2 Laboratories

Samples for dioxins/furans and PCB congeners will be shipped to SGS Environmental Services (an accredited Superfund CLP laboratory) in North Carolina. Samples for semi-volatiles (SVOCs), PAHs, PCB Aroclors, pesticides and trace metals analyses will be shipped to an accredited Superfund CLP laboratory (yet to be determined). Samples for grain size, total organic carbon, and percent solids will be delivered to ARI Labs located in Tukwila WA. Laboratory coordination shall be the responsibility of EPA Region 10.

Samples for Procept® and CALUX® Rapid Dioxin Screening shall be handled by the US Army Corps of Engineers (COE) and shipped to their contract labs. Laboratory coordination and contract oversight for these analyses shall be the responsibility of COE.

Samples for archive shall be shipped Fedex overnight or hand delivered to the USEPA Manchester Environmental Laboratory located in Port Orchard WA.

Samples for molecular analysis will be hand-delivered to the laboratory of Dr. Carolyn Friedman at the University of Washington for holding in custody at -80 °C until transferred (date to be arranged at a later time) to Dr. Timothy E. Mattes, 4112 Seamans Center for the Engineering Arts and Sciences, The University of Iowa, Iowa City, IA 52242-1527.

Chain of Custody Forms (see Attachment 3) will be prepared for all samples collected.

2.3 Science Team

Table 1 - 2008 OSV Bold Science Team Puget Sound PCB and Dioxin Sediment Survey

Name	Survey Responsibility	Organization	Berth
Matthew Liebman	Chief Scientist	EPA R1	02-36-2
David Kendall	Principal Investigator Watch Captain	COE-Seattle	
Laura Inouye	Watch Captain	WDOE	
David Fox	Watch Captain	COE- Seattle	
Lauran Warner	Survey Support	COE - Seattle	
Ted Benson	Survey Support	WDOE	
Jeff Rodin	Survey Support	EPA R10 ECL	
Jennifer Fitchorn	Survey Support	EPA R10 OCE	
Sean Standing	Survey Support	Environment Canada	
Korina Lane-Jones	Survey Support	EPA R10 OMP	

Name	Survey Responsibility	Organization	Berth
Erin Seyfried	Survey Support	EPA R10 OWW	
Alicia Boyd	Survey Support	Hanford	
Laura Buelow	Survey Support	Hanford	
Valerie Partridge	Survey Support	WDOE	
Mandy Michelsen	Survey Support	COE	
Elaine Somers	Survey Support	ETPA	
Harry Craig	Survey Support	EPA R10 OOO	

2.4 Roles and Responsibilities

2.4.1 Chief Scientist: The project Chief Scientist will be Matthew Liebman. Matthew Liebman is an environmental biologist in the Oceans and Coastal Protection Unit at EPA Region 1. He has fifteen years experience at EPA overseeing and conducting environmental research, including several surveys on board EPA research vessels. He is a certified chief scientist, and a Contracting Officer's Representative. He will provide expertise on sediment collection and processing. He will provide oversight to the team during sample collection and serve as a Watch Captain.

2.4.2 Principal Investigators/Watch Captains: Dr. David Kendall (COE-Seattle), Dr. Laura Inouye (WDOE), and David Fox (COE-Seattle) shall be Watch Captains. They have the overall responsibility for project management. They will support the Chief Scientist and will be points of contact and decision makers for the project. They will coordinate with team members and other agencies involved with the project and ensure that the logistical needs, scope, objectives and goals of the project are met and implemented. They will ensure that the science team is well informed of their roles and responsibilities and received adequate training on boat safety, sample collection and handling. EPA Watch Captains will assist with all necessary equipment deployment and retrieval.

2.4.3 OSV Bold Crew: *OSV Bold* Captain and mates will be responsible for vessel operation, maintenance, safety and navigation. Due to liability issues, the *OSV Bold* technicians shall be responsible for winch operation and deployment and retrieval of sampling equipment.

2.4.4 Science Team: The team will provide technical and hands-on support to the Chief Scientist and Watch Captains. Survey staff will be responsible for ensuring that adequate personal and work-related logistical supplies are available on board. They will assist in the deployment/retrieval of sampling equipment. They will be responsible for the physical characterization, handling and processing of the sediment samples after collection. They will be responsible for wet-sieving sediment samples (63 µm) to determine rough grain-size categories. They will be responsible for sampling equipment decontamination. They will be responsible for the preparation and maintenance of the chain of custody of the samples and other documentation associated with sample collection and shipment. They will ensure that all samples are properly labeled, preserved, sealed and packaged for eventual shipment/transport to the laboratories.

2.4.5 Technical Support Team

2.4.5.1 OEA Liaison Officer: The point of contact for the Office of Environmental Assessment and the Science Team on shore is Mr. Andy Hess. His organization phone number is (360) 871-8711 and his e-mail address is Hess.Andy@epa.gov. He will interface with the ETPA and OEA management and will be responsible for ensuring that the science team is properly and adequately equipped for the implementation of the project. He will provide supplies, materials and equipment for sample collection, processing and shipment. He will coordinate and inform other OEA scientists if and when additional technical support is needed. He will provide briefing and hands-on demonstration on boat safety, sample handling and processing to the members of the team prior to mobilization to the site, if needed.

2.4.5.2 Project Quality Assurance Manager (QAM): Ginna Grepo-Grove is the designated project QAM. She will work with the Chief Scientist and Watch Captains and assist in the development of the Quality Assurance Project Plan (QAPP) for the project. She will review and approve the QAPP, all amendments and subsequent revision(s). She will provide QA oversight for environmental sample collection and analyses. If requested, she may assist the Project Managers during field, laboratory and data assessment activities. She will validate the dioxin/furan and PCB congener data generated for this project.

2.4.5.3 Regional Sample Control Coordinator (RSCC): The Region 10 RSCC is Bethany Plewe. She is the point of contact for coordinating and scheduling analytical services for Region 10. She provides sample numbers, sample tags (if needed), custody seals and chain of custody forms. She interfaces with the laboratories and ensure that sample shipments are on schedule and that all documentation are present. She will provide hands-on training to the team on chain-of-custody forms and the use of FORMS II Lite in the field.

2.5 *OSV BOLD* Communication Protocols

The *OSV BOLD* has three cellular telephones. Two are handheld; one is carried by the Captain and one by the watch-stander. The other is permanently installed and is located in the ship's office for data transfer only.

Captain's cell phone:	(850) 625-4020
Watch-stander's cell phone:	(850) 625-4719

Crew & Scientists personal E-mail normally can be accessed only when cellular service is available. Limited personal E-mails may be exchanged at sea via the Mini-M at the discretion of the Chief Scientist. The address for the Crew account is:

osvboldcrew@seawardservices.com

EPA ship's Business E-mail can be accessed any time by cellular phone if service is available or using the Mini-M terminal while at sea. The address for the Business account is:

osvboldbusiness@seawardservices.com

Captain's Email can be accessed only by the Captain or his designate at any time by cellular phone if service is available or by using the Mini-M satellite terminal while at sea. The address for the Captain's account is:

osvboldmaster@seawardservices.com

2.6 Project Description

2.6.1 Background

The Dredged Material Management Program (DMMP) agencies comprising of the Seattle District US Army Corps of Engineers (ACOE), Region 10 US Environmental Protection Agency (EPA), Washington State Department of Ecology (DOE) and Washington State Department of Natural Resources (DNR), hereafter shall be called the "Agencies", are in the process of developing new guidance for the disposal of dredged material containing dioxins/furans and PCB congeners to protect human health and the environment, support the Puget Sound Initiative's goals for Puget Sound, maintain the viability of the open-water disposal program, and ensure consistency with regulatory requirements. To support the new disposal guidance, a number of alternatives are under consideration. While the Puget Sound Ambient Monitoring Program (PSAMP) has generated a geographically extensive, long-term sediment data set from sites throughout Puget Sound, they have not routinely analyzed for dioxins/furans and have limited their PCB congener analysis to a subset of the 209 possible congeners.

There is little high resolution dioxin/furan or polychlorinated biphenyl (PCB) congener data available for Puget Sound outside of certain Superfund and Model Toxics Control Act (MTCA) cleanup sites and thus, making it difficult to evaluate the practical, economic, environmental, and regulatory consequences of the alternatives. In order to make an informed decision, the agencies have determined that additional sediment sampling is needed to provide data on concentrations of dioxins/furans and PCB congeners in non-urban areas of Puget Sound. In addition to being analyzed for dioxins/furans and PCB congeners, these samples will also be evaluated using cell/PCR assays as well as being analyzed for sediment conventionals (TOC, grain size, % solids) and the full suite of DMMP contaminants of concern (COCs) including semi-volatiles, PAHs, Aroclor PCBs, pesticides and trace metals. The breadth of characterization of these sediments will support the use of this data for the dredging program as well as other programs focused on sediment contamination in the Puget Sound region.

2.6.2 Problem Identification

The DMMP agencies have identified the following policy and technical questions that need to be answered to evaluate the alternatives under consideration and select a final approach:

Question 1. What are the concentrations of dioxins/furans/PCBs in the existing reference areas used by the DMMP? Currently, there is very limited number of high resolution dioxin/furan and PCB data from DMMP reference sites in Puget Sound. Specifically, there are only nine dioxin/furan data points and five detected PCB Aroclor values collected from three of the five Puget Sound DMMP reference locations (Carr Inlet, Samish Bay and Sequim Bay). There is no high resolution (209 congeners) PCB data collected from these areas at all. From a programmatic and regulatory standpoint, these data points may not be considered representative of the organic carbon or grain size range distribution in reference bays or typical dredging projects. Dioxin-like congener data along with dioxin/furan data may be needed to accurately evaluate human health and ecological risks. High resolution GC/MS analytical techniques will be needed to reliably measure and report low detection limits of PCB congeners and dioxins/furans.

Question 2. What are the concentrations of dioxins/furans/PCBs generally present in Puget Sound, outside of the areas that have already been sampled (urban bays, cleanup sites)? Most of the existing high resolution dioxin/furan/PCB data for Puget Sound are from Superfund and MTCA cleanup sites. In addition, some data are being collected by the Puget Sound Initiative in several urban bays in the Sound. Outside of these areas, almost no high resolution data exist other than those collected recently by the DMMP agencies in the vicinity of the open-water disposal sites. This project is expected to generate the much needed dioxin and PCB congener information which could be an invaluable tool for Puget Sound mapping and characterization. The data will also help in determining the current environmental health of Puget Sound.

Question 3. Are the concentrations of dioxins/furans/PCBs in the existing reference areas different from those in Puget Sound that are also away from known sources? There has been an assumption that the existing Puget Sound DMMP reference areas, selected to support bioassay testing, and areas away from known sources such as outfalls and cleanup sites are generally cleaner than the chemical contaminant concentrations in Puget Sound. However, there is not enough data to test this assumption. The results of this project could affect how all of these areas fall under the various definitions of background concentrations used in MTCA and Sediment Management Standards (SMS).

Question 4. Are these concentration distributions affected by TOC or grain size? The agencies are interested in whether there are consistent correlations between dioxins/furans/PCBs and TOC or grain size. Because the greater Puget Sound area has widely differing grain-size and TOC levels, this could affect the levels of dioxins/furans/PCBs found in these areas, even in the absence of localized sources.

Question 5. Is there a less expensive method for testing dioxins/furans and coplanar PCBs that could be used to reduce the cost of testing for both agencies and applicants? One issue affecting the debate in DMMP monitoring is the cost of testing for dioxins/furans and PCB congener analyses. Currently, the analytical cost for dioxins/furans and PCB congeners range is from $650-900/sample and $900-1300, respectively. Several assays have recently been approved by EPA as alternative to standard methods of analysis with much lower costs involved. However, the use of these techniques has not been exhaustively evaluated and documented at lower concentrations. This project presents a great opportunity to do that. Samples collected for this project will be analyzed using two alternative techniques and standard fixed laboratory methods. It is hoped that through this project, the Agencies will be able to correlate results, and determine cost effectiveness, comparability and data quality for both methods.

Question 6. What are concentrations of the standard suite of COCs in these sediment samples?
Because of the value of this information for dredging and clean-up programs in the Region, EPA took the opportunity to analyze these sediment samples for a broad suite of contaminants that are typically evaluated in dredging and clean-up programs.

A cooperative research opportunity has also been identified with a researcher at the University of Iowa, who has proposed to accept samples in order that separate project funding may be obtained for using molecular tools to determine the presence and activity of aerobic PCB-degrading microorganism. The presence of active PCB-degrading microbes could significantly contribute to the understanding of processes that contribute to the health of the Puget Sound ecosystems. The area of Puget Sound represented in this OSV Bold cruise would be considered in this future research, plus samples (if they may be obtained) from the urban bay studies concurrently being done by Ecology under a separate investigative effort. At this time and for this cruise, provision is made only to take samples so that molecular analyses may be accomplished later as a separate but complimentary task; the data quality objectives for analysis performed by the University of Iowa researcher will be developed at a later time and will be supported by separate funding. Therefore, the research questions/objectives that will be part of this separate study are not further described herein.

2.6.3 Study Objectives

Based on the five questions above, the following objectives were developed for this study:

1. Determine the concentration distributions of dioxins/furans/PCB congeners in the existing DMMP reference areas.

2. Determine the concentration distributions of dioxins/furans/PCB congeners in Puget Sound generally, away from known sources and cleanup sites.

3. Compare the concentration distributions in the existing reference areas to general concentrations in Puget Sound away from known sources and sites to determine whether they are statistically different.

4. Evaluate whether the concentration distributions appear to be correlated with grain size or TOC (if possible).

5. Conduct a test of two alternative analytical methods for dioxin/furan/PCB congeners and determine the correlation of results with standard methods of analyses, Method 1613B and Method 1668A, respectively. Comparability of detection limits and tests cost-effectiveness will also be determined[1].

[1] A third test consisting of the Corps-developed 101L dioxin assay may also be included, depending on availability of Corps Dredging Operations Technical Support (DOTS) funding. No additional sample volume is required for this additional analysis; as it is yet unclear if it will be funded, the 101L dioxin bioassay is not described in this QAPP.

6. Objective 6. Conduct simultaneous testing for the standard suite of DMMP Contaminants of Concern (COCs) in order to gain a better understanding of their concentrations throughout Puget Sound.

2.6.4 Study Design

The proposed work will involve collection of 70 surface (0-10 cm) sediment samples from reference sites and other locations within Puget Sound that are distant from known sources of contamination. All of the sediment samples will be analyzed for (1) PCB congeners and dioxins/furans using high resolution GC/MS methods; (2) the full suite of DMMP COCs including SVOCs, PAHs, PCB Aroclors, pesticides, and trace metals; (3) sediment conventionals including total organic carbon (TOC), grain size, and percent solids. Sediment samples will also be evaluated using two alternative PCR/Cell assays. Sediment samples will also be archived for potential future analysis of additional analytes.

2.7 Project Schedule

Surface sediment samples will be collected on board the *OSV Bold* during a survey scheduled from July 31 to August 8, 2008. A detailed schedule for survey operations is provided in Table 3. All samples will be either frozen (-18 °C), deep frozen (-80 °C) or refrigerated and delivered directly to the contract analytical laboratories (TBD), Manchester Labs (archive samples only), and the University of WA (molecular analysis) immediately after the survey(s) conclude. Note: The schedule may change depending on the tide, logistics and other conditions that are out of the control of the team.

Date	Approximate Time	Activity
7/31	0900	EPA/COE/WDOE/DNR Survey crew arrives, mobilization in Seattle, vessel orientation, safety briefing, survey briefing
7/31	1300	Depart, begin sampling
		Transit to and sampling at 11 stations in Central Puget Sound (CPS_3, CPS_5), North Central Puget Sound (NCPS_0, NCPS_1, NCPS_3, NCPS_4), and Admiralty Inlet (AI_1, AI_0, AI_3, AI_2, AI_4).
		Transit to and sampling at 5 stations in the Straits of Juan de Fuca (SJF_1, SJF_2, SJF_0, SJF_3, SJF_6).
		Transit to and sampling at 10 stations in the San Juan Islands (SJI_4, SJI_1, SJI_3, SJI_6, SJI_0) and in Samish Bay

Date	Approximate Time	Activity
		(R_SAM_3, R_SAM_4, R_SAM_1, R_SAM_5, R_SAM_0).
		Transit to Hood Canal
		Transit to and sampling at 10 stations in Hood Canal (HC_1, HC_ 3, HC_ 6, HC_ 0, HC_ 2) and Dabob Bay (R_DAB_2, R_DAB_ 3, R_DAB_ 0, R_DAB_ 1, R_DAB_5).
		Transit to North Central Puget Sound Area
		Transit to and sampling at 6 stations in North Central Puget Sound (NCPS_2), Port Susan and Possession Sound (PSPS_8, PSPS_2, PSPS_1, PSPS_9, PSPS_3).
		Transit to and sampling at 10 stations in Saratoga Passage/Skagit Bay (SPSB_0, SPSB_2, SPSB_1, SPSB_6, SPSB_3) and Holmes Harbor (R_HOL_3, R_HOL_4, R_HOL_7, R_HOL_1, R_HOL_0)
		Transit to Central Puget Sound
		Transit to and sampling at 8 stations in Central Puget Sound (CPS_0, CPS_4, CPS_1) and South Central Puget Sound (SCPS_2, SCPS_1, SCPS_5 ,SCPS_3, SCPS_4).
		Transit to and sampling at 10 South Sound (SS_6), Carr Inlet (R_CAR_1, R_CAR_5, R_CAR_2, R_CAR_0, R_CAR_4), and South Sound (SS_7, SS_1, SS_2, SS_0)
8/6		Transit to Seattle and demobilization
8/7-8/2008		Weather days
8/7/2008		Sample shipment to the contract labs

2.8 Station Locations

Surface sediment samples will be collected from a total of 70 target sampling locations that have been identified throughout Puget Sound including the San Juan Islands and the Strait of Juan de Fuca (Figure 1)

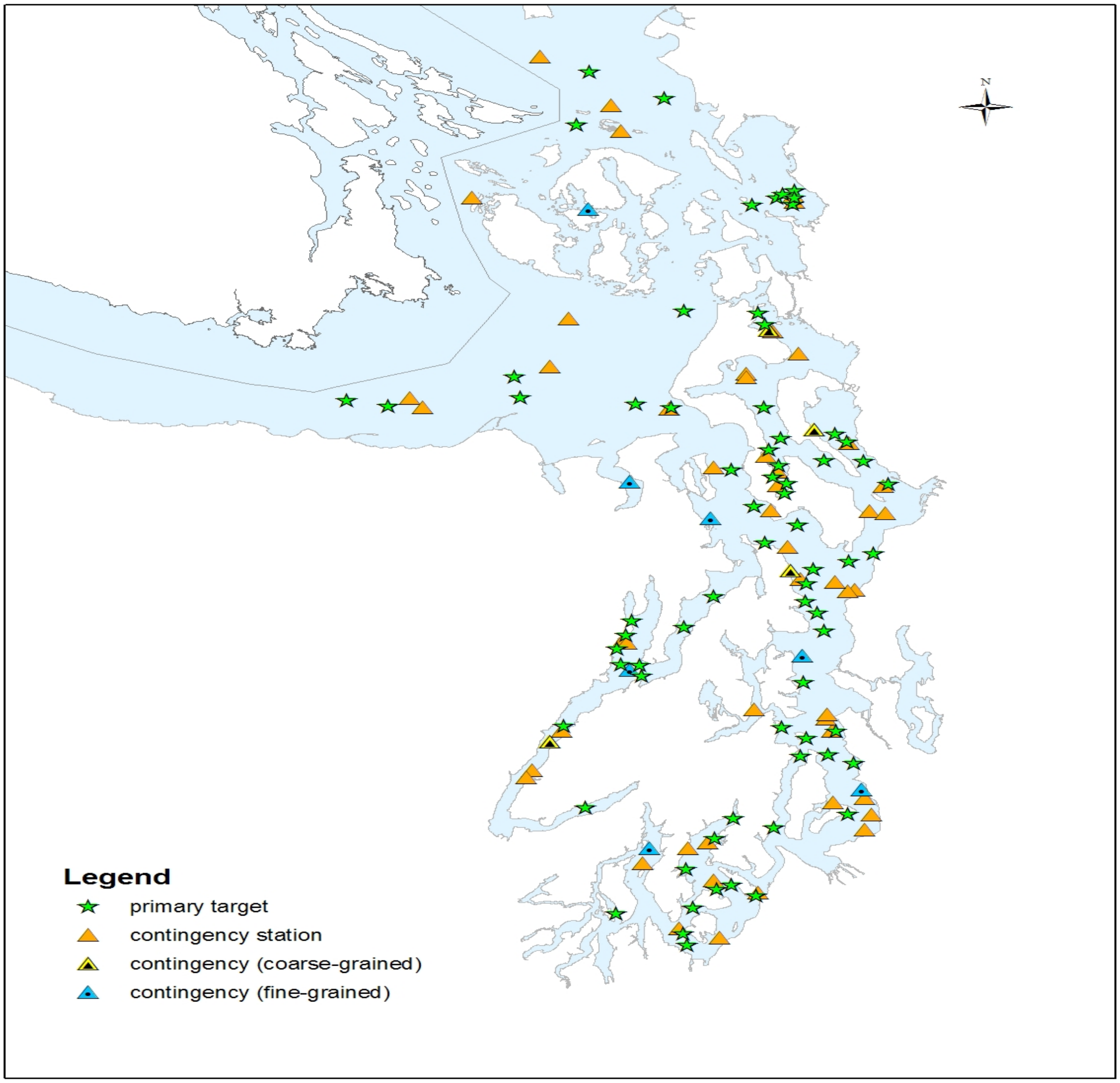

Figure 1. Target and Contingency Sampling Locations for Puget Sound Sediment Dioxin/Furan and PCB Congeners Survey (stars indicate target sample locations; triangles indicate contingency sampling locations).

A subset of these sample locations (n = 20) are located within four of the existing reference areas (Carr Inlet, Samish Bay, Holmes Harbor, and Dabob Bay), as depicted in Figure 2. In each reference area, 5 target (and 2-3 contingency[2]) sediment sampling locations have been located based on a stratified random sampling design.

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[2] Contingency samples will serve as alternate sampling locations in the event that a sample can not be obtained from a target location or based on the wet sieving results. The decision to sample at contingency locations will be made on a sample location-specific basis by the Chief Scientist, Principal Investigator and/or Watch Captain.

The remaining 50 sample locations are spread throughout Puget Sound and are intended to represent areas outside the influence of urban bays and known point sources. Both target and contingency stations were located using the same stratified random approach as was used for the reference sites.

Target geographic coordinates as well as depths for each target and contingency sampling station are provided in Table 3.

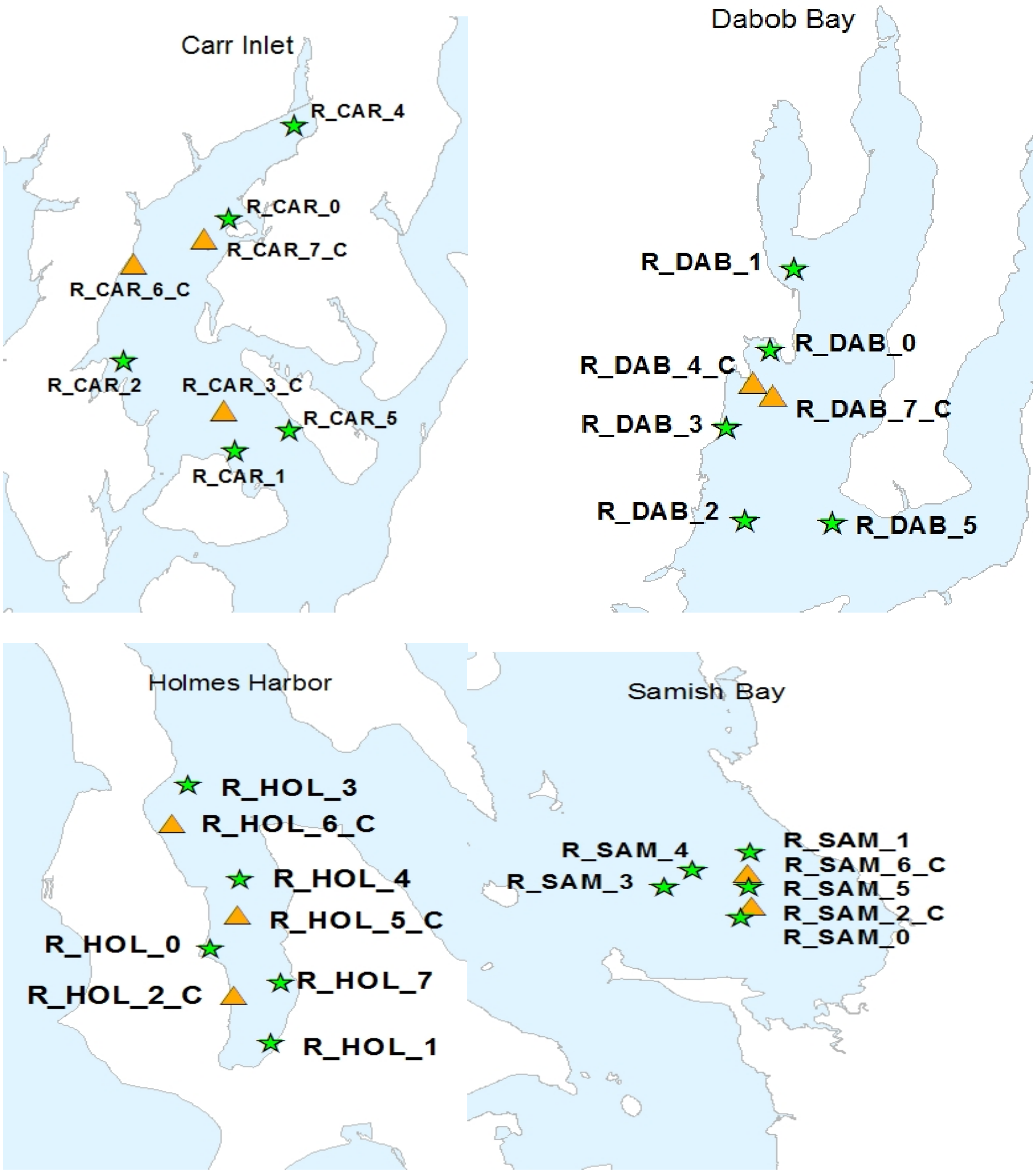

Figure 2. Target and Contingency sampling locations in four Puget Sound reference areas (stars indicate target sample locations; triangles indicate contingency sampling locations).

Table 3. Target and Contingency Coordinates for Puget Sound PCB and Dioxin Survey

Station ID	Area Name	Depth (ft)	Depth (m)	Target Latitude (NAD83)	Target Longitude (NAD83)
AI_0	Admiralty Inlet	70	21.34	47.924110	-122.563920
AI_1	Admiralty Inlet	280	85.34	47.959856	-122.492100
AI_2	Admiralty Inlet	410	124.97	48.070659	-122.635635
AI_3	Admiralty Inlet	150	45.72	47.997431	-122.587007
AI_4	Admiralty Inlet	220	67.06	48.195790	-122.764289
AI_5_C	Admiralty Inlet	110	33.53	47.988730	-122.549094
AI_9_C	Admiralty Inlet	200	60.96	48.192895	-122.768338
AI_11_C	Admiralty Inlet	330	100.58	48.075672	-122.672890
AI_13_C	Admiralty Inlet	320	97.54	47.916343	-122.513550
AI_8_C_GS	Admiralty Inlet	35	10.67	47.973011	-122.681740
R_CAR_0	Carr Inlet	60	18.29	47.334214	-122.675090
R_CAR_1	Carr Inlet	190	57.91	47.233204	-122.672441
R_CAR_2	Carr Inlet	60	18.29	47.272381	-122.737715
R_CAR_4	Carr Inlet	35	10.67	47.374243	-122.636240
R_CAR_5	Carr Inlet	370	112.78	47.241984	-122.640453
R_CAR_3_C	Carr Inlet	320	97.54	47.250274	-122.678730
R_CAR_6_C	Carr Inlet	60	18.29	47.314357	-122.731719
R_CAR_7_C	Carr Inlet	60	18.29	47.325396	-122.689822
CPS_0	Cen. Puget Sound	560	170.69	47.547542	-122.415114
CPS_1	Cen. Puget Sound	140	42.67	47.554908	-122.531002
CPS_3	Cen. Puget Sound	530	161.54	47.645750	-122.483205
CPS_4	Cen. Puget Sound	120	36.58	47.534222	-122.477740
CPS_5	Cen. Puget Sound	310	94.49	47.748103	-122.438174
CPS_7_C	Cen. Puget Sound	590	179.83	47.548048	-122.422688
CPS_8_C	Cen. Puget Sound	110	33.53	47.591691	-122.590295
CPS_9_C	Cen. Puget Sound	370	112.78	47.572799	-122.434395
CPS_10_C	Cen. Puget Sound	560	170.69	47.580355	-122.432650
CPS_18_C_GS	Cen. Puget Sound	560	170.69	47.698344	-122.486853
R_DAB_0	Dabob Bay	100	30.48	47.740752	-122.863135
R_DAB_1	Dabob Bay	380	115.82	47.769133	-122.851855
R_DAB_2	Dabob Bay	400	121.92	47.681601	-122.874953
R_DAB_3	Dabob Bay	50	15.24	47.713740	-122.883457
R_DAB_5	Dabob Bay	320	97.54	47.680358	-122.834842
R_DAB_4_C	Dabob Bay	130	39.62	47.729425	-122.871281
R_DAB_7_C	Dabob Bay	310	94.49	47.724925	-122.861720
R_HOL_0	Holmes Harbor	35	10.67	48.055562	-122.544993
R_HOL_1	Holmes Harbor	50	15.24	48.023633	-122.520458

Station ID	Area Name	Depth (ft)	Depth (m)	Target Latitude (NAD83)	Target Longitude (NAD83)
R_HOL_3	Holmes Harbor	90	27.43	48.110552	-122.553370
R_HOL_4	Holmes Harbor	170	51.82	48.078638	-122.532449
R_HOL_7	Holmes Harbor	100	30.48	48.043833	-122.516294
R_HOL_2_C	Holmes Harbor	35	10.67	48.039516	-122.535434
R_HOL_5_C	Holmes Harbor	170	51.82	48.066487	-122.533583
R_HOL_6_C	Holmes Harbor	210	64.01	48.097494	-122.559938
HC_0	Hood Canal	520	158.50	47.559638	-122.997660
HC_1	Hood Canal	170	51.82	47.817637	-122.674166
HC_2	Hood Canal	70	21.34	47.395863	-122.950929
HC_3	Hood Canal	310	94.49	47.756145	-122.739541
HC_6	Hood Canal	260	79.25	47.660054	-122.830690
HC_9_C_GS	Hood Canal	540	164.59	47.527951	-123.029273
HC_7_C	Hood Canal	470	143.26	47.549012	-123.002194
HC_8_C	Hood Canal	370	112.78	47.470629	-123.065274
HC_11_C	Hood Canal	360	109.73	47.456785	-123.077453
HC_10_C_GS	Hood Canal	390	118.87	47.670896	-122.856849
NCPS_0	N.C. Puget Sound	580	176.78	47.784440	-122.453153
NCPS_1	N.C. Puget Sound	35	10.67	47.807343	-122.476675
NCPS_2	N.C. Puget Sound	410	124.97	47.886134	-122.382194
NCPS_3	N.C. Puget Sound	580	176.78	47.843304	-122.474905
NCPS_4	N.C. Puget Sound	510	155.45	47.870643	-122.458771
NCPS_8_C_GS	N.C. Puget Sound	35	10.67	47.868874	-122.510327
NCPS_5_C	N.C. Puget Sound	400	121.92	47.850815	-122.488448
NCPS_6_C	N.C. Puget Sound	35	10.67	47.829089	-122.371447
NCPS_7_C	N.C. Puget Sound	170	51.82	47.826947	-122.384955
NCPS_9_C	N.C. Puget Sound	550	167.64	47.845526	-122.412361
PSPS_1	Port Susan & Possession Sound	390	118.87	48.086850	-122.349191
PSPS_2	Port Susan & Possession Sound	290	88.39	48.040256	-122.296362
PSPS_3	Port Susan & Possession Sound	360	109.73	48.140775	-122.410020
PSPS_8	Port Susan & Possession Sound	50	15.24	47.902704	-122.329394
PSPS_9	Port Susan & Possession Sound	390	118.87	48.125836	-122.384334
PSPS_18_C_GS	Port Susan & Possession Sound	35	10.67	48.150435	-122.456142
PSPS_10_C	Port Susan & Possession Sound	540	164.59	47.986540	-122.338158
PSPS_11_C	Port Susan & Possession Sound	460	140.21	47.982623	-122.303402
PSPS_12_C	Port Susan & Possession Sound	330	100.58	48.035960	-122.307563
PSPS_13_C	Port Susan & Possession Sound	390	118.87	48.122467	-122.379460
R_SAM_0	Samish Bay	35	10.67	48.600899	-122.497630
R_SAM_1	Samish Bay	35	10.67	48.627423	-122.492978
R_SAM_3	Samish Bay	60	18.29	48.613228	-122.531947

Station ID	Area Name	Depth (ft)	Depth (m)	Target Latitude (NAD83)	Target Longitude (NAD83)
R_SAM_4	Samish Bay	50	15.24	48.620263	-122.519330
R_SAM_5	Samish Bay	35	10.67	48.613246	-122.493851
R_SAM_2_C	Samish Bay	35	10.67	48.604998	-122.492693
R_SAM_6_C	Samish Bay	35	10.67	48.618640	-122.493980
SJI_0	San Juan Islands	80	24.38	48.599295	-122.585156
SJI_1	San Juan Islands	180	54.86	48.812616	-122.776990
SJI_3	San Juan Islands	500	152.40	48.866061	-122.940864
SJI_4	San Juan Islands	110	33.53	48.388244	-122.736483
SJI_6	San Juan Islands	360	109.73	48.760060	-122.970321
SJI_7_C	San Juan Islands	480	146.30	48.895844	-123.049165
SJI_8_C	San Juan Islands	580	176.78	48.799432	-122.893780
SJI_9_C	San Juan Islands	400	121.92	48.747298	-122.871798
SJI_10_C	San Juan Islands	540	164.59	48.614209	-123.198400
SJI_11_C_GS	San Juan Islands	130	39.62	48.592258	-122.945322
SPSB_0	Saratoga Passage and Skagit Bay	380	115.82	48.088416	-122.433149
SPSB_1	Saratoga Passage and Skagit Bay	260	79.25	48.195613	-122.563329
SPSB_2	Saratoga Passage and Skagit Bay	290	88.39	48.133111	-122.527406
SPSB_3	Saratoga Passage and Skagit Bay	50	15.24	48.383986	-122.573772
SPSB_6	Saratoga Passage and Skagit Bay	35	10.67	48.360947	-122.559682
SPSB_7_C_GS	Saratoga Passage and Skagit Bay	35	10.67	48.349920	-122.554089
SPSB_8_C	Saratoga Passage and Skagit Bay	80	24.38	48.301405	-122.488223
SPSB_9_C	Saratoga Passage and Skagit Bay	80	24.38	48.262497	-122.600549
SPSB_10_C	Saratoga Passage and Skagit Bay	80	24.38	48.346449	-122.543734
SPSB_11_C	Saratoga Passage and Skagit Bay	90	27.43	48.255486	-122.600853
SCPS_1	South Central Puget Sound	580	176.78	47.501406	-122.431181
SCPS_2	South Central Puget Sound	340	103.63	47.497574	-122.490001
SCPS_3	South Central Puget Sound	50	15.24	47.381893	-122.390316
SCPS_4	South Central Puget Sound	110	33.53	47.354724	-122.550134
SCPS_5	South Central Puget Sound	590	179.83	47.482868	-122.377790
SCPS_6_C	South Central Puget Sound	35	10.67	47.404266	-122.422097
SCPS_10_C	South Central Puget Sound	370	112.78	47.349586	-122.354801

Station ID	Area Name	Depth (ft)	Depth (m)	Target Latitude (NAD83)	Target Longitude (NAD83)
SCPS_12_C	South Central Puget Sound	490	149.35	47.380417	-122.340269
SCPS_13_C	South Central Puget Sound	580	176.78	47.413152	-122.354191
SCPS_7_C_GS	South Central Puget Sound	590	179.83	47.430825	-122.363980
SS_0	South Sound	35	10.67	47.183985	-122.885831
SS_1	South Sound	110	33.53	47.120918	-122.735566
SS_2	South Sound	240	73.15	47.144589	-122.743990
SS_6	South Sound	230	70.10	47.219255	-122.588781
SS_7	South Sound	160	48.77	47.195448	-122.722988
SS_8_C	South Sound	390	118.87	47.135336	-122.666505
SS_9_C	South Sound	140	42.67	47.284715	-122.830372
SS_11_C	South Sound	250	76.20	47.225275	-122.583501
SS_13_C	South Sound	210	64.01	47.154437	-122.751763
SS_10_C_GS	South Sound	90	27.43	47.314601	-122.817023
SJF_0	Strait of Juan de Fuca	440	134.11	48.208629	-123.468376
SJF_1	Strait of Juan de Fuca	220	67.06	48.202536	-122.841072
SJF_2	Strait of Juan de Fuca	520	158.50	48.256914	-123.103888
SJF_3	Strait of Juan de Fuca	410	124.97	48.197449	-123.379288
SJF_6	Strait of Juan de Fuca	280	85.34	48.215930	-123.091114
SJF_8_C	Strait of Juan de Fuca	400	121.92	48.214024	-123.330270
SJF_9_C	Strait of Juan de Fuca	460	140.21	48.276670	-123.027870
SJF_10_C	Strait of Juan de Fuca	490	149.35	48.373441	-122.986706
SJF_11_C	Strait of Juan de Fuca	240	73.15	48.195738	-123.302630
SJF_12_C_GS	Strait of Juan de Fuca	160	48.77	48.046926	-122.857203

2.9 Sampling Procedures

2.9.1 Navigation and Positioning Control

Positioning and navigation will be accomplished using a differential Global Positioning System (DGPS) integrated with a computerized navigation and survey system. Sampling locations, range and bearing to target, and the vessel's track line are displayed along with vessel position to aid the helmsman in steering. Navigation equipment should be suitable for consistently fixing the vessel's position to within 10 meters. Samples will be collected within a target radius of 15 meters.

All aspects of navigation and positioning control will be handled by the Captain, with consultation from the Chief Scientist, as needed. The Chief Scientist or Watch Captain will be notified if the GPS signal is lost. For sediment grab stations, the stern of the OSV Bold will be navigated to within 15 meters of the station. A laptop with the Hypack-Survey software will be located in the wet lab and connected to the DGPS system for the ship. The software automatically compensates for the difference between the locations of the sampler deployment davit and the GPS receiver. Samples deemed too far off station by the Watch Captain will be re-sampled.

Latitude and longitude coordinates will be updated every second and displayed directly on an onboard computer. The coordinates at the time the sampling device reaches the bottom and its doors close will be stored in real time using Hypack software for managing positioning data. The GPS device takes coordinates directly into North American Datum (NAD) 83 degrees and decimal minutes. The vertical datum will be the National Oceanic and Atmospheric Administration's mean lower low water (MLLW) datum. Vertical control will be provided by the ship's depth finder.

The following are quality control (QC) procedures for navigation during the 2008 Puget Sound Sampling cruise:

- Daily navigation system checks (horizontal control checks) will be conducted by comparing the DGPS coordinates of 6 GPS devices available in the BOLD. These comparisons will be made daily to check for possible errors in the DGPS or navigation system.

- Before field operations, the system's hardware, software, and DGPS system will be checked to make sure all systems are functional.

- Field, station, and sample logs will be maintained to document all information related to station keeping and sample taking.

- The vessel operator is directly responsible for the accurate operation of the navigation system and will act as the quality assurance officer for vessel positioning throughout the project.

- A proper supply of electronic and mechanical spares will be maintained on shore and aboard the research vessel to ensure minimal downtime.

2.9.2 Sample Collection

All sample handling, sub-sampling, judgment of sample acceptability, gear and utensil decontamination, compositing, storage, and chain-of-custody procedures will be conducted in accordance with Puget Sound Estuary Protocols (PSEP 1986, 1987, 1997a,b,c) and Puget Sound Dredge Disposal Analysis protocols (PSDDA 1989). A summary of sample collection methods is provided below. Detailed standard operating procedures (SOPs) for the collection and processing of sediment samples using PSEP protocols are provided in Attachment 1.

The sediment samples will be collected with either a grab- or box core-type sampler. A stainless steel double van Veen sampler will be the primary sampling device, although if sediments are particularly fine, the box core may be more successful in collecting undisturbed samples. A 0.1-m^2 Ted Young-modified van Veen grab will also be available as a backup to the primary sampler. The samplers may need to be modified depending on the availability and applicability of the samplers and attachments.

The Chief Scientist, Principal Investigator, or watch captain will direct field sampling efforts. She/He will decide on the following and record those decisions in the field logbook:

- Sampling order for target sampling locations
- The need to sample from contingency location.
- The need to modify sampling procedures.
- Acceptability of each grab sample.

The determination of sufficient quantity is made by measuring the depth of penetration of the grab. The sampler must be at least half full to contain enough sediment for distribution among the required sample jars. Undisturbed samples will be achieved by careful attention to established deployment and recovery procedures.

If an acceptable sample can not be collected from a target location, a contingency sample location will be chosen. Potential reasons for sampling an alternate location include physical obstruction, failure of sampling devices to penetrate the substrate after three attempts, and achieving a representative grain-size distribution for a particular area.

Established deployment and recovery procedures for the sampling gear will be followed to ensure that the best possible samples are recovered and risks to personnel and equipment are minimized (refer to SAIC SOP 1005-M - Appendix A). A minimum of one grab sample (one cast of the double van Veen) will be taken to collect an adequate volume of sediment for all physical and chemical testing as well as for archival (a total of approx 1 to 1.5 liter). Once a sample is taken, the overlying water is carefully siphoned off one side of the sampler. If the sample is judged to be acceptable according to PSEP specifications, the penetration depth will be measured with a decontaminated stainless steel ruler and sample quality and texture described in the sediment sampling field and sample data sheet log (see Attachment 3).

A single composite sample will be collected at each sampling location. Sediments representing the top 10 cm from one or more grab samples will be placed in a decontaminated stainless steel bowl and mixed until uniform in color and texture. Only those sediments not in direct contact with the sampler walls will be obtained. To prevent bias in grain size distribution, sediments will be transferred to sample jars while the composite is mixed. Concurrent with the processing of the grab for sample distribution, a subsample of collected sediments will be wet sieved in the field to determine approximate grain size, so that a representative grain size distribution can be achieved for a given area. Sediment wet sieving procedures are described in detail in the wet sieving SOP (Attachment 1).

2.9.3 Sample Handling

After homogenization, the sediment samples will be distributed into eight 4-oz, one 8-oz, and one 32-oz certified-clean wide-mouthed glass jar containers, plus one 15-mL polypropylene centrifuge tube. In the field, all sediment samples for dioxin/furan, PCB congener, % solids, cell/PCR assays, and archival will be labeled, placed in storage containers, and frozen at -20 °C ± 2 °C. Samples for molecular analysis will be placed in the ultra-low freezer at -80 °C. Samples to be analyzed for TOC, organic COCs (e.g., SVOCs, PAHs, PCB Aroclors, pesticides), trace metals, and grain size will be refrigerated at 4 °C ± 2 °C (samples for grain size may also be stored at room temperature). Following the completion of each day's sampling, chain-of-custody forms will be completed for each sampling area. A list of sediment samples to be collected, including jar types and laboratories, is provided in Table 4. Sediment samples collected for chemical analyses will be delivered to the contracted analytical laboratories by overnight courier or by project staff at the end of the survey. Original chain-of-custody forms and analysis request forms will accompany all the samples to the appropriate locations.

Table 4- Minimum required analytical sediment sample sizes and storage conditions for Puget Sound Dioxin/Furan and PCB Congener Survey

Parameter	Matrix	Laboratory	Number of Sediment Samples	Minimum Quantity Required (wet wt.)	Containers (2/3 full)	Extraction/ Prep Holding Time	Preservative
Grain size	Sediment	ARI	75	150 grams	32-oz P, TLJ – 300 g capacity	6 months	4 °C or room temp
Total organic carbon & Total solids	Sediment	ARI	75	75 grams	4-oz G, WM, TLJ - 100 g capacity	28 days	4 °C ± 2C
Total PCBs (209 Congeners)	Sediment	SGS	75	25 grams	4-oz G, WM, TLJ* 100 g capacity	1 year	-18 to -20 °C
Dioxins and furans	Sediment	SGS	75	25 grams	4-oz G, WM, TLJ 100 g capacity	1 year	-18 to -20 °C
CALUX assay	Sediment	TBD	75	30 grams	4-oz G, WM, TLJ 100 g capacity	1 year	-18 to -20 °C
Procept assay	Sediment	TBD	75	30 grams	4-oz WM, TL 100 g capacity	3 months	-18 to -20 °C
Sediment archive[3]	Sediment	MEL Contract	75	224 grams	2 x 4- oz G, WM, TLJ 100 g x 2 capacity	1 year	-18 to -20 °C
Molecular Analysis	Sediment	Holding at U. of Washing-ton for eventual shipment to U. of Iowa	75	15 mL (approx 25 grams)	STATE MANUFAC TURER 15 mL screw-top centrifuge tubes	2 years (not specified in PSEP)	-80 °C
SVOCs, PAHs, Pesticides, PCB Aroclors	Sediment	CLP	75	150 grams	8-oz	14 days	4 °C + 2 C
Total Mercury and Metals Analyses	Sediment	CLP	75	20 grams	4-oz-WM, G jars	Hg - 28 days; metals - 6 mos.	4 °C ± 2C

* WM= wide mouth; TLJ = Teflon –lined jars; G= Glass; P=Plastic

Note: Fill the jars only 2/3 full to allow for expansion during freezing and prevent container breakage.

[3] Archived sediments may be analyzed for PBDEs and Pharmaceuticals in the future.

2.9.4 Decontamination Procedures

As much as possible, all of the sampling and sub-sampling utensils that will be used will be dedicated and disposable. The mixing containers will be decontaminated after each sampling station is completed following PSEP (1997c) decontamination procedures (i.e., wash with Liquinox™ and rinse with clean site water). Should a noticeable oily sheen or petroleum odor be observed on the sampling gear and/or utensils, they will be set aside and will not be used again until fully decontaminated with rinses of methanol, nitric acid (for mercury and metals) and a final distilled water rinse per PSEP protocols.

2.9.5 Field Documentation and Records

The Chief Scientist will maintain a cruise log including the time and location of all sample stations. The OSV Bold bridge crew will maintain a log of all vessel activities. This will be used for all bottom samples. At the beginning of the survey, the times on the EPA Region 10's navigation system (Hypack) will be synchronized with the DGPS. The EPA Watch Captain will note the time and location for the beginning and ending of each sample collection. Navigation files from EPA's navigation system will be backed up every 6 hours.

As a back-up for the position fixes recorded electronically by the navigation system, a written sample log will be kept by the EPA Chief Scientist or his designee (watch captain). Information recorded in the electronic and field logbook includes:

<u>Survey General Information</u>:

- Date
- Observations on weather conditions, environmental conditions, or other pertinent observations
- Sampling Crew
- Time of arrival at vessel
- Time of survey commencement
- Time of survey conclusion
- Time departing vessel

<u>Sample Collection and Station Location Information</u>:

- EPA Sample Tracking Number
- Date/time of each sample (local)
- Latitude and longitude of each sample (recorded as decimal degrees to a minimum of 5 decimal places).
- Sample ID
- Water depth (meters)
- Visual characterization of each sample (color, sediment type)

- Wet-sieving results (percent fines)
- Watch captain's name
- Weather at the time of sampling
- Number of casts required/notes regarding each cast
- Sample depth (cm)

There will be a designated sample control and sample documentation officers in the vessel responsible for keeping track of all the samples collected and the preparation of associated custody documentation. Region 10 sample tracking numbers will be used to identify each sample collected. FORMS II Lite software will be used for chain of custody and generation of all container labels.

2.9.6 Chain of Custody Procedures

Chain-of-custody procedures are intended to document sample possession from the time of collection to disposal. Chain-of-custody forms must document transfers of sample custody. A sample is considered to be under custody if it is in one's possession, view, or in a designated secure area.

FORMS II Lite chain-of-custody software will be used for this project. A minimum of two sample control/documentation officers will be trained and designated in the survey team and will be responsible for ensuring that samples collected are all properly documented, labeled, accounted for, preserved and packaged for shipment to the laboratories. Sample labels and chain-of custody forms may be pre-prepared and pre-printed prior to sample collection dates. The chain-of-custody record will include, at a minimum, the following information:

- Project name
- Sample Tracking Number or Sample ID
- Sample collector's name
- Mailing address and telephone number (various depending on the sample)
- Designated recipient of data (Laboratory Sample Custodian - name and telephone number)
- Analytical laboratory's name and city
- Description of each sample (i.e., matrix, physical description, etc.)
- Date and time of collection
- Quantity of each sample or number of containers
- Type of analysis required
- Requested turn-around times
- Date and method of shipment.

Transfer of sediment samples will be documented on the custody forms. All samples will be distributed to the appropriate laboratory personnel by hand or by Federal Express. A copy of the COC form will be retained by the field sample custodian in the field log. The original will accompany the samples to the laboratory for subsequent sample transfer. When samples arrive at each of the laboratories, custody will be relinquished to the laboratory custodian. The custodian will verify that the custody seals on the cooler are intact and include this information in the laboratory tracking system. The laboratory sample custodian will examine the samples, verify that sample-specific information is accurately recorded on the COC, cooler temperature is acceptable, samples are still frozen when received and that the sample integrity is uncompromised. The lab sample custodian shall log the samples into the laboratory tracking system, and complete and sign the COC form so that transfer of custody of the samples is complete. Any discrepancies between sample labels, transmittal forms, and unusual events or deviations from the project QAPP (e.g., change in decontamination procedure) resulting from unavoidable circumstances will be documented in detail on the Corrective Action Form (Attachment 3). Any deviations from the approved QAPP involving a particular sediment sample (e.g., modification to sample location,) shall be documented on the Sample Alteration Form (Attachment 2). Both forms shall be sent to the Project QA Manager and the Project Manager. Copies of completed COCs will be faxed back to the Project Manager and RSCC (Bethany Plewe) within 24 hours of receipt. The signed original custody forms will be retained in the project files. All samples will be stored according to the QAPP's specifications in the OSV BOLD and in the laboratories.

2.9.6 Laboratory Deliverables

As many as four contracts may be needed for analytical services for this project. ARI will analyze the sediment for grain size, total organic carbon and percent solids. The analytical methods and reporting limits specified in the PSEP protocols shall be followed. Analysis for trace metals, SVOAs, PAHs, PCB Aroclors, and pesticides will be conducted by Contract Laboratory Program (CLP) laboratories (yet to be determined). The analytical methods and reporting limits specified in the PSEP protocols shall be followed.

For the dioxin/furan and PCB congener analyses, samples will be sent to SGS Environmental Services. These analytical services are a buy-in contract managed by the Superfund's Analytical Support Branch and the designated Regional Project Officers (Ginna Grepo-Grove for Region 10). The dioxin/furan analyses shall follow the CLP Statement of Work (SOW) for polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) version DLM02.0. The PCB congener analyses shall follow the SOW for Polychlorinated Biphenyl Analysis (CB01.0). The SVOC, PAH-SIM, pesticides and PCB analyses shall follow the CLP Statement of Work for Organic Analysis version SOM1.2 and the inorganic analyses shall follow the CLP Statement of Work for Organic Analysis version ILM05.4. All of these CLP SOWs can be accessed at this link: http://www.epa.gov/superfund/programs/clp/ . Additional technical and deliverable requirements for PCB congener and PCDD/PCDF, SVOCs, PAH-SIM, pesticides, PCB Aroclor and metals analyses are listed in the SOW that was sent to the CLP laboratories for Invitation for Bids (IFB). These SOWs can be found in Attachment 4 of this QAPP. Two more laboratories will be contracted by USACE for the PCR/cell assay analyses for PCB congener and dioxins/furans.

2.9.7 Data Validation Deliverables

All of the analytical data generated by the CLP laboratories, i.e, dioxins and furans, PCB congeners, SVOCs, PAH-SIM, pesticides, PCBs and metals shall be fully validated by the BOLD Project QA Manager or deginee. The quality and usability of the data will be assessed following the technical specifications of the analytical methods used, the CLP Statement of Work for Dioxin and Furan Analyses (version DLM02.0) and the Statement of Work for CB Congener Analyses (version CB01.0), Methods 1613B and 1668A, Statement of Work for Organics and Inorganic Analyses (SOM1,2 and ILM05.4), the applicable criteria in the CLP Functional Guidelines for Data Review and the reviewer's professional judgment.

Validation Deliverables:

- A signed validation memo with general discussions on the maintenance of sample integrity from the field until analysis, holding times, detection limits, verification of identification and quantitation, procedural/instrumental deficiencies, and general assessment of QC results and their effects on data usability.
- A tabulated summary of sample and QC sample analytical results with applicable validation qualifiers.
- List and definitions of qualifiers

3.0 Measurement and Data Acquisition

3.1 Analytical Methods

Tables 5 - 7 provide a summary of the methods and quantitation limits for sediment conventionals, COCs, dioxins/furans, and PCB congeners. Brief summaries of the SW 846 methods for the Procept® Rapid Dioxin Assay and CALUX assay are also provided. The laboratories shall report down to the Method Detection Limits (MDLs).

Table 5 - Methods and quantitation limits for sediment conventionals and COCs

Target Compounds	Analytical Method	Target SQLs ug/kg (dry)
PAHs (ug/kg)		
Naphthalene	CLP 8270 FS and SIM	20
Acenaphthylene	CLP 8270 FS and SIM	20
Acenaphthene	CLP 8270 FS and SIM	20
Fluorene	CLP 8270 FS and SIM	20
Phenanthrene	CLP 8270 FS and SIM	20
Anthracene	CLP 8270 FS and SIM	20
2-Methylnaphthalene	CLP 8270 FS and SIM	20
Fluoranthene	CLP 8270 FS and SIM	20
Pyrene	CLP 8270 FS and SIM	20
Benzo(a)Anthracene	CLP 8270 FS and SIM	20
Chrysene	CLP 8270 FS and SIM	20
Benzo(b)fluoranthene	CLP 8270 FS and SIM	20

Target Compounds	Analytical Method	Target SQLs ug/kg (dry)
Benzo(k)fluoranthene	CLP 8270 FS and SIM	20
Benzo(a)pyrene	CLP 8270 FS and SIM	20
Indeno(1,2,3-cd)pyrene	CLP 8270 FS and SIM	20
Dibenzo(a,h)anthracene	CLP 8270 FS and SIM	20
Benzo(g,h,i)perylene	CLP 8270 FS and SIM	20
Chlorinated Hydrocarbons (ug/kg)		
1,3-Dichlorobenzene	Mod CLP 8270 FS	20
1,4-Dichlorobenzene	Mod CLP 8270 FS	20
1,2-Dichlorobenzene	Mod CLP 8270 FS	20
1,2,4-trichlorobenzene	Mod CLP 8270 FS	20
Hexachlorobenzene (HCB)	Mod CLP 8270 FS	10
Phthalates (ug/kg)		
Dimethylphthalate	Mod CLP 8270 FS	20
Diethylphthalate	Mod CLP 8270 FS	20
Di-n-Butylphthalate	Mod CLP 8270 FS	20
Butylbenzylphthalate	Mod CLP 8270 FS	20
Bis(2-ethylhexyl)Phthalate	Mod CLP 8270 FS	100
Di-n-octylphthalate	Mod CLP 8270 FS	20
Phenol	Mod CLP 8270 FS	20
2-Methylphenol	Mod CLP 8270 FS	20
4-Methylphenol	Mod CLP 8270 FS	20
2,4-Dimethyphenol	Mod CLP 8270 FS	20
Pentachlorophenol	Mod CLP 8270 FS	100
Benzyl Alcohol	Mod CLP 8270 FS	50
Benzoic Acid	Mod CLP 8270 FS	100
Dibenzofuran	Mod CLP 8270 FS	20
Hexachloroethane	Mod CLP 8270 FS	20
Hexachlorobutadiene	Mod CLP 8270 FS	10
N-Nitrosodiphenylamine	Mod CLP 8270 FS	20
Pesticides (ug/kg)	Mod CLP 8270 FS	
gamma-BHC (Lindane)	CLP 8081	2
Heptachlor	CLP 8081	2
Aldrin	CLP 8081	2
Dieldrin	CLP 8081	2
Endrin	CLP 8081	2
4,4'-DDE	CLP 8081	2
4,4'-DDD	CLP 8081	2
4,4'-DDT	CLP 8081	2

Target Compounds	Analytical Method	Target SQLs ug/kg (dry)
2,4'-DDE	CLP 8081	2
2,4'-DDD	CLP 8081	2
2,4'-DDT	CLP 8081	2
alpha-Chlordane	CLP 8081	2
gamma-Chlordane	CLP 8081	2
PCB Aroclors (ug/kg)		
1016	CLP 8082	10
1221	CLP 8082	10
1232	CLP 8082	10
1242	CLP 8082	10
1248	CLP 8082	10
1254	CLP 8082	10
1260	CLP 8082	10
Total PCBs	CLP 8082	10
Metals – (mg/kg)		
Antimony	6010/6020	0.5
Arsenic	6010/6020	5
Cadmium	6010/6020	0.5
Chromium	6010/6020	5
Copper	6010/6020	5
Lead	6010/6020	5
Mercury	7471	0.05
Nickel	6010/6020	5
Silver	6010/6020	0.5
Zinc	6010/6020	5
Total Organic Carbon (%)	PSEP 1997	0.1
Total Solids (%)	EPA 2450-G	0.1
Grain Size Analysis (%)	ASTM D422-mod	1.0

Table 6- PCDD/PCDF Target Compounds, Method Detection Limits, Project Target SQLs and Mammalian TEF values (WHO 2005)

PCDD/PCDF Method: 1613B/CLP DLM02.0	Method Detection Limits (dry)	Target SQLs (dry)	Mammalian TEFs WHO 2005
Dioxins	ng/kg	ng/kg (dry)	
2,3,7,8-TCDD	0.012	1	1
1,2,3,7,8-PeCDD	0.054	1	1
1,2,3,4,7,8-HxCDD	0.095	2.5	0.1
1,2,3,6,7,8-HxCDD	0.10	2.5	0.1
1,2,3,7,8,9-HxCDD	0.060	2.5	0.1
1,2,3,4,6,7,8-HpCDD	0.088	2.5	0.01
OCDD	0.20	5	0.0003
Furans			
2,3,7,8-TCDF	0.011	1	1
1,2,3,7,8-PeCDF	0.073	2.5	0.03
2,3,4,7,8-PeCDF	0.075	1	0.3
1,2,3,4,7,8-HxCDF	0.087	2.5	0.1
1,2,3,6,7,8-HxCDF	0.044	2.5	0.1
1,2,3,7,8,9-HxCDF	0.074	2.5	0.1
2,3,4,6,7,8-HxCDF	0.076	2.5	0.1
1,2,3,4,6,7,8-HpCDF	0.053	2.5	0.01
1,2,3,4,7,8,9-HpCDF	0.030	2.5	0.01
OCDF	0.17	5	0.0003

Table 7 - PCB Congener Target Compound List, Method Detection Limits and SQLs and Mammalian TEF Values (WHO 2005) for TEQ Calculations

PCB Congeners Method: 1668A/CLP CB01.0	Method Detection Limits (dry)	Target SQLs (dry)	Mammalian TEFs WHO 2005
Non-ortho–substituted PCBs	*ng/kg (dry)*	*ng/kg (dry)*	
3,3',4,4'-tetraCB (PCB 77)	0.5	3	0.0001
3,4,4',5-tetraCB (PCB 81)	0.5	3	0.0003
3,3',4,4',5-pentaCB (PCB 126)	0.5	3	0.1
3,3',4,4',5,5'-hexaCB (PCB 169)	0.5	3	0.03
Mono-ortho–substituted PCBs			
2,3,3',4,4'-pentaCB (PCB 105)	0.5	3	0.00003
2,3,4,4',5-pentaCB (PCB 114)	0.5	3	0.00003
2,3',4,4',5-pentaCB (PCB 118)	0.5	3	0.00003
2',3,4,4',5-pentaCB (PCB 123)	0.5	3	0.00003
2,3,3',4,4',5-hexaCB (PCB 156)	0.5	3	0.00003
2,3,3',4,4',5'-hexaCB (PCB 157)	0.5	3	0.00003
2,3',4,4',5,5'-hexaCB (PCB 167)	0.5	3	0.00003
2,3,3',4,4',5,5'-heptaCB (PCB 189)	0.5	3	0.00003
Non-Dioxin like PCBs	5	10	-

SW846 EPA Method 4430 - The Procept® Rapid Dioxin Assay detects dioxin and dioxin-like compounds present in a test sample. The dioxin compounds activate the Ah Receptor (AhR) to a form that binds DNA. The activated complex is trapped onto a micro-well and the receptor-bound DNA is amplified by an instrument known as PCR (polymerase chain reaction).

The PCR performs repeated temperature gradient cycles in which the DNA in the sample well is replicated. The amount of DNA in the sample is monitored by means of a fluorescent dye. The cycle number in which the fluorescence increases above background is referred to as the threshold cycle, or Ct. This Ct value is inversely related to the amount of DNA in the well, and correspondingly, the amount of dioxin in the original sample. A standard curve is constructed by plotting dioxin concentration vs. Ct. Using this curve, the concentration of dioxin of the sample can be predicted from the Ct of the sample. Because the Procept® Rapid Dioxin Assay, like reporter gene screening techniques, is based on the Ah Receptor interaction with dioxin, the test approximates a direct measurement of toxicity in the sample.

The Procept® Rapid Dioxin Assay soil sample preparation method is similar but much simpler than the traditional GC-MS sample preparation. The Procept® method extracts 5 to up to 30 grams of sample, depending on the target reporting limits, and uses Soxhlet or pressurized fluid extraction techniques. Extract clean-up involves a smaller, multi-layered silica column followed by a florisil column. There is no need for the carbon column clean-up used in the GC-MS sample prep. The Procept® Rapid Dioxin assay responds on chemical structure and not on mass. This method's detection limits depend on the sample size and final extract volume, as summarized in Table 7.

Procept® Rapid Dioxin Assay Sample Preparation, and Clean-up Procedure is in Attachment 2.

Table 8 – Approximate Range of Quantification (pg/g) for Combination of Sample Size and Extract Volume for the Procept® Rapid Dioxin Assay

Table 1. Approximate Range of Quantification (pg/g, ppt) for Combinations of Sample Size and Extract Volume for the Procept Rapid Dioxin Assay[1]

Extract Volume (microliters)	Sample Size (grams) 1	2	3	4	5	6	7
25	2.0 to 125	1.0 to 63	0.7 to 42	0.5 to 31	0.4 to 25	0.3 to 21	0.3 to 18
50	3.9 to 250	2.0 to 125	1.3 to 83	1.0 to 63	0.8 to 50	0.7 to 42	0.6 to 36
100	7.8 to 500	3.9 to 250	2.6 to 167	2.0 to 125	1.6 to 100	1.3 to 83	1.1 to 71
200	16 to 1000	7.8 to 500	5.2 to 333	3.9 to 250	3.1 to 200	2.6 to 167	2.2 to 143
300	23 to 1500	12 to 750	7.8 to 500	5.9 to 375	4.7 to 300	3.9 to 250	3.3 to 214
400	31 to 2000	16 to 1000	10 to 667	7.8 to 500	6.2 to 400	5.2 to 333	4.5 to 286
500	39 to 2500	20 to 1250	13 to 833	10 to 625	7.8 to 500	6.5 to 417	5.6 to 357
750	59 to 3750	29 to 1875	20 to 1250	15 to 938	12 to 750	10 to 625	8.4 to 536
1000	78 to 5000	39 to 2500	26 to 1667	20 to 1250	16 to 1000	13 to 833	11 to 714
1500	117 to 7500	59 to 3750	39 to 2500	29 to 1875	23 to 1500	20 to 1250	17 to 1071
2000	156 to 10000	78 to 5000	52 to 3333	39 to 2500	31 to 2000	26 to 1667	22 to 1429

Extract Volume (microliters)	Sample Size (grams) 8	9	10	15	20	25	30
25	0.2 to 16	0.2 to 14	0.2 to 13	0.1 to 8.3	0.1 to 6.3	0.1 to 5.0	0.1 to 4.2
50	0.5 to 31	0.4 to 28	0.4 to 25	0.3 to 17	0.2 to 13	0.2 to 10	0.1 to 8.3
100	1.0 to 63	0.9 to 56	0.8 to 50	0.5 to 33	0.4 to 25	0.3 to 20	0.3 to 17
200	2.0 to 125	1.7 to 111	1.6 to 100	1.0 to 67	0.8 to 50	0.6 to 40	0.5 to 33
300	2.9 to 188	2.6 to 167	2.3 to 150	1.6 to 100	1.2 to 75	0.9 to 60	0.8 to 50
400	3.9 to 250	3.5 to 222	3.1 to 200	2.1 to 133	1.6 to 100	1.2 to 80	1.0 to 67
500	4.9 to 313	4.3 to 278	3.9 to 250	2.6 to 167	2.0 to 125	1.6 to 100	1.3 to 83
750	7.3 to 469	6.5 to 417	5.9 to 375	3.9 to 250	2.9 to 188	2.3 to 150	2.0 to 125
1000	10 to 625	8.7 to 556	7.8 to 500	5.2 to 333	3.9 to 250	3.1 to 200	2.6 to 167
1500	15 to 938	13 to 833	12 to 750	7.8 to 500	5.9 to 375	4.7 to 300	3.9 to 250
2000	20 to 1250	17 to 1111	16 to 1000	10 to 667	7.8 to 500	6.2 to 400	5.2 to 333

[1]Values are estimates, actual achievable limits will depend on sample matrix and effectiveness of sample preparation method

SW846 EPA Method 4435, CALUX, Chemically-Activated Luciferase Gene Expression bioassay a product of Xenobiotic Detection Sytems, Inc. located in Durham NC.
This method is a rapid bio-analytical screening procedure for dioxin-like compounds in soils and sediment. This method is based on the ability of dioxin and other dioxin-like compounds to activate the Aryl hydrocarbon receptor (AhR), a chemical responsive DNA binding protein that is responsible for producing the toxic and chemical effects of these chemicals. Samples are solvent extracted following a modified Method 8290 or Method 1613B extraction procedures. Three sets of 10-gm sub-samples are used for the three modes of analysis, i.e., screening mode with historical recovery, screening mode with surrogate recovery and the semi-quantitative mode. Clean-up techniques involve acid silica gel column to remove PAHs and then XCARB column to remove PCBs and different percentages of hexane, toluene, ethyl acetate as eluants. TEQs are calculated by measuring the relative light units produced by the luciferase activity over a 15-second time period. Detection limits for this assay are 1 pg/g for 10-gm extraction.

CALUX Assay Sample Preparation and Clean-up Procedure is in Attachment 2.

3.2 Turn Around Times

Chemical analysis turn around time will be 30 days from the verified time of sample receipt (VTSR) of the last sample in the sample delivery group at the lab.

The submission of analytical data shall not be paid in full unless all of the hard copy and electronic deliverables have passed the contract compliance screening and the data deliverable assessment tools conducted by the Analytical Services Branch of OSTRI.

Data validation turn around times will be 4-6 weeks from the receipt of the last sample delivery group data package from the laboratories.

3.3 Quality Control Procedures

QA/QC Procedures for Collection Methods: All survey personnel will be briefed by the Chief Scientist and spot-checked to ensure consistency in sample handling, processing and data recording. . Field split samples will be collected at 5 selected stations and submitted blind to the laboratory.

QA/QC Procedure for Sample Collection: Pre-cleaned and dedicated sampling tools will be used to sub-sample the sediment collection equipment to avoid cross-contamination between stations. Equipment that is not dedicated (bowls for homogenizing and van Veen samplers) will be decontaminated between sampling stations.

QA/QC Procedures for Analytical Methods: Routine QC samples will be analyzed by the laboratories at the frequency specified by the project QAPP, analytical methods and SOWs

3.4 Instrument/Equipment Testing, Inspection and Maintenance

The primary objective of an instrument/equipment testing, inspection, and maintenance program is to help ensure the timely and effective completion of a measurement effort by minimizing the downtime of crucial sampling and/or analytical equipment due to expected or unexpected component failure.

Testing, inspection, and maintenance will be carried out on all field and laboratory equipment in accordance with manufacturer's recommendations and analytical method specifications. Analytical laboratory equipment preventative maintenance program will be addressed in the laboratories' QA manual. As appropriate, schedules and records of calibration and maintenance will be maintained for the field equipment in the field notebook. Equipment that is out of calibration or is malfunctioning will be removed from operation until it is recalibrated or repaired.

3.5 Instrument Calibration and Frequency

All laboratory instruments shall be calibrated at a frequency specified by the analytical methods. All calibration requirements must be met before sample analysis can begin. If calibration non-conformances are noted, samples will be re-analyzed within method-specified holding times.

3.6 Inspection/Acceptance Requirements for Supplies and Consumables

Equipment from *OSV Bold*: Positioning data (navigation and depth feed) and wet lab, Inner space 448 Depth Sounder (paper recorder not necessary), large Young modified Van Veen sampler, temperature controlled freezers, refrigerators. Expendable Supplies from OSV Bold (Attach check list if possible): writeable CDs, ice, paper towels, D.I. water.

Equipment from EPA Region 10:

A List of Supplies/Equipment (Expendable and Non-Expandable) from Region 10 is provided in Table 9.

Equipment from USACE: Centrifuge tubes and insulated gloves, ice pick and all other supplies associated with the molecular cell sampling and analyses.

Equipment from WA Department of Ecology: Two double van Veen samplers (and frames) will be supplied and transported to/from the *OSV Bold* by WDOE staff.

4 Assessment/Oversight

4.1 Assessment and Response Actions

Nonconforming items and activities are those which do not meet the project requirements or approved work procedures. Corrective action will be taken in the field to correct any non-conformance observed during field activities and shall be initiated by the Watch Captains and/or the Chief Scientist. If necessary and appropriate, corrective action may consist of re-sampling. If implementation of corrective action in the field is not possible, the non-conformance and its potential impact on data quality will be discussed in the report.

Corrective action to be taken as a result of non-conformance during field activities will be situation-dependent. All corrective actions must be documented in the Corrective Action Form (Attachment II). Unavoidable deviations from the QAPP shall be documented in the Sample Alteration Form (Attachment I).

Table 9. Supplies/Equipment (Expendable and Non-Expandable) from Region 10 EPA

Number	Item	Status
3	Large Scrubbers for Van Veen	OK
1	NOAA Double van Veen + frame	Picked –up by EPA 7/23
1	Double Van Veen from Ecology	Ecology will deliver Pier 91
1	Hypack	Tim Siwiec will install
1	FORMS IILite Training	Training completed 7/24/08
2	Digital Cameras (2 Gig mem. cards) with waterproof housing	Get from Andy
2	Flash drives/removable drives 2 G	Renee from Computer
1 box	Mechanical Pencils	Renee Get from Mail Room
2	Lap Tops with FORMS II Lite software	Renee Check out from Computer
	Avery Labels for sample bottles	Check with Bethany
	Printer – for Sample Labels	OK check-out from Ginna
25 pcs	Custody Seals	Check with Bethany
15 ea	Sample Coolers with temp blanks ea	OK
	Cooler Return Shipping Labels with acct no.	OK
	Blue Ice,	OK
1 roll	Packing Materials Bubble wrap	OK
1 ea	Garden sprayer/Hand Sprayer	Ordered
2 ea	Large squirt bottles (500 ml)	ordered
	FedEx Shipping Forms with account number	OK
4 ea/2ea	Strapping Tape/Duct Tape	OK
6 ea	Rite in the Rain Log books	OK
2 box ea	Nitrile Gloves (all sizes)	OK
5 ea	Safety Glass	OK
1 Gal	Liquinox or Alconox	OK
1 ea	Methanol 1 gal AR grade	Get from MEL – OK
1 ea	Nitric Acid 1 gal AR grade	Get from MEL – OK
6 ea	Sharpies – fine and ultra fine (water proof)	Ordered
200 pcs	Ziploc Bags (1 gal/1 quart)	OK
2 ea	Aluminum Foil (heavy duty) industrial size	OK
2 rolls	Transparent tape (for labels)	OK
2 ea	Scissors	OK
1 ea	Retractable blade cutters	OK
80 ea	Stainless Steel Spoons (regular size)	OK available
15 ea	Stainless Steel Spoons (big) for mixing	Ordered
15 ea	Stainless Steel Bowls (2 gals)	Ordered
30 boxes x 24	4-oz wide mouth jars (QC certified) glass Teflon lined caps	Ordered
7 boxes x 12	8 oz wide mouth jars (QC certified) glass Teflon lined caps	Ordered
7 boxes x 12	32 oz wide mouth jars (QC certified) plastic	Ordered
3 ea	#230 sieves (63 um mesh)	Ordered
10 ea	Buckets plastic 5 gals	Ordered
12 ea	100 ml Beakers or Graduated cylinder	Ordered
2 packs	Poly ethylene plastic sheets	Purchased
1 ea	Large plastic wash tub	Purchased
3 ea	Hand-held Scrub brushes	OK
1 ea	Teflon or HDPE tubing (50 ft)	OK

4.2 Reports to Management

The Chief Scientist will prepare a survey report within 30 days of the completion of the survey (September 22, 2008). The Principal Investigator and Project Manager will collate, evaluate and interpret all the analytical data generated during chemical analyses.

5 Data Validation and Usability

5.1 Data Review, Validation and Verification Requirements.

5.1.1 Sediment Chemistry Data

Analytical data generated by the CLP laboratory shall undergo several layers of internal reviews and verification prior to release to EPA. Laboratory analysts are responsible for reviewing instrument calibration integrity, sample holding times, method compliance, and completeness of tests, forms, logbooks and analytical data summary reports. In addition, verification of completeness, method and contract compliance, as well as raw data entry, transcription errors, electronic data deliverables (EDDs) and calculations are reviewed by the CSC contract staff at Analytical Support Branch at EPA HQ. A Case Narrative is submitted by the laboratory with the sample summary and associated QC sample results in PDF format. Data points may be qualified based on the QC sample results and professional judgment of the lab analyst and the reviewer.

The PCB congener and dioxin/furan data generated by the CLP lab will be sent to the CLP Project Officer in Seattle and will be validated by the Project QA Manager. An EPA Stage 4 full data validation will be performed on the dioxin/furan, PCB congener and TOC analyses. Bias and usability will be assessed and documented in a validation memo following the technical specifications of the QAPP, the analytical methods and the laboratory SOPs. The following QC elements will be assessed and documented during external data validation:

- Data Completeness
- Sample Holding Times – extraction and analytical
- Compliance with QAPP specified Analytical Methods
- Sample Prep and Clean-up
- Surrogate Recoveries
- QC Sample Results
- Instrument Performance and Calibration
- Compound Identification Verification
- Reporting Limits
- Calculation Checks
- Overall Usability and Data Assessment

5.2 Reconciliation with Data Quality Objectives

This element describes how the verified/validated project data will be reconciled with the project DQOs, how data quality issues will be addressed, and how the limitations on the data usability will be reported and handled. The purpose of this section is to indicate the methods by which it will be ensured that the data collected for this investigation fall in line with the project DQOs. To meet these DQOs, a combination of qualitative evaluations and statistical procedures will be used to check the quality of the data.

The primary objectives for assessing the usability of the data are to ensure that (1) data is representative of the current conditions of the reference areas and other locations, (2) all datasets are complete and defensible, and (3) data are of the quality needed to meet the overall objectives of the project.

5.2.1 Comparison to Measurement Criteria

5.2.1.1 Precision and Accuracy Assessment

The accuracy and precision of the data generated during this program will be assessed by comparison to the project specific data quality objectives specified in this QAPP. All of the analyses shall meet the accuracy criteria specified by the analytical methods. Precision of measurements shall be within 50%.

Data that fail to meet the criteria may necessitate sample re-processing, analysis of archival material, sample re-collection, or flagging of the data, depending on the magnitude of the nonconformance, logistical constraints, schedule, and cost.

All of the analyses shall meet the precision and accuracy criteria specified by the analytical methods.

5.2.1.2 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of results planned for collection. The goal of this program is to generate valid, usable data. However, in environmental sampling and analysis, some data may be lost due to sampling location logistics, or field or laboratory errors. The overall completeness goal for the project is 100% of planned samples to be collected and analyzed. Project Manager will assess the completeness of the overall data generation against the project goals. Following completion of the sampling, analysis, and data review, the percent completeness will be calculated

$$\%\ \text{Completeness} = \frac{\text{Number of valid/usable results obtained}}{\text{Number of valid/usable results planned}} \times 100$$

If this goal is not met, data gaps may exist that will require evaluation to determine the effect on the intended use of the data. Sample re-analysis, analysis of archived material, and/or re-collection of the sample may be appropriate depending on criticalness of the missing data, logistical constraints, cost, and schedule.

5.2.1.3 Representativeness Assessment

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness of the field data will be assessed by verifying that the sampling program was implemented as proposed and that proper sampling techniques were used.

The assessment of representativeness in the laboratory will consist of verifying that the proper analytical procedures and appropriate methods were used.

5.2.1.4 Data Validation Report and Data Qualifiers

Based on the results of the DQO assessments performed, bias and usability of the reported results will be evaluated and discussed in a Data Validation memo. Analytical results will be qualified using the following qualifiers as a result of the data validation:

Table 10 - Data Qualifiers

	U	The analyte was not detected at or above the reported result.
	J	The analyte was positively identified. The associated numerical result is an estimate.
	UJ	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.
	R	The data are unusable for all purposes.
	N	There is evidence the analyte is present in this sample.
	JN	There is evidence that the analyte is present. The associated numerical result is an estimate.

5.2.1.2 Overall Assessment of Environmental Data

Data assessment will involve an evaluation to determine if the data collected are of the appropriate quality, quantity, and representativeness for the purposes required by the project. This evaluation will be performed by the Project Manager in concert with other users of the data. Data generated in association with QC results that meet these objectives will be considered usable. Data that do not meet the objectives and/or the data validation criteria might still be usable. This assessment may require various statistical procedures to establish outliers, correlations between data sets, adequate sampling location coverage, etc., in order to assess the effect of qualification or rejection of data. The effect of the qualification of data or loss of data deemed unacceptable for use, for whatever reason, will be discussed and decisions made on corrective action for potential data gaps.

References:

EPA (U.S. Environmental Protection Agency). 2005. Statement of Work for Multi-media, Multi-Concentration Chlorinated Biphenyl Congeners Analysis, CB01.0, Final, Office of Solid Waste and Emergency Response (O SWER).

EPA (U.S. Environmental Protection Agency). 2005. Statement of Work for Multi-media, Multi-Concentration Dioxins and Furans Analysis, DLM02.0, Final, Office of Solid Waste and Emergency Response (O SWER).

EPA (U.S. Environmental Protection Agency). 2007. Statement of Work for Multi-media, Multi-Concentration Organic Analytical Service for Superfund, SOM1.2, Office of Solid Waste and Emergency Response (O SWER).

EPA (U.S. Environmental Protection Agency). 2007. Statement of Work for Multi-media, Multi-Concentration Inorganic Analytical Service for Superfund, ILM05.4, Office of Solid Waste and Emergency Response (O SWER).

EPA (U.S. Environmental Protection Agency). 2007. Test methods for Evaluating Solid Waste, Physical and Chemical Methods. Office of Solid Waste, Economic, Methods and Risk Analysis Division.

EPA (U.S. Environmental Protection Agency). 1992. Monitoring Guidance for the National Estuary Program, Final. EPA, Office of Water, Office of Wetlands, Oceans, and Watersheds, Ocean and Coastal Protection Division. EPA-503/8-91-002, Washington, D.C.

EPA. 2001. EPA Requirements for Quality Assurance Project Plans, March 2001, (EPA QA/R-5), EPA/240/B-01/003, United States Environmental Protection Agency, Washington, D.C., http://www.epa.gov/quality/qs-docs/r5-final.pdf.

EPA. 2002. EPA Guidance for Quality Assurance Project Plans, December 2002, (EPA QA/G-5), EPA/240/R-02/009, United States Environmental Protection Agency, Washington, D.C.

EPA. 2006. Northwest Regional Sediment Evaluation Framework, Interim Final, EPA/RSET/Army Corps of Engineers, September 2006., http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/DMMO/RSET_Interim_Final.pdf

EPA. 2007. Miami, Florida/Port Everglades Ocean Dredged Material Disposal Sites (ODMDS) and South Florida Reference Evaluation (S-Flare) Ocean Survey Quality Assurance Project Plan, Final, September 2007, Christopher McArthur, United States Environmental Protection Agency, Region 4, Athens GA.

EPA. 2007. Survey Plan - Cape Canaveral, Florida Ocean Dredged Material Disposal Site (ODMDS) and Central Florida Reference Evaluation (CFLARE), March 2007, Mal Parsons, United States Environmental Protection Agency, Region 4, Athens G.

EPA. 2007. Savanna ODMDS Seafloor Mapping, Sidescan Sonar and Bathymetry Survey Quality Assurance Project Plan, Christopher McArthur, United States Environmental Protection Agency, Region 4, Athens G.

Plumb Jr., R.H., 1981. Procedures for handling and chemical analysis of sediment and water samples. Tech. Rep. EPA/CE-81-1. Vicksburg, MS: U.S. Army Corps of Engineers. 478 pp.

Puget Sound Estuary Protocols (PSEP), 1996. Recommended protocols for measuring selected environmental variables in Puget Sound. Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA, USA.

Puget Sound Dredge Disposal Analysis (PSDDA),1989. Abbreviated data Quality Evaluation for Dredge Material Disposal Projects, Draft Final Report prepared for Washington Department of Ecology by PTI Environmental Services.

Attachments

Attachment 1 – Standard Operating Procedures

SOP 1 - Decontamination of Hand Sampling Equipment Between Sample Locations

Required Equipment:

Source-approved potable tap water
Laboratory-grade detergent (i.e., Liquinox, Alconox, or equivalent)
ASTM Type II, or equivalent, reagent deionized water
Nitric acid rinse for metals,
5-gallon buckets
Scrub brushes
Plastic sheeting
Garden and hand sprayers (plastic)

Typical Procedures:

Preparation:

Set up decontamination area, including buckets, plastic sheeting, scrub brushes, sprayers.
Set up “clean” area upwind of decontamination area for air drying of equipment.
Fill one 5-gallon bucket with detergent and site water .
Fill a second 5-gallon bucket with site water.
Fill new/clean spray bottles with deionized water (garden sprayer).

Decontamination of Sampling Equipment:

Scrub all sampling equipment to remove gross contamination.
Wash equipment in detergent.
Rinse with site water.
Rinse with deionized water.
Note: If sticky or oily residues are observed during sampling, an acid/solvent rinse sequence (i.e., nitric acid (0.1 percent) and methanol) will be added prior to the final deionized water rinse.

Air dry.

Place disposable items (sampling gloves, paper towels, etc.) in garbage can, garbage bag, or 5-gallon bucket with lid.
Document activities in the site logbooks.

Note: All decontamination fluids will be contained in a tub or bucket for proper disposal (see Standard Operating Procedure, “Investigation-Derived Waste Handling”).

SOP 2 - Investigation-Derived Waste Handling

Liquid Waste Handling:

Decontamination liquids containing only water and detergent will generally be disposed of into the *OSV Bold*'s greywater holding tanks. Water containing methanol and/or nitric acid will be segregated for appropriate disposal, as necessary.

SOP 3 - Decontamination of Van Veen Sampler

Required Equipment:

Sampling and Analysis Plan, Site logbook
Indelible black ink pens
Site water
deionized water
Laboratory-grade non-phosphate detergent (Liquinox or equivalent)
Large plastic wash tub
5-gallon buckets
Scrub brushes
Garden sprayer(s) with wand and flow-adjustment/hand sprayers (plastic body and tip)
Hand sprayers
Hose assembly and salt water pump
Gloves and safety glasses
Typical Procedures:

Preparation:

• Fill a bucket or tub with site water and add detergent.

• Fill a new/clean garden sprayer with deionized water.

• If possible, set up a hose assembly to provide ambient water for rinsing equipment.

Note: Prior to field work, the Material Safety Data Sheets (MSDSs) for all chemicals used in the sampling program should be reviewed as well as specific information in the Site Health and Safety Plan (SHSP) regarding these substances.

Decontamination of van Veen Samplers:

• Don gloves prior to decontamination procedures. Staff should be wearing protective coveralls or rain gear at all times during decontamination.

• Decontaminate spoons, buckets, Teflon® tubing, and other incidental sampling equipment (see Standard Operating Procedure, Decontamination of Hand Sampling Equipment") prior to decontaminating the van Veen Sampler.

• After bowls have been decontaminated, suspend the van Veen Sampler over the side of the work vessel and decontaminate the frame using the procedures described in Standard Operating Procedure – Decontamination of Hand Sampling Equipment. The van Veen sampler will be placed back in the clean frame following decontamination.

• Remove excess sediment from the van Veen Sampler. This may be accomplished by gently agitating the sampler up and down in the water column beside the work vessel.

• Scrub the van Veen Sampler, while it is resting in its stand.

Note: The van Veen sampler tends to collect sediment and debris in the square corners at the top and in the screens and flaps. Check these areas carefully.

• Rinse the sampler with ambient water while it is resting in its stand. The water may be collected in the sampler tray and emptied back into Puget Sound.

• If sticky or oily residue is observed, rinse with dilute nitric acid and methanol

• Rinse equipment with deionized water.

• Allow excess liquid on the equipment to evaporate if possible.

• Secure the Van Veen Sampler in it frame.

• Document the decontamination procedures in the site logbook.

SOP 4 - Navigation and Positioning Control

OSV Bold:

The work vessel for this survey will be the *OSV Bold.* . The *OSV Bold* is a suitable platform for conducting the proposed survey as it meets or exceeds the following minimum requirements for equipment and features:

- all U.S. Coast Guard-mandated safety equipment, including life jackets for the crew and field crew members
- a functioning and calibrated depth finder (Fathometer)
- a winch, line, and boom or davit capable of handling at least five times the weight of the largest sediment sampler potentially used for the program, and with at least 4 feet of clearance over the stern or side of the vessel with the boom end a minimum of 10 feet above the rail. The largest potential piece of sampling equipment is the Van Veen, which has a loaded weight of approximately 300 - 500 pounds
- an approved (rated) source of 120-volt AC, 60-Hz, 20-amp power for navigation equipment
- a seawater pump and deck hose for ambient water supply
- sample deck space for four field crew members, sediment sampling equipment, and benthic sampling and handling equipment (a minimum of approximately 100 square feet)
- an enclosed area adjacent to or part of the pilothouse for protection and operation of navigation equipment
- space for storage of sampling supplies, and shelter for crew during work breaks
- bathroom facilities

The captain of the vessel has the necessary licensing and insurance for the project. The captain will be expected to review boating safety issues and emergency equipment with the vessel crew and field personnel. The captain and vessel crew will be provided with a copy of EPA Region 10's Health and Safety Plan for the project and will be expected to abide by the provisions of the plan at all times during field activities. The field crew will rely on the experience and knowledge of the captain to determine if and when inclement weather conditions preclude planned daily sampling activities.

Navigation:

Horizontal positioning will be provided using a differential global positioning system (DGPS). The DGPS system provides horizontal accuracies on the order of ±1 meter. This system uses two receivers. One receiver is positioned directly over the selected sampling location while the second differential receiver is used to generate differential corrections. These differential corrections can be generated by a base station established on site, by use of commercial corrections, or by use of U.S. Coast Guard (USCG) broadcast corrections.

The sample station receiver establishes the horizontal location of the station using information transmitted from the global positioning system (GPS) satellites. The differential receiver accepts real-time positioning signals from satellites in the GPS system and transmits offset corrections to the sampling station receiver based upon the known coordinates of the control point. The on-vessel system also can provide the range and bearing from one known station to another in order to guide the vessel operator. For work on a small or shallow-draft vessel, a hand-held DGPS device may serve as the sampling station receiver.

GPS positions are given in latitude and longitude using the 1984 World Geodetic System datum (WGS 84) created by the U.S. Defense Mapping Agency. This datum is essentially identical to the North American Datum (NAD 83), which is a common datum used in coordinate transformations to the State Plan Coordinate System.

Digital sample positioning on the Bold using Hypack Survey:

Hypack Survey is a software program used to collect sample information in the marine environment. Hypack Survey software program runs on a laptop and requires COM inputs from the Innerspace 448 Echosounder and Furuno DGPS device located above the bridge. These devices provide depth, heading, time and GPS positioning information that is recorded into the software application along with sample id and comments when a sample is collected. Once Hypack Survey is activated and is successfully loaded and configured to communicate properly with the above connections found in the wet lab, the system is ready for sample collection. Below are the steps required to properly record a sample in the Hypack system:

1) To create new sample location press “F5”
2) Modify sample location once created, add Sample ID as name
3) Enter heading into “bearing” field manually from GPS feed
4) Enter comments about sample characteristics
5) Close and save sample, double check to see sample id shows on Hypack mapping component.

SOP 5 - Shipping and Handling of Samples

Required Equipment:

Sampling and Analysis Plan, site logbook, sample logs, sample labels
Indelible black ink pens
One gallon Ziploc® bags
Cooler
Blue Ice® or other ice packs
Strapping tape or duct tape
Chain of custody forms
Custody seals
Bubble wrap, newspaper, or other packing material
Typical Procedures:

NOTE: Before packaging, all samples will be individually labeled and noted in the site logbook by the sampler. Labels will be completed with all required information. The samples will be assigned individual numbers that describe sample type and sample location. The sample numbers will be used to complete the chain-of-custody forms and track the samples.

Samples to be hand-delivered to the EPA Manchester laboratory:

1. Place each sample in a plastic Ziploc® bag and align the label so it can be easily read. Seal the bag.

2. Place individual samples into the cooler so that each container is safely secured.

3. Include enough (four or more) ice packs to maintain a temperature of 4ºC or lower.

4. Complete a chain-of-custody form for the containers and seal in a Ziploc® bag. Tape the bag containing the chain-of-custody form to the inside of the cooler lid. Always transport the cooler together with its accompanying chain-of-custody form.

5. Always include a temperature blank with every cooler. A temperature blank or EPA temperature indicator is de-ionized water in a sealed container kept inside each cooler shipped. It is used to effectively monitor the cooler shipping temperature. The temperature blank is clearly labeled as EPA temperature blank or EPA temperature Indicator. It is measured at the time of sample receipt at the laboratory and reported on the Case Narrative.

6. Close and latch cooler and affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.

7. Deliver samples to the laboratory and obtain a signed copy of the chain-of-custody form for tracking purposes.

Samples to be shipped to analytical laboratories:

1. Place each sample in a plastic Ziploc® bag and align the label so it can be easily read. Seal the bag.

2. Wrap each sample with bubble wrap, newspaper, or other packing material.

3. Place individual samples into the cooler so that the addition of Blue Ice® and/or packing materials will prevent significant movement of samples during shipping. Keep in mind that we cannot predict in what position the cooler will be shipped. Each container has clearance on all sides.

4. Fill the void spaces with ice packs, bubble wrap, newspaper, or other packing material to ensure samples do not break during shipment.

5. Cover the head space inside the cooler with ice packs.

6. Tape bag containing the chain-of-custody form to the inside of the cooler lid. Remember to remove the last copy of the form for tracking purposes.

7. Always include a temperature blank with every cooler.

8. Close and latch cooler, and wrap cooler and lid with at least two turns of strapping, duct, or packaging tape. Affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.

9. Label coolers with up arrows and information to comply with Department of Transportation requirements.

10. Notify the laboratory approximately when and how many samples will arrive. The samples must be kept under refrigeration (or packed with ice) between sampling and analysis.

Note: If samples are to be stored overnight before shipping, they must be secured in a locked room or other inaccessible area. The cooler should be sealed with a signed and dated custody seal. Before shipping, the Blue Ice® in the cooler should be replaced and the cooler resealed according to the instructions in this Standard Operating Procedure.
Samples may be shipped in coolers or any other sturdy, water-tight, appropriate container. This Standard Operating Procedure refers to coolers for simplicity and because they are the most common type of transport container.

Molecular Analysis Samples to be Delivered to the University of Washington

1. Place all Ziploc® bags containing samples and all complete chain-of-custody forms into the portable cooler with the dry ice. A temperature blank is not required.

2. Securely close and latch cooler and affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.

3. The samples will be transported by USACE personnel to Dr. Carolyn Friedman, School of Aquatic and Fishery Sciences, University of Washington, P.O. Box 355020, Seattle, Washington 98195. Dr. Friedman will store the sediment samples at -80 ºC in her secure laboratory freezer pending transport to under chain of custody procedures to Dr. Timothy E. Mattes at 4112 Seamans Center for the Engineering Arts and Sciences, The University of Iowa, Iowa City, IA 52242-1527.

SOP 6 - Wet Sieving for Approximate Grain Size Analysis

Objective

This SOP describes the volumetric wet-sieving procedures used to determine approximate sediment grain size (coarse/fine-grained fraction) while in the field. Wet sieving will proceed concurrently with the processing of the grab for distribution into sample containers.

Background

Use of the wet-sieving method is important because of the need to estimate grain size in the field. It is often necessary to collect sediment samples in a certain grain size range. Wet-sieving provides a quick method for estimating the coarse/fine-grained fraction of sediments. A known volume of sediment is washed through a 63 µm screen (the division between the gravel/sand and silt/clay grain size fraction is 63 µm), and the remaining gravel/sand fraction is recovered and re-measured to give the coarse-grained fraction. The percent fines (silts/clays) are estimated by subtraction.

In order to optimize the chances of obtaining a range of sediment grain size for the various regions within the Sound, the volumetric wet-sieving method will be used to determine the approximate grain size of the test sediments. This method was first developed by the U.S. Environmental Protection Agency (EPA) in a reconnaissance survey of reference sediments in Carr Inlet, Washington (PTI, 1990).

Equipment

- No. 230 (63 µm) sieve
- 100 mL plastic or glass beakers and/or graduated cylinders
- Squirt bottle
- Spoon
- Bucket
- Running water supply, if available
- Field log book

Procedure

The following procedures will be followed when using the volumetric wet-sieving method to determine grain size.

1. Using the spoon, carefully collect 100 mL of sediment into the plastic or glass beaker. When obtaining a sample from a grab sampler, care will be taken to ensure that as much overlying water is removed as possible. If the sediment is extremely fine-grained with high water content, the sediment should be allowed to settle to minimize any overlying water in the volumetric measurement.

2. Pour or scoop the sediment into the 63 µm sieve. With the squirt bottle, gently wash any sediment adhering to the beaker into the sieve.

3. If running water is available, use a low stream of water to gently wash the sediment until the water passing the sieve is clear. The squirt bottle can be used if the flow of water is too great. For extremely fine sediments, the sieve will have a tendency to clog up and fill with water. Care should be taken to avoid spilling any sediment. Gentle agitation of the sieve or rubbing the underside of the sieve will help clear the screen and allow the water and fine sediments to pass.

4. If running water is not available, use a bucket filled with water to wash the sediments. Gently agitate the sieve in the water, taking extra care to ensure that no sediment is lost. The squirt bottle can also be used to gently wash the sediments.

5. Once the water passing through the sieve is clear, scoop the majority of the remaining coarse-grained sediment into the 100 mL beaker or graduated cylinder. Gently rinse the remaining sediment into the beaker using the squirt bottle. Care should be taken to avoid spilling any sediment.

6. Allow the sediment to settle in the beaker/cylinder before taking a measurement. The sediment remaining is the coarse-grained (sand and gravel) fraction; the fine fraction is estimated by subtracting the sand/gravel content from 100. For example, if 35 mL of sediment remains after sieving, the grain size estimate is 35% sand/gravel and 65% silt/clay.

7. It is recommended that this procedure be replicated in the field to verify initial measurements. Field estimates should be within 10%.

8. Document results in the field logbook.

Field Quality Assurance

Variability can exist between wet-sieve grain size results and laboratory results because the wet-sieve method is measured by volume, whereas the laboratory method is calculated by weight. Fine-grained sediments often contain higher interstitial water than coarse-grained sediments. When fine-grained sediments are wet-sieved, the volumetric measurement can overestimate the amount of fines because of the high water content. The following is recommended when extremely fine-grained sediments are to be wet-sieved:

1. Ensure that as much surface water as possible is removed from the grab sample surface before collecting sediment for sieving.
2. The 100 mL of sediment to be sieved should be allowed to settle to minimize any overlying water in the volumetric measurement.

3. Conduct duplicate field measures. Repeat until a concurrence of ± 10 mL is achieved.

References

PTI. 1990. *Reconnaissance survey of reference area sediments in shallow waters of Carr Inlet.* Technical memorandum to the U.S. Environmental Protection Agency, Region 10. PTI Environmental Services, Bellevue, WA.

SOP 7 - Surface Sediment Sampling and Processing

Objective

To define the processes to be followed in collecting and processing surface sediment samples using grab samplers. This SOP is intended to be in conformance with the Puget Sound Estuary Program guidelines (PSEP 1991, 1997) to ensure data quality that is consistent with other Puget Sound programs.

Background

Sediments are being collected for a variety of analyses. A double van Veen grab sampler will be used for this study. These samplers are constructed entirely of stainless steel and are appropriate for collecting sediment samples for both biological and chemical analyses. The top of the sampler is hinged to allow for the removal of the top layer of sediment for chemical and toxicity analyses. This gear is relatively easy to operate and requires little specialized training.

Equipment

- van Veen grab sampler with frame
- Hydraulic winch with power source
- Hydrowire (or approved alternative), swivels, and shackles for sampler
- Decontaminated stainless steel sampling spoons and mixing bowls
- Seawater washing system
- Solvents, deionized water, and Alconox® or the equivalent for cleaning sampling equipment and tools
- Sample jars and centrifuge tubes
- One gallon Ziplock bags
- Ice chests and Blue Ice® /Freezers
- QAPP, site logbook, sample labels, sample logs,
- Navigation system (Hypack)
- Hand pump (if needed) and Teflon® or Tygon tubing for siphoning water from sampler
- Indelible black ink pens
- Camera
- Aluminum foil
- Tools for assembly and disassembly of equipment
- Extra metal floats (to adjust sampler penetration, if necessary)
- Stainless steel nuts, bolts, and washers
- Unpowdered disposable gloves
- Decontamination equipment (see Standard Operating Procedure – Decontamination of Hand Sampling Equipment)

Preparation

Move sampling equipment and supplies to work vessel and assemble Van Veen Bottom Grab apparatus. The hydrowire should be attached to the sampler using a ball-bearing swivel or similar hardware to minimize twisting forces during deployment and retrieval. For safety, the hydrowire, swivel, and shackles should have a load capacity at least three times the weight of the sampler. After assembly, secure the Van Veen sampler by placing it in the frame and releasing the tension on the hydrowire.

NOTE: The Van Veen sampler should always be secured when the work vessel is in motion.

- Move work vessel to sampling location and anchor or hold on station using GPS data and navigation system.
- Record necessary data in site logbook, including date, time, and sampling station coordinates.

Sediment Collection

1. Prior to commencing sampling for a project, thoroughly clean the sampler with a non-phosphate laboratory detergent (e.g., Alconox®) to remove any sediment, debris, rust, or grease that might otherwise contaminate the sample. Rinse inner surfaces first with seawater and then with deionized water. Between stations, the van Veen sampler(s) should be cleaned with Alconox® and rinsed with site water. Should a noticeable oily sheen or petroleum odor be observed on the sampling gear and/or utensils, they will be set aside and will not be used again until fully decontaminated with rinses of methanol, nitric acid (10%), and a final deionized water rinse per PSEP protocols.

2. Once the survey vessel is on station, prepare to deploy the sampler. Secure all vessel discharges and ensure that all exhaust fumes are directed away from the sample collection area (rear deck) until the sample has been collected.

3. Attach the sampler to the end of the winch cable with a shackle and tighten the pin. An auxiliary link may be also installed to provide added assurance against loss of the equipment.

4. If necessary, attach one set of weights to the sampler. These can be removed, or additional weights added depending on the sediment type. The grab is then cocked.

5. Lower the grab sampler through the water column such that travel through the last 5 meters is no faster than 1 m/sec. This minimizes the effects of bow wake disturbance of surficial sediments. Record the time and location of sample collection when the grab hits bottom. State when grab sampler "closes" and collects sample.

6. Lower the van Veen onto its frame. Open the hinged top and determine whether the sample is acceptable or not. An acceptable grab is one having relatively level, intact sediment over the entire area of the grab, and generally a sediment depth at the center of at least 7 centimeters. Grabs containing no sediments, partially filled grabs, grabs with substantial shell substrate, or grossly slumped surfaces are unacceptable. Grabs completely filled to the top, where the sediment is in direct contact with the hinged top, may also be unacceptable. It may take several attempts using different amounts of weight to obtain the first acceptable sample. The more weight that is added, the deeper the bite of the grab. In very soft mud, pads may be needed to prevent the sampler from sinking in the mud. If pads are used, the rate of descent near the bottom should be slowed even further to reduce the bow wake.

7. Open and tie back the vent flaps of the sampler and carefully siphon off any overlying water over the side of the boat.

8. Visually inspect the sample for acceptability (an undisturbed surface layer is evident, the overlying water is not excessively turbid, and adequate penetration was achieved); if the sample is not

acceptable, it should be discarded and another sample should be collected. Record whether the sample was retained or rejected.

9. If the sample is acceptable, note the time of collection, the condition of the surface, penetration depth, and any other notable information in the field log notebook and sample log sheets (if used). The time and location of collection of all grabs, and whether they were acceptable or rejected should be recorded. This gives a general record of the level of difficulty in obtaining a sample at a particular location, should the site be sampled again during another survey.

Field Processing of Sediments for Chemistry

Samples for chemical analyses will be taken from the upper 10 cm of the sample. Because of volume requirements, multiple grabs may be necessary to achieve sufficient material to conduct wet sieving (see SOP #7), run chemical analyses and to set aside sediment for archiving. The top 10 cm of these grabs are removed, homogenized, and split for chemical analyses and archiving. The volume of material required for collection depends on the analyses to be conducted, and the laboratory performing the analyses; this study will need approximately 1 - 1.5 L of sediment per sample[4]. Quantities to be collected for specific analyses are described below. Because of contamination concerns, the samples are removed and processed in the following order:

1. As each grab is retrieved, carefully examine it to determine acceptability as described above in Step 6. Record notes on the appearance of acceptable samples, and carefully remove and discard large, non-living surface items such as rocks or pieces of wood. Sample descriptions should be entered into the field log in free form or in a sample log. The observations, which should be recorded, are similar to those described in Step 9 of this SOP.

2. A clean, decontaminated stainless steel spoon is used to remove sediments from grab samples for these analyses. To avoid contamination, care will be taken to sample sediments that are not in contact with the side of the grab. In addition, personnel sampling the grab should wear gloves (e.g., polyethylene or nitrile gloves) while sampling.

3. Remove the top 10 cm of sediment using a stainless steel spoon. Take a subsample of sediment for wet sieving (see SOP #7). Place remaining sediment removed in a stainless bowl and cover the bowl with foil. If air temperatures warrant it, the bowl may be placed on ice to keep it cool between grabs.

4. Repeat the collection procedure until a sufficient quantity of sediment has been collected for all analyses and archiving requirements. Composite all the sediment in one stainless steel bowl, stirring the sediment homogenate after every addition to the composite to ensure adequate mixing. Keep the container covered and on ice (if warranted) between grabs.

5. Just before sub-sampling and after enough sediment has been collected, homogenize the sediment by stirring with a stainless steel spoon until a consistent color and texture is achieved.

6. **Sediment Conventional Chemistry and Particle Size -** Using a stainless steel spoon, fill a 32-oz glass jar with the sediment for particle size analysis. A 4-oz glass jar should be filled for total

[4] Five stations will have field split samples taken and will need roughly 3 liters of sediment collected.

organic carbon analysis. Store these sample jars at 4°C (Grain size jars can be stored at room temperature if necessary).

7. **Dioxin/Furan and PCB Congeners -** Using a stainless steel spoon, fill a 4-oz glass jar for dioxin/furan analysis and another 4-oz glass jar for PCB congener analysis; jars should be filled only 2/3 full to allow expansion during freezing.. Care must be taken to assure that the inside of the jar, jar cap, and the sediment sample is not contaminated. Label and freeze at -18 °C as soon as possible.

8. **Organic COCs (SVOCs, PAHs, PCB Aroclors, and pesticides) -** Using a stainless steel spoon, fill one 8-oz glass jar for analysis; jar should be filled only 2/3 full to allow expansion if frozen. Care must be taken to assure that the inside of the jar, jar cap, and the sample are not contaminated. Label and refrigerate at 4 °C as soon as possible.

9. **Trace metals and mercury -** Using a stainless steel spoon, fill one 4-oz glass jar for analysis; jar should be filled only 2/3 full to allow expansion if frozen. Care must be taken to assure that the inside of the jar, jar cap, and the sediment sample is not contaminated. Label and refrigerate at 4 °C as soon as possible.

10. **CALUX assay -** Using a stainless steel spoon, fill a 4-oz glass jar only 2/3 full to allow expansion when frozen. Care must be taken to assure that the inside of the jar, jar cap, and sample is not contaminated. Label and freeze at -18 °C as soon as possible.

11. **Procept® assay -** Using a stainless steel spoon, fill a 4-oz glass jar only 2/3 full to allow expansion if frozen. Care must be taken to assure that the inside of the jar, jar cap, and sample is not contaminated. Label and freeze at -18 °C as soon as possible.

12. **Archived Samples -** Using a stainless steel spoon, fill two 4-oz glass jars only 2/3 full to allow expansion during freezing. Care must be taken to assure that the inside of the jars, jar caps, and the samples are not contaminated. Label and freeze at -18 °C as soon as possible.

13. **Molecular Analysis Samples**. Using a clean sampling implement to be provided by the Corps, fill a pre-labled 15 mL polypropylene centrifuge tube for molecular analysis and write the date and time of collection on the sample label. The centrifuge tube need not be over filled, just loosely packed. Place tubes individually in Ziploc® bags, and place immediately in store on-ship's in ultra-low freezer at -80°C. These samples will be transferred under custody in portable coolers to University of Washington at the end of the cruise. <u>Note</u> that these samples will not go through the EPA Region 10 laboratory for shipment assignment.

14. **Field Split Samples.** Five sediment sampling locations (HC_2, NCPS_2, PSPS_1, SPSB_0, CPS_3) were selected for the collection of field split samples. All five locations are primary target stations and are expected to be fine-grained samples. Fine grain size samples were selected for field splits because of the higher likelihood that they will have detectable dioxin concentrations and more challenging matrices than coarse-grained samples, thus providing a more meaningful measure of precision. Two sets of samples from each analysis group (see #1 - 13 above) will be taken from the steel bowl homogenized composite and stored as specified (Table 4 in QAPP) for each sample type.

Safety considerations

Sediment grab samplers are potentially dangerous pieces of equipment. All personnel should wear hard hats and steel-toed boots when working with the samplers. Once the device is cocked, it could accidentally trip at any time. The operators must be careful not to place hands or fingers in a position where they could be injured in the event that the device trips prematurely.

The sampler is a heavy piece of equipment (especially when full). The operators must take care when deploying or retrieving this gear under adverse weather conditions. A grab sampler swinging wildly at the end of a boom can be very dangerous. Safety limes are recommended during adverse weather conditions.

Sediment sampling may result in exposure to hazardous site chemicals. All field personnel must read and comply with the site specific health and safety plan prepared for the sampling program. Appropriate levels of personal protection and decontamination procedures must be followed.

Quality assurance

There are a number of steps that can be taken to ensure the integrity of the samples collected.

1. The interior surfaces of the grab sampler (including the underside of the hinged top) must be washed and thoroughly rinsed prior to use to assure that no sediment remains from the previous station.

2. Prior to use, all stainless steel supplies which are to come into contact with samples must also be properly decontaminated.

3. ASSURE THAT THE PROPER LABELS ARE AFFIXED TO ALL SAMPLES.

4. Project depending, "blanks" for chemistry will be obtained at selected sites. Leave an empty glass chemistry jar open whenever the sample is exposed, mimicking the treatment it would receive if a sample were to be placed in it. Then seal the jar and record the sample number. This jar is then treated in the same fashion as all other chemistry samples.

5. Care should be taken to assure that the sediment saved for chemical analyses are collected only from the top 10 cm of the grab.

6 Care must be taken to assure that the chemistry samples do not become contaminated. This requires great care in extracting the sample, homogenizing it, and placing it in the proper container. If it is raining when the sample is collected, care should be taken to prevent contamination of the sample by rain water.

7 Great care must be taken to avoid atmospheric contamination from engine exhaust. The engine must either be turned off or the boat maneuvered to assure the engine exhaust is down wind of the sample.

Contingency plans

It is recognized that at certain stations, the sediment type may prevent the collection of sediment samples. If a single "acceptable" grab sample cannot be obtained after a reasonable number of attempts (to be determined by the Chief Scientist and/or watch captain), then additional attempts may be abandoned and a contingency station used.

Any deviations from this SOP, or from the field sampling plans, must be recorded in the field logs.

References

Puget Sound Estuary Program. 1991. *Recommended Guidelines for Measuring Selected Environmental Variables in Puget Sound.* U.S. Environmental Protection Agency, Region 10, Seattle.

Puget Sound Estuary Program. 1997. *Recommended guidelines for sampling marine sediment, water column, and tissue in Puget Sound.* Prepared for the U.S. Environmental Protection Agency, Region 10

Attachment 2 – Cell/PCR Assay Protocols

CALUX CELL-BASED ASSAY PROTOCOL

The Chemical Activated LUciferase Gene Expression (CALUX) assay has been accepted by EPA as SW-846 method 4435. This recombinant cell bioassay system for the detection and relative quantification of dioxin-like chemicals was developed by Dr. George C. Clark of Xenobiotic Detection Systems (XDS) and Dr. Michael Denison at the University of California Davis, and is marketed by Xenobiotic Detection Systems (1601 East Geer Street, Suite S, Durham NC, 27704 USA). The XDS-CALUX method includes a proprietary method of separating PCBs and dioxin-like compounds to generate separate PCB-TEQs and dioxin-TEQs for samples. DR-CALUX is now offered by BioDetection Systems (Kruislaan 406, 1098 SM, Amsterdam, The Netherlands), but does not include the capability of separating PCB and dioxins.

The file "US EPA dioxin method 4435.pdf" provides the EPA 4435 documentation that overviews the method, and is available along with this document at http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=Dioxin_Work_Group.

HYBRIZYME qt-PCR ASSAY PROTOCOL

The Aryl Hydrocarbon-Receptor PCR Assay (Procept® Rapid Dioxin Assay) has recently been accepted by EPA as SW-846 method 4430. Originally developed by Hybrizyme Corporation (Suite G-70 2801 Blue Ridge Road Raleigh, NC 27607), it is being marketed through Eichrom Technologies, Inc (8205 S. Cass Ave Suite 106 Darien, IL 60561). Currently, the only commercial laboratory performing the assay is APPL, Inc. (4203 W. Swift Ave, Fresno, CA 93722). This assay is participating in a series of Superfund Innovative Technology Evaluation studies, details of which can be found at the following websites:
http://www.epa.gov/ORD/SITE/reports/540r05005/540r05005.pdf
http://www.epa.gov/esd/cmb/pdf/eichrom-web508.pdf

The EPA 4430 documentation that overviews the method can be found in the file "US EPA Method 4430.pdf", and the detailed methodology provided by Eichrom can be found in the file "DFS01-11_dioxin_soil_method.pdf", both available for download along with this document at http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=Dioxin_Work_Group.

Attachment 3 – Sample Forms

DGPS/GPS and Fathometer Daily Check Log

PUGET SOUND SEDIMENT DIOXIN/FURAN AND PCB CONGENERS SURVEY

Date (mm/dd/yyyy)	Time	
Logged In By:		
Known Position	N	E
GPS Model/SN		
Leadline Depth		
Fathometer Model/SN	**Depth (ft)**	
Check Completed By:		

Date (mm/dd/yyyy)	Time	
Logged In By:		
Known Position	N	E
GPS Model/SN		
Leadline Depth		
Fathometer Model/SN	**Depth (ft)**	
Check Completed By:		

CS/WC Signature**:** ____

SEDIMENT SAMPLING FIELD AND DATA SHEET

PUGET SOUND DIOXIN AND PCB CONGENER SURVEY

USEPA OCEAN SURVEY VESSEL BOLD PROJECT
REGION 10 OFFICE OF ECOSYSTEM, TRIBAL AND PUBLIC AFFAIRS
REGION 1 SCIENCE AND ECOSYSTEM SUPPORT DIVISION
AUGUST 2008

Sediment Sample Data Sheet (p 1. of 4)
PUGET SOUND DIOXIN AND PCB CONGENER SAMPLING FIELD DATA

Date (mm/dd/yyyy)	Station ID	Name of Person Recording data	Vessel/Crew ID

Chief Scientist/Watch Captain (CS/CW):____________________________________

____

____

Weather	
Temp:	**Other:**
Wind	**Waves:**

Sample Type (circle)		
	% solids/TOC/ Grain Size	**Trace metals and Mercury**
	PCB Congeners	**Procept/CALUX**
	Dioxins/Furans	**Organic COCs**

Sample QA/AC Type (Circle)	Routine Sample	Field Duplicate	Matrix Spike	Matrix Spike Duplicate

Equipment Used (circle):

Young Van Veen	**Double Van Veen**	**Box Core**	**Trowels**	**Others**

Grab Penetration Depth (cm): _______________

Deviation from Plan:

____

Comments and Sketches:

____

____

____

____

____

____

CS/WC Signature: ____

UNITED STATES • ENVIRONMENTAL PROTECTION AGENCY •

Sediment Sample Data Sheet (p 2. of 4)
PUGET SOUND DIOXIN AND PCB CONGENER SAMPLING
SAMPLE DATA (Station ID: ____________________)

Grab 1					
Time (Military)	START			FINISH	
Latitude	**Longitude**	Depth (ft) Datum			
Sample Quality:	Degree				Comments:
Leakage	**None**	**Minor**	**Moderate**	**Excessive**	
Winnowing	**None**	**Minor**	**Moderate**	**Excessive**	
Overfill	**None**	**Minor**	**Moderate**	**Excessive**	
Disturbance	**None**	**Minor**	**Moderate**	**Excessive**	
Penetration (cm)					
Sediment Characteristics					
Grain Size:	**Cobble**	**Gravel**	**Sand (C/M/F)**	**Silt**	**Clay**
Approximate % each					
Color (circle)	**Light** **Dark**	**Gray**	**Brown**	**Black**	**Other:**
Odor (circle)	**Normal** **Sewage**	**Petroleum**	**Chemical**	**H2S**	**Other:**
Presence of:	Y/N	Description and Quantity			
Organisms					
Debris					
Other					
Comments:					
Grab 2					
Time (Military)	START			FINISH	
NORTHING	**EASTING**	ELEVATION (ft) Datum			
Sample Quality:	Degree				Comments:
Leakage	**None**	**Minor**	**Moderate**	**Excessive**	
Winnowing	**None**	**Minor**	**Moderate**	**Excessive**	
Overfill	**None**	**Minor**	**Moderate**	**Excessive**	
Disturbance	**None**	**Minor**	**Moderate**	**Excessive**	
Penetration (cm)					
Sediment Characteristics					
Grain Size:	**Cobble**	**Gravel**	**Sand (C/M/F)**	**Silt**	**Clay**
Approximate % each					
Color (circle)	**Light** **Dark**	**Gray**	**Brown**	**Black**	**Other:**
Odor (circle)	**Normal** **Sewage**	**Petroleum**	**Chemical**	**H2S**	**Other:**
Presence of:	Y/N	Description and Quantity			
Organisms					
Debris					
Other					
Comments:					

CS/WC Signature: ____

Sediment Sample Data Sheet (p. 3 of 4)
PUGET SOUND DIOXIN AND PCB CONGENER SAMPLING
SAMPLE DATA (Station ID: ____________________)

Grab 3					
Time (Military)	START		FINISH		
Longitude	**Latitude**	ELEVATION (ft) Datum			
Sample Quality:	Degree				Comments:
Leakage	**None Minor Moderate Excessive**				
Winnowing	**None Minor Moderate Excessive**				
Overfill	**None Minor Moderate Excessive**				
Disturbance	**None Minor Moderate Excessive**				
Penetration (cm)					
Sediment Characteristics					
Grain Size:	**Cobble**	**Gravel**	**Sand (C/M/F)**	**Silt**	**Clay**
Approximate % each					
Color (circle)	**Light Dark Gray Brown Black Other:**				
Odor (circle)	**Normal Sewage Petroleum Chemical H2S Other:**				
Presence of:	Y/N	Description and Quantity			
Organisms					
Debris					
Other					
Comments:					
Grab 4					
Time (Military)	START		FINISH		
Longitude	**Latitude**	ELEVATION (ft) Datum			
Sample Quality:	Degree				Comments:
Leakage	**None Minor Moderate Excessive**				
Winnowing	**None Minor Moderate Excessive**				
Overfill	**None Minor Moderate Excessive**				
Disturbance	**None Minor Moderate Excessive**				
Penetration (cm)					
Sediment Characteristics					
Grain Size:	**Cobble**	**Gravel**	**Sand (C/M/F)**	**Silt**	**Clay**
Approximate % each					
Color (circle)	**Light Dark Gray Brown Black Other:**				
Odor (circle)	**Normal Sewage Petroleum Chemical H2S Other:**				
Presence of:	Y/N	Description and Quantity			
Organisms					
Debris					
Other					
Comments:					

CS/WC Signature: ____

Sediment Sample Data Sheet (p. 4 of 4)
PUGET SOUND DIOXIN AND PCB CONGENER SAMPLING
Sample Container Log

Sample ID	Date & Time
Check Sample	
PCB CONGENERS	1x 4 –oz wide mouth jars with Teflon liners
DIOXINS/FURANS	1x 4- oz wide mouth jars with Teflon liners
CONVENTIONALS	
GRAIN SIZE	1 x 32-oz wide mouth jars with Teflon liners
% SOLIDS & TOTAL ORGANIC CARBON	1-x 4 –oz wide mouth jars with Teflon liners
IMMUNO ASSAY Calux	1 x 4 oz- wide mouth jars with Teflon liners
IMMUNO ASSAY Procept	1 x 4 oz- wide mouth jars with Teflon liners
Total Mercury and Metals	1 x 4 –oz wide mouth jars with Teflon liners
Organic COCs	1 x 8-oz wide mouth jars with Teflon liners
ARCHIVE	2 x 4 oz wide mouth jars with Teflon liners
Comments:	

CS/CW Signature: ____

Sample Alteration Form

Project Name and Number: ____

Material to be Sampled: ____

Measurement Parameter:___ ____

Standard Procedure for Field Collection & Laboratory Analysis (as specified in the QAPP):

_________________________________ ____________________________________

Reason for Change in Field Procedure or Analysis Variation:

______________________________ _______________________________________

Variation from Field or Analytical Procedure:

______________________________ ____

Special Equipment, Materials or Personnel Required:

____ ______________________________

Initiators Name:____ Date: ____________

Project Manager:____ Date:____________

Chief Scientist (OSV BOLD)_______________________________Date:_____________

QA Officer:____Date:____________

Corrective Action Form

Project Name and Number:____

Sample Collection Dates Involved:____

Measurement Parameter:____

Problem Areas Requiring Corrective Action:___________________________________
____

Measures Required to Correct Problem:______________________________________
____
____

Means of Detecting Problems and Verifying Correction:_________________________
____
____

Initiators Name:_______________________________________ Date:____________

Project Manager:______________________________________ Date:___________

Chief Scientist (OSV Bold) ______________________________ Date:____________

QA Officer:____ Date:____________

Attachment 4 – Modifications to the CLP Statement of Work

Statement of Work and Modified Analysis Request for CLP Support

Dioxin/Furan and PCB Congener Analytical Services

Task Order No: ________
Regional Tracking Number (Filled by Regional TOPO) – PS-DIOX-CB-08-_08

PCDD/PCDF and PCB CONGENER ANALYTICAL SERVICES
CLIENT REQUEST FORM

The following sections (I, II, III, IV, and V) will be completed by the Regional Task Order Project Officer (TOPO) and sent to OAM.

I. General Information:

A. Program: Office of Ecosystems, Tribal and Public Affairs

B. Additional Known/Suspected Site Contaminants: Sediment samples are expected to be in the low concentration, background levels. Trace PCBs & SVOCs and maybe metals may be present.

C. Region: 10

II. Contact Information

A. Task Order Project Officer (TOPO): Ginna Grepo-Grove

Phone: (206) 553-1632

Fax Number: (206) 553-8210

B. Task Order Project Officer (alternate): Bethany Plewe

Phone: (206) 553-1603

Fax Number: (206) 553-8210

C. Sample Contact: Erika Hoffman
Phone: (360) 753-9540 (Work)
Phone: (Mobile) TBD
E-Mail: hoffman.erika@epa.gov

D. Return of Sample Shipment Coolers: Sample coolers will be sent back to US EPA Manchester Environmental Laboratory in Port Orchard, WA. Completed air bills accompanied by plastic with adhesive backs and address labels will be included in the chain of custody bags taped inside the cooler lids. The air bills are marked second day economy service with the appropriate charge number for shipment.

7411 Beach Drive E.
Port Orchard WA 98366
ATTN: Sample Custodian

III. Invoice Approval Officer (Default - TOPO): Ginna Grepo-Grove

Phone: (206) 553-1632

IV. Additional Comments: Period of Performance - Time of award – July 2008

V. Summary of Requirements

A. Shipping Information

1. Sampling Dates: weeks of August 1-5; & 19-22, 2008

2. Tentative Shipping Dates: (1) August 8, 2008
(2) August 25, 2008

3. Sampling Event Identification: region 10's Puget Sound Dioxin and PCB Congener Sediment Study (BOLD Project)

B. Data Turnaround Time: 30 days from the receipt of last sample in the SDG

C. Number of Samples: **Please note: Number of samples are not guaranteed, however, a minimum of 70 and a maximum of 80 (including QC samples) total number of samples may be sent to the laboratory for analysis.**

1. Dioxin/Furan Analysis -
Soil/Sediment #___75___ Water #_______

Other: Specify Matrix Type: NA
Number of samples: NA

D. Analyses Required: (please check all that apply)-

✓ Dioxins/Furans

✓ CB Congeners

E. Sample Delivery Group (SDG) for the Task Order (definition):

(Choose either option 1, 2 or 3. If 3 is chosen, the TOPO must give a definition of the SDG).
Hard Copy - Circle or Check your option.

Option 1. Up to (but not exceeding) 20 samples of the similar matrix extracted in the same preparatory batch with appropriate QC samples.

Option 2. Up to (but not exceeding) 20 samples of a similar matrix received within a 7 day period (said period starting with the receipt of the first sample in the SDG).

Option 3. Regional Definition of SDG (done by TOPO): Up to 20 samples of the same matrix, extracted in the same preparatory batch with appropriate QC samples.

Chosen: Option 3

Reminder: Section 4.2.2.2.4 of Exhibit A of the DLM02.0 and the CBC01.0 SOWs instruct the following: "*The Contractor shall submit signed copies of Chain-of-Custody/Traffic Reports for all samples in an SDG to the alternate TOPO within* ***three (3) working days*** *following receipt of the last sample in the SDG. Chain-of-Custody/Traffic Reports shall be submitted in SDG sets (e.g., all Chain-of-Custody/Traffic Reports for an SDG shall be clipped together) with a Chain-of-Custody/Traffic Report Cover Sheet containing information regarding the SDG, as specified in Exhibit B*".

The chain-of-custody/Traffic Report shall be faxed to Bethany Plewe at the number listed in Section IIB above.

F. Data Delivery Recipient:

1. Sample Management Office - Nazy Abousaeedi
2. Regional Contact - Bethany Plewe

G. Data Delivery Address:

1. Sample Management Office:

Nazy Abousaeedi
CSC, Sample Management Office
15000 Conference Center Drive
Chantilly, VA 20151-3808

2. Regional Delivery Recipient:

Bethany Plewe
1200 6th Ave Suite 900
MS-OEA-095
Seattle WA 98101

H. Analytical Methods Requested:

1. **Percent Solids (no additional cost)**
2. **Dioxin and Furan Analyses - DLM02.0 + additional instructions below**
3. **CB Congener Analyses – CBC01.0 + additional instructions below**

PARAMETER	PREPARATION METHOD	CLEAN UP METHOD
PCDDs/PCDFs	per DLM02.0 (see additional instructions)	(see additional instructions)
CB Congeners (209)	Per CBC01.0 (see additional instructions)	(see additional instructions)

I. Technical instructions for the PCDD/PCDF Analyses:

The samples shall be analyzed for PCDDs/PCDFs in accordance with the requirements and protocols set forth by Statement of Work exhibit D of the DLM02.0, incorporating the following additional instructions:

1 Target Quantitation Limits

	DLM02.0 CRQLs	**Target Analytical Method Detection Limit (MDL)**	**Target Analytical Quantitation Limit (QL)**	**Mammalian TEF WHO (2005)**
Dioxins	ng/kg	ng/kg (dry)	ng/kg (dry)	
2,3,7,8-TCDD	1.0	0.012	1	1
1,2,3,7,8-PeCDD	5.0	0.054	1	1
1,2,3,4,7,8-HxCDD	5.0	0.095	2.5	0.1
1,2,3,6,7,8-HxCDD	5.0	0.10	2.5	0.1
1,2,3,7,8,9-HxCDD	5.0	0.060	2.5	0.1
1,2,3,4,6,7,8-HpCDD	5.0	0.088	2.5	0.01
OCDD	10	0.20	5	0.0003
Furans				
2,3,7,8-TCDF	1.0	0.011	1	1
1,2,3,7,8-PeCDF	5.0	0.073	2.5	0.03
2,3,4,7,8-PeCDF	5.0	0.075	1	0.3
1,2,3,4,7,8-HxCDF	5.0	0.087	2.5	0.1
1,2,3,6,7,8-HxCDF	5.0	0.044	2.5	0.1
1,2,3,7,8,9-HxCDF	5.0	0.074	2.5	0.1
2,3,4,6,7,8-HxCDF	5.0	0.076	2.5	0.1
1,2,3,4,6,7,8-HpCDF	5.0	0.053	2.5	0.01
1,2,3,4,7,8,9-HpCDF	5.0	0.030	2.5	0.01
OCDF	10	0.17	5	0.0003

2 Because this contract will be facilitated thru NRAS, case number, EPA sample numbers (from SMO) and sample tags may not be included when samples are sent to the lab. The regional sample numbers will be used by the lab.

3 The laboratory shall use bigger sample size for extraction (20-25 grams), inject larger extract size (2 uL), and/or employ other means to meet the target analytical quantitation samples' primary extracts must undergo clean-ups as stipulated in section 10.5 of DLM02.0 Exhibit D (GPC, carbon column, anthropogenic isolation column, acidified silica gel, acid-base/neutral back extraction, etc). If chlorinated diphenyl ethers (CDPEs) are detected, alumina and/or florisil clean-up <u>must</u> be employed and extracts re-analyzed at no additional cost.

4 All of the 2, 3, 7, 8-TCDF positively identified in DB5 column at concentrations at or above the CRQL limits must have a confirmatory analysis using a dissimilar column (DB225) or equivalent column is required (see section 11.1.2 DLM02.0). Note: The confirmatory analyses is not required when the contractor used a primary column that meets the ion specificity requirements for 2, 3, 7, 8-TCDD and 2, 3, 7, 8-TCDF. The column must meet all criteria established in section 9 Exhibit D of the DLM02.0.

5 Calculations of Quantitation limits: Reporting limits shall be calculated and reported using the lowest concentration of the standard analyzed during initial calibration, amount of sample extracted and final extract volume taking into account the dilution factors and percent moisture. Equations used to calculate results and example of calculations must be included in the Case Narrative.

6 Both Quantitation and Method Detection Limits (MDLs) in dry weights will be reported on the Summary of Analytical results (Form 1)

7 TEQs will be calculated using the 2005 WHO TEF values (see item 1).

8 Total PCDD/PCDF homologues and TEQs will be reported.

9 Electronic deliverable requirements. A PDF file of the whole data package must be submitted to the region. Electronic deliverables (summary of results) in excel format is highly desired. The region must approve electronic deliverable formats other than stated above prior to the award of the samples.

10 Specific modifications to the DLM02.0 SOW to meet the target quantitation limits must be submitted to the region prior to sample analyses and must be included in the Case Narrative.

J. Technical instructions for the CB Congener Analyses:

The samples shall be analyzed for the 209 CB Congeners in accordance with the requirements and protocols set forth by Statement of Work exhibit D of the CBC01.0, incorporating the following additional instructions:

Target Quantitation Limits

Polychlorinated Biphenyls	Target MDLs	Target Quantitation Limits	Mammalian TEF WHO (2005)
		ng/kg (dry)	
Non-ortho–substituted PCBs	*ng/kg (dry)*		
3,3',4,4'-tetraCB (PCB 77)	0.5	3	0.0001
3,4,4',5-tetraCB (PCB 81)	0.5	3	0.0003
3,3',4,4',5-pentaCB (PCB 126)	0.5	3	0.1
3,3',4,4',5,5'-hexaCB (PCB 169)	0.5	3	0.03
Mono-ortho–substituted PCBs			
2,3,3',4,4'-pentaCB (PCB 105)	0.5	3	0.00003
2,3,4,4',5-pentaCB (PCB 114)	0.5	3	0.00003
2,3',4,4',5-pentaCB (PCB 118)	0.5	3	0.00003
2',3,4,4',5-pentaCB (PCB 123)	0.5	3	0.00003
2,3,3',4,4',5-hexaCB (PCB 156)	0.5	3	0.00003
2,3,3',4,4',5'-hexaCB (PCB 157)	0.5	3	0.00003
2,3',4,4',5,5'-hexaCB (PCB 167)	0.5	3	0.00003
2,3,3',4,4',5,5'-heptaCB (PCB 189)	0.5	3	0.00003
Non-Dioxin like PCBs	5	10	

1. Because this contract will be facilitated thru NRAS, case number, EPA sample numbers (from SMO) and sample tags may not be included when samples are sent to the lab. The regional sample numbers will be used by the lab.

2. The laboratory shall use bigger sample size for extraction (20-25 grams), inject larger extract size (2 uL), and/or employ other means to meet the target analytical quantitation limits. All of the samples' primary extracts must undergo clean-ups as stipulated in section 10.5 of DLM02.0 Exhibit D (GPC, carbon column, anthropogenic isolation column, acidified silica gel, acid-base/neutral back extraction, etc). If chlorinated diphenyl ethers (CDPEs) are detected, alumina and/or florisil clean-up must be employed and extracts re-analyzed at no additional cost.

3. Clean-up: Usual extract clean-ups specified in section 2.2 and 7.0 of the SOW must be employed. Activated carbon clean-up may be necessary to get a better isolation and chromatographic separation of co-planar PCBs.

4. Calculations of Quantitation limits: Reporting limits shall be calculated and reported using the lowest concentration of the standard analyzed during initial calibration, amount of sample extracted and final extract volume taking into account the dilution factors and percent moisture. Equations used to calculate results and example of calculations must be included in the Case Narrative.

5. Both Quantitation and Method Detection Limits (MDLs) will be reported on the Summary of Analytical results (Form 1)

6. TEQs will be calculated using the 2005 WHO TEF values (see item 1).

7. Total CB congener homologues and TEQs will be reported.

8. Electronic deliverable requirements. A PDF file of the whole data package must be submitted to the region. Electronic deliverables (summary of results) in excel format is highly desired. The region must approve electronic deliverable formats other than stated above prior to the award of the samples.

9. Specific modifications to the DLM02.0 SOW to meet the target quantitation limits must be submitted to the region prior to sample analyses and must be included in the Case Narrative.

K. Additional Instructions:

The laboratory is required to conduct an Initial Precision and Recovery (IPR) Study, Initial Demonstration of Capabilities (IDCs) and/or Minimum Detection Limits (MDLs) Study and submit the summary of results to the Region prior to the analysis of samples.

L. Signature of TOPO:_____________________________

Request for Quote (RFQ) for Modified Analysis

Date: July 24, 2008
Subject: Modification Reference Number:
Title: Sample Matrix: Soil/Sediment
Fraction Affected: Metals and Mercury
Statement of Work: ILM05.4
Number of Samples: 75
Shipping Dates: week of August 8th and week of August 19, 2008
Turn Around Time: 21 days

Purpose:

The Contractor Laboratory is requested to perform the following modified analyses under the Inorganic Statement of Work (SOW) ILM05.4, based on the additional specifications listed below. Unless specifically modified by this modification, all analyses, Quality Control (QC), and reporting requirements specified in SOW ILM05.4 remain unchanged and in full force and effect. The number of samples requested in this modification is not guaranteed.

Please note that accepting a modified analysis request is voluntary, and that the Laboratory is not required to accept the modified analysis. There will be no adverse effect to the Laboratory for not accepting the modified analysis request. However, once the Laboratory accepts the request for modified analysis, it shall perform the analysis in accordance with this modification and as specified in SOW ILM05.4.

The Laboratory is requested to review the modification described herein, determine whether or not it shall accept the requested modified analyses, and complete the attached response form. The Laboratory shall provide comments in response to the required changes in the designated area, in order to ensure that the modified analysis can be completed in accordance with the specifications described herein.

The requirements in the RFQ are as stated and any defects will be assessed by SMO per the laboratory contract. The laboratory should take this into account when submitting their quote.

Notice to Contractors: Acceptance of Modified Analysis samples will not count against the monthly capacity.

Modification to the SOW Specifications:

The Laboratory shall analyze sediment samples for the Target Analyte List (TAL) by ICP-MS and for Hg by CVAA, as indicated on the Traffic Report/Chain of Custody record.

Analyte	Reporting Limits or CRQL (mg/kg) dw	Spike level (mg/kg)
Sb	0.5	5
As	1.0	5
Cd	0.5	5
Cr	1.0	10
Cu	1.0	5
Pb	1.0	2
Hg	0.02	0.2
Ni	1.0	10
Se	1.0	5
Ag	0.5	5
Zn	3.0	10

A Method Detection Limit (MDL) study, by the preparation and analysis procedures, is required for ICP-MS. The MDL for each ICP-MS analyte shall be less than one-half the CRQL for that analyte listed above.

The Laboratory shall prepare soil samples for ICP-MS analysis as follows: To a 1 gram sample aliquot, add 4 mL of 1:1 nitric acid and 10 mL of 1:4 hydrochloric acid and reflux for 30 minutes. Cool, filter, and bring to 100 mL volume with reagent water. If necessary for chloride correction or interferences, dilute a suitable aliquot of this solution using 1% nitric acid.

The Laboratory may increase the mass the amount (mass) of sample digested for ICP-MS analysis to meet the CRQLs. The samples are expected to have low percent solids and the Laboratory should adjust sample masses accordingly.

The Laboratory is not required to adjust the concentrations of the Check Standard (CRI) solution.

The Laboratory shall prepare and analyze an LCSS, using the solid LCSS provided for ICP-AES analysis or another suitable solid reference material.

The Laboratory shall prepare samples for Mercury so that the modified CRQL is met. The Laboratory may increase the amount (mass) of sample digested as a way of meeting the modified CRQL.

Reporting Requirements:

Hardcopy and electronic data reporting are required as specified per SOW ILM05.4. All hardcopy and electronic data shall be adjusted to incorporate modified specifications. This includes attaching a copy of the requirements for modified analysis to the SDG Narrative. If specific problems occur with incorporation of the modified analysis into the hardcopy and/or electronic deliverable, the Laboratory shall contact the DASS Manager within the Sample Management Office (SMO) at (703) 818-4233 or via e-mail at CCSSUPPORT@fedcsc.com for resolution.

All samples and/or fractions assigned to an SDG shall be analyzed under the same Modified Analysis requirements as established in this memorandum. The Laboratory shall not include data from multiple Modified Analyses in one SDG.

The Laboratory shall include the Modification Reference Number on each hardcopy data form under the "NRAS No:" header appearing on each form as well as the "NRAS No." field on the Record type 21 of the electronic deliverable (if diskette deliverable is required). The Laboratory shall also document the Modification Reference Number and the Solicitation Number on the SDG Coversheet.

Clarifications/Revisions to the RFQ for Modified Analysis:

Laboratory Name:
Laboratory Comments:

Request for Quote (RFQ) for Modified Analysis

Date: July 24, 2008

Subject: Modification Reference Number:
Title: Puget Sound Background Survey
Sample Matrix: Sediment
Fraction Affected: SVOCs, PAHs- SIM, Pesticides, PCB Aroclors
Statement of Work: SOM01.2
Number of Samples: 75
Shipping Dates: week of August 8th and week of August 19, 2008

Purpose:

The Contractor Laboratory is requested to perform the following modified analyses under the Organic Statement of Work (SOW) SOM01.2, based on the additional specifications listed below. Unless specifically modified by this modification, all analyses, Quality Control (QC), and reporting requirements specified in SOW SOM01.2 remain unchanged and in full force and effect. The number of samples requested in this modification is not guaranteed.

Please note that accepting a modified analysis request is voluntary, and that the Laboratory is not required to accept the modified analysis. There will be no adverse effect to the Laboratory for not accepting the modified analysis request. However, once the Laboratory accepts the request for modified analysis, it shall perform the analysis in accordance with this modification and as specified in SOW SOM01.2.

The Laboratory is requested to review the modification described herein, determine whether or not it shall accept the requested modified analyses, and complete the attached response form. The Laboratory shall provide comments in response to the required changes in the designated area, in order to ensure that the modified analysis can be completed in accordance with the specifications described herein.

The requirements in the RFQ are as stated and any defects will be assessed by SMO per the laboratory contract. The Laboratory should take this into account when submitting their quote.

Notice to Contractors: Acceptance of Modified Analysis samples will not count against the monthly capacity.

Modification to the SOW Specifications:

The Statement of Work (SOW) SOM01.2 requires contract laboratories to analyze samples for Semi-volatile organic compounds (SVOCs) and Polynuclear Aromatic Hydrocarbons (PAH-SIM) in Exhibit D, Analytical Method for the Analysis of Semi-volatile Organic Compounds; Pesticide target compounds in Exhibit D, Analytical Method for the Analysis of Pesticides; and Aroclor target compounds in Exhibit D, Analytical Method for the Analysis of Aroclors. The Laboratory shall report all non-detected target analyte down to the Method Detection Limit (MDL) levels. Detection between the MDL and the Contract Specified Quantitation Limit (CRQL) shall be qualified estimated.

Additional Target Compounds:

Pesticides TAL	CAS No	Required CRQLs (dw)
2,4-DDD	53-19-0	1.0
2,4-DDE	3424-82-6	1.0
2,4-DDT	789-01-6	1.0
Oxychlordane	27304-13-8	1.0
Cis-Nonachlor	5103-73-1	1.0
Trans-Nonachlor	39765-80-5	1.0
Mirex	2385-85-5	1.0

The CRQLs required for this MA are low-levels and are based on dry weight. The laboratory will need to extract additional amount of samples (>50 grams) to compensate for the moisture content of the sample, adjust the final volume after GPC and use larger injection volumes and/or use lower initial calibration standards. Surrogate and spike compounds concentrations added to the samples and QC samples will need to be adjusted accordingly if sample size and final extract volumes will be modified.

PAHs and PCP will be analyzed using the SIM techniques following the SOW SOM1.2 and reported at the SOW CRQLs (dry). Adjustment in the amount of sample extracted may be needed to compensate for the percent moisture. The PAH & PCP may or may not be included in the SVOC target list if also analyzed using SIM techniques.

Project Specific CRQLs are listed in the Tables below:

Table 1 – Semivolatile Target Analyte List

Analyte Name	**CAS Number**	**CRQL ug/kg (dw)**
1,2-Dichlorobenzene	95-50-1	20
1,3-Dichlorobenzene		20
1,4-Dichlorobenzene	106-46-7	20
2,4-Dichlorophenol	120-83-2	20
2,4-Dimethylphenol	105-67-9	50

Analyte Name	CAS Number	CRQL ug/kg (dw)
2-Chlorophenol	95-57-8	20
2-Methylphenol	95-48-7	20
4-Methylphenol	106-44-5	20
Benzoic Acid	65-85-0	100
Benzyl alcohol	100-51-6	50
Bis(2-ethylhexyl)phthalate	117-81-7	100
Butylbenzylphthalate	85-68-7	20
Di-n-butylphthalate	84-74-2	20
Diethylphtahalate	84-66-2	20
Dimethylphthalate	131-11-3	20
Di-n-octylphthalate	117-84-0	20
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	87-68-3	10
Hexachloroethane	67-72-1	10
N-Nitrosodiphenylamine	86-30-6	20
Phenol	108-95-2	20
SIM Analyte List		
Analyte Name	**CAS Number**	**CRQL ug/kg (dw)**
Pentachlorophenol	87-86-5	6
Naphthalene	91-20-3	3
Acenaphthene	83-32-9	3
Fluorene	86-73-7	3
Anthracene	120-12-7	3
Fluoranthene	206-44-0	3
Pyrene	129-00-0	3
Benzo(a)anthracene	56-55-3	3
Chrysene	218-01-9	3
Benzo(b)fluoranthene	205-99-2	3
Benzo(k)fluoranthene	207-08-9	3
Benzo(a)pyrene	50-32-8	3
Indeno(1,2,3-cd)pyrene	193-39-5	3
Dibenzo(a,h) anthracene	191-24-2	3
Dibenzofuran	132-64-9	3
Table 2 PESTICIDE Target Analyte List		
2,4-DDD	53-19-0	1.0
2,4-DDE	3424-82-6	1.0
2,4-DDT	789-01-6	1.0
4,4'-DDD	72-54-8	1.0

Analyte Name	CAS Number	CRQL ug/kg (dw)
4,4'-DDE	72-55-9	1.0
4,4'-DDT	50-29-3	1.0
Aldrin	309-00-2	1.0
alpha-BHC	319-84-6	1.0
beta-BHC	319-85-7	1.0
Delta-BHC	319-86-8	1.0
gamma-BHC(Lindane)	58-89-9	1.0
Alpha-Chlordane	5103-71-9	1.0
Gamma_Chlordane	5103-74-2	1.0
Oxychlordane	27304-13-8	1.0
Cis-Nonachlor	5103-73-1	1.0
Trans-Nonachlor	39765-80-5	1.0
Dieldrin	60-57-1	1.0
Endosu1fan I	959-98-8	1.0
Endosulfan II	33213-65-9	1.0
Endosulfan Sulfate	1031-07-8	1.0
Endrin	72-20-8	1.0
Endrin aldehyde	7421-93-4	1.0
Endrin ketone	53494-70-5	1.0
Heptachlor	76-44-8	1.0
Heptachlor epoxide	1024-57-3	1.0
Methoxychlor	72-43-5	5.0
Mirex	2385-85-5	1.0
Toxaphene	8001-35-2	10
Table 3 - Aroclor Target Analyte List		
Aroclor 1016	12674-11-2	5
Aroclor 1221	11104-28-2	5
Aroclor 1232	11141-16-5	5
Aroclor-1242	53469-21-9	5
Aroclor-1248	12672-29-6	5
Aroclor-1254	11097-69-1	5
Aroclor-1260	11096-82-5	5

Reporting Requirements:

Hardcopy and electronic data reporting are required as specified per SOW SOM01.2. All hardcopy and electronic data shall be adjusted to incorporate modified specifications. This includes attaching a copy of the requirements for modified analysis to the SDG Narrative. If specific problems occur with incorporation of the modified analysis into the hardcopy and/or electronic deliverable, the Laboratory shall contact the DASS Manager within the Sample Management Office (SMO) at (703) 818-4233 or via e-mail at CCSSUPPORT@fedcsc.com for resolution.

All samples and/or fractions assigned to an SDG shall be analyzed under the same Modified Analysis requirements as established in this memorandum. The Laboratory shall not include data from multiple Modified Analyses in one SDG.

The Laboratory shall include the Modification Reference Number _____ on each hardcopy data form under the "Mod. Ref. No." header appearing on each form as well as the data element "ServicesID" under the "SamplePlusMethod" node of the EDD. This should be done for the fractions affected by the modified analysis only. The "ServicesID" field should remain blank for all other fractions reported in the SDG. The Laboratory shall also document the Modification Reference Number and the Solicitation Number on the SDG Coversheet.

Clarifications/Revisions to the RFQ for Modified Analysis:

Laboratory Name:
Laboratory Comments:

Contractor Laboratory Acknowledgment Document

Analysis	Modification Reference Number	Hardcopy Turnaround Requirement	(A) Estimated No. of Samples by Matrix (including billable QC)*	Cost For Modified Analysis (B) New Per Sample Price	Cost For Modified Analysis (A X B) Total Cost
				$______________	$______________
				$______________	$______________
				Total Project Cost	$______________

Project Information
Estimated Shipping Period:
Additional Information:

Note: The data will be evaluated for timeliness and contract compliance in accordance with the laboratory contract and all applicable amendments. If any of the services do not conform to the requested requirements, the USEPA reserves the right to reduce the value or reject the data in accordance with the laboratory contract.

Name of Contractor Laboratory:
Address of Contractor Laboratory:
Statement of Work:
Contract Number:
Delivery Order No.:

___ Laboratory AGREES to perform analysis through the modified analysis protocol outlined in Modified Analysis Request.
___ Laboratory DECLINES to perform analysis through the modified analysis protocol outlined in Modified Analysis Request.

Signature of Laboratory Representative: ____ Date:

Signature of USEPA Contracting Officer: ____ Date:

Analysis: Description of the analyses being requested by the USEPA for this Case. Line items that do not require modified analysis may also be included on this form if Requested by USEPA. This column is completed by SMO.

Modification Reference Number: The numerical value assigned to the technical requirements describing the changes to the Statement of Work. This column is completed by SMO.

Hardcopy Turnaround Requirement: The analytical data turnaround time required for this Case. This column is completed by SMO.

Estimated No. of Samples and sample Matrix (including QC): The client's estimated number of samples (by matrix), including billable QC samples, to be collected and shipped to the laboratory. This column is completed by SMO.

New Per Sample Price: Laboratory's sample price for analyzing the samples identified in the line item. This column is completed by the laboratory.

Total Cost: For line items that require modified analysis, this value is the Estimated No. of Samples (including QC) multiplied by the New Per Sample Price. For line items that do not require modified analysis, this value is the Estimated No. of Samples (including QC) multiplied by the Contract Per Sample Price. This column is completed by the laboratory.

Total Project Cost: Sum of the total costs for all line items. This column is completed by the laboratory.

Attachment 5- Health and Safety Plan (HASP)

EPA SITE SAFETY PLAN

ADDENDUM for - PUGET SOUND SEDIMENT DIOXIN/FURAN AND PCB CONGENERS SURVEY - WASHINGTON

for

R10 Survey Work on the OSV Bold
EPA Research Vessel, OSV Bold

Prepared By:

Environmental Services Unit
Office of Environmental Assessment
US Environmental Protection Agency
1200 6th Avenue Suite 900
Seattle WA 98101

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Sign –Off Sheet:

I, whose name and signature appears below, certify that I have read and understood the Project Health and Safety Plan and the Quality Assurance Project Plan for "THE PUGET SOUND SEDIMENT DIOXIN/FURAN AND PCB CONGENERS SURVEY". I hereby certify that I fully understand my role and responsibilities as a member of the project team and as a responsible vessel occupant.

Table 1 - 2008 OSV Bold Science Team Puget Sound PCB and Dioxin Sediment Survey

Name	Survey Responsibility	Organization	Initials/Date
Matthew Liebman	Chief Scientist	EPA R1	
David Kendall	Principal Investigator Watch Captain	COE-Seattle	
Laura Inouye	Watch Captain	WDOE	
David Fox	Watch Captain	COE- Seattle	
Lauran Warner	Survey Support	COE - Seattle	
Ted Benson	Survey Support	WDOE	
Jeff Rodin	Survey Support	EPA R10 ECL	
Jennifer Fitchorn	Survey Support	EPA R10 OCE	
Sean Standing	Survey Support	Environment Canada	
Korina Lane-Jones	Survey Support	EPA R10 OMP	
Erin Seyfried	Survey Support	EPA R10 OWW	
Alicia Boyd	Survey Support	Hanford	
Laura Buelow	Survey Support	Hanford	
Valerie Partridge	Survey Support	WDOE	
Mandy Michelsen	Survey Support	COE	
Elaine Somers	Survey Support	EPA R10 ETPA	
Harry Craig	Survey Support	EPA R10 OOO	

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SITE SAFETY PLAN
FOR
R10 Activities on the OSV Bold

This Site Safety Plan defines and designates Health and Safety requirements and protocols to be followed during sampling and analysis activities from the OSV Bold in support of USEPA Region 10. Applicability extends to all EPA personnel and contractors involved during sample collection activities at the site.

______________________________	____________________
Matthew Leibman, Chief Scientist, US EPA Region 1	Date
______________________________	____________________
David Kendall, Principal Investigator Army Corps of Engineers, Seattle WA	Date
______________________________	____________________
Laura Inouye, Watch Captain WA Department of Ecology	Date
______________________________	____________________
David Fox, Watch Captain Army Corps of Engineers, Seattle WA	Date
______________________________	____________________
Cathe Bell, Health and Safety Officer US EPA Region 10 Seattle WA	Date

1.0 GENERAL INFORMATION

1.1 Site Description

A map showing the site locations and general sampling stations is included in the Quality Assurance Project Plan for "THE PUGET SOUND SEDIMENT DIOXIN/FURAN AND PCB CONGENERS SURVEY" - Figures 1 and 2 of that document.

The objective of the proposed work is to collect 70 surface (0-10 cm) sediment samples from reference sites and other locations throughout Puget Sound including the San Juan Islands and the Strait of Juan de Fuca that are distant from known sources of contamination. All of the sediment samples will be analyzed for PCB congeners and dioxins/furans, grain size, total organic carbon, percent moisture, semi-volatile compounds, pesticides, PCB Aroclors, metals and mercury. See Section 2 of the QAPP for the study's problem identification, objective, and design.

1.2 Site Activities

Work collecting the Conductivity-Temperature-Dissolved Oxygen Profile, Sonar Transect, and hard-bottom ROV data are not specifically covered in this HSP. These activities are covered in the OSV Bold HSP. (See specific references in the following sections to this HSP.)

The following samples will be collected by the EPA as part of this investigation.

<u>Sediment</u>

The sediment samples will be collected with either a grab- or box core-type sampler. A stainless steel double van Veen sampler will be the primary sampling device, although if sediments are particularly fine, the box core may be more successful in collecting undisturbed samples. A 0.1-m^2 Ted Young-modified van Veen grab will also be available as a backup to the primary sampler.

When samples are taken in the field, the locations will be documented in a field notebook/Watch Captain logbook and laptop(s) as appropriate for each procedure. The ship's location will be recorded using field GPS (Differential Global Positioning System) – see project QAPP for details.

A description of sample collection for chemical analysis can be found in Section 2.9 of the QAPP.

The location of the proposed sample sites are shown in the QAPP, Figures 1 and 2.

1.3 Project/Task Description and Schedule

See Section 2.7, Table 2 of the QAPP.

1.4 Site Reconnaissance

This is the OSV Bold ship orientation, safety briefing and survey briefing on July 31, 2008.

1.5 Site Sampling Plan

Refer to the Quality Assurance and Sampling Plan preceeding this document.

1.6 Site Personnel

There are several personnel with site safety responsibilities:

- OSV Bold Captain: Jere Chamberlain;
- Chief Scientist: Matthew Liebman;
- Watch Captains: David Kendall, Laura Inouye, and David Fox ;
- Vessel Safety Officer: Bob Overmon, First Mate;
- Document Control Officer: Jennifer Fitchorn and Mandy Michelson (maintenance of sample chain of custody)

Safety Officers (SSO) responsibilities include, but are not limited to

- Being knowledgeable of federal, state, local and company requirements applicable to their work assignments;
- Evaluating the potential hazards of projects and appropriately managing for control of these hazards;
- Establishing, through personal example, the desired safety environment for the performance of duties;

- Ensuring that all employees under their direction are properly qualified to complete their work assignments;
- Ensuring that all EPA employees under their supervision or control meet the eligibility requirements of the EPA Health and Safety Plan before they are allowed to enter a hazardous waste site or are assigned to a specific laboratory task that may result in workplace exposure to chemical hazards;
- Verifying that appropriate safety equipment and protective devices are provided for each job and are continuously in proper working order (this includes drinking water and other fluid replacement beverages);
- Identifying special training requirements and ensuring compliance as appropriate;
- Identifying and correcting health and safety deficiencies within their control and promptly notifying EPA management or health and safety staff of deficiencies outside their control;
- Enforcing established air monitoring requirements, use of appropriate levels of protection, and procedures to minimize any hazards to EPA personnel and community residents;
- Monitoring the condition of workers on site to assess need for work hour limitations and recommending changes in the work schedule of site workers in order to avoid accidents due to fatigue and environmental stress;
- Implementing the on-site Health and Safety Plan.
- Recommending any field HASP changes as needed due to changed site conditions or work.

2.0 EMERGENCY PROCEDURES/CONTINGENCY PLAN

In the event of an emergency, site Personnel should stop work and retreat to a designated area to determine appropriate response and establish site security and control. The designated area of retreat shall be determined by the Safety Officers at the vessel safety briefing and as described in the OSV Bold Vessel Safety Manual (VSM):

Vessel personnel must read and be familiar with VSM-Section 13 (Appendix A). The following is “Station Bill” as discussed in Appendix A.

"A vessel's Station Bill assigns each person aboard various duties associated with emergencies. It also assigns individuals to muster stations and survival craft. On many research vessels, the Station Bill is specifically for vessel crew members, while a subset of the Station Bill as well as emergency procedure information (also referred to as a Bunk Card) is posted in research party staterooms. Everyone is given an orientation of the vessel and instructions. Part of your orientation is to ensure that you know your assigned stations and duties as listed on the Station Bill and, if applicable, your Bunk Card. Examine these documents carefully; memorize your duties and muster station. You should know two routes for getting out of your living and working spaces in the event of emergency situations; know how to exit these spaces in the dark. ***It is highly recommended that each person bring a small LED headlamp***.]

The Station Bill lists the various emergency signals to be used for calling the crew and the research party members to their stations or to give instructions while at their stations. Your vessel uses standard signals, commonly used in the merchant fleet and required to regulatory agencies." VSM Appendix A and Section 13 are provided under separate cover.

All vessel personnel are assigned muster stations for fire and lifeboat drills.

2.1 Reporting of Accident

An employee who suffers a work injury or becomes involved in an accident, regardless of how minor, which may have resulted in an injury to him-/herself or others, is required to report the accident and/or work injury as soon as possible to his or her supervisor. OSV Bold procedures are covered in **Section**

Accident Reporting Requirements

Procedures

Any accident on an EPA vessel that results in: (1) Death; (2) An OSHA Reportable Injury or Occupational Illness to any person on-board; (3) Any damage to non-EPA property; or (4) Significant damage to EPA property:

Shall be reported immediately to the appropriate EPA Ship Vessel Management Official by the Vessel Master, Chief Scientist or the injured party and confirmed in writing within 48 hours after the accident occurs. Such written reports shall provide full details of the accident, including witnesses' statements.

The EPA Vessel Management Official shall immediately notify the local SHEMD Manager. The local SHEMD Manager shall notify Headquarters, SHEMD.

2.2 Emergency Phone Numbers

The Vessel Safety Officer, Captain, or Chief Scientist will radio/call as necessary for any emergency medical evacuation.

Captain's cell phone: (850) 625-4020

Watch-stander's cell phone: (850) 625-4719

3.0 SAFETY AND HEALTH HAZARD ANALYSIS

The ship orientation and safety briefings at the start of the survey (July 31) is the start of safety and health hazard analysis and management. **Vessel personnel shall read and be familiar with Appendix A of the QAPP, "Section 13 of the VSM (Safety Overview and On-Board Safety Requirements)".**

3.1 Site Chemical Hazards of Concern

Personnel should always attempt to keep any exposures as low as possible. Procedures which will minimize the risk of chemical exposure to site personnel include but are not limited to the following.

- Hands should be washed frequently and always before meals or when leaving the contaminated area.
- Disposable equipment will be used whenever possible.

3.2 Physical Hazards of Concern

Appendix B of the Vessel Safety Manual is important reading for some duty assignments. This Appendix is important for personnel involved in small boats, sediment sampling, and related activities. There are a myriad of safety topics covered there: heavy rigging and overhead mechanical gear for sampling or otherwise, handling of flammable materials and hazardous materials, compressed gases, confined space procedures, electrical systems, fire prevention and control, lifesaving, stability and watertight integrity, engineering safety (e.g., lockout/tag-out), and personal health (note – be prepared for weather conditions such as sun and dehydration and also for foul weather).

4.0 TRAINING

This applies for vessel personnel handling benthic samples preservation in formalin only – they will be currently certified in compliance with OSHA training requirements as specified in 29CFR 1910.1048. In addition, these personnel will:

- Review and sign the Site Safety Plan prior to beginning field work;
- Attend the site-specific safety briefing prior to beginning field activities;
- Attend all other safety meetings as required by USEPA.
- Maintain copies of all OSHA required training records at site.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Level D PPE will be utilized as a rule while working around the sediment dredging area. Levels A, B, and C protection will normally not be utilized on this project but workers are encouraged to take whatever steps are necessary to protect themselves since not all circumstances can be anticipated prior to going into the field.

Level D protective equipment is sufficient when:

- The atmosphere contains no known hazard; and
- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level D protective equipment to be used during operation will consist of the following.

- Hardhat;
- Safety Shoes (personal safety boots and steel-toe rubber boots);
- Safety glasses;
- Tyvek Coveralls;
- Either PVC or nitrile gloves for sampling activities;
- Hearing protection;
- Cotton or leather work gloves.
- Ergonomic Back Braces

Additional safety equipment will be available on the vessel and some equipment will be sent from the Region 10 Laboratory. EPA personnel will bring pre-assigned lab coats, safety glasses, cotton coveralls, back braces, and steel-toed boots (as necessary).

Personnel who are enrolled in medical monitoring and have been fit-tested are encouraged to use respirators when they feel conditions warrant them or the SSO decides they are necessary. If any suspicious odor is detected, the use of a respirator becomes mandatory for all affected personnel.

6.0 MEDICAL MONITORING PROGRAM

All EPA personnel involved in activities resulting in exposure to chemical or biological hazards will be current participants in the EPA **OCCUPATIONAL MEDICAL MONITORING PROGRAM** and will have medical clearance to participate in this type of field activity.

7.0 AIR MONITORING PROGRAM

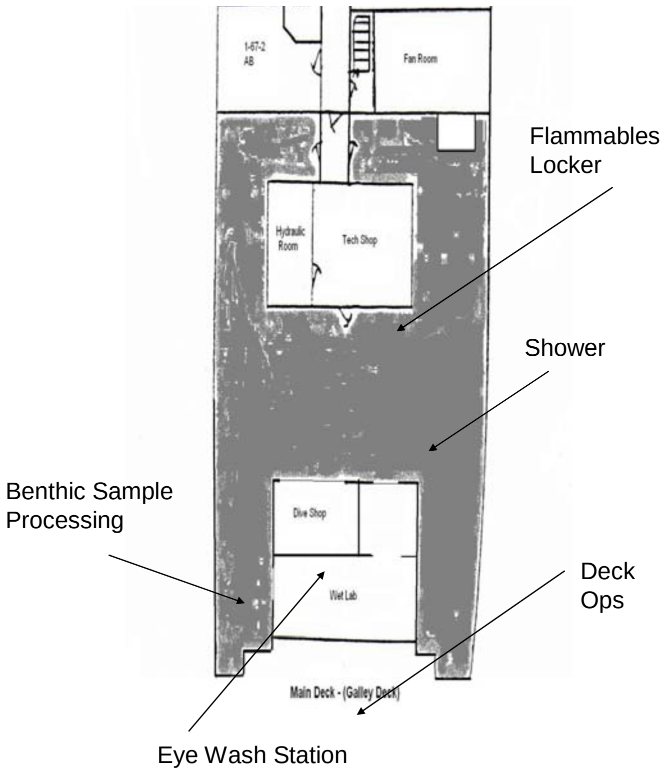
Air monitoring with personal monitors is not required for the Puget Sound survey work.

8.0 SITE CONTROL MEASURES

Depending upon the site specific hazards encountered, various levels of site control will be implemented to reduce the potential for personal exposures and to prevent cross-contamination by ersonnel or equipment leaving the site. In general, restricted work areas will be delineated. The restricted work area will, in essence, function as the exclusion zone. An area adjacent to this restricted work area will be designated for personnel and equipment decontamination.

Work area(s) and controls will be established based on potential exposures to chemical and physical hazards. Only authorized personnel wearing the required personal protective equipment will be permitted to enter work areas. A restricted area may be designated when there is potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful chemicals.

Diagram of the sample processing area, lab, and emergency shower and eye wash locations is shown below:



8.1 Work Zones

Only EPA-approved personnel will be allowed access to the work area. Note that the OSV Bold crew personnel are EPA contractors and will be deploying the sampling equipment.

8.2 Communications and Emergency Alarm System

See Section 13.9 of the Vessel Safety Manual**.**

9.0 DECONTAMINATION

General procedures:

All disposable protective gear will be bagged and removed from the site for proper disposal. Any contaminated wash and rinse solutions will be collected, analyzed and properly disposed. Decontamination during this site investigation will include:

- proper disposal of outer/contaminated garments;
- washing of hands and other areas of contamination;
- showering off-site at earliest convenience;
- washing of sampling equipment with soap, water, and/or bleach solution;
- cleaning of sampling equipment between sampling locations.

The water used for sampling equipment decontamination must be contaminant free.

10.0 CONFINED SPACE

Any confined spaces present at the site will not be entered by EPA personnel.

11.0 SPILL CONTAINMENT

Should a spill occur, personnel should immediately contain the spill with available absorbent material, neutralize the spilled material, if appropriate, and subsequently dispose of the spilled material appropriately.

12.0 HAZARD COMMUNICATION

In accordance with 29 CFR 1910.1200, all personnel will have been briefed according to the Hazard Communication Standard. MSDSs will be available on-site for any hazardous chemicals brought to the site (including but not limited to preservatives, flammable fuel, decontamination chemicals) or those used in the mobile lab. Workers will be instructed regarding hazards and the location of the MSDSs.

13.0 STANDARD ON-SITE SAFETY PRACTICES

All EPA personnel will conduct their work in accordance with the *Quality Assurance Project Plan for the Oregon Coastal Surveys, the Site Safety Plan* and applicable rules. Personnel will be directed to leave the site if they fail to observe the safety requirements or in any way create a safety hazard. Standard personnel precautions include the following:

- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.

- Care must be taken when wearing personal protective equipment because of the increased potential for fatigue and/or heat stress related injuries due to dehydration.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, **do not** walk through puddles, mud and discolored surfaces; kneel on the ground; lean, sit, place equipment on drums, containers, vehicles, or on the ground.

- Medicine and alcohol can potentially increase the effects of exposure to toxic chemicals. Prescribed drugs should not be taken by personnel working on site where the potential of absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages are prohibited on the OSV Bold.

- On-site personnel will be required to remove contaminated clothing and thoroughly wash hands and face prior to smoking, handling of any food or drink, using the restroom facilities, or leaving the site.

- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after protective garments have been removed.

APPENDIX A - Section 13 of the OSV Bold Safety Manual

Section 13 - On-Board Safety Requirements

Vessel Safety Manual

13.1 Vessel Safety Familiarization

13.1.1 Applicability

This element is applicable to EPA Class B and C Vessels.

13.1.2 Purpose

The purpose of this element is to provide a means for crew members, and scientific staff to review the basic safety requirements for vessel operations.

13.1.3 Program Elements

13.1.3.1 Familiarization Guide

Appendix A of this manual contains a safety familiarization guide that addresses safety issues applicable to all EPA vessels with a laboratory aboard. Also, portions of the guide are generally applicable to EPA Class B Vessels that do not have a laboratory aboard. The guide was adapted from Chapter 1, of the Safety Training Manual - Crew Supplement prepared by the UNOLS Research Vessel Operators Committee. It provides basic safety information for those crew members and scientists who are serving aboard an EPA vessel for the first time.

Each Class B and C EPA Vessel shall have sufficient copies of the guide to provide one to each new crew member and members of the scientific staff who have not previously embarked on the vessel. The vessel Master may choose to use the guide as written, or they may prepare a vessel specific guide that includes the same categories of material.

The guide does not replace the requirement to prepare Station Bills, or the need to conduct emergency drills as required by other sections of this manual.

13.1.3.2 UNOLS Safety Training Manual

The UNOLS Safety Training Manual - Crew Supplement, was prepared to provide more in-depth coverage of the safety issues associated with science vessels. A copy of the manual is recommended for inclusion in the library of each Class C Vessel, and Class B Vessels that have a laboratory aboard.

13.1.4 Program Responsibilities

13.1.4.1 Master

The Master of each applicable EPA vessel shall ensure that there are sufficient copies of the guide aboard to provide one to each new crew member and new members of the scientific staff who have not previously embarked on the vessel.

13.1.4.2 New Crew members

To help ensure their safety while aboard, each new crew member should read the guide and ensure that they understand the basic principles as well as their individual responsibilities for their personal safety and the safety of other crew and the vessel. Questions should be directed to the Master or the Chief Scientist, as appropriate.

13.2 Scientific Diving Operations

13.2.1 Applicability

This element is applicable to all categories of EPA vessels from which scientific diving operations are conducted. It does not apply to commercial diving activities conducted in support or maintenance of EPA vessels. These commercial diving activities are, instead, covered by the provisions of OSHA's Commercial Diving Standard, 29 CFR 1910.401-442.

Note: The EPA diving program is based on the exceptions, and requirements, set forth in the Commercial Diving Standard for scientific diving, that states, in part, *"Scientific diving means diving performed solely as a part of scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: placing or removing heavy objects underwater; inspections of pipelines and similar objects; construction; demolition; cutting and welding; or the use of explosives".*

Accordingly, activities such as clearing a vessel's fouled anchor or propeller and vessel repair are not covered by the EPA diving program.

13.2.2 Purpose

EPA scientific diving operations are conducted under the requirements set forth in the EPA "Diving Safety Manual - Version 1.0", dated August, 1997. The purpose of this section of the vessel safety manual is to establish criteria to ensure that EPA vessels, and assigned crew, are qualified and equipped to support scientific diving operations conducted in accordance with the EPA Diving Safety Manual.

13.2.3 Program Elements

13.2.3.1 Procedures

<u>These procedures are based on the fact that the Master of the vessel retains ultimate authority for all diving operations conducted from the vessel</u>, which includes terminating all diving operations if, in the Master's judgment, conditions endanger the vessel or personnel. In practical terms, and to minimize risk, this means that <u>the approval of two persons are required to commence a dive operation - The Master of</u>

the vessel and the Divemaster. Either one of these responsible individuals can terminate a dive operation.

As different types of diving operations may be performed from many different types of EPA vessels, it is very important that the Divemaster and the vessel's Master fully understand what is to be accomplished and the characteristics of the involved vessel - to include any limitations. Accordingly, the following procedures are general in nature:

13.2.3.1.1 Dive Plan. At least two weeks prior to embarking on a dive operation, the Divemaster will provide the Master with a dive plan for his or her coordination. From an EPA vessel perspective, the dive plan will include at least the following information:

13.2.3.1.1.1 Location(s) and date(s) of the dive(s);

13.2.3.1.1.2 Number and organizational make-up of the dive party (It is also important for the Master to know if other agency reciprocity personnel are included);

13.2.3.1.1.3 The identification of potential hazards;

13.2.3.1.1.4 The identification of potential sources of pollution;

13.2.3.1.1.5 A description of the expected environmental conditions, e.g.:

- Tidal heights;
- Water currents;
- Expected water temperature;
- Maximum dive depths;
- Expected in-water visibility;
- Expected weather; and
- Expected boat/vessel traffic.

13.2.3.1.1.6 Equipment such as communications gear, SCBA air supply, gear storage space, small boat, etc., that the Master is expected to provide, and/or any other special requirements of the vessel or the vessel's crew.

If the Master perceives any problems with the dive plan, in particular with the expected location and expected environmental conditions, he or she will immediately notify the Divemaster.

13.2.3.1.2 Class B & C Vessels Pre-Dive Survey. If dives have not been previously accomplished from a particular EPA Class B or C vessel, a pre-dive survey will be completed by the Divemaster, in conjunction with the Master, prior to embarking on a dive cruise. The purpose of the pre-dive survey is to:

13.2.3.1.2.1 Ensure there is a practical and safe means for divers to enter the water and re-board the vessel while wearing SCBA;

13.2.3.1.2.2 Inspect, if provided by the vessel, the equipment for providing SCBA air;

13.2.3.1.2.3 Evaluate the means for signaling between the Master (and/or the Watch Officer) and the Divemaster - Evaluate also lines of site from the bridge to the diving staging area on the vessel (**Note**: The Master or watch officer must have a reliable means to provide a positive response before any diver leaves the vessel):

13.2.3.1.2.4 If the vessel's small boat is to be used to support the dive, examine the boat and ensure that it is equipped as necessary for the intended operation;

13.2.3.1.2.5 Evaluate the vessel's ability to provide for the emergency communications capabilities required by the EPA Diving Safety Manual;

13.2.3.1.2.6 Evaluate the vessel equipment, if any, required to support a diving emergency;

13.2.3.1.2.7 Evaluate available first aid supplies. - If additional, specialized, first aid supplies are required for the dive, it is the responsibility of the Divemaster to ensure that they are brought aboard and are properly stowed; and

13.2.3.1.2.8 Identify applicable vessel equipment that should be secured and/or controlled during diving operations - For example:

- Rudder;
- Trash Disposal Unit;
- Tank Blows;
- Tank Vents;
- Propeller shaft(s);
- Sea Suctions;
- Sea Discharges;
- Under water (U/W) electrical equipment; and
- Other UW equipment - not listed.

13.2.3.1.3 Crew Procedures. The Master will ensure that procedures are developed and implemented to support the diving operation. These procedures should include:

13.2.3.1.3.1 Communications between the Divemaster and the Watch Officer;

13.2.3.1.3.2 A means to signal all crew, in particular the engine room, that diving operations will commence. The EPA Diving Manual prescribes the following announcement, which should be amended to address the equipment on specific EPA vessels:

"There are divers working over the side. DO NOT operate any equipment over the side, rotate screws, cycle rudder, take suction from or discharge to the sea, blow or vent any tanks, activate sonar or underwater electrical equipment, open or close any valves or cycle trash disposal units before checking with the Dive Master______________(Name)".

13.2.3.1.3.3 Procedures for the small boat operator, if applicable, including the means to communicate reliably with the Watch Officer. **Note:** Appendix B contains a safety plan for small boat operations, prepared by the crew of the EPA Vessel Peter W. Anderson, that should be used as a guide for this requirement;

13.2.3.1.3.4 Setting the required diving operation signals;

13.2.3.1.3.5 Crew member responsibilities in the event of a dive emergency;

13.2.3.1.3.6 Completion of the Dive Safe Ship Operations - Checklist (NOAA Form 64-3), required by Paragraph 13, Appendix A-2, of the EPA Diving Safety Manual. **Note:** A copy of this checklist is at Appendix B of this manual; and

13.2.3.1.3.7 Proper stowage of divers gear.

13.2.3.1.4 Equipment Requirements. The following minimum list of equipment is required to support an EPA diving operation conducted in accordance with the EPA Diving Manual:

13.2.3.1.4.1 Dive operations signaling equipment for both national and international waters/or traffic;

13.2.3.1.4.2 Emergency communications gear that meets the communications requirements of the EPA Diving Safety Manual (e.g., Divers Alert Network and Medical Advisory System, etc.);

13.2.3.1.4.3 First Aid Equipment - Vessels will be equipped with the level of first aid equipment as set forth in this manual. If additional, specialized, first aid supplies are required for diving operations, it is the responsibility of the Divemaster to ensure that they are brought aboard and are properly stowed;

13.2.3.1.4.4 If applicable, a means of supplying diver's air that meets the quality specifications set forth in the EPA Diving Manual;

13.2.3.1.5 Training. Applicable crew members, as designated by the Master, will be provided sufficient training to enable them to carry out their responsibilities in support of EPA scientific diving operations from their vessel. This training will be documented in the ship's Log.

13.2.4 Program Responsibilities

While afloat, The Master has the ultimate responsibility and authority for the safe operation of the vessel and embarked persons, to include all scientific diving operations conducted from the vessel. To this end, the Master will ensure that he or she fully understands the proposed diving operation, and that the vessel is equipped, and the vessel's crew is prepared, to effectively support the operation.

13.3 Vessel Chemical Hygiene Plan (VCHP)

13.3.1 Applicability

This element is applicable to all EPA vessels that have a laboratory aboard. This includes all laboratories internal to the vessel's original structure as well as van or container laboratories secured to a weather deck(s).

13.3.2 Purpose

The purpose of this program is to ensure that the safety measures required by the various EPA laboratories ashore, as set forth in their Chemical Hygiene Plans (CHP) required by 29 CFR 1910.1450, are integrated with and are carried over to laboratory operations afloat.

Further, the VCHP must address the additional and/or different risks associated with operating a laboratory on a vessel.

As determined by each Chief Scientist, the chemical hygiene plan required by this element may be:

- A stand-alone document for a specific EPA vessel; or
- An appendix or chapter in the laboratory's primary CHP.

Regardless of the method used, the document:

- Must address the specific design, installed equipment, and contemplated laboratory operations of the shipboard laboratory(s) on a specific EPA vessel;
- Should ensure that chemical exposures encountered on the vessel are considered in concert with exposures to the same individual(s) in their laboratory work ashore;
- Be reviewed, and approved, by the Master with respect to those issues that can effect the safety of the vessel and/or crew, e.g., amount and type of hazardous materials brought on board, Hazardous material storage procedures, etc; and
- Must be available on the vessel.

13.3.3 VCHP Elements

The following elements, included in most chemical hygiene plans ashore, are discussed from the perspective of the potential additions and/or the differences associated with operating a shipboard laboratory. Each Chemical Hygiene Officer should review this listing and make a decision regarding the relative effectiveness of preparing a stand-alone document for the laboratory(s) on a specific EPA vessel or an appendix or chapter in the laboratory's primary CHP.

13.3.3.1 Chemical Hygiene Officer (CHO) - A CHO, who will be present during the cruise, should be appointed to provide expertise in areas of laboratory safety and industrial hygiene and to ensure that the requirements of the VCHP are carried out. The Chemical Hygiene Officer should be familiar with the vessel and vessel laboratory operations, and should report to the Chief Scientist.

13.3.3.2 Standard Operating Procedures (SOP) - Shipboard operations may require additional precautions, over operations ashore, such as handling acids in heavy seas, power interruptions, different equipment, exposures from sampling, equipment storage, emergency equipment, emergency evacuation, drills, etc.

13.3.3.3 Ventilation - The VCHP should address the differences in the ventilation systems on the vessel and how these differences may effect staff exposures, to include how and how often the system must be evaluated. Also, consider the effect of laboratory ventilation on non-laboratory areas of the vessel.

13.3.3.4 Spills - The clean up and disposal of spilled materials on a vessel present significantly different risk issues and should be addressed in the document.

13.3.3.5 Distribution and Storage of Hazardous materials - This is an area that can significantly effect the safety of the vessel and crew and should address specifically:

- The amount and type of materials to be brought aboard;
- Procurement and maintenance of a Material Safety Data Sheet (MSDS) for all hazardous materials brought on board. A copy of the MSDS must be furnished to the Master and a copy must be readily available to the scientific staff.
- The distribution of the material to be brought aboard, e.g., laboratory and storage area(s);
- Approval of storage areas;
- Segregation of materials;
- Security against moving and breakage in heavy seas;
- Labeling;
- Periodic inventories to ensure un-needed materials are not kept on board and/or are removed at the end of the voyage;
- On-board movement of materials in heavy weather, etc.

13.3.3.6 Environmental Monitoring - Differences between ashore and vessel monitoring requirements with respect to materials, hoods, ventilation systems, etc.

13.3.3.7 Protective and Emergency Equipment - Address the differences in equipment. For example:

- Location and type of drench-type safety shower(s) - And testing requirements;
- Location and type of emergency eyewash(s) - And testing requirements;
- Fire fighting systems (blankets, extinguishers, fixed systems, etc);
- Type and audibility of alarms and expected response (Include alarms associated with vessel operations and how various vessel emergencies may effect critical laboratory operations);
- Inter-vessel communications, e.g., intercom and telephones;

13.3.3.8 Records - Record keeping requirements afloat should be in consonance with, and support record keeping by the CHP - ashore, to include:

- Maintaining an accurate record of any measurement taken to monitor employee exposures and any medical consultation and examinations required by the basic CHP; and
- A system to maintain and transfer records to the ashore facility at the end of a survey voyage or trip.

13.3.3.9 Laboratory Waste Disposal - Prepare and enforce a written procedure for disposing of laboratory waste for the vessel, to include:

- Specifying how waste is to be collected, segregated, stored, and transported; and
- Precautions for use of sinks, sifting trays, etc.

13.3.3.10 Fume Hoods - Hoods should be selected, installed, operated, and maintained in accordance with the same criteria used in the laboratory ashore.

13.3.3.11 Respirators - Respirators should be selected, used, and maintained in accordance with the same basic criteria used in the laboratory ashore - to include all medical approval and fit test requirements.

Important Note: When selecting respirators for use aboard an EPA vessel, the Chemical Hygiene Officer should also consider the environment that the respirator will be used in. For example, the effect of salt spray on a charcoal canister filter.

13.3.4 Program Responsibilities

13.3.4.1 The vessel's Master shall review and approve the VCHP with respect to those issues that can effect the safety of the vessel and/or crew, e.g., amount and type of hazardous materials brought on board, Hazmat storage procedures, etc; and

13.3.4.2 The Chief Scientist Shall be responsible for ensuring that:

- A Chemical Hygiene Officer is appointed for the cruise;
- A VCHP has been prepared for the vessel that accurately and completely addresses the appropriate laboratory safety issues and is in consonance with the intended operations and the design and equipment of the vessel; and
- Scientific staff are familiar with the requirements of the VCHP and comply with it's provisions.

13.4 Tag Out

13.4.1 Applicability

This program is applicable to all EPA Class C Vessels.

It is also applicable to smaller EPA vessels, as deemed appropriate by the Regional Vessel Management Official, when application of the Tag Out Program will reduce the risk of EPA vessel operations and/or maintenance.

13.4.2 Purpose

The purpose of the Tag Out Program is to prevent injury to personnel and/or damage to equipment by notifying personnel that equipment or systems are not in a normal operating condition.

Very Important Note: This Program should not be confused with the Lock Out Tag Out Program (LOTO), which is covered in Section E., below. The use of tags or labels under this Tag Out program is not a substitute for the additional safety measures required under the LOTO Program, such as chaining or locking valves, removing fuses or racking out circuit breakers.

13.4.3 Program Elements

The Tag-Out Program consists of the following elements:

13.4.3.1 Use of Yellow Tags and/or Labels

The Tag-Out procedure consists of a series of yellow tags or adhesive labels that are applied, as appropriate, to equipment, switches, valves, instruments, gages or meters to indicate that the equipment is inoperative, has restricted use, is out of calibration, etc. The yellow tags or labels, available from commercial sources, must contain the information necessary to avoid injury to personnel and/or damage to equipment.

Tag-Out procedures are to be used for all corrective maintenance including work done by an outside maintenance or repair activity.

Tag-Out procedures shall be enforced at all times.

All components necessary for the isolation of a system must be tagged. Only in this manner can safety to be assured. Once tags are attached, only authorized individuals may remove the tags and place the system back in operation.

13.4.3.2 Recordkeeping

A Tag-Out Log, indicating which equipment is tagged out, must be established for the vessel. The Log will include:

13.4.3.2.1 A listing of all disabled switches, valves, or other components;

13.4.3.2.2 The date on which the equipment was placed out-of-service, tag locations, valve/switch positions, and the name of the person who attached the tag(s);

13.4.3.2.3 The date on which the equipment was placed back in service and the tag(s) were removed - and the name of the person who removed the tag(s);

13.4.3.2.4 A section to document training on the Tag Out program.

13.4.3.3 Training. All hands must receive training on the Tag-Out program upon reporting aboard and annually thereafter. This training will be documented in the ship's Tag-Out Log. Additionally, scientific staff embarked must be familiar with the program as science related equipment, e.g., fume hoods, cranes, etc., may be involved.

13.4.4 Program Responsibilities

13.4.4.1 The vessel's Master shall ensure that all hands comply with the Equipment Tag-Out procedures.

13.4.4.2 The Chief Engineer Shall:

13.4.4.2.1 Manage the Tag-Out Program;

13.4.4.2.2 Establish and supervise a Tag Out Log and ensure that sufficient supplies of tags, labels and forms are available to properly execute the program; and

13.4.4.2.3 Personally check the Tag-Out Log at least once a month, note errors, bring errors to the attention of responsible personnel and remove completed Tag-Out Record Sheets and Instrument Logs.

13.5 Control of Hazardous Energy (Lock-Out-Tag-Out)

13.5.1 Applicability

This program is applicable to all Class B and C Vessels. The requirements apply to the vessel crew, or the organization that provides maintenance for the vessel.

13.5.2 Purpose

The purpose of the Lock-Out Tag-Out (LOTO) Program is to prevent injury to personnel by ensuring that equipment that has been de-energized for maintenance cannot be inadvertently re-energized.

The LOTO process is the placement of a lock and red tag on the energy isolating device in accordance with an established procedure after the device has been de-energized. The presence of the lock and tag indicates that the energy isolating device shall not be activated until removal of the lock and tag takes place by the individual who was responsible for the initial placement. An isolating device can be an electrical circuit breaker, disconnect switch, a line valve, or similar device used to block or isolate energy.

The applicable OSHA Standard for Control of Hazardous Energy Sources is 29 CFR 1910.147. This element describes how this standard will be applied on EPA vessels.

Warning: Removing the power source from any type of equipment does not necessarily remove any energy that may be stored in the equipment such as electrical energy stored in a capacitor, kinetic energy stored in flywheels, mechanical energy due to pressure differences, heat energy and hot surfaces, and potential *energy stored in pendulums, and heavy objects not at their lowest position. Therefore, it is imperative that crew members responsible for removing power sources are thoroughly knowledgeable of the system characteristics. Any stored energy should be released. If this is not possible, it should be controlled by blocking or other means and all persons that could be injured from such unexpected energy releases must be free and clear of the danger zones.*

13.5.3 Program Elements

The LOTO Program consists of the following elements:

13.5.3.1 General Requirements

13.5.3.1.1 An initial survey of the vessel shall be made to identify all energy sources and related exposures to determine if machines, equipment, and processes can be isolated.

13.5.3.1.2 The requirements for red tags, chains, locks, adapters, pins, and the like, shall be ascertained, based on the initial survey, and an adequate supply shall be maintained, distributed or assigned as needs dictate.

13.5.3.1.3 The red tags used for this program shall be uniform throughout the vessel (i.e., size, shape, color, and format). Also, they shall be durable enough to withstand the environment to which they may be exposed for the maximum period of time that exposure is expected.

13.5.3.1.4 Red tags must warn against hazardous conditions if the equipment/process is re-energized and shall include the legends: **DO NOT START, DO NOT OPEN, DO NOT CLOSE**, or similar language.

13.5.3.1.5 Only the person who has locked out a piece of equipment is authorized to remove the lock. To assure compliance, only those employees actually engaged in the repair, maintenance or replacement of the equipment or process shall have the key to the locking device.

13.5.3.1.6 LOTO procedures are to be used for all corrective maintenance including work done by an outside maintenance or repair activity.

13.5.3.1.7 LOTO procedures must be enforced at all times.

13.5.3.1.8 All components necessary for the isolation of a system must be locked out. Only in this manner can safety be assured. Once red tags are attached, only authorized individuals may remove the red tags and place the system back in operation.

13.5.3.2 Procedures

13.5.3.2.1 All Personnel affected by the LOTO shall be informed before the LOTO takes place.

13.5.3.2.2 Using appropriate equipment/process shutdown procedures, all operating controls shall be turned off or returned to the neutral mode.

13.5.3.2.3 All involved energy isolating devices shall be located and operated in such a manner as to isolate the equipment or process from the energy source.

13.5.3.2.4 Appropriate locking devices shall be applied to each energy isolating control. The preferred method shall be by lockout and tag-out. Tag-out without lockout shall be considered only as a last resort. Lockout devices shall be attached in such a manner as to prevent the operation of energy isolating devices. Tag-out devices shall be attached to the energy isolating device except, that where the installation does not permit this attachment, they shall be so located in such a manner as to be immediately obvious to anyone attempting to operate the energy isolating device. Where Lock Out tags are used, the crew member responsible for completing tag information shall include:

- Date and time of LOTO;
- Printed name of Crew member performing the LOTO; and
- Reason for LOTO.

13.5.3.2.5 Using due care, the following actions shall be taken after LOTO to determine if the operation of the energy isolating devices has, in fact, produced the required isolation of the equipment or process:

- Operate the equipment or process operating controls (push buttons, switches, etc.) to determine that the energy isolation has been effective, and
- Test the equipment or process by use of appropriate test equipment and/or visual inspection to determine that the energy isolation has been effective.

Warning: Return operating controls to off or neutral position after each test.

13.5.3.2.6 The equipment or process shall be carefully examined to detect and relieve, disconnect, or restrain any residual energy.

13.5.3.2.7 Where hydraulic, steam, water, pneumatic, gas, etc., isolation valves are involved, they shall be tightly closed, chained, locked and appropriately tagged.

13.5.3.3 Release of LOTO

Warning: Energy stored in a locked or tagged out system must be considered prior to restoring the power to the system, regardless of the source. It is essential the involved crew member is well versed in the possibility of unexpected movement or power when the locking mode is removed.

13.5.3.3.1 Before energy is restored to the equipment/process, a visual inspection of the work area shall be made to ensure that all nonessential items have been removed and that all components are operationally intact. At this time, advise all affected personnel that locks and tags are to be removed for the purpose of restoring energy.

13.5.3.3.2 Devices shall be removed from each energy isolating device by the individual who initially applied the device.

13.5.3.3.3 After ensuring that all affected personnel have been advised of the LOTO removal, restore energy to the equipment/process.

13.5.3.4 Recordkeeping. A LOTO log, indicating which equipment is locked out, must be established for the vessel. The Log will include:

13.5.3.4.1 The date and time on which the equipment was placed locked out and the name of the person who attached the locks and tag(s);

13.5.3.4.2 The date on which the equipment was placed back in service and the locks and tag(s) were removed - and the name of the person who removed the locks and tag(s);

13.5.3.4.3 A section to document training on the LOTO program.

13.5.3.5 Training. All crew members must receive training on the LOTO program upon reporting aboard and annually thereafter. This training will be documented in the ship's LOTO Log. Additionally, scientific staff embarked must be familiar with the program as science related equipment, e.g., fume hoods, cranes, etc., may be involved.

13.5.4 Program Responsibilities

13.5.4.1 The vessel's Master shall ensure that all hands comply with the LOTO procedures.

13.5.4.2 The Chief Engineer Shall:

13.5.4.2.1 Manage the LOTO Program; and

13.5.4.2.2 Ensure that a sufficient supply of locks, locking devices and red tags are available to properly execute the program.

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13.6 Confined Spaces

13.6.1 Applicability

This program is applicable to all EPA vessels that have a confined space capable of being entered.

13.6.2 Purpose

The purpose of this program is to ensure that no one enters or works in a confined space with an atmosphere that exposes a person to death, incapacitation, impairment of ability to self-rescue, or acute illness. By design, some vessels have confined spaces (especially tanks and voids) in which both toxic and non-toxic gas or vapor creating substances are used in the normal operation of the vessel, or that may accumulate as a result of system failures. Hazardous atmospheres may be created that can explode or cause asphyxiation. Compounding the problem is that many gases or vapors are not detected by the human ability of smell, and personnel attempting to save a fallen shipmate may themselves be overcome by undetected vapors. It is for these reasons that the atmosphere of every confined space must be tested before entry, and there must be an effective means of safe rescue immediately available.

This program element was developed from 29 CFR 1915, Subpart B - Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment, and is intended to describe the minimum requirements for EPA vessels.

13.6.3 Program Elements

The Confined Space Entry Program consists of the following elements:

13.6.3.1 Initial Survey and Marking: All EPA Class B and C Vessels will be surveyed to identify potential confined spaces (For example: tanks; voids; cofferdams; and double bottoms). The entry's to all such spaces, e.g., hatches, manholes, etc., will be labeled, "DANGER - CONFINED SPACE - DO NOT ENTER" in prominent letters. The remaining elements apply to entry into a confined space.

13.6.3.2 Entry Restrictions: In normal practice, entry to vessel confined spaces is a part of normal maintenance evolutions and should be conducted only while the vessel is along side a pier or in a yard. The purpose of this restriction is to conduct the entry only when competent technical advise and local rescue capabilities are readily available in the event of a mishap.

Confined space entries while underway shall be considered to be an emergency procedure, and shall be attempted only when the Master determines that such entry is necessary for the safety of the vessel.

13.6.3.3 Required Equipment: The following equipment is the minimum required for confined space entry:

13.6.3.3.1 Properly calibrated test equipment capable of measuring oxygen levels, flammable atmospheres, and any involved toxics;

13.6.3.3.2 Ventilation equipment capable of ventilating the confined space;

13.6.3.3.3 Rescue equipment suitable for rescue of an incapacitated person(s) in the space, from without the space, e.g., life line and harness, rescue tripod, etc; and

13.6.3.3.4 A means to communicate with the person(s) who enter a confined space.

13.6.3.4 Qualifications: Only the following persons are authorized to test and certify the atmosphere in a confined space on an EPA vessel:

13.6.3.4.1 A Marine Chemist;

13.6.3.4.2 A Certified Industrial Hygienist; or

13.6.3.4.3 A person designated by the Vessel Management Official as a "Competent Person". Competent Persons must be qualified IAW 29 CFR 1915.7

13.6.3.5 Procedures:

13.6.3.5.1 Ventilation - The space will be opened and ventilated to the outside atmosphere with a portable blower.

13.6.3.5.2 Testing - After ventilation, and prior to entry, the space must be tested, in the following sequence

- Oxygen - A space will not be entered if the oxygen content is below 19.5% or above 22.0%
- Flammable Atmospheres - A space will not be entered when the concentration of flammable vapors or gases is equal to or greater than 10% of the lower explosive limit.
- Other - A space will not be entered until a competent person has determined that toxic vapors or gases do not present a dangerous atmosphere.

13.6.3.5.3 Certification - After testing, the person who performed the test will complete a "Gas Free Certificate" (Available from commercial sources). The certificate will be:

- Signed by the person who completed the tests;
- Signed by the person who will enter the space;
- Posted in plain view of the confined space entry point; and
- Retained by the Chief Engineer upon completion of the work.

13.6.3.5.4 Entry - Persons entering a confined space will be equipped with a harness and lifeline to facilitate rescue in the event of a mishap. At least one person will remain immediately outside the entry point to man the lifeline and communication system. If required, a tripod or chain hoist device will be immediately available to assist in any required rescue.

13.6.3.6 Training. The Chief Engineer is responsible for ensuring that personnel involved in confined space entry receive training upon reporting aboard and annually thereafter. Records of such training shall be maintained. Training will consist of at least the following topics:

- How to identify confined/enclosed areas.

- Hazards encountered when entering confined/enclosed spaces.
- Procedures for requesting gas-free testing.
- Procedures for helping shipmates in an emergency to include CPR. Training must stress to all personnel that if a person is seen unconscious in any space, no one is to enter that space without appropriate respiratory protective equipment and a backup assistant.

13.6.4 Program Responsibilities

13.6.4.1 If the vessel design is such that there are confined spaces where toxic and non-toxic gases may accumulate, the vessel's Master is responsible for a comprehensive confined-space entry program. The vessel's Master shall ensure that:

13.6.4.1.1 There is at least one trained, qualified and certified "Competent Person" on board.

13.6.4.1.2 Confined-space entry practices are established.

13.6.4.1.3 The program is evaluated annually for compliance and effectiveness.

13.6.4.2 The Chief Engineer shall ensure that:

13.6.4.2.1 Applicable crew members are trained concerning confined-space entry procedures and precautions. Additional support may be obtained from qualified marine chemists or industrial hygienists.

13.6.4.2.2 All entryways to confined spaces are properly labeled.

13.6.4.2.3 All equipment required for proper evaluation of confined spaces and rescue is aboard the ship, inventoried annually, and properly maintained.

13.6.4.2.4 Gas-free certificates are posted in necessary areas.

13.6.4.2.5 Records of gas-free space testing are kept.

13.6.4.2.6 Assigned personnel receive training on the confined-space entry program upon reporting aboard and annually thereafter.

13.6.4.3 All hands are responsible to ensure that:

13.6.4.3.1 The Chief Engineer is notified prior to entering any unventilated, non-occupied space that has been designated to store hazardous or toxic materials or any sealed space.

13.6.4.3.2 The Chief Engineer is notified prior to conducting hot work on a bulkhead, deck, or overhead, adjacent to a space containing flammable or potentially explosive atmospheres (such as a fuel oil or contaminated holding tank).

13.6.4.3.3 Gas-free engineering certificates posted on spaces are complied with at all times.

13.6.4.3.4 Gas-free engineering retesting of spaces is accomplished prior to the end of the period for which a gas free certificate is valid. If a change is made to a space, the space shall be retested and re-certified prior to any additional work in the space.

13.6.4.3.5 Notify the Chief Engineer prior to entering any unventilated, non-occupied space designated to store hazardous or toxic materials or any sealed space. Verify that such a space was checked by a Competent Person prior to entry, and comply with the gas-free engineering certificates posted outside the space.

13.6.4.3.6 Notify the Chief Engineer before any new space is used to store hazardous or toxic material or of any spill of hazardous or toxic material.

13.7 Electrical Safety

13.7.1 Applicability

This element is applicable to all Class C EPA vessels.

Specific procedures should be written when using fish shocking equipment.

13.7.2 Purpose

The purpose of this element is to provide guidance to assist in the identification of electrical hazards, and to prevent mishaps that could cause fatal injuries and extensive damage to shipboard equipment and compromise the ship's mission capabilities.

13.7.3 Program Responsibilities

13.7.3.1 The vessel's Master shall assign an electrical safety officer.

13.7.3.2 The electrical safety officer shall:

13.7.3.2.1 Ensure that this program is evaluated for compliance and effectiveness;

13.7.3.2.2 Provide electrical safety training;

13.7.3.2.3 Ensure that all electrical equipment (The vessels, scientific, or personal) received aboard the vessel is inspected and approved for use aboard the vessel;

13.7.3.2.4 Ensure that all electrical equipment is periodically inspected;

13.7.3.3 Electrical safety is the responsibility of all aboard. All hands and scientific staff shall request permission to bring electrical/electronic equipment aboard.

13.8 Smoking Policy

13.8.1 Purpose

EPA considers occupational health of primary importance in the establishment of its smoking policy, since the Surgeon General has determined that smoking is hazardous to smokers' health, and there is evidence that secondary smoke is harmful to nonsmokers.

13.8.2 Policy

It is EPA policy that smoking shall be prohibited on EPA vessels in all food service and preparation areas, in laboratories, in conference rooms, and in staterooms.

13.9 Accident Reporting Requirements

13.9.1 Applicability

This element is applicable to all EPA vessels, owned or chartered.

13.9.2 Procedures

Any accident on an EPA vessel that results in: (1) Death; (2) An OSHA Reportable Injury or Occupational Illness to any person on-board; (3) Any damage to non-EPA property; or (4) Significant damage to EPA property:

13.9.2.1 Shall be reported immediately to the appropriate EPA Ship Vessel Management Official by the Vessel Master, Chief Scientist or the injured party and confirmed in writing within 48 hours after the accident occurs. Such written reports shall provide full details of the accident, including witnesses' statements.

13.9.2.2 The EPA Vessel Management Official shall immediately notify the local SHEMD Manager. The local SHEMD Manager shall notify Headquarters, SHEMD.

13.9.2.3 SHEMD will determine the need for additional notifications and/or investigations. Based on the circumstances, vessel ownership, who is injured, what is damaged, etc., notification may be required to the USCG and/or DOL. Note: Accidents involving a death or the in-patient hospitalization of three or more employees must be reported to OSHA within 8 hours.

13.9.2.4 In addition, in accordance with U. S. Department of Labor, Occupational Safety and Health Administration requirements, EPA personnel shall complete Form CA-1, "Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation", following any applicable injury on board. This form shall be filed with the employee's supervisor for appropriate action.

13.10 Vessel Crew Respirators

13.10.1 Applicability

This element is applicable to all EPA vessels where the non-science related work conditions may require the use of a respirator, e.g., painting, welding, etc. The selection and use of respirators for science related exposures is addressed in the Vessel's Chemical Hygiene Plan.

13.10.2 Purpose

Many vessel repair and maintenance operations generate air contaminants which may be dangerous if inhaled. These contaminates can be in the form of gases, dusts, mists, fumes or vapors. Engineering controls are the most effective means for protecting personnel against such contaminants. However, when engineering controls are not practical or feasible, respirators are necessary to ensure the protection of personnel. Respirators are available in many types and styles and must be matched to the hazard where they will be used for protection. Both the respirator construction material and the filter element composition, for those types that use a filter, must be taken into consideration.

13.10.3 Procedures

13.10.3.1 Selection - Respirators will be selected for a specific shipboard purpose in accordance with Occupational Safety and Health Administration (OSHA) requirements for the use of respirators as contained in 29 CFR 1910.134, Respiratory Protection Standard.

13.10.3.2 Medical Clearance - Vessel Masters are to ensure all crew members required to wear respirators are medically approved to do so.

13.10.3.3 Fit Testing - Qualitative fit testing, by a qualified person, is required prior to any employee's initial use of a tight-fitting respirator and at yearly intervals thereafter. A respirator shall be assigned only to the individual for whom the respirator was fit tested.

Note: Fit testing should not be confused with a fit check which is a test conducted by the wearer to determine if the respirator is properly sealed to the face. A fit check should be performed each time the respirator is donned or adjusted.

13.10.3.4 Cleaning, Inspection and Repair - Each individual who has been fitted for and assigned a respirator is responsible for cleaning and maintaining it in accordance with the manufacturer's instruction manual or pamphlet. The respirator must be inspected prior to and after each use. Any necessary repairs shall be completed in accordance with the manufacturer's instructions. Supervisor's shall conduct periodic checks for serviceability and to make sure respirators are being cleaned and maintained as required.

13.10.3.5 Recordkeeping - The Master shall ensure that a record is maintained of the results for each individual fit tested for wearing a tight-fitting respirator. The records shall be retained for a minimum of three years.

13.10.3.6 Problems With Use - If the wearer of a respirator experiences difficulty in breathing, dizziness, senses irritation, can smell or taste the contaminant(s), or the respirator becomes damaged, he/she must discontinue the procedure immediately and seek medical attention.