

# DREDGE MATERIAL MANAGEMENT PROGRAM (DMMP) SEDIMENT CHARACTERIZATION REPORT

## THATCHER BAY NEARSHORE RESTORATION PROJECT

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**Prepared for**

Dredged Material Management Office

**On Behalf of**

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**July 2009**

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## 1 INTRODUCTION

A combined cleanup and habitat restoration project is underway at the site of a former saw mill in Thatcher Bay on Blakely Island, Washington. This nearshore restoration project is being performed by the Skagit Fisheries Enhancement Group.

Historic saw mill activities in Thatcher Bay date back to 1879 and continued for more than 60 years until the mill closed in 1942. The saw mill activities resulted in accumulation of wood waste in an intertidal area as shown in Figure 1. The distribution and thickness of accumulated wood waste have been previously investigated (University of Washington 2008). Because this wood waste is reducing the quality of this high value intertidal habitat, it is desirable to remove the wood waste-contaminated sediment and to replace it with a sediment substrate that will provide more suitable habitat. The project includes removal and off-site disposal of the wood waste-contaminated intertidal surface sediment. The excavated intertidal areas will be backfilled with clean sand and gravel to restore nearshore habitat. The combined plan includes dredging of up to approximately 12,900 cubic yards (cy) of mixed surficial woody debris and sediments, as depicted on Figure 1.

This report provides the results of Dredge Material Management Program (DMMP) suitability characterization sampling and analysis. The scope of the sampling and analyses is described in the sampling and analysis plan (SAP; Breems 2008) and in an addendum to the SAP (Anchor QEA 2009). The purpose of this evaluation is to assess whether the offshore dredged sediments could potentially be transported by barge and disposed of at the Port Gardner non-dispersive DMMP disposal site or to the Rosario Strait dispersive DMMP disposal site after larger wood and any debris greater than 2 feet in any dimension, are removed.

### 1.1 Overview of DMMP Sediment Characterization

As discussed above, up to approximately 12,900 cy of mixed surficial woody debris and sediments will be dredged, as depicted on Figure 1. This document provides the results from the chemical sediment characterization work and includes a summary of the field sampling collection performed and validated chemical analyses. This document also contains the sediment sampling report (Appendix A), core processing report (Appendix B), summaries of

the chemical analyses and the raw data from the chemical analyses (Appendix C), results from the data validation (Appendix D), and dioxin/furan standard reference material analyses (Appendix E). All sample collection, handling, and chemical analyses followed the most recent Puget Sound Estuary Program (PSEP) protocols (PSEP 1986 as updated in 1989, 1991, 1995, and 1997) and the 2008 DMMP User's Manual and Clarification Papers (DMMO 2008; Hoffman 1998; Kendall 1997 and 2001). Chemical analyses followed the 2008 DMMP User's Manual and Clarification Papers.

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## **2 SEDIMENT SAMPLE COLLECTION AND HANDLING**

This section summarizes the sediment sampling and processing activities conducted in connection with the chemical characterization of the sediments proposed for dredging. Sampling and processing were carried out in accordance with the SAP (University of Washington 2008) and the SAP Addendum (Anchor QEA 2009). Deviations from the SAP are discussed below and are summarized in Section 2.3.

### **2.1 Sample Collection**

Sediment cores at designated stations (8, 10, 12, 21, and 30) were collected on April 27, 2009. At each station, the target total core depth ranged from 5 to 7.5 feet in-situ (i.e., compaction corrected) below the mudline. These depths target the bottom of the wood waste plus a 2-foot allowable overdredge.

Locations of the actual core sampling locations are shown in Figure 1. It was necessary to move some of the sample locations slightly due to refusal after multiple core attempts or insufficient recovery of material at the target station location. The cause of refusal at these locations is unknown and may have been wood or rock that prevented further penetration of the vibrocore. The locations at which cores were collected are well distributed geographically with a bias towards those areas that contain deeper depths of wood waste (as determined by Breems and Warinner 2008 and depicted in Figure 1). The original sampling by Breems (University of Washington 2008) was done with a much smaller 3 cm diameter split auger and SAP sampling required a 3 inch diameter core to obtain the required sediment volume and it is very likely that these two methods have differences their ability to penetrate the sediment substrates at Thatcher Bay. At location 30, the target penetration depth (5 feet) was not achieved after multiple attempts and the longest core collected (total penetration of 2.3 feet) was retained, as described in Appendix A. Appendix A provides the field sampling report and Table 1 presents coordinates for actual sampling locations.

### **2.2 Core Processing and Handling Procedures**

One core was collected at each station shown on Figure 1. Cores were stored on ice in the field and during transport to the core processing facility. Cores were processed on April 28, 2009 as described in Appendix B. The sediment collected from the target sample interval

within each core was homogenized, and a proportionate volume of each individual core was placed into a decontaminated stainless steel bowl for compositing as described in the SAP. The composite sample created was submitted for analysis.

### **2.3 Deviations from the Sampling and Analysis Plan**

The only deviation from the SAP was that the target total penetration was not achieved at location 30, as described in Section 2.1 above. There were no other deviations from the SAP or the SAP Addendum, and all sample handling and processing followed the procedures detailed in these documents.

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### 3 CHEMICAL TEST RESULTS

Sediment samples were analyzed at Analytical Resources, Incorporated (ARI) in Tukwila, Washington and, for dioxins and furans, by Analytical Perspectives in Wilmington, North Carolina. Both laboratories performed these analyses according to procedures specified in the DMMP Users Manual for chemical characterization of dredged material for open-water disposal. Composite samples results are discussed below and validated results are summarized in Table 2. Notably, none of the chemical results exceeded any of the DMMP chemical criteria and most results were very low and/or not detected, which is consistent with the pristine nature of this area. These chemical results were provided to David Fox of the Dredged Material Management Office (DMMO) and because none of the chemical results exceeded any DMMP criteria, it was determined that bioassay testing of the Thatcher Bay sediments was not required (Studley 2009). The comparison to the DMMP's interim approach for evaluation of dioxin/furan data is presented below for disposal at both the Port Gardner non-dispersive disposal site and at the Rosario dispersive site.

Pending development of programmatic guidelines, the current DMMP interim approach for evaluating dioxins/furans in dredged material is performed on a project-specific basis using the current interim DMMP guidelines adopted in March 2007. For non-dispersive sites such as the Port Gardner disposal site located near Everett, dioxin/furan suitability is currently based on a comparison of concentrations in dredge material management unit (DMMU) sediments to disposal site background, defined using sediment dioxin/furan data generated as part of DMMP site monitoring. For the Port Gardner disposal site, dioxin/furan concentrations in any given DMMU may not exceed the current disposal site maximum sediment dioxin toxic equivalent quotient (TEQ) concentration of 5.2 parts per trillion (ppt), and average concentrations weighted to the volume of each DMMU cannot exceed the current mean disposal site TEQ concentration of 4.1 ppt. The Thatcher Bay sediments contain very low TEQ concentrations of between 0.2 to 0.3 ppt TEQ depending upon which summation rule is applied (i.e., how non-detect results are represented). These TEQs are below the Port Gardner mean background concentration (4.1 ppt TEQ), which means that these sediments are potentially suitable for open-water disposal at the Port Gardner non-dispersive disposal site. Similarly, the Thatcher Bay sediments could also be disposed of at

the Bellingham Bay non-dispersive site which has a maximum TEQ of 10.5 and a mean of 6.9.

These materials are also potentially suitable for disposal at the Rosario dispersive site. The current DMMP interim approach for suitability determinations at dispersive sites is to compare to reference background, where “background” is defined using sediment dioxin data from the nearest reference site. The Thatcher Bay sediments (0.2 to 0.3 ppt TEQ) are below the nearest reference sites (locations SJI 0, SJI 20, SJF 10, and SPSB 3) measured during the OSV Bold Survey (USEPA 2008 and DMMO 2009), which contained an average dioxin/furan TEQ of 0.48 to 0.80 ppt for the two summation rules (i.e., non-detect equal to zero or to  $\frac{1}{2}$  the detection limit). Thatcher Bay sediments were also below the OSB Bold results for the Carr Inlet reference area, which contained an average dioxin/furan TEQ of 1.4 to 1.8 ppt TEQ. Since the Thatcher Bay sediments contain dioxin/furan TEQs lower than reference areas, these sediments are potentially suitable for disposal at the Rosario dispersive disposal site.

### **3.1 Summary of Suitability Determination**

Based on the chemical results summarized in Table 2, the Thatcher Bay sediments, representing up to approximately 12,900 cy, are potentially suitable for open-water disposal at the Port Gardner or Bellingham Bay non-dispersive sites or at the Rosario Strait dispersive site.

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## 4 REFERENCES

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U.S. Environmental Protection Agency (USEPA). 2008. OSV Bold Survey Report. Puget Sound Sediment PCB and Dioxin 2008 Survey. July 31 to August 6, 2008. U.S. Environmental Protection Agency New England Oceans and Coastal Protection Unit. Boston, Massachusetts

# TABLES

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**Table 1**  
**Sample Station Locations**

<b>Station ID</b>	<b>Northing</b>	<b>Easting</b>	<b>Latitude (°N)</b>	<b>Longitude (°S)</b>
8	572331.217	1160318.124	48 33.122	122 48.947
10	572312.358	1160341.867	48 33.119	122 48.941
12	572169.106	1160318.412	48 33.095	122 48.945
21	572322.625	1160261.796	48 33.118	122 48.958
30	572476.473	1160346.095	48 33.146	122 48.941

Notes:

Northings and Eastings in Washington North Zone, feet

Latitude and Longitude in WGS 84, degrees and decimal minutes

**Table 2  
DMMP Chemical Results**

Sample ID: Sample Collection Date: Sample Type:		DMMP Screening Level	DMMP Bioaccumulation Trigger	DMMP Maximum Level Marine Guideline	THATCHER 4/27/2009 Normal
<b>Conventional Parameters (pct)</b>					
Ammonia	E350.1M				60.4
Ash Content	D2974				87.1
Sulfide	E376.2				156
Total organic carbon	Plumb 1981				1.35
Total solids	E160.3				58.6
Total Volatile Solids	D2974	25%			12.9
<b>Grain Size (pct)</b>					
Total Gravel	PSEP				5.3
Total Sand	PSEP				8.2
Total Silt	PSEP				71.4
Total Clay	PSEP				14.9
Total Fines (silt + clay)	PSEP				86.3
<b>Muffled Grain Size (pct)</b>					
Total Gravel	PSEP				0.8
Total Sand	PSEP				5.4
Total Silt	PSEP				83.7
Total Clay	PSEP				10.1
Total Fines (silt + clay)	PSEP				93.8
<b>Metals (mg/kg)</b>					
Antimony	SW6010B	150		200	R
Arsenic	SW6010B	57	507.1	700	8 U
Cadmium	SW6010B	5.1	11.3	14	1.2
Chromium	SW6010B		267		23.4
Copper	SW6010B	390	1027	1300	12.1
Lead	SW6010B	450	975	1200	3 U
Mercury	SW7471A	0.41	1.5	2.3	0.03 U
Nickel	SW6010B	140	370	370	17
Selenium	SW7740		3		0.8
Silver	SW6010B	6.1	6.1	8.4	0.5 U
Zinc	SW6010B	410	2783	3800	43
<b>PCB Aroclors (µg/kg)</b>					
Aroclor 1016	SW8082				20 U
Aroclor 1221	SW8082				20 U
Aroclor 1232	SW8082				20 U
Aroclor 1242	SW8082				20 U
Aroclor 1248	SW8082				20 U
Aroclor 1254	SW8082				20 U
Aroclor 1260	SW8082				20 U
Total PCB (U = 0)	SW8082	130		3100	20 U
<b>PCB Aroclors (mg/kg-OC)</b>					
Aroclor 1016	SW8082				1.5 U
Aroclor 1221	SW8082				1.5 U
Aroclor 1232	SW8082				1.5 U
Aroclor 1242	SW8082				1.5 U
Aroclor 1248	SW8082				1.5 U
Aroclor 1254	SW8082				1.5 U
Aroclor 1260	SW8082				1.5 U
Total PCB (U = 0)	SW8082		38		1.5 U
<b>Aromatic Hydrocarbons (µg/kg)</b>					
Total LPAH (U = 0)		5200		29000	19 U
Naphthalene	SW8270D	2100		2400	19 U
Acenaphthylene	SW8270D	560		1300	19 U
Acenaphthene	SW8270D	500		2000	19 U
Fluorene	SW8270D	540		3600	19 U
Phenanthrene	SW8270D	1500		21000	19 U
Anthracene	SW8270D	960		13000	19 U
2-Methylnaphthalene	SW8270D	670		1900	19 U
Total HPAH (U = 0)	SW8270D	12000		69000	19 U
Fluoranthene	SW8270D	1700	4600	30000	19 U
Pyrene	SW8270D	2600	11980	16000	19 U
Benzo(a)anthracene	SW8270D	1300		5100	19 U
Chrysene	SW8270D	1400		21000	19 U
Benzo(b)fluoranthene	SW8270D				19 U
Benzo(k)fluoranthene	SW8270D				19 U
Total Benzofluoranthenes (b,j,k) (U = 0)	SW8270D	3200		9900	19 U
Benzo(a)pyrene	SW8270D	1600		3600	19 U
Indeno(1,2,3-c,d)pyrene	SW8270D	600		4400	19 U
Dibenzo(a,h)anthracene	SW8270D	230		1900	19 U
Benzo(g,h,i)perylene	SW8270D	670		3200	19 U
Total PAH (U = 0)	SW8270D				19 U
1-Methylnaphthalene	SW8270D				19 U

**Table 2**  
**DMMP Chemical Results**

Sample ID: Sample Collection Date: Sample Type:		DMMP Screening Level	DMMP Bioaccumulation Trigger	DMMP Maximum Level Marine Guideline	THATCHER 4/27/2009 Normal
<b>Chlorinated Hydrocarbons (µg/kg)</b>					
1,3-Dichlorobenzene	SW8260B	170			1.3 U
1,3-Dichlorobenzene	SW8270D	170			19 U
1,4-Dichlorobenzene	SW8260B	110		120	1.3 U
1,4-Dichlorobenzene	SW8270D	110		120	19 U
1,2-Dichlorobenzene	SW8260B	35		110	1.3 U
1,2-Dichlorobenzene	SW8270D	35		110	19 U
1,2,4-Trichlorobenzene	SW8260B	31		64	6.6 UJ
1,2,4-Trichlorobenzene	SW8270D	31		64	19 U
Hexachlorobenzene	SW8081B	22	168	230	0.96 U
Hexachlorobenzene	SW8270D	22	168	230	19 U
<b>Phthalates (µg/kg)</b>					
Dimethyl phthalate	SW8270D	71		1400	19 U
Diethyl phthalate	SW8270D	200		1200	19 U
Di-n-butyl phthalate	SW8270D	1400		5100	19 U
Butylbenzyl phthalate	SW8270D	63		970	19 U
Bis(2-ethylhexyl) phthalate	SW8270D	1300		8300	19 U
Di-n-octyl phthalate	SW8270D	6200		6200	19 U
<b>Phenols (µg/kg)</b>					
Phenol	SW8270D	420		1200	19 U
2-Methylphenol (o-Cresol)	SW8270D	63		77	19 U
4-Methylphenol (p-Cresol)	SW8270D	670		3600	19 U
2,4-Dimethylphenol	SW8270D	29		210	19 U
Pentachlorophenol	SW8270D	400	504	690	97 U
<b>Miscellaneous Extractables (µg/kg)</b>					
Benzyl alcohol	SW8270D	57		870	R
Benzoic acid	SW8270D	650		760	190 U
Dibenzofuran	SW8270D	540		1700	19 U
Hexachloroethane	SW8270D	1400		14000	19 U
Hexachlorobutadiene	SW8081B	29		270	0.96 U
Hexachlorobutadiene	SW8270D	29		270	19 U
N-Nitrosodiphenylamine	SW8270D	28		130	19 U
<b>Volatile Organics (µg/kg)</b>					
Trichloroethene (TCE)	SW8260B	160		1600	1.3 U
Tetrachloroethene (PCE)	SW8260B	57		210	1.3 U
Ethylbenzene	SW8260B	10		50	1.3 U
o-Xylene	SW8260B				1.3 U
m,p-Xylene	SW8260B				1.3 U
Total Xylene (U = 0)	SW8260B	40		160	1.3 U
<b>Pesticides &amp; PCBs (µg/kg)</b>					
4,4'-DDD (p,p'-DDD)	SW8081B				1.9 U
4,4'-DDE (p,p'-DDE)	SW8081B				1.9 U
4,4'-DDT (p,p'-DDT)	SW8081B				1.9 U
Total DDT (U = 0)		6.9	50	69	1.9 U
Aldrin	SW8081B	10			0.96 U
alpha-Chlordane (cis-Chlordane)	SW8081B				0.96 U
Oxychlordane	SW8081B				1.9 U
cis-Nonachlor	SW8081B				1.9 U
trans-Nonachlor	SW8081B				1.9 U
Total Chlordane (U = 0)	SW8081B	10	37		1.9 U
Dieldrin	SW8081B	10			1.9 U
Heptachlor	SW8081B	10			0.96 U
gamma-BHC (Lindane)	SW8081B	10			0.96 U
gamma-Chlordane	SW8081B				0.96 U

**Table 2**  
**DMMP Chemical Results**

Sample ID: Sample Collection Date: Sample Type:		DMMP Screening Level	DMMP Bioaccumulation Trigger	DMMP Maximum Level Marine Guideline	THATCHER 4/27/2009 Normal
<b>Dioxin Furans (ng/kg)</b>					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	E1613				<b>0.0842 J</b>
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	E1613				0.138 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613				0.132 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613				<b>0.385 J</b>
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	E1613				<b>0.407 J</b>
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	E1613				<b>3.49</b>
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	E1613				<b>24.7</b>
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	E1613				<b>0.138 J</b>
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	E1613				0.119 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	E1613				0.102 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	E1613				0.0569 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613				<b>0.0719 J</b>
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	E1613				0.0789 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	E1613				<b>0.0558 J</b>
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	E1613				<b>0.369 J</b>
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	E1613				0.0507 U
1,2,3,4,5,6,7,8-Octachlorodibenzofuran (OCDF)	E1613				<b>0.446 J</b>
Total Tetrachlorodibenzo-p-dioxin (TCDD)	E1613				<b>0.701 J</b>
Total Pentachlorodibenzo-p-dioxin (PeCDD)	E1613				<b>0.95 J</b>
Total Hexachlorodibenzo-p-dioxin (HxCDD)	E1613				<b>3.29 J</b>
Total Heptachlorodibenzo-p-dioxin (HpCDD)	E1613				<b>7.43</b>
Total Tetrachlorodibenzofuran (TCDF)	E1613				<b>1.79 J</b>
Total Pentachlorodibenzofuran (PeCDF)	E1613				<b>0.4</b>
Total Hexachlorodibenzofuran (HxCDF)	E1613				<b>0.708 J</b>
Total Heptachlorodibenzofuran (HpCDF)	E1613				<b>0.974</b>
Total Dioxin/Furan TEQ (Mammal) (U = 0)	E1613				<b>0.2</b>
Total Dioxin/Furan TEQ (Mammal) (U = 1/2)	E1613				<b>0.3</b>

Notes:

- Detected concentration is greater than DMMP Screening Level
- Detected concentration is greater than DMMP Bioaccumulation Trigger
- Detected concentration is greater than DMMP Maximum Level Marine Guideline
- Non-detected concentration is above one or more identified screening levels

**Bold = Detected result**

J = Estimated value

U = Compound analyzed, but not detected above detection limit

R = Rejected during data validation

Total LPAH (Low PAH) are the total of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene and Anthracene. 2-Methylnaphthalene is not included in the sum of LPAHs

Total HPAH (High PAH) are the total of Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene

Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene. 2-Methylnaphthalene is not included.

Benzo(j)fluoranthene is included in the total of benzo(b&k)fluoranthenes

Sum DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT

Total Chlordane includes alpha-chlordane (cis-chlordane), beta-chlordane (trans-chlordane), cis-nonaclor, trans-nonaclor and oxychlordane.

Total xylene is the sum of o-, m-, p- isomers

Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.

U=1/2; Half of the detection limit is included in the sum of results (applies to dioxin/furan TEQ calculation only)

-- Results not reported or not applicable

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

ng/kg = nanograms per kilogram

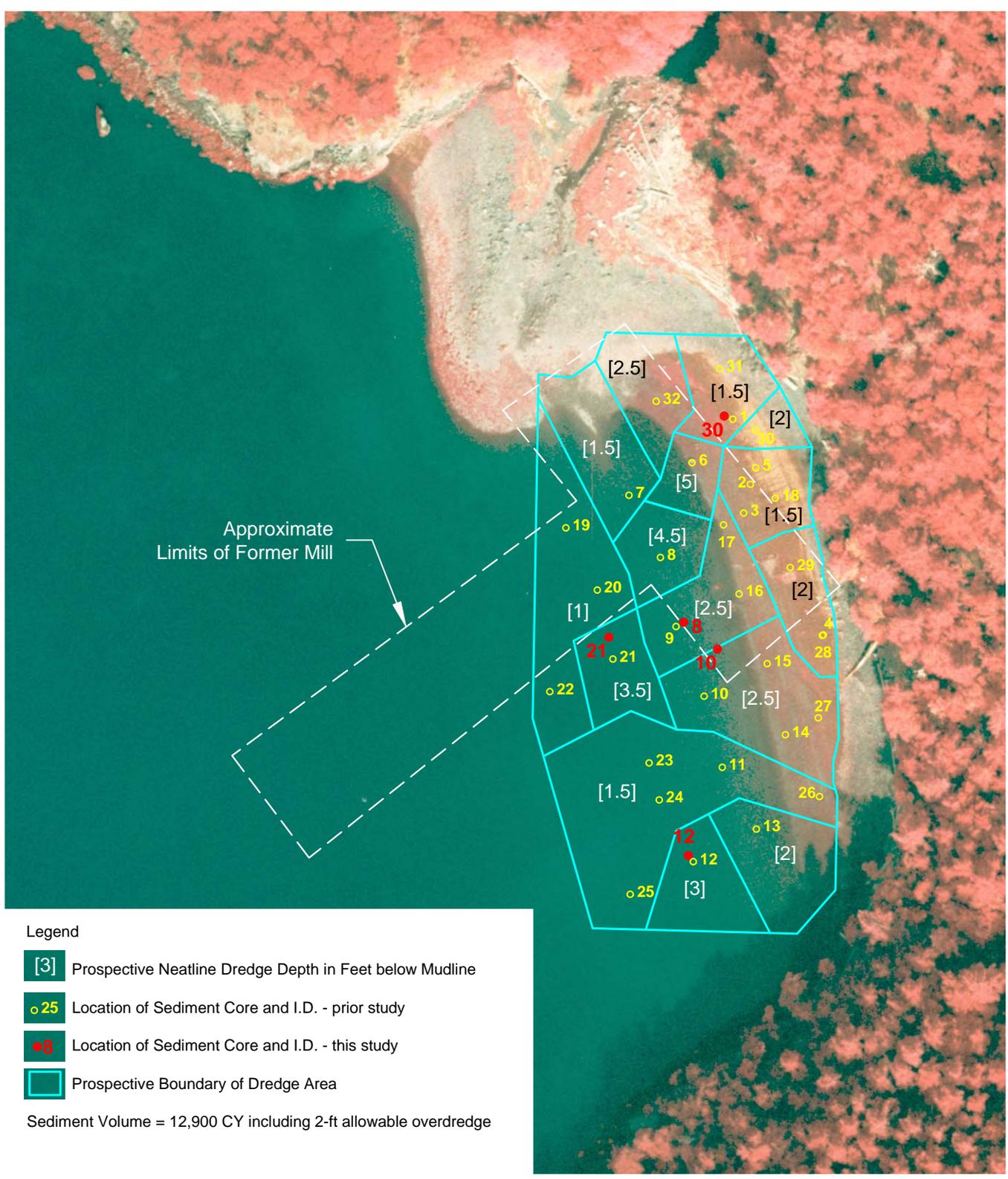
N = Normal Field Sample FD = Field Duplicate

Toxicity Equivalency (TEQ) values as of 2005, World Health Organization.

# FIGURES

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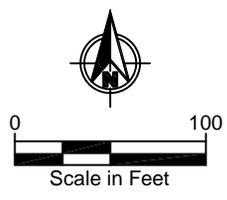
Jun 29, 2009 3:24pm jlaplante C:\DOCUMENTS\1\JLAPLA-1\LOCALS-1\Temp\AcPublish\_5748\09061301-RP-002.dwg Fig 1



- Legend
- [3] Prospective Neatline Dredge Depth in Feet below Mudline
  - o 25 Location of Sediment Core and I.D. - prior study
  - o 8 Location of Sediment Core and I.D. - this study
  - Prospective Boundary of Dredge Area

Sediment Volume = 12,900 CY including 2-ft allowable overdredge

Source: Drawing prepared from GIS files provided by Skagit Fisheries.  
Horizontal Datum: Washington State Plane South, NAD83.  
Vertical Datum: N/A.



**Figure 1**  
Actual Core Locations and Prospective Dredge Areas  
Thatcher Bay Site

APPENDIX A  
SAMPLE COLLECTION REPORT

---

# **Preliminary report: Sediment sampling in support of wood waste removal in conjunction with the restoration of Thatcher Bay, Blakely Island, Washington**

**Andrea Ogston<sup>1</sup> & Sandy Wyllie-Echeverria<sup>2</sup>**

<sup>1</sup>School of Oceanography, Box 357940, University of Washington, Seattle, WA 98195

<sup>2</sup>Friday Harbor Laboratories, Box 351812, 620 University Road, Friday Harbor, WA 98250 & UW Botanic Gardens, College of Forest Resources, University of Washington, Seattle, WA 98195

## **Purpose:**

The purpose of this report is to describe sampling procedures used in Thatcher Bay on 27 April 2009 and present preliminary findings. This work was completed to satisfy objectives, specified by Skagit Fisheries Enhancement Group, to (1) acquire sediment samples within the identified woodwaste polygon to comply with a Sampling and Analysis Plan (SAP) requirement; (2) determine the textual characteristics of sediment at the location of each SAP core and (3) delimit subtidal boundaries of woodwaste impact within the study site.

## **Coring Activities**

Vibracores, sediment trays, and exploratory gravity cores were taken at the Thatcher Bay restoration site on 27 April, 2009 during low tide conditions. The core locations are shown in Figure 1. A land-based portable vibracore system was utilized with 3" diameter aluminum core barrel (Figure 2). The vibracore system had difficulty with large woodwaste pieces, and thus sites were moved to collect cores that penetrated through the wood waste into the native sediment below. Surface sediment trays (Figure 3) were collected within a couple of meters of the vibracore sites where the sediment was undisturbed from vibracoring activities. Exploratory gravity cores were taken with a small, hand-deployed corer (Figure 4) deployed from a small boat. The core barrel is approximately 1.5" in diameter and can collect cores up to 25 cm in length.

Cores returned to the sediment core facility at U.W. (i.e., sediment trays and exploratory cores) are being kept in cold storage (34° F). Preliminary visual observations have been made, and further analyses are planned as a summer project for the student involved in this project.

## **Preliminary Results**

### **1. Vibracores as required in the SAP**

Vibracores were collected as near as possible to the designated sampling location in the Sampling and Analysis Plan (Breems and Warinner 2008). Table 1 contains the locations and recovery information of the five cores. The woodwaste was difficult to penetrate. Large pieces (branches, bark strands, etc) stopped penetration, and when these were encountered, the core location was moved. The woodwaste compacted significantly during vibracoring, causing a reduction of core length by 36 to 50%. Sediment

Table 1. Location and recovery of vibracores.

Station	Latitude	Longitude	Penetration (m)	Recovery (m)	Compaction (%)	Notes:
8	48° 33.122	122° 48.947	3.5	1.94	44.6	
10	48° 33.119	122° 48.941	1.66	0.98	41.0	May not have gotten below woodwaste
12	48° 33.095	122° 48.945	2.42	1.45	40.1	
21	48° 33.118	122° 48.958	3.9	2.48	36.4	
30	48° 33.146	122° 48.941	0.71	0.35	50.7	Could not get through woodwaste (third try)

at site 30 consisted of dry, coarse sand overlying dry wood waste, and could not be penetrated with the vibracore system. Although the site was moved for greater penetration, the core only achieved 0.71 m of penetration, resulting in 0.35 m of core material. The vibracores at Sites 8 and 10 were located in areas of much large wood debris, and had to be moved significantly. Site 10 may not have penetrated below the wood waste. The rest of the cores penetrated through the surface sediment, woodwaste and into the native sediment underneath. These cores were passed to R. Warinner, WDFW, for extrusion and preparation for the required chemical analyses.

## 2. Surface sediment trays

At each of the vibracore sites, an additional core was taken from the upper 20 cm of surface sediment to explore the textural characteristics of sediment that is depositing on top of the wood waste, it's density

Table 2. Location and visual observations of the surface sediment trays. Depths of the different layers indicate the depth from the sediment surface to the bottom of the layer, and "none" indicates that there was no sediment layer of that type.

Station	Latitude	Longitude	Total Core Length (m)	Depth of: Surface Sed (m)	Mixed – Mostly Mud (m)	Mostly Woodwaste (m)
8	48° 33.122	122° 48.947	0.18	0.12	none	0.18
10	48° 33.119	122° 48.941	0.18	0.02	none	0.18
12	48° 33.095	122° 48.945	0.2	0.08	0.18	0.2
21	48° 33.118	122° 48.958	0.23	0.05	0.16	0.23

structure and tendency towards physical (waves and tides) or biological reworking. These cores were visually observed to be dominantly bioturbated, but the layer of wood waste was clearly defined. Bioturbation has likely caused a surface layer of mixed mud and wood waste above the clearly defined woodwaste layer. X-radiography and textural analysis will be accomplished this summer.

### 3. Exploratory gravity cores

Eight exploratory gravity cores were taken to begin evaluation of the spread of woodwaste beyond the designated removal area. These cores were taken from a small boat deployed system (Figure 3) designed for shallow water and relatively unconsolidated sediments. Cores were retrieved at eight sites surrounding the designated removal area. At these sites, the positioning is relatively crude, as the GPS was not able to sit stationary and obtain a number of fixes as was done for the vibracore/sediment tray sites. Cores penetrated between 9 and 25 cm into the seabed; Preliminary visual observations of these cores indicates that there is woodwaste visible in the muddy matrix at some of the sites. It is of low volume concentration in all cases. At site TH-C, the corer did not penetrate deeply which indicates a more consolidated layer below, potentially consisting of higher concentrations of woodwaste. Another core nearby at TH-E did penetrate, and showed some woodwaste within the muddy matrix. These cores will be extruded and a more accurate evaluation of the volume concentration and state of woodwaste evaluated.

Table 3. Location and visual observations of the exploratory gravity cores; Observations are strictly qualitative at present. "some wood waste" likely represents a small amount of wood waste by volume mixed in with native sediment (<10%), and "slight wood waste" represents an even smaller amount (< a few%).

<b>Station</b>	<b>Latitude</b>		<b>Longitude</b>		<b>Core Length (m)</b>	<b>Visual Observations:</b>
TH-I	48°	33.114	122°	49.057	0.16	no clear wood waste
TH-G	48°	33.071	122°	49.025	0.19	no clear wood waste
TH-A	48°	33.090	122°	48.972	0.09	much Ulva - no clear wood waste
TH-B	48°	33.113	122°	49.037	0.25	no clear wood waste
TH-C	48°	33.118	122°	48.975	few cm	slight wood waste in sample
TH-D	48°	33.096	122°	49.048	0.23	some shell pieces and wood chips?
TH-E	48°	33.113	122°	48.971	0.18	some wood waste



Figure 1. Locations of cores obtained at the Thatcher Bay restoration site. The vibracores are identified as Site 8, 10, 12, 21, and 30. The sites designated in the SAP are indicated as TH 8, 10, 12, 21, 30. Sites were moved to allow appropriate penetration through the wood waste.



Figure 2. Vibracore extraction tripod and coring system in Thatcher Bay.



Figure 3. Sediment trays used for X-radiography and surface grain-size analysis.



Figure 4. Hand-held gravity corer and liner used to obtain the exploratory cores indicated in Figure 1 as TH-A through TH-I.

# APPENDIX B

## CORE PROCESSING REPORT

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# **Extrusion and preparation of sediment samples in conjunction with the restoration of Thatcher Bay, Blakely Island, San Juan County, Washington.**

An appendix to:

Preliminary report: Sediment sampling in support of wood waste removal in conjunction with the restoration of Thatcher Bay, Blakely Island, Washington, Andrea Ogston & Sandy Wyllie-Echeverria

## **Robert Warinner**

Washington Department of Fish and Wildlife  
La Conner District Office, 111 Sherman St. La Conner, WA 98257

Described within this report are the methods of handling and processing of sediment samples taken in Thatcher Bay, WA. Sediment cores were taken to evaluate possible chemical contaminants and toxicity to evaluate the suitability of disposing the sediments at an open water disposal site in Puget Sound.

### **Sample Collection**

On April 27, 2009, five sediment samples were taken by Andrea Ogston of the University of Washington as contracted by Skagit Fisheries Enhancement Group. Samples were taken by driving 3 inch diameter aluminum tubes into the sediment and extracting the tubes with the aid of a tripod and winch apparatus (Ogston Wyllie-Echeverria 2009). After extraction each tube was transferred to Robert Warinner of Washington Department of Fish and Wildlife (WDFW) and stored on ice in preparation for transport. When all five tubes were extracted they were immediately transported to WDFW's La Conner field office and stored on ice over night.

### **Sample Processing**

The morning following sample collection, the samples where extruded and processed for transport to a laboratory for analysis as described below.

The extrusion process was conducted as follows:

The end cap from the top end of the tube was removed. To verify penetration and compaction documented during the sampling, a tape measure was used to measure the head space from the sediment sample to the top of the tube. This data is presented in Table 1 below.

Each tube was then cut with an electric saw with a steel blade just above the sample. The tubes were measured from the top of the sample to the extent of the compaction corrected target interval (Keithly 2009) plus the compacted corrected Z sample and cut to the resulting length. The bottom 12 inches adjusted for compaction of each tube was cut off and retained for the Z sample. When sampling for location 30 the sampling equipment was unable to penetrate below the target interval and a Z sample was not collected; the entire sample was processed for analysis.

Samples were extruded into a stainless steel bowl from each of the tube sections by holding the tubes over the bowls and shaking them until the sample slid out of the tube.

Upon extraction, aliquots were immediately removed for VOC analysis, placed in a sample jar and stored in a cooler with ice.

As the samples were extruded a 30g composite sample was taken and preserved with 5 ml of 1 N zinc acetate for sulfide analysis.

An aliquot was taken of the basal sediment of each sample to be tested for grain size.

After all the samples were extruded, they were composited in a stainless steel bowl by mixing them with a stainless steel spoon.

The composited sample was placed into sample containers as described in table 3. (sample storage) of the *Sampling And Analysis Plan For Wood Waste Dredging In Conjunction With The Restoration Of Thatcher Bay, Blakely Island, Washington* (Breems and Warinner 2008). As the samples were divided they were transferred to coolers with ice.

An additional aliquot was frozen and stored for transport to Analytical Perspectives lab Wilmington, NC, for dioxin analysis.

Immediately after the completion of the sediment processing the coolers were transported to Analytical Resources Incorporated, Tukwila, WA for analysis.

## Results

Measurements of the head space above the sediment samples within the tubes verified measurements taken in the field for penetration and compaction (table 1). Recovery corrected intervals submitted for chemical analyses and archived for biological analyses are presented in Table 2.

*Table 1: Measurement of recovery and compaction in the field and in the laboratory.*

Station	Field observations				Lab Observations		Compaction	
	Penetration		Recovery		Recovery		Field	Lab
	inches	meters	inches	meters	inches	meters	%	%
8	137.80	3.50	76.38	1.94	77.00	1.96	44.6	44.1
10	65.35	1.66	38.58	0.98	38.00	0.97	41.0	41.9
12	95.28	2.42	57.09	1.45	57.50	1.46	40.1	39.6
21	153.54	3.90	97.64	2.48	99.30	2.52	36.4	35.3
30	27.95	0.71	13.78	0.35	13.50	0.34	50.7	51.7

*Table 2: Intervals sampled for chemical analyses and archived for biological testing.*

Station	Lab Recovery inches	Lab Compaction %	Lab Recovery %	Target Interval (In-Situ) inches	Sampled Interval (Recovery Corrected) Inches
8	77.00	44.1	55.9	0 to 78	0 to 44
10	38.00	41.9	58.1	0 to 54	0 to 31
12	57.50	39.6	60.3	0 to 60	0 to 36
21	99.30	35.3	64.7	0 to 66	0 to 43
30	13.50	51.7	48.3	0 to 48	0 to 13.5*

\* Target interval was 23" (48" x 48.3%, however 13.5" of sediment was recovered and all material recovered was submitted for analyses

## References

Breems, Joel and Robert Warinner 2008, *Sampling And Analysis Plan For Wood Waste Dredging In Conjunction With The Restoration Of Thatcher Bay, Blakely Island, Washington* Prepared for the Skagit Fisheries Enhancement Group August 2008.

Ogston, Andrea & Sandy Wyllie-Echeverria (2009) Preliminary report: Sediment sampling in support of wood waste removal in conjunction with the restoration of Thatcher Bay, Blakely Island, Washington, Prepared for the Skagit Fisheries Enhancement Group, May 2009.

Keithly, James, Anchor QEA L.L.C (2009), *Thatcher Bay Sampling and Analysis Plan ADDENDUM*, Memorandum to David Fox, US Army Corps of Engineers.

APPENDIX C

CHEMISTRY LABORATORY REPORTS

---



**Analytical Resources, Incorporated**

Analytical Chemists and Consultants

May 27, 2009

Alison Studley  
Skagit Fisheries Enhancement Group  
P.O. Box 2497  
407 Main Street, Suite 212  
Mount Vernon, WA 98273

**RE: Client Project: Thatcher Bay  
ARI Job No: OW96**

Dear Alison:

Please find enclosed the original Chain-of-Custody (COC) record, sample receipt documentation, and the final results for the sample from the project referenced above. One sediment sample and one set of trip blanks were received on April 28, 2009. For further details regarding sample receipt, please refer to the enclosed Cooler Receipt Form.

The sample was analyzed for Total Metals, Pesticides, General Conventionals parameters, Semivolatiles, PCBs, Volatiles, and Geotechnical parameters as requested on the COC.

For the volatiles analysis, the internal standard d4-1, 4 dichlorobenze was outside of the recommended QC limits for the sample, the matrix spike, and the matrix spike duplicate. All other QC was within compliance, indicating a possible matrix effect because of the replication for this sample. No further action was required. For the semivolatiles analysis, Benzoic Acid recovery was just below QC limits in the Continuing Calibration. As all other QC was within compliance and Benzoic Acid is considered a poor performer, no corrective action was necessary. The method blank (MB) associated with the metals analysis had a low response for Zinc. As the sample had greater than ten times the level in the MB, no corrective action was necessary.

There were no further anomalies associated with the analyses of this sample.

A copy of this report and all associated raw data will be kept on file at ARI. If you have any questions or require additional information, please contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink, appearing to read "Susan D. Dunnihoo".

Susan D. Dunnihoo  
Director, Client Services  
206-695-6207  
[sue@arilabs.com](mailto:sue@arilabs.com)

Enclosures  
cc: Efile OW96

# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 1 of 1
ARI Client Company: Skagit Fisheries Enhancement Grp.	Phone: 360-336-0172	Date: 4/28/09
Client Contact: Alison Studley		Ice Present? YES
Client Project Name: Thatcher Bay		No. of Coolers: 2
Client Project #:	Samplers: Wannner/Otson	Cooler Temps: 10.4, 9.8



**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested								Notes/Comments
					NOA	Pest PCB SUA	Metals	TOC NH3/TS	T-Sulfide	Grain Size	Bioassay	Grainsize	
Thatcher	4/27/09	1200	SED		X	X	X	X	X	X	X	X	Archive Bioassay and any that say Archive
Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)									
	Printed Name: Robert Wannner	Printed Name: Jami Hayes	Printed Name:	Printed Name:									
	Company: Sk WDFW/SEEG	Company: ARI	Company:	Company:									
	Date & Time: 4/28/09 1710	Date & Time: 4/28/09 1710	Date & Time:	Date & Time:									

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



# Cooler Receipt Form

ARI Client: Skagit Fish

Project Name: Thatcher Bay

COC No(s): \_\_\_\_\_ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 0W96

Tracking No: \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) \_\_\_\_\_

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 101886

Cooler Accepted by: JH Date: 4/29/09 Time: 1707

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_

Was sufficient ice used (if appropriate)? NA YES NO

Were all bottles sealed in individual plastic bags? YES NO

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Samples Logged by: MM Date: 4/29/09 Time: 749

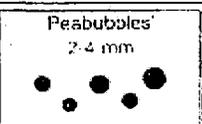
**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

TBs not included on COC, 4 TBs found in cooler.  
4 of 4 TBs had sm bubbles

By: mm Date: 4/29/09



Small → "sm"  
Peabubbles → "pb"  
Large → "lg"  
Headspace → "hs"

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: MB-050609

Page 1 of 1

METHOD BLANK

Lab Sample ID: MB-050609

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: *[Signature]*

Date Sampled: NA

Reported: 05/13/09

Date Received: NA

Instrument/Analyst: FINN5/PAB

Sample Amount: 5.00 g-dry-wt

Date Analyzed: 05/06/09 12:57

Purge Volume: 5.0 mL

Moisture: NA

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.0	< 1.0	U
127-18-4	Tetrachloroethene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	1.0	< 1.0	U
95-47-6	o-Xylene	1.0	< 1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	< 5.0	U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	100%
Bromofluorobenzene	97.4%
d4-1,2-Dichlorobenzene	98.1%

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B  
Page 1 of 1

Sample ID: Thatcher  
SAMPLE

Lab Sample ID: OW96A

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: *[Signature]*

Date Sampled: 04/27/09

Reported: 05/13/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/PAB

Sample Amount: 3.78 g-dry-wt

Date Analyzed: 05/06/09 15:22

Purge Volume: 5.0 mL

Moisture: 40.5%

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.3	< 1.3	U
127-18-4	Tetrachloroethene	1.3	< 1.3	U
100-41-4	Ethylbenzene	1.3	< 1.3	U
179601-23-1	m,p-Xylene	1.3	< 1.3	U
95-47-6	o-Xylene	1.3	< 1.3	U
95-50-1	1,2-Dichlorobenzene	1.3	< 1.3	U
541-73-1	1,3-Dichlorobenzene	1.3	< 1.3	U
106-46-7	1,4-Dichlorobenzene	1.3	< 1.3	U
120-82-1	1,2,4-Trichlorobenzene	6.6	< 6.6	U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	94.3%
Bromofluorobenzene	77.9%
d4-1,2-Dichlorobenzene	88.1%

VOA SURROGATE RECOVERY SUMMARY



Matrix: Sediment

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

ARI ID	Client ID	Level	DCE	TOL	BFB	DCB	TOT OUT
MB-050609	Method Blank	Low	NA	100%	97.4%	98.1%	0
LCS-050609	Lab Control	Low	NA	99.3%	99.5%	100%	0
LCSD-050609	Lab Control Dup	Low	NA	99.4%	99.9%	101%	0
OW96A	Thatcher	Low	NA	94.3%	77.9%	88.1%	0
OW96AMS	Thatcher	Low	NA	94.9%	79.8%	88.9%	0

SW8260B	LCS/MB LIMITS		QC LIMITS	
	Low	Med	Low	Med
(DCE) = d4-1,2-Dichloroethane	75-120	76-120	72-134	69-120
(TOL) = d8-Toluene	80-122	80-120	78-124	80-120
(BFB) = Bromofluorobenzene	79-120	80-120	66-120	76-128
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-120	79-120	80-120

Log Number Range: 09-10095 to 09-10095

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: Thatcher

Page 1 of 1

**MATRIX SPIKE**

Lab Sample ID: OW96A

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 05/13/09

Date Received: 04/28/09

Instrument/Analyst MS: FINN5/PAB

Sample Amount MS: 3.80 g-dry-wt

Date Analyzed MS: 05/06/09 16:18

Purge Volume MS: 5.0 mL

Moisture: 40.5%

Analyte	Sample	MS	Spike Added	Recovery
Trichloroethene	< 1.3 U	57.9	65.8	88.0%
Tetrachloroethene	< 1.3 U	64.9	65.8	98.6%
Ethylbenzene	< 1.3 U	61.3	65.8	93.2%
m,p-Xylene	< 1.3 U	117	132	88.6%
o-Xylene	< 1.3 U	52.7	65.8	80.1%
1,2-Dichlorobenzene	< 1.3 U	33.5	65.8	50.9%
1,3-Dichlorobenzene	< 1.3 U	41.2	65.8	62.6%
1,4-Dichlorobenzene	< 1.3 U	39.2	65.8	59.6%
1,2,4-Trichlorobenzene	< 6.6 U	15.4	65.8	23.4%

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

NA-No recovery due to high concentration of analyte in original sample, calculated negative recovery, or undetected spike.

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: Thatcher

Page 1 of 1

**MATRIX SPIKE**

Lab Sample ID: OW96A

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 05/13/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/PAB

Sample Amount: 3.80 g-dry-wt

Date Analyzed: 05/06/09 16:18

Purge Volume: 5.0 mL

Moisture: 40.5%

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.3	---	
127-18-4	Tetrachloroethene	1.3	---	
100-41-4	Ethylbenzene	1.3	---	
179601-23-1	m,p-Xylene	1.3	---	
95-47-6	o-Xylene	1.3	---	
95-50-1	1,2-Dichlorobenzene	1.3	---	
541-73-1	1,3-Dichlorobenzene	1.3	---	
106-46-7	1,4-Dichlorobenzene	1.3	---	
120-82-1	1,2,4-Trichlorobenzene	6.6	---	

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	94.9%
Bromofluorobenzene	79.8%
d4-1,2-Dichlorobenzene	88.9%

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: Thatcher

Page 1 of 1

DUPLICATE

Lab Sample ID: OW96A

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 05/13/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/PAB

Sample Amount: 3.81 g-dry-wt

Date Analyzed: 05/06/09 15:52

Purge Volume: 5.0 mL

Moisture: 40.5%

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.3	< 1.3	U
127-18-4	Tetrachloroethene	1.3	< 1.3	U
100-41-4	Ethylbenzene	1.3	< 1.3	U
179601-23-1	m,p-Xylene	1.3	< 1.3	U
95-47-6	o-Xylene	1.3	< 1.3	U
95-50-1	1,2-Dichlorobenzene	1.3	< 1.3	U
541-73-1	1,3-Dichlorobenzene	1.3	< 1.3	U
106-46-7	1,4-Dichlorobenzene	1.3	< 1.3	U
120-82-1	1,2,4-Trichlorobenzene	6.6	< 6.6	U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	94.6%
Bromofluorobenzene	76.8%
d4-1,2-Dichlorobenzene	88.0%

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: LCS-050609

Page 1 of 1

LAB CONTROL SAMPLE

Lab Sample ID: LCS-050609

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: *[Signature]*

Date Sampled: NA

Reported: 05/13/09

Date Received: NA

Instrument/Analyst LCS: FINN5/PAB

Sample Amount LCS: 5.00 g-dry-wt

LCSD: FINN5/PAB

LCSD: 5.00 g-dry-wt

Date Analyzed LCS: 05/06/09 11:58

Purge Volume LCS: 5.0 mL

LCSD: 05/06/09 12:31

LCSD: 5.0 mL

Moisture: NA

Analyte	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Trichloroethene	49.8	50.0	99.6%	43.7	50.0	87.4%	13.0%
Tetrachloroethene	49.6	50.0	99.2%	42.6	50.0	85.2%	15.2%
Ethylbenzene	51.0	50.0	102%	45.1	50.0	90.2%	12.3%
m,p-Xylene	101	100	101%	89.0	100	89.0%	12.6%
o-Xylene	50.0	50.0	100%	45.2	50.0	90.4%	10.1%
1,2-Dichlorobenzene	49.6	50.0	99.2%	46.1	50.0	92.2%	7.3%
1,3-Dichlorobenzene	51.2	50.0	102%	46.2	50.0	92.4%	10.3%
1,4-Dichlorobenzene	50.4	50.0	101%	46.0	50.0	92.0%	9.1%
1,2,4-Trichlorobenzene	49.1	50.0	98.2%	47.0	50.0	94.0%	4.4%

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

RPD calculated using sample concentrations per SW846.

**Volatile Surrogate Recovery**

	LCS	LCSD
d8-Toluene	99.3%	99.4%
Bromofluorobenzene	99.5%	99.9%
d4-1,2-Dichlorobenzene	100%	101%

**ORGANICS ANALYSIS DATA SHEET**

Volatiles by Purge & Trap GC/MS-Method SW8260B

Sample ID: Trip Blank

Page 1 of 1

**SAMPLE**

Lab Sample ID: OW96B

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10096

Project: Thatcher Bay

Matrix: Water

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 05/13/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/PAB

Sample Amount: 5.00 mL

Date Analyzed: 05/06/09 16:45

Purge Volume: 5.0 mL

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.0	< 1.0	U
127-18-4	Tetrachloroethene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	2.0	< 2.0	U
95-47-6	o-Xylene	1.0	< 1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	< 5.0	U

Reported in  $\mu\text{g/L}$  (ppb)

**Volatile Surrogate Recovery**

---

VOA SURROGATE RECOVERY SUMMARY



Matrix: Water

QC Report No: OW96-Skagit Fisheries Enhancement Gr  
Project: Thatcher Bay

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
OW96B	Trip Blank	5	NA	NA	NA	NA	0

LCS/MB LIMITS

QC LIMITS

SW8260B

(DCE) = d4-1,2-Dichloroethane	79-120	80-120
(TOL) = d8-Toluene	80-120	80-120
(BFB) = Bromofluorobenzene	80-120	76-120
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-124

Prep Method: SW5030B

Log Number Range: 09-10096 to 09-10096

**ORGANICS ANALYSIS DATA SHEET**

PSDDA Semivolatiles by SW8270D GC/MS

Page 1 of 1

Sample ID: MB-043009

METHOD BLANK

Lab Sample ID: MB-043009

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: *[Signature]*

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

NA

Date Sampled: NA

Date Received: NA

Date Extracted: 04/30/09

Date Analyzed: 05/06/09 15:27

Instrument/Analyst: NT4/LJR

GPC Cleanup: Yes

Sample Amount: 25.0 g

Final Extract Volume: 0.5 mL

Dilution Factor: 1.00

Percent Moisture: NA

CAS Number	Analyte	RL	Result
108-95-2	Phenol	20	< 20 U
541-73-1	1,3-Dichlorobenzene	20	< 20 U
106-46-7	1,4-Dichlorobenzene	20	< 20 U
100-51-6	Benzyl Alcohol	20	< 20 U
95-50-1	1,2-Dichlorobenzene	20	< 20 U
95-48-7	2-Methylphenol	20	< 20 U
106-44-5	4-Methylphenol	20	< 20 U
67-72-1	Hexachloroethane	20	< 20 U
105-67-9	2,4-Dimethylphenol	20	< 20 U
65-85-0	Benzoic Acid	200	< 200 U
120-82-1	1,2,4-Trichlorobenzene	20	< 20 U
91-20-3	Naphthalene	20	< 20 U
87-68-3	Hexachlorobutadiene	20	< 20 U
91-57-6	2-Methylnaphthalene	20	< 20 U
131-11-3	Dimethylphthalate	20	< 20 U
208-96-8	Acenaphthylene	20	< 20 U
83-32-9	Acenaphthene	20	< 20 U
132-64-9	Dibenzofuran	20	< 20 U
84-66-2	Diethylphthalate	20	< 20 U
86-73-7	Fluorene	20	< 20 U
86-30-6	N-Nitrosodiphenylamine	20	< 20 U
118-74-1	Hexachlorobenzene	20	< 20 U
87-86-5	Pentachlorophenol	100	< 100 U
85-01-8	Phenanthrene	20	< 20 U
120-12-7	Anthracene	20	< 20 U
84-74-2	Di-n-Butylphthalate	20	< 20 U
206-44-0	Fluoranthene	20	< 20 U
129-00-0	Pyrene	20	< 20 U
85-68-7	Butylbenzylphthalate	20	< 20 U
56-55-3	Benzo(a)anthracene	20	< 20 U
117-81-7	bis(2-Ethylhexyl)phthalate	20	< 20 U
218-01-9	Chrysene	20	< 20 U
117-84-0	Di-n-Octyl phthalate	20	< 20 U
205-99-2	Benzo(b)fluoranthene	20	< 20 U
207-08-9	Benzo(k)fluoranthene	20	< 20 U
50-32-8	Benzo(a)pyrene	20	< 20 U
193-39-5	Indeno(1,2,3-cd)pyrene	20	< 20 U
53-70-3	Dibenz(a,h)anthracene	20	< 20 U
191-24-2	Benzo(g,h,i)perylene	20	< 20 U
90-12-0	1-Methylnaphthalene	20	< 20 U

Reported in µg/kg (ppb)

**Semivolatile Surrogate Recovery**

d5-Nitrobenzene	57.6%	2-Fluorobiphenyl	62.8%
d14-p-Terphenyl	72.0%	d4-1,2-Dichlorobenzene	63.2%
d5-Phenol	58.7%	2-Fluorophenol	57.9%
2,4,6-Tribromophenol	66.7%	d4-2-Chlorophenol	62.1%

**ORGANICS ANALYSIS DATA SHEET**

PSDDA Semivolatiles by SW8270D GC/MS

Page 1 of 1

Sample ID: Thatcher  
SAMPLE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: *[Signature]*

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

NA

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/06/09 22:39

Instrument/Analyst: NT4/LJR

GPC Cleanup: Yes

Sample Amount: 25.8 g-dry-wt

Final Extract Volume: 0.5 mL

Dilution Factor: 1.00

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
108-95-2	Phenol	19	< 19 U
541-73-1	1,3-Dichlorobenzene	19	< 19 U
106-46-7	1,4-Dichlorobenzene	19	< 19 U
100-51-6	Benzyl Alcohol	19	< 19 U
95-50-1	1,2-Dichlorobenzene	19	< 19 U
95-48-7	2-Methylphenol	19	< 19 U
106-44-5	4-Methylphenol	19	< 19 U
67-72-1	Hexachloroethane	19	< 19 U
105-67-9	2,4-Dimethylphenol	19	< 19 U
65-85-0	Benzoic Acid	190	< 190 U
120-82-1	1,2,4-Trichlorobenzene	19	< 19 U
91-20-3	Naphthalene	19	< 19 U
87-68-3	Hexachlorobutadiene	19	< 19 U
91-57-6	2-Methylnaphthalene	19	< 19 U
131-11-3	Dimethylphthalate	19	< 19 U
208-96-8	Acenaphthylene	19	< 19 U
83-32-9	Acenaphthene	19	< 19 U
132-64-9	Dibenzofuran	19	< 19 U
84-66-2	Diethylphthalate	19	< 19 U
86-73-7	Fluorene	19	< 19 U
86-30-6	N-Nitrosodiphenylamine	19	< 19 U
118-74-1	Hexachlorobenzene	19	< 19 U
87-86-5	Pentachlorophenol	97	< 97 U
85-01-8	Phenanthrene	19	< 19 U
120-12-7	Anthracene	19	< 19 U
84-74-2	Di-n-Butylphthalate	19	< 19 U
206-44-0	Fluoranthene	19	< 19 U
129-00-0	Pyrene	19	< 19 U
85-68-7	Butylbenzylphthalate	19	< 19 U
56-55-3	Benzo(a)anthracene	19	< 19 U
117-81-7	bis(2-Ethylhexyl)phthalate	19	< 19 U
218-01-9	Chrysene	19	< 19 U
117-84-0	Di-n-Octyl phthalate	19	< 19 U
205-99-2	Benzo(b)fluoranthene	19	< 19 U
207-08-9	Benzo(k)fluoranthene	19	< 19 U
50-32-8	Benzo(a)pyrene	19	< 19 U
193-39-5	Indeno(1,2,3-cd)pyrene	19	< 19 U
53-70-3	Dibenz(a,h)anthracene	19	< 19 U
191-24-2	Benzo(g,h,i)perylene	19	< 19 U
90-12-0	1-Methylnaphthalene	19	< 19 U

Reported in µg/kg (ppb)

**Semivolatile Surrogate Recovery**

d5-Nitrobenzene	56.0%	2-Fluorobiphenyl	61.6%
d14-p-Terphenyl	65.2%	d4-1,2-Dichlorobenzene	58.4%
d5-Phenol	54.1%	2-Fluorophenol	57.3%
2,4,6-Tribromophenol	75.5%	d4-2-Chlorophenol	58.4%

**SW8270 SEMIVOLATILES SOIL/SEDIMENT SURROGATE RECOVERY SUMMARY**

Matrix: Sediment

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

Client ID	NBZ	FBP	TPH	DCB	PHL	2FP	TBP	2CP	TOT	OUT
MB-043009	57.6%	62.8%	72.0%	63.2%	58.7%	57.9%	66.7%	62.1%	0	
LCS-043009	49.6%	56.8%	63.2%	55.6%	51.5%	50.7%	61.9%	54.7%	0	
Thatcher	56.0%	61.6%	65.2%	58.4%	54.1%	57.3%	75.5%	58.4%	0	
Thatcher DUP	56.0%	65.2%	64.0%	57.6%	54.4%	56.0%	77.3%	58.7%	0	
Thatcher MS	52.8%	61.6%	61.6%	55.6%	56.5%	55.5%	61.6%	57.9%	0	

	LCS/MB LIMITS	QC LIMITS
(NBZ) = d5-Nitrobenzene	(37-85)	(29-87)
(FBP) = 2-Fluorobiphenyl	(39-82)	(32-88)
(TPH) = d14-p-Terphenyl	(38-105)	(21-97)
(DCB) = d4-1,2-Dichlorobenzene	(33-79)	(25-82)
(PHL) = d5-Phenol	(40-85)	(29-85)
(2FP) = 2-Fluorophenol	(20-93)	(10-114)
(TBP) = 2,4,6-Tribromophenol	(40-96)	(25-103)
(2CP) = d4-2-Chlorophenol	(41-81)	(30-84)

Prep Method: SW3550B  
Log Number Range: 09-10095 to 09-10095

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Semivolatiles by SW8270D GC/MS**  
 Page 1 of 1

**Sample ID: Thatcher**  
**MATRIX SPIKE**

Lab Sample ID: OW96A  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized:   
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 23:45  
 Instrument/Analyst: NT4/LJR  
 GPC Cleanup: YES

Sample Amount: 25.9 g-dry-wt  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00  
 Percent Moisture: 39.2 %

Analyte	Sample	Matrix Spike	Spike Added	Recovery
Phenol	< 19.4	233	483	48.2%
1,3-Dichlorobenzene	< 19.4	256	483	53.0%
1,4-Dichlorobenzene	< 19.4	260	483	53.8%
Benzyl Alcohol	< 19.4	< 19.3	967	NA
1,2-Dichlorobenzene	< 19.4	270	483	55.9%
2-Methylphenol	< 19.4	293	483	60.7%
4-Methylphenol	< 19.4	518	967	53.6%
Hexachloroethane	< 19.4	252	483	52.2%
2,4-Dimethylphenol	< 19.4	255	483	52.8%
Benzoic Acid	< 19.4	437	1450	30.1%
1,2,4-Trichlorobenzene	< 19.4	310	483	64.2%
Naphthalene	< 19.4	286	483	59.2%
Hexachlorobutadiene	< 19.4	290	483	60.0%
2-Methylnaphthalene	< 19.4	284	483	58.8%
Dimethylphthalate	< 19.4	289	483	59.8%
Acenaphthylene	< 19.4	288	483	59.6%
Acenaphthene	< 19.4	287	483	59.4%
Dibenzofuran	< 19.4	293	483	60.7%
Diethylphthalate	< 19.4	290	483	60.0%
Fluorene	< 19.4	302	483	62.5%
N-Nitrosodiphenylamine	< 19.4	275	483	56.9%
Hexachlorobenzene	< 19.4	320	483	66.3%
Pentachlorophenol	< 97.0	334	483	69.2%
Phenanthrene	< 19.4	336	483	69.6%
Anthracene	< 19.4	290	483	60.0%
Di-n-Butylphthalate	< 19.4	307	483	63.6%
Fluoranthene	< 19.4	340	483	70.4%
Pyrene	< 19.4	334	483	69.2%
Butylbenzylphthalate	< 19.4	299	483	61.9%
Benzo(a)anthracene	< 19.4	344	483	71.2%
bis(2-Ethylhexyl)phthalate	< 19.4	340	483	70.4%
Chrysene	< 19.4	338	483	70.0%
Di-n-Octyl phthalate	< 19.4	330	483	68.3%
Benzo(b)fluoranthene	< 19.4	375	483	77.6%
Benzo(k)fluoranthene	< 19.4	358	483	74.1%
Benzo(a)pyrene	< 19.4	310	483	64.2%
Indeno(1,2,3-cd)pyrene	< 19.4	252	483	52.2%
Dibenz(a,h)anthracene	< 19.4	315	483	65.2%
Benzo(g,h,i)perylene	< 19.4	275	483	56.9%
1-Methylnaphthalene	< 19.4	293	483	60.7%

Results reported in µg/kg  
 NA-No recovery due to high concentration of analyte in original sample and/or  
 calculated negative recovery.

**ORGANICS ANALYSIS DATA SHEET**

PSDDA Semivolatiles by SW8270D GC/MS

Page 1 of 1

Sample ID: Thatcher

MATRIX SPIKE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized:

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

NA

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/06/09 23:45

Instrument/Analyst: NT4/LJR

GPC Cleanup: Yes

Sample Amount: 25.9 g-dry-wt

Final Extract Volume: 0.5 mL

Dilution Factor: 1.00

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
108-95-2	Phenol	19	---
541-73-1	1,3-Dichlorobenzene	19	---
106-46-7	1,4-Dichlorobenzene	19	---
100-51-6	Benzyl Alcohol	19	---
95-50-1	1,2-Dichlorobenzene	19	---
95-48-7	2-Methylphenol	19	---
106-44-5	4-Methylphenol	19	---
67-72-1	Hexachloroethane	19	---
105-67-9	2,4-Dimethylphenol	19	---
65-85-0	Benzoic Acid	190	---
120-82-1	1,2,4-Trichlorobenzene	19	---
91-20-3	Naphthalene	19	---
87-68-3	Hexachlorobutadiene	19	---
91-57-6	2-Methylnaphthalene	19	---
131-11-3	Dimethylphthalate	19	---
208-96-8	Acenaphthylene	19	---
83-32-9	Acenaphthene	19	---
132-64-9	Dibenzofuran	19	---
84-66-2	Diethylphthalate	19	---
86-73-7	Fluorene	19	---
86-30-6	N-Nitrosodiphenylamine	19	---
118-74-1	Hexachlorobenzene	19	---
87-86-5	Pentachlorophenol	97	---
85-01-8	Phenanthrene	19	---
120-12-7	Anthracene	19	---
84-74-2	Di-n-Butylphthalate	19	---
206-44-0	Fluoranthene	19	---
129-00-0	Pyrene	19	---
85-68-7	Butylbenzylphthalate	19	---
56-55-3	Benzo(a)anthracene	19	---
117-81-7	bis(2-Ethylhexyl)phthalate	19	---
218-01-9	Chrysene	19	---
117-84-0	Di-n-Octyl phthalate	19	---
205-99-2	Benzo(b)fluoranthene	19	---
207-08-9	Benzo(k)fluoranthene	19	---
50-32-8	Benzo(a)pyrene	19	---
193-39-5	Indeno(1,2,3-cd)pyrene	19	---
53-70-3	Dibenz(a,h)anthracene	19	---
191-24-2	Benzo(g,h,i)perylene	19	---
90-12-0	1-Methylnaphthalene	19	---

Reported in µg/kg (ppb)

**Semivolatile Surrogate Recovery**

d5-Nitrobenzene	52.8%	2-Fluorobiphenyl	61.6%
d14-p-Terphenyl	61.6%	d4-1,2-Dichlorobenzene	55.6%
d5-Phenol	56.5%	2-Fluorophenol	55.5%
2,4,6-Tribromophenol	61.6%	d4-2-Chlorophenol	57.9%

**ORGANICS ANALYSIS DATA SHEET**

PSDDA Semivolatiles by SW8270D GC/MS

Page 1 of 1

Sample ID: Thatcher

DUPLICATE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized:

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

NA

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/06/09 23:12

Instrument/Analyst: NT4/LJR

GPC Cleanup: Yes

Sample Amount: 25.8 g-dry-wt

Final Extract Volume: 0.5 mL

Dilution Factor: 1.00

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result	RPD
108-95-2	Phenol	19	< 19 U	NA
541-73-1	1,3-Dichlorobenzene	19	< 19 U	NA
106-46-7	1,4-Dichlorobenzene	19	< 19 U	NA
100-51-6	Benzyl Alcohol	19	< 19 U	NA
95-50-1	1,2-Dichlorobenzene	19	< 19 U	NA
95-48-7	2-Methylphenol	19	< 19 U	NA
106-44-5	4-Methylphenol	19	< 19 U	NA
67-72-1	Hexachloroethane	19	< 19 U	NA
105-67-9	2,4-Dimethylphenol	19	< 19 U	NA
65-85-0	Benzoic Acid	190	< 190 U	NA
120-82-1	1,2,4-Trichlorobenzene	19	< 19 U	NA
91-20-3	Naphthalene	19	< 19 U	NA
87-68-3	Hexachlorobutadiene	19	< 19 U	NA
91-57-6	2-Methylnaphthalene	19	< 19 U	NA
131-11-3	Dimethylphthalate	19	< 19 U	NA
208-96-8	Acenaphthylene	19	< 19 U	NA
83-32-9	Acenaphthene	19	< 19 U	NA
132-64-9	Dibenzofuran	19	< 19 U	NA
84-66-2	Diethylphthalate	19	< 19 U	NA
86-73-7	Fluorene	19	< 19 U	NA
86-30-6	N-Nitrosodiphenylamine	19	< 19 U	NA
118-74-1	Hexachlorobenzene	19	< 19 U	NA
87-86-5	Pentachlorophenol	97	< 97 U	NA
85-01-8	Phenanthrene	19	< 19 U	NA
120-12-7	Anthracene	19	< 19 U	NA
84-74-2	Di-n-Butylphthalate	19	< 19 U	NA
206-44-0	Fluoranthene	19	< 19 U	NA
129-00-0	Pyrene	19	< 19 U	NA
85-68-7	Butylbenzylphthalate	19	< 19 U	NA
56-55-3	Benzo(a)anthracene	19	< 19 U	NA
117-81-7	bis(2-Ethylhexyl)phthalate	19	< 19 U	NA
218-01-9	Chrysene	19	< 19 U	NA
117-84-0	Di-n-Octyl phthalate	19	< 19 U	NA
205-99-2	Benzo(b)fluoranthene	19	< 19 U	NA
207-08-9	Benzo(k)fluoranthene	19	< 19 U	NA
50-32-8	Benzo(a)pyrene	19	< 19 U	NA
193-39-5	Indeno(1,2,3-cd)pyrene	19	< 19 U	NA
53-70-3	Dibenz(a,h)anthracene	19	< 19 U	NA
191-24-2	Benzo(g,h,i)perylene	19	< 19 U	NA
90-12-0	1-Methylnaphthalene	19	< 19 U	NA

Reported in µg/kg (ppb)

**Semivolatile Surrogate Recovery**

d5-Nitrobenzene	56.0%	2-Fluorobiphenyl	65.2%
d14-p-Terphenyl	64.0%	d4-1,2-Dichlorobenzene	57.6%
d5-Phenol	54.4%	2-Fluorophenol	56.0%
2,4,6-Tribromophenol	77.3%	d4-2-Chlorophenol	58.7%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Semivolatiles by SW8270D GC/MS**  
 Page 1 of 2

**Sample ID: LCS-043009**  
**LAB CONTROL**

Lab Sample ID: LCS-043009  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *[Signature]*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 16:00  
 Instrument/Analyst: NT4/LJR  
 GPC Cleanup: YES

Sample Amount: 25.0 g  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00  
 Percent Moisture: NA

Analyte	Lab Control	Spike Added	Recovery
Phenol	238	500	47.6%
1,3-Dichlorobenzene	255	500	51.0%
1,4-Dichlorobenzene	258	500	51.6%
Benzyl Alcohol	465	1000	46.5%
1,2-Dichlorobenzene	269	500	53.8%
2-Methylphenol	252	500	50.4%
4-Methylphenol	497	1000	49.7%
Hexachloroethane	258	500	51.6%
2,4-Dimethylphenol	221	500	44.2%
Benzoic Acid	785	1500	52.3%
1,2,4-Trichlorobenzene	302	500	60.4%
Naphthalene	278	500	55.6%
Hexachlorobutadiene	288	500	57.6%
2-Methylnaphthalene	266	500	53.2%
Dimethylphthalate	261	500	52.2%
Acenaphthylene	264	500	52.8%
Acenaphthene	270	500	54.0%
Dibenzofuran	274	500	54.8%
Diethylphthalate	260	500	52.0%
Fluorene	277	500	55.4%
N-Nitrosodiphenylamine	270	500	54.0%
Hexachlorobenzene	297	500	59.4%
Pentachlorophenol	272	500	54.4%
Phenanthrene	308	500	61.6%
Anthracene	271	500	54.2%
Di-n-Butylphthalate	283	500	56.6%
Fluoranthene	296	500	59.2%
Pyrene	339	500	67.8%
Butylbenzylphthalate	299	500	59.8%
Benzo(a)anthracene	308	500	61.6%
bis(2-Ethylhexyl)phthalate	318	500	63.6%
Chrysene	309	500	61.8%
Di-n-Octyl phthalate	306	500	61.2%
Benzo(b)fluoranthene	301	500	60.2%
Benzo(k)fluoranthene	365	500	73.0%
Benzo(a)pyrene	284	500	56.8%
Indeno(1,2,3-cd)pyrene	304	500	60.8%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Semivolatiles by SW8270D GC/MS**  
 Page 2 of 2

Sample ID: LCS-043009  
 LAB CONTROL

Lab Sample ID: LCS-043009  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Date Analyzed: 05/06/09 16:00

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Analyte	Lab Control	Spike Added	Recovery
Dibenz(a,h)anthracene	370	500	74.0%
Benzo(g,h,i)perylene	366	500	73.2%
1-Methylnaphthalene	278	500	55.6%

**Semivolatile Surrogate Recovery**

d5-Nitrobenzene	49.6%
2-Fluorobiphenyl	56.8%
d14-p-Terphenyl	63.2%
d4-1,2-Dichlorobenzene	55.6%
d5-Phenol	51.5%
2-Fluorophenol	50.7%
2,4,6-Tribromophenol	61.9%
d4-2-Chlorophenol	54.7%

Results reported in  $\mu\text{g}/\text{kg}$

ORGANICS ANALYSIS DATA SHEET  
PSDDA Pesticides/PCB by GC/ECD  
Page 1 of 1

Sample ID: MB-043009  
METHOD BLANK

Lab Sample ID: MB-043009  
LIMS ID: 09-10095  
Matrix: Sediment  
Data Release Authorized:   
Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

Date Sampled: NA  
Date Received: NA

Date Extracted: 04/30/09  
Date Analyzed: 05/06/09 05:42  
Instrument/Analyst: ECD7/AAR  
GPC Cleanup: No  
Sulfur Cleanup: Yes  
Florisil Cleanup: No  
Acid Cleanup: No

Sample Amount: 25.0 g-dry-wt  
Final Extract Volume: 5.0 mL  
Dilution Factor: 1.00  
Silica Gel: Yes  
Percent Moisture: NA

CAS Number	Analyte	RL	Result
58-89-9	gamma-BHC (Lindane)	1.0	< 1.0 U
76-44-8	Heptachlor	1.0	< 1.0 U
309-00-2	Aldrin	1.0	< 1.0 U
60-57-1	Dieldrin	2.0	< 2.0 U
72-55-9	4,4'-DDE	2.0	< 2.0 U
72-54-8	4,4'-DDD	2.0	< 2.0 U
50-29-3	4,4'-DDT	2.0	< 2.0 U
5103-74-2	gamma Chlordane	1.0	< 1.0 U
5103-71-9	alpha Chlordane	1.0	< 1.0 U
118-74-1	Hexachlorobenzene	1.0	< 1.0 U
87-68-3	Hexachlorobutadiene	1.0	< 1.0 U
27304-13-8	oxy Chlordane	2.0	< 2.0 U
5103-73-1	cis-Nonachlor	2.0	< 2.0 U
39765-80-5	trans-Nonachlor	2.0	< 2.0 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Pest/PCB Surrogate Recovery**

Decachlorobiphenyl	77.8%
Tetrachlorometaxylene	74.0%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Pesticides/PCB by GC/ECD**  
 Page 1 of 1

Sample ID: Thatcher  
**SAMPLE**

Lab Sample ID: OW96A  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *AS*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 06:23  
 Instrument/Analyst: ECD7/AAR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Florisil Cleanup: No  
 Acid Cleanup: No

Sample Amount: 26.1 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: Yes  
 Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
58-89-9	gamma-BHC (Lindane)	0.96	< 0.96 U
76-44-8	Heptachlor	0.96	< 0.96 U
309-00-2	Aldrin	0.96	< 0.96 U
60-57-1	Dieldrin	1.9	< 1.9 U
72-55-9	4,4'-DDE	1.9	< 1.9 U
72-54-8	4,4'-DDD	1.9	< 1.9 U
50-29-3	4,4'-DDT	1.9	< 1.9 U
5103-74-2	gamma Chlordane	0.96	< 0.96 U
5103-71-9	alpha Chlordane	0.96	< 0.96 U
118-74-1	Hexachlorobenzene	0.96	< 0.96 U
87-68-3	Hexachlorobutadiene	0.96	< 0.96 U
27304-13-8	oxy Chlordane	1.9	< 1.9 U
5103-73-1	cis-Nonachlor	1.9	< 1.9 U
39765-80-5	trans-Nonachlor	1.9	< 1.9 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Pest/PCB Surrogate Recovery**

Decachlorobiphenyl	79.5%
Tetrachlorometaxylene	75.2%

**SW8081 PESTICIDE SOIL/SEDIMENT SURROGATE RECOVERY SUMMARY**

Matrix: Sediment

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

<u>Client ID</u>	<u>DCBP</u>	<u>TCMX</u>	<u>TOT OUT</u>
MB-043009	77.8%	74.0%	0
LCS-043009	76.0%	73.2%	0
Thatcher	79.5%	75.2%	0
Thatcher DUP	74.8%	72.2%	0
Thatcher MS	78.5%	76.2%	0

	<u>LCS/MB LIMITS</u>	<u>QC LIMITS</u>
(DCBP) = Decachlorobiphenyl	(65-125)	(52-143)
(TCMX) = Tetrachlorometaxylene	(53-112)	(43-128)

Prep Method: SW3550B  
Log Number Range: 09-10095 to 09-10095

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Pesticides/PCB by GC/ECD**  
 Page 1 of 1

Sample ID: Thatcher  
**MATRIX SPIKE**

Lab Sample ID: OW96A  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *AS*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 07:05  
 Instrument/Analyst: ECD7/AAR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Florisil Cleanup: No

Sample Amount: 25.9 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: Yes  
 Percent Moisture: 39.2%

Analyte	Sample	Matrix Spike	Spike Added	Recovery
gamma-BHC (Lindane)	< 0.959	3.58	3.87	92.5%
Heptachlor	< 0.959	3.36	3.87	86.8%
Aldrin	< 0.959	3.21	3.87	82.9%
Dieldrin	< 1.92	6.79	7.73	87.8%
4,4'-DDE	< 1.92	7.60	7.73	98.3%
4,4'-DDD	< 1.92	6.48	7.73	83.8%
4,4'-DDT	< 1.92	6.50	7.73	84.1%
gamma Chlordane	< 0.959	3.36	3.87	86.8%
alpha Chlordane	< 0.959	3.23	3.87	83.5%
Hexachlorobenzene	< 0.959	3.40	3.87	87.9%
Hexachlorobutadiene	< 0.959	3.04	3.87	78.6%

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Pesticides/PCB by GC/ECD**  
 Page 1 of 1

**Sample ID: Thatcher**  
**MATRIX SPIKE**

Lab Sample ID: OW96A  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *[Signature]*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 07:05  
 Instrument/Analyst: ECD7/AAR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Florisil Cleanup: No  
 Acid Cleanup: No

Sample Amount: 25.9 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: Yes  
 Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
58-89-9	gamma-BHC (Lindane)	0.97	---
76-44-8	Heptachlor	0.97	---
309-00-2	Aldrin	0.97	---
60-57-1	Dieldrin	1.9	---
72-55-9	4,4'-DDE	1.9	---
72-54-8	4,4'-DDD	1.9	---
50-29-3	4,4'-DDT	1.9	---
5103-74-2	gamma Chlordane	0.97	---
5103-71-9	alpha Chlordane	0.97	---
118-74-1	Hexachlorobenzene	0.97	---
87-68-3	Hexachlorobutadiene	0.97	---
27304-13-8	oxy Chlordane	1.9	< 1.9 U
5103-73-1	cis-Nonachlor	1.9	< 1.9 U
39765-80-5	trans-Nonachlor	1.9	< 1.9 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Pest/PCB Surrogate Recovery**

Decachlorobiphenyl	78.5%
Tetrachlorometaxylene	76.2%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Pesticides/PCB by GC/ECD**  
 Page 1 of 1

Sample ID: Thatcher  
 DUPLICATE

Lab Sample ID: OW96A  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *B*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 06:44  
 Instrument/Analyst: ECD7/AAR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Florisil Cleanup: No  
 Acid Cleanup: No

Sample Amount: 25.9 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: Yes  
 Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
58-89-9	gamma-BHC (Lindane)	0.96	< 0.96 U
76-44-8	Heptachlor	0.96	< 0.96 U
309-00-2	Aldrin	0.96	< 0.96 U
60-57-1	Dieldrin	1.9	< 1.9 U
72-55-9	4,4'-DDE	1.9	< 1.9 U
72-54-8	4,4'-DDD	1.9	< 1.9 U
50-29-3	4,4'-DDT	1.9	< 1.9 U
5103-74-2	gamma Chlordane	0.96	< 0.96 U
5103-71-9	alpha Chlordane	0.96	< 0.96 U
118-74-1	Hexachlorobenzene	0.96	< 0.96 U
87-68-3	Hexachlorobutadiene	0.96	< 0.96 U
27304-13-8	oxy Chlordane	1.9	< 1.9 U
5103-73-1	cis-Nonachlor	1.9	< 1.9 U
39765-80-5	trans-Nonachlor	1.9	< 1.9 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**Pest/PCB Surrogate Recovery**

Decachlorobiphenyl	74.8%
Tetrachlorometaxylene	72.2%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA Pesticides/PCB by GC/ECD**  
 Page 1 of 1

**Sample ID: LCS-043009**  
**LAB CONTROL**

Lab Sample ID: LCS-043009  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized: *AB*  
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: 04/27/09  
 Date Received: 04/28/09

Date Extracted: 04/30/09  
 Date Analyzed: 05/06/09 06:03  
 Instrument/Analyst: ECD7/AAR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Florisil Cleanup: No

Sample Amount: 25.0 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: Yes  
 Percent Moisture: NA

Analyte	Lab Control	Spike Added	Recovery
gamma-BHC (Lindane)	3.38	4.00	84.5%
Heptachlor	3.30	4.00	82.5%
Aldrin	3.26	4.00	81.5%
Dieldrin	7.00	8.00	87.5%
4,4'-DDE	7.60	8.00	95.0%
4,4'-DDD	6.82	8.00	85.2%
4,4'-DDT	6.60	8.00	82.5%
gamma Chlordane	3.42	4.00	85.5%
alpha Chlordane	3.34	4.00	83.5%
Hexachlorobenzene	3.30	4.00	82.5%
Hexachlorobutadiene	3.08	4.00	77.0%

**Pest/PCB Surrogate Recovery**

Decachlorobiphenyl	76.0%
Tetrachlorometaxylene	73.2%

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA PCB by GC/ECD**  
 Page 1 of 1

**Sample ID: MB-043009**  
**METHOD BLANK**

Lab Sample ID: MB-043009  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized:   
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay  
 Date Sampled: NA  
 Date Received: NA

Date Extracted: 04/30/09  
 Date Analyzed: 05/01/09 09:11  
 Instrument/Analyst: ECD5/JGR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Acid Cleanup: Yes  
 Florisil Cleanup: No

Sample Amount: 25.0 g  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: No  
 Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	20	< 20 U
53469-21-9	Aroclor 1242	20	< 20 U
12672-29-6	Aroclor 1248	20	< 20 U
11097-69-1	Aroclor 1254	20	< 20 U
11096-82-5	Aroclor 1260	20	< 20 U
11104-28-2	Aroclor 1221	20	< 20 U
11141-16-5	Aroclor 1232	20	< 20 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**PCB Surrogate Recovery**

Decachlorobiphenyl	81.0%
Tetrachlorometaxylene	80.5%

**ORGANICS ANALYSIS DATA SHEET**

PSDDA PCB by GC/ECD

Page 1 of 1

Sample ID: Thatcher  
SAMPLE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/01/09 12:37

Instrument/Analyst: ECD5/JGR

GPC Cleanup: No

Sulfur Cleanup: Yes

Acid Cleanup: Yes

Florisil Cleanup: No

Sample Amount: 25.6 g-dry-wt

Final Extract Volume: 5.0 mL

Dilution Factor: 1.00

Silica Gel: No

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	20	< 20 U
53469-21-9	Aroclor 1242	20	< 20 U
12672-29-6	Aroclor 1248	20	< 20 U
11097-69-1	Aroclor 1254	20	< 20 U
11096-82-5	Aroclor 1260	20	< 20 U
11104-28-2	Aroclor 1221	20	< 20 U
11141-16-5	Aroclor 1232	20	< 20 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**PCB Surrogate Recovery**

Decachlorobiphenyl	75.0%
Tetrachlorometaxylene	69.8%

**SW8082/PCB SOIL/SEDIMENT SURROGATE RECOVERY SUMMARY**

Matrix: Sediment

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

<u>Client ID</u>	<u>DCBP % REC</u>	<u>DCBP LCL-UCL</u>	<u>TCMX % REC</u>	<u>TCMX LCL-UCL</u>	<u>TOT OUT</u>
MB-043009	81.0%	65-117	80.5%	63-119	0
LCS-043009	85.5%	65-117	82.5%	63-119	0
Thatcher	75.0%	43-148	69.8%	48-123	0
Thatcher DUP	80.8%	40-139	76.8%	49-120	0
Thatcher MS	83.8%	43-148	84.0%	48-123	0

PSDDA Control Limits

Prep Method: SW3550B

Log Number Range: 09-10095 to 09-10095

**ORGANICS ANALYSIS DATA SHEET**

PSDDA PCB by GC/ECD

Page 1 of 1

Sample ID: Thatcher

**MATRIX SPIKE**

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/01/09 13:11

Instrument/Analyst: ECD5/JGR

GPC Cleanup: No

Sulfur Cleanup: Yes

Acid Cleanup: Yes

Sample Amount: 25.8 g-dry-wt

Final Extract Volume: 5.0 mL

Dilution Factor: 1.00

Silica Gel: No

Percent Moisture: 39.2%

Analyte	Sample	Matrix Spike	Spike Added	Recovery
Aroclor 1016	< 19.5	86.3	96.8	89.2%
Aroclor 1260	< 19.5	116	96.8	120%

Results reported in  $\mu\text{g}/\text{kg}$  (ppb)

**ORGANICS ANALYSIS DATA SHEET**

PSDDA PCB by GC/ECD

Page 1 of 1

Sample ID: Thatcher

MATRIX SPIKE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: *B*

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/01/09 13:11

Instrument/Analyst: ECD5/JGR

GPC Cleanup: No

Sulfur Cleanup: Yes

Acid Cleanup: Yes

Florisil Cleanup: No

Sample Amount: 25.8 g-dry-wt

Final Extract Volume: 5.0 mL

Dilution Factor: 1.00

Silica Gel: No

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	19	---
53469-21-9	Aroclor 1242	19	< 19 U
12672-29-6	Aroclor 1248	19	< 19 U
11097-69-1	Aroclor 1254	19	< 19 U
11096-82-5	Aroclor 1260	19	---
11104-28-2	Aroclor 1221	19	< 19 U
11141-16-5	Aroclor 1232	19	< 19 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**PCB Surrogate Recovery**

Decachlorobiphenyl	83.8%
Tetrachlorometaxylene	84.0%

**ORGANICS ANALYSIS DATA SHEET**

PSDDA PCB by GC/ECD

Page 1 of 1

Sample ID: Thatcher  
DUPLICATE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: *[Signature]*

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

Date Extracted: 04/30/09

Date Analyzed: 05/01/09 12:54

Instrument/Analyst: ECD5/JGR

GPC Cleanup: No

Sulfur Cleanup: Yes

Acid Cleanup: Yes

Florisil Cleanup: No

Sample Amount: 25.9 g-dry-wt

Final Extract Volume: 5.0 mL

Dilution Factor: 1.00

Silica Gel: No

Percent Moisture: 39.2%

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	19	< 19 U
53469-21-9	Aroclor 1242	19	< 19 U
12672-29-6	Aroclor 1248	19	< 19 U
11097-69-1	Aroclor 1254	19	< 19 U
11096-82-5	Aroclor 1260	19	< 19 U
11104-28-2	Aroclor 1221	19	< 19 U
11141-16-5	Aroclor 1232	19	< 19 U

Reported in  $\mu\text{g}/\text{kg}$  (ppb)

**PCB Surrogate Recovery**

Decachlorobiphenyl	80.8%
Tetrachlorometaxylene	76.8%

**ORGANICS ANALYSIS DATA SHEET**  
**PSDDA PCB by GC/ECD**  
 Page 1 of 1

**Sample ID: LCS-043009**  
**LAB CONTROL**

Lab Sample ID: LCS-043009  
 LIMS ID: 09-10095  
 Matrix: Sediment  
 Data Release Authorized:   
 Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
 Project: Thatcher Bay

Date Sampled: NA  
 Date Received: NA

Date Extracted: 04/30/09  
 Date Analyzed: 05/01/09 09:28  
 Instrument/Analyst: ECD5/JGR  
 GPC Cleanup: No  
 Sulfur Cleanup: Yes  
 Acid Cleanup: Yes  
 Florisil Cleanup: No

Sample Amount: 25.0 g-dry-wt  
 Final Extract Volume: 5.0 mL  
 Dilution Factor: 1.00  
 Silica Gel: No  
 Percent Moisture: NA

Analyte	Lab Control	Spike Added	Recovery
Aroclor 1016	92.9	100	92.9%
Aroclor 1260	129	100	129%

**PCB Surrogate Recovery**

Decachlorobiphenyl	85.5%
Tetrachlorometaxylene	82.5%

Results reported in  $\mu\text{g}/\text{kg}$  (ppb)

**INORGANICS ANALYSIS DATA SHEET**

**TOTAL METALS**

Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: OW96MB

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: NA

Date Received: NA

Percent Total Solids: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	04/29/09	6010B	05/05/09	7440-36-0	Antimony	5	5	U
3050B	04/29/09	6010B	05/05/09	7440-38-2	Arsenic	5	5	U
3050B	04/29/09	6010B	05/05/09	7440-43-9	Cadmium	0.2	0.2	U
3050B	04/29/09	6010B	05/05/09	7440-47-3	Chromium	0.5	0.5	U
3050B	04/29/09	6010B	05/05/09	7440-50-8	Copper	0.2	0.2	U
3050B	04/29/09	6010B	05/05/09	7439-92-1	Lead	2	2	U
CLP	04/29/09	7471A	04/30/09	7439-97-6	Mercury	0.02	0.02	U
3050B	04/29/09	6010B	05/05/09	7440-02-0	Nickel	1	1	U
3050B	04/29/09	7740	05/11/09	7782-49-2	Selenium	0.2	0.2	U
3050B	04/29/09	6010B	05/05/09	7440-22-4	Silver	0.3	0.3	U
3050B	04/29/09	6010B	05/05/09	<b>7440-66-6</b>	<b>Zinc</b>	1	<b>3</b>	

U-Analyte undetected at given RL

RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**

**TOTAL METALS**

Page 1 of 1

Sample ID: Thatcher  
SAMPLE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

Percent Total Solids: 59.5%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	04/29/09	6010B	05/05/09	7440-36-0	Antimony	8	8	U
3050B	04/29/09	6010B	05/05/09	7440-38-2	Arsenic	8	8	U
3050B	04/29/09	6010B	05/05/09	<b>7440-43-9</b>	<b>Cadmium</b>	0.3	<b>1.2</b>	
3050B	04/29/09	6010B	05/05/09	<b>7440-47-3</b>	<b>Chromium</b>	0.8	<b>23.4</b>	
3050B	04/29/09	6010B	05/05/09	<b>7440-50-8</b>	<b>Copper</b>	0.3	<b>12.1</b>	
3050B	04/29/09	6010B	05/05/09	7439-92-1	Lead	3	3	U
CLP	04/29/09	7471A	04/30/09	7439-97-6	Mercury	0.03	0.03	U
3050B	04/29/09	6010B	05/05/09	<b>7440-02-0</b>	<b>Nickel</b>	2	<b>17</b>	
3050B	04/29/09	7740	05/11/09	<b>7782-49-2</b>	<b>Selenium</b>	0.8	<b>0.8</b>	
3050B	04/29/09	6010B	05/05/09	7440-22-4	Silver	0.5	0.5	U
3050B	04/29/09	6010B	05/05/09	<b>7440-66-6</b>	<b>Zinc</b>	2	<b>43</b>	

U-Analyte undetected at given RL

RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**

**TOTAL METALS**

Page 1 of 1

Sample ID: Thatcher

**MATRIX SPIKE**

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

**MATRIX SPIKE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Antimony	6010B	8 U	35	333	10.5%	N
Arsenic	6010B	8 U	275	333	82.6%	
Cadmium	6010B	1.2	68.5	83.3	80.8%	
Chromium	6010B	23.4	86.9	83.3	76.2%	
Copper	6010B	12.1	100	83.3	106%	
Lead	6010B	3 U	266	333	79.9%	
Mercury	7471A	0.03 U	0.34	0.301	113%	
Nickel	6010B	17	81	83.3	76.8%	
Selenium	7740	0.8	18.2	16.6	105%	
Silver	6010B	0.5 U	72.4	83.3	86.9%	
Zinc	6010B	43	113	83.3	84.0%	

Reported in mg/kg-dry

N-Control Limit Not Met

H-% Recovery Not Applicable, Sample Concentration Too High

NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

**INORGANICS ANALYSIS DATA SHEET**

**TOTAL METALS**

Page 1 of 1

Sample ID: Thatcher  
DUPLICATE

Lab Sample ID: OW96A

LIMS ID: 09-10095

Matrix: Sediment

Data Release Authorized: 

Reported: 05/13/09

QC Report No: OW96-Skagit Fisheries Enhancement Grp

Project: Thatcher Bay

Date Sampled: 04/27/09

Date Received: 04/28/09

**MATRIX DUPLICATE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Antimony	6010B	8 U	8 U	0.0%	+/- 8	L
Arsenic	6010B	8 U	8 U	0.0%	+/- 8	L
Cadmium	6010B	1.2	1.2	0.0%	+/- 0.3	L
Chromium	6010B	23.4	24.2	3.4%	+/- 20%	
Copper	6010B	12.1	12.7	4.8%	+/- 20%	
Lead	6010B	3 U	3 U	0.0%	+/- 3	L
Mercury	7471A	0.03 U	0.03	0.0%	+/- 0.03	L
Nickel	6010B	17	17	0.0%	+/- 20%	
Selenium	7740	0.8	0.8 U	0.0%	+/- 0.8	L
Silver	6010B	0.5 U	0.5 U	0.0%	+/- 0.5	L
Zinc	6010B	43	42	2.4%	+/- 20%	

Reported in mg/kg-dry

\*-Control Limit Not Met

L-RPD Invalid, Limit = Detection Limit

**INORGANICS ANALYSIS DATA SHEET**

**TOTAL METALS**

Page 1 of 1

**Sample ID: LAB CONTROL**

Lab Sample ID: OW96LCS

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10095

Project: Thatcher Bay

Matrix: Sediment

Data Release Authorized: 

Date Sampled: NA

Reported: 05/13/09

Date Received: NA

**BLANK SPIKE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Antimony	6010B	199	200	99.5%	
Arsenic	6010B	193	200	96.5%	
Cadmium	6010B	47.8	50.0	95.6%	
Chromium	6010B	47.1	50.0	94.2%	
Copper	6010B	48.0	50.0	96.0%	
Lead	6010B	187	200	93.5%	
Mercury	7471A	0.49	0.50	98.0%	
Nickel	6010B	47	50	94.0%	
Selenium	7740	10	10	100%	
Silver	6010B	47.1	50.0	94.2%	
Zinc	6010B	50	50	100%	

Reported in mg/kg-dry

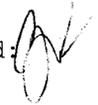
N-Control limit not met

NA-Not Applicable, Analyte Not Spiked

Control Limits: 80-120%

METHOD BLANK RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized:   
Reported: 05/13/09

Project: Thatcher Bay  
Event: NA  
Date Sampled: NA  
Date Received: NA

Analyte	Date	Units	Blank
Total Solids	04/29/09	Percent	< 0.01 U
Preserved Total Solids	04/30/09	Percent	< 0.01 U
N-Ammonia	04/30/09	mg-N/kg	< 0.10 U
Sulfide	04/30/09	mg/kg	< 1.00 U
Total Organic Carbon	05/01/09	Percent	< 0.020 U

SAMPLE RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized:  
Reported: 05/13/09

A handwritten signature in black ink, appearing to be 'JL' or similar, written over the 'Data Release Authorized' text.

Project: Thatcher Bay  
Event: NA  
Date Sampled: 04/27/09  
Date Received: 04/28/09

Client ID: Thatcher  
ARI ID: 09-10095 OW96A

Analyte	Date	Method	Units	RL	Sample
Total Solids	04/29/09 042909#1	EPA 160.3	Percent	0.01	58.60
Preserved Total Solids	04/30/09 043009#1	EPA 160.3	Percent	0.01	54.90
N-Ammonia	04/30/09 043009#1	EPA 350.1M	mg-N/kg	0.80	60.4
Sulfide	04/30/09 043009#1	EPA 376.2	mg/kg	9.27	156
Total Organic Carbon	05/01/09 050109#1	Plumb, 1981	Percent	0.020	1.35

RL Analytical reporting limit  
U Undetected at reported detection limit

Ammonia determined on 2N KCl extracts.

MS/MSD RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized:   
Reported: 05/13/09

Project: Thatcher Bay  
Event: NA  
Date Sampled: 04/27/09  
Date Received: 04/28/09

Analyte	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: OW96A Client ID: Thatcher						
N-Ammonia	04/30/09	mg-N/kg	60.4	214	159	96.8%
N-Ammonia	04/30/09	mg-N/kg	60.4	221	164	98.1%
Sulfide	04/30/09	mg/kg	156	346	225	84.4%
Total Organic Carbon	05/01/09	Percent	1.35	2.94	1.34	118.7%

REPLICATE RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized  
Reported: 05/13/09

A handwritten signature in black ink, appearing to be 'M' or 'B', written over the 'Data Release Authorized' text.

Project: Thatcher Bay  
Event: NA  
Date Sampled: 04/27/09  
Date Received: 04/28/09

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
<b>ARI ID: OW96A    Client ID: Thatcher</b>					
Total Solids	04/29/09	Percent	58.60	58.40 59.10	0.6%
Preserved Total Solids	04/30/09	Percent	54.90	55.70 55.90	1.0%
N-Ammonia	04/30/09	mg-N/kg	60.4	58.3 60.6	2.1%
Sulfide	04/30/09	mg/kg	156	146 162	5.2%
Total Organic Carbon	05/01/09	Percent	1.35	1.30 1.76	17.2%

LAB CONTROL RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized:   
Reported: 05/13/09

Project: Thatcher Bay  
Event: NA  
Date Sampled: NA  
Date Received: NA

Analyte	Date	Units	LCS	Spike Added	Recovery
Sulfide	04/30/09	mg/kg	6.10	6.17	98.9%
Total Organic Carbon	05/01/09	Percent	0.523	0.500	104.6%

STANDARD REFERENCE RESULTS-CONVENTIONALS  
OW96-Skagit Fisheries Enhancement Grp



Matrix: Sediment  
Data Release Authorized:   
Reported: 05/13/09

Project: Thatcher Bay  
Event: NA  
Date Sampled: NA  
Date Received: NA

Analyte/SRM ID	Date	Units	SRM	True Value	Recovery
N-Ammonia SPEX 28-24AS	04/30/09	mg-N/kg	101	100	101.0%
Total Organic Carbon NIST #8704	05/01/09	Percent	3.61	3.35	107.8%



**Client:** Skagit Fisheries Enhancement Group

**ARI Project No.:** OW96

**Client Project:** Thatcher Bay

### Case Narrative

1. One sample was received on April 28, 2009, and was in good condition.
2. The sample was submitted for grain size analysis according to Puget Sound Estuary Protocol (PSEP) methodology.
3. The sample was run in a single batch and this sample, THATCHER, was chosen for triplicate analysis. The triplicate data is reported on the QA summary.
4. The sample contained some shells.
5. The sample was submitted for loss on ignition determination according to ASTM Method D2974. A triplicate analysis was run on this test
6. A grain size analysis, according to Puget Sound Estuary Protocol (PSEP) methodology, was then run on the sample remains from the loss on ignition determination. A triplicate analysis was run on this test.
7. Burning the sample may have broken down the sample particles affecting the grain size analysis.
8. The data is provided in summary tables and plots.
9. There were no other noted anomalies in this project.

Approved by: Elizabeth Toble  
Lead Technician

Date: 5/13/19

Skagit Fisheries Enhancement Group  
Thatcher Bay

Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	Phi Size	Phi Size	Phi Size						Phi Size					
	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Sieve Size (microns)	3/8"	#4 (4750)	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (63)	31.00	15.60	7.80	3.90	2.00	1.00
Thatcher	100.0	95.8	94.7	93.2	92.2	91.1	89.6	86.4	71.6	36.8	20.9	15.0	12.1	9.2
	100.0	94.4	92.8	91.3	90.1	88.7	87.1	84.2	68.8	35.5	20.0	14.0	11.5	8.7
	100.0	96.1	94.5	93.0	91.9	90.8	89.3	85.9	70.1	36.8	20.4	14.3	11.6	9.0
Thatcher Burnt	100.0	100.0	99.2	98.9	98.7	98.2	97.1	93.7	74.5	33.8	15.9	10.0	7.2	5.7
	100.0	100.0	99.4	99.1	99.0	98.4	97.1	94.1	71.8	32.9	15.6	9.6	7.1	5.6
	100.0	100.0	98.9	98.5	98.2	97.6	96.2	92.7	68.8	32.3	15.2	9.6	6.5	5.1

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

Skagit Fisheries Enhancement Group  
Thatcher Bay

Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay			Total Fines
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10	<4
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0	<230 (<62)
Thatcher	5.3	1.4	1.1	1.0	1.5	3.2	14.8	34.8	15.9	5.9	2.9	2.8	9.2	86.4
	7.2	1.6	1.2	1.4	1.6	3.0	15.3	33.3	15.5	6.1	2.4	2.8	8.7	84.2
	5.5	1.5	1.1	1.1	1.5	3.4	15.8	33.3	16.4	6.1	2.7	2.7	9.0	85.9
Thatcher Burnt	0.8	0.3	0.2	0.4	1.2	3.3	19.3	40.7	17.9	5.8	2.9	1.5	5.7	93.7
	0.6	0.2	0.2	0.6	1.3	3.0	22.2	39.0	17.2	6.0	2.6	1.4	5.6	94.1
	1.1	0.4	0.3	0.6	1.4	3.5	24.0	36.4	17.1	5.6	3.1	1.5	5.1	92.7

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

**QA SUMMARY**

Client:	Skagit Fisheries Enhancement Group	Project No.:	Thatcher Bay
ARI Trip. Sample ID:	OW96A	Batch No.:	OW96-1
Client Trip. Sample ID:	Thatcher	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Thatcher	100.0	95.8	94.7	93.2	92.2	91.1	89.6	86.4	71.6	36.8	20.9	15.0	12.1	9.2
	100.0	94.4	92.8	91.3	90.1	88.7	87.1	84.2	68.8	35.5	20.0	14.0	11.5	8.7
	100.0	96.1	94.5	93.0	91.9	90.8	89.3	85.9	70.1	36.8	20.4	14.3	11.6	9.0
AVE	NA	95.43	93.98	92.49	91.37	90.20	88.66	85.48	70.20	36.39	20.45	14.44	11.76	8.99
STDEV	NA	0.89	1.02	1.08	1.11	1.31	1.35	1.18	1.41	0.76	0.44	0.55	0.30	0.26
%RSD	NA	0.94	1.09	1.17	1.22	1.45	1.52	1.38	2.01	2.10	2.13	3.79	2.54	2.92

The Triplicate Applies To The Following Samples

Client ID	Date Sampled	Date Extracted	Date Complete	QA Ratio (95-105)	Data Qualifiers	Pipette Portion (5.0-25.0g)
Thatcher	4/27/2009	5/5/2009	5/8/2009	97.4		19.9
	4/27/2009	5/5/2009	5/8/2009	97.0		19.9
	4/27/2009	5/5/2009	5/8/2009	96.4		18.4
Thatcher Burnt	4/27/2009	5/5/2009	5/8/2009	102.9		18.7
	4/27/2009	5/5/2009	5/8/2009	100.6		20.5
	4/27/2009	5/5/2009	5/8/2009	101.3		19.7

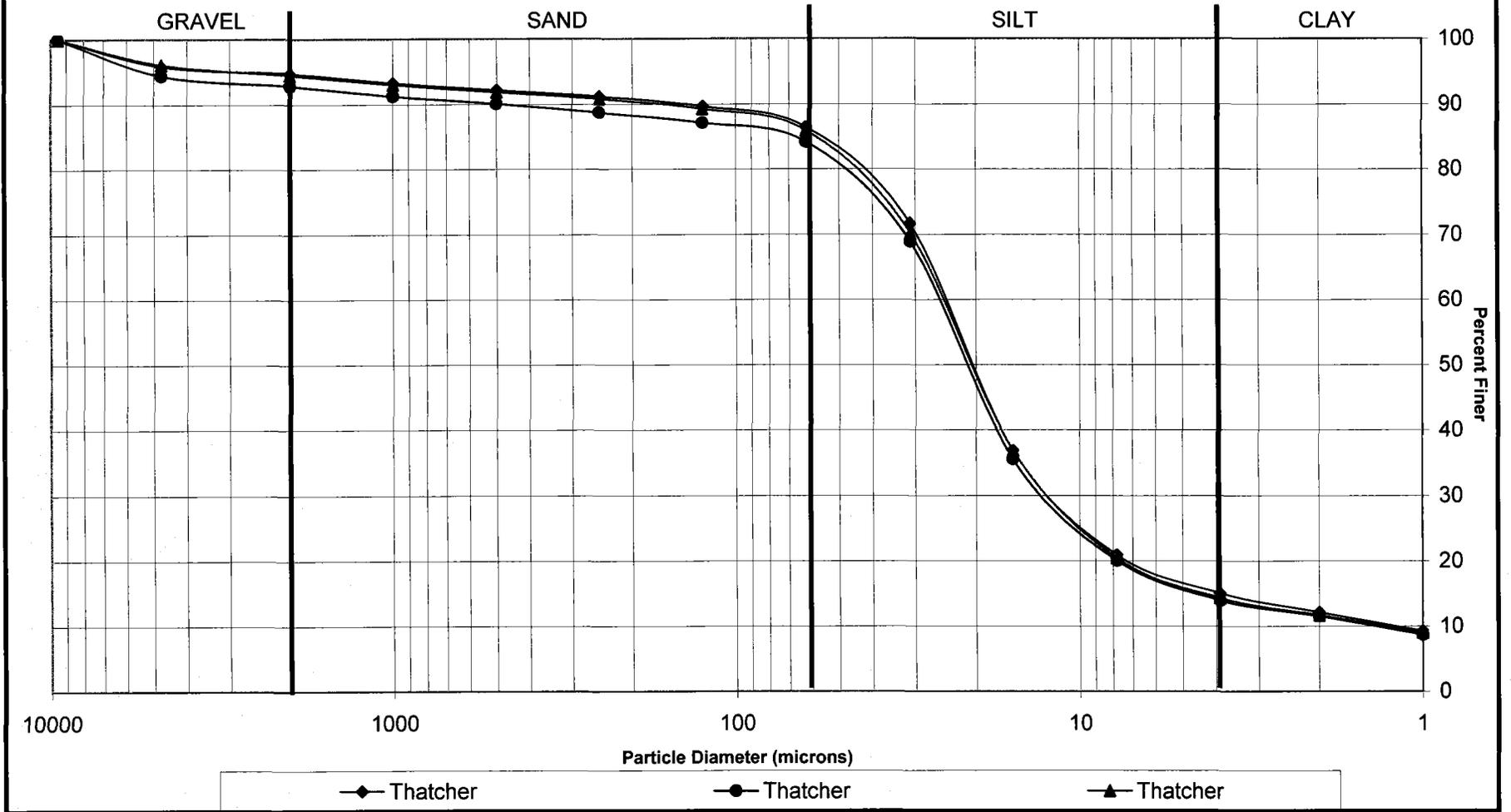
\* ARI Internal QA limits = 95-105%

Notes to the Testing:

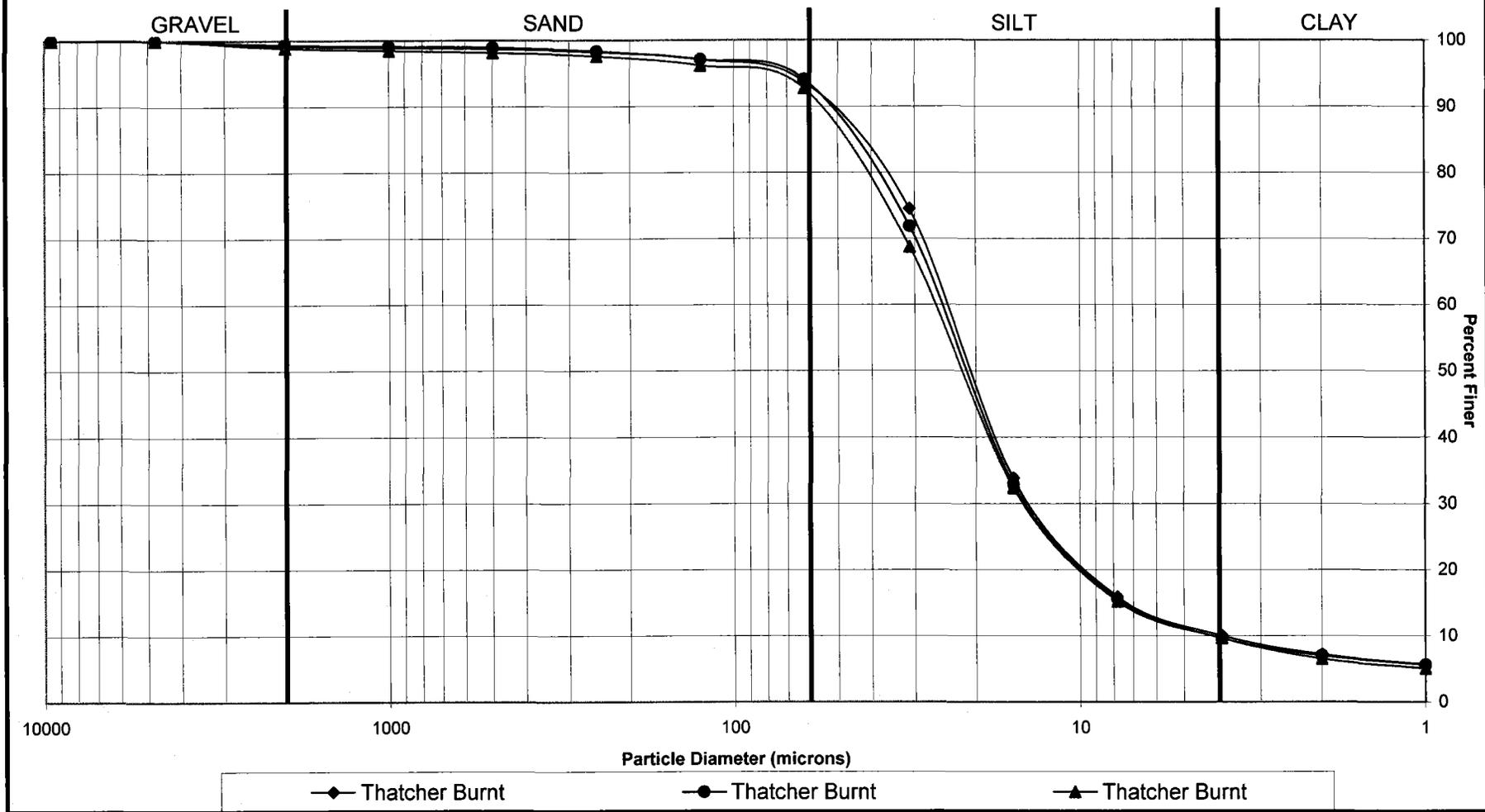
1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

# PSEP Grain Size Distribution

Triplicate Sample Plot



### PSEP Grain Size Distribution



**GEOTECHNICAL ANALYSIS DATA SHEET**  
**Organic Matter by Method ASTM D2974**



Data Release Authorized: ..... QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Reported: 06/01/09 ..... Project: Thatcher Bay  
Date Received: 04/28/09  
Page 1 of 1

<b>Client/ ARI ID</b>	<b>Date Sampled</b>	<b>Matrix</b>	<b>Analysis Date</b>	<b>Result</b>	<b>RPD</b>
Thatcher OW96A 09-10095	04/27/09	Sediment	05/05/09 10:26	12.90	
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	12.88	0.16 %
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	14.79	13.65 %

**Organic/Ash Content Burn Temperature 440 C Per ASTM D2974**

GEOTECHNICAL ANALYSIS DATA SHEET  
Total Solids by Method ASTM D2974



Data Release Authorized: QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Reported: 06/01/09 Project: Thatcher Bay  
Date Received: 04/28/09  
Page 1 of 1

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result	RPD
Thatcher OW96A 09-10095	04/27/09	Sediment	05/05/09 10:26	64.28	
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	64.12	0.25 %
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	65.60	2.03 %



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

June 11, 2009

Alison Studley  
Skagit Fisheries Enhancement Group  
P.O. Box 2497  
407 Main Street, Suite 212  
Mount Vernon, WA 98273

**RE: Client Project: Thatcher Bay – corrected pages**  
**ARI Job No: OW96**

Dear Alison:

Please find enclosed two pages of corrections for the OW96 report.

The Organic Analysis Data Sheet for the Trip Blank should replace the sheet currently in your report.

The VOA SURROGATE RECOVERY SUMMARY should be added to the report, preferable behind the page of the same name already in the file.

The surrogates had been omitted from the original report. These corrections do not affect the data submitted previously.

A copy of this submission will remain on file at ARI.

I apologize for any inconvenience this may have caused.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Dunnihoo  
Director, Client Services  
206-695-6207  
[sue@arilabs.com](mailto:sue@arilabs.com)

Enclosures  
cc: Efile OW96-r

VOA SURROGATE RECOVERY SUMMARY



Matrix: Water

QC Report No: OW96-Skagit Fisheries Enhancement G  
Project: Thatcher Bay

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
OW96B	Trip Blank	5	NA	101%	96.6%	98.4%	0

LCS/MB LIMITS

QC LIMITS

SW8260B

(DCE) = d4-1,2-Dichloroethane	79-120	80-120
(TOL) = d8-Toluene	80-120	80-120
(BFB) = Bromofluorobenzene	80-120	80-120
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-120

Prep Method: SW5030B  
Log Number Range: 09-10096 to 09-10096

**ORGANICS ANALYSIS DATA SHEET**

**Volatiles by Purge & Trap GC/MS-Method SW8260B**

**Sample ID: Trip Blank**

Page 1 of 1

**SAMPLE**

Lab Sample ID: OW96B

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10096

Project: Thatcher Bay

Matrix: Water

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 06/09/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/AAR

Sample Amount: 5.00 mL

Date Analyzed: 05/06/09 16:45

Purge Volume: 5.0 mL

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.0	< 1.0	U
127-18-4	Tetrachloroethene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	2.0	< 2.0	U
95-47-6	o-Xylene	1.0	< 1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	< 5.0	U

Reported in µg/L (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	101%
Bromofluorobenzene	96.6%
d4-1,2-Dichlorobenzene	98.4%

**ORGANICS ANALYSIS DATA SHEET**

**Volatiles by Purge & Trap GC/MS-Method SW8260B**

**Sample ID: Trip Blank  
SAMPLE**

Page 1 of 1

Lab Sample ID: OW96B

QC Report No: OW96-Skagit Fisheries Enhancement Grp

LIMS ID: 09-10096

Project: Thatcher Bay

Matrix: Water

Data Release Authorized: 

Date Sampled: 04/27/09

Reported: 06/09/09

Date Received: 04/28/09

Instrument/Analyst: FINN5/AAR

Sample Amount: 5.00 mL

Date Analyzed: 05/06/09 16:45

Purge Volume: 5.0 mL

CAS Number	Analyte	RL	Result	Q
79-01-6	Trichloroethene	1.0	< 1.0	U
127-18-4	Tetrachloroethene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	2.0	< 2.0	U
95-47-6	o-Xylene	1.0	< 1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	< 1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	< 1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	< 1.0	U
120-82-1	1,2,4-Trichlorobenzene	5.0	< 5.0	U

Reported in µg/L (ppb)

**Volatile Surrogate Recovery**

d8-Toluene	101%
Bromofluorobenzene	96.6%
d4-1,2-Dichlorobenzene	98.4%

VOA SURROGATE RECOVERY SUMMARY



Matrix: Water

QC Report No: OW96-Skagit Fisheries Enhancement G  
Project: Thatcher Bay

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
OW96B	Trip Blank	5	NA	101%	96.6%	98.4%	0

	LCS/MB LIMITS	QC LIMITS
<b>SW8260B</b>		
(DCE) = d4-1,2-Dichloroethane	79-120	80-120
(TOL) = d8-Toluene	80-120	80-120
(BFB) = Bromofluorobenzene	80-120	80-120
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-120

Prep Method: SW5030B  
Log Number Range: 09-10096 to 09-10096

GEOTECHNICAL ANALYSIS DATA SHEET  
Organic Matter by Method ASTM D2974



Data Release Authorized: QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Reported: 06/01/09 Project: Thatcher Bay  
Date Received: 04/28/09  
Page 1 of 1

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result	RPD
Thatcher OW96A 09-10095	04/27/09	Sediment	05/05/09 10:26	12.90	
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	12.88	0.16 %
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	14.79	13.65 %

Organic/Ash Content Burn Temperature 440 C Per ASTM D2974

GEOTECHNICAL ANALYSIS DATA SHEET  
Total Solids by Method ASTM D2974



Data Release Authorized: QC Report No: OW96-Skagit Fisheries Enhancement Grp  
Reported: 06/01/09 Project: Thatcher Bay  
Date Received: 04/28/09  
Page 1 of 1

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result	RPD
Thatcher OW96A 09-10095	04/27/09	Sediment	05/05/09 10:26	64.28	
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	64.12	0.25 %
Thatcher OW96ALR	04/27/09	Sediment	05/05/09 10:26	65.60	2.03 %

8 June 2009

Alison Studley  
 Skagit Fisheries Enhancement Group  
 P.O. Box 2497  
 Mt. Vernon, WA 98273

Ph.: 360-336-0172  
 Email: [astudley@skagitfisheries.org](mailto:astudley@skagitfisheries.org)

Subject: Certificate of Results

Dear Alison;

Attached to this narrative are the analytical results you requested on the samples submitted for the determination of polychlorinated dibenzo-*p*-dioxins and dibenzofurans. The insert below summarizes the relevant information pertaining to your project. QC annotations bring to your attention specific analytical observations and assessments made during the sample handling and data interpretation phases. Results are presented in both a dry-weight and 'as received' basis, and relate only to the items tested.

Project Information Summary	When applicable, see QC Annotations for details
<b>Client Project No.</b>	SFEG - Thatcher Bay
<b>AP Project No.</b>	<b>P1327</b>
<b>Analytical Protocol</b>	1613B
<b>No. Samples Submitted</b>	1
<b>No. Samples Analyzed</b>	1
<b>No. Laboratory Method Blanks</b>	1
<b>No. OPRs / Batch CS3</b>	1
<b>No. Outstanding Samples</b>	0
<b>Date Received</b>	15-May-2009
<b>Condition Received</b>	good
<b>Temperature upon Receipt (C)</b>	1
<b>Extraction within Holding Time</b>	yes
<b>Analysis within Holding Time</b>	yes
<b>Data meet QA/QC Requirements</b>	see below
<b>Exceptions</b>	see below
<b>Analytical Difficulties</b>	see below

**QC Annotations:**

1. A “J” data qualifier is used for analytes with a concentration below the reporting limit.
2. The new ratio – [Ra] -- for 2,3,7,8-TCDD following the  $^{37}\text{Cl}_4$ -2,3,7,8-TCDD correction is shown between squared brackets in the DL column.

Analytical Perspectives remains committed to serving you in the most effective manner. Should you have any questions or need additional information and technical support, please do not hesitate to contact us. Thank you for choosing Analytical Perspectives as part of your analytical support team.

Sincerely,



Kimberly Mace, Ph.D.  
Project Manager

# P1327 - TEQ

Project ID: General Analytical HRMS

<b>Sample Summary</b> <b>Part 1 (dry weight)</b>			<b>Method 1613</b>
<b>Analyte</b>	<b>0_6843_MB001</b>  pg/g	<b>SFEG</b>  pg/g	
2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	(0.101) (0.082) (0.137) (0.154) (0.166) (0.186) (0.28)	0.0842 (0.138) (0.132) 0.385 0.407 3.49 24.7	
2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	(0.0654) (0.0487) (0.0436) (0.0743) (0.0657) (0.0737) (0.101) (0.0724) (0.0945) (0.108)	[0.138] (0.119) (0.102) (0.0569) [0.0719] [0.0558] (0.0789) 0.369 (0.0507) [0.446]	
<b>ITEF TEQ (ND=0; EMPC=0)</b>	<b>0.00</b>	<b>0.227</b>	
<b>ITEF TEQ (ND=0; EMPC=EMPC)</b>	<b>0.00</b>	<b>0.254</b>	
<b>ITEF TEQ (ND=DL/2; EMPC=0)</b>	<b>0.127</b>	<b>0.311</b>	
<b>ITEF TEQ (ND=DL/2; EMPC=EMPC)</b>	<b>0.127</b>	<b>0.33</b>	
<b>ITEF TEQ (ND=DL; EMPC=EMPC)</b>	<b>0.254</b>	<b>0.407</b>	
Checkcode	1378	0021	

( ) = DL  
 [ ] = EMPC

Reviewer .....  
 Date .....



# P1327 - WHO 2005 TEF-TEQ

Project ID: General Analytical HRMS

<b>Sample Summary</b> <b>Part 1 (dry weight)</b>			<b>Method 1613</b>
<b>Analyte</b>	<b>0_6843_MB001</b>  pg/g	<b>SFEG</b>  pg/g	
2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	(0.101) (0.082) (0.137) (0.154) (0.166) (0.186) (0.28)	0.0842 (0.138) (0.132) 0.385 0.407 3.49 24.7	
2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	(0.0654) (0.0487) (0.0436) (0.0743) (0.0657) (0.0737) (0.101) (0.0724) (0.0945) (0.108)	[0.138] (0.119) (0.102) (0.0569) [0.0719] [0.0558] (0.0789) 0.369 (0.0507) [0.446]	
<b>WHO 2005 TEF TEQ (ND=0; EMPC=0)</b>	<b>0.00</b>	<b>0.209</b>	
<b>WHO 2005 TEF TEQ (ND=0; EMPC=EMPC)</b>	<b>0.00</b>	<b>0.236</b>	
<b>WHO 2005 TEF TEQ (ND=DL/2; EMPC=0)</b>	<b>0.142</b>	<b>0.317</b>	
<b>WHO 2005 TEF TEQ (ND=DL/2; EMPC=EMPC)</b>	<b>0.142</b>	<b>0.336</b>	
<b>WHO 2005 TEF TEQ (ND=DL; EMPC=EMPC)</b>	<b>0.285</b>	<b>0.436</b>	
Checkcode	1378	0021	

( ) = DL  
 [ ] = EMPC

Reviewer .....  
 Date ..... 

# P1327 - Totals

## Project ID: General Analytical HRMS

Sample Summary Part 2 (dry weight)		Method 1613
Analyte	0_6843_MB001	SFEG
	pg/g	pg/g
<b>Totals</b>		
TCDDs	0	0.391
PeCDDs	0	0.792
HxCDDs	0	3.01
HpCDDs	0	7.43
OCDD	0	24.7
TCDFs	0	0.825
PeCDFs	0	0.4
HxCDFs	0	0.341
HpCDFs	0	0.974
OCDF	0	0
<b>Total PCDD/Fs (ND=0; EMPC=0)</b>	<b>0.00</b>	<b>38.9</b>
<b>Total PCDD/Fs (ND=0; EMPC=EMPC)</b>	<b>0.00</b>	<b>41.4</b>
<b>Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)</b>	<b>1.85</b>	<b>42.1</b>
<b>Total 2378s (ND=0; EMPC=0)</b>	<b>0.00</b>	<b>29.4</b>
<b>Total 2378s (ND=0.5; EMPC=0)</b>	<b>0.927</b>	<b>29.9</b>
<b>Total 2378s (ND=1; EMPC=0)</b>	<b>1.85</b>	<b>30.4</b>
<b>Total 2378s (ND=0; EMPC=1)</b>	<b>0.00</b>	<b>30.1</b>
<b>Total 2378s (ND=0.5; EMPC=1)</b>	<b>0.927</b>	<b>30.5</b>
<b>Total 2378s (ND=1; EMPC=1)</b>	<b>1.85</b>	<b>30.8</b>
Checkcode	1378	0021

Total 2378s = Sum of 17 2378-substituted PCDD/PCDF congeners (SARA 313)

( ) = DL  
[ ] = EMPC

Reviewer .....  
Date ..... 

**P1327 - Others**  
**Project ID: General Analytical HRMS**

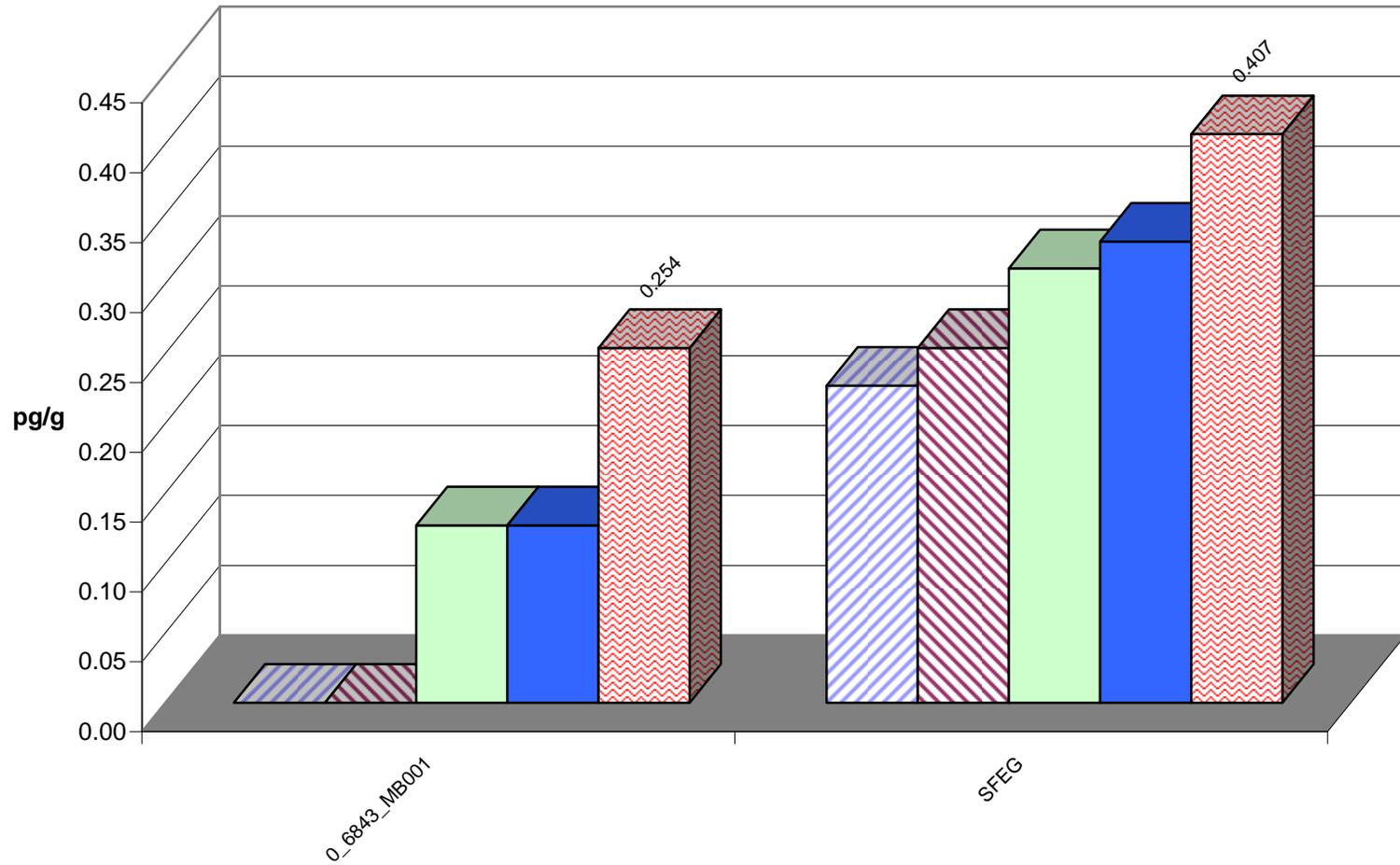
<b>Sample Summary</b>			<b>Method 1613</b>	
<b>Part 3 (dry weight)</b>			<b>0_6843_MB001</b> pg/g	<b>SFEG</b> pg/g
<b>Other PCDD/Fs (ND=0, EMPC=0)</b>				
Other TCDD	0	0.307		
Other PeCDD	0	0.792		
Other HxCDD	0	2.22		
Other HpCDD	0	3.94		
Other TCDF	0	0.825		
Other PeCDF	0	0.4		
Other HxCDF	0	0.341		
Other HpCDF	0	0.605		
<b>Other PCDD/Fs (ND=0, EMPC=EMPC)</b>				
Other TCDD	0	0.617		
Other PeCDD	0	0.95		
Other HxCDD	0	2.49		
Other HpCDD	0	3.94		
Other TCDF	0	1.65		
Other PeCDF	0	0.4		
Other HxCDF	0	0.581		
Other HpCDF	0	0.605		

( ) = DL  
 [ ] = EMPC

Reviewer .....  
 Date ..... 

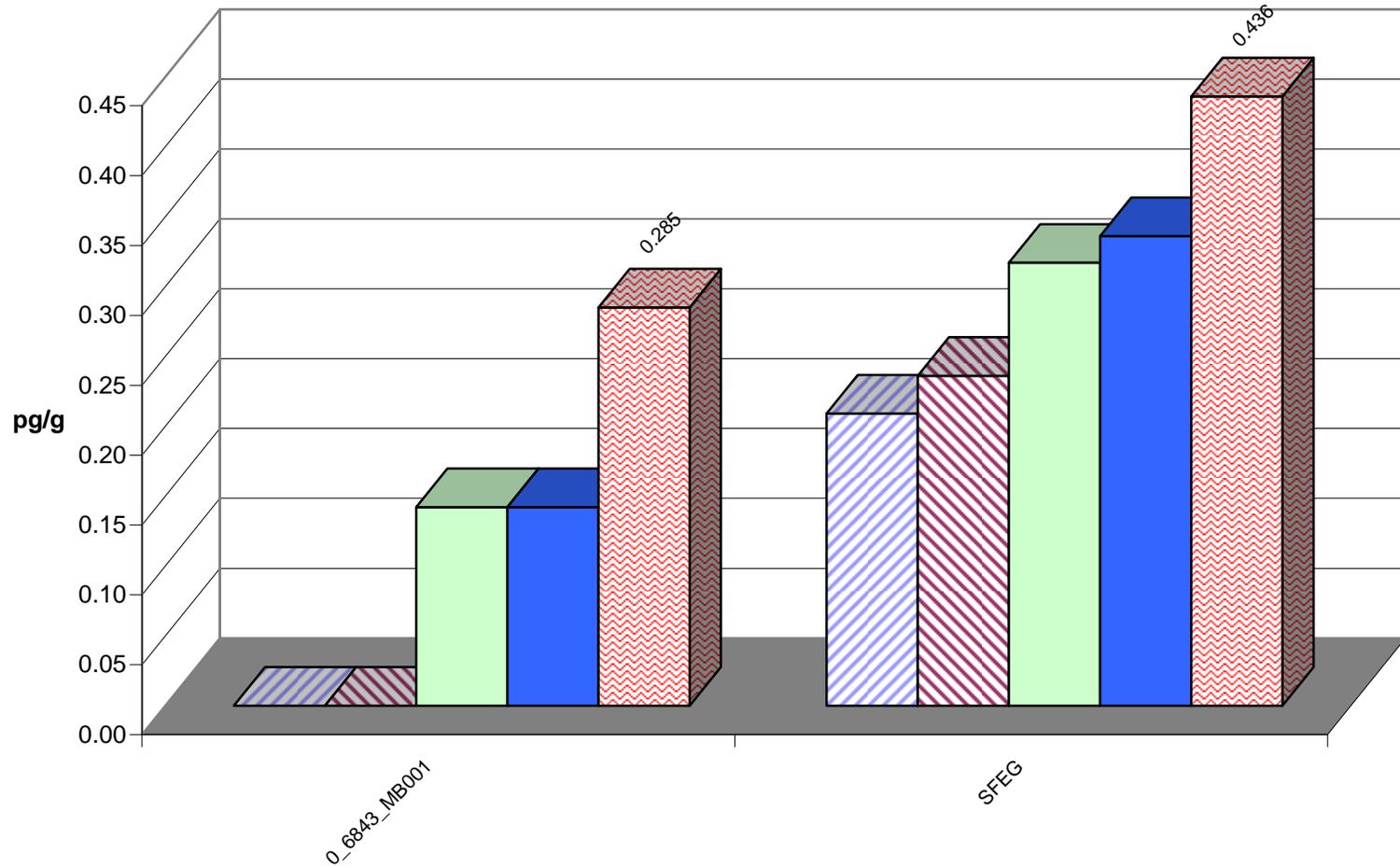
**ITEF-TEQ**  
**Project ID: General Analytical HRMS**  
**P1327**

- ND=0; EMPC=0
- ▨ ND=0; EMPC=EMPC
- ND=DL/2; EMPC=0
- ND=DL/2; EMPC=EMPC
- ▨ ND=DL; EMPC=EMPC



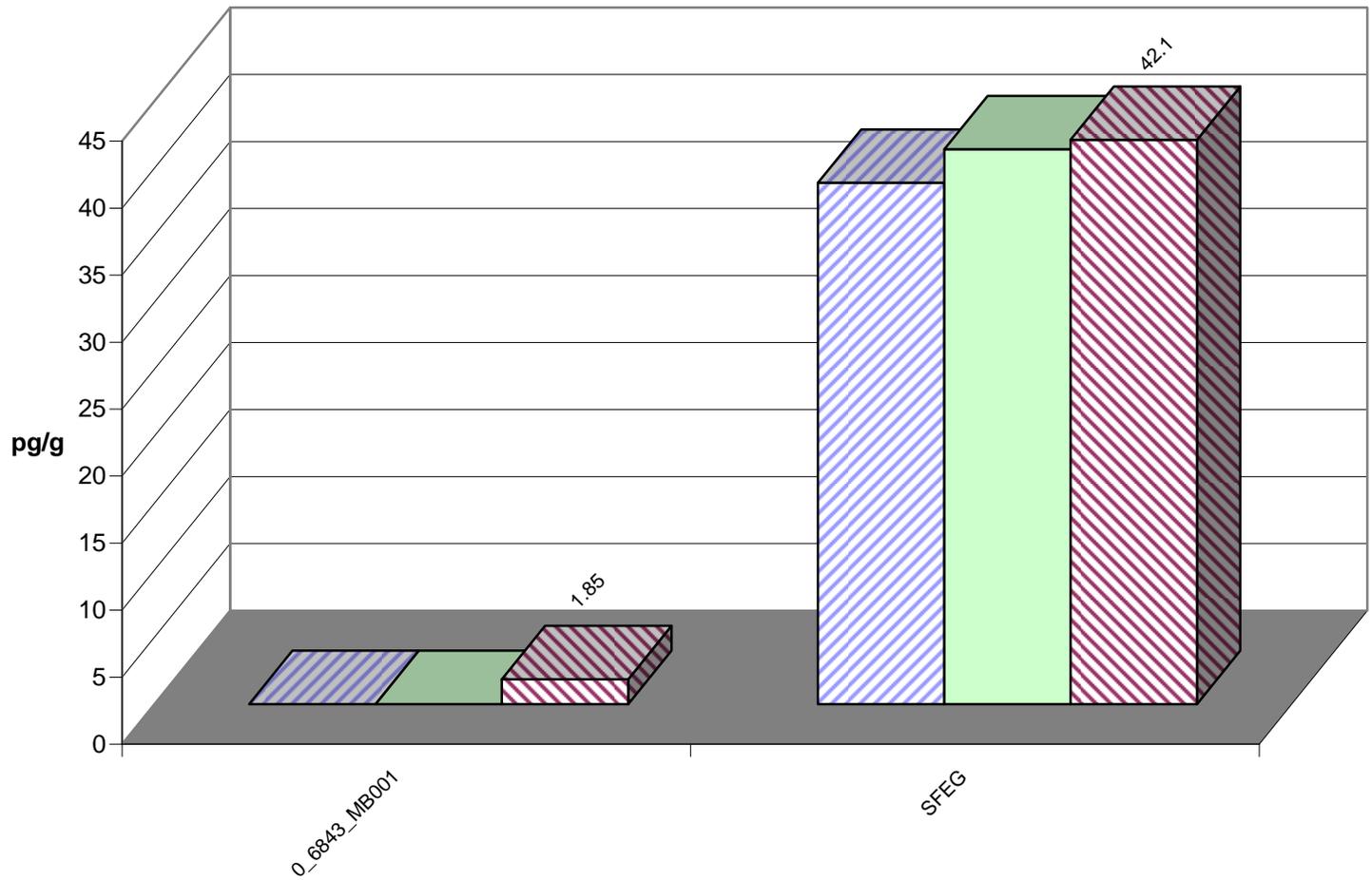
**WHO 2005 TEF-TEQ**  
Project ID: General Analytical HRMS  
P1327

- ND=0; EMPC=0
- ▨ ND=0; EMPC=EMPC
- ▨ ND=DL/2; EMPC=0
- ▨ ND=DL/2; EMPC=EMPC
- ▨ ND=DL; EMPC=EMPC

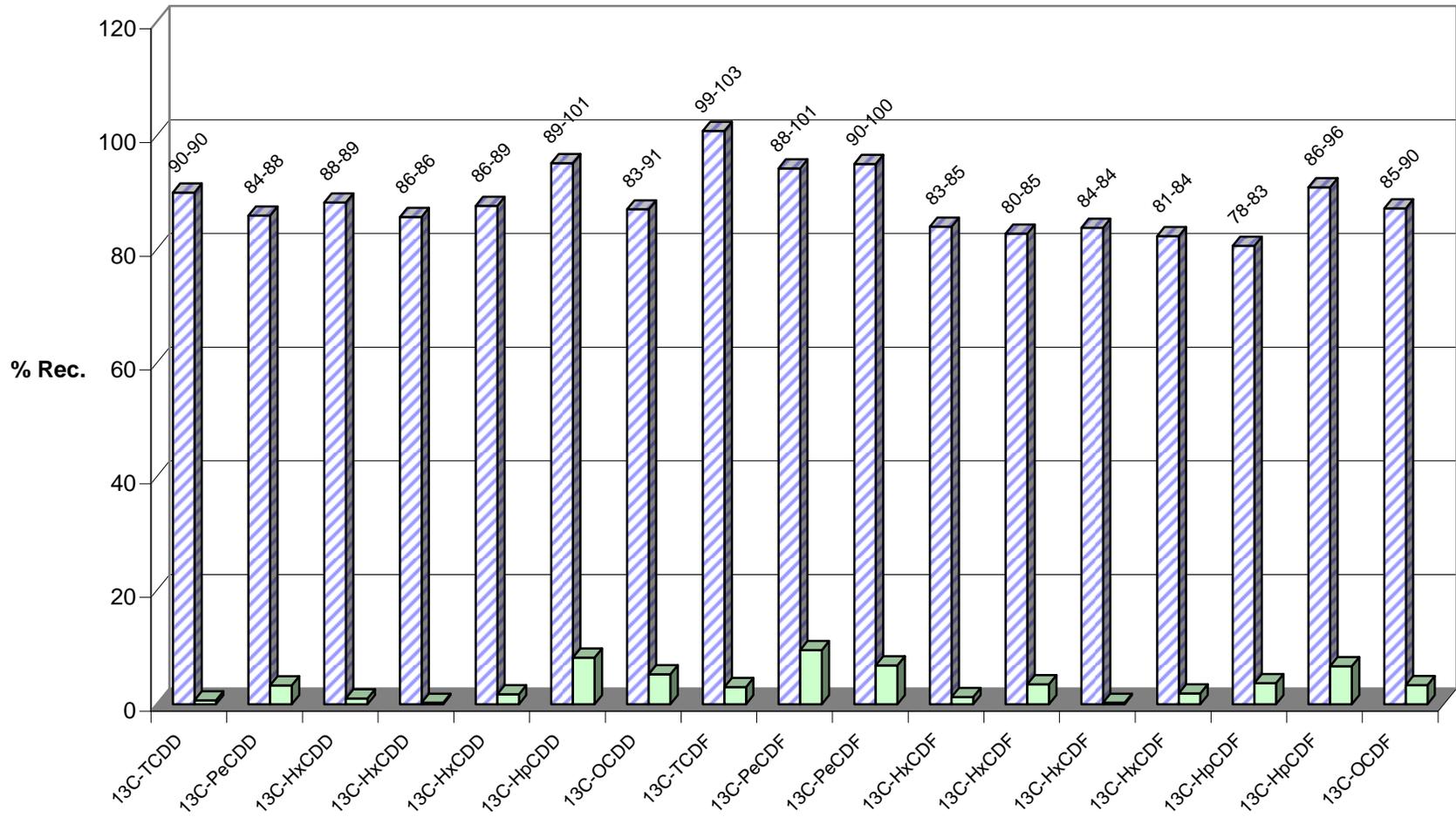
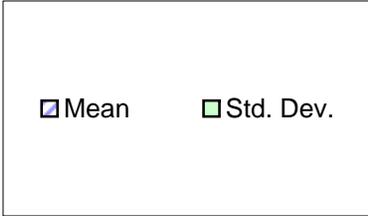


**Totals**  
**Project ID: General Analytical HRMS**  
**P1327**

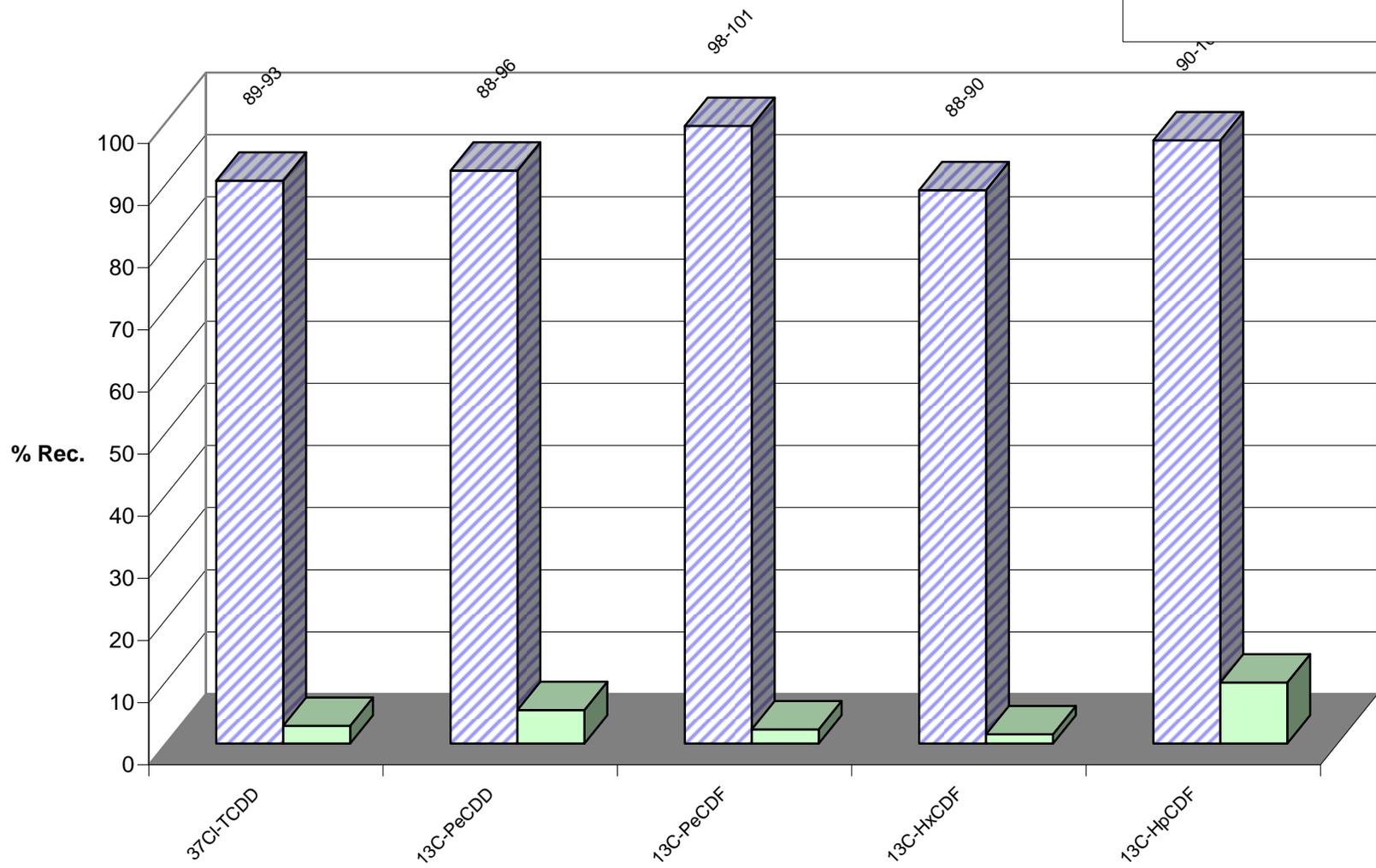
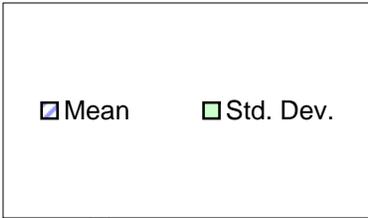
- Total PCDD/Fs (ND=0; EMPC=0)
- Total PCDD/Fs (ND=0; EMPC=EMPC)
- Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)



**Mean Recoveries of Extraction Standards (N=2)**  
**Project ID: General Analytical HRMS**  
**P1327**



**Mean Recoveries of Clean-Up Standards (N=2)**  
**Project ID: General Analytical HRMS**  
**P1327**





# Sample ID: 0\_6843\_MB001

# Method 1613

Client Data		Sample Data		Laboratory Data			
Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids	Project No.:	P1327	Date Received:	n/a
Project ID:	General Analytical HRMS	Weight/Volume:	10.00 g	Sample ID:	MB1_6843_DF_SDS	Date Extracted:	27/May/2009
Date Collected:	n/a	% Solids:	n/a	QC Batch No.:	6843	Date Analyzed:	03/Jun/2009
		Split:	-	Dilution:	-	Time Analyzed:	12:54:16
Analyte	Conc. (pg/g)	DL (pg/g)	EMPC (pg/g)	Qualifiers	Standard	ES Recoveries	Qualifiers
2,3,7,8-TCDD	ND	0.101			13C-2,3,7,8-TCDD	90.5	
1,2,3,7,8-PeCDD	ND	0.082			13C-1,2,3,7,8-PeCDD	88.3	
1,2,3,4,7,8-HxCDD	ND	0.137			13C-1,2,3,4,7,8-HxCDD	87.5	
1,2,3,6,7,8-HxCDD	ND	0.154			13C-1,2,3,6,7,8-HxCDD	85.5	
1,2,3,7,8,9-HxCDD	ND	0.166			13C-1,2,3,7,8,9-HxCDD	86.4	
1,2,3,4,6,7,8-HpCDD	ND	0.186			13C-1,2,3,4,6,7,8-HpCDD	89.4	
OCDD	ND	0.28			13C-OCDD	83.3	
2,3,7,8-TCDF	ND	0.0654			13C-2,3,7,8-TCDF	103	
1,2,3,7,8-PeCDF	ND	0.0487			13C-1,2,3,7,8-PeCDF	101	
2,3,4,7,8-PeCDF	ND	0.0436			13C-2,3,4,7,8-PeCDF	99.9	
1,2,3,4,7,8-HxCDF	ND	0.0743			13C-1,2,3,4,7,8-HxCDF	83.1	
1,2,3,6,7,8-HxCDF	ND	0.0657			13C-1,2,3,6,7,8-HxCDF	85.3	
2,3,4,6,7,8-HxCDF	ND	0.0737			13C-2,3,4,6,7,8-HxCDF	83.6	
1,2,3,7,8,9-HxCDF	ND	0.101			13C-1,2,3,7,8,9-HxCDF	81	
1,2,3,4,6,7,8-HpCDF	ND	0.0724			13C-1,2,3,4,6,7,8-HpCDF	78	
1,2,3,4,7,8,9-HpCDF	ND	0.0945			13C-1,2,3,4,7,8,9-HpCDF	86.2	
OCDF	ND	0.108			13C-OCDF	84.8	
<b>Totals</b>						<b>CS Recoveries</b>	
TCDDs	ND	0.101			37Cl-2,3,7,8-TCDD	88.6	
PeCDDs	ND	0.082			13C-1,2,3,4,7-PeCDD	96	
HxCDDs	ND	0.152			13C-1,2,3,4,6-PeCDF	101	
HpCDDs	ND	0.186			13C-1,2,3,4,6,9-HxCDF	88	
					13C-1,2,3,4,6,8,9-HpCDF	90.1	
TCDFs	ND	0.0654					
PeCDFs	ND	0.0461				<b>AS Recoveries</b>	
HxCDFs	ND	0.0772			13C-1,3,6,8-TCDD	82.9	
HpCDFs	ND	0.0825			13C-1,3,6,8-TCDF	106	
<b>Total PCDD/Fs</b>	<b>0</b>		<b>0</b>				
<b>ITEF TEQs</b>							
TEQ: ND=0	0		0				
TEQ: ND=DL/2	0.127		0.127				
TEQ: ND=DL	0.254		0.254				



2714 Exchange Drive  
 Wilmington, NC 28405  
 USA  
 Tel: +1 910 794-1613; Toll-Free 866 846-8290 info@ultratrace.com  
 Fax: +1 910 794-3919 www.ultratrace.com

Checkcode: 1378

AP D/F 2009 Rev. J

Reviewer .....  
 Date .....

# Sample ID: SFEG

# Method 1613

Client Data		Sample Data		Laboratory Data			
Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids	Project No.:	P1327	Date Received:	15/May/2009
Project ID:	General Analytical HRMS	Weight/Volume:	11.23 g	Sample ID:	P1327_6843_001	Date Extracted:	27/May/2009
Date Collected:	27/Apr/2009	% Solids:	59.1 %	QC Batch No.:	6843	Date Analyzed:	03/Jun/2009
		Split:	-	Dilution:	-	Time Analyzed:	14:33:17

Analyte	Conc. (pg/g)	DL (pg/g)	EMPC (pg/g)	Qualifiers	Standard	ES Recoveries	Qualifiers
2,3,7,8-TCDD	0.0842	[Ra=0.754]		J	13C-2,3,7,8-TCDD	89.5	
1,2,3,7,8-PeCDD	ND	0.138			13C-1,2,3,7,8-PeCDD	83.6	
1,2,3,4,7,8-HxCDD	ND	0.132			13C-1,2,3,4,7,8-HxCDD	89	
1,2,3,6,7,8-HxCDD	0.385			J	13C-1,2,3,6,7,8-HxCDD	85.9	
1,2,3,7,8,9-HxCDD	0.407			J	13C-1,2,3,7,8,9-HxCDD	88.9	
1,2,3,4,6,7,8-HpCDD	3.49				13C-1,2,3,4,6,7,8-HpCDD	101	
OCDD	24.7				13C-OCDD	90.8	
2,3,7,8-TCDF	EMPC		0.138	J	13C-2,3,7,8-TCDF	98.7	
1,2,3,7,8-PeCDF	ND	0.119			13C-1,2,3,7,8-PeCDF	87.5	
2,3,4,7,8-PeCDF	ND	0.102			13C-2,3,4,7,8-PeCDF	90.2	
1,2,3,4,7,8-HxCDF	ND	0.0569			13C-1,2,3,4,7,8-HxCDF	84.9	
1,2,3,6,7,8-HxCDF	EMPC		0.0719	J	13C-1,2,3,6,7,8-HxCDF	80.3	
2,3,4,6,7,8-HxCDF	EMPC		0.0558	J	13C-2,3,4,6,7,8-HxCDF	84	
1,2,3,7,8,9-HxCDF	ND	0.0789			13C-1,2,3,7,8,9-HxCDF	83.7	
1,2,3,4,6,7,8-HpCDF	0.369			J	13C-1,2,3,4,6,7,8-HpCDF	83.3	
1,2,3,4,7,8,9-HpCDF	ND	0.0507			13C-1,2,3,4,7,8,9-HpCDF	95.7	
OCDF	EMPC		0.446	J	13C-OCDF	89.6	
<b>Totals</b>						<b>CS Recoveries</b>	
TCDDs	0.391		0.701		37Cl-2,3,7,8-TCDD	92.6	
PeCDDs	0.792		0.95		13C-1,2,3,4,7-PeCDD	88.4	
HxCDDs	3.01		3.29		13C-1,2,3,4,6-PeCDF	97.8	
HpCDDs	7.43				13C-1,2,3,4,6,9-HxCDF	90.1	
					13C-1,2,3,4,6,8,9-HpCDF	104	
TCDFs	0.825		1.79				
PeCDFs	0.4					<b>AS Recoveries</b>	
HxCDFs	0.341		0.708		13C-1,3,6,8-TCDD	85.1	
HpCDFs	0.974				13C-1,3,6,8-TCDF	105	
<b>Total PCDD/Fs</b>	<b>38.9</b>		<b>41.4</b>				
<b>ITEF TEQs</b>							
TEQ: ND=0	0.227		0.254				
TEQ: ND=DL/2	0.311		0.33				
TEQ: ND=DL	0.395		0.407				



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Checkcode: 0021

AP D/F 2009 Rev. J

Reviewer .....  
 Date .....

# P1327 - TEQ

Project ID: General Analytical HRMS

Sample Summary Part 1 (dry weight)	 <b>ANALYTICAL PERSPECTIVES</b>		Method 1613
Analyte	0_6843_MB001 pg/g	SFEG pg/g	
2,3,7,8-TCDD	(0.101)	0.0842	
1,2,3,7,8-PeCDD	(0.082)	(0.138)	
1,2,3,4,7,8-HxCDD	(0.137)	(0.132)	
1,2,3,6,7,8-HxCDD	(0.154)	0.385	
1,2,3,7,8,9-HxCDD	(0.166)	0.407	
1,2,3,4,6,7,8-HpCDD	(0.186)	3.49	
OCDD	(0.28)	24.7	
2,3,7,8-TCDF	(0.0654)	[0.138]	
1,2,3,7,8-PeCDF	(0.0487)	(0.119)	
2,3,4,7,8-PeCDF	(0.0436)	(0.102)	
1,2,3,4,7,8-HxCDF	(0.0743)	(0.0569)	
1,2,3,6,7,8-HxCDF	(0.0657)	[0.0719]	
2,3,4,6,7,8-HxCDF	(0.0737)	[0.0558]	
1,2,3,7,8,9-HxCDF	(0.101)	(0.0789)	
1,2,3,4,6,7,8-HpCDF	(0.0724)	0.369	
1,2,3,4,7,8,9-HpCDF	(0.0945)	(0.0507)	
OCDF	(0.108)	[0.446]	
ITEF TEQ (ND=0; EMPC=0)	<b>0.00</b>	<b>0.227</b>	
ITEF TEQ (ND=0; EMPC=EMPC)	<b>0.00</b>	<b>0.254</b>	
ITEF TEQ (ND=DL/2; EMPC=0)	<b>0.127</b>	<b>0.311</b>	
ITEF TEQ (ND=DL/2; EMPC=EMPC)	<b>0.127</b>	<b>0.33</b>	
ITEF TEQ (ND=DL; EMPC=EMPC)	<b>0.254</b>	<b>0.407</b>	
Checkcode	1378 ✓	0021	

() = DL  
[] = EMPC

Reviewer:   
Date: 04 Jan 09  
HLS

# P1327 - WHO 2005 TEF-TEQ

Project ID: General Analytical HRMS

<b>Sample Summary</b> <b>Part 1 (dry weight)</b>	 <b>ANALYTICAL PERSPECTIVES</b>		<b>Method 1613</b>
<b>Analyte</b>	<b>0_6843_MB001</b>  pg/g	<b>SFEG</b>  pg/g	
2,3,7,8-TCDD	(0.101)	0.0842	
1,2,3,7,8-PeCDD	(0.082)	(0.138)	
1,2,3,4,7,8-HxCDD	(0.137)	(0.132)	
1,2,3,6,7,8-HxCDD	(0.154)	0.385	
1,2,3,7,8,9-HxCDD	(0.166)	0.407	
1,2,3,4,6,7,8-HpCDD	(0.186)	3.49	
OCDD	(0.28)	24.7	
2,3,7,8-TCDF	(0.0654)	[0.138]	
1,2,3,7,8-PeCDF	(0.0487)	(0.119)	
2,3,4,7,8-PeCDF	(0.0436)	(0.102)	
1,2,3,4,7,8-HxCDF	(0.0743)	(0.0569)	
1,2,3,6,7,8-HxCDF	(0.0657)	[0.0719]	
2,3,4,6,7,8-HxCDF	(0.0737)	[0.0558]	
1,2,3,7,8,9-HxCDF	(0.101)	(0.0789)	
1,2,3,4,6,7,8-HpCDF	(0.0724)	0.369	
1,2,3,4,7,8,9-HpCDF	(0.0945)	(0.0507)	
OCDF	(0.108)	[0.446]	
<b>WHO 2005 TEF TEQ (ND=0; EMPC=0)</b>	<b>0.00</b>	<b>0.209</b>	
<b>WHO 2005 TEF TEQ (ND=0; EMPC=EMPC)</b>	<b>0.00</b>	<b>0.236</b>	
<b>WHO 2005 TEF TEQ (ND=DL/2; EMPC=0)</b>	<b>0.142</b>	<b>0.317</b>	
<b>WHO 2005 TEF TEQ (ND=DL/2; EMPC=EMPC)</b>	<b>0.142</b>	<b>0.336</b>	
<b>WHO 2005 TEF TEQ (ND=DL; EMPC=EMPC)</b>	<b>0.285</b>	<b>0.436</b>	
Checkcode	1378 ✓	0021 ✓	

( ) = DL  
 [ ] = EMPC

Reviewer \_\_\_\_\_  
 Date Oct 11 2009

HLS 4 Jun 09

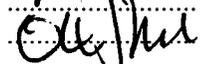
# P1327 - Totals

Project ID: General Analytical HRMS

Sample Summary Part 2 (dry weight)	 <b>ANALYTICAL PERSPECTIVES</b>		Method 1613
Analyte	0_6843_MB001  pg/g	SFEG  pg/g	
<b>Totals</b>			
TCDDs	0	0.391	
PeCDDs	0	0.792	
HxCDDs	0	3.01	
HpCDDs	0	7.43	
OCDD	0	24.7	
TCDFs	0	0.825	
PeCDFs	0	0.4	
HxCDFs	0	0.341	
HpCDFs	0	0.974	
OCDF	0	0	
Total PCDD/Fs (ND=0; EMPC=0)	0.00	38.9	
Total PCDD/Fs (ND=0; EMPC=EMPC)	0.00	41.4	
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	1.85	42.1	
Total 2378s (ND=0; EMPC=0)	0.00	29.4	
Total 2378s (ND=0.5; EMPC=0)	0.927	29.9	
Total 2378s (ND=1; EMPC=0)	1.85	30.4	
Total 2378s (ND=0; EMPC=1)	0.00	30.1	
Total 2378s (ND=0.5; EMPC=1)	0.927	30.5	
Total 2378s (ND=1; EMPC=1)	1.85	30.8	
Checkcode	1378 ✓	0021 ✓	

Total 2378s = Sum of 17 2378-substituted PCDD/PCDF congeners (SARA 313)

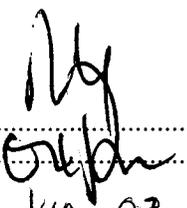
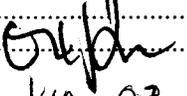
( ) = DL  
[ ] = EMPC

Reviewer   
Date   
HLS 4 Jun 89

**P1327 - Others**  
**Project ID: General Analytical HRMS**

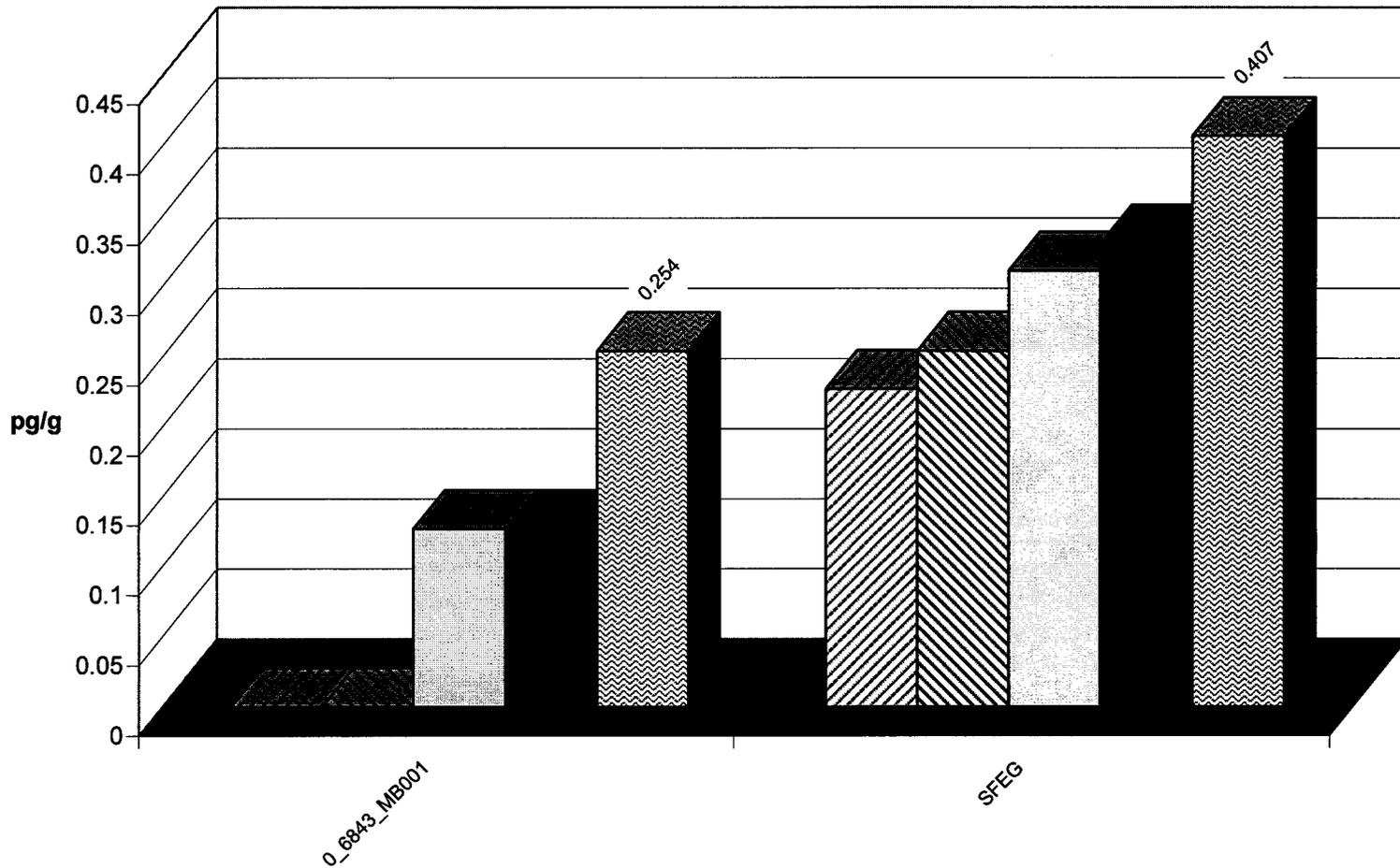
<b>Sample Summary Part 3 (dry weight)</b>		<b>Method 1613</b>
<b>Analyte</b>	<b>0_6843_MB001</b>	<b>SFEG</b>
	pg/g	pg/g
<b>Other PCDD/Fs (ND=0, EMPC=0)</b>		
Other TCDD	0	0.307
Other PeCDD	0	0.792
Other HxCDD	0	2.22
Other HpCDD	0	3.94
Other TCDF	0	0.825
Other PeCDF	0	0.4
Other HxCDF	0	0.341
Other HpCDF	0	0.605
<b>Other PCDD/Fs (ND=0, EMPC=EMPC)</b>		
Other TCDD	0	0.617
Other PeCDD	0	0.95
Other HxCDD	0	2.49
Other HpCDD	0	3.94
Other TCDF	0	1.65
Other PeCDF	0	0.4
Other HxCDF	0	0.581
Other HpCDF	0	0.605

( ) = DL  
 [ ] = EMPC

Reviewer   
 Date   
 HLS 4 Jun 02

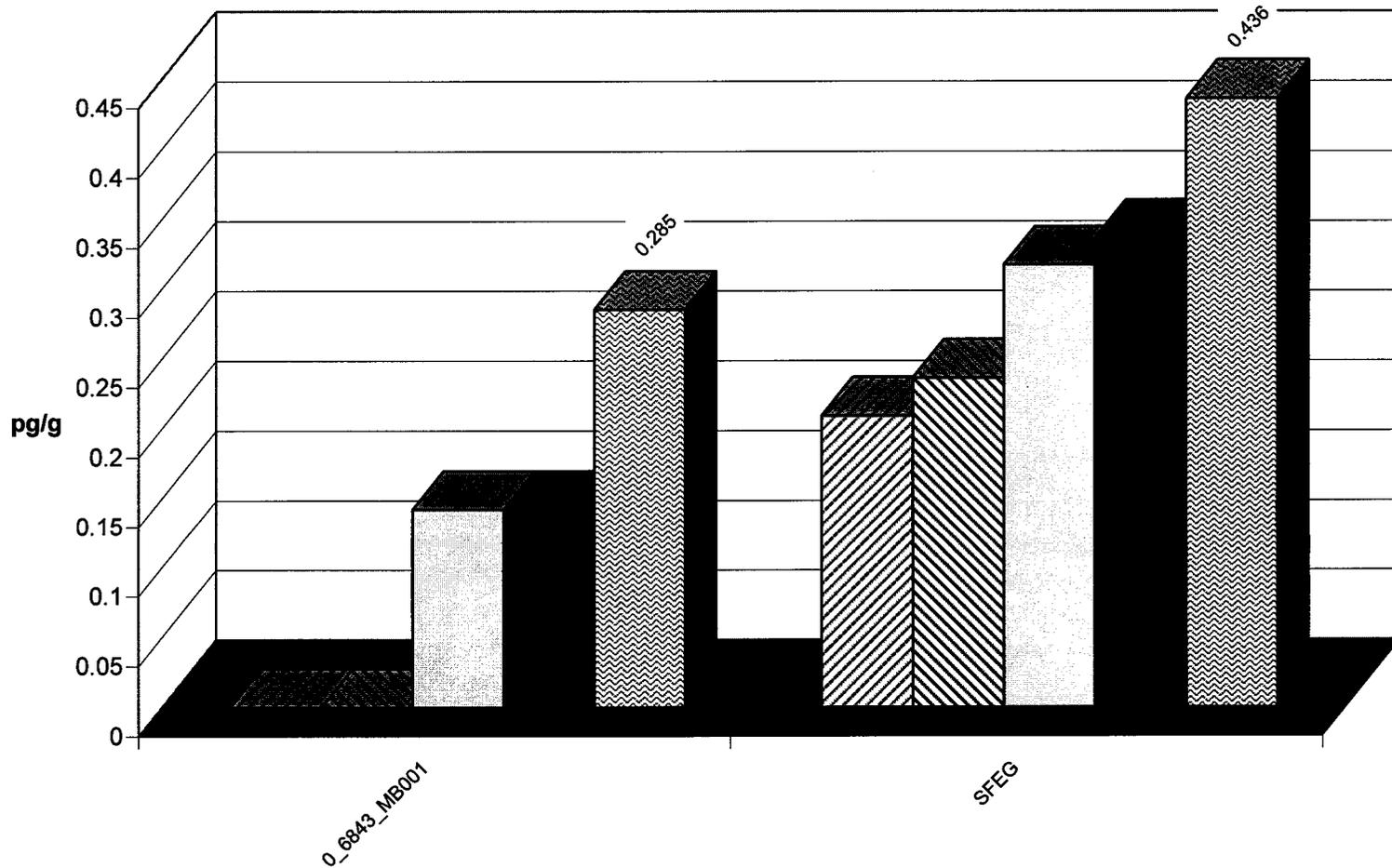
**ITEF-TEQ**  
**Project ID: General Analytical HRMS**  
**P1327**

- ▣ ND=0; EMPC=0
- ▣ ND=0; EMPC=EMPC
- ▣ ND=DL/2; EMPC=0
- ND=DL/2; EMPC=EMPC
- ▣ ND=DL; EMPC=EMPC



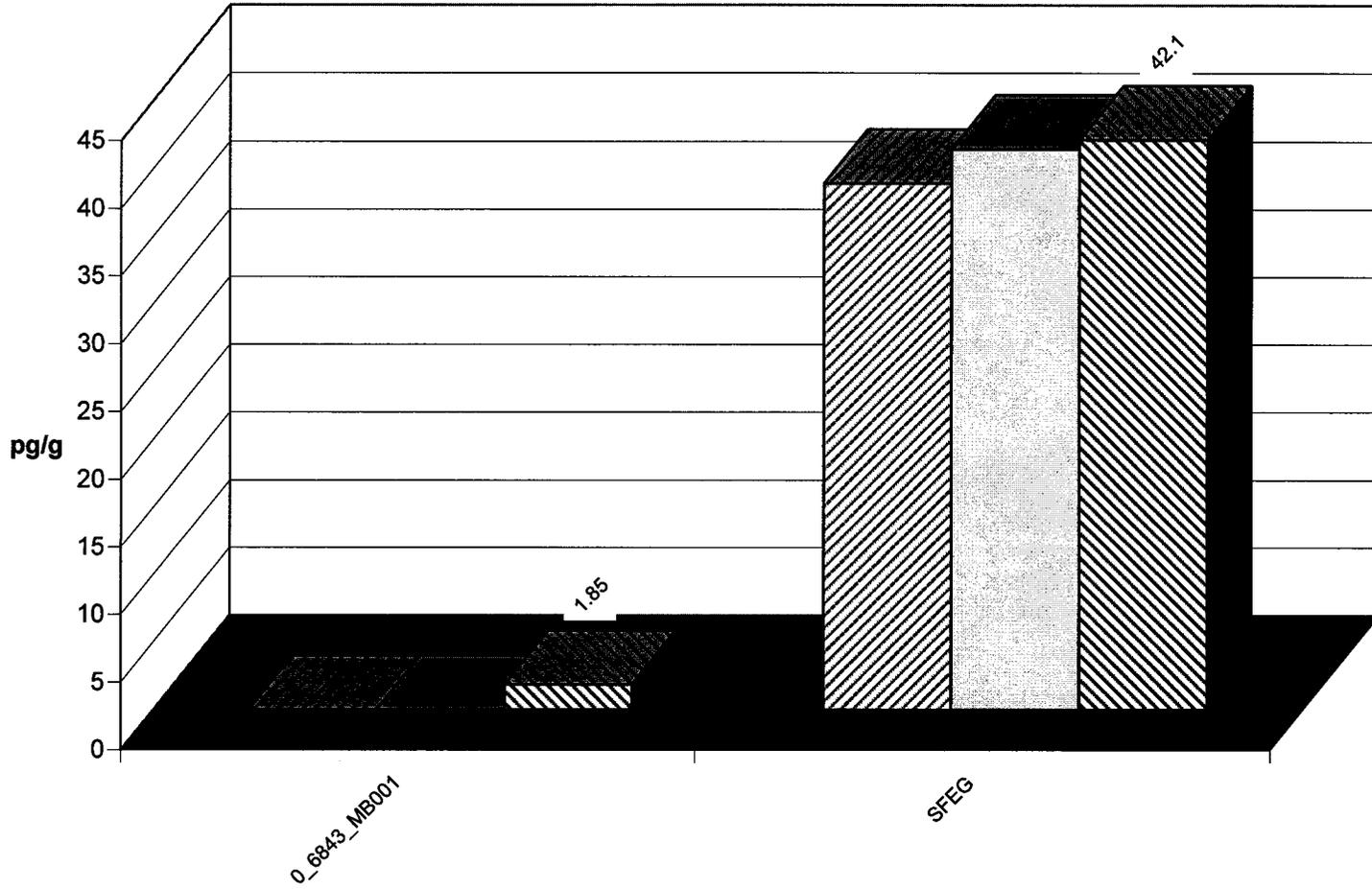
**WHO 2005 TEF-TEQ**  
**Project ID: General Analytical HRMS**  
**P1327**

- ▣ ND=0; EMPC=0
- ▤ ND=0; EMPC=EMPC
- ND=DL/2; EMPC=0
- ND=DL/2; EMPC=EMPC
- ▨ ND=DL; EMPC=EMPC

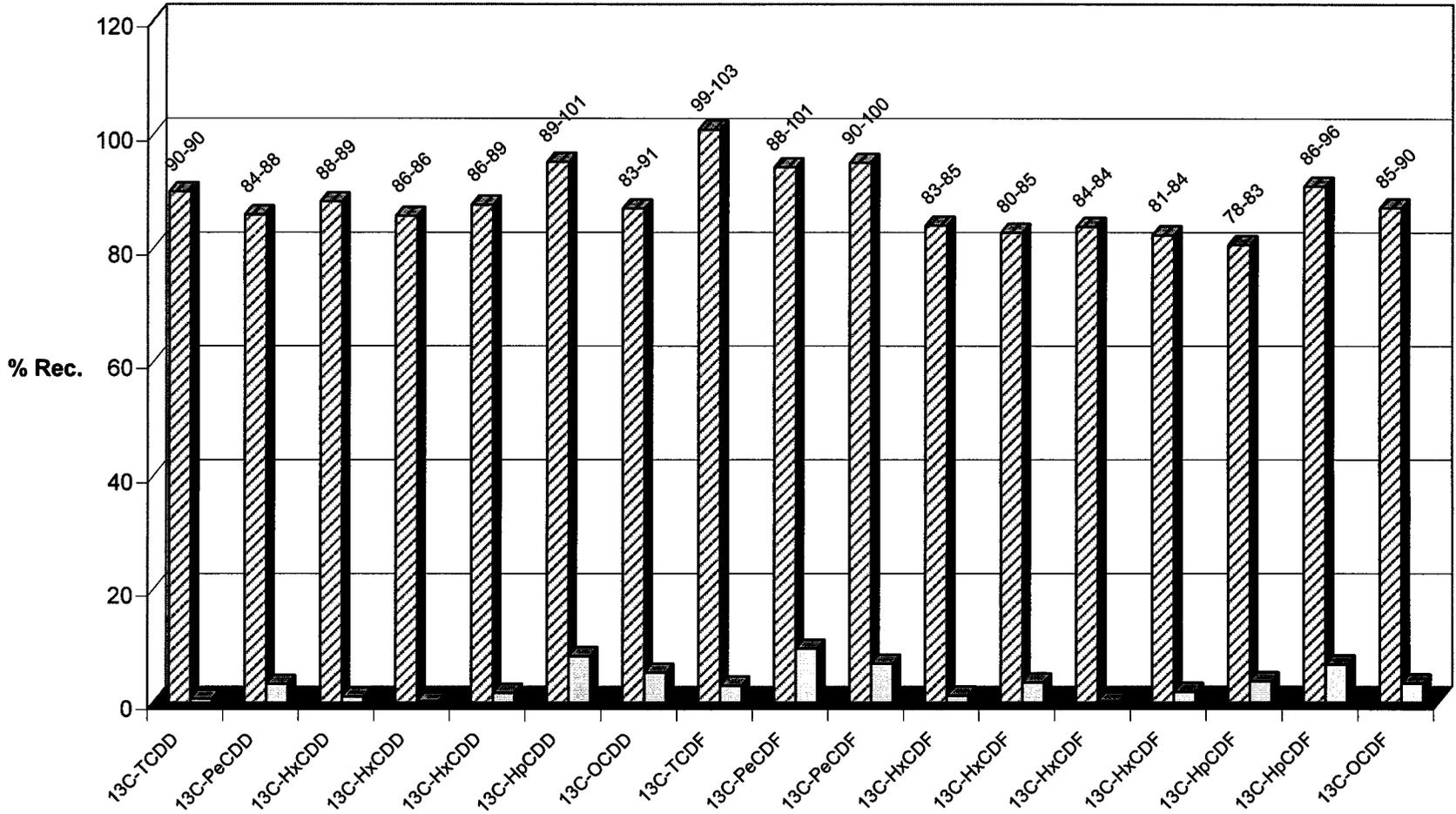
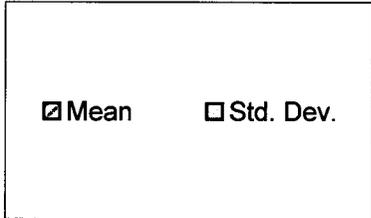


**Totals**  
**Project ID: General Analytical HRMS**  
**P1327**

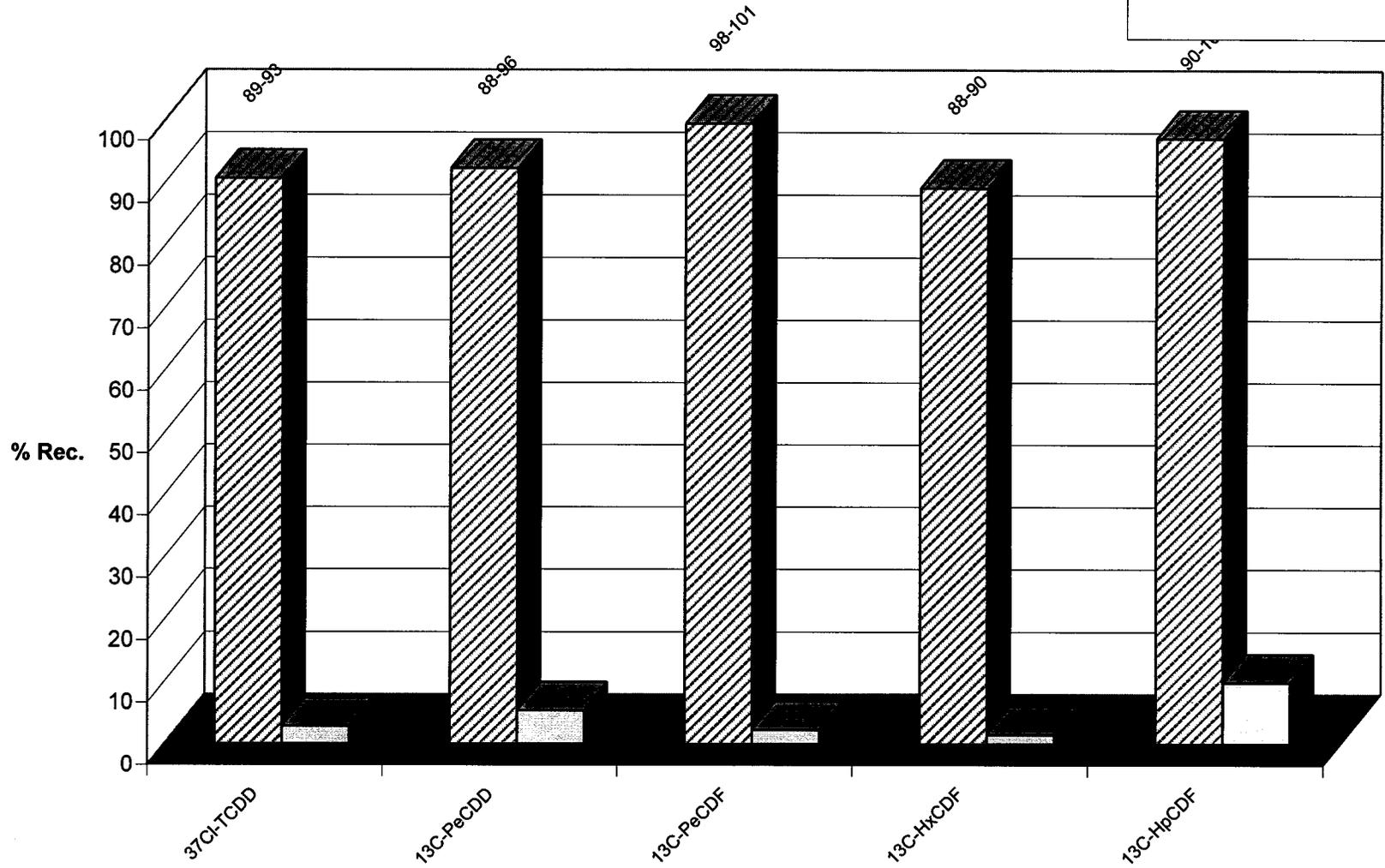
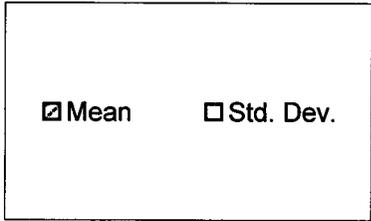
- ▨ Total PCDD/Fs (ND=0; EMPC=0)
- Total PCDD/Fs (ND=0; EMPC=EMPC)
- ▩ Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)



**Mean Recoveries of Extraction Standards (N=2)**  
**Project ID: General Analytical HRMS**  
**P1327**



**Mean Recoveries of Clean-Up Standards (N=2)**  
**Project ID: General Analytical HRMS**  
**P1327**



# Sample ID: 0\_6843\_MB001

# Method 1613

Client Data		Sample Data		Laboratory Data		Date Received: n/a	
Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids	Project No.:	P1327	Date Extracted:	27 May 2009
Project ID:	General Analytical HRMS	Weight/Volume:	10.00 g	Sample ID:	MB1_6843_DF_SDS	Date Analyzed:	03 Jun 2009
Date Collected:	n/a	% Solids:	n/a	QC Batch No.:	6843	Time Analyzed:	12:54:16
		Split:	-	Dilution:	-		

Analyte	Conc. (pg/g)	DL (pg/g)	EMPC (pg/g)	Qualifiers	Standard	ES Recoveries	Qualifiers
2,3,7,8-TCDD	ND	0.101			13C-2,3,7,8-TCDD	90.5	
1,2,3,7,8-PeCDD	ND	0.082			13C-1,2,3,7,8-PeCDD	88.3	
1,2,3,4,7,8-HxCDD	ND	0.137			13C-1,2,3,4,7,8-HxCDD	87.5	
1,2,3,6,7,8-HxCDD	ND	0.154			13C-1,2,3,6,7,8-HxCDD	85.5	
1,2,3,7,8,9-HxCDD	ND	0.166			13C-1,2,3,7,8,9-HxCDD	86.4	
1,2,3,4,6,7,8-HpCDD	ND	0.186			13C-1,2,3,4,6,7,8-HpCDD	89.4	
OCDD	ND	0.28			13C-OCDD	83.3	
2,3,7,8-TCDF	ND	0.0654			13C-2,3,7,8-TCDF	103	
1,2,3,7,8-PeCDF	ND	0.0487			13C-1,2,3,7,8-PeCDF	101	
2,3,4,7,8-PeCDF	ND	0.0436			13C-2,3,4,7,8-PeCDF	99.9	
1,2,3,4,7,8-HxCDF	ND	0.0743			13C-1,2,3,4,7,8-HxCDF	83.1	
1,2,3,6,7,8-HxCDF	ND	0.0657			13C-1,2,3,6,7,8-HxCDF	85.3	
2,3,4,6,7,8-HxCDF	ND	0.0737			13C-2,3,4,6,7,8-HxCDF	83.6	
1,2,3,7,8,9-HxCDF	ND	0.101			13C-1,2,3,7,8,9-HxCDF	81	
1,2,3,4,6,7,8-HpCDF	ND	0.0724			13C-1,2,3,4,6,7,8-HpCDF	78	
1,2,3,4,7,8,9-HpCDF	ND	0.0945			13C-1,2,3,4,7,8,9-HpCDF	86.2	
OCDF	ND	0.108			13C-OCDF	84.8	

Totals						CS Recoveries	
TCDDs	ND	0.101			37Cl-2,3,7,8-TCDD	88.6	
PeCDDs	ND	0.082			13C-1,2,3,4,7-PeCDD	96	
HxCDDs	ND	0.152			13C-1,2,3,4,6-PeCDF	101	
HpCDDs	ND	0.186			13C-1,2,3,4,6,9-HxCDF	88	
					13C-1,2,3,4,6,8,9-HpCDF	90.1	
TCDFs	ND	0.0654					
PeCDFs	ND	0.0461					
HxCDFs	ND	0.0772			13C-1,3,6,8-TCDD	82.9	
HpCDFs	ND	0.0825			13C-1,3,6,8-TCDF	106	

<b>Total PCDD/Fs</b>	<b>0</b>		<b>0</b>
<b>ITEF TEQs</b>			
TEQ: ND=0	0		0
TEQ: ND=DL/2	0.127		0.127
TEQ: ND=DL	0.254		0.254

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USA

**ANALYTICAL PERSPECTIVES**

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Fax: +1 910 794-3919      www.ultratrace.com

Checkcode: 1378

AP D/F 2009 Rev. J

Reviewer: *[Signature]*  
Date: *4 Jun 09*

**Sample ID: 0\_6843\_MB001**

**TEQ Summary**

**Method 1613**

Client Project Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids ✓	Lab Sample ID:	MB1_6843_DF_SDS
Client Project ID:	General Analytical HRMS	Weight/Volume:	10.00 g	QC Batch No.:	6843
Date Collected:	n/a	Split:	-	Date Extracted:	27 May 2009 ✓
Date Received:	n/a	Dilution:	-	Date Analyzed:	03 Jun 2009 12:54 ✓
Lab Project No:	P1327	Units:	pg/g	% Solids:	n/a

Analyte	Result	Qualifiers	DLs	I-TEQ	WHO-1998	WHO-2005
2,3,7,8-TCDD	(0.101)		0.101	(0.101)	(0.101)	(0.101)
1,2,3,7,8-PeCDD	(0.082)		0.082	(0.041)	(0.082)	(0.082)
1,2,3,4,7,8-HxCDD	(0.137)		0.137	(0.0137)	(0.0137)	(0.0137)
1,2,3,6,7,8-HxCDD	(0.154)		0.154	(0.0154)	(0.0154)	(0.0154)
1,2,3,7,8,9-HxCDD	(0.166)		0.166	(0.0166)	(0.0166)	(0.0166)
1,2,3,4,6,7,8-HpCDD	(0.186)		0.186	(0.00186)	(0.00186)	(0.00186)
OCDD	(0.28)		0.28	(0.00028)	(0.000028)	(0.000084)
2,3,7,8-TCDF	(0.0654)		0.0654	(0.00654)	(0.00654)	(0.00654)
1,2,3,7,8-PeCDF	(0.0487)		0.0487	(0.00244)	(0.00244)	(0.00146)
2,3,4,7,8-PeCDF	(0.0436)		0.0436	(0.0218)	(0.0218)	(0.0131)
1,2,3,4,7,8-HxCDF	(0.0743)		0.0743	(0.00743)	(0.00743)	(0.00743)
1,2,3,6,7,8-HxCDF	(0.0657)		0.0657	(0.00657)	(0.00657)	(0.00657)
2,3,4,6,7,8-HxCDF	(0.0737)		0.0737	(0.00737)	(0.00737)	(0.00737)
1,2,3,7,8,9-HxCDF	(0.101)		0.101	(0.0101)	(0.0101)	(0.0101)
1,2,3,4,6,7,8-HpCDF	(0.0724)		0.0724	(0.000724)	(0.000724)	(0.000724)
1,2,3,4,7,8,9-HpCDF	(0.0945)		0.0945	(0.000945)	(0.000945)	(0.000945)
OCDF	(0.108)		0.108	(0.000108)	(0.0000108)	(0.0000324)

 <b>ANALYTICAL PERSPECTIVES</b> 2714 Exchange Drive Wilmington, NC 28405, USA Tel: +1 910 794-1613; Toll-Free 866 846-8290 Fax: +1 910 794-3919 info@ultratrace.com www.ultratrace.com	<b>TEQ Summaries</b>			
	EMPC = 0, ND = 0	0	0	0
	EMPC = 0, ND = DL / 2	0.127	0.147	0.142
	EMPC = 0, ND = DL	0.254	0.295	0.285
	EMPC = 0, < J-level = 0	0	0	0
	EMPC = EMPC, ND = 0	0	0	0
EMPC = EMPC, ND = DL / 2	0.127	0.147	0.142	
EMPC = EMPC, ND = DL	0.254	0.295	0.285	
EMPC = EMPC, < J-level = 0	0	0	0	

# Sample ID: SFEG

# Method 1613

Client Data		Sample Data		Laboratory Data		Date Received: 15 May 2009	
Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids	Project No.:	P1327	Date Received:	15 May 2009
Project ID:	General Analytical HRMS	Weight/Volume:	11.23 g	Sample ID:	P1327_6843_001	Date Extracted:	27 May 2009
Date Collected:	27 Apr 2009	% Solids:	59.1 %	QC Batch No.:	6843	Date Analyzed:	03 Jun 2009
		Split:	-	Dilution:	-	Time Analyzed:	14:33:17

Analyte	Conc. (pg/g)	DL (pg/g)	EMPC (pg/g)	Qualifiers	Standard	ES Recoveries	Qualifiers
2,3,7,8-TCDD	0.0842	[Ra=0.754]		J	13C-2,3,7,8-TCDD	89.5	
1,2,3,7,8-PeCDD	ND	0.138			13C-1,2,3,7,8-PeCDD	83.6	
1,2,3,4,7,8-HxCDD	ND	0.132			13C-1,2,3,4,7,8-HxCDD	89	
1,2,3,6,7,8-HxCDD	0.385			J	13C-1,2,3,6,7,8-HxCDD	85.9	
1,2,3,7,8,9-HxCDD	0.407			J	13C-1,2,3,7,8,9-HxCDD	88.9	
1,2,3,4,6,7,8-HpCDD	3.49				13C-1,2,3,4,6,7,8-HpCDD	101	
OCDD	24.7				13C-OCDD	90.8	
2,3,7,8-TCDF	EMPC		0.138	J	13C-2,3,7,8-TCDF	98.7	
1,2,3,7,8-PeCDF	ND	0.119			13C-1,2,3,7,8-PeCDF	87.5	
2,3,4,7,8-PeCDF	ND	0.102			13C-2,3,4,7,8-PeCDF	90.2	
1,2,3,4,7,8-HxCDF	ND	0.0569			13C-1,2,3,4,7,8-HxCDF	84.9	
1,2,3,6,7,8-HxCDF	EMPC		0.0719	J	13C-1,2,3,6,7,8-HxCDF	80.3	
2,3,4,6,7,8-HxCDF	EMPC		0.0558	J	13C-2,3,4,6,7,8-HxCDF	84	
1,2,3,7,8,9-HxCDF	ND	0.0789			13C-1,2,3,7,8,9-HxCDF	83.7	
1,2,3,4,6,7,8-HpCDF	0.369			J	13C-1,2,3,4,6,7,8-HpCDF	83.3	
1,2,3,4,7,8,9-HpCDF	ND	0.0507			13C-1,2,3,4,7,8,9-HpCDF	95.7	
OCDF	EMPC		0.446	J	13C-OCDF	89.6	

Totals						CS Recoveries	
TCDDs	0.391		0.701		37Cl-2,3,7,8-TCDD	92.6	
PeCDDs	0.792		0.95		13C-1,2,3,4,7-PeCDD	88.4	
HxCDDs	3.01		3.29		13C-1,2,3,4,6-PeCDF	97.8	
HpCDDs	7.43				13C-1,2,3,4,6,9-HxCDF	90.1	
					13C-1,2,3,4,6,8,9-HpCDF	104	
TCDFs	0.825		1.79				
PeCDFs	0.4						AS Recoveries
HxCDFs	0.341		0.708		13C-1,3,6,8-TCDD	85.1	
HpCDFs	0.974				13C-1,3,6,8-TCDF	105	

Total PCDD/Fs				ANALYTICAL PERSPECTIVES			
38.9				2714 Exchange Drive			
41.4				Wilmington, NC 28405			
ITEF TEQs				USA			
TEQ: ND=0	0.227		0.254	Tel: +1 910 794-1613; Toll-Free 866 846-8290			
TEQ: ND=DL/2	0.311		0.33	Fax: +1 910 794-3919			
TEQ: ND=DL	0.395		0.407	info@ultratrace.com			
				www.ultratrace.com			

Checkcode: 0021

AP D/F 2009 Rev. J

Reviewer: *[Signature]*  
Date: *[Signature]*

*HLW 4 Jun 09*

# Sample ID: SFEG

# TEQ Summary

# Method 1613

Client Project Name:	Skagit Fisheries Enhancement Group	Matrix:	Solids ✓	Lab Sample ID:	P1327_6843_001
Client Project ID:	General Analytical HRMS	Weight/Volume:	11.23 g	QC Batch No.:	6843
Date Collected:	27 Apr 2009	Split:	-	Date Extracted:	27 May 2009 ✓
Date Received:	15 May 2009	Dilution:	-	Date Analyzed:	03 Jun 2009 14:33 ✓
Lab Project No:	P1327	Units:	pg/g	% Solids:	59.1 %

Analyte	Result	Qualifiers	DLs	I-TEQ	WHO-1998	WHO-2005
2,3,7,8-TCDD	[0.0842]	J	0.183	[0.0842]	[0.0842]	[0.0842]
1,2,3,7,8-PeCDD	(0.138)		0.138	(0.069)	(0.138)	(0.138)
1,2,3,4,7,8-HxCDD	(0.132)		0.132	(0.0132)	(0.0132)	(0.0132)
1,2,3,6,7,8-HxCDD	0.385	J	0.148	0.0385	0.0385	0.0385
1,2,3,7,8,9-HxCDD	0.407	J	0.155	0.0407	0.0407	0.0407
1,2,3,4,6,7,8-HpCDD	3.49		0.2	0.0349	0.0349	0.0349
OCDD	24.7		0.308	0.0247	0.00247	0.00741
2,3,7,8-TCDF	[0.138]	J	0.0373	[0.0138]	[0.0138]	[0.0138]
1,2,3,7,8-PeCDF	(0.119)		0.119	(0.00595)	(0.00595)	(0.00357)
2,3,4,7,8-PeCDF	(0.102)		0.102	(0.051)	(0.051)	(0.0306)
1,2,3,4,7,8-HxCDF	(0.0569)		0.0569	(0.00569)	(0.00569)	(0.00569)
1,2,3,6,7,8-HxCDF	[0.0719]	J	0.0558	[0.00719]	[0.00719]	[0.00719]
2,3,4,6,7,8-HxCDF	[0.0558]	J	0.0596	[0.00558]	[0.00558]	[0.00558]
1,2,3,7,8,9-HxCDF	(0.0789)		0.0789	(0.00789)	(0.00789)	(0.00789)
1,2,3,4,6,7,8-HpCDF	0.369	J	0.0369	0.00369	0.00369	0.00369
1,2,3,4,7,8,9-HpCDF	(0.0507)		0.0507	(0.000507)	(0.000507)	(0.000507)
OCDF	[0.446]	J	0.138	[0.000446]	[0.0000446]	[0.000134]

 <b>ANALYTICAL PERSPECTIVES</b> 2714 Exchange Drive Wilmington, NC 28405, USA Tel: +1 910 794-1613; Toll-Free 866 846-8290 Fax: +1 910 794-3919 info@ultratrace.com www.ultratrace.com	<b>TEQ Summaries</b>			
	EMPC = 0, ND = 0	0.143	0.12	0.125
	EMPC = 0, ND = DL / 2	0.318	0.331	0.324
	EMPC = 0, ND = DL	0.494	0.541	0.523
	EMPC = 0, < J-level = 0	0.0596	0.0374	0.0423
	EMPC = EMPC, ND = 0	0.254	0.231	0.236
	EMPC = EMPC, ND = DL / 2	0.33	0.342	0.336
	EMPC = EMPC, ND = DL	0.407	0.453	0.436
EMPC = EMPC, < J-level = 0	0.0596	0.0374	0.0423	

# APPENDIX D

## CHEMISTRY DATA VALIDATION

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Seattle, Washington 98101  
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## Data Validation Review Report – EPA Level 2

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**Project:** Thatcher Bay

**Project Number:** 090613-01

**Date:** June 25, 2009

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This report summarizes the review of analytical results for one sediment sample collected on April 27, 2009. Samples were collected by Skagit Fisheries Enhancement Group and submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington. The sample was analyzed for the following:

- Semivolatile Organic Compounds (SVOCs) by United States Environmental Protection Agency (USEPA) method 8270D
- Volatile organic compounds (VOCs) by USEPA method 8260B
- Organochlorine pesticides by USEPA method 8081A
- Aroclor polychlorinated biphenyls (PCBs) by USEPA method 8082
- Total metals by USEPA methods 6010B, 7740, and 7471A
- Ammonia by USEPA method 350.1M
- Sulfides by USEPA method 376.2
- Total organic carbon (TOC) by Plumb, 1981
- Total solids (TS) by USEPA method 160.3
- Grainsize by PSEP

ARI sample data group (SDG) number OW96 was reviewed in this report.

### **Data Validation and Qualifications**

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective section of the Sampling and Analysis Plan (SAP). Laboratory results were reviewed following USEPA guidelines using *USEPA Contract Laboratory Program National*

*Functional Guidelines for Inorganics Data Review (USEPA, 2000) and USEPA Contract Laboratory National Functional Guidelines for Organics Data Review (USEPA, 1999) as guidelines, applying laboratory and method QC criteria as stated in SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.*

### **Field Documentation**

Field documentation was checked for completeness and accuracy. The chain-of-custody was signed by ARI at the time of sample receipt; the samples were received in good condition. The sample was received at temperatures above the recommended  $4^{\circ} \pm 2^{\circ}$  C. The sample was received within twelve hours after collection so the data are not impacted.

### **Holding Times and Sample Preservation**

Samples were appropriately preserved and analyzed within holding times.

### **Laboratory Method Blanks**

Laboratory method blanks were analyzed at the required frequencies. All method blanks were free of target analytes with the exception of zinc in the metals method blank. The associated sample result was significantly greater than (>5x) the level found in the method blank so no data were qualified.

### **Field Quality Control**

#### *Field Blanks*

No field blanks were collected in association with this sample set.

#### *Trip Blanks*

One trip blank was analyzed in association with this data set. No volatile analytes were detected in the trip blank.

### *Field Duplicates*

No field duplicates were collected in association with this sample set.

### **Surrogate Recoveries**

Surrogate recoveries were within laboratory control limits for all surrogates.

### **Compound Quantitation**

No PCBs were detected in the sample.

### **Matrix Spike (MS)**

MS samples were analyzed at the required frequencies for all analyses. All MS analyses yielded percent recoveries (%R)s within the laboratory control limits with the following exceptions:

- VOCs – 1,2,4-Trichlorobenzene recovered below the laboratory control limit in the MS. The associated sample result has been qualified “UJ” to indicate a potentially low bias.
- SVOCs – Benzyl alcohol did not recover in the MS analysis. The sample result has been determined to be unusable and has been rejected.
- Metals – Antimony recovered below 30% in the MS sample. The sample result has been determined to be unusable and has been rejected.

### **Laboratory Control Sample (LCS) and LCS Duplicate (LCSD)**

An LCS and LCSD were analyzed at the required frequencies and resulted in recoveries within laboratory control limits with the exception of the PCB LCS which recovered high for aroclor 1260. Since the recovery was high and no PCB analytes were detected in the sample, no data have been qualified.

### **Laboratory Duplicates/Triplicates**

Laboratory duplicates/ triplicates were analyzed at the required frequencies. All RPD/relative standard deviation (RSD) values were within laboratory required control limits.

**Method Reporting Limits**

Reporting limits were deemed acceptable as reported. All values were reported using the laboratory's reporting limits. Values were reported as undiluted, or when diluted, the reporting limit accurately reflects the dilution factor.

**Overall Assessment**

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the laboratory duplicates/triplicates and LCS/LCSD RPD/RSD values. Most data were deemed acceptable as reported; all other data are judged to be acceptable as qualified. One SVOC analyte and one metal result were rejected due to no or low recoveries in the MS sample. Table 1 summarizes the qualifiers applied to samples reviewed in this report.

**Table 1  
 Data Qualification Summary**

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
Thatcher	VOCs	1,2,4-Trichlorobenzene	6.6U µg/kg	6.6UJ µg/kg	Low MS %R
	SVOCs	Benzyl alcohol	19U µg/kg	R	0%R in MS
	Metals	Antimony	8U mg/kg	R	Low MS %R

## REFERENCES

USEPA. 1983. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio. EPA-600/4-79-020.

USEPA. 1986. Test methods for Evaluating Solid Waste: Physical/Chemical Methods. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA-530/SW-846.

USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Office of Emergency Response. EPA 540/R-99/008. October.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540-R-04-004. October 2004.

APPENDIX E  
DIOXIN/FURAN SRM RESULTS

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Participant code:	<b>103</b>						
	<b>Analytical Perspectives</b>						
Weight Analysed:							
		<b>Average</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>	<b>SD</b>	<b>%RSD</b>
2,3,7,8-TeCDD	0.001	0.001	0.001	0.000	0.018	0.003	190%
1,2,3,7,8-PeCDD	0.002	0.002	0.002	0.000	0.01	0.00	36%
1,2,3,4,7,8-HxCDD	0.003	0.006	0.003	0.001	0.14	0.02	301%
1,2,3,6,7,8-HxCDD	0.007	0.008	0.007	0.0030	0.07	0.01	108%
1,2,3,7,8,9-HxCDD	0.005	0.009	0.005	0.000	0.09	0.02	179%
1,2,3,4,6,7,8-HpCDD	0.099	0.10	0.09	0.0520	0.5	0.1	65%
OCDD	0.592	0.55	0.56	0.0075	1.0	0.1	26%
2,3,7,8-TeCDF	0.051	0.058	0.055	0.028	0.11	0.01	25%
1,2,3,7,8-PeCDF	0.050	0.048	0.049	0.010	0.08	0.01	26%
2,3,4,7,8-PeCDF	0.045	0.042	0.039	0.010	0.15	0.02	47%
1,2,3,4,7,8-HxCDF	0.121	0.122	0.121	0.044	0.19	0.03	21%
1,2,3,6,7,8-HxCDF	0.051	0.074	0.049	0.005	1.59	0.18	248%
1,2,3,7,8,9-HxCDF	<0.0005	0.028	0.010	0.002	0.60	0.07	266%
2,3,4,6,7,8-HxCDF	0.033	0.05	0.03	0.004	1.04	0.14	257%
1,2,3,4,6,7,8-HpCDF	0.450	0.41	0.43	0.029	0.68	0.10	25%
1,2,3,4,7,8,9-HpCDF	0.084	0.11	0.08	0.025	1.16	0.17	153%
OCDF	1.350	1.30	1.24	0.048	3.85	0.47	36%
<b>TEQ (PCDD/DF) Lowerbound</b>	0.062	<b>0.09</b>	<b>0.06</b>	<b>0.018</b>	<b>1.49</b>	<b>0.18</b>	<b>199%</b>
<b>TEQ (PCDD/DF) Upperbound</b>	0.062	<b>0.09</b>	<b>0.06</b>	<b>0.018</b>	<b>1.49</b>	<b>0.18</b>	<b>199%</b>
PCB #77	0.299	0.308	0.278	0.0067	2.52	0.30	98%
PCB #126	0.028	0.027	0.026	0.010	0.11	0.01	47%
PCB #169	0.006	0.013	0.006	0.002	0.31	0.04	319%
<b>TEQ (including PCBs) Lowerbound</b>	0.065	<b>0.06</b>	<b>0.06</b>	<b>0.007</b>	<b>0.11</b>	<b>0.01</b>	<b>20%</b>
<b>TEQ (including PCBs) Upperbound</b>	0.065	<b>0.06</b>	<b>0.06</b>	<b>0.006</b>	<b>0.13</b>	<b>0.02</b>	<b>26%</b>
Other PCBs (Optional)							
PCB #81	0.016	0.142	0.008	0.0030	6.05	0.85	597%
PCB #105	1.690	1.69	1.70	0.02	3.37	0.45	27%
PCB #114	0.075	0.24	0.08	0.016	5.59	0.80	331%
PCB #118	5.150	4.94	5.10	0.12	7.80	1.32	27%
PCB #123	0.071	0.247	0.088	0.014	5.44	0.74	299%
PCB #156	1.100	1.049	1.065	0.306	1.579	0.221	21%
PCB #157	0.199	0.199	0.183	0.03	1.16	0.14	68%
PCB #167	0.514	0.468	0.456	0.06	0.89	0.13	27%
PCB #189	0.186	0.181	0.173	0.09	0.59	0.07	37%
<b>TEQ Total Lowerbound</b>	0.066	<b>0.06</b>	<b>0.06</b>	<b>0.001</b>	<b>0.11</b>	<b>0.02</b>	<b>26%</b>
<b>TEQ Total Upperbound</b>	0.066	<b>0.06</b>	<b>0.06</b>	<b>0.001</b>	<b>0.13</b>	<b>0.02</b>	<b>23%</b>
* all values in ng/g ND: not detected < than value expected NA: not analyzed			Sediment A1				

SRM EDF5184



Method 1613

Project: P9591B

Analyte	Conc.	Assigned Value	Lower QC Limit	UpperQC Limit	Measured value within QC limits (y/n)?	%D from Assigned value
	(pg/g)	(pg/g)	(pg/g)	(pg/g)		
2,3,7,8-TCDD	2.15	1.96	0.86	3.06	Y	9.69%
1,2,3,7,8-PeCDD	6	5.79	3.67	7.91	Y	1.04%
1,2,3,4,7,8-HxCDD	5.53	5.61	2.89	8.33	Y	-1.43%
1,2,3,6,7,8-HxCDD	11	10.9	7.4	14.4	Y	0.92%
1,2,3,7,8,9-HxCDD	6.72	6.88	4.94	8.82	Y	-2.33%
1,2,3,4,6,7,8-HpCDD	256	231	153.4	308.6	Y	10.82%
OCDD	2,190	2050	1470	2630	Y	6.83%
2,3,7,8-TCDF	230	219	171.2	266.8	Y	5.02%
1,2,3,7,8-PeCDF	131	122	98	146	Y	7.38%
2,3,4,7,8-PeCDF	199	164	113.6	214.4	Y	21.34%
1,2,3,4,7,8-HxCDF	289	277	234.2	319.8	Y	4.33%
1,2,3,6,7,8-HxCDF	166	159	135.4	182.6	Y	4.40%
2,3,4,6,7,8-HxCDF	92.7	48.4	29.7	67.1	N	91.53%
1,2,3,7,8,9-HxCDF	48.1	7.44	0.06	14.82	N	546.51%
1,2,3,4,6,7,8-HpCDF	366	346	300.4	391.6	Y	5.78%
1,2,3,4,7,8,9-HpCDF	80.6	80.2	49.8	110.6	Y	0.50%
OCDF	310	301	250.4	351.6	Y	2.99%
TCDDs	29.2	25	11.4	38.6	Y	16.80%
PeCDDs	43.2	45.8	-3.4	95	Y	-5.68%
HxCDDs	161	193	59	327	Y	-16.58%
HpCDDs	527	497	193	801.0	Y	6.04%
TCDFs	1,830	1680	1194	2166	Y	8.93%
PeCDFs	1,660	1490	690	2290	Y	11.41%
HxCDFs	1,360	1240	842	1638	Y	9.68%
HpCDFs	713	659	197	1121	Y	8.19%

T:\MS-MSD MDL OPR TRI spreadsheets

\* RED BOLD denote EMPC

Reviewer  
Date