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# Analytical Chemistry Data Package
# Inorganics Analysis

## Project: West Lake Sediment Sampling

## Analysis of AVS and SEM Metals in Sediment

Battelle Project No. 51558
CF No. 2710

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# INORGANIC CHEMISTRY ANALYSIS DATA PACKAGE CONTENTS

**West Lake Sediment Sampling**
**Analysis of AVS and SEM Metals in Sediment**

**FH Sample IDs:** B1H821, B1H822
**MSL Codes:** 2710-1, 2710-2


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## CERTIFICATION STATEMENT AND DATA RELEASE

Battelle Marine Sciences Laboratory is releasing the following data set:

# WEST LAKE AVS-SEM
# Project #51558

# Analysis of AVS and SEM Metals in Sediment

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager and client services as verified by the following signatures."

5/18/07

Jill M. Brandenberger — Date
MSL Metals Chemistry Project Manager

5/21/2007

Gary Gill — Date
MSL Metals Chemistry Group Manager

*BATTELLE MARINE SCIENCES LABORATORY*
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**West Lake Sediment Sampling**
AVS-SEM in SEDIMENT

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | | Receipt Date | Collection Date | AVS Analysis Date | SEM ICP-MS Analysis Date | SEM CVAA Analysis Date | % Dry Weight | AVS (µmole/g DW) | SEM Ag (µmole/g DW) |
|---|---|---|---|---|---|---|---|---|---|---|
| **AVS Reagent Blank** | | | | | | | | | | |
| AVS Blank | 2710 Blank 1 | | -- | -- | 4/26/2007 | 5/1/2007 | 5/3/2007 | *0.0* | 1.12 U | 0.00115 |
| **Blank Corrected Data** | | | | | | | | | | |
| B1N821 | 2710-1 | | 4/24/2007 | 4/23/2007 | 4/26/2007 | 5/1/2007 | 5/3/2007 | 34.9 | 18.7 | 0.00094 U |
| B1N822 | 2710-2r1 | | 4/24/2007 | 4/23/2007 | 4/26/2007 | 5/1/2007 | 5/3/2007 | 37.3 | 24.9 | 0.00094 U |
| B1N822DUP | 2710-2r2 | DUP | 4/24/2007 | 4/23/2007 | 4/26/2007 | 5/1/2007 | 5/3/2007 | 37.3 | 26.8 | 0.00094 U |
| Method Detection Limit | | | | | | | | | 1.20 | 0.00094 |

U Not detected above DL

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**West Lake Sediment Sampling**
AVS-SEM In SEDIMENT

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | | SEM Cd (µmole/g DW) | SEM Cu (µmole/g DW) | SEM Hg (µmole/g DW) | SEM Ni (µmole/g DW) | SEM Pb (µmole/g DW) | SEM Zn (µmole/g DW) |
|---|---|---|---|---|---|---|---|---|
| **AVS Reagent Blank** | | | | | | | | |
| AVS Blank | 2710 Blank 1 | | 0.00134 U | 0.0178 | 0.00000634 | 0.0178 | 0.00102 | 0.0524 |
| **Blank Corrected Data** | | | | | | | | |
| B1N821 | 2710-1 | | 0.00384 | 0.0975 | 0.00000317 U | 0.126 | 0.0402 | 0.303 |
| B1N822 | 2710-2r1 | | 0.00634 | 0.135 | 0.0000187 | 0.142 | 0.0366 | 0.368 |
| B1N822DUP | 2710-2r2 | DUP | 0.00598 | 0.197 | 0.0000282 | 0.140 | 0.0335 | 0.273 |
| Method Detection Limit | | | 0.00120 | 0.00746 | 0.00000317 | 0.00813 | 0.000653 | 0.0155 |

U Not detected above DL

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**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Matrix | % Dry Weight | AVS (µmole/g) | AVS MDL (µmole/g) | SEM RATIO (g/mL) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | NA | *0* | 0.738 U | 1.19 | 0.000292 |
| B1N821 | 2710-1 | Sediment | 34.9 | 18.7 | 1.29 | 0.000271 |
| B1N822 | 2710-2r1 | Sediment | 37.3 | 24.9 | 1.35 | 0.000258 |
| B1N822DUP | 2710-2r2 | Sediment | 37.3 | 26.8 | 0.976 | 0.000357 |
| Detection Limit (mean used for AVS) | | | | | *1.20* | *0.000295* |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | Sediment | 37.3 | 24.9 | 1.35 | 0.000258 |
| B1N822DUP | 2710-2r2 | Sediment | 37.3 | 26.8 | 0.976 | 0.000357 |
| | **RPD** | | | **8%** | | |

**Laboratory Control Sample Results**

| | | |
|---|---|---|
| LCS r1 | LCS r1 110706 | 0.515 |
| LCS r2 | LCS r2 110706 | 0.503 |
| | Spike Concentration | 0.505 |
| | Percent Recovery | **102%** |
| | | **100%** |

RPD Relative percent difference
U Not detected above DL

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**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Ag (µg/L) | Ag µg/mL | Ag blk corr (µg/mL) | SEM Ag (µg/g) | SEM Ag (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.0361 | 0.0000361 | 0.000036 | 0.124 | 0.00115 |
| B1N821 | 2710-1 | 0.0281 | 0.0000281 | -0.0000080 | -0.0295 | -0.0003 U |
| B1N822 | 2710-2r1 | 0.0410 | 0.0000410 | 0.0000049 | 0.0190 | 0.000176 U |
| B1N822DUP | 2710-2r2 | 0.0416 | 0.0000416 | 0.0000055 | 0.0154 | 0.000143 U |
| Detection Limit | | 0.0300 | 0.000030 | 0.000030 | 0.102 | 0.00094 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 0.0410 | 0.0000410 | 0.00000490 | 0.0190 | 0.000176 U |
| B1N822DUP | 2710-2r2 | 0.0416 | 0.0000416 | 0.00000550 | 0.0154 | 0.000143 U |
| | **RPD** | | | | | **NA** |

**Analysis Method Blank**

| | | | |
|---|---|---|---|
| Blank | diss blk | 0.03 | U |

**Standard Reference Material Data**

| | |
|---|---|
| 1640 Direct | 6.98 |
| Certified Value | 7.62 |
| Percent Recovery | 92% |

**Blank Spike**

| | | |
|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.0361 |
| Blank Spike | | 47.9 |
| Amount Spiked | | 50 |
| Percent Recovery, BS | | 96% |

**Matrix Spike Results**

| | | |
|---|---|---|
| 2710-1 | 0.03 | U |
| 2710-1 MS | 47.1 | |
| 2710-1 MSD | 48.3 | |
| Amount Spiked | 50 | |
| Percent Recovery, MS | 94% | |
| Percent Recovery, MSD | 97% | |
| **RPD** | **3%** | |

U Not detected above DL
* Outside QC criteria for replicate precision (<25%)

***BATTELLE MARINE SCIENCES LABORATORY***
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*(360) 681-3650*

**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Cd (µg/L) | Cd µg/mL | Cd blk corr (µg/mL) | SEM Cd (µg/g) | SEM Cd (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.00508 | 0.0000051 | 0.000005 | 0.0174 | 0.000155 U |
| B1N821 | 2710-1 | 0.122 | 0.000122 | 0.000117 | 0.431 | 0.00384 |
| B1N822 | 2710-2r1 | 0.189 | 0.000189 | 0.000184 | 0.712 | 0.00634 |
| B1N822DUP | 2710-2r2 | 0.245 | 0.000245 | 0.000240 | 0.672 | 0.00598 |
| Detection Limit | | 0.040 | 0.00004 | 0.0000400 | 0.135 | 0.00120 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 0.189 | 0.000189 | 0.000184 | 0.712 | 0.00634 |
| B1N822DUP | 2710-2r2 | 0.245 | 0.000245 | 0.000240 | 0.672 | 0.00598 |
| | **RPD** | | | | | **6%** |

**Analysis Method Blank**

| | | | |
|---|---|---|---|
| Blank | diss blk | 0.04 | U |

**Standard Reference Material Data**

| | |
|---|---|
| 1640 Direct | 22.3 |
| Certified Value | 22.8 |
| Percent Recovery | 98% |

**Blank Spike**

| | | | |
|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.04 | U |
| Blank Spike | | 48.4 | |
| Amount Spiked | | 50 | |
| Percent Recovery, BS | | 97% | |

**Matrix Spike Results**

| | |
|---|---|
| 2710-1 | 0.122 |
| 2710-1 MS | 49.2 |
| 2710-1 MSD | 49.1 |
| Amount Spiked | 50 |
| Percent Recovery, MS | 98% |
| Percent Recovery, MSD | 98% |
| **RPD** | **0%** |

U Not detected above DL
* Outside QC criteria for replicate precision (<25%)

***BATTELLE MARINE SCIENCES LABORATORY***
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**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Cu (µg/L) | Cu (µg/mL) | Cu blk corr. (µg/mL) | SEM Cu (µg/g) | SEM Cu (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.330 | 0.000330 | 0.000330 | 1.13 | 0.0178 |
| B1N821 | 2710-1 | 2.01 | 0.00201 | 0.00168 | 6.20 | 0.0975 |
| B1N822 | 2710-2r1 | 2.55 | 0.00255 | 0.00222 | 8.60 | 0.135 |
| B1N822DUP | 2710-2r2 | 4.79 | 0.00479 | 0.00446 | 12.5 | 0.197 |
| Detection Limit | | 0.14 | 0.000140 | 0.000140 | 0.474 | 0.00746 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 2.55 | 0.00255 | 0.00222 | 8.60 | 0.135 |
| B1N822DUP | 2710-2r2 | 4.79 | 0.00479 | 0.00446 | 12.5 | 0.197 |
| | **RPD** | | | | | **37% *** |

**Analysis Method Blank**

| | | | |
|---|---|---|---|
| Blank | diss blk | 0.14 | U |

**Standard Reference Material Data**

| | |
|---|---|
| 1640 Direct | 81.0 |
| Reference Value | 85.2 |
| Percent Recovery | 95% |

**Blank Spike**

| | | |
|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.330 |
| Blank Spike | | 50.0 |
| Amount Spiked | | 50 |
| Percent Recovery, BS | | 99% |

**Matrix Spike Results**

| | |
|---|---|
| 2710-1 | 2.01 |
| 2710-1 MS | 53.6 |
| 2710-1 MSD | 53.3 |
| Amount Spiked | 50 |
| Percent Recovery, MS | 103% |
| Percent Recovery, MSD | 103% |
| **RPD** | **1%** |

U Not detected above DL
* Outside QC criteria for replicate precision (<25%)

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**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Hg (µg/L) | Hg (µg/mL) | Hg blk corr (µg/mL) | SEM Hg (µg/g) | SEM Hg (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.000371 | 0.00000037 | 0.00000037 | 0.001272 | 0.00000634 |
| B1N821 | 2710-1 | 0.000497 | 0.0000005 | 0.00000013 | 0.000465 | 0.00000232 U |
| B1N822 | 2710-2r1 | 0.00134 | 0.0000013 | 0.00000097 | 0.003752 | 0.0000187 |
| B1N822DUP | 2710-2r2 | 0.00239 | 0.0000024 | 0.00000202 | 0.005657 | 0.0000282 |
| Detection Limit | | 0.000188 | 0.0000002 | 0.00000019 | 0.000636 | 0.00000317 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 0.00134 | 0.00000134 | 0.00000097 | 0.00375 | 0.0000187 |
| B1N822DUP | 2710-2r2 | 0.00239 | 0.00000239 | 0.00000202 | 0.00566 | 0.0000282 |
| | **RPD** | | | | | **40% *** |

**Analysis Method Blank**

| | | |
|---|---|---|
| Blank | Bubbler Blank | 0.000188 U |

**Standard Reference Material Data**

| | |
|---|---|
| 1641d | 1630 |
| Certified Value | 1590 |
| Percent Recovery | 103% |

**Blank Spike**

| | | |
|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.000371 |
| Blank Spike | | 0.207 |
| Amount Spiked | | 0.200 |
| Percent Recovery, BS | | 103% |

**Matrix Spike Results**

| | |
|---|---|
| 2710-1 | 0.000497 |
| 2710-1 MS | 0.0316 |
| 2710-1 MSD | 0.0336 |
| Amount Spiked | 0.0318 |
| Percent Recovery, MS | 98% |
| Percent Recovery, MSD | 104% |
| **RPD** | **6%** |

U Not detected above DL

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**Project:** West Lake Sediment Sampling
**File #:** *2710*

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Ni (µg/L) | Ni (µg/mL) | Ni blk corr (µg/mL) | SEM Ni (µg/g) | SEM Ni (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.305 | 0.000305 | 0.000305 | 1.05 | 0.0178 |
| B1N821 | 2710-1 | 2.31 | 0.00231 | 0.00201 | 7.39 | 0.126 |
| B1N822 | 2710-2r1 | 2.46 | 0.00246 | 0.00216 | 8.34 | 0.142 |
| B1N822DUP | 2710-2r2 | 3.23 | 0.00323 | 0.00293 | 8.20 | 0.140 |
| Detection Limit | | 0.141 | 0.00014 | 0.000141 | 0.477 | 0.00813 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 2.46 | 0.002 | 0.0022 | 8.34 | 0.142 |
| B1N822DUP | 2710-2r2 | 3.23 | 0.003 | 0.0029 | 8.20 | 0.140 |
| | **RPD** | | | | | **2%** |

**Analysis Method Blank**

| | | | |
|---|---|---|---|
| Blank | diss blk | 0.141 | U |

**Standard Reference Material Data**

| | |
|---|---|
| 1640 Direct | 25.3 |
| Reference Value | 27.4 |
| Percent Recovery | 92% |

**Blank Spike**

| | | |
|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.305 |
| Blank Spike | | 51.4 |
| Amount Spiked | | 50 |
| Percent Recovery, BS | | 102% |

**Matrix Spike Results**

| | |
|---|---|
| 2710-1 | 2.31 |
| 2710-1 MS | 54.3 |
| 2710-1 MSD | 53.7 |
| Amount Spiked | 50 |
| Percent Recovery, MS | 104% |
| Percent Recovery, MSD | 103% |
| **RPD** | **1%** |

U Not detected above DL
* Outside QC criteria for replicate precision (<25%)

***BATTELLE MARINE SCIENCES LABORATORY***
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**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Pb (µg/L) | Pb µg/mL | Pb blk corr (µg/mL) | SEM Pb (µg/g) | SEM Pb (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.0617 | 0.000062 | 0.000062 | 0.212 | 0.00102 |
| B1N821 | 2710-1 | 2.32 | 0.00232 | 0.0023 | 8.33 | 0.0402 |
| B1N822 | 2710-2r1 | 2.02 | 0.00202 | 0.0020 | 7.58 | 0.0366 |
| B1N822DUP | 2710-2r2 | 2.54 | 0.00254 | 0.0025 | 6.94 | 0.0335 |
| Detection Limit | | 0.04 | 0.000040 | 0.0000400 | 0.135 | 0.000653 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 2.02 | 0.002 | 0.0020 | 7.58 | 0.0366 |
| B1N822DUP | 2710-2r2 | 2.54 | 0.003 | 0.0025 | 6.94 | 0.0335 |
| | **RPD** | | | | | **9%** |

**Analysis Method Blank**

| | | | |
|---|---|---|---|
| Blank | diss blk | 0.04 | U |

**Standard Reference Material Data**

| | |
|---|---|
| 1640 Direct | 26.2 |
| Certified Value | 27.9 |
| Percent Recovery | 94% |

**Blank Spike**

| | | |
|---|---|---|
| AVS Blank | 2710 Blank 1 | 0.0617 |
| Blank Spike | | 46.6 |
| Amount Spiked | | 50 |
| Percent Recovery, BS | | 93% |

**Matrix Spike Results**

| | |
|---|---|
| 2710-1 | 2.32 |
| 2710-1 MS | 49.6 |
| 2710-1 MSD | 49.4 |
| Amount Spiked | 50 |
| Percent Recovery, MS | 95% |
| Percent Recovery, MSD | 94% |
| **RPD** | **0%** |

U Not detected above DL

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*(360) 681-3650*

**Project:** West Lake Sediment Sampling
**File #:** 2710

| SAMPLE ID SPONSOR | SAMPLE ID BATTELLE | Zn (µg/L) | Zn µg/mL | Zn blk corr (µg/mL) | SEM Zn (µg/g) | SEM Zn (µmole/g) |
|---|---|---|---|---|---|---|
| AVS Blank | 2710 Blank 1 | 1.00 | 0.00100 | 0.00100 | 3.43 | 0.0524 |
| B1N821 | 2710-1 | 6.37 | 0.00637 | 0.00537 | 19.8 | 0.303 |
| B1N822 | 2710-2r1 | 7.21 | 0.00721 | 0.00621 | 24.0 | 0.368 |
| B1N822DUP | 2710-2r2 | 7.38 | 0.00738 | 0.00638 | 17.9 | 0.273 |
| Detection Limit | | 0.30 | 0.000300 | 0.000300 | 1.02 | 0.0155 |
| **Replicate Analysis Results** | | | | | | |
| B1N822 | 2710-2r1 | 7.21 | 0.00721 | 0.00621 | 24.0 | 0.368 |
| B1N822DUP | 2710-2r2 | 7.38 | 0.00738 | 0.00638 | 17.9 | 0.273 |
| | **RPD** | | | | | **29% *** |
| **Analysis Method Blank** | | | | | | |
| Blank | diss blk | 0.30 | U | | | |
| **Standard Reference Material Data** | | | | | | |
| 1640 Direct | | 56.3 | | | | |
| Reference Value | | 53.2 | | | | |
| Percent Recovery | | 106% | | | | |
| **Blank Spike** | | | | | | |
| AVS Blank | 2710 Blank 1 | 1.00 | | | | |
| Blank Spike | | 52.1 | | | | |
| Amount Spiked | | 50 | | | | |
| Percent Recovery, BS | | 102% | | | | |
| **Matrix Spike Results** | | | | | | |
| 2710-1 | | 6.37 | | | | |
| 2710-1 MS | | 59.1 | | | | |
| 2710-1 MSD | | 57.8 | | | | |
| Amount Spiked | | 50 | | | | |
| Percent Recovery. MS | | 105% | | | | |
| Percent Recovery, MSD | | 103% | | | | |
| **RPD** | | **2%** | | | | |

U Not detected above DL

# QA/QC NARRATIVE

**PROJECT:** West Lake Sediment Sampling

**PARAMETER:** Acid Volatile Sulfide (AVS) and Simultaneously Extracted Metals (SEM) – mercury (Hg), silver (Ag), cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb), and zinc (Zn)

**LABORATORY:** Pacific Northwest National Laboratory operated by Battelle, Marine Sciences Laboratory (MSL), Sequim, Washington

**MATRIX:** Sediment

**SAMPLE CUSTODY AND PROCESSING:** Two sediment samples were received in on 04/24/07. All samples were received in good condition (i.e., no sample containers were broken or leaking). Samples were assigned a Battelle Central File (CF) identification number (2710) and were entered into the MSL sample tracking and project management system.

**SAMPLE PROCESSING INFORMATION:**

| **MSL Code:**<br>Description: | **2710*1-2**<br>Sediment |
|---|---|
| Collection dates | 04/23/07 |
| Laboratory arrival date | 04/24/07 |
| Cooler temperature on arrival | 5.9°C |
| AVS Analysis Date: | 04/26/07 |
| SEM Analysis Dates: | Hg: 05/03/07 and ICP-MS: 05/01/07 |

**METHODS:** Sediment samples were extracted and analyzed for AVS in accordance with Battelle SOP MSL-C-001. This procedure is based on a peer-reviewed, published procedure for the analysis of AVS in sediment and dissolved sulfide in aqueous samples, adopted from a draft EPA method (Allen et al. 1991.). In this method, sulfide in the sample is converted to hydrogen sulfide by the addition of hydrochloric acid at room temperature. The hydrogen sulfide ($H_2S$) is purged from the sample by an inert gas and trapped in a sodium hydroxide (NaOH) solution. With the addition of a mixed-diamine reagent (MDR), the sulfide is converted to methylene blue and measured on a spectrometer. AVS results were reported in units of μmole/g and μg/g on a dry-weight basis.

SEM extracts were analyzed for Total mercury (Hg) by Cold Vapor Atomic Fluorescence (CVAF) in accordance with Battelle SOP MSL-I-013, Total Mercury in Aqueous Samples by CVAF based on EPA Method 1631 Revision E.

SEM extracts were analyzed for all other metals by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) in accordance with Battelle SOP MSL-I-022, Determination of Elements in Aqueous and Digestate Samples by ICP/MS. The analysis guidelines for this procedure are adapted from USEPA Method 1638 Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma-Mass Spectrometry.

SEM data are converted to units of μmole/g and μg/g dry weight based on the mass of sediment extracted during the AVS analysis.

# QA/QC NARRATIVE

**HOLDING TIMES:** The suggested holding time for AVS in sediment is 14 days per Battelle SOP MSL-C-001. All samples were analyzed within the holding time.

**DATA QUALITY CRITERIA (DQC):**

| Analyte | Analytical Method | Method Range of Spike Recovery | Replicate Precisions (RPD) | Achieved MDL (µmole/g) |
|---|---|---|---|---|
| AVS | Spectrometer | 75-125% | ±25% | 1.2 |
| SEM Hg | CVAA | 75-125% | ±25% | 0.00000371 |
| SEM Ag | ICP-MS | 75-125% | ±25% | 0.00094 |
| SEM Cd | ICP-MS | 75-125% | ±25% | 0.00120 |
| SEM Cu | ICP-MS | 75-125% | ±25% | 0.00746 |
| SEM Ni | ICP-MS | 75-125% | ±25% | 0.00813 |
| SEM Pb | ICP-MS | 75-125% | ±25% | 0.000653 |
| SEM Zn | ICP-MS | 75-125% | ±25% | 0.0155 |

**DETECTION LIMITS:** Analytical results were reported to the laboratory achieved method detection limits (MDL) as determined from the Annual MDL study. MDLs were determined according to EPA's "Definition and Procedure for the Determination of the Method Detection Limit - revision 1.11" 40 CFR Part 136, Appendix B. Data were evaluated and flagged in accordance with the following criteria:

U Undetected at the MDL, RL reported.

* QC sample outside criteria.

**METHOD BLANKS:** One AVS Blank was prepared with the samples. The AVS analytical procedure includes the addition of reagents that contain trace quantities of metals. Therefore, the SEM data was reported as blank corrected and determined as the SEM value minus the AVS Blank value. Analytical method blanks were also prepared for the two analytical methods: ICP-MS and CVAA. Analytical method blanks were less than the MDL for all metals.

**LABORATORY CONTROL SAMPLE (LCS) ACCURACY:** Sediment samples were analyzed with two LCS samples. The percent recoveries for the AVS LCS were 102% and 100%, which are within the project QC criterion of 75-125% recovery. Blank spikes were also analyzed with each of the two SEM methods: (ICP-MS and CVAA). All SEM blank spikes were within the 75-125% recovery criterion.

**REPLICATE PRECISION:** One samples was selected for an AVS laboratory duplicate. Precision of duplicate analyses was expressed as the relative percent difference (RPD) of replicate results. The RPD was 8% and within the QC criterion of ±25%. Precision for SEM analyses was determined by the analysis of matrix spike duplicates (MS/MSD). All RPD values were within the QC criterion. The AVS laboratory duplicates generated two SEM samples. Both SEM samples were analyzed, but do not represent laboratory precision.

**MATRIX SPIKE ACCURACY:** Matrix spike samples were analyzed for both SEM methods: ICP-MS and CVAA. Matrix spike recoveries were within the QC acceptance criterion.

**REFERENCES:**

Allen, H.E., F. Gongmin, W. Boothman, D. DiToro, and J. Mahoney. 1991. Determination of Acid Volatile Sulfides (AVS) and Simultaneously Extracted Metals in Sediment. Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment. USEPA Office of Science and Technology, Washington, DC. April, 1991.

cc: Project Manager/Central File
Login File 2710

# SAMPLE LOGIN

(SOP# MSL-A-001)

Project Manager: Brandenberger
Date Received: 04/24/07
Batch: 1

PROJECT: West Lake

| SPONSOR CODE | Site Description | BATTELLE CODE | MATRIX | STORAGE LOCATION | PARAMETERS REQUESTED | COLLECTION DATE | INITIALS |
|---|---|---|---|---|---|---|---|
| B1N821 | na | 2710-1 | solid | Refrigerator #8 Lab 223 | metals, AVS, SEM | 04/23/07 | MLFM |
| B1N822 | na | 2710-2 | solid | Refrigerator #8 Lab 223 | metals, AVS, SEM | 04/23/07 | MLFM |

[redacted]

| Fluor Hanford Inc. | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | F06-037-008 | PAGE 1 OF 1 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| COLLECTOR 04-23-07 ~~HOGAN, JG~~ B. Tiller | COMPANY CONTACT TRENT, SJ | TELEPHONE NO. 373-5869 | PROJECT COORDINATOR TRENT, SJ | PRICE CODE 9H | DATA TURNAROUND |
| SAMPLING LOCATION West Lake | PROJECT DESIGNATION West Lake Sediment Sampling | | SAF NO. F06-037 | AIR QUALITY ☐ | 30 Days / 30 Days |
| ICE CHEST NO. | FIELD LOGBOOK NO. | COA 121527E520 | METHOD OF SHIPMENT FEDERAL EXPRESS | | |
| SHIPPED TO Battelle Marine Sciences | OFFSITE PROPERTY NO. | | BILL OF LADING/AIR BILL NO. N/A | | |

MATRIX*
A=Air
DL=Drum Liquids
DS=Drum Solids
L=Liquid
O=Oil
S=Soil
SE=Sediment
T=Tissue
V=Vegitation
W=Water
WI=Wipe
X=Other

**POSSIBLE SAMPLE HAZARDS/ REMARKS**
Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR but are not releasable per DOE Order 5400.5 (1990/1993)

**SPECIAL HANDLING AND/OR STORAGE**

| | |
|---|---|
| PRESERVATION | Cool 4C |
| TYPE OF CONTAINER | aG |
| NO. OF CONTAINER(S) | 1 |
| VOLUME | 250mL |
| SAMPLE ANALYSIS | SEE ITEM (1) IN SPECIAL INSTRUCTIONS |

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | |
|---|---|---|---|---|
| B1N821 2710.1 | OTHER SOLID | 04-23-07 | 1420 | X |
| B1N822 2710.2 | OTHER SOLID | 04-23-07 | 1422 | X |

**CHAIN OF POSSESSION** / **SIGN/ PRINT NAMES**

| RELINQUISHED BY/REMOVED FROM | DATE/TIME | RECEIVED BY/STORED IN | DATE/TIME |
|---|---|---|---|
| B Tiller BRETT TILLER (cooler) | 04-23-07/1515 | FED EX. TRK# 7991 2755 7691 | 04-23-07 1515 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**SPECIAL INSTRUCTIONS**
** Laboratories are to extract/prep entire sample mass for analysis
(1)AVS - SEM - METALS {Cadmium, Copper, Lead, Nickel, Zinc} AVS - SEM - HG {Mercury} AVS - SEM - SULFIDES {Sulfide}

| | | | |
|---|---|---|---|
| LABORATORY SECTION | RECEIVED BY Battelle MSL | TITLE | DATE/TIME 04/24/07 1240 |
| FINAL SAMPLE DISPOSITION | DISPOSAL METHOD | DISPOSED BY | DATE/TIME |

LOG-IN CHECKLIST West Lake Samples. Reference SOP# MSL-A-001

Central File #: 2710 Sample No(s): 1-2 Project Manager: Brandon Bunger

TO BE COMPLETED BY PROJECT MANAGER (prior to arrival when possible)

Matrix: Sediment WP#

| Yes | No | |
|---|---|---|
| | ✓ | Navy-type Project (requires high-level sample tracking procedures) |
| | ✓ | Filter Samples: Amount: Entire sample Half of sample |
| | ✓ | Freeze dry sample(s) - samples will be weighed and placed in ultralow temp freezer (Lab# 130) |
| ✓ | | Special instructions: Keep sealed |

Sample Preservation Instructions: refrigerate until analyses

Date To Archive: Date To Dispose:

TO BE COMPLETED UPON SAMPLE ARRIVAL/LOG-IN

| Yes | No | N/A | Indicate in Appropriate Box |
|---|---|---|---|
| | N/A | | Was a custody seal present? Note: Custody seal on samples was present. |
| | | N/A | Was the custody seal intact? Note: Custody seal was intact. |
| N/A | | | Was cooler(s) temperature(s) within acceptable range of 4±2°C or frozen? 5.9 °C (if multiple coolers, note temp. of each) °C |
| | | N/A | Was Project Manager notified of any custody/login discrepancies (cooler temp, sponsor codes, etc)? Comment/Remedy: |
| N/A | | | Were all chain of custody forms signed and dated? |
| | N/A | | Were samples filtered at MSL? |

Sample condition(s): Acceptable Other (explain):

Container type: Teflon Poly Glass Spex Other:

Notes: PM notes- the custody seal questions above are for the coolers the samples arrive in. The custody seals were on the sample jars. JMS 4/25/07

Completed By: [signature] Date/Time: 04/24/07 1240

SAMPLE PRESERVATION

| | |
|---|---|
| N/A | Sample(s) were preserved at MSL |
| | Sample(s) were preserved prior to arrival at MSL (noted on CoC / Sample / per PM Instruction ) |
| | Random pH checked for ~10% of samples (use dip paper) Sample IDs: |
| | Complete pH check required for project (use pH meter and record on pH Record form) |

If preservation necessary, record Acid Lot#

| Type: | | | |
|---|---|---|---|
| | | 0.2% HNO3 | Notes: |
| | | 0.5% HCl (Hg samples) | Notes: |
| | N/A | Refrigerate/Freeze | Notes: fridge in lab 223 |
| | | Other | Notes: |

Completed By: [signature] Date/Time: 04/24/07 1240

Revised 033006