ATTACHMENT A
LABORATORY ANALYTICAL RESULTS

GROUNDWATER COMPLIANCE MONITORING CLOSURE REPORT
Norwegian Salmon Industries Site
Gig Harbor, Washington

Farallon PN: 879-003

Analytical Resources, Incorporated
Analytical Chemists and Consultants

May 10, 2005

Ms. Pam Morrill
CDM
11811 N.E. First Street
Suite 201
Bellevue, WA 98009

RE: Project ID: Norwegian Salmon / 5000-36262 Task 9
ARI Job No: HZ96

Dear Pam:

Please find enclosed the original chain of custody documentation (COC) and final analytical results for the sample from the project referenced above. Analytical Resources Inc. (ARI) accepted two water samples on April 29, 2005. ARI received the samples intact and in good condition. There were no discrepancies between the COC and the sample containers' labels.

The samples were analyzed for total arsenic referencing US EPA method 200.8. Quality control analyses are included for your review.

No analytical complications were noted for these analyses. A copy of these reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Respectfully,

ANALYTICAL RESOURCES, INC.

Mary Lou Fox

Mary Lou Fox
Project Manager
Phone: 206-695-6211

Enclosures
cc: file HZ96
MLF/mlf

CDM HZ96

CHAIN-OF-CUSTODY

Date 4/28/05 Page 1 of 1

PROJECT INFORMATION

Project Manager: Pam Morrill
Project Name: Norwegian Salmon
Project Number: 5000-36262 TASK9
Site Location: Gig Harbor, WA Sampled By: SL

DISPOSAL INFORMATION

☐ Lab Disposal (return if not indicated)
Disposal Method:
Disposed by: Disposal Date:

QC INFORMATION (check one)

☐ SW-846 ☐ CLP ☐ Screening ☐ CDM Std. ☐ Special

Laboratory Number:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	PETROLEUM HYDROCARBONS: TPH-HCID State:	TPH-G State:	TPH-D State:	TPH-418.1 State:	8015M Fuel Hydrocarbon	TPH Special Instructions	ORGANIC COMPOUNDS: 8010 Halogenated VOCs	8020 Aromatic VOCs	8020M - BETX only	8240 GC/MS Volatiles	8270 GC/MS Semivolatiles	8310 PAHs	8040 Phenols	DWS - Volatiles and Semivolatiles	PESTS/PCBs: 8080 OC Pest/PCBs	8080M PCBs only	8140 OP Pesticides	8150 OC Herbicides	DWS - Herb/Pest	METALS: Selected Metals: list	Organic Lead (Ca)	TCL Metals (23)	Priority Poll. Metals (13)	DWS - Metals	MFSP - Metals (Wa)	LEACHING TESTS: TCLP - Volatiles (ZHE)	TCLP - Semivolatiles	TCLP - Pesticides	TCLP - Metals	OTHER				AS (Total)	NUMBER OF CONTAINERS
MW 3A	4/28/05	1440	H_2O																																		X	1
MW 5A	"	1522	"																																		X	1

LAB INFORMATION	SAMPLE RECEIPT	RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Lab Name: ARI	Total Number of Containers:	Signature: S. Rammacher Time:	Signature: Time:	Signature: Time:
Lab Address: Tukwila, WA	Chain-of-Custody Seals: Y/N/NA	Printed Name: Nakt Rammachat Date:	Printed Name: Date:	Printed Name: Date:
Via: Pick up	Intact?: Y/N/NA	Company: CDM	Company:	Company:
	Received in Good Condition/Cold:	**RECEIVED BY: 1.**	**RECEIVED BY: 2.**	**RECEIVED BY: 3.**
Turn Around Time: ☒ Standard ☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 1 wk.		Signature: Time: 1530	Signature: Time:	Signature: Time:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSH DATA		Printed Name: Bryan P. Bassey Date: 4/29/05	Printed Name: Date:	Printed Name: Date:
Special Instructions:		Company: ARI	Company:	Company:

CDM OFFICES: Bellevue: (206) 453-8383
Portland: (503) 232-1800

DISTRIBUTION: White, Canary to Analytical Laboratory; Pink to CDM Project Files; Gold to CDM Disposal Files

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ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: HZ96MB
LIMS ID: 05-7467
Matrix: Water
Data Release Authorized:
Reported: 05/06/05

QC Report No: HZ96-CDM
Project: Norwegian Salmon
5000-36262 TASK9
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	05/03/05	200.8	05/05/05	7440-38-2	Arsenic	0.2	0.2	U

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: MW 3A
SAMPLE

Lab Sample ID: HZ96A
LIMS ID: 05-7467
Matrix: Water
Data Release Authorized
Reported: 05/06/05

QC Report No: HZ96-CDM
Project: Norwegian Salmon
5000-36262 TASK9
Date Sampled: 04/28/05
Date Received: 04/29/05

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	05/03/05	200.8	05/05/05	7440-38-2	Arsenic	0.2	0.8	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: MW 5A
SAMPLE

Lab Sample ID: HZ96B
LIMS ID: 05-7468
Matrix: Water
Data Release Authorized
Reported: 05/06/05

QC Report No: HZ96-CDM
Project: Norwegian Salmon
5000-36262 TASK9
Date Sampled: 04/28/05
Date Received: 04/29/05

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	05/03/05	200.8	05/05/05	7440-38-2	Arsenic	0.2	0.6	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: HZ96LCS
LIMS ID: 05-7467
Matrix: Water
Data Release Authorized:
Reported: 05/06/05

QC Report No: HZ96-CDM
Project: Norwegian Salmon
5000-36262 TASK9
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	200.8	25.1	25.0	100%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

ATTACHMENT B
GROUNDWATER DATA ANALYSIS

GROUNDWATER COMPLIANCE MONITORING CLOSURE REPORT
Norwegian Salmon Industries Site
Gig Harbor, Washington

Farallon PN: 879-003

EnviroSphere Consulting *Air Water Fire & Earth*
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Groundwater Data Analysis

Introduction

This document presents the results of graphical and statistical data analyses conducted on conformational groundwater samples obtained from the Norwegian Salmon Fisheries (NSI) site located near Gig Harbor, Washington. Cleanup activities at this site were completed under Washington Department of Ecology (Ecology) Agreed Order No. DE 97TC-5438. The purpose of the data analyses was to confirm the long-term effectiveness of upland source removal in preventing future contamination of marine sediments. During the autumn of 2004, Ecology expressed concern about potential impact to groundwater and marine sediments from a small volume of arsenic bearing soil left in place near former Test Pit 14. This test pit, excavated and sampled in 1998, is located near the west side of the upland soil area at the toe of a steep coastal bluff. Ground water flow from Test Pit 14 is towards well MW3A which is located on the east side of the upland soil area.

Water samples used for the analyses were collected from autumn 2002 through spring 2005 at wells MW1, MW2, MW3A and MW5/5A. All data plots and calculations were completed in accordance with Ecology and US Environmental Protection Agency (EPA) required or recommended procedures as discussed in the documents listed in the reference section at the end of this document. For graphical data analysis, arsenic concentrations versus time plots were constructed. These plots show that groundwater quality has attained steady-state conditions at the selected wells. The plots also show that arsenic concentrations in quarterly groundwater samples are below its cleanup standard of 5 ug/L. Statistical data analysis methods were used to document the attainment of arsenic's cleanup standard and to predict the long-term effectiveness of upland source removal on maintaining this compliance.

Groundwater Elevation and Tidal Data

Groundwater elevations measured for quarterly monitoring at wells MW1, MW2, MW3A and MW5/5A and associated tide heights are listed in **Table 1**. Tide height data is referenced to the mean lower low water (MLLW) mark. These data confirm that quarterly groundwater samples were collected at or near low tide.

Elevation data listed in **Table 1** show that since completion of source removal activities, groundwater flow is directed from the north and south portions of the site towards MW3A which lies in the middle of the site.

Field Parameter Measurements and Arsenic Data

Field parameter measurements and arsenic data for groundwater samples collected from MW1, MW2, MW3A and MW5/5A are listed in **Table 2**. Note that samples collected from MW3A and

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MW5/5A in the autumn of 2002, 2003 and 2004 have high specific conductance indicating salt water intrusion.

During cleanup action, EPA Method 200.8 (ICP-MS) was used to determine arsenic in groundwater. According to EPA and the US Geological Survey guidance documents, arsenic concentration determined by this method can be biased high due to chloride and bromide interference effects. These two elements are found at elevated concentrations in salt water. Of the three high specific conductance occurrences, only the October 2004 samples from wells MW3A and MW5A were properly corrected at the laboratory for chloride and bromide interference effects. The November 2002 and October 2003 samples obtained from MW5A were only corrected for chloride and are considered data outliers since they have been previously demonstrated to be in error. A discussion of these data, the nature and magnitude of bromide interference effects and the corrective actions taken to address this analytical problem are presented in a February 17, 2005 letter to Ecology (EnviroSphere Consulting 2005).

All groundwater samples collected during the 1999-2000 remedial investigation (RI) were analyzed using EPA Method 7060A (atom absorption spectroscopy). Method 7060A is not affected by the presence of chloride and bromide in water samples. Arsenic data for this time period therefore represent pre-cleanup action groundwater quality.

Arsenic Concentration versus Time Plots

Arsenic data for RI and cleanup action groundwater samples are shown on **Figures 1, 2 3 and 4.** These figures are concentration versus time plots for wells MW1, MW2, MW3/3A and MW5/M5A and were prepared in accordance with US EPA guidance (US EPA 1992). Plots include arsenic's 5 ug/L cleanup standard for reference.

Note that RI first quarter groundwater samples for all wells were analyzed using a practical quantitation limit (PQL) of 50 ug/L. Subsequent sample analyses used a PQL of 1 ug/L. For cleanup action groundwater sample analysis, the PQL for arsenic was 3.3 ug/L from September 2002 to July 2004 and 0.5 ug/L for October 2004 to April 2005. For these data plots, non-detect arsenic results were replaced with ½ the 1999 and 2002-2004 PQLs (25 ug/L or 1.7 ug/L).

At well locations MW1 and MW2, the three remaining RI groundwater samples had variable arsenic concentrations but their arithmetic means are greater than the 5 ug/L cleanup standard. After cleanup activity was completed in August 2003, arsenic concentrations in groundwater samples collected from September 2003 through July 2003 were all less than the cleanup standard.

At well location MW3, arsenic concentrations in the three remaining RI samples were all below the cleanup standard. At well location MW3A, all but one of the cleanup samples were less than the 5 ug/L cleanup standard. The single cleanup sample exceeding the standard was reported as 5.5 ug/L and was collected in November 2002 - a time of known salt water intrusion.

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At well location MW5, the mean arsenic concentration for RI data is greater than the 5.0 ug/L cleanup standard. After removal of all contaminated soil near MW4 and MW5, groundwater samples collected from well location MW5A from January 2004 to April 2005 all contained less than 5 ug/L.

Statistical Data Analysis

Statistical analysis results for arsenic data from wells MW1, MW2, MW3A and MW5/5A are listed in **Table 3**. As recommended in Ecology's guidance document for site managers, the 95% upper confidence level (UCL) of the median was used to compare individual well results with the 5.0 ug/L arsenic cleanup standard. When non-detect results were reported, a concentration of one-half the PQL was used (e.g. 1.7 ug/L). PQL was lowered to 0.5 ug/L in late 2004 when a new project laboratory was selected.

The 95% UCL of the medians for wells MW1 and MW2 using five samples (September 2002 through July 2003) are 2.6 and 2.7 ug/L. The 95% UCL of the median for well MW3A using eight samples (November 2002 to April 2005) is 2.8 ug/L and the 95% UCL of the median for well MW5/5A using nine samples (February through July 2003 and January 2004 through April 2005) is 3.2 ug/L. **Table 3** also lists the sample means for the evaluated samples. The 95% UCL of the means were not calculated but can easily be shown to be less than the cleanup standard.

Long-Term Effectiveness

Upland area source removal action completed in August 2003 has resulted in attainment of the arsenic cleanup level for groundwater. A covenant excluding future subsurface excavation below the 2-foot clean-soil cap ensures that site hydrogeology and groundwater flow direction will remain stable. Arsenic concentration versus time graphical plots indicate that groundwater quality beneath the site is stable. Statistical data analysis of arsenic in groundwater demonstrates that the 95% UCL of the medians for groundwater collected at well locations MW1, MW2, MW3A and MW5/5A are below the 5.0 ug/L cleanup standard. In addition, samples from the last seven quarterly rounds at MW3A and the last six quarterly rounds at MW5A are below the arsenic cleanup standard. There is no indication that the small volume of arsenic contaminated soil left in place up-gradient from well MW3A is impacting groundwater quality and marine sediment.

References

Environmental Protection Agency. 1992. Methods for Evaluating the Attainment of Cleanup Standards. Volume 2: Ground Water. EPA 230-R-92-014. July.

EnviroSphere Consulting. 2005. Arsenic in Groundwater and Evidence for Salt Water Intrusion. Letter to Ecology dated February 17, 2005.

Washington State Department of Ecology. 2001. Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC. Publication No. 94-06. Amended 2001.

Washington State Department of Ecology. 1995. Guidance on Sampling and Data Analysis Methods. Publication No. 94-49.

Washington State Department of Ecology. 1992. Statistical Guidance for Ecology Site Managers. Publication No. 92-54.

Table 1
Groundwater Elevation and Tide Data
Manson Construction Co./NSI Site
Gig Harbor, Washington

Monitoring Well	Date Measured	Time Measured (hour)	Top of Casing Elevation a,b (feet)	Depth to Groundwater* (feet)	Groundwater Elevation (feet)	Tide Data** (feet)	Tide Data** (hour)
MW1	09/04/02	13:30	10.04	10.41	-0.37	NR	NR
	11/04/02	11:50	10.04	10.40	-0.36	NR	NR
	02/08/03	14:30	10.04	8.95	1.09	2.7	1641
	05/08/03	14:47	10.04	9.60	0.44	0.2	1557
	07/15/03	11:18	10.04	10.32	-0.28	-2.7	1306
	10/23/03	10:00	10.05	8.55	1.50	2.3	1004
	01/26/04	14:13	10.05	7.87	2.18	4.3	1509
	04/22/04	13:08	10.05	9.95	0.10	-0.6	1353
	07/20/04	13:00	10.05	10.45	-0.40	-0.9	1353
	10/25/04	8:50	10.05	9.83	0.22	2.5	953
	01/31/05	15:15	10.05	8.29	1.76	1.1	1542
	04/28/05	13:52	10.05	9.24	0.81	-2.3	1456
MW2	09/04/02	12:10	10.12	11.43	-1.31	NR	NR
	11/04/02	11:22	10.12	10.97	-0.85	NR	NR
	02/08/03	15:45	10.12	10.21	-0.09	2.7	1641
	05/08/03	14:44	10.12	10.35	-0.23	0.2	1557
	07/15/03	11:17	10.12	10.78	-0.66	-2.7	1306
	10/23/03	10:02	10.13	9.85	0.28	2.3	1004
	01/26/04	14:15	10.13	8.73	1.40	4.3	1509
	04/22/04	13:10	10.13	10.85	-0.72	-0.6	1353
	07/20/04	13:02	10.13	11.03	-0.90	-0.9	1353
	10/25/04	8:49	10.13	10.52	-0.39	2.5	953
	01/31/05	14:17	10.13	9.08	1.05	2.9	1542
	04/28/05	13:54	10.05	9.87	0.18	-2.3	1456
MW3A	09/04/02	NM	14.48	NM	NM	NM	NM
	11/04/02	9:25	14.48	16.23	-1.75	NR	NR
	02/08/03	17:15	14.48	16.58	-2.10	2.7	1641
	05/08/03	14:42	14.48	16.14	-1.66	0.2	1557
	07/15/03	11:15	14.48	15.64	-1.16	-2.7	1306
	10/23/03	10:05	14.48	16.35	-1.87	2.3	1004
	01/26/04	14:17	14.48	14.41	0.07	4.3	1509
	04/22/04	13:12	14.48	16.35	-1.87	-0.6	1353
	07/20/04	13:04	14.48	16.38	-1.90	-0.9	1353
	10/25/04	8:47	14.48	16.14	-1.66	2.5	953
	01/31/05	16:12	14.48	14.58	-0.10	2.5	1542
	04/28/05	13:57	14.48	15.23	-0.75	-2.3	1456
MW5	09/04/02	NM	8.35	NM	NM	NM	NM
	11/04/02	8:20	8.35	10.68	-2.33	NR	NR
	02/08/03	16:35	8.35	12.88	-4.53	2.7	1641
	05/08/03	14:40	8.35	12.98	-4.63	0.2	1557
	07/15/03	11:10	8.35	13.55	-5.20	-2.7	1306
MW5A	10/23/03	10:09	11.04	9.95	1.09	2.3	1004
	01/26/04	14:20	11.04	9.50	1.54	4.3	1509
	04/22/04	13:15	11.04	10.48	0.56	-0.6	1353
	07/20/04	13:07	11.04	10.70	0.34	-0.9	1353
	10/25/04	8:43	11.04	10.56	0.48	2.5	853
	01/31/05	15:25	11.04	9.78	1.26	2.9	1542
	04/28/05	14:00	11.04	9.98	1.06	-2.3	1456

Notes:
Field data collected by Camp, Dresser and McKee (2003 to 2005).
a) Benchmark is a 2 ft by 6 ft board located just southeast of MW3 on the edge of the embankment above seawater. Benchmark is assumed to be an arbitrary datum of 10.00 feet.
b) Resurvey on 9/23/03 using southernmost wood piling near MW3A.
MLLW - Mean Lower Low Water.
NM - not measured.
NR - not reported
* - measured from top of casing
** - height above or below MLLW

Table 2
Groundwater Field Parameters and Arsenic Concentration
Manson Construction Co./NSI Site
Gig Harbor, Washington

Monitoring Well	Date Sampled	Specific Conductance (mS/cm)	pH	Temperature (°C)	Turbidity (NTU)	Arsenic (mg/L)
MW1	09/04/02	195	5.90	15.3	NR	<0.0033
	11/04/02	203	5.60	12.1	NR	0.0039
	02/08/03	203	6.11	9.3	9.8	<0.0033
	05/08/03	NM	6.41	12.4	6	<0.0033
	07/15/03	177	6.30	14.6	6.6	<0.0033
MW2	09/04/02	185	5.40	14.4	NR	<0.0033
	11/04/02	180	5.40	13.1	NR	<0.0033
	02/08/03	325	6.12	9.0	70	0.0041
	05/08/03	NM	6.33	12.1	10	<0.0033
	07/15/03	184	6.18	13.9	9.6	<0.0033
MW3A	09/04/02	NS	NS	NS	NS	NS
	11/04/02	301	5.80	11.3	NR	0.0055
	02/08/03	300	6.43	10.3	25	<0.0033
	05/08/03	NM	6.52	11.8	4	<0.0033
	07/15/03	395	6.21	13.7	8.1	<0.0033
	0/23/03	765	6.10	14.2	4.4	0.0036
	10/25/04	2,340	6.03	12.6	0.9	0.0008**
	01/31/05	528	NR	NR	NR	0.0012
	04/28/05	307	6.20	11	2.4	0.0008
MW5	09/04/02	NS	NS	NS	NS	NS
	11/04/02	5,080	5.40	11.2	NR	0.032*
	02/08/03	1,221	6.30	8.6	2.54	0.0066
	05/08/03	NM	6.95	9.7	4	0.0043
	07/15/03	900	6.21	14.2	3.1	0.0059
MW5A	10/23/03	7,680	5.84	14.2	25	0.036*
	01/26/04	440	6.03	8.3	8.5	<0.0033
	04/22/04	195	5.54	9.5	9.2	<0.0033
	07/20/04	414	5.74	14.1	9.5	<0.0033
	10/25/04	3,240	5.65	12.5	2.9	0.0006**
	01/31/05	500	NR	NR	NR	0.0005
	04/28/05	299	6.09	10.1	6.9	0.0006

Notes:
Field measurements obtained by Camp, Dresser & McKee.
Laboratory analyses completed by OnSite Environmental and ARI Laboratories
mS/cm - microsiemens per centimeter
sea water is approximately 50,000 uS/cm
°C - degrees Celsius
NR - not reported
< - not detected at or above listed quantitation level
ug/L - micrograms per liter
NM - not measured
NS - not sampled
NTU - nephelometric turbidity units
* - analytical result only corrected for chloride interference
** - analytical result corrected for chloride and bromide interference

Table 3
Statistical Data Analysis
Manson Construction Co./NSI Site
Gig Harbor, Washington

Data Summary

Monitoring Well	Date Sampled	Arsenic RI data (ug/L)	Arsenic CU data (ug/L)
MW1	06/25/99	25	
	09/23/99	21	
	12/22/99	4	
	03/20/00	1	
MW1	09/04/02		1 7
	11/04/02		3 9
	02/08/03		1 7
	05/09/03		1 7
	07/15/03		1.7
MW2	06/25/99	25	
	09/23/99	5	
	12/22/99	10	
	03/20/00	11	
MW2	09/04/02		1 7
	11/04/02		1 7
	02/08/03		4 1
	05/09/03		1.7
	07/15/03		1.7
MW3	06/25/99	25	
	09/23/99	0 5	
	12/22/99	0 5	
	03/20/00	1	
MW3A	11/04/02		5 5
	02/08/03		1 7
	05/09/03		1 7
	07/15/03		1 7
	10/23/03		3 6
	10/25/04		0 8
	01/31/05		1 2
	04/28/05		0.8
MW5	06/25/99	25	
	09/23/99	5	
	12/22/99	8	
	03/20/00	3	
MW5	02/08/03		6 6
	05/09/03		4 3
	07/15/03		5.9
MW5A	01/26/04		1 7
	04/22/04		1 7
	07/20/04		1 7
	10/25/04		0 6
	01/31/05		0 5
	04/28/05		0.6

MW1 and MW2 Statistical Data

Number of Samples	MW1 Cleanup (ug/L)	MW2 Cleanup (ug/L)
1	3 9	4 1
2	1 7	1 7
3	1 7	1 7
4	1 7	1 7
5	1 7	1 7
Mean	2.1	2.2
SD	1 0	1 1
Median	1.7	1.7
95% UCL of Median	2.6	2.7

MW3A and MW5/5A Statistical Data

Number of Samples	MW3A Cleanup (ug/L)	MW5/5A Cleanup (ug/L)
1	5 5	6 6
2	3 6	5 9
3	1 7	4 3
4	1 7	1.7
5	1 7	1.7
6	1 2	1 7
7	0 8	0 6
8	0 8	0 6
9		0.5
Mean	2.1	2.6
SD	1 6	2 4
Median	1.7	1.7
95% UCL of Median	2.8	3.2

95% UCL Median Calculation

Statistical Parameter	MW1 Cleanup (ug/L)	MW2 Cleanup (ug/L)
median	1.7	1.7
n	5	5
n-1	4	4
t	2 132	2 132
SD	1.0	1.1
SQT (n)	2.24	2.24
95% UCL of median	2.6	2.7

95% UCL Median Calculation

Statistical Parameter	MW3A Cleanup (ug/L)	MW5A Cleanup (ug/L)
median	1.7	1.7
n	8	9
n-1	7	8
t	1 895	1 860
SD	1.6	2.4
SQT (n)	2.83	3.00
95% UCL of median	2.8	3.2

Notes:
Median calculated per Ecology's Statistical Guidance for Site Managers
If sample number (n) is odd, sample median estimate is (n+1)/2
If sample number (n) is even, sample median estimate is [(n/2 + (n+2)/2]/2

Data for Nov '02 and Oct '03 are outliers per Ecology guidance document.
These data are considered to be in error due to salt water intrusion.

Upper Confidence Level for alpha = 0.05
UCL = median + t (0.95 and n-1)*(SD/SQT(n))

1/2 practical quantitation limit (25 and 1.7 ug/L) used before August 2004
PQL after July 2004 was 0.5 ug/L

Note:
Chemical data obtained from Camp, Dresser & McKee, Inc.
RI data - remedial investigation data
CU data - cleanup action data
Nov '02 arsenic data (32 ug/L) and Oct '03 arsenic data (36 ug/L) were rejected due to high bias caused by salt water intrusion.
Chloride and bromide can cause interference with ICP-MS analysis. Oct '04 data were corrected for salt water interference.

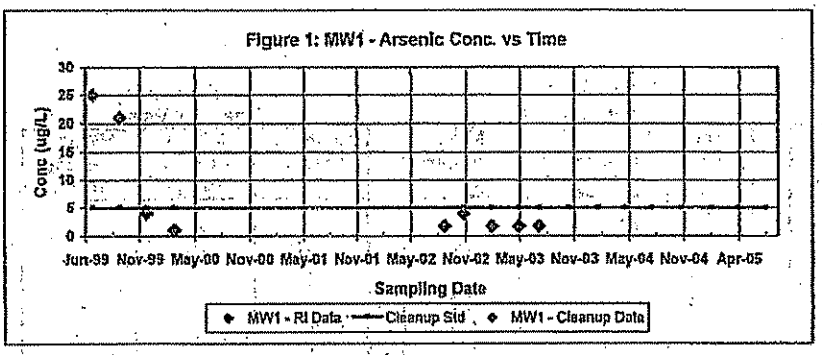
Figure 1: MW1 - Arsenic Conc. vs Time
Conc (ug/L)
30
25
20
15
10
5
0
Jun-99 Nov-99 May-00 Nov-00 May-01 Nov-01 May-02 Nov-02 May-03 Nov-03 May-04 Nov-04 Apr-05
Sampling Date
MW1 - RI Data
Cleanup Std
MW1 - Cleanup Data

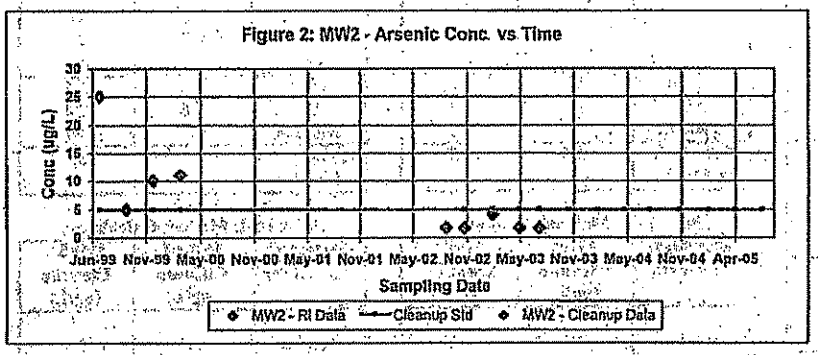
Figure 2: MW2 - Arsenic Conc. vs Time
Conc (ug/L)
30
25
20
15
10
5
0
Jun-99 Nov-99 May-00 Nov-00 May-01 Nov-01 May-02 Nov-02 May-03 Nov-03 May-04 Nov-04 Apr-05
Sampling Date
MW2 - RI Data
Cleanup Std
MW2 - Cleanup Data

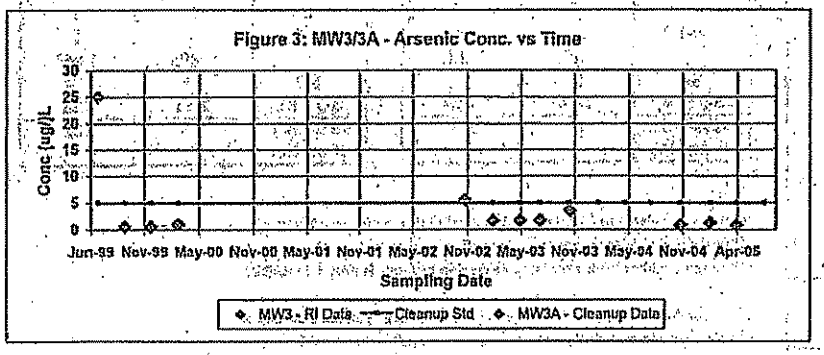
Figure 3: MW3/3A - Arsenic Conc. vs Time
Conc (ug/L)
30
25
20
15
10
5
0
Jun-99 Nov-99 May-00 Nov-00 May-01 Nov-01 May-02 Nov-02 May-03 Nov-03 May-04 Nov-04 Apr-05
Sampling Date
MW3 - RI Data
Cleanup Std
MW3A - Cleanup Data

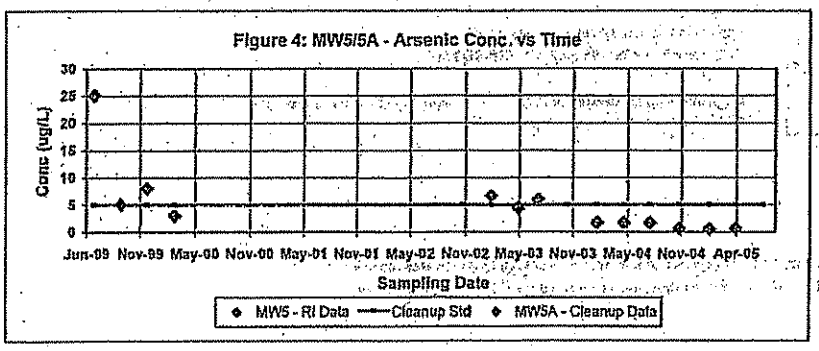
Figure 4: MW5/5A - Arsenic Conc. vs Time
Conc (ug/L)
30
25
20
15
10
5
0
Jun-99 Nov-99 May-00 Nov-00 May-01 Nov-01 May-02 Nov-02 May-03 Nov-03 May-04 Nov-04 Apr-05
Sampling Date
MW5 - RI Data
Cleanup Std
MW5A - Cleanup Data