

US Army Corps of Engineers® New England District

# **2004 SEMI-ANNUAL REPORT**

# LONG TERM MONITORING AREA OF CONTAMINATION (AOC) 57 DEVENS, MASSACHUSETTS SPRING 2004 SAMPLING EVENT

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# 2004 SEMI-ANNUAL REPORT LONG TERM MONITORING AREA OF CONTAMINATION (AOC) 57 DEVENS, MASSACHUSETTS SPRING 2004 SAMPLING EVENT

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## 2004 SEMI-ANNUAL REPORT LONG TERM MONITORING AREA OF CONTAMINATION (AOC) 57 DEVENS, MASSACHUSETTS SPRING 2004 SAMPLING EVENT

#### **1. SUMMARY OF RESULTS**

The New England District Corps of Engineers (NAE) conducted the Spring 2004 semi-annual groundwater sampling event at Area of Contamination (AOC) 57 at Devens, Massachusetts on May 19, 2004. Sampling of the four sumps was conducted on June 2, 2004. This data report presents the summary of results, tabulated analytical results on Tables 1 and 2, data quality evaluation report (Appendix A), chemical quality assurance report (Appendix B), and groundwater field analysis forms (Appendix C). Information on obtaining an electronic copy of the raw analytical laboratory data is included as Appendix D.

Groundwater was sampled at eight monitoring well locations using the U.S. EPA's Low Flow Method and three surface water locations. Monitoring wells sampled were 57M-03-01X, 57M-03-02X, 57M-03-03X, 57M-03-04X, 57M-03-05X, 57M-03-06X, 57M-95-03X, and 57M-96-11X. Prior to sampling the monitoring wells, water levels were measured in the set of exterior piezometers and monitoring wells used in this program. Monitoring well purge water and decontamination fluids were non-hazardous and were disposed onsite. Surface water samples and the four sumps, numbers 1 through 4 were sampled using a pond sampler with a clean jar attached to the end and were decanted into the appropriate sample container. A new jar was used for each location. Sheens were observed on the sump water surface but were determined to be organic in nature. A bailer was used to check for thin layers of floating product that may have been present. None were detected in any of the four sumps or in the vicinity of the surface water locations.

Analyses performed on the groundwater, sump, and surface water samples were: Volatile Organic Compounds (VOC) and Extractable Petroleum Hydrocarbons (EPH) according to the MADEP method, PCBs, and arsenic, lead and cadmium. VOC, EPH, PCB and metal samples, including the appropriate QC (duplicate, matrix spike/matrix spike duplicate) samples, were analyzed by the primary laboratory, AMRO Environmental Laboratories Corporation of Merrimack, New Hampshire. The QA sample was analyzed by the QA laboratory, Severn Trent Laboratories of Colchester, Vermont. No QA or QC samples were collected for the sump samples. Analytical results were compared against the action levels for the site as established in the Record of Decision. Exceedances are tabulated on the following page.

Arsenic was detected above the cleanup goal of 50 ug/L in samples from Area 3 well 57M-96-11X and Area 2 Sump 1 at concentrations of 210 ug/L and 55 ug/L, respectively. Numerous other volatiles and metals were also detected but were below their respective cleanup goals. See Table 1 showing groundwater and surface water results and Table 2 for sump sample results.

		MAY 2004	
WELL/ LOCATION	PARAMETERS	Concentration-ug/L [Cleanup Goal -ug/L]	Remarks
Area 3 57M-96-11X	• Arsenic	• 210 [50]	Decrease from November 2003
57M-DUP	Arsenic	• 240 [50]	Duplicate of 57M-96-11X
SUMP 1	Arsenic	• 55 [50]	First time sampled

Arsenic was detected above the cleanup goal of 50 ug/L in samples from Area 3 well 57M-96-11X and Area 2 Sump 1 at concentrations of 210 ug/L and 55 ug/L, respectively. Numerous other volatiles and metals were also detected but were below their respective cleanup goals. See Table 1 showing groundwater and surface water results and Table 2 for sump sample results.

General water quality chemistry parameters (temperature, pH, specific conductivity, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity) were also measured at the wells and are found in Appendix C. DO and ORP results can also be found on Table 1. No trends were evident but all water quality parameters stabilized relatively quickly. Water level data was collected and will be analyzed the annual report.

A data validation was performed and minimal qualifications were made to the VOC, metals, and PCB data. See Appendix A for the data quality report.

NAE ecological staff monitored the habitat restoration sites. On June 16, 2004, the Area 2 seeded upland was observed to be well covered with grass/herbs, exceeding the cover criterion. The Area 2 wetland was observed to have a lowered water level, and a small ponded area at edge. Vegetation exceeded the 75% indigenous wetland cover criterion. Phragmites were treated with herbicide and subsequently was seen as 100% effective. Continued actions here include:

- Monitoring exotics/invasives;
- Scarifying/reseeding a small area of erosion between a rock-lined drain chute and wetland in the spring;
- Removing stakes and the silt screen before winter;
- Selective removal/herbicide action by a MA licensed applicator.

On June 23, 2004, the upland at Area 3 showed mild erosion, consisting of several dry rivulets and fine material deposited at the wetland edge. Thirteen of the red oaks that were planted on the upland slope had leafed out. Some plantings had reseeded at the upland edge of the mitigated area. There was limited intrusion into the wetland at Area 3. The wetland mitigation was seen as successful by having more than 75 % of the cover native wetland plants, which satisfies the performance standard. No exotics visible. Future actions include:

- Removing the silt screen anytime as it's no longer needed;
- Monitoring for exotics;
- Controlling the mild erosion with a spring hydro seeding.

The 2004 annual report will contain a review and discussion of the results of the May 2004 and the November 2004 sampling events, as well as the habitat restoration monitoring results. Analytical results will be compared to analytical results from the previous years and trends will be analyzed.

# APPENDIX A

# DATA EVALUATION REPORT

Data Evaluation Report For AOC 57, DEVENS, MA Long Term Monitoring Groundwater and Surface Water Samples Collected May 19, 2004 And Sump Water Samples Collected June 2, 2004

#### Introduction

Eight groundwater samples from monitoring well 57M-03-01X, 57M-03-02X, 57M-03-04X, 57M-03-03X, 57M-03-05X, 57M-03-06X, 57M-95-03X and 57M-96-11X, and three surface water samples 57-AREA3-SW1, 57-AREA2-SW2 and 57-AREA2-SW3 at AOC 57, were collected on May 19, 2004. In addition, samples from four sumps: SUMP 1, SUMP 2, SUMP3, and SUMP 4 were collected on June 2, 2004. The samples were analyzed at AMRO Environmental Laboratories Corporation in Merrimack NH for Volatile Organic Compounds (VOCs), polychlorinated biphenyls (PCBs), total metals and Extractable Petroleum Hydrocarbons (EPH) in accordance with the methods stated in Table 1. All results were compared to the MCP Method 1 GW-1 Groundwater Standards. The arsenic values exceeded the MCP GW-1 standards for sample 57M-96-11X and its duplicate, and the sample from Sump 1. The data is reported in Analytical Results Tables 4-2a and 4-2b.

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, standard EPA SW846 guidance, guidelines provided in the "Interim Chemical Data Quality Management (CDQM) Policy for USACE Hazardous, Toxic and Radioactive Waste (HTRW) Projects", dated 23 November 1998, and/or EM 200-1-10 (DRAFT/Final), "Guidance for Evaluating Performance Based Chemical Data Packages".

#### Sample Shipment and Receipt

All sample coolers were packed with ice at the site and some of the coolers were picked up by an AMRO sample courier and delivered to the laboratory the day of sampling; others were shipped via FedEx overnight delivery to AMRO laboratory by Corps personnel on May 19, 2004 and June 2, 2004. Samples were received by the laboratory on May 19, 2004, May 20, 2004 and June 3, 2004. All samples were appropriately preserved by the procedures shown in Table 1. There were no sample shipment or receipt anomalies associated with these samples.

#### **Holding Times**

Samples were prepared and analyzed in accordance with the methods and holding time requirements cited in Table 1.

#### Volatile Organic Compound (VOC) Analysis

Eight groundwater samples, three surface water samples, and four sump samples were analyzed for VOCs using SW846 method 8260B. In addition, the laboratory analyzed one groundwater field duplicate (57M-DUP, a duplicate of sample 57M-96-11X), one equipment blank (57M-EB, dated 5/19/04), and two trip blanks (dated 5/19/04 and 6/2/04).

Laboratory Method Blank (MB), Trip Blank (TB), and Equipment Blank (EB) Results: All target compounds were undetected at levels above the laboratory's practical quantitation limit (PQL) in the MB, TB, and EB. Methylene chloride was detected in the EB and the 6/2/04 TB, at estimated concentrations below the PQL, therefore, no data qualification was applied. All results were acceptable.

<u>Field Duplicate Sample Results</u>: The results for groundwater sample 57M-96-11X and its duplicate sample 57-DUP showed less than 20% relative percent difference (RPD) for the project specific analytes detected above the PQL. Therefore, the duplicate results were acceptable.

<u>Surrogate Results</u>: All VOC sample surrogate recoveries were within the laboratory's stated acceptance limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of groundwater MS/MSD samples was analyzed for AOC 57. All MS/MSD recoveries and RPDs were within the laboratory's acceptance limits for VOC analysis except for the recoveries for five compounds. 1,4-dioxane and tertiary butanol exhibited high recoveries outside the laboratory's control limits in both the MS and MSD. No data qualification was made since these two compounds were not reported as target compounds for the project. Dichlorodifluoromethane, chloromethane and bromoform all exhibited low matrix spike recoveries. As a result, reporting limit values and positive detected values for dichlorodifluoromethane, chloromethane and bromoform were qualified as estimated (J) for all groundwater samples in the Analytical Results Table. The maximum RPD of 20% was exceeded for precision between the MS and MSD for acetone. As a result, reporting limit values and detected values for acetone were also qualified estimated (J) in the Analytical Results Table for all groundwater samples.

One set of sump water MS/MSD samples was also analyzed. Dichlorodifluoromethane exhibited low spike recoveries in both the MS and MSD samples. The reporting limit was qualified as estimated (J) for this compound in all four sump samples due to the low recoveries.

<u>Laboratory Control Sample Results (LCS)</u>: Since no matrix spike samples were analyzed for the surface water samples, the LCS data was evaluated. Eight laboratory control spike recoveries were low in the LCS associated with the three surface water samples. The reporting limits for the affected compounds, Dichlorodifluoromethane, chloromethane, acetone, carbon disulfide, bromodichloromethane, dibromochloromethane, bromoform and 1, 2-dibromo-3-chloropropane were qualified as estimated (J) due to the low recoveries.

#### **Total Metals Analysis**

Eight groundwater samples, three surface water samples and four sump samples were analyzed for arsenic, cadmium, and lead using USEPA methods 206.2, 213.2 and 239.2, respectively. The arsenic concentration for the Sump 2 sample was determined by the Method of Standard Addition. The laboratory also analyzed one groundwater field duplicate (57M-DUP, a duplicate of sample 57M-96-11X), and one equipment blank (57M-EB, dated 5/19/04).

Laboratory Preparation Blank and Equipment Blank Results: Target analytes were undetected at levels above the laboratory's PQL in the laboratory method blank samples, except for arsenic that was reported in the EB at 8.5 ug/L. As a result, arsenic values in the groundwater samples that were less than or equal to five times the concentration found in the EB were qualified as estimated (J) in the Analytical Results Table. Nondetect reporting limit values for arsenic remained unqualified. Since the EB was associated with the groundwater samples only, all other samples were unaffected.

<u>Field Duplicate Sample Results</u>: The results for groundwater sample 57M-96-11X and its duplicate sample 57M-DUP showed less than 20% RPD for the project specific analytes detected above the PQL. Therefore, the duplicate results were acceptable.

<u>Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results</u>: One set of groundwater MS/MSD samples was analyzed. The MS/MSD recoveries and RPDs were within the laboratory's acceptance limits for all the metals analyses. All results for the MS/MSD were acceptable.

<u>Laboratory Control Sample Results (LCS)</u>: Since no matrix spike samples were analyzed for the surface and sump water samples, the LCS data was evaluated. The LCS recoveries for arsenic, cadmium and lead were within the laboratory's acceptable limits.

#### Polychlorinated Biphenyls (PCBs) Analysis

Eight groundwater samples, three surface water samples and four sump samples were analyzed for PCBs using SW-846 methods 3510/8082. In addition, the laboratory analyzed one groundwater field duplicate (57M-DUP, a duplicate of sample 57M-96-11X), and one equipment blank (57M-EB, dated 5/19/04).

Laboratory Method Blank (MB), and Equipment Blank (EB) Results: All target PCB aroclors were undetected at levels above the laboratory's PQL in the MBs and EB. All blank results were therefore acceptable.

<u>Field Duplicate Sample Results</u>: The results for groundwater sample 57M-96-11X and its duplicate sample 57-DUP showed comparable results in that no PCB aroclors were detected in either sample. The duplicate results were therefore acceptable.

<u>Surrogate Results</u>: All surrogate recoveries were within the laboratory's stated acceptance limits with the exception of DCB in sample 57-AREA3-SW-1 and TCMX in sample 57M-96-11X. Since the TCMX recovery was high and no aroclors were detected in sample 57M-96-11X, the results

were not qualified. The DCB recovery was marginally low, and since the aroclors were not detected in sample 57-AREA3-SW-1, the reporting limits were qualified as estimated (J).

<u>Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results</u>: One set of groundwater MS/MSD samples was analyzed for AOC 57. All MS/MSD recoveries and RPDs were within the laboratory's acceptance limits for PCB analysis.

<u>Laboratory Control Sample Results (LCS)</u>: Since no matrix spike samples were analyzed for the surface and sump water samples, the LCS data was evaluated. All LCS/LCSD recoveries and RPDs were within the laboratory's acceptance limits for PCB analysis.

#### **Extractable Petroleum Hydrocarbons (EPH)**

Eight groundwater samples, three surface water samples and four sump samples were analyzed for EPH by the MADEP method for EPH analysis. In addition, the laboratory analyzed one groundwater field duplicate (57M-DUP, a duplicate of sample 57M-96-11X), and one equipment blank (57M-EB, dated 5/19/04).

<u>Laboratory Method Blank (MB), and Equipment Blank (EB) Results</u>: All target EPH analytes and hydrocarbon ranges were undetected at levels above the laboratory's PQL in the MB and EB. All results were acceptable.

<u>Field Duplicate Sample Results</u>: The results for groundwater sample 57M-96-11X and its duplicate sample 57-DUP showed comparable results in that no EPH target analytes or hydrocarbon ranges were detected in either sample. The duplicate analysis results were therefore acceptable.

<u>Surrogate Results</u>: All EPH sample surrogate recoveries were within the laboratory's stated acceptance limits with the following exceptions. A couple of surrogate recoveries were high in the blank and blank spike samples analyzed with the sump water samples. This did not result in data qualification since no EPH values were detected. There were low surrogate spike recoveries for 2-Bromonaphthalene in most of the groundwater samples, and in all of the surface water and sump water samples. In addition, the spike recoveries for this surrogate were low in many of the laboratory control samples. Naphthalene and substituted naphthalene compounds that should remain in the aromatic fraction of the extract tend to go into the aliphatic fraction of the extract. This most accounted for the low recovery of 2-Bromonaphthalene. The laboratory documented the loss of naphthalene itself and 2-methylnaphthalene from the aromatic fraction into the aliphatic fraction, which further supported the reason for the poor surrogate recovery. These low recoveries did not affect the sample results for the EPH target range of  $C_{11}$ - $C_{22}$  Aromatics for the project, since they do not behave like the naphthalene compounds. The EPH data for the project was therefore not qualified due to the poor surrogate recoveries.

<u>Matrix Spike/Matrix Duplicate (MS/MD) Results</u>: One set of groundwater MS/MD samples was analyzed for AOC 57. All MS recoveries of EPH target analytes were within the laboratory's acceptance limits. The sample result and matrix duplicate sample result were in agreement.

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) Results: Since no matrix spike samples were analyzed for the surface and sump water samples, the LCS data was evaluated. The RPD from the recovery of naphthalene in the LCS/LCSD sample was out of acceptable QC limits. This did not affect the EPH sample results for the reasons stated in the surrogate results section. All EPH results were reported without qualification.

## Conclusions

Laboratory reports were reviewed for adherence to acceptable laboratory practices. Based on the data evaluation elements reviewed (including holding times, blank sample results, surrogate recoveries, MS/MSD recoveries and LCS recoveries), all data may be reported without qualification with the following exceptions:

- The reporting limit values and positive detects for the VOCs dichlorodifluoromethane, chloromethane and bromoform in the groundwater samples were qualified as estimated (J) due to low matrix spike compound recoveries. Also, the maximum RPD of 20% was exceeded for precision between the MS and MSD for acetone. As a result, reporting limit values for acetone were qualified as estimated (J) in the Analytical Results Table for the groundwater samples.
- The reporting limit for dichlorodifluoromethane was qualified as estimated in the four sump samples due to low matrix spike recoveries. The reporting limits for dichlorodifluoromethane, chloromethane, acetone, carbon disulfide, bromodichloromethane, dibromochloromethane, bromoform and 1,2-dibromo-3-chloropropane were qualified as estimated due to low LCS spike recoveries.
- Arsenic was reported for the metals EB sample above the RL. As a result the arsenic values in the groundwater samples that were less than or equal to five times the concentration found in the EB sample were qualified as estimated (J) in the Analytical Results Table.
- The reporting limits for the PCB aroclors for sample 57AREA3-SW-1 were qualified as estimated due to the low surrogate recovery in that sample. The remainder of the data was acceptable and reported without qualification.

 Table 1

 Sample Preparation and Analysis Methods, Containers, Holding Times, and Preservatives

Parameter	Preparation Method <sup>1</sup>	Analysis Method <sup>1</sup>	Sample Container <sup>2</sup>	Preservative	Holding Time
VOC	5030B	8260B	3 X 40 mL vials with Teflon septa screw caps	HCl to pH less than 2 (No Headspace) 4+/- 2°C	14 days to analysis
Metals - Arsenic Cadmium Lead	200 series	206.2/213.2/239.2 or 6010B	1-Liter HDPE	HNO3 to pH less than 2	180 days to analysis
PCBs	3510	8082	l-Liter Glass Amber	Ice 4+/- 2ºC	7 days to extractio n 40 days to analysis
EPH	MADEP	MADEP	l-Liter Glass Amber	HCl to pH less than 2	14 days to extractio n 40 days to analysis

1 "Methods for Chemical Analysis of Water and Wastes", Cincinnati, OH, March 1979, EPA 600-4-79-020. "Test Methods for Evaluating Solid Waste, Physical and Chemical Methods", U.S. EPA SW-846, 3rd Edition.

2 Additional sample containers/volume is required for matrix quality control samples.

#### Lable 4-2a Groundwater and Surface WaterAnalytical Results May 19, 2004 AOC 57 Devens Massachusetts (SHEET 1 of 3)

PARAMETERS	Well No.	57M-03-01X	57M-03-02X	57M-03-03X	57M-DUP	57M-03-04X	57M-03-05X	57M-03-06X	57M-95-03X	57M-96-11X	57-AREA 2-SW2	57-AREA 2-SW3	57-AREA 3-SW1
	GW STANDARD (1)	μg/L	µg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	µg/L	μg/L	μg/L
VOLATILES (8260B)	ug/L												
Dichlorodifluoromethane	NS	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ
Chloromethane	NS	2.7J	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ	5UJ
Vinyl chloride	2	2U	2U	20	2U	2U	2U	20	20	20	2U	2U	20
Chloroethane	NS	50	5U	50	5U	50	5U	5U	5U	5U	50	5U	5U
Bromomethane	10	2U	2U	2U	2U	2U	2U	20	2U	20	2U	2U	20
Trichlorofluoromethane	NS	2U	2U	2J	20	2U	2U	3.7	2U	2U	20	2U	2U
Diethyl ether	NS	5U	50	5U	5U	5U	5U	5U	50	5U	50	5U	5U
Acetone	3,000	10UJ	10UJ	10UJ	4 J	10UJ	10UJ	10UJ	10UJ	10UJ	10UJ	10UJ	10UJ
1,1-Dichloroethene	7	1U	10	1U	1U	1U	10	10	10	10	10	10	10
Carbon disulfide	NS	2U	2U	2U	2U	2U	2U	20	20	20	2UJ	2UJ	2UJ
Methylene chloride	~ 5	5U	5U	5U	5U	5U	5U	5U	5U	5U	50	5U	5U
Methyl tert-butyl ether	70	2U	2U	20	2U	2U	2U	2U	20	20	20	2U	2U
trans-1,2-Dichloroethene	100	20	2U	20	2U	2U	2U	20	2U	20	20	2U	20
1,1-Dichloroethane	70	2U	2U	2U	2U	2U	20	20	20	20	2U	2U	20
2-Butanone	350	10U	10U	10U	7.4 J	10U	10U	100	10U	7.3 J	100	10U	10U
2,2-Dichloropropane	NS	20	20	2U	20	2U	20	2U	20	2U	2U	2U	2U
cis-1,2-Dichloroethene	70	0.71J	7.1	2U	1.5 J	7.3	4.3	20	2U	1.6 J	2U	2U	20
Chloroform	NS	2U	2U	20	2U	2U	20	2U	2U	2U	2U	20	20
Tetrahydrofuran	NS	100	10U	100	10U	10U	10U	10U	100	10U	10U	10U	10U
Bromochloromethane	NS	2U	20	2U	2U	2U	20	2U	2U	20	2U	2U	2U
1,1,1-Trichloroethane	200	20	20	2U	20	20	20	20	2U	20	20	2U	2U
1,1-Dichloropropene	NS	20	2U	20	20	2U	20	2U	20	20	2U	2U	20
Carbon tetrachloride	5	2U	2U	20	20	20	2U	2U	20	2U	2U	2U	20
1,2-Dichloroethane	5	2U	20	20	20	20	2U	20	20	20	2U	20	20
Benzene	5	10	10	10	10	10	10	10	10	10	1U	10	10
Trichloroethene	5	0.75J	4.3	20	20	2.2	2U	2U	2U	0.52 J	2U	20	2U
1.2-Dichloropropane	5	2U	20	20	2U	20	2U	2U	2U	2U	20	20	20
Bromodichloromethane	5	2U	20	20	2U	20	20	20	20	2U	2UJ	2UJ	2UJ
Dibromomethane	NS	20	20	2U	2U	20	20	20	2U	20	2U	20	2U
4-Methyl-2-pentanone	350	10U	10U	10U	100	10U	10U	10U	10U	10U	10U	10U	10U
cis-1,3-Dichloropropene	1	10	10	10	<u>1U</u>	1ປ	10	10	10	10	10	10	10

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

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Source wells: 57M-95-03X Sentry wells: 57M-96-11X

#### Groundwater and Surface Water Analytical Results May 19, 2004 AOC 57 Devens Massachusetts (SHEET 2 of 3)

PARAMETERS	Well No.	57M-03-01X	57M-03-02X	57M-03-03X	57M-DUP	57M-03-04X	57M-03-05X	57M-03-06X	57M-95-03X	57M-96-11X	57-AREA 2-SW2	57-AREA 2-SW3	57-AREA 3-SW1
	GW					l.	1			h <u>.</u>		8	
	STANDARD (1)	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
VOLATILES (8260B) cont'd	uq/L	r. <del>.</del>	1.2	P-0	<i></i>	1 1.9-	1.3	r9	r-3	1.2	7.5-	P-5-	F-3
Toluene	1,000	2U	1.2 J	2U	8,9	2U	16	2U	1.6 J	8.5	20	0.88 J	2U
trans-1,3-Dichloropropene	1	10	1U	10	10	10	10	10	10	10	10	10	10
1,1,2-Trichloroethane	5	20	2U	2U	20	20	20	2U	20	20	2U	20	20
1,2-Dibromoethane	· NS	2U	2U	2U	2U	20	20	20	2U	20	2U	20	2U
2-Hexanone	NS	10U	10U	10U	10U	100	10U	100	10U	10U	10U	10U	10U
1,3-Dichloropropane	NS	2U	20	20	20	2U	20	2U	2U	20	20	2U	2U
Tetrachloroethene	5	2U	2.3	2J	20	3.4	2U	2U	0.82 J	2U	20	20	2U
Dibromochloromethane	5	2U	2U	20	20	2U	20	2U	2U	20	2UJ	2UJ	2UJ
Chlorobenzene	100	2U	2U	2U	2.9	20	0.72 J	2U	2U	2.6	2U	2U	2U
1,1,1,2-Tetrachloroethane	5	2U	2U	2U	20	20	20	2U	2U	20	2U	2U	2U
Ethylbenzene	700	20	2U	20	3.6	20	26	2U	7.5	3.4	20	20	20
m,p-Xylene	10,000	2U	2U	2U	5.3	20	20	2U	21	4.7	2U	2U	20
o-Xylene	10,000	2U	2U	2U	3.1	20	0.56 J	2U	15	2.8	2U	2U	20
Styrene	100	2U	2U	2Ú	2U	20	2U	2U	20	20	2U	2U	2U
Bromoform	5	2UJ	2UJ	201	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ
Isopropylbenzene	NS	2U	2U	2U	1.2 J	20	0.76 J	2U	2.6	1 J	20	2U	2U
1,1,2,2-Tetrachloroethane	2	2U	2U	2U	20	20	2U	2U	2U	20	2U	2U	2U
1.2.3-Trichloropropane	NS	2U	20	2U	2Ú	20	20	2U	2U	2U	2U	2U	20
Bromobenzene	NS	2U	2U	2U	2U	20	20	2U	2U	20	2U	2U	20
n-Propylbenzene	NS	2U	2U	2U	2.3	2U	1.5 J	2U	4	2.2	20	2U	2U
2-Chlorotoluene	NS	2U	20	2U	2U	2U	20	20	2U	20	2U	2U	2U
4-Chlorotoluene	NS	2U	20	2U	2U	20	20	2U	2U	20	20	2U	20
1,3,5-Trimethylbenzene	NS	2U	20	20	5.2	2U	20	20	14	4.5	2U	2U	20
tert-Butylbenzene	NS	2U	2U	20	2U	20	20	20	2U	20	2U	2U	2U
1,2,4-Trimethylbenzene	NS	2U	2U	20	18	20	7.4	2U	49	17	20	2U	20
sec-Butylbenzene	NS	20	2U	2U	0.7 J	2U	1.1 J	2U	1.1 J	0.59 J	2U	2U	2U
4-Isopropyltoluene	NS	2U	2U	2U	0.64 J	2U	1 J	20	1.1 J	0.61 J	2U	2U	20
1,3-Dichlorobenzene	600	2U	20	20	20	2U	2U	2U	2U	2U	2U	2U	2U
1,4-Dichlorobenzene	5	2U	2U	2U	4.2	2U	5U	2U	2.2	3.8	20	2U	20
n-Butylbenzene	NS	2U	20	20	2U	2U	1 J	20	20	2U	20	2U	2U
1,2-Dichlorobenzene	600	2U	20	2U	10	0.6 J	0.89 J	2U	3.3	9.9	2U	2U	20
1.2-Dibromo-3-chloropropane	NS	5U	5U	5U	5U	5U	5U	50	5U	5U	5UJ	5UJ	5UJ
1.2,4-Trichlorobenzene	70	20	2U	20	2U	20	20	2U	20	20	20	2U	20
Hexachlorobutadiene	0.6	2U	2U	2U	20	20	20	2U	20	20	2U	2U	2U
Naphthalene	20	50	5U	5U	5,3	5U	2.6 J	50	5.5	5.3	50	5U	5U
1,2,3-Trichlorobenzene	NS	2U	20	20	2U	20	20	20	20	20	20	2U	2U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

Source wells: 57M-95-03X Sentry wells: 57M-96-11X

#### AOC 57 Devens Massachusetts (SHEET 3 of 3)

PARAMETERS	Well No.	57M-03-01X	57M-03-02X	57M-03-03X	57M-DUP	57M-03-04X	57M-03-05X	57M-03-06X	57M-95-03X	57M-96-11X	57-AREA 2-SW2	57-AREA 2-SW3	57-AREA 3-SW1
	GW												
	STANDARD (1)	μg/L	μg/L	μ <b>g/L</b>	µg/L	μg/L	μg/L	µg/L	μg/L	μg/L	μg/L	µg/L	ug/L
PCBs (8082)	ug/L			2									
Aroclor 1016	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Arocior 1221	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Aroclor 1232	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Aracior 1242	0.5	0.24 U	0 24 U	0.22 U	0.23 U	0_22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Aroclor 1248	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Araclor 1254	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ
Aroclor 1260	0.5	0.24 U	0.24 U	0.22 U	0.23 U	0.22 U	0.22U	0.22U	0.21 U	0.22U	0.21 U	0.21 U	0.22UJ

Metals (206.2, 213.2, 239.2)		hð\r	µg/L	µg/L	μg/L	µg/L	µg/L	µg/L	µg/L	μg/L	μg/L	µg/L	µg/L
Arsenic	50	5U	6.4 J	5U	240	30 J	21 J	50	44	210	4.4 J	8.1	3.1 J
Cadmium	5	0.3 J	0.65 J	0.55 J	0.5 J	0.31 J	0.47 J	0.5 J	0.6 J	0.32 J	0.42 J	0.51 J	0.59 J
Lead	15	50	0.88 J	5U	5U	5U	5U	5U	5U	5U	5U	50	50

EPH (MADEP-EPH)		µg/L	μg/L	µg/L	µg/L.	µg/L							
C <sub>11</sub> -C <sub>22</sub> Aromatics	200	120U	120U	100U	110U	100U	110U	1100	1100	120U	110U	110U	110U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

25 Exceeds MCP GW-1 Groundwater Standard

#### I able 4-2b Sump Water Analytical Results June 2, 2004 AOC 57 Devens Massachusetts (SHEET 1 of 3)

PARAMETERS	Well No.	SUMP 1	SUMP 2	SUMP 3	SUMP 4
	GW				
	STANDARD (1)	μg/L	μg/L	μg/L	μg/L
VOLATILES (8260B)	ug/L				
Dichlorodifluoromethane	NS	5UJ	5UJ	5UJ	5UJ
Chloromethane	NS	5U	5U	5U	5U
Vinyl chloride	2	2U	20	2U	20
Chloroethane	NS	5U	5U	5U	5U
Bromomethane	10	2U	2U	2U	2U
Trichlorofluoromethane	NS	2U	20	2U	2U
Diethyl ether	NS	5U	5U	5U	5U
Acetone	3,000	10U	10U	10U	10U
1,1-Dichloroethene	7	1U	10	10	1U
Carbon disulfide	NS	2U	2U	20	2U
Methylene chloride	5	5U	5U	5U	5U
Methyl tert-butyl ether	70	2U	2U	20	2U
trans-1,2-Dichloroethene	100	2U	2U	2U	2U
1,1-Dichloroethane	70	2U	2U	20	2U
2-Butanone	350	10U	10U	10U	10U
2,2-Dichloropropane	NS	2U	2U	2U	2U
cis-1,2-Dichloroethene	70	0.84 J	0.86 J	2U	2U
Chloroform	NS	2U	2U	2U	2U
Tetrahydrofuran	NS	10U	10U	10U	10U
Bromochloromethane	NS	2U	2U	2U	2U
1,1,1-Trichloroethane	200	2U	2U	2U	2U
1,1-Dichloropropene	NS	2U	2U	2U	2U
Carbon tetrachloride	5	2U	2U	2U	2U
1,2-Dichloroethane	5	2U	2U	2U	2U
Benzene	5	1U	1U	1U	1U
Trichloroethene	5	2U	2U	2U	2U
1,2-Dichloropropane	5	2U	2U	2U	2U
Bromodichloromethane	5	2U	2U	2U	2U
Dibromomethane	NS	2U	2U	2U	2U
4-Methyl-2-pentanone	350	10U	10U	10U	10U
cis-1,3-Dichloropropene	1	1U	1U	1U	1U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

#### Table 4-2b Sump Water Analytical Results June 2, 2004 AOC 57 Devens Massachusetts (SHEET 2 of 3)

PARAMETERS	Well No.	SUMP 1	SUMP 2	SUMP 3	SUMP 4
VOLATILES (8260B) cont'd	GW STANDARD (1) ug/L	μg/L	μg/L	μg/L	μg/L
Toluene	1,000	2U	2U	2U	2U
trans-1,3-Dichloropropene	1,000	10	10	10	1U
1,1,2-Trichloroethane	5	20	20	20	20
1,2-Dibromoethane	NS	20	20	20	20
2-Hexanone	NS	10U	100	100	10U
1,3-Dichloropropane	NS	20	20	20	20
Tetrachloroethene	5	0.57 J	0.58 J	20	0.98 J
Dibromochloromethane	5	20	20	20	2U
Chlorobenzene	100	20 2U	20	20	20 2U
1,1,1,2-Tetrachloroethane	5	20	20	20	20 2U
	700	20 2U	20 2U	20 2U	20 2U
Ethylbenzene		20	20		20 2U
m,p-Xylene	10,000			20	
o-Xylene	10,000	2U	20	20	20
Styrene	100	20	2U	20	2U
Bromoform	5	2U	20	20	20
Isopropylbenzene	NS	2U	2U	20	20
1,1,2,2-Tetrachloroethane	2	2U	2U	20	20
1,2,3-Trichloropropane	NS	20	20	2U	2U
Bromobenzene	NS	2U	2U	20	2U
n-Propylbenzene	NS	2U	2U	2U	2U
2-Chlorotoluene	NS	20	20	20	2U
4-Chlorotoluene	NS	2U	20	2U	2U
1,3,5-Trimethylbenzene	NS	20	2U	20	2U
tert-Butylbenzene	NS	2U	2U	20	2U
1,2,4-Trimethylbenzene	NS	2U	20	2U	2U
sec-Butylbenzene	NS	2U	2U	20	2U
4-Isopropyltoluene	NS	2U	2U	20	20
1,3-Dichlorobenzene	600	2U	2U	2U	2U
1,4-Dichlorobenzene	5	0.62 J	0.53 J	2U	2U
n-Butylbenzene	NS	2U	2U	2U	2U
1,2-Dichlorobenzene	600	2U	2U	2U	2U
1,2-Dibromo-3-chloropropane	NS	5U	5U	5U	5U
1,2,4-Trichlorobenzene	70	2U	2U	20	2U
Hexachlorobutadiene	0.6	2U	2U	20	2U
Naphthalene	20	5U	5U	5U	5U
1,2,3-Trichlorobenzene	NS	2U	20	2U	2U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

## June 2, 2004 AOC 57 Devens Massachusetts (SHEET 3 of 3)

PARAMETERS	Well No.	SUMP 1	SUMP 2	SUMP 3	SUMP 4
	GW				
	STANDARD (1)	μg/L	μg/L	μg/L	μg/L
PCBs (8082)	ug/L				
Aroclor 1016	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1221	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1232	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1242	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1248	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1254	0.5	0.23 U	0.23 U	0.22U	0.23 U
Aroclor 1260	0.5	0.23 U	0.34	0.22U	0.23 U

Metals (206.2, 213.2, 239.2)		hð/r	µg/L	µg/L	μg/L
Arsenic	50	55	28	22	21
Cadmium	5	0.37 J	0.47 J	2U	0.28 J
Lead	15	1.3 J	1.1 J	1.2 J	0.8 J

EPH (MADEP-EPH)		μg/L	μg/L	µg/L	µg/L
C <sub>11</sub> -C <sub>22</sub> Aromatics	200	120U	120U	110U	120U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

25

Exceeds MCP GW-1 Groundwater Standard

# **APPENDIX B**

# CHEMICAL QUALITY ASSURANCE REPORT

#### CHEMICAL QUALITY ASSURANCE REPORT

## PREPARED BY KATHERINE MILLER OF THE GEOLOGY & CHEMISTRY SECTION ENGINEERING/PLANNING DIVISION

## DEPARTMENT OF THE ARMY NEW ENGLAND DISTRICT, CORPS OF ENGINEERS CONCORD, MASSACHUSETTS

SEPTEMBER 10, 2004

## CHEMICAL QUALITY ASSURANCE REPORT

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#### CHEMICAL QUALITY ASSURANCE REPORT

#### **Executive Summary**

One groundwater QA sample from AOC 57 Long Term Monitoring, Devens, Massachusetts project was analyzed by the QA laboratory, resulting in a total of 77 target analyte determinations. In 20 of these determinations, one or both laboratories detected analytes.

AMRO Environmental Laboratories, Merrimack, NH, performed all primary laboratory analyses. Severn Trent Laboratories, Colchester, VT, performed QA laboratory analyses (Reference 6a and 6b). See Table 2 for analyses performed by the QA lab. See Attachment D-1 for Primary and QA laboratory comparison data.

Results from the analysis of the QA sample were compared with results from analysis of the corresponding primary sample. Agreement was expressed in terms of relative percent difference (RPD). For all analyses, values were considered to be in agreement if the RPD was less than 75. In a situation where one lab reported a detected value and the other reported a non-detect less than the reporting limit (RL), agreement was evaluated based on consistency of the quantity of the detected value with respect to the RL for that analyte from the other lab. If the detected value from one lab was higher than the other lab's RL, and the RPD was greater than 75, the comparison was considered a data discrepancy.

The primary and QA samples agreed overall in 76 (99%) of the comparisons. Primary and QA samples agreed quantitatively in 19 out of 20 (95%) of the comparisons. Refer to Table 1 for a QA split sample data comparison summary. Quantitative agreement represents only those determinations where an analyte was detected by at least one laboratory. There was one data discrepancy between the primary laboratory and the QA laboratory sample results. The RPD between the cadmium results for the primary and QA laboratories was 78%. Both cadmium concentrations were estimated values below the reporting limit, but above the contract required detection limit (CRDL). The concentrations below the reporting limit were estimated due to the higher degree of variation at the lower range of the calibration curve. This accounted for the RPD value exceeding 75%. The estimated results were valid. The data is usable for its intended purposes. DQOs for the project have been satisfied.

Analytical results were compared to the MCP GW-1 standards. The arsenic results reported by both laboratories exceeded the MCP GW-1 standard of 50  $\mu$ g/L. The primary laboratory reported an arsenic concentration of 213  $\mu$ g/L and the QA laboratory reported 210  $\mu$ g/L of arsenic.

# Table ES-1Quality Assurance Split SampleData Comparison SummaryProject: AOC 57 LTM Devens, Massachusetts

	Overall Ag	Quantitative Agreement (2)						
Test Parameter	Number	Percent	Number	Percent				
VOC	66/66	100	17/17	100				
ЕРН	1/1	100	NA	NA				
РСВ	7/7	100	NA	NA				
Metals	2/3	67	2/3	67				
Total	76/77	99	19/20	95				

#### NOTES:

(1) Represents the number and percentage agreement of all determinations including analytes not detected by either laboratory.

(2) Represents the number and percentage agreement of only those determinations where an analyte was detected by at least one laboratory.

# Table ES-2QA Analyses Performed

Sample Description	Matrix	Sample Date	Analysis
57M-96-11X-QA	WATER	05/19/04	VOC, EPH, PCB, METALS

#### CHEMICAL QUALITY ASSURANCE REPORT

#### QA Findings

#### 1. QA sample shipping and chain-of-custody deficiencies.

The QA laboratory, Severn Trent Laboratories, received one groundwater sample, 57M-96-11X-QA, on 5/20/04. Proper sample handling protocols were followed. There was no sample handling or custody documentation deficiency.

Copies of chain-of-custody document and sample receipt checklists are appended to this report for reference.

#### 2. Data comparison for volatile organic compounds (VOC).

There were 66 VOC determinations. In 17 of these determinations, one or both laboratories detected target analytes. There was overall agreement in all 66 (100%) cases and quantitative agreement in 17 out of 17 (100%) of the cases. There was no data discrepancy between the primary and QA laboratory sample results. The reporting limit for the detected VOCs was higher than the estimated detections of VOCs in each case when only one laboratory detected a VOC compound. All RPDs were less than 30% for the cases when both laboratories detected VOCs.

a. Batch QC Evaluation for the Primary Laboratory.

QC for the primary laboratory was evaluated and reported in the data evaluation report.

b. Batch QC Evaluation for the QA Laboratory.

*<u>Holding times</u>*: QA samples for VOC analysis were analyzed within prescribed holding times.

<u>Method blanks</u>: The method blank sample showed no detection of VOCs above the laboratory's practical quantitation limit (PQL). Hexachlorobutadiene and naphthalene contamination was detected in the method blank sample associated with sample, but at estimated concentrations below the PQL. Therefore, no data qualification was applied to the well sample data.

*<u>Trip blank</u>*: The trip blank sample showed no detection of VOCS.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)</u>: Results of the analysis of laboratory control samples were within laboratory control limits for recovery of all VOCs. All RPD values were within QC limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSDs): MS/MSDs were not required for the QA lab.

<u>Surrogate Spike Recoveries</u>: Surrogate spike recoveries from the sample, the associated method blank sample, trip blank sample LCS and LCSD were within laboratory acceptance limits.

#### 3. Data comparison for extractable petroleum hydrocarbons (EPH).

The  $C_{11}$ - $C_{22}$  aromatic hydrocarbon range was the only EPH contaminant of concern for the site. Neither laboratory detected  $C_{11}$ - $C_{22}$  aromatic hydrocarbons. Therefore, there was overall agreement for the one comparison (100%).

a. Batch QC Evaluation for the Primary Laboratory.

QC for the primary laboratory was evaluated and reported in the data evaluation report.

b. Batch QC Evaluation for the QA Laboratory.

*<u>Holding times</u>*: The QA sample for EPH analysis was analyzed within the prescribed holding time.

<u>Method blanks</u>: Method blank results showed no detection of project target analytes above the laboratory's reporting limit.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)</u>: All hydrocarbon ranges and EPH analytes were recovered within laboratory acceptance limits. All LCS/LCSD RPDs were acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSDs): Matrix spikes were not required for the QA laboratory.

<u>Surrogate Spike Recoveries</u>: Surrogate spike recoveries for the QA sample, the associated method blank sample, the LCS and LCSD were within laboratory acceptance limits.

## 4. Data comparison for polychlorinated biphenyls (PCB).

There were seven determinations for PCB aroclors. In all determinations, neither laboratory detected PCBs. There was overall agreement in all seven (100%) cases.

a. Batch QC Evaluation for the Primary Laboratory.

QC for the primary laboratory was evaluated and reported in the data evaluation report.

b. Batch QC Evaluation for the QA Laboratory.

*<u>Holding times</u>*: The QA sample for PCB analysis was analyzed within the prescribed holding time.

<u>Method blanks</u>: Method blank results showed no PCB detected above the laboratory's reporting limit.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)</u>: PCB aroclor 1260 was recovered within laboratory acceptance limits for the LCS and LCSD. The RPD was within QC limits.

<u>Matrix Spike/Matrix Spike Duplicate (MS/MSDs)</u>: Matrix spikes were not required for the QA laboratory.

<u>Surrogate Spike Recoveries</u>: Surrogate spike recoveries for the QA sample, the associated method blank and LCSs were within laboratory acceptance limits.

## 5. Data comparison for metals.

There was one determination each for arsenic, cadmium and lead. Both laboratories detected arsenic and cadmium in sample 57M-96-11X. There was overall agreement in two of the three (67%) cases and quantitative agreement in two out of the three cases (67%). There was one data discrepancy for cadmium. Both laboratories detected cadmium at an estimated concentration above the instrument detection limit but below the CRDL. The results were marginally outside the acceptable RPD of 75% at 78%. The concentrations below the reporting limit were estimated by the laboratory due to the higher degree of variation at the lower end of the calibration curve. This accounted for the data discrepancy. The reported results, qualified as estimated, were acceptable.

a. Batch QC Evaluation for the Primary Laboratory.

QC for the primary laboratory was evaluated and reported in the data evaluation report.

b. Batch QC Evaluation for the QA Laboratory.

Holding times: All samples were analyzed within prescribed holding times.

<u>Method blanks</u>: Method blank results showed no contamination above the laboratory's detection limit.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)</u>: The LCS and LCSD results were within laboratory acceptance limits.

<u>Matrix Spike/Matrix Spike Duplicate (MS/MSDs)</u>: Matrix spikes were not required for the QA laboratory.

#### 6. References.

- a. Data reports for AOC 57 Long Term Monitoring, Devens, Massachusetts, May 2004, submitted by Severn Trent Laboratories, Inc., dated June 3, 2004.
- b. Data reports for AOC 57 Long Term Monitoring, Devens, Massachusetts, May 2004, submitted by AMRO Environmental Laboratories Corporation, dated July 2, 2004.
- c. EM 200-1-6, Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects, dated 10 October 1997.

# ATTACHMENT D-1

# DATA COMPARISON TABLES

## Groundwater Analytical Results - May 19, 2004 AOC 57 Devens Massachusetts (SHEET 1of 3)

PARAMETERS	Well No.	57M-96-11X-QA	57M-96-11X
(Analytical Method)	GW	μg/L	μg/L
	STANDARD (1)		
VOLATILES (8260B)	ug/L		
Dichlorodifluoromethane	NS	5.0 U	5UJ
Chloromethane	NS	5.0 U	5UJ
Vinyl chloride	2	5.0 U	2U
Chloroethane	NS	5.0 U	5U
Bromomethane	10	5.0 U	2U
Trichlorofluoromethane	NS	5.0 U	20
Acetone	3,000	12	5U
1,1-Dichloroethene	7	5.0 U	10UJ
Carbon disulfide	NS	5.0 U	1U
Methylene chloride	5	5.0 U	5U
Methyl tert-butyl ether	70	5.0 U	2U
trans-1,2-Dichloroethene	100	5.0 U	2U
1,1-Dichloroethane	70	5.0 U	20
2-Butanone	350	7.1	7.3 J
2,2-Dichloropropane	NS	√ 5.0 U	2U
cis-1,2-Dichloroethene	70	1.6 J	1.6 J
Chloroform	NS	5.0 U	20
Tetrahydrofuran	NS	50 U	10U
Bromochloromethane	NS	5.0 U	2U
1,1,1-Trichloroethane	200	5.0 U	2U
1,1-Dichloropropene	NS	5.0 U	2U
Carbon tetrachloride	5	5.0 U	2U
1,2-Dichloroethane	5	5.0 U	20
Benzene	5	5.0 U	10
Trichloroethene	5	5.0 U	0.52 J
1,2-Dichloropropane	5	5.0 U	2U
Bromodichloromethane	5	5.0 U	2U
Dibromomethane	NS	5.0 U	2U
4-Methyl-2-pentanone	350	5.0 U	10U
cis-1,3-Dichloropropene	1	5.0 U	10

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

#### Groundwater Analytical Results - May 19, 2004 AOC 57 Devens Massachusetts (SHEET 2of 3)

PARAMETERS	Well No.	57M-96-11X-QA	57M-96-11X
(Analytical Method)	GW	μg/L	μg/L
	STANDARD (1)		
VOLATILES (8260B) cont'd	ug/L		
Toluene	1,000	8.3	8.5
trans-1,3-Dichloropropene	1	5.0 U	1U
1,1,2-Trichloroethane	5	5.0 U	2U
1,2-Dibromoethane	NS	5.0 U	2U
2-Hexanone	NS	5.0 U	10U
1,3-Dichloropropane	NS	5.0 U	2U
Tetrachloroethene	5	5.0 U	2U
Dibromochloromethane	5	5.0 U	2U
Chlorobenzene	100	2.8 J	2.6
1,1,1,2-Tetrachloroethane	5	5.0 U	2U
Ethylbenzene	700	3.5 J	3.4
m,p-Xylene	10,000	5.2	4.7
o-Xylene	10,000	3.2 J	2.8
Styrene	100	5.0 U	2U
Bromoform	5	5.0 U	2UJ
Isopropylbenzene	NS	1.2 J	1 J
1,1,2,2-Tetrachloroethane	2	5.0 U	2U
1,2,3-Trichloropropane	NS	5.0 U	2U
Bromobenzene	NS	5.0 U	2U
n-Propylbenzene	NS	2.0 J	2.2
2-Chlorotoluene	NS	5.0 U	20
4-Chlorotoluene	NS	5.0 U	2U
1,3,5-Trimethylbenzene	NS	5.9	4.5
tert-Butylbenzene	NS	5.0 U	2U
1,2,4-Trimethylbenzene	NS	18	17
sec-Butylbenzene	NS	5.0 U	0.59 J
4-Isopropyltoluene	NS	5.0 U	0.61 J
1,3-Dichlorobenzene	600	5.0 U	2U
1,4-Dichlorobenzene	5	3.2 J	3.8
n-Butylbenzene	NS	5.0 U	2U
1,2-Dichlorobenzene	600	9.7	9.9
1,2-Dibromo-3-chloropropane	NS	5.0 U	5U
1,2,4-Trichlorobenzene	70	5.0 U	2U
Hexachlorobutadiene	20	40 10	<u> </u>
Naphthalene	20	4.9 JB	5.3
1,2,3-Trichlorobenzene	NS	5.0 U	2U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

B - Compound is detected in the sample and the associated method blank sample

#### Groundwater Analytical Results - May 19, 2004 AOC 57 Devens Massachusetts (SHEET 3of 3)

PARAMETERS	Well No.	57M-96-11X-QA	57M-96-11X
(Analytical Method)	GW	μg/L	μg/L
	STANDARD (1)		
PCBs (8082)	ug/L		
Aroclor 1016	0.5	0.57 U	0.22 U
Aroclor 1221	0.5	0.57 U	0.22 U
Aroclor 1232	0.5	0.57 U	0.22 U
Aroclor 1242	0.5	0.57 U	0.22 U
Aroclor 1248	0.5	0.57 U	0.22 U
Aroclor 1254	0.5	0.57 U	0.22 U
Aroclor 1260	0.5	0.57 U	0.22 U
Metals (206.2, 213.2, 239.2)	- Primary Lab		
Select Metals (SW846 6010E	3) - QA Lab		
Arsenic	50	213	210
Cadmium	5	0.73 B	0.32 J
Lead	15	4.5	5 U
EPH (MADEP-EPH)			
C <sub>11</sub> -C <sub>22</sub> Aromatics	200	180U	120 U

(1) - MCP Method 1 GW-1 Groundwater Standards

U - Below laboratory reporting limit

J - Estimated concentration below laboratory reporting limit but above the MDL

B - Compound is detected in the sample and the associated method blank sample

Exceeds MCP GW-1 Groundwater Standard

# ATTACHMENT D-2

# **CUSTODY DOCUMENTATION**

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		Devens -,	400 57			Pro	oject I	Manag	ger:	Paul	400	_	14	nplers د <i>ا</i> د	Ye	enc	<u>.</u>		0Project No.: 0405140
	<b>Project State:</b>	MA											Pat	nick	P	y S V V	meri	5	
Sample 1D	Date/Time	Matrix	Total # Comp Grab Analysis R												Remarks				
	Sampled	A= Air	of Cont.		1				1		T		1	Τ		T	Ī		
		S= Soil	& Size			1													
		GW= Ground W.					5.												
		WW= Waste W.	S. J. S			1 N	20	Ļ.											
		DW= Drinking W.	3 5			I X	20	PH	$  \mathfrak{O}  $										
	19MAY 2004	O= Oil	40mL 10A Plastic IL Amber				22	E I	PC										
				<u> </u>		<u> </u>			<u>.</u>	<u> </u>	<u> </u>						<u> </u>		
57M-03-03X	/0940	( <u> </u>	314	ļ	$ \times$	3		ス	ス									i	
57m-03-01X	/0930	GW	31/4			3	1	2	2										
57M-03-01X-MS	/0930	GW	314		$ \times $	3		Z	Z										
57M-03-01X-MSD	/0930	GW	3114	ļ	$\mid \times \mid$	3		Ζ	2										
57M-03-06X	11045	GW	3114		X	3	1	z	z										
57M-03-04X	11210	GW	314		X	S	-	2	2										
57M-03-02X	/1220	GW	3114		X	3	1	Z	Z.										
57-Areaz-SW2	1155	sω	314		X	3	١	Z	2										
57-Areaz-SWZ	/1205	SW	314		$ \times$	3	1	Z	Z										
57M-03-05X	/1330	GW	3/1/4		K	3	1	Z	Z										
reservative: CI-HCI, MeOH, N-HN			her		<u> </u>	22	N	CL	1										·
ontainer Type: P- Plastic, G-Glass	ومصحوبة والمحدود والمحدود فتنته والم					<u>IG</u>	ρ	G	G					<u> </u>					
nd Results To: DAVID LUBIANC		FAX No.:	17	Se	al Intaci	1?	P	.O. No		GW-1	*	ł	GW-2_		G	GW-3			
S. ARMY CORPS OF ENGING 696 VIRGINIA ROAD	JER)	978-319-80	060 )	Yes	No	N/A				мсрі	Level N	Jeeder	1.						
ONCORD, MA DI742				<del> </del>	Needed								-	al cost					
Relinquished By		Date/ Time			eceived										D TI	IME .	AUTH	ORIZA	TION
1/	•	1				<del>`</del>				1						•			st have requested
Katherle That	lig .	5-19.04 KZ	5 91C	no	w	20	Ð			in adv	ance	and r	eceive	d a co	ied A	AUTE	IORIZ	ATION	NUMBER.
Kather Mill Burnono		5-19-04 <b>KZ</b> 5/19/04 1725	Ĉ Ce	au	ley	Samples arriving after 1 on the following day.							noo	n will	be tra	cked and	billed as received		
					ſ				AUTHORIZATION No BY:										
lease print clearly, legibly and co	ompletely. Sam	ples can not be	NOTES: Pres	ervatives	s, Specia	l repor	ting li	mits, l	Кпочт	n Conta	minati	ion, el	c;	A	IRO	policy	requires	notificati	on in writing to
ged in and the turnaround time clock will not start until any $[S \ w]$				sucfe												cases where the samples were			
nbiguities are resolved.														co	llected	d from	highly c	contamina	ted sites.
ILiu I. L. Carro	Vallan: A			D:_1_ (	712	<b>.</b>	······································												
hite: Lab Copy	Yellow: Accon	ipanies report		TINK: C	Client C	лору				I SI	HEET		/		OF		ん		

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Project No.:	Project Name:	DEVENS -	AUC S	7		Pro	ject N	/Ianag	ger: 7	Paul Yours		ers (Signatu Kec		AMRO Project No.: 0405140		
	Project State:		12100 - 2100 - 11111									UL BI		/		
Sample ID	Date/Time	Matrix A= Air	Total # of Cont.	Comp	Grab			Analysis Required					Remarks			
	Sampled	A= Air S= Soil	& Size (													
		GW= Ground W.	1 1													
		WW= Waste W.	J I			S	36.0									
		DW= Drinking W. O= Oil	HUM- Flast			Š	2 2	Чd	PCB							
	HMAY 2004	14 · · ·	311-			-	43	ľ	ð							
57m.96-11X	1 /1530	-GW	$\left\  \begin{array}{c} \\ \end{array} \right\  = \left\  \begin{array}{c} \\ \end{array} \  = \left\  \end{array} \  = \left\  \begin{array}{c} \\ \end{array} \  = \left\  \end{array} \  = \left\  \begin{array}{c} \\ \end{array} \  = \left\  \end{array} \  = \left\  \left\  \left\  \right\  = \left\  \\ \\ \\ \end{array} \  = \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \left\  \left\  \left\  \left\  \left\  \left\  \left\  \right\  = \left\  \right\  = \left\  $		$\times$	3		-2-	2					M Shipped 5-19-04		
57M-95-03X	/1515	GW	314		$\times$	3	1	Z	Z					evening after el		
57-Area3-SWI	N/11440	SW	31 H		$\times$	3	1	2	2							
57M DUP		GW			$\star$	5	1	2	2		+			thm Shipped 5-19-04		
57M-53-	-1615				$\times$	3		Ż.	2					KAM I		
-TRIP BLANK		- w'			$\star$	2	Kam							Ktm		
													43	Sample		
i no					_									Coolers		
<u> </u>														1 Couler w/		
						<u> </u>								extra, unused		
Preservative: Cl-HCl, MeOH, N-H Container Type: P- Plastic, G-Glas			ner			$\leftarrow$	$\mathcal{P}$		- 6		<u> </u>			tiottles.		
Send Results To: DAVID LUBIAL		FAX No.:		 	I Intact	G ,		.O. No		GW-1*	GW-2	GW	3			
U.S. ARAMY (CRASS OF ENGINEE		978-318-866	\$3	Jea	n meaci			.0. 110		<u> </u>	G 11-2		. <u>.</u>			
696 VIRGINIA ROAD				Yes	No	N/A				MCP Level Need						
CONCORD, MA OIT42			Ja	Results						*= May require						
Relinquished By		Date/ Time		Re	eceived	By				PRIORITY T						
Kathere Mil	la	5-19-04 /16-24	b 918	Ju	52	577	~	-		in advance and	received a	coded AU	THORIZA	you must have requested <b>ATION NUMBER.</b>		
Kathere Mil Buonow		5/19/04 1725		Consler						Samples arrivi on the followin		:00 noon v	vill be traci	ked and billed as received		
· · · · · · · · · · · · · · · · · · ·						AUTHORIZATION No.							umorus -	BY:		
Please print clearly, legibly and c	completely. Sam	ely. Samples can not be NOTES: Preservatives, Speci					ting li	mits, I	Knowi	n Contamination,	etc;	AMRO pol	icy requires n	notification in writing to		
logged in and the turnaround tim	ogged in and the turnaround time clock will not start until any													where the samples were		
ambiguities are resolved.												collected from highly contaminated sites.				
White: Lab Copy	Yellow: Accon	panies Report	<u>II</u>	Pink: C	lient C	Copy				SHEET	2	OF	2			

Project No.:	Project Name:	DEVENS	- AOC.	AOC 57 Project Manager: Paul Youns									Samplers (Signature): Betrick Blumerts					AMRO Projec	t No.: 15/40	
	Project State:	mA				1								cic.				. <b>-</b>		
Sample ID	Date/Time	Matrix	Total #	Comp	Grab			··		A	naly	sis Re	eguir	ed					Rei	narks
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		S= Soil	& Size			v	2					1								
		GW= Ground W.	S J			i .	ه ر	۲ I												,
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57m-96-11X	-1/1530	1	314		X	3	١	2	Z		İ	1	Ī	l		ĺ				<u> </u>
57m-DUP	1/530	GW	314	1	X	2	,	2	Z	-	[		1			1			Duo tal	(10 Q)
57M-EB	/1615	W	314		$\overline{\mathbb{C}}$	3	1	2	2			1	<u> </u>			1			Dup tak 57m-	Harling
	1/1013	$\sim$			$\mathbf{b}$	2		e	~	<u>~</u>		<u> </u>					<u> </u>		5.70	
TRIP BLANK	₩/		2	<u> </u>	+×-	10		<u> </u>											<b> </b>	
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						Υ.Υ.														•
Preservative: Cl-HCl, MeOH, N-H			her		<u> </u>	·*·														
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Send Results To: David Lut		FAX No.:	81.15	Se	al Intaci	t? P.O. No;				GW-1* GW-2 GW-3										
U.S. Army Corps of E		9178 -318.	50003	Yes	No	N/A			l	MCP Level Needed:										
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AMRO Environmental Laboratories Corporation

# SAMPLE RECEIPT CHECKLIST

111 Herrick Street Merrimack, NH 03054 (603) 424-2022

roject Name: <u>Section APC 67</u> hip via: (circle one) Fed Ex., OPS , AMRO Courier, and Del., Other Courier, Other:	AMRO I Date Re Date Du	C.:	5-19	04 15/20/04		
hip via: (circle one) Fed Ex., OPS , AMRO Courier,			277	04 10/04		
			5-24.04			
			<u></u>	<i></i>		
erns to be Checked Upon Receipt	Yes	No	NA	Comments		
Army Samples received in individual plastic bags?						
Custody Seals present?	V					
Custody Seals Intact?						
Air Bill included in folder if received?						
Is COC included with samples?	V					
Is COC signed and dated by client?	~					
Laboratory receipt temperature. TEMP = $2^{\circ} t 5^{\circ}$	) <del></del>					
Samples rec. with iceice packsneither						
Were samples received the same day they were sampled?		i				
Is client temperature 4°C ± 2°C?	1/			1		
If no obtain authorization from the client for the analyses.						
Client authorization from: Date: Obtained by:						
Is the COC filled out correctly and completely?	V					
. Does the info on the COC match the samples?	V					
. Were samples rec. within holding time?	V					
. Were all samples properly labeled?	1					
. Were all samples properly preserved?	~					
. Were proper sample containers used?	~					
. Were all samples received intact? (none broken or leaking)	1		1	1		
. Were VOA vials rec. with no air bubbles?			1			
. Were the sample volumes sufficient for requested analysis?				5.		
. Were all samples received?						
. VPH and VOA Soils only:						
Sampling Method VPH (circle one): M=Methanol, E=EnCore (air-tight conta	liner)	L	1	I		
Sampling Method VOA (circle one): M=Methanol, SB=Sodium Bisulfate, E=E	-	B=Bulk				
If M or SB:	[		T			
Does preservative cover the soil?						
If NO then client must be faxed.						
Does preservation level come close to the fill line on the vial?						
If NO then client must be faxed.						
Were vials provided by AMRO?						
If NO then weights MUST be obtain	ed from	client				
Was dry weight aliquot provided?						
If NO then fax client and inform the	VOA la	ASAP.				
Subcontracted Samples:						
What samples sent:	-					
Where sent:						
Date:						
Analysis:						
TAT:						
Information entered into:						
Internal Tracking Log?	~					
Dry Weight Log?			~			
Client Log?			V			
Composite Log?			1			
Filtration Log?						
eived By: CC Date: 5/19 / 54 + 5/20/1 4 Logged in By: (56	An/	~	Date:	5120/04		
eled By: Co Date: 5720/174 Checked By:	M6	<u>ר</u>	Date:	5-21-010		

NA= Not Applicable

qc/qcmemos/forms/samplerec Rev.18 06/00

AMRO Environmental Laboratories Corporation

lease Circle if:

ample= Soil

ample= Waste

AMRO ID: 0405140

						List			
•						Preserv.		Volume	Final
0	<b>.</b>	Volume	Preserv.		Acceptable?		Solution ID #	Preservative	adjusted
Sample ID	Analysis	Sample	Listed	рН	Y or N	AMRO	of Preserv.	Added	рН
OIA	VOC	3×40m1V	HCI		7				
DRA		9×40mil		• <b></b> -		·			
31-713A		3740 mlV							
:14A	$\overline{\mathbf{V}}$	2x4DmlV	Ψ.		V				
01B 02B	Metals	INSDOM P	HNCz	<u>22</u>	<u>}</u>				
0213		3X5DOMIP		42					
367138		IX 5DAMIP		42	$\nabla$				
∩IÆ	EPH	AXUSP	HCI	-2	Y				
026 30->130		6XILGA		142					
36->136	V	2XILAAA	$\mathbf{V}$	12	$\vee$				
021	PCB	271264	NA	5	Y				
021		12×11617		6					
OSD		2×12617	· .	5					
4D-710D		1	1	6					
D,12D				7					
130	V	$\mathbf{V}$	V	5	V				
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Checked By: KM/CC

Date: 26/04 5

pH adjusted By:

Date:

#### UTAIN OF LUSIOUY RECORD

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Report to: Company: <u>U.S. ARMY CORPS oF ENGINEERS</u> Address: <u>646 VIRGINIA Road</u> <u>Concord, MA 01742</u> Contact: <u>DAVID LubiANEZ</u> Phone: <u>978-318-8311</u> Fax: <u>978-318-8663</u> Contract/ Quote: Sampler's Name	Invoice to Company: <u>SAME</u> Address: Contact: Phone: Fax: Sampler's Signature J ACK KEENAN						ANALY	STED	1 1				7		7			when r 1 2 Custod Intact Screen	ate: of coolers eceived (C* 3 y Seal	): N / Y N / Y
Proj. No. Project Name DEVENS - AUC	577	No/Ty	ype of C	<del></del>	r			1112 - COM	A A				/							
Matrix Date Time o r Identifying Marks of Sam	ole(s)	VOA	A/G 1 Lt.	250 ml	P/0	2	7 8								/ .	/	I	_ab/Sample	ID (Lab Us	e Only)
1-W 9/14/1530 X 57M-96-1	ly-QA	×	×	×	-	3	1	2	2	- {		-	-1							
W THING X STRIP BLANK		X	_	-		2	-	_	-								Bubbl	ein 1	VSA VII	<i>ا</i> کر
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	ime Received by: (Signature / 960 AIR Bill #\$4655	Feb. 6	Ξχρ, 1310		Date		Time		Ren	narks	10	000	ER	5/	41pp	でい				
							Time		1											
	ime Received by: (Signature	sen				24	091	_		nte -	dinan	of oo-	nntan	concli	itutos -		anaa of	Severn Trent	Inharatari	~-
Relinquished by: (Signature) Date 7	ime Received by: (Signature				Date		Time				-		•				ance or chedule.		Laboratoria	
<sup>1</sup> Matrix WW - Wastewater W - Water S <sup>2</sup> Container VOA - 40 ml vial A/G - Amber / Or	-	Air bag Je moutl	-		arcoal - Pla		r other		Sludge		0	- 0	 _				oase Fa	accept ver x written c 02) 655-12	hanges to	

STL8234-200 (12/02)

#### Campio i rocorration bocaniont

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		COD	Cyanide *	Hardness	Metals	Depor 11 NO3/NO2			Phosphate		TKN	тос	<u> 00</u>   tox	TP
SAMPLE ID	Ammonia pH<2	pH <2	pH >12	pH <2	pH <2	pH <2		pH <2		pH >10			pH <2	рН
72290					22								<b></b>	<u> </u>
(+EPH <2)										·		<u> </u>		<u> </u>
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			*Not including	Reactive Cyanid	e.					*Not includi	ng Reactive	Sulfide.	+	

SM.0003A.081199

STL Burlington COOLER RECEIPT CHECKLIST										
Date Received: 52004 Sample Custodian:										
Time Received: 0915 ETR/SDG: 100284/100284										
<b>RADIATION SCREEN:</b> <0.05 MR/HRYESNOIf no, stop work and alert the Supervisor and the PM.VESNO										
CUSTODY SEALS PRESENT: YES NO										
If yes, were the custody seals signed? YES NO										
If yes, are custody seal numbers present? YES NO										
List custody seal numbers:										
TEMPERATURE CHECK: (°C)										
Acceptance Criteria (0-6°C) except air samples, which should be shipped at ambient temperature and/or biota/tissue samples, which may be frozen on receipt. The thermal preservation of samples that are hand delivered immediately following collection is considered acceptable if there is evidence that the chilling process has begun.										
Thermal Preservation Type:										
CONDITION OF SAMPLE CONTAINERS: (NTACT BROKEN										
If broken, list the client ID for each broken container:										
Ware any complex reasined with a short held time* remaining?										

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Were any samples received with a short hold time\* remaining? \* <7 Days ŗ \_\_\_\_

WET CHEMISTRY	YES	(NO)
METALS	YES	NO
ORGANIC EXTRACTABLES	YES	NO
VOLATILE (received unpreserved)	YES	NO

If yes, expedite sample log in procedure and alert the appropriate Department Manager. 0125

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		Project Name: DEVENS - AOC 57					-									ers (Signature): AMRO Proj.				0406018
1	<b>Project State:</b>	mA				·· ····	i							Aa	ick	Keen	E		-	
Sample ID	Date/Time	Matrix		otal #		mp Gr:	ıb E					Analy	sis Re	quire	d					Remarks
	Sampled	A= Air S= Soil	1	Cont Size	112															
		GW=Ground W.	а а	a olze				17	y											
		WW= Waste W.			¥			5	1											
		DW= Drinking W.	1	2	8		۱ <sup>°</sup> ر	)まる	z	0										
-		O= Oil	0	à	AM		175	36											:	
		Other= Specify	ア	<u> </u>				000		<u> </u>	<u>\</u>		<u> </u>							
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SUMP 3	cpley 1420	SW	3	<u> </u>	/	$\times$	3	1	2	2										
SUMP 4	chla4 1435	SW	3	1	7		- 3	ł	2	2										
TRIP BLANK						$\times$	)		-	-										AIR BUBBLE
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Preservative: CI-HCl, MeOH, N-HN			ier				CL	N			1	1								
Container Type: P- Plastic, G-Glass							G	P	G	G						1				
Send Results To: DAVID LUBIANE		FAX No.:		-		Seal Int	ict?	1 1	P.O. N	0:	GW-	-1*		GW-2		(	GW-3			
U.S. ARMY COMPS OF GNGING	GUNS	978-318-	366	3			:													
696 VIRGINIA ROAD						es No ults Neéd					-	P Level		-	1					
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Paul Journy		12/01/ 1700	1			76124		-	•											TION NUMBER.
		10725		1/		. 1	1.									00 noc	on wi	ill be t	rack	ed and billed as received
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						- () <sup>‡</sup>				AUT	HORI	ZATIC	ON No.		<u> </u>				BY:	
Please print clearly, legibly and completely. Samples can not be NOTES						tives, Spe				Know	n Con	ntamina	ition, e	tc;	Ī	AMRO	polic	y requi	res no	otification in writing to
	gged in and the turnaround time clock will not start until any				50	2 FAC	ei	VAT	En							the labe	orator	y in cas	ses wi	here the samples were
nbiguities are resolved.				2	600	leng	shippers					collected from highly contaminated sites.								
White: Lab Copy	hite: Lab Copy Yellow: Accompanies Report				Pin	k: Clien	Conv					SHEE	Г	1		OI		1	<u></u>	

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AMRO Environmental Laboratories Corporation

## SAMPLE RECEIPT CHECKLIST

111 Herrick Street Merrimack, NH 03054 (603) 424-2022

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Client: Project Name: Ship via: (circle one) Fed Ex., UPS , AMRO Courier, Hand Del., Other Courier, Other:	AMRO ID Date Rec Date Due	».:	0401#01 1#- <b>3-</b> 04 1#-10-04	<u>(003) 424-2022</u> <u>8</u>
Items to be Checked Upon Receipt	Yes	No	NA T	Comments
1. Army Samples received in individual plastic bags?			·····	
2. Custody Seals present?				<u></u>
3. Custody Seals Intact?	V			**************************************
4. Air Bill included in folder if received?		······		
5. Is COC included with samples?	V			
3. Is COC signed and dated by client?	V			
'. Laboratory receipt temperature. TEMP = $3^{\circ}_{1} 3^{\circ}_{2}$				
Samples rec. with ice <u>v</u> ice packs neither <u></u>				
I. Were samples received the same day they were sampled?		V.		
Is client temperature 4°C ± 2°C?				
If no obtain authorization from the client for the analyses.				
Client authorization from: Date: Obtained by:				
Is the COC filled out correctly and completely?				
0. Does the info on the COC match the samples?				
1. Were samples rec, within holding time?				
2. Were all samples properly labeled?				·····
3. Were all samples properly preserved?				
4. Were proper sample containers used?				
5. Were all samples received intact? (none broken or leaking)				
3. Were VOA vials rec. with no air bubbles?				
<ol> <li>Were the sample volumes sufficient for requested analysis?</li> <li>Were all and the same instance.</li> </ol>	-4-		<u> </u>	
3. Were all samples received?	<u> </u>			
<ol> <li>VPH and VOA Soils only:</li> <li>Security Mathematical VIDL/ (signals and): Mathematical Enforcement (signals and):</li> </ol>			$\overline{V}$	·····
Sampling Method VPH (circle one): M=Methanol, E=EnCore (air-tight conta Sampling Method VOA (circle one): M=Methanol, SB=Sodium Bisulfate, E=		-Bulk		
If M or SB:				
Does preservative cover the soil?		<u>-</u>		
If NO then client must be faxed.		<u>_</u>		
Does preservation level come close to the fill line on the vial?				<u></u>
If NO then client must be faxed.				
Were vials provided by AMRO?				
If NO then weights MUST be obtain	ned from o	client		
Was dry weight aliquot provided?				
If NO then fax client and inform the	e VOA lab	ASAP.		·····
. Subcontracted Samples:				
What samples sent:			*	
Where sent:				
Date:		·		
Analysis:				
TAT:				
Information entered into:				
Internal Tracking Log?				
Dry Weight Log?				
Client Log?		V	/	
Composite Log?		~	71	
Filtration Log?		6		
eled By: KH Date: U-3-04 Logged in By: K Date: U-3-04 Checked By: K	Ho.	Da Da	ite: 4-3-	04 3-04

NA= Not Applicable

ac/acmemos/forms/samplerer Rev 18.06/00

AMRO Environmental Laboratories Corporation

111 Herrick Street
Merrimack, NH 03054
(603) 424-2022

Please Circle if:

Sample= Soil Sample= Waste

# AMRO ID: 0406018

		1				List			
						Preserv.		Volume	Final
		Volume	Preserv.	Initial			Solution ID #	Preservative	adjusted
Sample ID	Analysis	Sample	Listed	рН	Y or N	AMRO	of Preserv.	Added	pH
		L		ļ					
11A⇒04A 15A	82/00	3-40 ml.	HCI		У				
15A	V	1-40ml.			Y				
•									
1B>04B	metals	HN03	1-500P	-2	7				
		K	2			)			· ···· ······
1C->04C	EPH	2-1LA	HCI	-2	7				
<u>nc = 0 10</u>		2 /0/					1	· · · · · · · · · · · · · · · · · · ·	
11->0415	PCB	2-1LA		te				·	
10-070		LILIT_		<u> </u>	<b>├</b> -∕		<u> </u>		
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Date: U-3-04 pH adjusted By:

Date:

### APPENDIX C

### **GROUNDWATER FIELD ANALYSIS FORMS**

GWM well #:	57M-03-0	1X (screened	10 to 20 ft BC	3S)	· · · · · · · · · · · · · · · · · · ·	US Army Corps of Engineers									
SCREENED IN			12-22 ft b	elow top o	of PVC	Gr		Sampling L		<b>~</b>	3-01X				
H <sub>2</sub> 0 LEVEL: P			<u> </u>			Project Na	me: Deve	ns Area of Cor	icern 57						
	POST-PUMP I		17,4			SAMPLE N	IETHOD: E	PA LOW STRE	ESS METH	HOD					
DEPTH SAMP DATE:	4/04 TIM	3: 0822				VOCs: 3 x 4	VOCs: 3 x 40 ml vial; HCl pH<2 PCBs: 2 x 1 L amber, id								
SAMPLED BY			Jan A VI			METALS (A	As Ph Cd):	1 x 500ml	EPH 2	x I L glass :	amber, HCl				
SAMILLD DI	0.	connionu	ί_				oly; $HNO_{3F}$		1	H<2					
RECORDED B		GNATURE:	Jan Ke			-									
Time	Wtr Dpth	Pump Setting	<sup>C</sup> Purge Rate	Cumulative	Water	Specific	PH	ORP/Eh	D.O.	Turbidity	COMMENTS				
(24 hr)	below MP feet		(ml/min)	Volume Purged	Temp (Celsius)	Conductance		(mV)	Mg/L	NTUs					
0907	14.42	83.8	400	<u> </u>	11.36	187	4.63	296.2	10.41	10.5	clear				
0914	14,42	83.8	450	1 gallon	12.34	166	5.74	260.3	9.78	1.5					
0919	14.42-	83,8	450		12.40	16.3	5.77	263.8	9.77	1.2					
0922	14,42	83.8	450	2	12.36	162	5.78	266.1	9.75	0.5					
0925	14.42	83.8	450		12.45	162	5.81	267.5	9.72	0.3					
0928	14.42	83,8	450	3	12.48	161	18.2	268.2	9.72	0.3					
		•													
		······································						······································	<b>_</b>						
· · · · · · · · · · · · · · · · · · ·															
				-											
NOTES: SAMPLE TAKI	EN AT. 0021	<b>`</b>		+	/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%					
SAWFLE I AKI							······································	in <del></del>							

YSI#: 02AOS27 AD

TURBIDITY #: 39575 PUMP – Grundfos Rediflow II

							· · · · · · · · · · · · · · · · · · ·					
GWM well #:	57M-03	3-02X (screen	ied 2 to 12 ft ]	BGS)			US A	Army Corp	s of En	gineers		
	NTERVAL DEI	PTH:				Gr		r Sampling I				
	RE-PUMP INS							ns Area of Con	-		0 <i>0-041</i> X	
	POST-PUMP I		50'			·						
DEPTH SAME	PLED:	10				the second s		PA LOW STRE	1			
DATE:	<u>/4/04</u> TIMI	$= 11 \times 2$				$VOCs: 3 \times 2$	40 ml vial; H	CI pH<2	PCBs: 2 x 1 L amber, ice			
SAMPLED BY	TR S		Farka 1	R		METALO	A. DL CH.	1 5001	EDU. 2			
	· ·		t				As, Pb, Cd):	-	amber, HCl			
RECORDED E	IZ JE:YE	GNATURE: _	Acreh A. It				oly; HNO <sub>3</sub> p		p.	H<2		
Time	Wtr Dpth	Pump Setting	/Purge Rate	Cumulative	Water	Specific	PH	ORP/Eh	D.O.	Turbidity	COMMENTS	
(24 hr)	below MP feet		(ml/min)	Volume Purged	Temp (Celsius)	Conductance		(mV)	Mg/L	NTUs		
1158	5.76	51.2	500	Tejetten	11.87	69	5.48	81.5	0.64	9.2	ned-traum susp. set	
1202	5.70	51.2	500	0	1Z.11	74	550	72.5	0.5)	5.6	clear	
1205	5.77	51.2	500	2	12.17	77	5.53	48.4	0.71	4.8		
12=8	5.77	51.Z	500		12.22	81	5.56	66.3	1.34	3.7		
1211	5.78	51.2	500	3	12.36	86	5.61	61.5	1.37	3,0		
1214	578	51.2	500	3.5	12.41	84	5.65	593	1.38	2.8		
1218	5.79	51.2	500	_4	12.46	87	5.48	56.8	<u> </u>	2.7		
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			· · · · · · · · · · · · · · · · · · ·									
NOTES:				-	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%		
SAMPLE TAK												
<b>1</b> 71 . 1	r,					1 I	C					

<u>Flyshed size of syspended sections to the beginning, resulting in initial drop of water level.</u> YSI #: 02AD 527 AD TURBIDITY #: 39575 PUMP-Grundfos Rediflow II

						· 1							
GWM w	ell #: 57M-0.	3-03X screen	nęd 2 – 12 :	ft bgs		US Army Corps of Engineers							
	IED INTERVAL DE				PVC	Gr		Sampling I		—			
H <sub>2</sub> 0 LEV	EL: PRE-PUMP INS		0.88' 0.90'					ns Area of Co			00 0011		
DEDTU		INSERTION _ 8'	0.40	·				PA LOW STR		HOD	······································		
	SAMPLED:						40 ml vial; H		1	2 x 1 L am	ber ice		
						V 0C3. J X	to ilia viai, 11		I CDS.				
SAMPLE	ED BY: <u><b>PB</b></u> S	SIGNATURE:	P.Bhi	•		METALS (	As, Pb, Cd):	1 x 500ml	EPH: 2	x I L glass	amber, HCl		
			P.Bhi			(							
RECORI		IGNATURE: _		~~ <b>~</b>						H<2			
Time		Pump Setting	Purge Rate		Water	Specific	PH	ORP/Eh	D.O.	Turbidity	COMMENTS		
(24 hr	r) below MP feet		(ml/min)	Volume Purged	Temp (Celsius)	Conductance		(mV)	Mg/L	NTUs			
5100	1.00	32.8	320		11.91	141	5,53	284.3	3.98	Nh disela	Water looks clear		
0908		32.8	360	~ Igal	12.33	134	5,83	268.6	3,62	0.79	Turb feult fixed )		
0913	3 0.92	32.8	320		12.25	134	5.85	263.6	3.61	0.44			
091	8 0.92	32.8	400	1 21/2 gol	12.07	134	5.86	262.3	3.53	0.35			
092	5 0.92	32.8	400		12,01	133	5.86	262.8	3.46		······································		
092	8 0.92	32.8	340	~ 3.2gel	12.00	133	5.87	262.5	3.41	0.32	····		
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NOTES:		P.n. 1		-	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%			
SAMPLE	TAKEN AT: <b>Ö</b> ¶	40 hrs											

YSI #: 99K0055 AB

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TURBIDITY #: **395 76** PUMP – Grundfos Rediflow II

-,

GWM well #: 57M-03-04X scr	eened 2 – 12 ft bgs			US A	Army Corps	s of En	gineers	9999-449 - 18-4-, a-rrown		
SCREENED INTERVAL DEPTH: assum		PVC	Groundwater Sampling Log Sheet 57M-03-04X							
H <sub>2</sub> 0 LEVEL: PRE-PUMP INSERTION	2.26		Project Name: Devens Area of Concern 57 SAMPLE METHOD: EPA LOW STRESS METHOD							
POST-PUMP INSERTION DEPTH SAMPLED:9'										
DATE: <u>5/19/04</u> TIME: <u>1111</u>	Sample time = 1		40 ml vial; H		PCBs: 2 x 1 L amber, ice					
SAMPLED BY: <b>PB</b> SIGNATURE	P.Bhi	METALS (As, Pb, Cd): 1 x 500ml			EPH: 2 x I L glass amber, HCl					
RECORDED BY: 18 SIGNATURE	l I	ooly; HNO <sub>3</sub> p	0H<2	pH<2						
Time Wtr Dpth Pump Setti (24 hr) below MP	ng Purge Rate Cumulative (ml/min) Volume	Specific Conductance	PH	ORP/Eh (mV)	D.O. Mg/L	Turbidity NTUs	COMMENTS			
1130 NOTES: Fost 40	Purged	(Celsius)	del some	how no	terial which	h look	ed like	ail when		
	was not ust int		YSI col	Discon	nected tubin	a lom	ed dire	Fle ist the		
bucket. The brown mel		e floc	(not ail	) 90				)		
1140 2.45 36.4	1200 101.04		290	5.90	170.5	0.49	7.5			
1145 2.50 36.4		10.74	279	5.85	168.6	5.85%	1			
1148 2.50 36.4	1200 3.4gel	10,71	274	5.84	166.4	0.61	6.6	Friend bocket		
1152 2.50 36.4	1200 NA get	10.61	270	5.84	158.2	0.60	2.2			
1156 2.50 36.4	1200 NG gal	10,70	270	5.84	151.7	0.59	1.7			
1200 2.50 36.4	1200 N. 7. 5 gal	10.68	269	5.84	146.0	0.60	0.8			
								······································		
						·				
NOTES:		+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%			
SAMPLE TAKEN AT: 1210						_				

YSI #: 99K0055 AB TURBIDITY #: 39576 PUMP - Grundfos Rediflow II

GWM well #:	3-05X screer	· · · · · · · · · · · · · · · · · · ·	US Army Corps of EngineersGroundwater Sampling Log Sheet57M-03-05XProject Name:Devens Area of Concern 57SAMPLE METHOD:EPA LOW STRESS METHODVOCs:3 x 40 ml vial; HCl pH<2PCBs:2 x 1 L amber, iceMETALS (As, Pb, Cd):1 x 500ml pH<2PCBs:2 x 1 L glass amber, HCl pH<2									
		PTH: assume 4			/C	Gro				-	03-05X	
H <sub>2</sub> 0 LEVEL: P	RE-PUMP INS POST-PUMP E		2.63'									
DEPTH SAMP		q'				SAMPLE METHOD: EPA LOW STRESS METHOD						
DATE: 5	19/07 TIM	E: 1125	13	30 Sampl	VOCs: 3 x 40 ml vial; HCl pH<2 PCBs: 2 x 1 L amber, ice							
								-				
SAMPLED BY: <u>PB</u> SIGNATURE: <u>PBUINE</u> . RECORDED BY: <u>PB</u> SIGNATURE: <u>PBUINE</u> .							• •		1	-	amber, HCl	
RECORDED B	I	Groundwater Sampling L ject Name: Devens Area of Co <u>APLE METHOD: EPA LOW STR</u> Cs: 3 x 40 ml vial; HCl pH<2 TALS (As, Pb, Cd): 1 x 500ml poly; HNO <sub>3</sub> pH<2 ecific PH ORP/Eh (mV) <u>0 2 6.14 - 12.6</u>			H<2							
Time	Wtr Dpth	Pump Setting	Purge Rate	Cumulative	Water	Specific	РН	{	D.O.	Turbidity	COMMENTS	
(24 hr)	below MP feet		(ml/min)	Volume Purged	Temp (Celsius)	Conductance		(mV)	Mg/L	NTUs		
1255	2.80	38.1	960	10.600	13.15	102	6.14	- 12.6	1.04	13.0		
1300	2.82	38.1	920	N 2 gal	13.55	103		- 22.9	0.68	8.8		
1305	2.82	38.1	1000	N Zgel	13.43			-28.2	0.54	7.2		
1308	2.82	38.1	930	~ Agal	13.41				0.47	5.5		
1313	2.82	38,1	960	r Tyal	13.30				0.41	4.0	······	
1311	<u> </u>	7011	100-	1 1 yai	17.23		6.01	- 30.7	0.51	2.8		
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NOTES: SAMPLE TAKI	FNAT 13	30 4.		-	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%		

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YSI #: 99K0055 AB TURBIDITY #: 39576 PUMP-Grundfos Rediflow II

GWM well #: 57M-03-06X screeped 2 – 12 ft bgs						US Army Corps of Engineers							
1		PTH: assume			PVC	Groundwater Sampling Log Sheet 57M-03-06X							
H <sub>2</sub> 0 LEVEL: P			<u>, 2.7</u> ]'	low top of		1			•	57M	-03-06X		
		NSERTION						ns Area of Con					
DEPTH SAMP	LED	R'				SAMPLE N	<u>IETHOD:</u> E	PA LOW STRE	ESS METH	HOD			
DATE: 5/14	1/04 TIM	E: 0852				VOCs: 3 x 40 ml vial; HCl pH<2 PCBs: 2 x 1 L amber, ice							
SAMPLED BY: PBSIGNATURE: 2. Blum													
							As, Pb, Cd):		EPH: 2	x I L glass	amber, HCl		
RECORDED BY: 18 SIGNATURE: P.BL.						I	oly; HNO <sub>3</sub> p	H<2	p	H<2			
RECORDED BY:     IS     SIGNATURE:     IS       Time     Wtr Dpth     Pump Setting     Purge Rate     Cumulative     Water						Specific	PH	ORP/Eh	D.O.	Turbidity	COMMENTS		
(24 hr)	below MP		(ml/min)	Volume	Temp	Conductance		(mV)	Mg/L	NTUS			
PB_	feet			Purged	(Celsius)								
10-30 1025	2.18	43.3	150		12.57	7!	5.69	249	6.56	5.8	(tojusting rate.)		
1030	A.0	45.2	800		12.19	71	5.67	255.6	6.18	4.5			
1033	4.03	45.2	800		12.13	70	5.65	261.9	5.99	1.6			
1037	4.05	45.2	800	~ <u>3. 3gal</u>	12.12	69	5.64	270.4	5.79	1.2			
1045	Sample	ime .				<u> </u>	<u> </u>			ļ			
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	······												
NOTES: (Se	e helow)			-	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%			
SAMPLE TAK	EN AT: 10	45 hrs		·····		·····							
						-							

YSI #: 99 KOO 55 AB TURBIDITY #: 395 76 PUMP - Grundfos Rediflow II

TOP OF PUCELEV = TOP OF METAL AFTER THE CAP IS OPENED. THIS IS 1.4 FF ABOVE GROUND LEVEL. 7.B.

DEPTH SAM DATE: <u>s 1</u>	INTERVAL DEI PRE-PUMP INS POST-PUMP I IPLED: 104 TIMI 104 St. PB S	NSERTION <i>/G '</i> E: <u>ryネ /420</u>	10,12 10.68' 	LE TIME I	US Army Corps of Engineers         Groundwater Sampling Log Sheet         Project Name:       Devens Area of Concern 57         SAMPLE METHOD:       EPA LOW STRESS METHOD         VOCs: 3 x 40 ml vial; HCl pH<2       PCBs: 2 x 1 L amber, ice         METALS (As, Pb, Cd): 1 x 500ml       EPH: 2 x I L glass amber, HCl							
RECORDED BY: 1B SIGNATURE: 1.BL							ooly; HNO <sub>3</sub> p		pH<2			
Time     Wtr Dpth     Pump Setting     Purge Rate     Cumulative     Water       (24 hr)     below MP     (ml/min)     Volume     Temp       feet     Purged     (Celsius)							РН	ORP/Eh (mV)	D.O. Mg/L	Turbidity NTUs	COMMENTS	
1445	11,20	72.2	560		9,71	151	6,18	90.0	0.83	10,4		
14 49	11-76 (0522	72.2	480	= 1.4 gal	10.00	166	6,17	38,2	1.10	5,5		
1454	11.22	72.2	500	~2 gal	10,14	180	6.19	16,4	1.11	A.3		
1457	11.22	72,2	440	~2.6gal	10.32	195	6.22	1.7	1.01	3.6		
1500	11.22	72.2	A40	3,2gal	10,38	204	6_25	- 8,2	0 92	2.9	TURBIDIMETER FLASHING "BATT	
150A	11.22	72,2	480	3,8	10.41	215	6.27	- 16, 5	0.83	_ 2.9		
1508	11, 22	72.2	500	vA15gal	10,36	221	6.28	-21,4	0.77	2.8		
	APLE TIMB			· · · · · · · · · · · · · · · · · · ·			********					
1530		ON PUL		P THE		: IT H	10 1006	FBROUS V	ZGETA	TIVE	MATTER	
	AROUND	17	TREE	ROOTS	??		·		L		· · · · · · · · · · · · · · · · · · ·	
	· [						·····		<b>_</b>			
······································											<u> </u>	
<u> </u>	- <u> </u>			<u></u>								
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	┥			-							<u></u>	
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			·····			<b></b>						
OTES C	EE 1530	NOTE A	Rasz		/- 3%	+/- 3%	( +/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%	,	
AMPLE TAI		15 HRS		т	7- 370	-11- 570	+/* 0.1 uill		77-1070	1070		

YSI #: 99 K 00 55 ABTURBIDITY #: 395 76 PUMP - Grundfos Rediflow II

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GWM well #:	57M-9	16-11X		-)		•	US A	Army Corp	os of En	gineers			
SCREENED II	NTERVAL DE	PTH: (4'-14' F	ROM / FUC	-)		Groundwater Sampling Log Sheet Project Name: Devens Area of Concern 57 SAMPLE METHOD: EPA LOW STRESS METHOD							
H <sub>2</sub> 0 LEVEL: P	RE-PUMP INS	SERTION _ NSERTION _	2.83 ++										
DEPTH SAMP	POST-PUMP I	NSERTION _	2.78 +2										
DEPTH SAMP	164 14 TIM	F. 1410							$2 \times 1 L am$	han tar			
DATE: 19May 04 TIME: 1410 SAMPLED BY: TRSIGNATURE: Jac A.A.							VOCs: 3 x 40 ml vial; HCl pH<2 METALS (As, Pb, Cd): 1 x 500ml				ider, ice		
											amber, HCl		
RECORDED BY: TK SIGNATURE: Acchalh							poly; HNO <sub>3 I</sub>	pri<2	p p	pH<2			
Time	Wtr Dpth	Pump Setting	Water	Specific	PH	ORP/Eh	D.O.	Turbidity	COMMENTS				
(24 hr)	below MP		(ml/min)	Volume	Temp	Conductance		(mV)	Mg/L	NTUs			
:11 7 /	feet			Purged	(Celsius)		100	07.0					
1436	4.53	40.7	200		12.37	575	6.25	-97.0	0.74	13.2	stry of large susp se		
1448	3.81	40.7	100		12.77 14.09	<u>581</u> 593	6.36 6.43	- 98.3	0.49	<u>4/.0</u> 378	in first by gallon (b with "burnt" snell		
1454	3.01	48.2	100	Igallon	14,57	595	6.46	-113-1	0.33	30,3	with wint shell		
1458	3,62	76.7	50	1 garion	15.63	603	6.50	~124, 2	0.31	32.6			
1504		(0,1	<u> </u>			0.5	<u> </u>	121, -		<u> </u>	backthalad		
1508	4.13	40.0	150		15.72	568	6.51	-119.0	0.64	35.0	Oucut hacad		
1512	3,44	40.0	150		15.85	567	4.51	-122,8	0.35	31.0			
1515	3.80	58.240. GTAY	150		15.77	596	6.52	-122.6	0.34	34.5			
1520	3.76	58.3	100		15.80	591	6.53	-126.2	0.27	32.1			
1525	3.62	55.3	100	2_	15.82	586	6.53	-128.3	0.25	31.5			
								ļ		ļ			
								· · · · · · · · · · · · · · · · · · ·					
			- HIN MILLION - HI					l	<u> </u>	L			
NOTES:				+	-1- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%			
SAMPLE TAK			<del></del>			-							
	mitic I slug	of suspende.		<u>K resultive</u> #: 29573		<u>el water la</u> P – Grundfos							

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YSI#: 02A05-27 AD TURBIDITY #: 39575 PUMP-Grundfos Rediflow II Prophad to be turned up, and eventually back-flushed, during sampling in order to maintain flow

#### APPENDIX D

#### **ELECTRONIC LABORATORY DATA**

Analytical results for the May 2004 Sampling Event are summarized in Tables 1 and 2, and compared to the Massachusetts Contingency Plan Reportable Concentration (RCGW-1) values. The data for the May 2004 sampling event are available in electronic format upon request to the US Army Corps of Engineers:

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