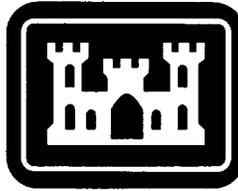


Superfund Records Center

SITE: New Bedford Harbor

BREAK: 7.6

OTHER: 25640



U.S. Army Corps of Engineers

New England District
Waltham, Massachusetts

Operations and Maintenance of the New Bedford Harbor Superfund Site New Bedford, Massachusetts

Contract No. DACW33-95-D-0004

FINAL GROUNDWATER SAMPLING AND ANALYSIS PLAN Delivery Order No. 0002 DCN: NBH-082097-AAJV

22 August 1997

**GROUNDWATER SAMPLING AND ANALYSIS PLAN
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS**

FINAL

Contract No. DACW33-95-D-0004
Delivery Order No. 0002
DCN: NBH-082097-AAJV

Prepared for:

**U.S. ARMY CORPS OF ENGINEERS
NORTH ATLANTIC DIVISION
NEW ENGLAND DISTRICT
424 Trapelo Road
Waltham, Massachusetts 02254-9149**

Prepared by:

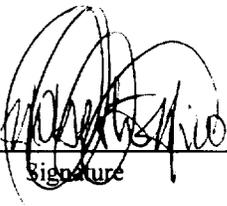
**ROY F. WESTON, INC
One Wall Street
Manchester, New Hampshire 03101-1501**

22 August 1997

W.O. No. 03886-118-002

**GROUNDWATER SAMPLING AND ANALYSIS PLAN
NEW BEDFORD HARBOR SUPERFUND SITE
Contract No. DACW33-95-D-004
AUGUST, 1997**

COMMITMENT TO IMPLEMENT THE ABOVE SAMPLING AND ANALYSIS PLAN

<u>ROBERTO RICO</u> Contractor's Project/Task Manager (print)	 Signature	<u>8/25/97</u> Date
_____ Contractor's QA Manager (print)	_____ Signature	_____ Date
_____ Other as Appropriate/Affiliation* (print)	_____ Signature	_____ Date

* Commitment signature is required for any ancillary sampling, analytical, or data gathering support provided by a contractor or subcontractor. For example, the Contractor's laboratory QA manager or director should sign the title page if analytical services are provided.

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- ATTACHMENT 1** APPENDIX F OF ACOE REGULATION EM-200-1-3
"REQUIREMENTS FOR THE PREPARATION OF SAMPLING
AND ANALYSIS PLANS"
- ATTACHMENT 2** INSTRUCTION E-5 OF ACOE REGULATION EM-200-1-3
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- ATTACHMENT 3** ANALYTICAL LABORATORY QUALITY ASSURANCE PROJECT
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LIST OF ACRONYMS

A/E	Architect/Engineer
CCQC	Contractor Chemical Quality Control
CDF	Confined Disposal Facility
CENAE	Corps of Engineers, North Atlantic Division, New England District
CO	Contracting Officer
DCQCR	Daily Chemical Quality Control Reports
DQOs	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
IDW	Investigation Derived Waste
LCS	Laboratory Control Sample
MS/MSD	Matrix Spikes/Matrix Spike Duplicates
O&M	Operations And Maintenance
PCBs	Polychlorinated Biphenyls
POC	Point of Contact
ppm	Parts Per Million
PTFE	Polytetrafluoroethylene
QA/QC	Quality Assurance And Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCO	Quality Control Officer
ROD	Record of Decision
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SOPs	Standard Operating Procedures
SRM	Standard Reference Material
USACE	U.S. Army Corps of Engineers
WESTON	Roy F. Weston, Inc.

SECTION 1

PROJECT DESCRIPTION

1. PROJECT DESCRIPTION

1.1 SITE HISTORY AND CONTAMINANTS

Bottom sediments within the Acushnet River and New Bedford Harbor, New Bedford, Massachusetts, are contaminated with elevated levels of polychlorinated biphenyls (PCBs) and metals. Field studies conducted in the late 1970s and early 1980s identified PCB concentrations in marine sediment over a 95-acre area ranging from a few parts per million (ppm) to over 100,000 ppm. In addition to the PCBs, heavy metals (notably cadmium, chromium, copper and lead) were found in sediments at concentrations ranging from a few ppm to over 5,000 ppm. The general site location is shown in Figure 1-1.

The Sawyer Street property was originally the site of a textile mill which was reportedly destroyed in the 1930s. The site was a vacant lot until the initial site activities were initiated in 1987. At this time, the original confined disposal facility (CDF) was constructed by removing approximately five feet of fill from portions of the site and using it to construct a soccer field and berm at the western half of the property. During this period, numerous test pits were dug on the site and sediments were sampled for metals and PCBs. Results from the Sawyer Street test pits indicate that the concentrations of PCBs in the soil are less than 15 ppm. Lead was present in the soil at concentrations less than 300 ppm.

In 1988 and early 1989 the U.S. Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA) conducted a Pilot Study of dredging and dredged material disposal methods in the estuary portion of New Bedford Harbor. This study evaluated three different types of hydraulic dredges and resulted in approximately 2,200 cubic yards of contaminated sediment being placed in the CDF which was constructed along the shoreline on the north side of Sawyer Street. This material was then capped with approximately 3,900 cubic yards of clean dredged material. Seven (7) monitoring wells in and around the CDF were installed during the initial construction of the facility in 1988. Two monitoring wells were replaced during 1996.

P:\DWG\ACOE\SIP\NEWBED-1.DWG (PLOT 1-1)



BASE MAP IS A PORTION OF THE FOLLOWING U.S.G.S. 7.5 MINUTE QUADRANGLE:
 NEW BEDFORD, MA, 1979 1:25,000



LOCATION MAP
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS



FIGURE 1-1

In April 1990, EPA issued a Record of Decision (ROD) for the "Hot Spot" portion of the site and identified the following remedial action:

- Dredging of 10,000 cubic yards of sediment.
- Initial disposal/dewatering in a confined disposal facility located at the foot of Sawyer Street in New Bedford.
- Water treatment.
- Incineration of contaminated sediments on-site.
- Disposal of ash in the CDF.
- Construction of a cap over the CDF.

During the fall of 1992, the site was prepared for the remediation of the Hot Spot sediments under this contract. This involved excavation/demolition of the remains of the textile mill foundations, excavation and burial of the existing sediment material under at least one foot of clean fill along the eastern bank of the CDF and installation of a liner and cover layer in the CDF. Preparation activities also included partitioning the CDF into three cells for the remediation activities.

The Hot Spot dredging was completed on September 6, 1995. In August 1994, the EPA decided not to proceed with the incineration of the dredged sediments. Currently, the sediments are being stored in the CDF on the Sawyer Street Site while the EPA evaluates alternative sediment treatment technologies. It is anticipated that these sediments will be stored on-site for a 3 - 5 year period.

1.2 SUMMARY OF EXISTING SITE GROUNDWATER DATA

Reference Table 1-1 Summary of Groundwater Sampling Results and Table 1-2 Height of Well from Bottom of Well to Top of Casing. Well numbers 2 and 3 had detectable values of PCBs. The area where wells 2 and 3 are installed contains pilot study dredged material. Data for wells 2 and 3 prior to placement of the dredged material spoils in the debris disposal area is not available. An inference can be made that the PCBs may be a result of the pilot study dredged materials, but a definitive conclusion can not be made based on the data available.

1.3 SITE SPECIFIC SAMPLING AND ANALYSIS PROBLEMS

No site specific sampling and analysis problems are expected or anticipated.

Table 1-1
Summary of Groundwater Sampling Analytical Results
March 11, 1992

Well No. (former Designation)	Dissolved PCBs ppb	Non-Dissolved PCBs ppb	Total PCBs ppb	Total Cadmium ppm	Total Chromium ppm	Total Copper ppm	Total Lead ppm	Dissolved Cadmium (ppm)	Dissolved Chromium (ppm)	Dissolved Copper (ppm)	Dissolved Lead (ppm)
1 (A)	<0.053	0.082	0.082	<0.0091	<0.012	<0.025	0.016	<0.0091	<0.012	<0.025	<0.0050
2 (B)	<0.051	0.41	0.41	<0.0091	J0.018	J0.048	0.013	<0.0091	<0.012	<0.025	<0.0050
3 (C)	<0.051	1.0	1.0	<0.0091	0.043	0.084	0.028	<0.0091	<0.012	<0.025	<0.0050
4 (D)	#	#	#	#	#	#	#	#	#	#	#
5 (E)	<0.056	<0.056	<0.056	<0.0091	<0.012	<0.025	<0.005	<0.0091	<0.012	<0.025	<0.0050
6 (F)	<0.052	<0.052	<0.052	<0.0091	<0.012	<0.025	0.022	<0.0091	<0.012	<0.025	<0.0050
7 (G)	<0.052	<0.052	<0.052	<0.0091	J0.015	J0.027	0.0085	<0.0091	<0.012	<0.025	<0.0050

- # Insufficient sample volume.
- J Estimated value; analyte detected less than the practical quantification limit.
- * USEPA analytical methods are:
 - 3510/8080-PCBs, filtered
 - 3540/8080-PCBs, non-dissolved
 - 3015/7421-lead total
 - 3015/7421-lead, dissolved
 - 3015/6010-metals, total
 - 3015/6010-metals, dissolved

Note: Well locations are identified on Figure 4-1.

Table 1-2

Height of Well From Bottom of Well to Top of Casing

WELL NUMBER	1988-1989	1990	1991
Well #7	16.50 feet	17.35 feet	17.20 feet
Well #1	18.50 feet	19.40 feet	19.20 feet
Well #6	16.50 feet	17.60 feet	17.40 feet
Well #4	28.50 feet	22.30 feet	22.00 feet
Well #5	18.50 feet	19.10 feet	19.00 feet
Well #2	17.50 feet	18.60 feet	18.40 feet
Well #3	14.50 feet	14.40 feet	14.20 feet

* Summary prepared by Environmental Laboratory

Note: Well locations are identified on Figure 4-1.

SECTION 2

PROJECT ORGANIZATION AND RESPONSIBILITIES

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT PERSONNEL

Roy F. Weston, Inc. (WESTON) will provide a staff of experienced administrative and technical professionals to serve as the key personnel for this project. These personnel were selected for their management and technical abilities. To ensure optimum communication during execution of a work task, WESTON has assigned Mr. John Hammond, P.E. as the Program Manager; Mr. Roberto Rico as Project Manager; and Mr. Peter Welch, P.E., as the Project Quality Control Manager.

2.1.1 Project Organization and Management

Figure 2-1 presents the overall organizational structure for project management for the Sawyer Street site.

2.1.2 Quality Assurance/Quality Control Personnel Responsibilities

Individuals responsible for implementing the quality assurance and quality control (QA/QC) aspects of the Sampling and Analysis (SAP) are shown in Figure 2-1. Their responsibilities are indicated in the following subsections.

2.1.3 Project Manager

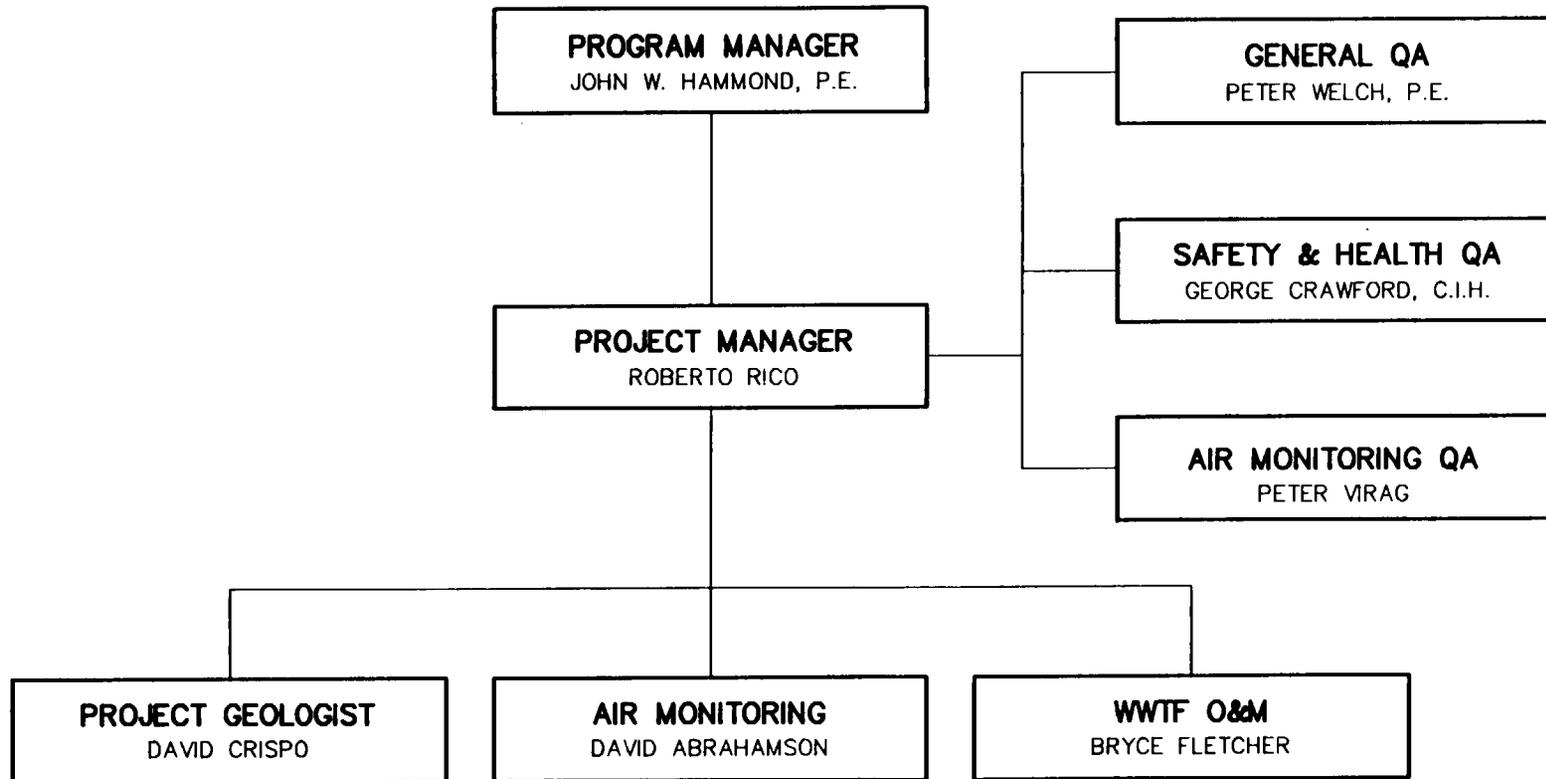
The project manager will be responsible for planning and coordinating the sampling activities. He will also be responsible for disposal of investigation derived waste (IDW).

2.1.4 Project Quality Control Officer

The Project Quality Control Officer (QCO) is responsible for ensuring the implementation of the SAP as it applies to field sampling, monitoring, and analysis processes performed for the

PROJECT ORGANIZATION CHART

OPERATION/MAINTENANCE OF SAWYER STREET FACILITIES NEW BEDFORD HARBOR SUPERFUND SITE NEW BEDFORD, MASSACHUSETTS



operation and maintenance of the site. Specifically, the QCO is responsible for the oversight of the following tasks during sampling activities:

- Proper sample container preparation and labeling;
- Sample preservation and transportation;
- Sample chain-of-custody;
- Ensuring proper sampling procedure (i.e. equipment calibrations); and
- Field documentation.

2.1.5 Laboratory Responsibilities

WESTON will use a U.S. Army Corps of Engineers (USACE) - certified laboratory, Lancaster Laboratories a Thermo Analytical Laboratory, for analyses of samples for the Sawyer Street site. Laboratory quality control procedures and responsibilities will be in accordance with the Corps of Engineers, North Atlantic Division, New England District (CENAE) approved laboratory's quality assurance plan. WESTON will be responsible for the collection and field screening of all samples required for completion of this project. WESTON will also be responsible for the collection of samples to be sent to the USACE laboratory for QA analysis.

SECTION 3

SCOPE AND OBJECTIVES

3. SCOPE AND OBJECTIVES

Quarterly groundwater sampling of seven monitoring wells is required under an operations and maintenance (O&M) contract with the USACE and WESTON. The purpose of the groundwater sampling and analysis is to detect releases of cadmium, chromium, lead, copper and PCBs to groundwater from the CDF. The wells were installed along the perimeter of the CDF located at the Sawyer Street Site in New Bedford. The O & M contract also requires WESTON to prepare a Groundwater SAP. The following USACE documents were referred to for guidance during preparation of the SAP: EM 200-1-3, "Requirements for the Preparation of Sampling and Analysis Plans", and ER 1110-1-263, "Chemical Data Quality Management for Hazardous Waste Remedial Activities".

3.1 GENERAL QA/QC PROCEDURES

Field control samples will be collected and generally include duplicates, splits, QA split samples, and rinsate blanks. They are used to monitor field sampling, packaging/shipping activities and the quality of analysis by the contractor's laboratory.

3.2 SITE ACCESS

Site investigations for the purpose of performing sampling and other field related work shall be conducted as appropriate. The contractor shall notify the Contracting Officer's representative at least 7 days prior to initiating any on-site investigations.

SECTION 4

FIELD ACTIVITIES

4. FIELD ACTIVITIES

4.1 GEOPHYSICS

Not relevant.

4.2 SOIL GAS SURVEY

Not relevant.

4.3 GROUNDWATER

4.3.1 Rationales

4.3.1.1 Monitoring Well Location & Installation

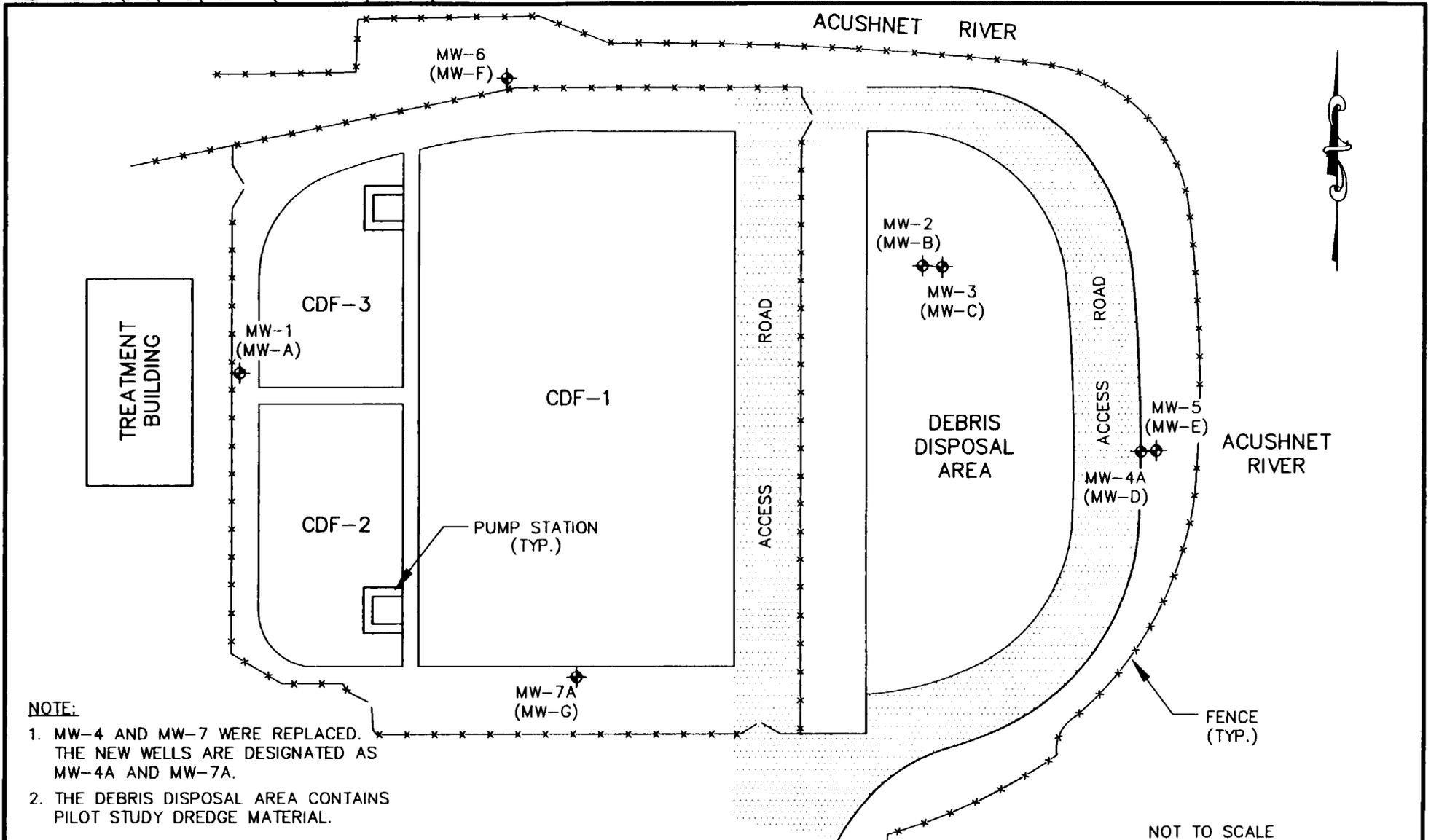
Seven groundwater monitoring wells were installed by others (reference Site Plan Figure 4-1).

4.3.1.2 Sample Collection And Field And Laboratory Analysis

Samples will be collected and field screened for temperature, pH and specific conductivity. Samples will be submitted for laboratory analysis for PCBs and selected metals. The EPA standard analytical methods to be used are as follows: PCBs (dissolved) 3510B/8081, PCBs (total) 3510B/8081, lead (total) 3020A/7421, lead (dissolved) 3020A/7421, metals (total - cadmium, chromium, copper) 3005A/6010A, metals (dissolved - cadmium, chromium, copper) 3005A/6010A. Reference Table 4-1 for a sample summary.

4.3.1.3 Upgradient, QA/QC, And Blank Samples And Frequency

Upgradient samples are not required. Equipment/rinsate blanks, duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected for each parameter during each groundwater sampling event. QC samples (i.e. duplicates) should represent approximately



NOTE:

1. MW-4 AND MW-7 WERE REPLACED. THE NEW WELLS ARE DESIGNATED AS MW-4A AND MW-7A.
2. THE DEBRIS DISPOSAL AREA CONTAINS PILOT STUDY DREDGE MATERIAL.

NOT TO SCALE

SITE PLAN

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

ROY F. WESTON, INC.



MANAGERS DESIGNERS/CONSULTANTS

DRAWN K.J.C.	DATE SEP 96	DES. ENG.	DATE	W. O. NO. 03886-118-002
CHECKED		APPROVED		DWG. NO. FIGURE 4-1

Table 4-1

Groundwater Sample Summary Table

SAMPLE LOCATION	SAMPLE ID	QC SAMPLE ID (DUP)	ASSOCIATED RINSATE BLANK ID	MS/MSD SAMPLE ID	SAMPLE ID (QA LAB)
MW-1	001-MYR	-	-	-	-
MW-2	002-MYR	-	202-MYR	-	-
MW-3	003-MYR	-	-	-	-
MW-4A	004-MYR	-	-	-	-
MW-5	005-MYR	-	-	005-MYR	-
MW-6	006-MYR	106-MYR	-	-	006-MYR-QA
MW-7A	007-MYR	-	-	-	-

- Notes:
1. All samples will be measured for the following parameters in the field: temperature, pH and specific conductance and analyzed for total and dissolved PCBs, cadmium, chromium, copper and lead.
 2. MYR = month and year of sampling.
 3. - = Not Collected.

10% of the field samples per ER 1110-1-263. QA samples (i.e. duplicates) should represent approximately 10% of the field samples per ER 1110-1-263. One equipment/rinsate blank per day for all parameters is recommended for water sampling events. There is no recommended frequency for MS/MSD samples in ER 1110-1-263. MS/MSD samples will be collected at the same frequency as equipment/rinsate blanks. Trip blank samples will not be collected as volatile organic compound analyses are not required.

4.3.1.4 Documentation

Logs & Well Installation Diagrams

Reference Figure 4-2 for typical monitoring well construction.

Development Record

Geophysical Logs

Photographs

4.3.1.5 Well Abandonment

No wells are expected to be abandoned during this project.

4.3.2 Determine Free Product Presence & Sampling

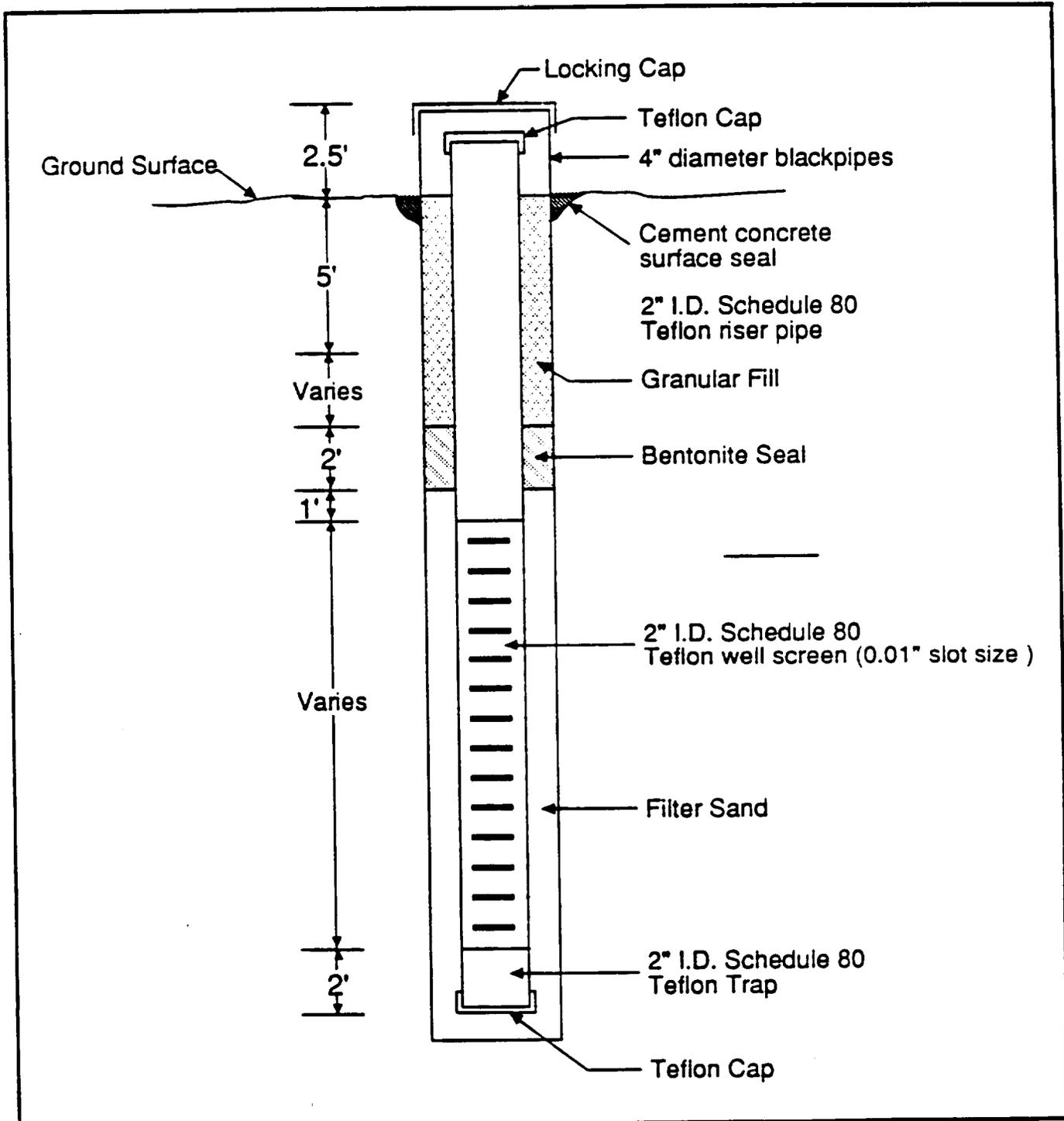
Free Product Is Not Expected To Be Encountered.

4.3.3 Aquifer Testing

Will not be performed.

Figure 4-2

Typical Monitoring Well Construction



4.3.4 Field Measurement Procedures and Criteria

Prior to collecting a groundwater sample, field personnel will calibrate all field instruments and document the calibrations in a field logbook. A Specific Conductance/Temperature meter and pH meter will be used to screen purged groundwater before sample collection. Field personnel will follow the procedures outlined in Subsection 4.3.5 of this plan.

4.3.5 Sample Collection Methods for Groundwater

Purging and sampling will be performed using a dedicated disposable polyethylene bailer.

4.3.5.1 Purging and Sampling Using a Bailer

- Prepare the work area outside the well by placing plastic sheeting on the ground to avoid cross contamination.
- Determine the saturated water column in the well. Calculate the volume of water in the casing and determine the volume of water to be removed, generally three times the submerged volume of casing and filter pack.
- Attach the bailer to cable or line or use dedicated bailer already in well.
- Lower bailer slowly until it contacts the water surface.
- Allow bailer to sink and fill with a minimum of surface disturbance.
- Slowly raise bailer to surface. Do not allow bailer or line to contact the ground. Purge water will be containerized and placed in the CDF. If the well does not recharge fast enough to permit removing three casing volumes, the well will be bailed dry, and sampled as soon as sufficient recharge has occurred to collect a sample.
- Purging will continue until the pH, temperature, and specific conductance have reached equilibrium. Equilibrium is established as follows: pH variation less than 0.2 pH units, temperature variation less than 0.5 degrees Celsius, and less than 10% variation in specific conductance. Equilibrium will be established by three consecutive readings, where one casing volume is removed between readings.
- Prior to sample collection, if a dedicated bailer is being used, replace the bailer line.

- Before a sample is collected from a well, the water level will be measured and recorded. Samples will be collected from the middle of the water column since the contaminants of concern at this site are metals and PCBs. Sample containers should be filled directly from the bailers. Sample bottles will be filled by tipping the bailer to allow a slow discharge of water from the top of the bailer to flow gently down the side of the sample bottle with minimal turbulence. If a bottom drain is present on the bailer, it is recommended that a slow steady flow be achieved through the bottom drain. Cap each sample bottle as filled. Containers to be analyzed for volatiles should be filled first, allowing no headspace and with as little disturbance of the water as possible.
- If preservative is added to the bottles prior to shipment to the field, care must be taken not to overfill the containers, and pH must be measured on samples where a value is specified. Sample collection, preservation and handling must be in accordance with the analytical method. Refer to Table 4-2.
- Label the sample bottle with an appropriate label. Be sure to complete the label with all necessary information.
- Place filled sample containers on ice immediately.
- Complete chain-of-custody documents, field logbook and field sheet per Section 5.
- Close well.

4.3.6 Sampling Methods for GW - Filtration

Field filtration procedures must be conducted prior to sample preservation, and both performed prior to sample shipment. Negative pressure (vacuum) filtration will be utilized.

- Select a presterilized filter assembly with a 0.45 μm pore size.
- Connect vacuum tubing to the hand pump and the filter assembly. Use polytetrafluoroethylene (PTFE) tubing for pump and filter connection.
- Pour the aqueous sample into the filter funnel portion of the filtration assembly. Avoid transferring solids that may have settled to the bottom of the collection flask.
- Using the hand pump, create a vacuum in the collection flask portion of the filtration assembly to start filtration.

- Replace the filter funnel portion of the assembly when the filter becomes too restricted because of solids buildup on the filter.

4.3.7 Sample Containers and Preservation Techniques

Specific sample containers and preservation will be performed according to Appendix I of EM 200-1-3. Holding times will be performed according to USACE Regulation ER 1110-1-263, Appendix F: Sample Handling Protocol for Low, Medium, and High Concentration Samples of Hazardous Waste (reference Table 4-2).

4.3.8 Field Quality Control Sampling Procedures

4.3.8.1 Equipment Blank/Rinsate Blanks

For each sample collection event, one equipment blank will be collected for analysis for each parameter to be analyzed. Ultra-Pure water will be poured over and through the sampling equipment in sufficient quantity to fill the sample containers for all analytes. The sampler will ensure that the water passes through each piece of equipment used in the sampling process, and in the same order as used in the sampling process, before collecting the aliquot(s). Each equipment blank will be documented on the chain-of-custody form. For sampling procedures in which direct collection into the sample bottles is performed, field blanks will be collected instead of equipment blanks by pouring the blank water directly into the appropriate sample containers in the field.

4.3.8.2 Duplicates

One duplicate sample per groundwater sampling event will be collected for each parameter. Duplicates will be collected directly, following the collection of the environmental sample at the specified sampling location.

Table 4-2

Sample Containers, Preservatives, and Holding Times

Sample ID & Location	Type & Number of Containers	USEPA Standard Methods*	Preservative	Maximum Holding Times
001-MYR (MW-1)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 x 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
002-MYR (MW-2)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
202-MYR (MW-2) BLANK	AG (2 X 1 liter)	3510B/8081 (PCBs -filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
003-MYR (MW-3)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
004-MYR (MW-4A)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
005-MYR MS/MSD (MW-5)	AG (6 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (6 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	

Table 4-2
Sample Containers, Preservatives, And Holding Times
(Continued)

Sample ID & Location	Type & Number of Containers	USEPA Standard Methods*	Preservative	Maximum Holding Times
	PE (4 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
006-MYR 006-MYR- QA (MW-6)	AG (4 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (4 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (4 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
106-MYR (DUP) (MW-6)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months
007-MYR (MW-7A)	AG (2 X 1 liter)	3510B/8081 (PCBs - filtered)	Cool 4°C	7 days extraction/ 40 days analysis from extraction
	AG (2 X 1 liter)	3510B/8081 (PCBs - total)	Cool 4°C	
	PE (2 x 1 liter)	3020A/7421 (lead - total) 3020A/7421 (lead - dissolved) 3005A/6010A (metals - total) 3005A/6010A (metals - dissolved)	HNO ₃ to pH<2 Cool 4°C	6 months

Notes:

1. PE = Polyethylene bottles
 2. AG = Amber glass bottle with teflon-lined lid
 3. d = days
 4. mo = months
- * U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste. November 1986. SW-846. Third Edition (revised July 1992, August 1993, and January 1995).

4.3.8.3 Matrix Spikes/Matrix Spike Duplicates (MS/MSD) Samples

One MS/MSD samples will be collected for each parameter during each groundwater sampling event, or at a frequency of 1 in 20 per parameter, whichever is more frequent.

4.3.8.4 Trip Blanks

Due to the fact that sampling for VOCs will not be done, a trip blank is not required.

4.3.8.5 Quality Samples

QA and QC Samples

QA/QC samples are analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, and equipment rinsate blanks.

QC Samples

Quality control samples are collected by the sampling team for use by the contractor's laboratory. The identity of these samples is held blind to the laboratory. The purpose of the sample is to provide site-specific field-originated checks that the data generated by the contractor's analytical laboratory are of suitable quality. One QC sample will be collected for each analyte per sampling event.

QA Samples

Samples are sent to a USACE QA laboratory by overnight delivery and analyzed to evaluate Architect/Engineer (A/E) and contractor laboratory performance. The contractor will coordinate with the designated QA laboratory not less than 48 hours before sampling to ensure that the QA laboratory is alerted to receive the QA samples and process them within the time limits specified

by applicable USEPA regulation and guidelines. One QA sample will be collected for each analyte per sampling event. This sample will be sent to the U.S. Army Corps of Engineers, Environmental Laboratory, 476 Cold Brook Road, Hubbardston, Massachusetts 01452-9743. The Point of Contact (POC) at the Corps of Engineers Laboratory is Mr. David Lubianez, (508) 928-4238. The QA project number (E0562) has been assigned. This number shall be supplied with all future QA samples.

4.3.9 Decontamination Procedures

All field screening and non-dedicated sampling equipment that will enter the well must be decontaminated prior to its use. Field screening equipment should be decontaminated in accordance with Instruction E-5 of EM 200-1-3. This instruction can be found in Attachment 2. Dedicated bailers and rope will be utilized for sampling. Bailers, other sampling equipment, and sample bottles must be physically separated from generators during transport and storage.

SECTION 5

LABORATORY ANALYTICAL PROCEDURES

5. LABORATORY ANALYTICAL PROCEDURES

5.1 LABORATORY ANALYSIS DATA QUALITY OBJECTIVES

Samples collected for laboratory analysis during this project will be shipped to Lancaster Laboratories a Thermo Analytical Laboratory of Lancaster, Pennsylvania (Lancaster Laboratories), a USACE-certified laboratory. The laboratory analytical methods and relevant data quality objectives, are presented in Table 5-1.

The specific procedures employed by Lancaster Laboratories, regarding preventive maintenance, instrument calibration and frequency, internal quality control checks, corrective action, data reduction, data validation, and documentation will be in accordance with the laboratory's quality assurance plan (as reviewed and approved by USACE during the certification process), as well as the standard analytical methods listed in Table 4-1. Laboratory analytical procedures are provided in Attachment 4. Additional procedures to be employed by WESTON to evaluate data quality are provided in this section.

Quality assurance samples (as identified in Table 4-1 as QA samples) will be shipped to the New England Division Environmental Laboratory in Hubbardston, Massachusetts.

5.2 LABORATORY DATA REPORTING REQUIREMENTS

Analytical data reports from WESTON will be in accordance with the USACE Memorandum dated August 16, 1989. Lancaster Laboratories will ensure its ability to provide analytical results within 14 days of receiving samples.

5.3 DATA VALIDATION

The data generated during this assessment are Level III for off-site analyses, as defined in EPA/540/G-87-003 (March 1987). The validation procedures to be employed will consist of the following activities:

**TABLE 5-1
LABORATORY ANALYSIS METHODS AND DATA QUALITY OBJECTIVES**

Analytes of Concern	Method ¹	Units	MDL	PQL	DQOs		
					Accuracy (% LCS)	Precision (% RPD)	Completeness ² (% valid Data)
Total Metals							
Lead	3020A/7421	mg/l	0.0011	0.003	80 - 120	20	100
Cadmium	3005A/6010A	mg/l	0.0031	0.01	80 - 120	20	100
Chromium	3005A/6010A	mg/l	0.0066	0.03	80 - 120	20	100
Copper	3005A/6010A	mg/l	0.0045	0.025	80 - 120	20	100
Total PCBs							
PCB-1016	3510B/8081	µg/l	0.07	1	48 - 125	30	100
PCB-1221	3510B/8081	µg/l	0.13	1	NR ³	NR ³	100
PCB-1232	3510B/8081	µg/l	0.08	1	NR ³	NR ³	100
PCB-1242	3510B/8081	µg/l	0.1	1	NR ³	NR ³	100
PCB-1248	3510B/8081	µg/l	0.05	1	NR ³	NR ³	100
PCB-1254	3510B/8081	µg/l	0.14	1	NR ³	NR ³	100
PCB-1260	3510B/8081	µg/l	0.06	1	67 - 128	30	100
Surrogates							
DCB	3510B/8081	NA	NA	NA	60 - 120	NA	NA
TCX	3510B/8081	NA	NA	NA	60 - 120	NA	NA
MS/MSD							
PCB-1016	3510B/8081	NA	NA	NA	48 - 125	NA	NA
PCB-1260	3510B/8081	NA	NA	NA	67 - 128	NA	NA
Dissolved Metals							
Lead	3020A/7421	mg/l	0.0011	0.003	80 - 120	20	100
Cadmium	3005A/6010A	mg/l	0.0031	0.01	80 - 120	20	100
Chromium	3005A/6010A	mg/l	0.0066	0.03	80 - 120	20	100
Copper	3005A/6010A	mg/l	0.0045	0.025	80 - 120	20	100
Dissolved PCBs							
PCB-1016	3510B/8081	µg/l	0.07	1	48 - 125	30	100
PBC-1221	3510B/8081	µg/l	0.13	1	NR ³	NR ³	100
PCB-1232	3510B/8081	µg/l	0.08	1	NR ³	NR ³	100
PCB-1242	3510B/8081	µg/l	0.1	1	NR ³	NR ³	100
PCB-1248	3510B/8081	µg/l	0.05	1	NR ³	NR ³	100
PCB-1254	3510B/8081	µg/l	0.14	1	NR ³	NR ³	100
PCB-1260	3510B/8081	µg/l	0.06	1	67 - 128	30	100
Surrogates							
DCB	3510B/8081	NA	NA	NA	60 - 120	NA	NA
TCX	3510B/8081	NA	NA	NA	60 - 120	NA	NA
MS/MSD							
PCB-1016	3510B/8081	NA	NA	NA	48 - 125	NA	NA
PCB-1260	3510B/8081	NA	NA	NA	67 - 128	NA	NA

¹ Method numbers taken from SW-846.

² Completeness goal for the laboratory.

³ Laboratory is not required to determine accuracy and precision for these compounds.

MDL = Method Detection Limit.

mg/l = Milligrams per liter.

µg/l = Micrograms per liter.

NR = Not Reported.

NA = Not Applicable.

Laboratory is reporting MDLs for this project (i.e. the minimum concentration of a substance that can be measured and reported).

Laboratory recommends preparatory Method 3020A for graphite furnace method only.

Laboratory recommends preparatory Method 3005A for ICP method.

Note: The accuracy range applies to both LCS and MS/MSD results. The precision values apply to MS/MSD and laboratory duplicate results.

- Review of chain-of-custody documents to verify sample identities.
- Review of sample log-in documents to verify any potential problems with custody seals, container integrity, sample preservation, labeling, etc.
- Review of method blank data to determine the presence of any sources of contamination in the analytical process.
- Review the matrix spike (MS) data to evaluate the potential for matrix effects and as a measure of analytical accuracy. MS recoveries will be compared against laboratory acceptance criteria to determine if they are within or outside of warning and control limits for percent recoveries.
- Review of matrix spike/matrix spike duplicate (MS/MSD) data to evaluate sample homogeneity and as a measure of analytical precision. MS/MSD data will be compared to laboratory acceptance criteria for the maximum relative percent difference (RPD).
- Review of standard reference material (SRM) or laboratory control sample (LCS) data (if available) as a measure of analytical accuracy. SRM and LCS data will be compared to the certified acceptable ranges of analytical values.
- Review of sample and sample duplicate data (if available) as a measure of sample homogeneity and as a measure of analytical precision. Sample and sample duplicate data will be compared against the laboratory acceptance criteria for the maximum RPD.
- Review of surrogate recovery data to assess extraction efficiency, effectiveness of sample introduction, and possible loss during cleanup activities. Surrogate recoveries will be compared to laboratory acceptance criteria to determine if they are within or outside of acceptable limits.
- Review of sample dates, extraction/digestion dates, and analysis dates to determine if maximum holding times were met or exceeded.

5.3.1 Procedures Used To Assess Laboratory Data Quality

5.3.1.1 Accuracy

Accuracy is a measure of the bias in a system or the degree of agreement of a measurement, A_O , with an accepted reference or true value, A_T . Accuracy is usually expressed as the difference

between the two values, $A_O - A_T$, or the difference as a percentage of the reference or true value, $100 [(A_O - A_T) / A_T]$, and sometimes expressed as a ratio (A_O / A_T).

Analytical accuracy is expressed as the percentage recovery of an analyte (or a surrogate in the case of organic analyses) that has been added to the sample (or standard matrix; for example, a

$$\text{Accuracy} = \text{Percent Recovery} = \frac{A_O - A_T}{A_T} \times 100 \text{ Percent}$$

blank) at a known concentration before analysis and is expressed by the following formula:

where:

A_T = True value.

A_O = Measured value.

The results of MS/MSD analyses will be used as a means for assessing accuracy.

5.3.1.2 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending on the "prescribed similar conditions."

Analytical precision is calculated by expressing, as a percentage, the difference between results of analyses of duplicate samples for a given analyte. Precision can be expressed by the formula:

$$RPD = \frac{C_1 - C_2}{(C_1 + C_2)/2} \times 100 \text{ Percent}$$

where:

- RPD = Relative percent difference.
- C₁ = Concentration of analyte in sample.
- C₂ = Concentration of analyte in replicate.

The results of field duplicate samples analyses will be a means for assessing precision.

5.3.1.3 Completeness

Completeness is a measure of the amount of valid data obtained from the measurement system compared with the amount that was expected under normalized conditions. Completeness for sampling will be met if valid data from 80% of the designated samples are obtained. The completeness goal for critical data points is 100%.

5.3.1.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, variation at a sampling point, a process condition, or an environmental condition. WESTON will ensure representativeness by following Standard Operating Procedures (SOPs) for sample collection and analysis and will ensure homogeneity of the environmental samples. Sample containers for matrices to be collected will be filled in the following order: VOCs, organic parameters, and inorganic parameters.

5.3.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. The comparability of the data is influenced by sampling and analytical procedures. By providing specific protocols to be used for obtaining and analyzing samples, data sets should be comparable, regardless of who obtained the sample or performed the analysis; however, WESTON will designate one person to be responsible for sample collection and handling so that

introduction of errors will be kept to a minimum. Analytical comparability will be ensured by using a USACE-certified laboratory (Lancaster Laboratories), and standardized analytical procedures.

5.3.2 Corrective Action

5.3.2.1 Field Corrective Action

The initial responsibility for monitoring the quality of field measurements and observations lies with the field personnel. The project geologist is responsible for verifying that QC procedures are followed. This requires that the project geologist assess the correctness of field methods and the ability to meet QA objectives. If a problem occurs that might jeopardize the integrity of the project or cause some specific QA objective not to be met, the Project Manager will notify the appropriate QC Manager. An appropriate corrective action will then be decided upon and implemented. The project geologist will document the problem, the corrective action, and results in the field logbook. Copies of the logbook will be provided to the Project Manager and the appropriate QC Manager.

5.3.2.2 Laboratory Corrective Action

The initial responsibility to monitor the quality of an analytical system lies with the analyst. The analyst will verify that all QC procedures are followed and results of an analysis of QC samples are within acceptance criteria. This requires that the analyst assess the correctness of all of the following items as appropriate:

- Sample preparation procedure.
- Initial calibration.
- Calibration verification.
- Method blank result.
- Laboratory control standard.
- Duplicate analysis.
- Fortified sample result.

If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately assess the analytical system to correct the problem. The analyst notifies the appropriate supervisor and laboratory QA coordinator of the problem and, if possible, identifies potential causes and corrective action.

The nature of the corrective action obviously depends on the nature of the problem. For example, if a continuing calibration verification is determined to be "out of control," the corrective action may require re-calibration of the analytical system and re-analysis of all samples since the last acceptable continuing calibration standard.

When the appropriate corrective action measures have been defined and the analytical system is determined to be "in control," the analyst documents the problem and the corrective action. Data generated concurrently with an "out-of-control" system will be evaluated for usability in light of the nature of the deficiency. If the deficiency does not impair the usability of the results, data will be reported and the deficiency noted in the case narrative. Where sample results are impaired, the laboratory QA coordinator is notified and appropriate corrective action (e.g., re-analysis, etc.) is taken.

SECTION 6

SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

6. SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

6.1 FIELD LOGBOOK

The field logbook should enable the sampling activity to be reconstructed without relying on the collector's memory. Logbooks should be kept in the field member's possession or in a secure place during field work. If an error is made in a logbook, a single line should be drawn through the entry and the entry initialed and dated. The following topics should be recorded in the field logbook:

- Name and title of author, date and time of entry.
- Name and address of field contact.
- Names and responsibilities of field crew members.
- Names and titles of any site visitors.
- Sample collection method.
- Number and volume of sample(s) taken.
- Information concerning sampling changes, scheduling modifications and change orders.
- Details of sampling location.
- Date and time of collection.
- Tidal cycle at time of groundwater sample collection.
- Field observations.
- Any field measurements made.
- Sample identification number(s).
- Information from containers, labels of reagents used, de-ionized water used for blanks, etc.

- Sampling methodology.
- Sample preservation.
- Sample distribution and transportation.
- Sample documentation (e.g. chain-of-custody record numbers).
- Decontamination procedures.
- Documentation for investigation-derived wastes (IDWs) (e.g. contents and approximate volume of waste, disposal method).
- Documentation of any scope of work changes required by field conditions.
- Signature and date (entered by personnel responsible for observations).
- Reference Attachment 5 WESTON SOP "Field Notes" SP No. 16-11-001.

6.2 PHOTOGRAPHS

Any photographs taken will be labeled with the project name, work order number, date, a description of what is shown in the photograph, and the name of the photographer. Photos will be collected if the sampling team is unable to collect a sample or if free product is encountered.

6.3 SAMPLE NUMBERING SYSTEM

Each sample collected will be given a unique sample number. The sample number will be determined as follows:

1. For environmental samples collected from monitoring wells the number will be : the well number preceded by two zeros and the month and year of sampling event (e.g. 001-695).
2. For duplicate samples the number will be a three digit well number that begins with 1, is followed by a zero and followed by the well number and the month and year of sampling event (e.g. 106-695). This designation will ensure the duplicate sample is "blind" to the laboratory.

3. For equipment blanks the number will be 2, followed by 0, followed by the well number for which the equipment was decontaminated, followed by the month and year of sampling event (e.g. 202-695).
4. For quality assurance samples the number will be the well number preceded by two zeros, the month and year of sample event and QA (e.g. 006-695-QA).

6.4 SAMPLE DOCUMENTATION

6.4.1 Sample Labels and/or Tags

Sample labels and tags will be consistent with the requirements of Attachment 1: Appendix F of EM 200-1-3. Sample tags will not be used.

Field personnel will be responsible for identifying, labeling, providing proper preservation, and packaging samples to preclude breakage during shipment.

Every sample will be labeled and labels will include:

- Project number and site name.
- Unique sample number.
- Sampling date and time.
- Initials of sampling technician.
- Method of sample preservation/conditioning.
- Project specific QA Laboratory project number (E0562) has been assigned for this project. This number should be included in all documentation sent to the QA laboratory.

6.4.2 Sample Field Sheets and/or Logbook

The system for identifying and tracking the samples and associated field data will be recorded in a permanently bound and weatherproof notebooks maintained by the field team. Team members

will record all information related to sampling procedures as specified in 6.1. Field documentation will be done in indelible ink.

6.4.3 Chain-of-Custody Records

Sample custody will be initiated by WESTON upon collection of samples. Chain-of-custody forms will be placed in waterproof plastic bags and taped to the inside lid of the cooler. The cooler will be sealed with chain-of-custody seals. Chain-of-custody forms will be used for recording pertinent information about the types and numbers of samples collected and shipped for analysis. The project specific QA Laboratory project number (E0562) should be included on the chain-of-custody documentation. Sample identification numbers will be included on the chain-of-custody form to ensure that no error in identification is made during shipment. Chain-of-Custody procedures shall be carried out in accordance with Attachment 1 (Appendix F to the EPA Guidance Document EM 200-1-3.).

6.5 DOCUMENTATION PROCEDURES

Prior to sample collection, labels will be affixed to sample containers using transparent tape. Indelible waterproof ink will be used for all logbook, chain-of-custody and sample label entries. Documentation will conform to Appendix F of EM 200-1-3 (Attachment 1).

6.6 CORRECTION TO DOCUMENTATION

6.6.1 Field Corrective Action

The initial responsibility for monitoring the quality of field measurements and observations lies with the field personnel. The project geologist is responsible for verifying that QC procedures are followed. This requires that the project geologist assess the correctness of field methods and the ability to meet QA objectives. If a problem occurs that might jeopardize the integrity of the project or cause some specific QA objective not to be met, the project geologist will notify the appropriate Project Quality Control Manager. An appropriate corrective action will then be decided upon and implemented. The project geologist will document the problem, the corrective

action, and the results in the field logbook. Copies of the logbook will be provided to the Project Manager and the appropriate Project Quality Control Manager.

SECTION 7

SAMPLE PACKAGING AND SHIPPING

7. SAMPLE PACKAGING AND SHIPPING

Samples will be placed in containers compatible with the intended analysis and properly preserved prior to shipment to the laboratory. Each sealed container will be placed in a leakproof plastic bag. Thermal ice chests will be filled approximately 3 inches with inert material, such as vermiculite. The bagged sample container will be placed in the ice chests and vermiculite will be added to nearly fill the ice chest. Bagged ice will be placed on top of the vermiculite to ensure samples are cooled to at least 4°C. A chain-of-custody form will be placed in a waterproof plastic bag and taped to the inside of the cooler. Ice chests will be taped shut with strapping tape, wrapped around the cooler in at least 2 places. Ice chests will be sealed with numbered and signed chain-of-custody seals. This packaging and shipment will be in accordance with USEPA protocol and Attachment 1 (Appendix F, Instruction F-2 of EPA Guidance Document, EM 200-1-3). Prior to shipment, a quality control (QC) check will be performed to ensure samples have been properly identified and packaged, and that appropriate documentation (chain-of-custody) will accompany them.

SECTION 8

INVESTIGATION DERIVED WASTE (IDW)

8. INVESTIGATION DERIVED WASTE (IDW)

Groundwater that is purged for monitoring wells will be collected and placed in either Cell 2 or Cell 3 of the CDF at the discretion of USACE.

SECTION 9

CONTRACTOR CHEMICAL QUALITY CONTROL (CCQC)

9. CONTRACTOR CHEMICAL QUALITY CONTROL (CCQC)

WESTON is required to ensure that quality is maintained throughout all field work. Due to the short duration of sampling events, estimated at one day each, CCQC activities will not be documented. WESTON will utilize experienced field personnel to perform sampling.

9.1 PREPARATORY PHASE

The CQC representative, the project geologist, in conjunction with the WESTON sampling team, will review all work requirements, examine all materials and equipment, examine work areas and demonstrate all field activities. If new sampling personnel arrive on-site during the work effort, the CQC representative must repeat this phase before new personnel begin work. A Preparatory Inspection Form can be found in Attachment 6.

9.1.1 Project Specific Checklist

9.1.1.1 *Field Equipment List Including the Following:*

- Sampling and analysis plan.
- Example tables for recording all data.
- QA sample table to match up QC and QA samples.
- Field screening instruments.
- Calibration standards.
- Instrument operating manuals.
- Backup instrument(s) for field screening.
- Decontamination materials.
- Sample collection equipment.
- Labels for sample containers.
- Examples of completed sample shipping documents.
- Sample containers.
- Chain-of-custody forms.
- Chain-of-custody seals.
- Sample shipping coolers.
- Sample packing materials.
- Ice packs.
- Sample preservatives.

- Laboratory information.
- Copy of a phone log showing QA samples have been scheduled.

9.1.1.2 Checklist of Activities

- Review data quality objectives (DQOs) and specific analytical method - required sampling, sample holding and analysis requirements.
- Review sampling and analysis plan.
- Calibrate all instruments.
- Review decontamination procedures.
- Review sample custody forms.
- Review sample numbering system.
- Discuss analytical test methods.
- Review sampling techniques.

9.2 INITIAL PHASE

The CQC representative is responsible for overseeing every step of work when that work is first initiated.

9.3 FOLLOW-UP PHASE

The CQC representative is responsible for continued daily contract compliance until completion of the particular feature of work.

SECTION 10

DAILY CHEMICAL QUALITY CONTROL REPORTS (DCQCR)

10. DAILY CHEMICAL QUALITY CONTROL REPORTS (DCQCR)

The daily quality control reports (DQCRs) will be submitted to USACE within one week of completion of a groundwater sampling event. A copy of the report form can be found in Attachment 6. These reports should include weather information at the time of sampling, field instrument measurements, calibrations, departures from the approved SAP, problems and instructions from government personnel. Any deviations that may affect data quality objectives will be conveyed to USACE personnel immediately. The following should be attached to the DQCR: a quality assurance sample table should be attached that matches up primary and QA samples (see Attachment 6), copies of chain-of-custody forms, field-generated analytical results, and any other project forms that are generated.

SECTION 11

CORRECTIVE ACTIONS

11. CORRECTIVE ACTIONS

11.1 DEPARTURE FROM APPROVED PLANS

WESTON will document and report all major departures from approved plans. The report will address the following:

- Reasons for departures.
- Problems identified.
- Corrective actions.
- Effect of the departure on scope and results.
- Instructions from USACE personnel for resampling and/or re-analysis
- These reports of significant problems will be sent to the Contracting Officer (CO) within 48 hours of the occurrence.

SECTION 12

PROJECT SCHEDULE

12. PROJECT SCHEDULE

It is assumed that the duration of the project will be 1 year. Monitoring wells will be sampled quarterly. January - March, April - June, July - September, and October - December.

SECTION 13

SAMPLING APPARATUS AND FIELD INSTRUMENTATION

13. SAMPLING APPARATUS AND FIELD INSTRUMENTATION

A list of the field equipment, containers, and supplies anticipated for the groundwater sampling is provided below.

- Alconox.
- Aluminum foil.
- Bailers (stainless steel or teflon).
- Camera.
- Deionized water
- Field logbook.
- Field filtering equipment.
- Garbage bags.
- Ice/coolers for sample preservation at 4°C.
- Indelible ink.
- Ion Meter for pH.
- Isopropyl alcohol.
- Personal protective equipment: safety goggles, surgical gloves, nitrile gloves, plastic booties, and tyvek suits.
- Plastic basins and scrub brushes.
- Plastic sheeting.
- Pumps for dewatering and groundwater sampling.
- Sample containers provided by laboratory.
- Site plans and forms.
- Specific Conductance/Temperature Meter.

SECTION 14

REFERENCES

14. REFERENCES

USACE (U.S. Army Corps of Engineers). 1990. *Engineering and Design, Chemical Data Quality Management for Hazardous Waste Remedial Activities*. ER-1110-1-263.

USACE (U.S. Army Corps of Engineers). 1994. *USACE Requirements for the Preparation of Sampling and Analysis Plans*. EM-200-1-3.