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A MEMBER OF THE ENVIRONMENTAL RESOURCES MANAGEMENT GROUP

# QUALITY ASSURANCE/ QUALITY CONTROL (QA/QC) PLAN

***REMOVAL ACTION***
***LIBERTY INDUSTRIAL FINISHING SITE***
***FARMINGDALE, NASSAU COUNTY, NEW YORK***

*21 September 1994*

Prepared By:

**ERM-Northeast**
*475 Park Avenue South*
*New York, New York 10016*

ERM

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*21 September 1994*

Approved by:

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EPA On-Scene Coordinator

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ERM Project Director

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ERM Quality Assurance/Quality Control Officer

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## *1.0 INTRODUCTION*

The Removal Action activities described in the Removal Action Work Plan (WP) focus on discrete areas of the Site which have been identified by EPA. These areas are: 1) contents of underground storage tanks (USTs), as set forth below; 2) soils confirmed or suspected to be impacted by polychlorinated biphenyls (PCBs), as set forth below; 3) dielectric fluids in transformers at two locations; and, 4) certain abandoned drums in the acetone building.

The actions required by the EPA under the Order involve addressing specific conditions and performing additional characterization and related removal, if necessary, of other conditions based on further investigation as described below. The required removal actions will be implemented in two phases. The first phase will involve further sampling to characterize materials to determine whether they are candidates for removal. A basis for deciding whether the results of further characterization warrant removal of these materials, subject to EPA approval, is presented in the WP. The first sampling phase will also permit delineation of the extent of removal which is required in areas where existing data is insufficient to define the scope of the required action. The second phase will consist of the off-site disposal/recycling of materials determined by EPA to be required based upon the sampling results described below.

This QA/QC Plan describes the procedures and protocols involved in obtaining and analyzing samples of the materials present in the four areas mentioned above. The methods for collecting samples of the contents of USTs and drums; of soil in four transformer areas; and of the dielectric fluids in transformers at two locations, are described in the WP. This QA/QC Plan addresses the data use and quality assurance objectives, approach and sample handling methodologies, quality assurance requirements, error determination, deliverables, and data validation associated with the Removal Action program.

This QA/QC Plan has been prepared in accordance with EPA's Quality Assurance/Quality Control Guidance for Removal Activities - Sampling QA/QC Plan and Data Validation Procedures (Interim Final, April 1990). That document provides guidance on developing site-specific sampling QA/QC plans, and assessing and substantiating data for various data users. The guidance is not intended to address field and laboratory QC practices. It is assumed and expected that the field samplers and analytical laboratories will follow approved methods (with their inherent QC checks) and adhere to generally accepted "good laboratory practices".

## 2.0 *DATA USE OBJECTIVES*

The EPA has determined there are six actions which must be accomplished as part of the removal action under the Order. These six actions are:

1) Removal of contents from USTs designated No.'s 2 and 4;
2) Characterization and potential removal of the materials stored in USTs designated 1,3,5,6,7 and 8. A subsequent decision as to the need for removal of these materials will be based on the analytical data;
3) Removal of soils, determined from laboratory analyses to contain PCBs at concentrations greater than or equal to 10 ppm, from certain transformer locations designated PCB 1 and PCB 2;
4) Characterization of soils at transformer locations designated PCB 3 and PCB 4, followed by removal of any soils determined from laboratory analyses to contain PCBs at concentrations greater than or equal to 10 ppm;
5) Characterization of liquids in transformers at locations designated PCB 1 and PCB 3 followed by removal of any PCB liquids in inactive units and assessment of options, including potential removal, to address PCB liquids in active units; and,
6) Removal of drums from the acetone building.

This QA/QC Plan was developed to ensure that valid, usable data would be generated from these activities, described in detail in Section 2.0 of the WP. This QA/QC Plan discusses the protocols to be used in the field and by the laboratory to generate data that can be relied upon to:

1) characterize the chemical quality of materials identified in the Order;
2) define the areal and vertical extent of PCBs in soils at concentrations of 10 ppm or greater at four transformer areas; and,

3) classify the types of materials to support selection of disposal/recycle options.

## 3.0 *QUALITY ASSURANCE OBJECTIVES*

## 3.1 *OVERALL PROJECT OBJECTIVES*

Quality Assurance Objectives (QAO) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision-making process. QAO define the total uncertainty in the data that is acceptable for each specific activity during the project. This uncertainty includes both sampling error and analytical error. Ideally, the prospect of zero uncertainty is the intent; however, the very process by which data is collected in the field and analyzed in the laboratory contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty to an acceptable level that will not hinder the intended use of the data.

In order to achieve the project QAO, specific data quality requirements such as detection limits, criteria for accuracy and precision, sample representativeness, data comparability and data completeness must be specified. The overall objectives and requirements are established such that there is a high degree of confidence in the measurements.

The data collected during the course of the Removal Action at the Site will be used to determine the presence and concentration of certain compounds and elements in the materials in USTs, soils, transformer fluids, and drum contents at specific locations described in Section 2.0 of the WP. Specific analyses and analytical methodologies for these samples are listed in Tables 6-5 and 6-6.

1. UST Contents - EPA Target Compound List (TCL) organics including volatile, semi-volatile, pesticide and PCB compounds and Target Analyte List (TAL) inorganics using SW-846 methodologies specified in Table 6-5.

2. UST Contents - Toxicity Characteristic Leaching Procedures for inorganics, volatiles, semi-volatiles, pesticides and herbicides. Sample analyses will be conducted using the SW-846 methodologies specified in Table 6-5.

3. UST Contents - RCRA Characteristics: ignitability, corrosivity, and reactive sulfide and reactive cyanide using SW-846 methods specified in Table 6-5.

4. UST Contents - BTUs, total halogens, percent sulfur using ASTM methods as specified in Table 6-5; percent solids using SW-846 methodologies as specified in Table 6-5; percent water calculated by difference; pH using SW-846 methodologies for liquids as specified in Table 6-5; flash point and cyanide reactivity using SW-846 methodologies as specified in Table 6-5.

5. Transformer Area Soils - Millipore EnviroGard field test, or equivalent, to screen for PCBs using October 1992 draft SW-846 Method 4020, specified in Table 6-5.

6. Transformer Area Soils - EPA TCL PCBs using SW-846 Method 8080 as specified in Table 6-5.

7. Transformer Area Soils - Toxicity Characteristic Leaching Procedures for inorganics, volatiles, semi-volatiles, pesticides and herbicides. Sample analyses will be conducted using the SW-846 methodologies specified in Table 6-5.

8. Transformer Area Soils - RCRA Characteristics: ignitability, corrosivity and reactive sulfide and reactive cyanide using SW-846 methods as specified in Table 6-5.

9. Transformer Area Concrete Pads - EPA TCL PCBs using SW-846 Method 8080 as specified in Table 6-5.

10. Drum Contents - EPA Toxicity Characteristics Leaching Procedure (TCLP) for inorganics, organic compounds including volatiles, semi-volatiles, pesticides and herbicides in accordance with the SW-846 methodologies specified in Table 6-5.

11. Drum Contents - BTUs, total halogens, percent sulfur using ASTM methods as specified in Table 6-5; percent solids using SW-846 methodologies as specified in Table 6-5; percent water calculated by difference; pH using SW-846 methodologies for liquids as specified in Table 6-5; flash point and cyanide reactivity using SW-846 methodologies as specified in Table 6-5.

12. Transformer Fluids - EPA TCL PCBs using SW-846 Method 8080 as specified in Table 6-5.

Samples of UST contents, soils, drum contents and transformer fluids will be collected and analyzed for the constituents listed above according to the analytical methods noted. Sampling and analysis will qualitatively determine the presence or absence of these constituents at sampled locations and will quantitatively determine the concentration of these constituents at areas of detection.

## 3.2 *QUALITY ASSURANCE OBJECTIVES*

Quality Assurance Objectives (QAOs) have been defined by EPA for assessing and substantiating the collection of data to support its intended use. There are three QAOs: QA1, QA2, and QA3. All three provide useful and valid data that meet the requirements of the data use. The QA characteristics are based on EPA QA objectives for precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS). These will be used to specify data quality requirements and to evaluate the analytical system performance. Table 3-1 presents definitions for these parameters.

The data collection activities described in Section 2.0 each have associated QA/QC Objectives. Data collection activities associated with immunoassay field screening for PCBs will meet the QA1 objectives. QA1 is a screening objective to afford a quick, preliminary assessment of site contamination. This objective for data quality is applicable for identifying classes of compounds (e.g., PCBs) when definitive quantitation is not required. Although no quality assurance data are collected at this objective, a calibration or performance check of the method is required along with verification of the detection level. Additionally, PCB concentrations will be verified on at least 25% of preliminary screened samples in accordance with SW-846 Method 8080, using an EPA-approved method different from the screening method. Confirmation analyses may be run on those samples collected at locations determined to be most critical to the project (i.e. areal and vertical limits of PCBs in soil < 10 ppm. The characteristics of the QA1 objective are listed in Table 3-2.

All other data collection activities (i.e., characterizing the chemical quality of defined material) will meet the QA2 objectives. QA2 is a verification objective used to verify analytical results. This objective for data quality is intended to give the decision-maker a level of confidence for a select portion of preliminary data (eg. at least 10% of soil samples screened for PCBs). This quality objective is also applicable to data that are generated by any method

which provide a level of confidence for a select round of critical samples so a decision can be made based on an action level with regard to further removal of soil, cleanup verification, or delineation of compounds and/or constituents. Only those methods that are analyte specific can be used for this quality objective. Error determinations are made for all analytes that are of interest to the OSC for each critical sample that is of interest. The characteristics of the QA2 objective are listed in Table 3-2.

## *3.3 FIELD INVESTIGATION QUALITY OBJECTIVES*

The objective of the Removal Action sampling program is to maximize the confidence in the data in terms of PARCCS.

In terms of precision and accuracy for the analytical samples, Section 4.1 of the QA/QC Plan presents the frequency with which field duplicates, travel blanks, and field blanks will be collected such that a specific degree of precision and accuracy can be calculated. The data quality objective for analytical sample duplicates is to achieve precision equal to or greater than the laboratory duplicate precision requirements established in the current SW-846 analytical methodologies.

Analytical precision is measured by laboratory duplicate or spike duplicate analyses. It is a quantitative measure of the variability of a group of measurements compared to their average value. Travel blanks and field blanks are analyzed to check for contamination.

Accuracy measures the bias in a measurement system and can be obtained by matrix spike, blank spike, standard reference materials, and/or surrogate recoveries.

The submission of blanks will provide a means to monitor contaminants potentially introduced during sampling, preservation, handling, shipping and analysis. Field blank samples are analyzed to check for procedural contamination at the Site that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Collection of field blanks is performed at a frequency of once per day, whereas trip blanks are taken at the same frequency when volatile organics in an aqueous matrix only are being collected. Collection of field blanks is one means of measuring representativeness. Environmental duplicate samples are also collected to demonstrate field sampling precision. Field duplicate samples should be collected at a 10 percent frequency for a QA2 objective level of effort. Representativeness is the degree to which a collected sample or sample data is characteristic of a population or representative of actual Site conditions.

The Quality Assurance Requirements for equipment rinsate blanks collected from non-dedicated sampling equipment is to be non-detect or less than the specified QAO estimated quantitation or method detection limit.

To assure UST, soil, transformer fluid, and drum sample representativeness, all sample collection will be performed in strict accordance with the EPA-recommended procedures for sample collection. Sample preservation and holding times for TCL/TAL and TCLP analyses will conform to SW-846 guidelines.

Completeness is the percentage of measurements which are judged to be valid. It is the minimum number of data sets required as the basis for a decision. The validity of sample data is determine by data validation. The data quality objective for the completeness of UST and drum contents, soil and transformer fluid data to be collected during the field investigation is 100%. In other words, the objective is to collect samples from all of the locations noted in the WP. In the event 100% is not obtained, due to inaccessibility of sampling

points or other field conditions, the effect that the missing data will have on the project objectives will be evaluated by the Project Coordinator. If necessary, corrective action will be initiated to resolve any data gaps that develop as a result of less than 100% data completeness.

Every effort will be made to obtain valid data for all UST, soil, transformer fluid, and drum sampling points, particularly those classified as critical points. In this regard, the sampling points identified as critical will be selected for QC sampling (duplicate sample collection) at the frequency specified in Section 4.1.

In order to establish a degree of comparability for analytical samples such that observations and conclusions can be directly compared with all historical or future data, EPA-approved standard operating procedures and methods will be used to meet the QA considerations regarding field sampling and analyses, proper sample preservation and storage, frequency of collection of field duplicate and matrix spike/matrix spike duplicate samples, chain-of-custody requirements, and holding times criteria.

## *3.4 ANALYTICAL LEVEL*

Analytical levels appropriate to the QA objectives of the Removal Action are defined in EPA's Hazardous Water Evaluation and Disposal Criteria - Operations Manual (March 1992). According to that guidance, QA2 objectives are appropriate for a remediation effort. QA2 analytical support is designed to provide laboratory analysis using standard EPA approved procedures other than current Contract Laboratory Program (CLP) Routine Analytical Service (RAS) in order to obtain similar analysis with less documentation. QA2 protocols all have built-in QA/QC, including calibration runs, surrogate standards, etc. External QA, which is also used for the CLP, is employed in the form of trip blanks, replicate and duplicate samples, and blind spikes submitted with the samples.

All analyses will be performed in an off-Site analytical laboratory. QA2 objectives will use SW-846 analytical procedures but will not utilize the validation or documentation procedures required of full CLP.

## 3.5 *LABORATORY DATA QUALITY OBJECTIVES*

The selected laboratory will have to demonstrate analytical precision and accuracy by the analysis of laboratory duplicates and matrix spike duplicates. Precision, as well as instrument stability, will also be demonstrated by comparison of response factors for calibration standards. Laboratory accuracy will be evaluated by the addition of surrogate and matrix spikes compounds, and will be presented as percent recovery. Precision will be presented as relative percent difference (RPD), percent relative standard deviation (%RSD), or percent difference (%D), whichever is appropriate for the data measured. Laboratory spiked blanks can also be used to demonstrate the accuracy of the analyses. The frequency of laboratory duplicates, matrix spikes and laboratory blanks is specified in Section 4.1.

## 3.6 *CRITERIA OBJECTIVES*

The quantitative criteria established for both field and laboratory accuracy and precision are summarized in Table 3-3.

The selected laboratory must report results from raw data into the appropriate reporting format for the various analytical parameters of interest for all UST and drum contents, soil and transformer fluid samples. The data format should follow the applicable forms given in SW-846 methodologies. The laboratory must correct for any dilution factors or percent solids for solid or non-aqueous samples. Final data must be reported by the laboratory in the proper units as specified in the SW-846 methodologies.

## 3.7 *DATA MANAGEMENT OBJECTIVES*

The primary data management objective is that all aspects of the investigation from sample design, collection, shipment, analysis, use/decisions, etc., be performed in conjunction with rigorous QA/QC protocols and documentation. The specific details of this documentation can be found throughout this QA/QC Plan and the associated WP.

The sampling and analysis program outlined in the WP and summarized in Section 4.1 is designed with separate data quality requirements for field sampling and laboratory analysis; thus the cause of any problems found in the system will be isolated and evaluated. The data quality requirements also provide an indication of the variability inherent to the overall system.

## 4.0 APPROACH AND SAMPLING METHODOLOGIES

### 4.1 SAMPLING AND ANALYSIS PLAN

The sampling and analysis plan described in the WP for each Removal Action activity were based on specific requirements in the Order as well as previous data generated by EPA during past investigations at the Site. A summary of the intended sampling and analysis plan for each of the areas is described below.

#### 4.1.1 UST Contents

A total of eight USTs will be sampled as part of the Removal Action. Each sample will be collected using a disposable polyethylene sampler. The exterior of the sampler will be wiped with a disposable absorbent pad as it is retrieved. The sample device will be dictated by the depth of liquid present in the UST. The objective will be to collect a sample representative of the liquid column to ensure any stratified layers are included for analysis. Upon retrieval, the sample will be transferred to laboratory prepared sample bottles. These bottles will be certified by the supplier or laboratory to be clean. All samples collected will be tagged and labeled by the sampler using waterproof ink. All sample containers will be custody-sealed prior to storage and shipment to an analytical laboratory. Custody seals will be placed on the containers such that they cover both the lid and the sample container. Care will be taken not to cover the septum of VOA vials. Immediately after collection, sample bottles requiring preservation will be stored in an insulated cooler containing double bagged ice or ice packs. Sample labels will also be protected with a covering of clean tape prior to shipment. Samples and associated chain of custody documentation will be sent to the analytical laboratory via messenger or overnight courier.

The samples from USTs 2 and 4 will be analyzed via the TCLP methodology as well as for RCRA characteristics. The samples from USTs 1, 3, 5, 6, 7, and 8 will be analyzed for TCL\TAL compounds using SW-846 analytical methodologies. The data package will correspond to a QA2 objective deliverable package. The samples will be accompanied by the appropriate QA/QC samples including matrix spike, matrix spike duplicate, duplicates, field blanks and trip blanks. A summary of the number of samples, including QA/QC samples is provided in Table 4-1.

In addition, the samples will be tested for BTU's, total halogens, percent sulfur, percent solids, percent water, pH, flash point and cyanide reactivity. This latter suite of analyses will be useful to assess whether fuel blending is an option if the contents of one or more USTs have to be removed.

### *4.1.2 Transformer Area Soil*

There are four transformer areas which will be addressed as part of the Removal Action. These areas are designated PCB-1, PCB-2, PCB-3, and PCB-4. Soil sampling will be conducted at each area to determine the extent of PCBs in soil at concentrations of 10 ppm or greater. Initially, field screening of soil samples using immunoassay detection will be done to ascertain the areal and vertical extent of potential PCB contamination in this medium at or above 10 ppm. Together with subsurface samples collected for field screening, the areal and vertical extent of potential PCB concentrations in soil of 10 ppm or greater will be defined. Approximately 25% of the soil samples collected for field screening will be sent to the laboratory for confirmation analysis. The selected samples will be biased toward those which indicate PCB concentrations less than 10 ppm with a few samples from areas exhibiting higher-end potential concentrations.

The samples will be collected at reference points within a grid established at each PCB location. The sampling grid, which will consist of 10-foot by 10-

foot spacing, is described in Section 2.3.3 of the WP. Discrete surface soil samples will be collected from the 0 to 6-inch soil interval with a decontaminated stainless steel trowel. The samples will each be homogenized in a decontaminated stainless steel bowl, then split and stored in two sets of sample bottles prepared by the laboratory and certified clean by the manufacturer or laboratory. One-half of the sample from each interval will be subjected to field screening while the other half will be stored for potential selection for laboratory analysis. The samples that may be selected for analysis will be tagged, labeled and custody sealed as described in Section 4.1.1 and then stored in an insulated cooler containing double bagged ice or ice packs to maintain them at 4°C.

If the field screen of the surface sample indicates potential PCB concentrations of 10 ppm or greater, then sampling will extend downward and outward. Two more samples will be collected: one from the 6- to 12-inch soil interval below the first sample, and one at the 0- to 6-inch soil interval at the next grid spacing location. These samples will also be collected with a decontaminated stainless steel trowel, and homogenized, bottled and field screened as described above. Each time a sample is determined to have a potential PCB concentration of 10 ppm or greater, sampling will again extend vertically downward, and outward at the designated grid intervals. This iterative process will continue until the areal extent of potential PCBs in soil with concentrations of 10 ppm or greater is ascertained. Samples collected at depths in excess of 12 inches will be collected using a decontaminated hand auger.

***Field Screening Methodology***

The field screening technique will be a Millipore EnviroGard field test, or equivalent, following the procedures set forth in draft EPA Method 4020. Method 4020 is a procedure for screening soils to determine when total PCBs are present at concentrations above five milligrams per kilogram (mg/kg). Method 4020 provides an estimate for the concentration of PCBs by

comparison with a standard. In general, this method is performed using an extract of a soil sample. Samples and an enzyme conjugate reagent are added to an immobilized antibody. The enzyme conjugate "competes" with PCBs present in the sample for binding to an immobilized PCB antibody. The test is interpreted by comparing the response produced by testing a sample to the response produced by testing standards simultaneously. The absorbance signal (optical density) of the final reaction mixture is inversely proportional to the concentration of PCB present in the original sample.

The following directions for the assay procedure are specifically for use with the EnviroGard PCB Test Kit with PCB calibrators (ENVR 000 09).

**Collect/Store the Sample**

1. Collect soil in appropriately-sized and labeled containers.

2. Remove excess twigs, organic matter and rocks or pebbles from the sample.

3. Soils obtained from areas adjacent to standing water, surface soils collected during or immediately after rain or snow, or any soils with relatively high amounts of water (> 30 percent by weight) should be dried overnight before testing.

4. Store soil samples at 4°C or room temperature for up to one month. Recommended soil storage for EPA method 8080 is at 4°C.

**Prepare the Sample/Extract the Soil**

1. Use the portable balance and weigh a boat to measure out five grams of soil:
   - Place the balance on a level surface and press ON/MEMORY.
   - Place the weigh boat on the balance and press TARE.
   - Weigh the soil.

2. Transfer the five grams of soil into an appropriately labeled, 30 milliliter (ml) polypropylene vial. If you are testing more than one soil sample, cap the vial loosely and repeat steps 1 and 2 until all soil samples have been weighted out. Use a clean weigh boat for each sample.

3. Position the Repeater pipettor at setting 5 and use a 50 ml pipette tip to pipette 5 ml of methanol into each soil sample.

4. Cap all vials tightly and shake vigorously for approximately two minutes. Let the contents settle briefly.

5. Pour the liquid contents of each vial into the appropriately labeled, lower (sample tube) piece of the filter base unit. In order to obtain K filtering efficiency, do not let more than one or two mixing beads slip into the filter device.

   Note: When extracting clay samples, it is possible that all of the methanol will be soaked up by the soil, leaving little or no excess liquid to decant. If this should happen, add an additional five ml of methanol to the sample, cover, and shake vigorously for an additional one to two minutes. Continue on to step 6. Make sure to factor the dilution into the calculations.

6. Insert a polyethylene frit into the outside, capped filter at each end of plunger unit.

   Note: It is not necessary to use the frit for a number of soil types; however, doing so improves filtration efficiency.

7. Insert the plunger into the filter base unit.

8. Push down on the plunger. After 30 to 60 seconds, push down on the plunger again.

9. For longer term or spill-safe storage, remove the cap from the plunger and carefully pour the sample extract into an appropriately labeled 4-ml glass vial. Cap the vial. Repeat this step for each of the sample extracts.

**Perform the Test**

1. Label the 12 mm x 75 mm test tubes ( no more than 20 tubes/assay; it is not necessary to perform the assay in duplicate, however, doing so increases the precision).

| Tube Label | Tube Contents |
|---|---|
| NC | Negative Control (optional control for quality control purposes) |
| 5 ppm | 5 ppm positive assay calibrator* |
| 10 ppm | 10 ppm positive assay calibrator |
| 50 ppm | 50 ppm positive assay calibrator |
| S1 | Sample 1 |
| S2 | Sample 2 |

** The selection of the appropriate positive assay calibrators will depend on the application and specific screening requirements.

Place the test tubes in the test tube rack and push down on each tube so that it is held firmly and will not fall out when shaken.

Caution: Do not "snap" the test tubes into the rack as this may result in a cracked tube.

2. Using the positive displacement pipettor, add 5 microliters (µl) of Negative Control (methanol) to the "NC" test tubes. Choose an appropriate calibrator (5 ppm, 10 ppm, or 50 ppm) and add it to the corresponding test tubes as follows:

   - 5 µl of the 5 ppm calibrator to the "5 ppm" test tubes
   - 5 µl of the 10 ppm calibrator to the "10 ppm" test tubes
   - 5 µl of the 50 ppm calibrator to the "50 ppm" test tubes
   - 5 µl of each sample extract to the appropriately labeled sample test tubes.

   Caution: Replace the cap(s) on the calibrator vials immediately after use to minimize evaporation.

3. Position the Repeator Pipettor at setting 2 and use the 12.5 ml syringe to add 50 µl of Assay Diluent to all test tubes. Briefly shake the test tube rack to mix, then incubate for five minutes.

4. Vigorously shake out the test tube contents into a sink or suitable container. Fill the test tubes to overflowing with cool tap or distilled water, then decant and vigorously shake out the remaining water.

   Repeat this wash step three more times, being certain to shake out as much water as possible on each wash. After the final wash, remove as much water as possible by tapping the inverted tubes on absorbent paper.

5. Position the Repeater pipettor at setting 2 and use the 5 ml syringe to add 200 µl of the PCB enzyme-conjugate to all test tubes. Briefly shake the test tube rack to mix, then incubate for five minutes.

6. Vigorously shake out the test tube contents into a sink or suitable container. Fill the test tubes to overflowing with cool tap or distilled water, then decant and vigorously shake out the remaining water.

Repeat this wash step three more times, being certain to shake out as much water as possible on each wash. After the final wash, remove as much water as possible by tapping the inverted tubes on absorbent paper.

7. Position the Repeator pipettor at setting 2 and use a clean 5 ml syringe to add 200 µl of substrate to all test tubes. Using a clean 5 ml syringe, follow immediately with 200 µl of Chromogen to all test tubes.

   Caution: The substrate must be added before the Chromogen. Do not reverse this order.

   Briefly shake the test tube rack to mix, then incubate for five minutes.

8. Position the Repeator pipettor at setting 2 and use a 12.5 ml syringe to add 500 µl of Stop Solution to all test tubes

   Warning: Stop Solution is 1.0 N sulfuric acid. Handle carefully.

9. Add 1.0 ml of Stop Solution to the blank test tube and insert the tube into the left well of the spectrophotometer. Dry the outside of each assay tube and measure the absorbance by placing each tube into the right well of the spectrophotometer. Record the absorbance of each tube.

**Interpret the Results**

- Samples with $OD_{450}$ values $\geq$ $OD_{450}$ of the 5 ppm positive assay calibrator contain less than 5 ppm PCB.
- Samples with $OD_{450}$ values $\leq$ $OD_{450}$ of the 5 ppm positive assay calibrator may contain more than 5 ppm PCB.
- Samples with $OD_{450}$ values $\geq$ $OD_{450}$ of the 10 ppm positive assay calibrator contain less than 10 ppm PCB.
- Samples with $OD_{450}$ values $\leq$ $OD_{450}$ of the 10 ppm positive assay calibrator may contain more than 10 ppb PCB.
- Samples with $OD_{450}$ values $\geq$ $OD_{450}$ of the 50 ppm positive assay calibrator contain less than 50 ppm PCB.
- Samples with $OD_{450}$ values $\leq$ $OD_{450}$ of the 50 ppm positive assay calibrator may contain more than 50 ppm PCB.

Soil samples that were extracted with more than 1.0 ml of methanol per gram of soil (e.g., for clay samples) require a correction factor in order to interpret the results. Multiply each of the calibrator concentrations by the ration of methanol (ml) to soil (grams).

For technical assistance from the field, call Millipore at 800-225-1380.

Seven samples will be collected from PCB-1 for field screening. Twenty-eight samples will be collected from PCB-2, 16 samples from PCB-3 and 40 samples from PCB-4.

***Laboratory Methodology***

Approximately 25% of the samples that are field screened with the immunoassay test for potential PCB contamination will be sent to a laboratory for confirmation analysis (except for PCB-1 where four of the seven samples will be sent for confirmation analysis). The samples will be collected concurrently with the field screening samples as described above. They will be stored in laboratory prepared sample bottles. These bottles will be certified by the supplier or laboratory to be clean. All samples collected will be tagged and labeled by the sampler using waterproof ink. All sample containers will be custody-sealed prior to storage and shipment to an analytical laboratory. Custody seals will be placed on the containers such that they cover both the lid and the sample container. Immediately after collection, sample bottles will be stored in an insulated cooler containing double bagged ice or ice packs. Sample labels will also be protected with a covering of clean tape prior to shipment. Samples and associated chain of custody documentation will be sent to the analytical laboratory via messenger or overnight courier.

The samples will be analyzed for TCL PCBs using SW-846 Method 8080. The data package will correspond to a QA2 objective deliverable package. The samples will be accompanied by the appropriate QA/QC samples including matrix spike, matrix spike duplicate, duplicates, field blanks and trip blanks. A

summary of the number of samples, including QA/QC samples, is provided in Table 4-1.

In addition, one composite sample from each PCB location (comprised of the samples collected for confirmation laboratory analysis) will be collected for TCLP analysis and RCRA characteristics in accordance with SW-846 analytical methodologies (see Table 6-5).

### *4.1.3 Transformer Area Concrete Pads*

Three of the designated PCB areas, PCB-1, PCB-2 and PCB-3, contain a concrete pad. In fact, the EPA soil sample collected from PCB-1 was reportedly of soil present on the surface of the concrete pad at that location. During the sampling of soil at each of these PCB locations, soil that is present on the surface of the concrete pad beneath the transformers will be collected and subject to field screening using the above-mentioned immunoassay test to determine the potential PCB concentration.

Once the soil has been removed from the pad, two to six wipe samples of the porous concrete surface will be collected. A 100 $cm^2$ template will be used to designate the sample boundaries at each sample location on the concrete pad surface. A moistened filter pad or gauze will be used to wipe the surface of the pad. Once the sampling is completed, the wipes will be placed in a clean glass jar which has been prepared and sent by the laboratory. These jars will be certified by the supplier or laboratory to be clean. All samples collected will be tagged and labeled by the sampler using waterproof ink. All sample containers will be custody-sealed prior to storage and shipment to an analytical laboratory. Custody seals will be placed on the containers such that they cover both the lid and the sample container. Immediately after collection, sample bottles will be stored in an insulated cooler containing double bagged ice or ice packs. Sample labels will also be protected with a covering of clean tape prior

to shipment. Samples and associated chain of custody documentation will be sent to the analytical laboratory via messenger or overnight courier. These wipe samples will be analyzed for TCL PCBs in accordance with current SW-846 analytical methodologies.

### *4.1.4 Drum Contents*

The 18 55-gallon drums contained in the acetone building will be opened and inspected. Based on information contained in EPA/'s Removal Site Evaluation Report (October 1993), eight of the drums are empty. Therefore, it is expected that 10 drums will be sampled.

Prior to sampling, an inventory of all drums will be completed and the information recorded on drum logs. The log will contain details pertaining to the drum number, drum size, drum composition, drum condition and drum type (bung, ring top, etc.) All written or printed information on the drum or drum label will be recorded onto the drum log to assist with future identification of the drum contents. A separate log will be kept for each drum.

To access each drum, its bung will be opened and a disposable polyethylene sampler will be inserted into the center of the liquids to be sampled. The exterior of the sampler will be wiped with a disposable absorbent pad as it is retrieved. The objective will be to collect a sample representative of the liquid column to ensure any stratified layers are included for analysis. The sample will be placed in laboratory prepared bottles, certified by the supplier or laboratory to be clean. All samples collected will be tagged and labeled by the sampler using waterproof ink. Upon retrieval, a sample aliquot will also be placed into a sample bottle for field characterization and compatibility testing. The sample bottle for compatibility testing will be numbered and stored on top of the respective drum.

At this point in the sampling activities, the sample will be recorded on the drum log all information about the drum contents, including phase (liquid, solid, sludge), color, percent full, and if multiple phases are present will be recorded on the drum log. The sampler will also record the date and time the sample is taken, ambient temperature, sample number, sampler's name, and any other appropriate information.

A compatibility check-list will be used during compatibility testing. The checklist will include information about the sample number, corresponding drum number, date, time, temperature and the name of the person completing the compatibility testing. It should also contain information about the phase, state and color of the sample, and if multiple phases exist. If multiple phases exist, a separate compatibility test will be necessary for each phase.

Compatibility testing will include field test for water and hexane solubility, water reactivity, pH, oxidizer, flammability/combustibility, cyanide, sulfide, chlorine, and PCBs.

Materials that are hexane soluble and/or flammable/combustible will be considered organic. Organic materials will be tested for pH (organic acids) and chlorine. Additionally, the contents of the three drums not sampled by EPA during the RSE will be field screened for PCBs considering the nature of the Site. If PCBs are found, the liquids will not be consolidated with other wastes in order to avoid increasing disposal costs. Organic materials not containing corrosives or chlorine can be bulked together.

Water soluble materials that are not flammable or combustible will be tested for pH, oxidizer, cyanide and sulfide. Materials found to contain oxidizers, cyanides or sulfides will be kept separate. Water soluble liquids can be bulked together as acid liquids (pH 0 to 2), neutral liquids (pH 3 to 11) or base liquids (pH 12 to 14). In all cases liquids will be kept separate from solids.

Prior to making a determination of the chemical compatibility of a substance, field personnel will take into account all information available, including markings on the container, Site history, and results of chemical testing.

A single composite sample will be prepared of the contents of drums deemed to contain compatible material. Based on existing information, it is likely that one composite sample will be prepared. The sample container will be custody-sealed prior to storage and shipment to an analytical laboratory. Custody seals will be placed on the container such to cover both the lid and the sample container. Immediately after collection, the sample bottle will be stored in an insulated cooler containing double bagged ice or ice packs. A sample label will also be protected with a covering of clean tape prior to shipment. The sample and associated chain of custody documentation will be sent to the analytical laboratory via messenger or overnight courier.

The composite drum sample will be analyzed for TCLP using SW-846 analytical methodologies. The purpose of this sampling is simply to evaluate disposal options. In addition, the samples will be tested for BTU's, total halogens, percent sulfur, percent solids, percent water, pH, flash point and cyanide reactivity. This latter suite of analyses will be useful to assess whether fuel blending is an option for subsequent disposal/recycling of these materials. A summary of the number of samples, including QA/QC samples is provided in Table 4-1.

### *4.1.5 Transformer Fluids*

There are nine transformer units at two locations designated PCB-1 and PCB-3. Some of the units at these locations were active at the time of the ERM Northeast Site inspection. After the electrical power to these transformers has been locked out and the units de-energized, a sample of dielectric fluid will be collected using either a disposable glass or polyethylene Coliwasa or thief, or equivalent method.

If a sample device is lowered into the fluid in the unit, the exterior of the sampler will be wiped with a disposable absorbent pad as it is retrieved. Once retrieved, the sample will be transferred into laboratory prepared sample bottles which have been certified by the supplier or laboratory to be clean. All samples collected will be tagged and labeled by the sampler using waterproof ink. All sample containers will be custody-sealed prior to storage and shipment to an analytical laboratory. Custody seals will be placed on the containers such that they cover both the lid and the sample container. Immediately after collection, sample bottles will be stored in an insulated cooler containing double bagged ice or ice packs. Sample labels will also be protected with a covering of clean tape prior to shipment. Samples and associated chain of custody documentation will be sent to the analytical laboratory via messenger or overnight courier.

The nine samples will be analyzed for TCL PCBs using SW-846 Method 8080. The data package will correspond to a QA2 objective deliverable package.

## *4.2 DATA REPORTING*

Data reporting practices will be followed to insure that raw data are not altered and that an audit trail is developed for those data which require reduction. All the field data, such as those generated during field measurements, observations and field instrument calibrations, will be entered directly into a bound field notebook. Each project team member will be responsible for proofing all data transfers made, and the Field Team Leader will proof at least 10% of all data transfers.

One or more bound books will be maintained for the site; each book will be consecutively numbered. The book(s) will remain with the Site file. Copies will be made for the Project Coordinator and for the person who made the entries if requested.

All entries in the Logbook will be made using permanent ink. Logbook entries will include but not be limited to the following:

First Page:

- Site Name and number
- Date and time started
- Personnel on site - daily site entry/exit logs and hot zone entry/exit logs must be maintained of personnel at the Site containing their respective signatures and place of employ.

Subsequent Pages:

- Detailed description of investigative activities including drilling, well construction, sampling; on-site meetings, including a record of persons attending containing their signatures and place of employ; the duration of these activities; and any problems encountered
- Documentation of all personnel monitoring results (e.g. PID readings). Site monitoring is discussed in detail in Section 4.2 of the Health and Safety Plan (HASP), as follows: site monitoring instruments - Section 4.2.1; site monitoring frequency - Section 4.2.2; and site monitoring action levels - Section 4.2.3.
- List of personal protection used and decontamination procedures, as discussed in the following sections of the HASP: personal protective equipment - Section 4.1; levels of protection for Site operations - Section 4.3; decontamination procedures for prescribed levels of protection - Section 5.3.
- Details of all samples obtained as detailed below (referenced to field logs if necessary)
- All other pertinent daily activities
- Weather - time of observation, temperature, wind direction and approximate velocity, cloud cover and precipitation, if any.

Each new day will contain:

- Date and time started
- Weather - time of observation, temperature, wind direction and approximate velocity, cloud cover and precipitation, if any.
- Personnel on-site - daily site entry/exit logs and hot zone entry/exit logs must be maintained of personnel at the Site containing their respective signatures and place of employ.
- Activity information
- Entries will be signed and dated at the bottom of each page and at the end of each day by the individual recording logbook entries. Documentation by the record keeper in the logbook must be made when transferring control of the logbook to another individual.

*Note: When a mistake is made in the log, it will be crossed out with a single ink line and will be initialed and dated.

Special care will be taken in the description and documentation of sampling procedures. Sampling information to be documented in the field notebook and/or associated forms are as follows:

- Sample #
- Date and Time Sample collected
- Source of Sample (well, stream, domestic well, borehole, etc.)
- Purged Well - type of equipment, purge volume, rate of purge, and decontamination procedures
- Location of Sample - document with a site sketch and/or written description of the sampling location so that accurate resampling can be conducted if necessary
- Sampling equipment (bailer, trowel, split spoon, thief, etc., and indicate if equipment is dedicated or decontaminated)
- Analysis and QA/QC required

- Number and types of sample containers used per matrix sampled; if sample was designated for MS/MSD or laboratory duplicate analysis
- Documentation concerning collection of blank samples (field, trip, and/or rinsate)
- Chemical preservation used ($HNO_3$, $H_2SO_4$, NaOH, etc.)
- Field data measurements (pH, temperature, conductivity, etc.)
- Field analytical equipment and other measuring equipment used (including serial numbers)
- Field instrument calibration including date of calibration, standards used and their source, results of calibration, any corrective actions taken, name of individual performing the calibration, date and time of day.
- Field observations - all significant observations will be documented
- Site condition (stressed vegetation, exposure of buried wastes, erosion problems, etc.)
- Sample condition (color, odor, turbidity, oil, sheen, etc.)
- Indication if more than one phase of a sample was collected from a given sampling location, and/or whether the sample is a composite or a grab sample. (Note: Collection of additional sample volume will be required when collecting a sample that consists of more than one phase.)
- Sample shipping procedure, date, time, destination and if custody seals were properly attached to sample containers and transport container(s)
- Comments - Any observation or event that occurred that would be relevant to the site; for example: weather changes and effect on sampling, conversations with the client, public official or private citizen; and instrument calibration, equipment problems, and field changes.

Upon receipt of the sample data packages, the laboratory data will be quantitatively and qualitatively validated by the contractor performing the work. The laboratory will supply all required data deliverables to enable validation of the data. Data validation is discussed in detail in Section 9.1.

The laboratory reports will contain results of field duplicates, matrix spike (MS) and matrix spike duplicates (MSDs) for the organic and inorganic fractions.

## *4.3 SAMPLE CUSTODY PROCEDURES*

The primary objective of the sample custody procedures is to create an accurate written record which can be used to trace the possession and handling of all samples from the moment of their collection, storage, through analysis, and until their final disposition. Sample custody for samples collected during this investigation will be maintained by the Project Coordinator on-site designee referred to as the Field Team Leader (FTL) or the field personnel collecting the samples. The FTL or field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory. When transferring the custody of samples, the individuals relinquishing and receiving will sign, date and note the time on the chain-of-custody form. This record documents sample custody transfer from the sampler, through the shipper, to the analytical laboratory. Any errors on the chain-of-custody form will be crossed through with a single line, initialed and dated.

A sufficient volume of sample will be placed in the appropriate laboratory-grade bottles for use as sample containers. All necessary chemical preservatives will be added to the bottles prior to the sampling event or immediately upon collection. Where applicable, indicator paper sensitive to pH 2 will be used to determine whether sufficient chemical preservative has been added to a sample requiring preservation to less than or equal to (≤) pH 2. In

order to avoid dipping the indicator paper into the sample container to measure pH, the amount of preservative to be added to any VOA vials will be determined prior to sample collection by adding the preservative to a sample test vial. If effervescence or problems with headspace in a VOA vial is caused by chemical preservation, it will be noted in the field logbook. The field logbook will also contain information as to whether preservatives were used, and if appropriate, the preservative used.

Custody of the sample bottles will be maintained by the FTL. Sample bottles needed for a specific sampling task will then be relinquished by the FTL to the sampling team after the FTL has verified the integrity of the bottles and that the proper bottles have been assigned for the task.

A self-adhesive sample label will be affixed to each container before sample collection. The sample label will contain the following information:

- Project ID (or number if anonymity of the Site is to be preserved)
- Laboratory Name
- Sample ID Number
- Sample Location or Field ID
- Sample Matrix
- Designation of sample as grab or composite
- Date and Time of Sample Collection
- Parameters to be Tested for
- Indicate if samples are designated for MS/MSD analyses
- Preservative Added and Resulting pH
- Signature of Sampler

Samples will be placed immediately into an insulated cooler. Samples will be hand-delivered or shipped via overnight courier to the analytical laboratory within 24 hours of collection. Field Chain-of Custody records (Figure 4-1) completed at the time of sample collection will accompany the samples inside

the cooler for shipment to the laboratory. These record forms will be sealed in a ziplock plastic bag to protect them against moisture. A copy of the chain-of-custody record will be retained by the FTL or other designated individual. The chain-of-custody form will sufficiently identify blanks to prevent their use by the laboratory for QC analyses, and samples designated for MS/MSD analyses. Each cooler will contain sufficient ice packs to insure that a 4°C temperature is maintained, and will be packed in a manner using vermiculite or other absorbent non-hazardous material to prevent damage to sample containers. Sample coolers will be sealed with nylon strapping tape and the FTL will sign and date custody seals placed at the front right and back left of the sample cooler in such a way that any tampering during shipment will be detected. A sample of the custody seal is shown in Figure 4-2.

Any coolers to be shipped via overnight courier will conform to current US DOT regulations. To maintain the chain-of-custody through shipping, the name of the courier service will be entered in the bill of lading in the section marked "Received by". Upon receiving the samples, the Sample Custodian at the selected laboratory will inspect the condition of the samples, compare the information on the sample labels against the field Chain-of-Custody record, assign a laboratory control number, and log the control number and date of sample receipt into the computer sample inventory system. The Sample Custodian will then store the sample in a secure sample storage cooler maintained at 4°C and maintain custody until the sample is assigned to an analyst for analysis. The following stages of analysis must be documented by the laboratory: sample extraction/preparation, sample analysis, data reduction, and data reporting. Custody will be maintained until disposal of the analyzed samples.

The Sample Custodian at the selected laboratory will note any damaged sample vials, void space within the vials, or discrepancies between the sample label and information on the field Chain-of-Custody record when logging the sample. This information will also be communicated to the FTL or field personnel so

proper action can be taken. The Chain-of-Custody form will be dated and signed by both the relinquishing and receiving parties and the reason for transfer indicated each time the sample changes hands.

An internal Chain-of-Custody form will be used by the selected laboratory to document sample possession from laboratory Sample Custodian to Analysts and final disposition. All Chain-of-Custody information will be supplied with the data packages for inclusion in the document control file. Identifying tags, labels, data sheets, chain-of-custody forms, and other laboratory records will be retained until analyses and quality assurance checks are completed.

## *4.4 PREVENTIVE MAINTENANCE*

Field equipment will be maintained through the use of a tracking system. Each piece of equipment will carry a tag which identifies the date of the most recent maintenance, and/or battery charge, and the condition. When equipment is damaged or in need of repair it will be immediately and appropriately flagged for the required maintenance to be performed. This process ensures that only operable and maintained equipment enters the field. Maintenance procedures on-Site will be only those necessary for keeping an instrument in service or in preparation for everyday use. Routine daily maintenance procedures conducted in the field will include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems.
- Protection of equipment from adverse weather conditions.
- Daily inspections of sampling equipment and measurement systems for possible problems such as cracked or clogged lines or tubing or weak batteries.
- Daily checks of instrument calibration.
- Charge battery packs for equipment that is not in use.
- Lubrication of moving parts.

- Cleaning of field instruments as per the manufacturers' instructions.
- Formalized record-keeping of all maintenance work performed on each piece of equipment.

Spare and replacement parts that are required to be stored in the field to minimize downtime include:

- Appropriately sized batteries.
- Locks.
- Extra sample containers and preservatives.
- Extra sample coolers, packing material, and sample location stakes.
- Additional supply of health and safety equipment (e.g., respirator cartridges, boots, gloves, tyvek, etc.).
- Additional equipment as necessary for the field tasks.

## *4.5 DECONTAMINATION*

Decontamination of all field investigation and sampling equipment will follow guidelines established in the USEPA Region II CERCLA Quality Assurance Manual, Final Copy, October 1989. A summary of the decontamination procedures is as follows:

1. Heavy Equipment (drill rigs, etc.) - All heavy equipment will be decontaminated in accordance with ASTM D-5088-90. The drilling equipment will be steamed cleaned with potable water before entering the study area. All down-hole equipment (auger flights, rods, etc.) will be steam-cleaned between uses at each location. Equipment will be scrubbed manually to remove heavy soils prior to steam-cleaning. Clean drilling equipment will be stored on-site and covered with plastic until use.

2. Sampling Equipment (knives, hand-auger, bowls, bailers) - All sampling equipment will be cleaned before each use by washing with solutions in the following order:

- wash and scrub with low-phosphate detergent;
- tap water rinse;
- rinse with 10% nitric acid ($HNO_3$), ultrapure, (for carbon steel split spoons use 1% nitric acid rinse;
- tap water rinse;
- acetone only rinse, or methanol followed by hexane (pesticide grade or better);
- thorough final rinse with demonstrated analyte-free deionized water (volume used must be three to five times the volume of solvent used in the previous step;
- air dry;
- wrap in aluminum foil for transport or until use.

If samples are not being collected for determination of inorganic analytes, the 10% nitric acid rinse may be omitted. Conversely, if samples are not being collected for determination of organic constituents, the solvent rinse step may be omitted. The tap water may be obtained from any municipal water treatment system. The laboratory will supply the analyte-free distilled, deionized water the analytical results of which will be available for review by EPA. The criteria for analyte-free water is as follows:

| | |
|---|---|
| Inorganics | < MDL |
| Purgeable Organics | < EQL |
| Semi-Volatile Organics | < EQL |
| Pesticides | < EQL |
| PCBs | < EQL |

The assigned values can be found in Tables 6-2 through 6-4 of this document. Analytical testing is required of the blank water to be demonstrated as analyte-free and must be performed prior to the start of sample collection. The results

should be sent to the Project Coordinator assigned to the Site or kept on-Site for review by EPA personnel during a field audit.

3. Meters and Probes - All meters and probes that are used in the field will be cleaned routinely as per the manufacturer's instructions. In addition, probes such as those used in pH and conductivity meters will be decontaminated between uses by rinsing with analyte-free deionized water in accordance with the EPA Region II CERCLA QA Manual (October, 1989).

Sampling equipment and probes will be decontaminated in an area covered by plastic near the sampling location. All sample collection, handling and shipping information will be recorded in the field notebook (see Section 4.2.). Decontamination procedures will also be documented in the field notebook.

Waste wash water from sample equipment decontamination will be containerized in a drum, labelled and placed in the drum storage area to be defined at the onset of the field work. Waste solvents or acids used in sample equipment decontamination will be placed in a separate container and stored in the drum storage area. As part of the second phase removal activities, these decontamination liquids will be removed from the site after undergoing disposal classification analysis.

## *4.6 CORRECTIVE ACTION*

Field quality assurance activities will be reported to the Project Coordinator. Problems encountered during the study that may affect quality assurance will be reported on the example Corrective Action form shown in Figure 4-3. The Field Team Leader will be responsible for initiating the corrective actions and for insuring that the actions are taken in a timely manner, and that the desired results are produced. The Field Team leader will report to the QA/QC Officer and the Project Coordinator on all necessary corrective actions taken, the

outcome of these actions, and their affect on data produced. All corrective action taken will be reported to the OSC.

## *4.7 SCHEDULE*

The Removal Action schedule is discussed in detail in Section 5.0 of the WP. The Order sets forth a maximum time frame of 180 days from the signing of the Order for completing the Removal Action. This time period equates with approximately 26 weeks.

Implementation of the Sampling and Analysis Plan is expected to take approximately three weeks, which will include the UST, drum, soil and transformer liquid sampling described in Section 3.0.

A six week time frame is being allotted for laboratory analysis and data validation following the conclusion of samples and analysis plan implementation. This time period allows for completion of laboratory tests to characterize the materials which are sampled as part of this Removal Action. It also includes time for data validation once received from the laboratory, where appropriate.

## 5.0 *PROJECT ORGANIZATION AND RESPONSIBILITIES*

While all personnel involved in the Removal Action and in the generation of data are implicitly a part of the overall project and QA/QC Plan, certain individuals have specifically designated responsibilities. Persons with specific quality assurance roles in the Removal Action are the Project Coordinator, Field Team Leader and the QA/QC Officer.

## 5.1 *PROJECT COORDINATOR*

The Project Coordinator is responsible for the overall direction of the Removal Action. The responsibilities of the Project Coordinator will include technical review, resolution of technical issues and client and agency interactions. The Project Coordinator is also responsible for overseeing the field investigation and removal activities, schedule and budget maintenance, reports to the EPA On-Scene Coordinator (OSC) and review of the project deliverables.

## 5.2 *FIELD TEAM LEADER*

The Field Team Leader (FTL) is the on-site representative of the Project Coordinator and is appointed to act in a supervisory capacity over the Removal Action work. The FTL is responsible for ensuring that quality assurance responsibilities are carried out during the Removal Action activities

## 5.3 *QUALITY ASSURANCE/QUALITY CONTROL OFFICER*

The Quality Assurance/Quality Control (QA/QC) Officer will report to the Project Coordinator and will be responsible for the implementation of this QA/QC Plan. This individual will also be responsible for maintaining quality control on all aspects of the project from sampling to report preparation. The QA/QC Officer will also interface with the laboratory to address issues which may arise in the laboratory's performance of the specified analytical

methodologies pursuant to desired protocols. This individual will also oversee the data validator who will be responsible for auditing and validating all analytical data generated during the Removal Action.

## 6.0 *QUALITY ASSURANCE REQUIREMENTS*

### 6.1 *OVERALL PROJECT QUALITY REQUIREMENTS*

This section describes the appropriate data quality indicators and QA/QC protocols, based on the QA/QC objectives described in Section 3.2, which will be followed in the evaluation of laboratory data packages. The data quality indicators for each QA objective are listed in Table 6-1.

Overall data quality will be maintained by careful adherence to the QA objectives. Data accuracy, precision and completeness will be closely monitored by maintaining thorough documentation of all decisions made during each phase of sampling, performing field audits, thoroughly reviewing and validating the analytical data as it is generated by the laboratory, and providing appropriate feedback as problems arise in the field or at the laboratory.

### 6.2 *FIELD QUALITY REQUIREMENTS*

To ensure that all field data are collected accurately and correctly, specific instructions will be issued to all personnel involved in field data acquisition by the Project Coordinator. The QA/QC Officer will also perform a field audit during an initial round of sampling to document that the appropriate procedures are being followed with respect to sample and blank collection. These audits will include a thorough review of the field books used by the project personnel to ensure that all tasks were performed as specified in the instructions. The field audits will necessarily enable the data quality to be assessed with regard to the field operations.

The evaluation of field blanks, and other field QC samples will provide definitive indications of the data quality. If a problem arises, corrective actions can be instituted for future field efforts.

## 6.3 *ANALYTICAL PROCEDURES*

USTs will be sampled for TCLP, RCRA characteristics, TCL\TAL compounds, BTU's, total halogens, percent sulfur, percent solids, percent water, pH, flash point and cyanide reactivity. Transformer Area Soils will be field screened for potential PCB contamination and sampled for TCL PCBs, TCLP analysis and RCRA characteristics. Wipe samples will be collected from transformer area concrete pads and analyzed for TCL PCBs. Drum contents will be sampled for TCLP, BTU's, total halogens, percent sulfur, percent solids, percent water, pH, flash point and cyanide reactivity. Transformer fluid samples will be analyzed for TCL PCBs.

Field screening will be conducted using a Millipore EnviroGard field test, or equivalent, following the procedures set forth in draft EPA Method 4020. TCL PCBs will be analyzed using SW-846 Method 8080. The TCLP extractions will be done in accordance with SW-846 Method 1311. The resulting extracts will be analyzed for TCL organics via Methods 8240A, 8270A, and 8080 and the TAL inorganics will be determined by Methods 6010A and 7470. The parameters, method detection limits, estimated quantitation limits and regulatory limits are shown in Table 6-2. Most analyses will be done in accordance with SW-846 protocols. Other methodologies for the additional parameters BTUs, percent sulfur, percent solids and percent water are listed in Table 6-5.

The analytical parameters and method detection limits and estimated quantitation limits for the TCLP and TCL/TAL analyses are shown in Table 6-2, Table 6-3 and Table 6-4. It is proposed that the method detection and estimated quantitation limits for the specified SW-846 methods be used for TCL and TAL. A summary of the UST, soil, transformer, and drum sampling programs, analytical methods, preservatives, holding times and containers are shown in Table 6-5 and Table 6-6.

## 7.0 *ERROR DETERMINATION*

Methods for determining analytical and total error are defined by EPA in the EPA Quality Assurance/Quality Control Guidance for Removal Activities - Sampling QA/QC Plan and Data Validation Procedures, Interim Final, April 1990 (hereafter referred to as "QA/QC Guidance document). It is not necessary to determine error for QA1. Any one of three methods can be used to determine error for QA2: matrix spike samples, site background samples or site action level samples (field duplicates). Each of these sample types is described in the sections that follow.

## 7.1 *MATRIX SPIKE SAMPLES*

For a QA2 objective and for those parameters requiring matrix spike/matrix spike duplicate (MS/MSD) analyses, each sample delivery group (SDG) will consist of a maximum of 20 samples with a minimum of one sample per matrix, analytical parameter, and concentration level designated for MS/MSD analyses. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD analyses. For the inorganic fraction, soil MS/MSD samples require no extra volume for VOCs or extractable organics. However, aqueous MS/MSD samples must be collected at triple the volume for VOCs and double the volume for extractable organics.

All laboratory samples will be labeled with the sample number and a notation will be made on the sample label and chain-of-custody form which sample is also to be used for laboratory quality control. The purpose of these samples is to evaluate the effect of possible matrix interferences on the sample results.

## 7.2 *SITE ACTION LEVEL SAMPLES*

For a QA2 objective, each SDG will consist of a maximum of 20 samples with one sample per matrix, analytical parameter, and concentration level designated for field duplicate analysis. Field duplicate results will be used to assess the precision of the sample results. They will be used to monitor overall precision, including the ability to reproduce sampling and analytical procedures, as distinct from the precision of analyses of laboratory replicates.

Blanks can be powerful indicators of and monitors for potential contamination problems. The results of QC blank analyses can provide detailed, quantitative, method- and analyte-specific information on additive effect contamination. Contaminants can come from many sources, most of which fall into one of four basic categories: the ambient environment; reagents; apparatus; and the operator.

The following QA/QC samples will also be collected and analyzed as part of the removal activities:

*Trip Blanks* - When sampling for VOCs, a trip blank, consisting of demonstrated analyte free water sealed in 40 ml Teflon lined septum vials, must be taken into the field where sampling is going on. It should be taken at a minimum frequency of one per day when VOCs in an aqueous matrix are being collected. Note that it is not necessary to take an aqueous trip blank when a non-aqueous medium is being sampled. Trip blanks are used to determine if any on-site atmospheric contaminants are seeping into the sample vials, or if any cross contamination of samples is occurring during the shipment or storage of sample containers. Trip blanks are only analyzed for VOCs.

*Equipment Rinsate Blank* - Equipment rinsate blanks will be collected for each type of sampling equipment used each day a decontamination procedure is carried out. They consist of sample container and the relevant specimens (e.g.,

water or solvent rinses) of cleaned sampling equipment taken just before initial field use and between subsequent uses. The rinsate blank must be collected in a specific sequential order for the parameters of interest (e.g., VOC, TOX, BNA, PCBs/pesticides, total metals, cyanide). Equipment rinsate blanks are collected to ensure that the sampling equipment is clean and that the potential for cross-contamination has been minimized by the equipment decontamination procedures. These blanks will be prepared by decontaminating the sampling device and then pouring distilled, deionized water over the device. The distilled deionized water will be supplied by the laboratory. The rinsate water will be collected in the appropriate sample containers. One equipment rinsate blank will be collected for each type of sampling equipment used each day a decontamination procedure is carried out. The rinsate blank must be collected prior to collection of associated environmental samples. The same aliquot of water may be used on all equipment associated with a particular sample matrix for all analyses specified in Table 6-5. The rinse must be performed sequentially on all sampling equipment. The equipment rinsate blank will be analyzed for the same parameters as the samples.

## 8.0 DELIVERABLES

### 8.1 ANALYTICAL LABORATORY DELIVERABLES

The analytical level appropriate to the QA objectives of the Removal Action is QA2 as discussed in Section 3.4. Therefore, the laboratory will supply all required data deliverables to enable the data to be validated. The deliverables will include appropriate QA/QC sample documentation including: matrix spike, matrix spike duplicate, duplicates, field blanks and trip blanks. A report of the sampling event will be incorporated into the Final Report on The Removal Action.

### 8.2 FINAL PROJECT REPORTING

Upon completion of the Removal Action activities, all analytical data will be reviewed, analyzed and summarized. The analytical data will be audited by an experienced data validator, as discussed in Section 9.0, to determine whether or not the data are consistent and whether or not there are either noticeable trends or grossly divergent results. The data will be tabulated by sampling medium and by area for ease of review.

The analytical data summaries will be included in the Final Report to be prepared and submitted to the EPA at the conclusion of the Removal Action activities. The analytical data summaries will include analytical results, QA/QC information and Chain-Of-Custody documentation.

## 9.0 *DATA VALIDATION AND REDUCTION*

## 9.1 *DATA VALIDATION*

All analytical data generated during the Removal Action will undergo a quantitative and qualitative data review by a qualified data validator. A preliminary review will be performed to verify that all necessary paperwork, such as chain-of-custodies, traffic reports, analytical reports, laboratory personnel signatures and deliverables (as stated in SW-846) are present. A detailed quality assurance review will be then performed by the data validator to verify the qualitative and quantitative reliability of the data as it is presented. This review will include a detailed evaluation and interpretation of all data generated by the laboratory. The primary tools which will be used by the experienced data review chemist will be EPA-approved guidance documents, established (contractual) criteria, and professional judgement.

Based upon the review of the UST, soil, transformer and drum sampling data, a data quality assurance report will be prepared which will describe the qualitative and quantitative reliability of the analytical data. The report will consist of an introduction section followed by a section which describes the analytical results and any qualifications that should be taken into account when using the data. A support documentation package will be prepared which will provide the backup information for all qualifying statements presented in the quality assurance report. Based upon the quality assurance review, qualifier codes will be placed next to specific sample results on the sample data summary table. These qualifier codes will serve as an indication of the qualitative and quantitative reliability of the data.

Once the review has been completed, the Data Validator will submit the findings to the QA/QC Officer and the Project Coordinator. The approved data tables and quality assurance reports will be signed and dated by the Data

Validator. Upon completion of the review, a copy of the signed tables and reports will be submitted to EPA

## *9.2 DATA REDUCTION*

Data reduction for this investigation will consist primarily of tabulating analytical results from Form I of the analytical reports on summary tables using correct reporting units and associated method detection or estimated quantitation limit (MDL or EQL). Data will be reduced and flagged with the appropriate data qualifiers based on the QA/QC data validation review. Data will be designated as quantitative, semi-quantitative, qualitative or invalid. Accompanying documentation will give the rationale for each designation. All QA2 objective data will be validated prior to use or, if released for decision, stamped to indicate that is it "Preliminary Data Subject to Revision after a Quality Assurance Review." All reduced data will be placed in the central file maintained by the Project Coordinator.

# *FIGURES*

ERM-Northeast
Environmental Resources Management

# Chain Of Custody Record

O 175 Froehlich Farm Boulevard • Woodbury • New York 11797 ☎ (516) 921-4300

Project No. / I.D. _____ Sheet No. _____

Sampler(s) _____ Bottles Supplied By _____

Date Sampled _____ Bottle Batch No. _____

| Sample I.D. | Sample Description | Sample Type | Sampling Method | Time | No. Of Contain-ers | Analysis Requested | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Relinquished By (Signature) | Received By (Signature) | Date/Time | Reason For Transfer |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Copies: White - Sampler; Yellow - Lab

TITLE

CHAIN OF CUSTODY RECORD

PREPARED FOR

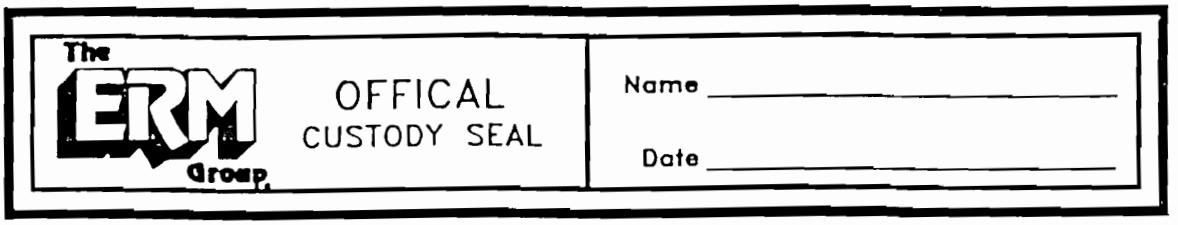
LIBERTY INDUSTRIAL FINISHING
SITE RAWP QA/QC PLAN

ERM-Northeast
Environmental Resources Management

SCALE None

DATE

FIGURE 4-1




TITLE

Custody Seal

PREPARED FOR

LIBERTY INDUSTRIAL FINISHING
SITE RAWP QA/QC PLAN

ERM-Northeast
Environmental Resources Management

SCALE

DATE 6-6-91

FIGURE 4-2

*Figure* 4-3 ***ERM's CORRECTIVE ACTION FORM***

Date: _____

Job Name: _____

Initiator's Name and Title: _____

Problem Description: _____

_____

_____

_____

_____

Reported To:_____

---

Corrective Action: _____

_____

_____

_____

_____

_____

_____

Reviewed and Implemented By: _____

cc: Field Investigation manager -_____
QA Manager -_____
Project Manager -_____

# *TABLES*

*Table 3-1 Definitions of Data Quality Parameters*

- Precision - a measure of the reproducibility of measurements under a given set of conditions. It is a quantitative measurement of the variability of a group of measurements compared to their average value.

- Accuracy - a measure of the bias that exists in a measurement system.

- Representativeness - the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

- Completeness - a measure of the amount of the valid data obtained from the measurement system compared to the amount that was expected to be obtained under anticipated normal conditions.

- Comparability - a measure of the similarity of conditions under which different sets of data are produced.

- Sensitivity - the relative position of a specific analytical method and the action level or concentration of concern will determine whether detected and non-detected data are usable, the possibility of a false positive and false negative data due to variability in analytical procedures, and/or the possibility of false negatives and unusable non-detected data due to imprecise analytical procedures.

*Table 3-2 Quality Assurance Objective Characteristics*

| QA1 Objective | QA2 Objective |
|---|---|
| Non-analyte or analyte specific (may also be specific for a chemical class, i.e., PCBs) | Analyte specific |
| Non-definitive (i.e., unconfirmed) identification, non-qualitative to semi-qualitative | VERIFICATION of analyte identity and/or concentration. Choose any one or any combination of the following three: |
| Non-definitive quantitation; no error determination (no precision and accuracy determination) | Definitive quantitation (choose one): Note: except for X-ray fluorescence (XRF), confirmation of identity applies to organic analytes only. Confirm XRF determined analytes by an EPA-approved method.<br><br>a. Screened data - confirm analyte identification by an EPA-approved method, different from the screening method , on at least 10% of preliminary screened samples.<br><br>b. Unscreened data - confirm analyte identification by an EPA-approved method on all unscreened environmental samples (field or lab) |
| | Non-definitive quantitation (choose one):<br><br>a. Screened data - verify analyte concentration on at least 10% of preliminary screened samples (field or lab) using an EPA-approved method, different from the screening method.<br><br>b. Unscreened data - determine analyte concentration on all unscreened environmental samples (field or lab) using an EPA-approved method. |

*Table 3-2* ***Quality Assurance Objective Characteristics (Continued)***

| | |
|---|---|
| | Definitive quantitation/analytical error - (choose one):<br>Note: Error determination is advised if data are being evaluated against a critical action level.<br><br>a. Screened data - determine the analytical error by calculating the precision, accuracy, and coefficient of variation for a subset (at least 10%) of the verified data using an EPA-approved method.<br><br>b. Unscreened data - determine the analytical error by calculating the precision, accuracy, and coefficient of variation for all of the quantitative results using an EPA-approved method. |
| Representative, comparable, complete | Representative, comparable, complete |
| QA requirements discussed in Section 6.0 of QA/QC Plan | QA requirements discussed in Section 6.0 of the QA/QC Plan. |

*Table 3-3 Criteria Objectives*

| | Aqueous | Solid/Other |
|---|---|---|
| **Precision Objectives** | | |
| Field Duplicate/Replicates (Blind or labeled) | Within 20% RPD | Within 30% RPD |
| Laboratory Duplicate | As specified in SW-846 Method 8240A, 8270A, 8080, 6010A/7470, 1020, 9045 | As specified in SW-846 extraction Method 1311 and analytical methods 8240A, 8270A, 8080, 6010A/7470, 1020, 9045 |
| **Accuracy Objectives** | | |
| Equipment Rinsate, Field, or Trip Blanks | Less than the MDL | Less than MDL |
| Laboratory Blanks | As specified in SW-846 Method 8240A, 8270A, 8080, 6010A/7470, 1020, 9045 | As specified in SW-846 extraction Method 1311 and analytical methods 8240A, 8270A, 8080, 6010A/7470, 1020, 9045 |

# TABLE 4-1
## ESTIMATED NUMBER OF SAMPLES FOR REMOVAL ACTION PROGRAM
### LIBERTY INDUSTRIAL FINISHING, FARMINGDALE, NEW YORK

*REMOVAL OF CONTENTS IN USTS 2 AND 4*

| Number of Samples Collected | | Media | Compounds to be Analyzed | Analytical Protocols to be Followed | QA/QC Samples |
|---|---|---|---|---|---|
| Laboratory | Field | | (Laboratory) | (Laboratory) | (Laboratory) |
| 2 | 0 | Liquid | Full TCLP, RCRA characteristics, BTU's, total halogens, % sulfur, %solids, % water, pH, flash point and cyanide reactivity | Standard Reporting | None |

*CHARACTERIZATION OF CONTENTS IN USTs 1,3,5,6,7 AND 8*

| Number of Samples Collected | | Media | Compounds to be Analyzed | Analytical Protocols to be Followed | QA/QC Samples |
|---|---|---|---|---|---|
| Laboratory | Field | | (Laboratory) | (Laboratory) | (Laboratory) |
| 6 | 0 | Liquid | TCL/TAL Compounds, BTU's, total halogens, % sulfur, % solids, % water, pH, flash point, and cyanide reactivity. | TCL/TAL - QA2 Recycling - Standard Reporting | TCL/TAL - 1 MS, 1 MSD, 1 Duplicate, 1 Field Blank and 1 Trip Blank; Recycling - None |

*PCB TRANSFORMER LOCATIONS (SOILS)*

| Number of Samples Collected | | Media | Compounds to be Analyzed | Analytical Protocols to be Followed | QA/QC Samples |
|---|---|---|---|---|---|
| Laboratory | Field | | (Laboratory) | (Laboratory) | (Laboratory) |
| 27 | 94 | Soil | PCBs, Full TCLP and RCRA Characteristics. | TCL PCBs - QA2; Full TCLP -Standard Reporting | TCL PCBs - 3 MS, 3 MSD, 3 Duplicate, and 4 Field Blank; TCLP - none |
| | | | | | |
| 6 - 18 | 0 | Wipe | PCBs | Standard Reporting | None |

*PCB TRANSFORMER LOCATIONS (LIQUID)*

| Number of Samples Collected | | Media | Compounds to be Analyzed | Analytical Protocols to be Followed | QA/QC Samples |
|---|---|---|---|---|---|
| Laboratory | Field | | (Laboratory) | (Laboratory) | (Laboratory) |
| 9 | 0 | Liquid | PCBs | TCL PCBs - QA2 | TCL PCBs - 1 MS, 1 MSD, 1 Duplicate |

*CHARACTERIZATION OF DRUMS FOR REMOVAL*

| Number of Samples Collected | | Media | Compounds to be Analyzed | Analytical Protocols to be Followed | QA/QC Samples |
|---|---|---|---|---|---|
| Laboratory | Field | | (Laboratory) | (Laboratory) | (Laboratory) |
| 1 | 0 | Liquid | Full TCLP; BTU's, total halogens, % sulfur, % solids, % water, pH, flash point and cyanide reactivity. | Full TCLP, Recycling - Standard Reporting | Full TCLP, Recycling- None |

## *TABLE 6-1 QUALITY ASSURANCE REQUIREMENTS*

| QA1 Objective | QA2 Objective |
|---|---|
| Sample documentation | Sample documentation |
| Instrument calibration data or a performance check of a test method (i.e., Draeger tubes, test strips, spot tests). | Chain of custody |
| Detection limit should be determined, unless inappropriate. | Sample holding times |
| | 10% Blanks |
| | 10% MS/MSD |
| | Confirmation Analysis |
| | Instrument Calibration |
| | Performance Evaluation Sample (Optional) |
| | Detection Limits |
| | Data Summary |
| | Select any one or any combination of the following: |
| | Definitive identification (choose one):<br><br>a. Screened Data - confirm the identification of analytes via an EPA-approved method different from the screening method (field or lab) on at least 10% of the preliminary screened samples collected; provides documentation such as gas chromatograms, mass spectra, etc.<br><br>b. Unscreened Data - confirm the identification of analytes via and EPA-approved method on all unscreened environmental samples; provide documentation such as gas chromatograms, mass spectra, etc. |
| | Non-definitive quantitation (choose one):<br><br>a. Screened data - provide documentation of quantitative results from both the screening method and the EPA-approved verification method.<br><br>b. Unscreened data - provide documentation of quantitative results<br><br>(Documentation includes information and/or evidence on calculation procedures, calibration data, sample weight or volume, dilution factor, etc.) |

*Table 6-1* ***Quality Assurance Requirements (Continued)***

| | |
|---|---|
| | Definitive quantitation/analytical error (choose one):<br>a. Screened Data - determine the analytical error by calculating the precision, accuracy and coefficient of variation by preparing and analyzing eight QA replicates from the subset of sample used to verify screening results using an EPA-approved method.<br><br>b. Unscreened Data - determine the analytical error by calculating the precision, accuracy and coefficient of variation by preparing and analyzing eight QA replicates from all of the samples analyzed using an EPA-approved method. |

*Table 6-2 Summary of Toxicity Characteristics Parameters and Detection Limits*

| Compound | Detection Limit (ug/l) | Regulatory Limit (ug/l) |
|---|---|---|
| **Volatile Organics** | | |
| Vinyl Chloride | 10 | 200 |
| 1,1-Dichloroethene | 5.0 | 700 |
| Methyl Ethyl Ketone | 10 | 200,000 |
| Chloroform | 5.0 | 6,000 |
| Carbon Tetrachloride | 5.0 | 500 |
| Benzene | 5.0 | 500 |
| 1,2-Dichloroethane | 5.0 | 500 |
| Trichloroethene | 5.0 | 500 |
| Tetrachloroethene | 5.0 | 700 |
| Chlorobenzene | 5.0 | 100,000 |
| **Semi-Volatile Organics** | | |
| 1,4-Dichlorobenzene | 10 | 7,500 |
| a-Cresol | 10 | 200,000 |
| Pyridine | 10 | 5,000 |
| m- and p-Cresol | 10 | 200,000 |
| Hexachloroethane | 10 | 3,000 |
| Nitrobenzene | 10 | 2,000 |
| Hexachlorobutadiene | 10 | 500 |
| 2,4,6-Trichlorophenol | 10 | 2,000 |
| 2,4,5-Trichlorophenol | 50 | 400,000 |
| 2,4-Dinitrotoluene | 10 | 130 |
| Hexachlorobenzene | 10 | 130 |
| Pentachlorophenol | 50 | 100,000 |
| **Pesticides** | | |
| Lindane (gamma BHC) | 0.2 | 400 |
| Chlordane | 0.5 | 30 |
| Endrin | 0.2 | 20 |
| Heptachlor | 0.2 | 8 |
| Heptachlor Epoxide | 0.2 | 8 |
| Methoxychlor | 0.5 | 10,000 |
| Toxaphene | 1.0 | 500 |

*Table 6-2* ***Summary of Toxicity Characteristics Parameters and Detection Limits (Continued)***

| | | |
|---|---|---|
| **Herbicides** | | |
| 2,4-D | 1.0 | 10,000 |
| 2,4,5-TP (Silvex) | 0.2 | 1,000 |
| **Inorganics** | | |
| Arsenic | 0.050 | 5,000 |
| Barium | 0.050 | 100,000 |
| Cadmium | 0.005 | 1,000 |
| Chromium | 0.020 | 5,000 |
| Lead | 0.050 | 5,000 |
| Mercury | 0.002 | 200 |
| Selenium | 0.050 | 1,000 |
| Silver | 0.010 | 5,000 |

*Table 6-3* ***Summary of Organic Analytical Parameters and Estimated Quantitation Limits***

| | Volatiles | Quantitation Limits[a] | |
|---|---|---|---|
| | | Low Aqueous (ug/l) | Low Soil/Sediments[b] (ug/kg) |
| 1. | Chloromethane | 10 | 10 |
| 2. | Bromomethane | 10 | 10 |
| 3. | Vinyl Chloride | 10 | 10 |
| 4. | Chloroethane | 10 | 10 |
| 5. | Methylene Chloride | 5 | 5 |
| 6. | Acetone | 100 | 100 |
| 7. | Carbon Disulfide | 100 | 100 |
| 8. | 1,1-Dichloroethene | 5 | 5 |
| 9. | 1,1-Dichloroethane | 5 | 5 |
| 10. | 1,2-Dichloroethene (total) | 5 | 5 |
| 11. | Chloroform | 5 | 5 |
| 12. | 1,2-Dichloroethane | 5 | 5 |
| 13. | 2-Butanone | 100 | 100 |
| 14. | 1,1,1-Trichloroethane | 5 | 5 |
| 15. | Carbon Tetrachloride | 5 | 5 |
| 16. | Bromodichloromethane | 5 | 5 |
| 17. | 1,2-Dichloropropane | 5 | 5 |
| 18. | cis-1,3-Dichloropropene | 5 | 5 |
| 19. | Trichloroethene | 5 | 5 |
| 20. | Dibromochloromethane | 5 | 5 |
| 21. | 1,1,2-Trichloroethane | 5 | 5 |
| 22. | Benzene | 5 | 5 |
| 23. | trans-1,3-Dichloropropene | 5 | 5 |
| 24. | Bromoform | 5 | 5 |
| 25. | 4-Methyl-2-pentanone | 50 | 50 |
| 26. | 2-Hexanone | 50 | 50 |
| 27. | Tetrachloroethene | 5 | 5 |
| 28. | Toluene | 5 | 5 |
| 29. | 1,1,2,2-Tetrachloroethane | 5 | 5 |
| 30. | Chlorobenzene | 5 | 5 |
| 31. | Ethyl Benzene | 5 | 5 |
| 32. | Styrene | 5 | 5 |
| 33. | Total Xylenes | 5 | 5 |

*Table 6-3* ***Summary of Organic Analytical Parameters and Estimated Quantitation Limits (Continued)***

| Semi-Volatiles | | Quantitation Limits | |
|---|---|---|---|
| | | Low Water (ug/l) | Low Soil/Sediments[b] (ug/kg) |
| 34. | Phenol | 10 | 660 |
| 35. | bis(2-Chloroethyl) ether | 10 | 660 |
| 36. | 2-Chlorophenol | 10 | 660 |
| 37. | 1,3-Dichlorobenzene | 10 | 660 |
| 38. | 1,4-Dichlorobenzene | 10 | 660 |
| 39. | 1,2-Dichlorobenzene | 10 | 660 |
| 40. | 2-Methylphenol | 10 | 660 |
| 41. | 2,2'-oxybis(1-Chloropropane) | 10 | 660 |
| 42. | 4-Methylphenol | 10 | 660 |
| 43. | N-Nitroso-di-n-propylamine | 10 | 660 |
| 44. | Hexachloroethane | 10 | 660 |
| 45. | Nitrobenzene | 10 | 660 |
| 46. | Isophorone | 10 | 660 |
| 47. | 2-Nitrophenol | 10 | 660 |
| 48. | 2,4-Dimethylphenol | 10 | 660 |
| 49. | bis(2-Chloroethoxy) methane | 10 | 660 |
| 50. | 2,4-Dichlorophenol | 10 | 660 |
| 51. | 1,2,4-Trichlorobenzene | 10 | 660 |
| 52. | Naphthalene | 10 | 660 |
| 53. | 4-Chloroaniline | 20 | 1300 |
| 54. | Hexachlorobutadiene | 10 | 660 |
| 55. | 4-Chloro-3-methylphenol (para-chloro-meta-cresol) | 20 | 1300 |
| 56. | 2-Methylnaphthalene | 10 | 660 |
| 57. | Hexachlorocyclopentadiene | 10 | 660 |
| 58. | 2,4,6-Trichlorophenol | 10 | 660 |
| 59. | 2,4,5-Trichlorophenol | 10 | 660 |
| 60. | 2-Chloronaphthalene | 10 | 660 |
| 61. | 2-Nitroaniline | 50 | 3300 |
| 62. | Dimethyl Phthalate | 10 | 660 |
| 63. | Acenaphthylene | 10 | 660 |
| 64. | 2,6-Dinitrotoluene | 10 | 660 |
| 65. | 3-Nitroaniline | 50 | 3300 |
| 66. | Acenaphthene | 10 | 660 |

*Table 6-3* ***Summary of Organic Analytical Parameters and Estimated Quantitation Limits (Continued)***

| Semi-Volatiles | | Quantitation Limits | |
|---|---|---|---|
| | | Low Water (ug/l) | Low Soil/Sediments[b] (ug/kg) |
| 67. | 2,4-Dinitrophenol | 50 | 3300 |
| 68. | 4-Nitrophenol | 50 | 3300 |
| 69. | Dibenzofuran | 10 | 660 |
| 70. | 2,4-Dinitrotoluene | 10 | 660 |
| 71. | Diethylphthalate | 10 | 660 |
| 72. | 4-Chlorophenyl phenyl ether | 10 | 660 |
| 73. | Fluorene | 10 | 660 |
| 74. | 4-Nitroaniline | 20 | ND |
| 75. | 4,6-Dinitro-2-methylphenol | 50 | 3300 |
| 76. | N-nitrosodiphenylamine | 10 | 660 |
| 77. | 4-Bromophenyl phenyl ether | 10 | 660 |
| 78. | Hexachlorobenzene | 10 | 660 |
| 79. | Pentachlorophenol | 50 | 3300 |
| 80. | Phenanthrene | 10 | 660 |
| 81. | Anthracene | 10 | 660 |
| 82. | Carbazole | 10 | 660 |
| 83. | Di-n-butyl phthalate | 10 | ND |
| 84. | Fluoranthene | 10 | 660 |
| 85. | Pyrene | 10 | 660 |
| 86. | Butyl benzyl phthalate | 10 | 660 |
| 87. | 3,3'-Dichlorobenzidine | 20 | 1300 |
| 88. | Benz(a)anthracene | 10 | 660 |
| 89. | Chrysene | 10 | 660 |
| 90. | bis(2-Ethylhexyl)phthalate | 10 | 660 |
| 91. | Di-n-octyl phthalate | 10 | 660 |
| 92. | Benzo(b)fluoranthene | 10 | 660 |
| 93. | Benzo(k)fluoranthene | 10 | 660 |
| 94. | Benzo(a)pyrene | 10 | 660 |
| 95. | Indeno(1,2,3-cd)pyrene | 10 | 660 |
| 98. | Dibenz(a,h)anthracene | 10 | 660 |
| 97. | Benzo(g,h,i)perylene | 10 | 660 |

*Table 6-3* ***Summary of Organic Analytical Parameters and Estimated Quantitation Limits (Continued)***

| | Pesticides/PCBs | Method Detection Limits[c] (ug/L) |
|---|---|---|
| 98. | alpha-BHC | 0.003 |
| 99. | beta-BHC | 0.006 |
| 100. | delta-BHC | 0.009 |
| 101. | gamma-BHC (Lindane) | 0.004 |
| 102. | Heptachlor | 0.003 |
| 103. | Aldrin | 0.004 |
| 104. | Heptachlor Epoxide | 0.083 |
| 105. | Endosulfan I | 0.014 |
| 106. | Dieldrin | 0.002 |
| 107. | 4,4'-DDE | 0.004 |
| 108. | Endrin | 0.006 |
| 109. | Endosulfan I | 0.004 |
| 110. | 4,4'-DDD | 0.011 |
| 111. | Endosulfan Sulfate | 0.006 |
| 112. | 4,4'-DDT | 0.012 |
| 113. | Methoxychlor | 0.176 |
| 114. | Endrin Ketone | 0.012 |
| 115. | Endrin aldehyde | 0.023 |
| 116. | alpha Chlordane | 0.014 |
| 117. | gamma Chlordane | 0.014 |
| 118. | Toxaphene | 0.24 |
| 119. | AROCLOR-1016 | ND |
| 120. | AROCLOR-1221 | ND |
| 121. | AROCLOR-1232 | ND |
| 122. | AROCLOR-1242 | 0.065 |
| 123. | AROCLOR-1248 | ND |
| 124. | AROCLOR-1254 | ND |
| 125. | AROCLOR-1260 | ND |

**Notes:**

(a) Quantitaion limits are instrument and laboratory dependent. The laboratory will follow the procedures of the specified SW-846 methods to arrive at a quantitation level for each constituent.

(b) If sample matrix is designated non-aqueous waste (e.g., UST or drum sample), the laboratory will report concentrations in appropriate units.

| Other Matrices | Factor |
|---|---|
| Water miscible liquid waste | 50 |
| High-concentration soil and sludge | 125 |
| Non-water miscible waste | 500 |

(c) Determination of Practical Quantitation Limits (PQL) for various matrices is as follows:

| Matrix | Factor |
|---|---|
| Aqueous | 10 |
| Low-level soil by sonification with GPC cleanup | 670 |
| Non-water miscible waste | 100,000 |

ND - Not Determined

*Table 6-4* ***Summary of Inorganic Analytical Parameters and Method Detection Limits***

| Inorganics | | Detection Limits[a] |
|---|---|---|
| | | Low Water and Low Soil/Sediments (ug/l) |
| 1. | Aluminum | 45 |
| 2. | Antimony | 32 |
| 3. | Arsenic | 53 |
| 4. | Barium | 2 |
| 5. | Beryllium | 0.3 |
| 6. | Cadmium | 4 |
| 7. | Calcium | 10 |
| 8. | Chromium | 7 |
| 9. | Cobalt | 7 |
| 10. | Copper | 6 |
| 11. | Iron | 7 |
| 12. | Lead | 42 |
| 13. | Magnesium | 30 |
| 14. | Manganese | 2 |
| 15. | Mercury | 0.2 |
| 16. | Nickel | 15 |
| 17. | Potassium | [b] |
| 18. | Selenium | 75 |
| 19. | Silver | 7 |
| 20. | Sodium | 29 |
| 21. | Thallium | 40 |
| 22. | Vanadium | 8 |
| 23. | Zinc | 2 |
| 24. | Cyanide | 10 |

Notes:

(a) The estimated instrumental detection limits shown are taken from: Winge, R.K.; Peterson, V.J.; Fassel, V.A. Inductively Coupled Plasma-Atomic Emission Spectroscopy: Prominent Lines (final report, March 1977 - February 1978); EPA-600/4-79-017, Environmental Reserach Laboratory, Athens, GA, March 1979; Ames Laboratory: Ames, IA. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

(b) Highly dependent on operating conditions and plasma position

*Table 6-5 Summary of UST, Transformer and Drum Sampling Program, Preservatives, Holding Times and Containers*

| Parameter | Number of Samples[2] | Sample Matrix | Analytical Method Reference | Sample Preservation | Holding Times[1] | Containers |
|---|---|---|---|---|---|---|
| TCL Volatiles | 11 | Liquid | SW-846 Method 8240A | Cool, 4°C HCl, pH<2[8] | 7/14[7] | 3x40ml vials with teflon-lined septum |
| TCL Semi-Volatiles | 10 | Liquid | SW-846 Method 8270A | Cool, 4°C | 7/40[3] | 3x1000ml amber glass |
| TCL Pesticides/PCBs | 22 | Liquid | SW-846 Method 8080 | Cool, 4°C | 7/40[3] | 3x1000ml amber glass |
| TAL Inorganics | 15 | Liquid | SW-846[5] | Cool, 4°C $HNO_3$, pH<2 | 6 months | 1x1000ml plastic bottle |
| Cyanide | 15 | Liquid | SW-846 Method 9010 | Cool, 4°C NaOH, pH>12 | 14 days | 1x1000ml plastic bottle |
| TCLP Volatiles | 3 | Liquid | SW-846 Method 8240A | Cool, 4°C | 7/14[7] | 3x40ml vials with teflon-lined septum |
| TCLP Semi-Volatiles | 3 | Liquid | SW-846 Method 8270A | Cool, 4°C | 14/7/40[4] | 2x8oz glass bottle |
| TCLP Inorganics (except mercury) | 3 | Liquid | SW-846 Method 6010A | Cool, 4°C | 180/180[3] | 2x8oz glass bottle |
| TCLP Mercury | 3 | Liquid | SW-846 Method 7470 | Cool, 4°C | 28/28[3] | |
| TCLP Pesticides/Herbicides | 3 | Liquid | SW-846 Method 8150A | Cool, 4°C | 14/7/30[4] | 2x8oz glass bottle |
| RCRA Ignitability | 2 | Liquid | Method 1010 | Cool, 4°C | 14 days | 8 oz. glass bottle |

*Table 6-5 Summary of UST, Transformer and Drum Sampling Program, Preservatives, Holding Times and Containers*

| Parameter | Number of Samples[2] | Sample Matrix | Analytical Method Reference | Sample Preservation | Holding Times[1] | Containers |
|---|---|---|---|---|---|---|
| RCRA Corrosivity | 2 | Liquid | Method 1110 | Cool, 4°C | NA | 8 oz. glass bottle |
| RCRA Reactivity | 2 | Liquid | SW-846, Chapter 7, Section 7.3, Rev. 1, July 1992[6] | Cool, 4°C | 14 days | 8 oz. glass bottle |
| BTUs | 9 | Liquid | ASTM D2015-91 | Cool, 4°C | NA | Collect one 1-liter amber glass bottle for this set of parameters |
| Total Halogens | 9 | Liquid | SW-846 Method 8010 | Cool, 4°C | NA | |
| Percent Sulfur | 9 | Liquid | ASTM D129-91 | Cool, 4°C | NA | |
| Percent Solids | 9 | Liquid | EPA Method 160.3 | Cool, 4°C | 7 days | |
| Percent Water | 9 | Liquid | Calculation by difference | Cool, 4°C | NA | |
| pH | 9 | Liquid | SW-846 Method 150.1 | Cool, 4°C | ASAP (analyze immediately) | |
| Flash Point | 9 | Liquid | SW-846 Method 1010 | Cool, 4°C | 14 days | |
| Cyanide Reactivity | 9 | Liquid | SW-846, Chapter 7, Section 7.3, Rev. 1, July 1992[6] | Cool, 4°C | 14 days | |

*Table 6-5* ***Summary of UST, Transformer and Drum Sampling Program, Preservatives, Holding Times and Containers***

**Notes:**

(1) Holding times begin at the time of sample collection. Holding time given are Regional technical holding time criteria and not contractual holding time criteria.

(2) Includes analytical samples and QA/QC samples.

(3) First number is time in days from collection to extraction, second number is time in days from extraction to analysis.

(4) First number is time in days from collection to extraction, second number is time in days from extraction to preparative extraction and third number is time in days from preparative extraction to analysis.

(5) SW-846 Methods for metals analysis are as follows:
arsenic - Method 7060
lead - Method 7421
mercury - Method 7470
selenium - Method 7740
thallium - Method 7841
all other metals - Method 6010A

(6) The procedures for quantifying total sulfide and total cyanide are given in SW-846 analytical methods 9030 and 9010, respectively.

(7) If unpreserved, aqueous samples maintained at 4°C that are to be analyzed for aromatic hydrocarbons must be analyzed within seven days of collection. If preserved with HCl to < pH 2 and stored at 4°C, aqueous samples must be analyzed within 14 days of collection.

(8) Preservation for TCL Volatile Organics varies with sample concentration: if low/medium concentration, preserve with HCL to pH<2; if high concentration, no preservation required.

*Table 6-6* ***Summary of Soil Sampling Program, Preservatives, Holding Times and Containers***

| Parameter | Number of Samples | Sample Matrix | Analytical Method Reference | Sample Preservation | Holding Times[1] | Containers |
|---|---|---|---|---|---|---|
| TCL PCBs | 46-58 | Soil/Wipes | SW-846 Method 8080 | Cool, 4°C | 7/40[2] | 3x1000ml amber glass |
| TCLP Volatiles | 4 | Soil | Zero Headspace Extraction - Method 1311; Method 8240A for extract | Cool, 4°C | 7/14[1A] | 3x40ml vials with teflon-lined septum[5] |
| TCLP Semi-Volatiles | 4 | Soil | Non Volatile Extraction - Method 1311; Method 8270A for extract | Cool, 4°C | 14/7/40[5] | 2x8oz glass bottle[5] |
| TCLP Inorganics (except mercury) | 4 | Soil | Non Volatile Extraction - Method 1311; Method 6010A for extract[4] | Cool, 4°C | 180/180[2] | 2x8oz glass bottle[5] |
| TCLP Mercury | 4 | Soil | Non Volatile Extraction - Method 1311; Method 7470 for extract | Cool, 4°C | 28/28[2] | |
| TCLP Pesticides/Herbicides | 4 | Soil | Non Volatile Extraction - Method 1311; Method 8150A for extract | Cool, 4°C | 14/7/30[3] | 2x8oz glass bottle[5] |

*Table 6-6* ***Summary of Soil Sampling Program, Preservatives, Holding Times and Containers (Continued)***

| Parameter | Number of Samples | Sample Matrix | Analytical Method Reference | Sample Preservation | Holding Times[1] | Containers |
|---|---|---|---|---|---|---|
| RCRA Ignitability | 4 | Soil | Method 1020 | Cool, 4°C | NA | 8 oz. glass bottle |
| RCRA Corrosivity | 4 | Soil | Method 9045 | Cool, 4°C | NA | 8 oz. glass bottle |
| RCRA Reactivity | 4 | Soil | SW-846, Chapter 7, Section 7.3, Rev. 1, July 1992[6] | Cool, 4°C | NA | 8 oz. glass bottle |

**Notes:**

(1) Holding times begin at the time of sample collection.

(1A) If unpreserved, low/medium-concentration aqueous samples maintained at 4°C are to be analyzed for aromatic hydrocarbons within seven days of collection. If preserved with HCl to pH <2 and stored at 4°C, aqueous samples must be analyzed within 14 days of collection. Holding times given are Regional technical times criteria and not contractual holding times criteria.

(2) First number is time in days from collection to extraction, second number is time in days from extraction to analysis.

(3) First number is time in days from collection to extraction, second number is time in days from extraction to preparative extraction and third number is time in days from preparative extraction to analysis.

(4) SW-846 Methods for metals analysis are as follows:

arsenic - Method 7060
lead - Method 7421
mercury - Method 7470
selenium - Method 7740
thallium - Method 7841

*Table 6-6* ***Summary of Soil Sampling Program, Preservatives, Holding Times and Containers (Continued)***

all other metals - Method 6010A

(5) According to EPA SW846 Method 1311, a minimum sample size of 100 grams is needed for TCLP extraction.

(6) The procedures for quantifying total sulfide and total cyanide are given in SW-846 analytical methods 9030 and 9010, respectively.