APPENDIX 9-A

SAMPLING AND ANALYSIS PLAN FOR CLOSURE OF THE MIXED WASTE FACILITY

MIXED WASTE FACILITY

RCRA/TSCA PERMIT APPLICATION

PERMA-FIX NORTHWEST RICHLAND, INC.

RICHLAND, WASHINGTON

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1. INTRODUCTION

This Sampling and Analysis Plan (SAP) includes the policies and procedures for testing during closure of the mixed waste treatment facility (MWF) located in Richland, Washington. Wastes generated during the closure will be managed in accordance with Washington State Dangerous Waste Regulations and/or TSCA regulations. An overview of the closure activities is provided in Section 1.1.

This SAP is organized according to the following structure:

- Overview of Activities
- Sampling Procedures
- Sampling Program
- Analysis of Selected Constituents
- Decontamination Procedures
- Sample Handling and Shipment Procedures
- Quality Assurance
- Health and Safety
- Reporting

1.1 Overview

A Project Manager will oversee all aspects of the closure activities. Field activities will be performed under the direction of the Field Supervisor with oversight from the Project Manager. At the time of closure, MWF will evaluate and select a laboratory to perform the analyses. The laboratory selection process will include verifying of the laboratory's ability to analyze the required constituents and its accreditation status with the State of Washington. Selection of multiple laboratories may be required to meet these conditions.

1.2 Schedule of Closure Activities

The closure of the MWF will include the following activities:

- Complete treatment of any in-process wastes;
- Return any waste inventories which are not in process to the generator (the MWF also has the option to send inventories not in process to an off-site permitted treatment or disposal facility);

- Decontaminate, sample, and remove MWF components including equipment and piping;
- Recycle, re-use, or process and dispose all waste materials in an appropriately permitted off-site facilities;
- Conduct sampling of soil beneath the MWF, as required, to verify no contamination has occurred.

2. SAMPLING PROCEDURES

The procedures outlined below are to be used by all field personnel when conducting sampling activities for the closure of the MWF. Adherence to these procedures will be documented in a bound field notebook using a pen with permanent ink. Information to be recorded in the notebook includes the following:

- Date
- Weather conditions
- Names of the field team members
- Times of site arrival and departure
- Documentation of all field sampling activities
- Any equipment malfunction
- Odd or unusual occurrences

The field notebook will be signed by the Field Supervisor at the end of each day of field work. The sampling procedures are outlined in the following sections.

2.1 Sampling Preparation

Prior to sampling, field personnel will obtain the necessary items identified in the sampling equipment checklist in Table 2-3. This checklist will be updated as necessary, to accommodate field conditions. All equipment will be checked for proper operation. Non-disposable material that comes in contact with soil will be decontaminated before each sample is collected (see Section 5 Decontamination Procedures).

Prior to sampling, the volume requirements for analyzing the samples of individual materials will be verified with the analytical laboratory. Generally, solid samples must be less than approximately four inches in diameter and capable of being size reduced and extracted by the analytical laboratory.

2.2 Sample Collection

Samples will be collected using the methods described in the following paragraphs. Materials to be sampled may include but not be limited to:

- Concrete from flooring,
- Epoxy coatings from flooring,
- Gypsum board from walls,
- Insulation from ceilings,
- Polyvinyl chlorine (PVC) wall coverings,
- Sheet metal from duct work,
- Steel from tanks, structures, and equipment,
- Rubber and silicone from equipment gaskets, seals, and wheels,
- Soils from beneath the concrete flooring,
- Granular activated carbon from filter devices, and
- Fabric filter media from liquid and heating, ventilation and air conditioning (HVAC) filters.

Wherever possible, material samples will be collected using methods such as wipe samples that minimize the generation of heat and prevent volatilization of contaminants. If wipe samples are not feasible, samples of gypsum board, insulation, PVC wall coverings, fabric filter media, rubber, and silicone will be collected using knives, shears, or saws. Samples of concrete and epoxy coatings will be collected using chisels, coring equipment, or an approved equivalent. Soils and carbon samples will be collected using trowels. Sheet metal samples will be collected using shears or saws. Wherever possible, steel samples will be collected by disassembling equipment into smaller parts or using saws or shears. Steel samples from monolithic structures will be collected as drill shavings from within one quarter inch of the surface. Examples of sampling methods and sample equipment are provided in Table 2-4.

The samples will be placed in glass sample containers provided by the laboratory. Where necessary, samples collected for analysis of volatile organic constituents will be collected first at a given sampling location to minimize loss of volatiles during sampling activities. Samples will be collected using a decontaminated hand-auger and drive sampler, and placed in glass sample containers provided by the laboratory. Glass sample containers will be filled such that head space is minimized. The anticipated volume of material required for each type of laboratory analysis is specified in Table 2-2. Disturbance to the samples will be minimized as much as possible. The level of radioactivity of samples will be measured in the field using an MWF supplied and calibrated Geiger-Mueller counter.

2.3 Sample Documentation

A sample identification label that identifies the sample number, date and time of sampling, matrix, and initials of sampling personnel will be completed and affixed to each sample container. An example of a sample label is provided in Figure 2-1. The sample will be sealed in a resealable plastic bag and stored in a cooler with ice or frozen reusable ice packs.

A Sampling Log will be completed for each sample collected. Information regarding the sampling will be recorded on the Sampling Log and will include the following:

- Date
- Weather conditions
- Unique sample identification number
- Location of sample collection including QA/QC blanks
- Times of sample collection
- Documentation of all sample collection method and equipment
- Description of material sampled
- Laboratory analyses to be performed on sample
- Names of sampling personnel
- Odd or unusual occurrences

2.4 Sample Numbering

Biased and unbiased samples will be placed on the same sample grid system. The grid system will be designed as described in the Ecology Guidance on Sampling and Data Analysis Methods (Publication 94-49, January, 1995). The sample numbers will be Building #-Rm #-Axis # X Axis # Y - Crew ID #. These numbers and sampling locations will be recorded in the daily Sampling Logs described in Section 2.3 and marked on a sample map with a grid system.

3. SAMPLING PROGRAM

The goal of the sampling program is to obtain representative samples capable of providing statistically valid, legally defensible data. This plan identifies the appropriate sampling methodology, sample type, and number of samples needed to establish that clean closure levels have been achieved. This program includes a combination of sampling techniques; these are discussed below in the order of use.

3.1 Decontamination Verification Sampling

The purpose of this first round of sampling is to verify that decontamination procedures are effective and to identify any hot spots that may exist within the facility. Decontamination verification samples will be conducted as wipe samples whenever feasible.

The decontamination of equipment and facilities will be verified by collecting wipe samples at the frequency of:

- One sample per each primary system component,
- One sample from each 100 linear feet of HVAC duct work,
- One sample from each HVAC blower,
- One sample from each HVAC filtration assembly,
- One sample from the walls, one sample from the ceiling, and one sample of concrete from the floor of every other 25 ft^2 sampling grid.

Whenever possible, these samples will be collected from:

- Locations where waste residues appear to persist,
- Locations showing discoloration or visible alteration from waste handling activities,
- For concrete samples only, locations beneath the feed of each primary tank component, locations at the bottom of each tank system sump, any locations where cracks are observed or recorded, any locations where damage to the epoxy coating is observed or recorded.

These samples will be analyzed by the methods listed in Table 2-2 unless indicator constituents are approved by Ecology.

3.1.1 Hot Spot Sampling

Any hot spots (patches of contamination above cleanup levels) identified through the biased or unbiased sampling will be used to identify areas that will be further decontaminated. Additional sampling may be conducted to further define the area of contamination. After the additional decontamination has occurred, the areas will be re-sampled.

3.2 Surrounding Soils and Subsoil Verification Sampling

Once decontamination procedures have been completed and all structural and base components have been removed or verified to meet applicable closure cleanup levels, sampling of subsoils will commence.

3.2.1 Biased Sampling

The first sampling phase will involve collecting biased samples from the uppermost three inches of subsoil beneath the concrete and submitting them for confirmation analysis. Samples will be collected from the following areas:

- Locations where concrete sampling verified contamination,
- Beneath the location of the feed for each primary tank component,
- Locations beneath the bottom of each system,
- Locations beneath apparent cracks in the concrete and where the epoxy coating appears to have been damaged,
- Areas where wastes were managed and treated (e.g., samples will be collected from beneath staging areas, areas outside of the facility where there were known spills or high traffic, the process chamber).

These soil samples will be submitted for analysis for the constituents listed in Table 2-2 until indicator constituents are approved by Ecology.

3.2.2 Unbiased Sampling

In addition to these biased samples, a number of unbiased samples will be collected. Unbiased samples will be collected throughout the rest of the facility and surrounding areas on a sampling grid system. The number of these samples can be seen in Table 3-1.

3.2.3 Hot Spot Sampling

Should laboratory analysis of these samples indicate subsoils beneath the MWF have been impacted by its operation, the second phase of sampling will be performed to evaluate the extent of subsoil contamination and the potential for impacts to groundwater. Sampling around these hot spots will be conducted as described below.

Sample locations with constituent levels above cleanup levels will be marked on the grid system which was established for the unbiased sampling. This grid will then be sampled at a depth of 2 feet and the surrounding grids will be sampled at the three inch depth. This sampling will continue out and down at increments of two feet until the depth and location of the hot spot is delineated.

If it is determined that there is a potential impact to groundwater an amended closure plan will be developed to address this issue.

3.3 Statistical Guidelines

The type and number of biased and unbiased samples represented in this closure plan should be sufficient to perform a statistical evaluation of the nature and extent of any residual contamination. On receipt of sample results, the data will be evaluated for statistical completeness based on contamination detected. Constituent concentrations will be compared to the clean closure levels desired in accordance with the Washington Model Toxics Control Act Standards (WAC 173-303-340) and PCB levels per 40 CFR 761.61 and/or 761.79. Additional samples may be collected to confirm or deny the existence of contaminants.

4. SELECTION OF CONSTITUENTS TO BE ANALYZED

Selection of the proper analytical constituents will reflect current and historic operations at the MWF. Certification of clean closure will consider all dangerous waste constituents generated or managed at the facility and its individual units. The closure process can often be expedited through use of indicator constituents. Indicator constituents will be proposed for approval by Ecology during closure activities after receiving the analytical results of the biased samples. PCB storage or processing areas will be subject to PCB wipe sampling.

4.1 Analysis of Biased Samples

In order to recommend indicator constituents, twenty-five decontamination verification samples, and twenty-five subsoil verification samples will be analyzed for the full suite of dangerous waste constituents managed at the facility. These analyses and the detection limits for each expected constituents are outlined in Table 2-2. Additional detection limits for other constituents detected by these analytical methods can be found in the U.S. EPA document *EPA/SW-846*. The recommendation of indicator constituents will be based on the information gathered from these analyses and information on past management practices at the facility.

4.2 Analysis of Further Sampling

Once indicator constituents have been approved by Ecology, all further sampling will be analyzed for these constituents only. Indicator constituents may vary from one area of the facility to another. For example, all areas that are designated as being PCB storage or treatment areas will have PCBs as one of their indicator constituents.

4.3 Evaluation of Data

"Clean closure" determinations for the MWF and the soils beneath the MWF will be made by comparing measured concentrations of constituents stored and managed at the MWF with numeric cleanup levels calculated according to the applicable MTCA Method A or B standards and the levels for PCBs specified under the TSCA regulations, as discussed in the closure plan. The actual numeric cleanup standards for dangerous wastes and dangerous waste constituents will be determined, as outlined in MTCA, at the time of cleanup because they are based on risk to human health and are subject to potential revision (due to continual new data regarding human risk assessment). If a sample exceeds the cleanup standard for any constituent or parameter, then it will be generally assumed that the material or area sampled does not meet the cleanup standard.

5. DECONTAMINATION PROCEDURES

Reusable sampling equipment will be decontaminated prior to use and after sampling at each location to avoid chemical cross-contamination of field samples. Equipment will be decontaminated by washing with a nonphosphate detergent and rinsing with distilled or de-ionized water. Wash and rinse water will be transferred to a container. All field personnel will wear dedicated nitrile or vinyl gloves when conducting decontamination procedures.

5.1 Equipment Decontamination

Clean sampling equipment will be used for each sample collected to prevent cross-contamination.

To minimize the amount of waste generated and to facilitate the management and disposal of contaminated wastes, equipment will be decontaminated in batches. Examples of expected wastes to be generated are:

- Waste wash water
- Used gloves and coveralls
- Drop cloths, towels, plastic bags, etc.

The majority of the decontamination activities will be performed in a dedicated area. Each decontamination area will be designed and equipped to ensure minimal hazards to the environment. The area will be positioned so that it does not drain to water, soil, or sewer systems. A "spill kit" will be placed at each central decontamination area and will contain:

- Four sets of disposable personal protective clothing,
- Four pairs nitrile latex gloves with 10-inch gauntlets,
- Barricade tape and posts (stanchions),
- One 10-ft X 40-ft sheet of 10 mil-thick plastic,
- Two shovels, non-sparking,
- 50 pounds of adsorbent material,
- Four organic/acid gas respirators.

To determine the effectiveness of sampling equipment decontamination procedures, equipment blanks will be collected once a day. Sampling equipment is generally decontaminated by scrubbing with a biodegradable commercial detergent (e.g., Alconox or equivalent), followed by a de-ionized water rinse. The equipment blank sample can then be collected by rinsing the equipment again with de-ionized water and collecting the rinsate into a sample container. Analytical parameters for the decontamination sample should be the same as those for the sampled material for which the device was previously used.

6. SAMPLE HANDLING AND SHIPMENT PROCEDURES

6.1 Sample Preservation and Storage

A summary of the sample handling procedures, including types of containers and preservatives required for each analysis, is provided in Table 2-2. All soil samples will be stored in a cooler with ice or frozen reusable ice packs immediately after collection. The cooler of filled sample containers will be transported by courier or hand-delivered to the laboratory for analysis.

6.2 Chain-of-Custody Procedures

All samples will remain in the custody of the sampling personnel during each sampling day. At the end of each sampling day and prior to the transfer of the samples to the courier, chain-of-custody entries will be made for all samples using a chain-of-custody record (Figure 2-2). One chain-of-custody form will be completed for each cooler of samples. All information on the chain-of-custody form and the sample container labels will be checked against the sampling log entries, and samples will be recounted before transferring custody. Upon transfer of custody to the courier or to the laboratory, the chain-of-custody form will be signed by a member of the field team, sealed in plastic, and taped to the inside lid of the cooler.

A signed, dated custody seal (Figure 2-3) will be placed over the lid opening of the sample cooler to indicate if the cooler is opened during shipment. All chain-of-custody forms received by the laboratory must be signed and dated by the laboratory's sample custodian.

The custodian at the laboratory will note the condition of each sample received as well as questions or observations concerning sample integrity. The sample custodian will also maintain a sample-tracking record that follows each sample through all stages of laboratory processing. The sample tracking records must show the date of sample extraction, if extraction was performed, and sample analysis. These records will be used to determine compliance with holding time limits during laboratory audits and data validation.

7. QUALITY ASSURANCE

The overall quality assurance objective is to ensure that data of known and defensible quality are obtained during the closure activities. To achieve that objective, all field activities related to sampling will be conducted in accordance with the methods described below.

Analytical data generated by the sampling and analysis activities will be validated to ensure that the precision and accuracy of laboratory analytical results are within established guidelines. Collection of quality control samples is discussed in the following section.

7.1 Field Quality Control

The following quality control (QC) samples will be collected and analyzed to evaluate the accuracy of sample analysis.

- Field duplicate samples will be collected at a frequency of one duplicate for every 20 samples.
- Trip blank samples will be prepared by the laboratory to accompany field samples until they are analyzed at the laboratory (one trip blank per cooler) for volatile organic constituents.
- Equipment (rinse) blank samples will be collected at a frequency of one per day and analyzed like the samples that were collected with that equipment.

7.2 Laboratory Quality Control

All samples will be analyzed by a laboratory that is accredited under WAC 173-50. Selection of multiple laboratories may be required to meet these conditions. The quality of analytical data generated is controlled by the frequency and type of internal QC checks developed for each analysis type. Internal laboratory QC checks will include the following:

- Method Blanks of laboratory reagent-grade water treated in the same manner as the sample (i.e., digested, extracted, distilled, etc.) then analyzed and reported as a standard sample. The analysis of method blanks serve as a check on reagents to assure that they are free of contamination.

- Method Blank Spikes of laboratory reagent-grade water fortified or spiked with the analytes of interest for the associated sample batch. Method blank spikes are not included with VOC analyses since the same function is served by the calibration standard analysis.
- Matrix Spikes consist of an aliquot of a field sample that is fortified (spiked) with the analytes of interest and analyzed with an associated sample batch to monitor the effects of the field sample matrix (matrix effects) on the analytical method.
- Surrogates consist of spiking the sample, method blank, blank spike and duplicate, and matrix spike and duplicate with the analyses of interest to monitor method performance and possible bias from matrix effects.
- Laboratory Control Standard for Inorganics is a standard solution with a certified concentration that is analyzed as a sample and is used to monitor analytical accuracy.

8. HEALTH AND SAFETY

All field personnel involved with implementing this SAP will have attended a minimum of 24-hour health and safety training course for conducting work at hazardous waste sites and annual 8-hour training updates. This course satisfies the initial training requirements of 29 CFR § 1910.120 (OSHA regulation of hazardous waste site activities). All field personnel involved in this project will also attend a site orientation, safety training, and radiation course. Additional health and safety procedures and requirements will be outlined in a site-specific Health & Safety Plan.

All personnel conducting sampling activities will follow the MWF's standard health and safety operating procedures.

9. REPORTING

Following data validation and evaluation, the results of implementing the closure plan will be reported to Ecology. This report will include a description of any additional activities required to complete closure of the MWF.

TABLES

Table 2-2 Summary of Sampling and Analysis Requirements
Mixed Waste Treatment Facility

Analyte	EPA Method	Container*	Preservative	Holding Time
Polynuclear Aromatic Hydrocarbons	8310	8 oz, P or G	Cool 4 C	7 days extraction 40 days analysis
Volatile Organics (modified list)	8260	8 oz, P or G	Cool 4 C	7 days extraction 14 days analysis
Organochlorine Pesticides & PCBs	8082	8 oz, P or G	Cool 4 C	7 days extraction 40 days analysis
Total Volatile HydrocarbonsNon-Halogenated Organics	8015	8 oz, P or G	Cool 4 C	14 days extraction 40 days analysis
TCLP Metals (16)	6010	4 oz, P or G	Cool 4 C	6 months
Organochlorine Pesticides by GC	8180	8 oz, P or G	Cool 4 C	14 days extraction 40 days analysis
Semi-volatile Organic Compounds	8270	8 oz, P or G	Cool 4 C	14 days extraction 40 days analysis
Cyanide	9010	4 oz, P or G	Cool 4 C	14 days
Mercury	7470 or 7471	4 oz, P or G	Cool 4 C	6 months
Gross alpha	900.0	4 oz, P or G	Cool 4 C	6 months
Gross beta	900.0	4 oz, P or G	Cool 4 C	6 months
Flashpoint	1010	8 oz, G	Cool 4 C	28 days
pH	9045	4 oz, P or G	Cool 4 C	7 days

*	Volume listed is minimum volume
C	Degrees celsius
G	Glass
oz	Ounce
P	Polyethylene

* Note: Soil samples will be collected in brass sleeve, Teflon-lined cap

TABLE 2-2 continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Sludge/Solids

Waste Code	Constituent	Method[1]		LOQ	MDL
		SW-846	Description		
D004	Arsenic	6010B	ICP-Atomic Emission Spectrometry	15 mg/kg	3 mg/kg
D005	Barium	6010B	ICP-Atomic Emission Spectrometry	2 mg/kg	0.3 mg/kg
D006	Cadmium	6010B	ICP-Atomic Emission Spectrometry	1.5 mg/kg	0.3 mg/kg
D007	Chromium	6010B	ICP-Atomic Emission Spectrometry	2 mg/kg	0.5 mg/kg
D008	Lead	6010B	ICP-Atomic Emission Spectrometry	15 mg/kg	3.5 mg/kg
D009	Mercury	7471A	Manual Cold-Vapor Technique (Liquids)	0.5	0.1
D010	Selenium	6010B	ICP-Atomic Emission Spectrometry	40 mg/kg	7.5 mg/kg
D011	Silver	6010B	ICP-Atomic Emission Spectrometry	3 mg/kg	0.5 mg/kg
		8270C	Semivolatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D012	Endrin	8270C	Semivolatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D013	Lindane	8270C	Semivolatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D014	Methoxychlor	8270C	Semivolatile Organic Compounds by GC/MS	100 ug/kg	20 ug/kg
D017	2,4,5 TP (Silvex)	8260A	Volatile Organic Compounds by GC/MS	1 ug/kg	0.2 ug/kg
D018	Benzene	8260A	Volatile Organic Compounds by GC/MS	1 ug/kg	0.2 ug/kg
D019	Carbon Tetrachloride	8082	Organochlorine Pesticides by GC	100 ug/kg	20 ug/kg
D020	Chlorodane	8260A	Volatile Organic Compounds by GC/MS	1 ug/kg	0.2 ug/kg
D021	Chlorobenzene	8260A	Volatile Organic Compounds by GC/MS	1 ug/kg	0.2 ug/kg

TABLE 2-2 continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Sludge/Solids

Waste Code	Constituent	Method[1]		LOQ	MDL
		SW-846	Description		
D022	Chloroform	8270C	Semivolatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
D023	o-Cresol (2-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
D024	m-Cresol (3-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
D025	p-Cresol (3-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
D026	Cresol total	8270C	Semivolatile Organic Compounds by GC/MS	1 ug/kg	0.2 ug/kg
D027	p-Dichlorobenzene	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D028	1,2-Dichloroethane	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/mg
D029	1,1-Dichloroethene	8270C	Semivolatile Organic Compounds by GC/MS	330 ug/kg	33 ug/kg
D030	2,4-Dinitrotoluene	8270C	Semivolatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D031	Heptachlor	8270C	Semivolatile Organic Compounds by GC/MS	330 ug/kg	33 ug/kg
D032	Hexachlorobenzene	8270C	Semivolatile Organic Compounds by GC/MS	330 ug/kg	33 ug/kg
D033	Hexachlorobutadiene	8270C	Semivolatile Organic Compounds by GC/MS	330 ug/kg	33 ug/kg
D034	Hexechloroethane	8270C	Semivolatile Organic Compounds by GC/MS	330 ug/kg	33 ug/kg
D036	Nitrobenzene	8270C	Semivolatile Organic Compounds by GC/MS	3300 ug/kg	33 ug/kg
D037	Pentrachlorophenol	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D039	Tetrachloroethene	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
D040	Trichloroethene	8270C	Semivolatile Organic Compounds by GC/MS	1700 ug/kg	100 ug/kg

TABLE 2-2 continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Sludge/Solids

Waste Code	Constituent	Method[1]		LOQ	MDL
		SW-846	Description		
D041	2,4,5-Trichlorophenol	8270C	Semivolatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
D042	2,4,6-Trichlorophenol	8260A	Volatile Organic Compounds by GC/MS	2 ug/kg	0.4 ug/kg
D043	Vinyl Chloride	8082	Organochlorine Pesticides and PCBs	100 ug/kg	20 ug/kg
PCB	Aroclor	8260A	Volatile Organic Compounds by GC/MS	2 ug/kg	0.4 ug/kg
F001	Carbon Tertrachloride				
	Methylene Chloride				
	Tetrachloroethylene				
	1,1,1-Trichloroethane				
	Trichloroethane				
	1,1,2-Trichloro-1,2,2-triflouroethane				
	Trichlorofluoromethane	8260A	Volatile Organic Compounds by GC/MS	2 ug/kg	0.4 ug/kg
F002	Chlorobenzene				
	o-Dichlorobenzene				
	Methylene Chloride				
	Tetrachloroethylene				
	1,1,1-Trichloroethane				
	1,1,2-Trichloroethane				

TABLE 2-2 continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Sludge/Solids

Waste Code	Constituent	Method[1]		LOQ	MDL
		SW-846	Description		
	Trichloroethane				
	1,1,2-Trichloro-1,2,2-triflouroethane				
	Trichlorofluoromethane	8260A	Volatile Organic Compounds by GC/MS	20 ug/kg	6 ug/kg
F003	Acetone				
	Ethyl acetate				
	Methanol				
	Methyl isobutyl ketone				
	Ethyl ether	8015B	Nonhalogenated Organics Using GC/FID	TBD	TBD
	Cyclohexanone	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
	Ethyl benzene			5 ug/kg	5 ug/kg
	Xylenes	8270C	Semi-volatile Organic Compounds by GC/MS	1000 ug/kg	100 ug/kg
F004	o-Cresol				
	m-Cresol				
	p-Cresol				
	Cresyilc Acid				
	Nitrobenzene	8260A	Volatile Organic Compounds by GC/MS	5 ug/kg	1 ug/kg
F005	Benzene			5 ug/kg	3 ug/kg

TABLE 2-2 continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Sludge/Solids

Waste Code	Constituent	Method[1]		LOQ	MDL
		SW-846	Description		
	Carbon disulfide			300 ug/kg	1 ug/kg
	Isobutyl alcohol			20 ug/kg	9 ug/kg
	Methyl ethyl ketone			TBD	TBD
	2-Nitropropane			1000 ug/kg	100 ug/kg
	Pyridine			5 ug/kg	1 ug/kg
	Toluene	8015B	Non-halogenated Organics Using GC/FID	TBD	TBD
	2-Ethoxyethanol (Ethylene Glycol)				

[1] From Test Methods for Evaluating Solid Waste Physical/Chemical Methods (EPA/SW-846) Third Edition Update III

TABLE 2-2 Continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Liquids

Waste Code	Constituent	Method[1]		LOQ (ug/l)	MDL (ug/l)
		SW-846	Description		
D004	Arsenic	6010B	ICP-Atomic Emission Spectrometry	150	30
D005	Barium	6010B	ICP-Atomic Emission Spectrometry	15	3
D006	Cadmium	6010B	ICP-Atomic Emission Spectrometry	15	3
D007	Chromium	6010B	ICP-Atomic Emission Spectrometry	15	5
D008	Lead	6010B	ICP-Atomic Emission Spectrometry	150	35
D009	Mercury	7470A	Manual Cold-Vapor Technique (Liquids)	0.5	0.1
D010	Selenium	6010B	ICP-Atomic Emission Spectrometry	400	75
D011	Silver	6010B	ICP-Atomic Emission Spectrometry	25	5
D012	Endrin	8270C	Semivolatile Organic Compounds by GC/MS	0.05	0.005
D013	Lindane	8270C	Semivolatile Organic Compounds by GC/MS	0.05	0.005
D014	Methoxychlor	8270C	Semivolatile Organic Compounds by GC/MS	0.05	0.005
D015	Toxaphene	8270C	Semivolatile Organic Compounds by GC/MS	1	0.1
D018	Benzene	8260A	Volatile Organic Compounds by GC/MS	1	0.2
D019	Carbon Tetrachloride	8260A	Volatile Organic Compounds by GC/MS	1	0.2
D020	Chlorodane	8081A	Organochlorine Pesticides by GC	1	0.1
D021	Chlorobenzene	8260A	Volatile Organic Compounds by GC/MS	1	0.2

TABLE 2-2 Continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Liquids

Waste Code	Constituent	Method[1]		LOQ (ug/l)	MDL (ug/l)
		SW-846	Description		
D022	Chloroform	8260A	Volatile Organic Compounds by GC/MS	1	0.2
D023	o-Cresol (2-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D024	m-Cresol (3-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D025	p-Cresol (3-Methylphenol)	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D026	Cresol total	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D027	p-Dichlorobenzene	8270C	Semivolatile Organic Compounds by GC/MS	1	0.2
D028	1,2-Dichloroethane	8260A	Volatile Organic Compounds by GC/MS	5	1
D029	1,1-Dichloroethene	8260A	Volatile Organic Compounds by GC/MS	5	1
D030	2,4-Dinitrotoluene	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D031	Heptachlor	8270C	Semivolatile Organic Compounds by GC/MS	0.05	0.005
D032	Hexachlorobenzene	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D033	Hexachlorobutadiene	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D034	Hexechloroethane	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D036	Nitrobenzene	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D037	Pentrachlorophenol	8270C	Semivolatile Organic Compounds by GC/MS	50	1
D039	Tetrachloroethene	8260A	Volatile Organic Compounds by GC/MS	5	1
D040	Trichloroethene	8260A	Volatile Organic Compounds by GC/MS	5	1

TABLE 2-2 Continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Liquids

Waste Code	Constituent	Method[1]		LOQ (ug/l)	MDL (ug/l)
		SW-846	Description		
D041	2,4,5-Trichlorophenol	8270C	Semivolatile Organic Compounds by GC/MS	50	1
D042	2,4,6-Trichlorophenol	8270C	Semivolatile Organic Compounds by GC/MS	10	1
D043	Vinyl Chloride	8260A	Volatile Organic Compounds by GC/MS	2	0.4
PCB	Aroclor	8082	Organochlorine Pesticides and PCBs	1	0.2
F001	Carbon Tertrachloride	8260A	Volatile Organic Compounds by GC/MS	2	0.4
	Methylene Chloride				
	Tetrachloroethylene				
	1,1,1-Trichloroethane				
	Trichloroethane				
	1,1,2-Trichloro-1,2,2-triflouroethane				
	Trichlorofluoromethane				
F002	Chlorobenzene	8260A	Volatile Organic Compounds by GC/MS	2	0.4
	o-Dichlorobenzene				
	Methylene Chloride				
	Tetrachloroethylene				
	1,1,1-Trichloroethane				
	1,1,2-Trichloroethane				

TABLE 2-2 Continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Liquids

Waste Code	Constituent	Method[1]		LOQ (ug/l)	MDL (ug/l)
		SW-846	Description		
	Trichloroethane				
	1,1,2-Trichloro-1,2,2-triflouroethane				
	Trichlorofluoromethane				
F003	Acetone	8260A	Volatile Organic Compounds by GC/MS	20	6
	Ethyl acetate				
	Methanol				
	Methyl isobutyl ketone				
	Ethyl ether				
	n-Butyl alcohol	8015B	Nonhalogenated Organics Using GC/FID	TBD	TBD
	Ethyl benzene	8260A	Volatile Organic Compounds by GC/MS	5	1
	Xylenes			5	5
F004	o-Cresol	8270C	Semi-volatile Organic Compounds by GC/MS	1000	100
	m-Cresol				
	p-Cresol				
	Cresyilc Acid				
	Nitrobenzene				
F005	Benzene	8260A	Volatile Organic Compounds by GC/MS	5	1

TABLE 2-2 Continued
Methods Detection Limits and Limits of Quantitation for Expected Constituents in Liquids

Waste Code	Constituent	Method[1]		LOQ (ug/l)	MDL (ug/l)
		SW-846	Description		
	Carbon disulfide			5	3
	Isobutyl alcohol			300	1
	Methyl ethyl ketone			20	9
	2-Nitropropane			TBD	TBD
	Pyridine			1000	100
	Toluene			5	1
	2-Ethoxyethanol (Ethylene Glycol)	8015B	Non-halogenated Organics Using GC/FID	TBD	TBD

[1] From Test Methods for Evaluating Solid Waste Physical/Chemical Methods (EPA/SW-846) Third Edition Update III

Table 2-3. Equipment Checklist - Sampling
Sampling and Analysis Plan

Sample Containers

___ 8-oz glass sampling jars
___ 6-inch brass or stainless-steel soil sampling tubes (2.5-inch diameter)
___ 3-inch wide Teflon™ tape
___ Plastic end caps (2 per sample tube)
___ Self-bonding silicone rubber tape
___ Self-sealing plastic bags (pint and quart sizes)

General Equipment

___ Coolers
___ Trash bags
___ Kim wipes
___ Frozen ice packs
___ Soil auger and extensions
___ Stainless-steel spoons
___ Shovel
___ Composite liquid waste sampler
___ Survey stakes
___ Survey paint
___ Flashlight
___ Plastic sheeting
___ Tools (chisel, trowel, shears, saws, drill, etc.)
___ Tape

Instrumentation

___ PID
___ Measuring tape
___ Hand transit

Documentation

___ Field notebook
___ Camera and film
___ Sample labels
___ Chain-of-custody records
___ Chain-of-custody seals
___ Task-specific forms
___ Waterproof pen

Table 2-4 Examples of Sampling Methods and Equipment
Mixed Waste Treatment Facility

Material	Sampling method	Sampling equipment
Containerized liquids	SW-846	COLIWASA* or tubing
Extremely viscous liquid	ASTM D140-70	Tubing or trier
Crushed or powdered material	ASTM D364-75	Tubing, trier, auger, scoop, or shovel
Soil or rock-like material	ASTM D420-93	Tubing, trier, auger, scoop, or shovel
Soil-like material	ASTM D1452-80	Tubing, trier, auger, scoop, or shovel
Fly ash-like material	ASTM D2234-86	Tubing, trier, auger, scoop, or shovel
Containment systems	Wipe sampling (OSHA 1977)	Filter paper and cleaning solution

*COLIWASA = Composite liquid waste sampler.

Table 3-1 Summary of Sample Quantity Mixed Waste Treatment Facility

	Sample Quantity					
Sample Type	Walls	Ceiling	Floors	Equipment	Soil	Hot Spots
Decontamination Verification	50	50	50	50		25
Subsoil Verification					75	15
Not Shown On Sampling Grid						
HVAC				25		
Electrical lighting				2		
Total	50	50	50	77	75	40

Note: Typical sampling locations are identified; actual locations will be based on criteria in the Closure Plan

FIGURES

ATTACHMENT 9-1

APPENDIX 9-A
Figure 2-1

EXAMPLE SAMPLE LABEL

ESS

ENVIRONMENTAL SAMPLING SUPPLY

LOT #
SAMPLE ID

SAMPLED BY	DATE
	TIME
LOCATION	PRESERVATIVE
ANALYSIS	CLIENT

ATTACHMENT 9-1

APPENDIX 9-A

EXAMPLE CHAIN-OF-CUSTODY FORM
Figure 2-2

Mixed Waste Facility

SEND REPORT TO:

Project Number ____________ **Project Fax** ____________

Project Name ____________ **Req'd Report Date** ____________

Project Manager ____________ **Lab Contact** ____________

Project Phone ____________ **Lab Phone** ____________

	Sample ID #	TYPE	CONTAINER	VOLUME	PRESERVATIVE	ANALYSIS REQ'D	DATE	NOTES	[LAB ID #]
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Sample TAT Req'd: ____________ **Notes:** ____________

SAMPLE CHARACTERISTICS

Flammable ☐ **Hazardous** ☐ **Gas** ☐ **Liquid** ☐ **BiPhase** ☐ **Sp. Grav.** ______ **Color** _

______ **Corrosive** ☐ **Radioactive** ☐ **Solid** ☐ **Sludge** ☐ **TriPhase** ☐ **Flash Pt.** ____ **Odor** ______

CUSTODY TRACKING

1) **Relinquished By:** ____________ **Date:** ______ **Time:** ______ **Received By:** ____________ **Date:** ______ **Time:** ______

2) **Relinquished By:** ____________ **Date:** ______ **Time:** ______ **Received By:** ____________ **Date:** ______ **Time:** ______

3) **Relinquished By:** ____________ **Date:** ______ **Time:** ______ **Received By:** ____________ **Date:** ______ **Time:** ______

ATTACHMENT 9-1

APPENDIX 9-A

EXAMPLE CHAIN-OF-CUSTODY SEAL
Figure 2-3

CUSTODY SEAL

Person Collecting Sample ______________________________ **Sample No.** ________________
(signature)

Date Collected ______________________________ **Time Collected** ________________