State of New Jersey
Department of Environmental Protection

QA/QC Project Management Plan For the Ellis Property Evesham Township, New Jersey

February 1987

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WESTON
DESIGNERS CONSULTANTS

QUALITY ASSURANCE PROJECT MANAGEMENT PLAN

of the

ELLIS PROPERTY
EVESHAM TOWNSHIP, NEW JERSEY

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February 1987

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SECTION 1

INTRODUCTION

1.1 OVERVIEW

A Remedial Investigation (RI) of the Ellis Property Site located on Sharp Road in Evesham Township, New Jersey will be conducted by the New Jersey Department of Environmental Protection (NJDEP) and its contractor, Roy F. Weston, Inc. The NJDEP previously conducted a removal action at the site, which addressed containerized wastes and shallow soil contamination (Ref. 1). The purpose of this investigation is to characterize any residual soil, groundwater, and surface water contamination which may exist at the site.

U.S. Environmental Protection Agency (U.S. EPA) policy, contained in the Administrator's Memorandum dated 30 May 1979, requires a Quality Assurance Project Plan (QAPP) for all environmental monitoring and measurements mandated or supported by the Agency. Funding for the Remedial Investigation of the Ellis Property has been provided by the U.S. EPA from the Superfund established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. A cooperative agreement between the U.S. EPA and the NJDEP designates the NJDEP as the lead agency.

This document constitutes the QAPP required for this Federally funded project. The U.S. EPA guidance document entitled Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (Ref. 2) was used extensively in preparing this Plan. The WESTON Standard Practices Manual (Ref. 3), currently on file with the NJDEP, was consulted extensively during preparation of this site-specific plan. The Field Sampling Plan (Ref. 1) was also integral in preparing this Plan.

1.2 APPLICABILITY

This QAPP applies to all environmental monitoring and measurements made at the Ellis Property Site. Samples collected off-site as part of the investigation are also subject to this plan. Field activities and laboratory procedures are subject to the provisions of this Plan.

Two laboratories will be utilized for the remedial investigation of the Ellis Property. The WESTON laboratory in Lionville, Pennsylvania will conduct all of the analyses with the exception of the 2,3,7,8-TCDD determinations. The 2,3,7,8-TCDD analyses will be conducted by California Analytical Laboratories in Sacramento, California. Both laboratories are subject to this Plan.

SECTION 2

PROJECT DESCRIPTION

2.1 BACKGROUND

The Ellis Property is an approximately 36-acre site located in Evesham and Medford Townships, Burlington County, New Jersey. Approximately 24 acres are situated in Evesham Township. The location of the site is depicted on the USGS 7 1/2 minute series quadrangle for the area in Figure 2-1. The site is in a rural area surrounded by farms and wooded lots.

The property, which was purchased by Mr. Irving Ellis in 1968, was the site of a drum reconditioning (cooperage) operation. Approximately 4 acres of the 36-acre tract were directly involved with these operations. As a part of these operations, residual materials from the drums delivered to the site were reportedly deposited on the ground in several locations. Historical aerial photographs have identified the potential locations where this was practiced (Ref. 4). The site was involved in an extensive fire, which occurred about 1978. A shed adjacent to the southern building houses a boiler. The cylindrical stack associated with the boiler fell over during the recent collapse of the roof over the boiler shed.

In September 1980, the NJDEP received an anonymous complaint regarding the site. A series of subsequent site investigations and inspections revealed the presence of several hundred containers at the site including 55-gallon steel drums, plastic barrels and drum liners, and 40-gallon fiber drums. Some of these drums were found to contain oils, grease, acids, and various organic compounds. Many of the drums had corroded or otherwise deteriorated so that the contents were leaking out of the containers. Dead or stressed vegetation and a high acidity in the soils surrounding the drums were observed. Sampling and analysis revealed the presence of hydrochloric acid, oils, and grease. Chromium and barium at levels exceeding the EP toxicity limits (40 CFR 261 and NJAC 7:26-8.12) were also encountered. Polychlorinated biphenyls (PCB's) were detected in the low parts per million concentration range. Historical data are summarized in Table 2-1.

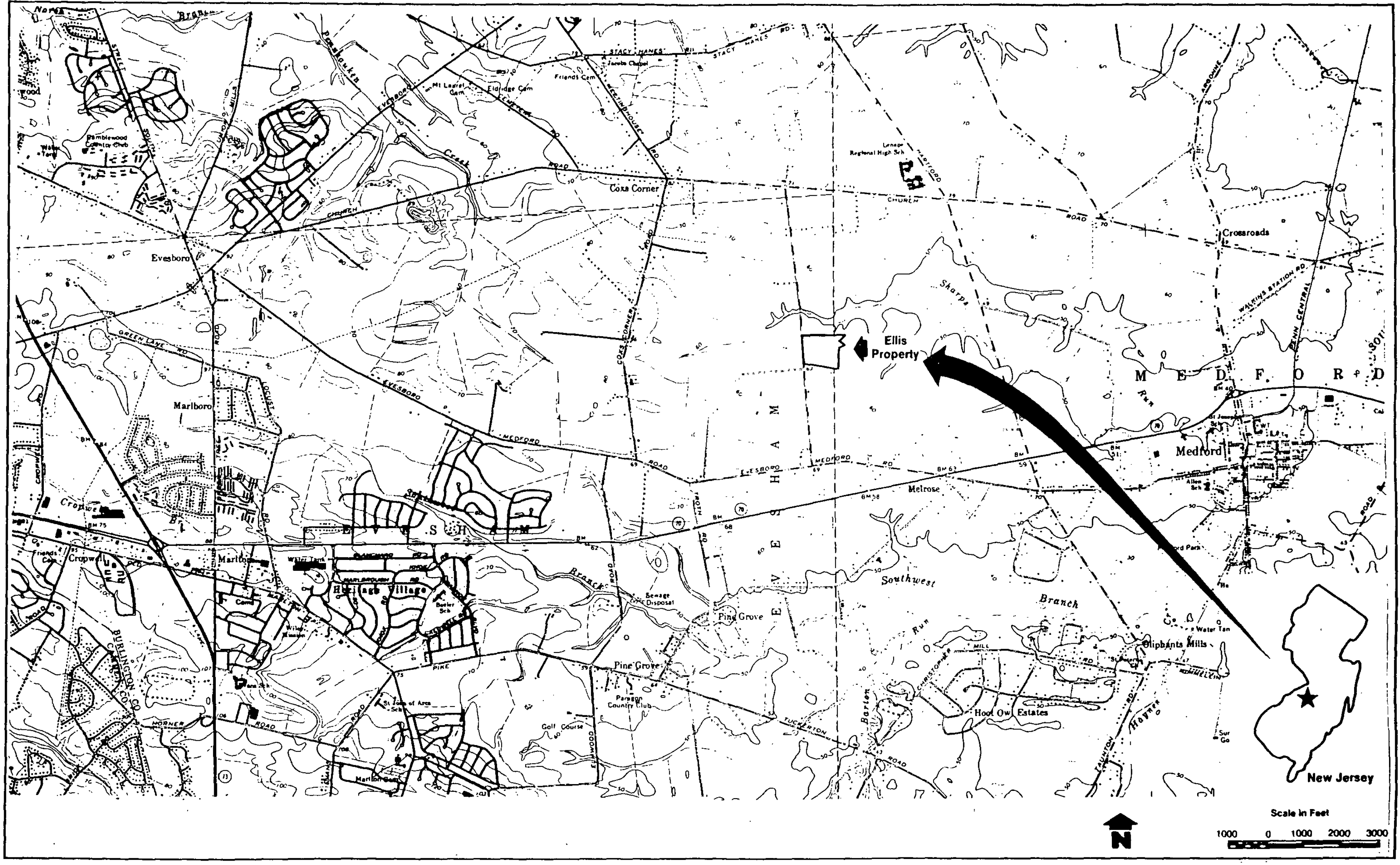


FIGURE 2-1 LOCATION MAP

Table 2-1

Historical Data

Compound	Greatest Concentration Detected at the Site	Matrix
Hydrochloric Acid	Concentrated, pH >1	drums[1]/ soil
Poly-chlorinated Biphenyls (PCB)	Approximately 3 ppm	drums/ soil
Total Petroleum Hydrocarbons	See Note 2	drums/ soil
Oil & Grease	Not Reported	drums/ soil
Chromium	100 ppm in EP Tox leachate	soil
Barium	1,600 ppm in EP Tox leachate	soil

Notes

[1] Drums of concentrated acid were removed during state clean-up activities.

[2] No data reported on sample analysis forms, although the analysis was apparently requested.

The NJDEP Division of Water Resources and the Burlington County Health Department conducted investigations pertaining to the quality of drinking water in the vicinity of the site. The January 1983 studies reported that the wells in the vicinity of the site were not being impacted by contaminants detected on the property.

The NJDEP attempted to persuade the owner to accept responsibility for the releases which were occurring on his property. The owner's repeated failure to cooperate with the NJDEP led to a subsequent NJDEP cleanup action. The cleanup conducted by the NJDEP was financed by the New Jersey Spill Compensation Fund. Approximately 100 drums containing acids were emptied and disposed of at a permitted off-site facility. Some containerized solids and flammable liquids were also removed and disposed of during the cleanup. Deposits of contaminated soils and sludges were also removed. Surface soils contaminated by acids were treated on-site by tilling approximately one ton of lime into the effected area. The site was subsequently referred to the State Attorney General's Office for further action. A lien against the property was obtained for reimbursement of response costs.

The U.S. EPA Region II issued a notice to the owner advising him of his responsibility under Federal regulations to remediate the site. The owner has not responded to the October 1984 notice. The site is in the preliminary phases of a Remedial Investigation/Feasibility Study (RI/FS) conducted pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (Superfund). A cooperative agreement has been signed between the U.S. EPA and the NJDEP, which designates the NJDEP as the lead agency for this Superfund financed project.

2.2 DEFINITION OF THE PROBLEM

A limited number of drum and soil samples were obtained at the site by the NJDEP during the initial cleanup. These samples identified the presence of several hazardous substances. Specific substances identified in the drums included high concentrations of hydrochloric acid and oil and grease. PCB's in the low parts per million concentration were also identified. During the March 1983 NJDEP cleanup, the drums that contained hazardous materials were removed from the site, and lime was mixed into the acid leaching area. However, residual soil contamination may still exist.

The site is situated on an outcrop of the Hornerstown and Vincentown Formations, which are primarily composed of glauconitic clay and sand. The Hornerstown Formation functions hydrologically as an aquitard. A hand dug well located on the property was inspected during January 1986. A static water level of 15 inches below grade was observed and may represent the water table conditions; however, recent precipitation may have entered the well, thereby raising the water level, and the actual water table may be somewhat deeper. A shallow water table combined with the deposition of wastes onto the surface soils raises the concern over groundwater impacts.

A swampy area located approximately 600 feet to the east of the site buildings is believed to be hydrologically connected to the water table. Groundwater discharging to this downgradient area may have transported contaminants to that area. Surface water runoff from the drum handling area may also have transported contaminants to the swamp.

2.3 INVESTIGATIVE TECHNIQUES

The portion of the Ellis Property, which was utilized for the drum recycling operations or which may have been impacted by those operations, will be investigated using a number of techniques including the following:

- Soil screening for volatile organic emissions and radioactivity.
- Geophysical surveys.
- Soil borings and sampling.
- Surface soil sampling.
- Shallow and deep monitoring-well installation and sampling.
- Surface water and sediment sampling.
- Container sampling.

The procedures and analytical parameters for these techniques are specified in Section 5 of this plan. Additional information regarding location of sampling points and specific techniques is provided in the Field Sampling Plan. The analytical methods which will be employed by the laboratories are summarized in Section 8 of this QA Plan.

SECTION 3

PROJECT ORGANIZATION AND RESPONSIBILITY

The project organization, line of authority (see Figure 3-1), and the responsibility of participating individuals are described in this section.

3.1 FIELD TEAM LEADER (SITE PROJECT ENGINEER)

The field team leader is responsible for the following quality control activities:

- Supervise implementation of the FSP; coordinate field activities with the Task Manager and Site Safety Officer (SSO).
- Supervise sample packaging, shipping and transportation procedures.
- Audit chain-of-custody documents on a daily frequency for accuracy and completeness.
- Audit field log books to ensure that comprehensive field notes are recorded.
- Ensure prevention of sample contamination by auditing decontamination procedures.
- Supervise any approved variances to the FSP. Approval in writing must be obtained from the Project Manager and the NJDEP Site Manager.

This position will be filled by Mr. Joseph Martino, a chemical engineer with more than five years of experience in field investigations.

3.2 FIELD QA/QC COORDINATOR (SITE PROJECT GEOLOGIST)

The field QA/QC coordinator is responsible for the following quality control activities:

- Supervise sample bottle preparation and labeling.
- Check and sign all field log books.
- Provide QA/QC oversight for sampling procedures.

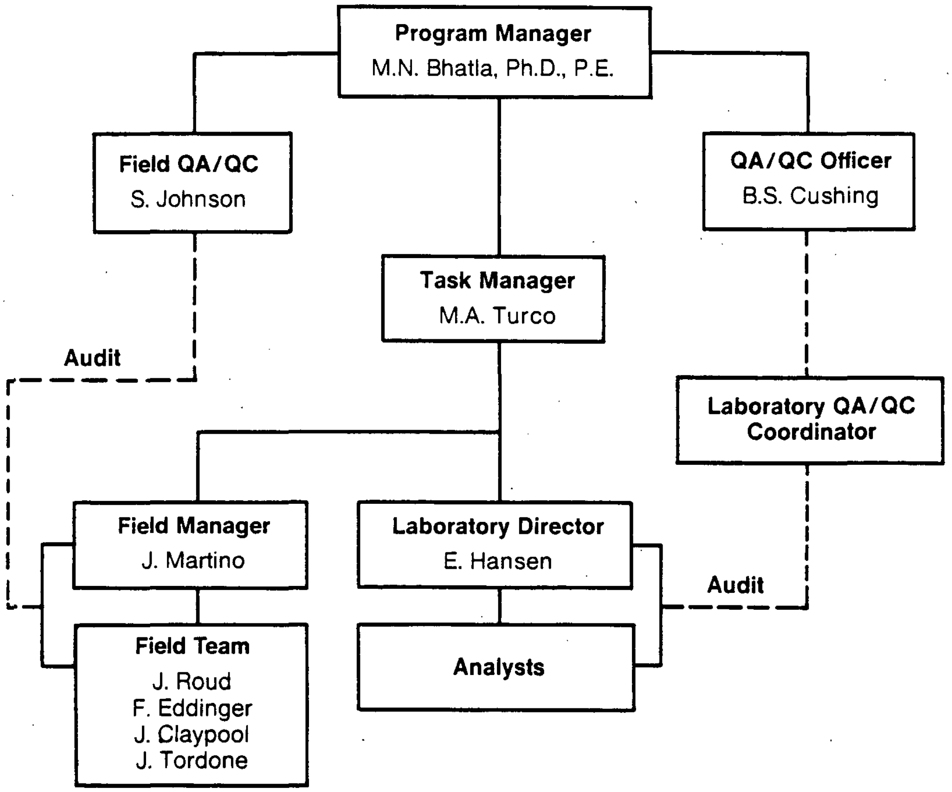


FIGURE 3-1 RESPONSIBILITIES CHART

- Prepare chain-of-custody documents; responsible for sample preservation, packaging, and transportation.
- Verify calibration of field instruments.

This position will be filled by Jody Roud, a project geologist.

3.3 LABORATORY QA/QC COORDINATOR

The laboratory QA/QC coordinator is responsible for the quality assurance activities of the laboratory. The duties of the laboratory QA/QC Coordinator are fully described in Standard Practice 16-22-003 (Ref. 3). These duties include the following:

- Ensure conformance with authorized policies, procedures, and sound practices; recommend improvements as necessary.
- Inform the laboratory supervisor of nonconformance to the QA Program.
- Responsible for logging in samples, introduction of control samples into the sampling train, and establishment of testing lots.
- Based on visual observation of incoming samples, provide input to the Field QA/QC Coordinator as to the acceptability of sample size, physical characteristics, and packaging. In the laboratory, ensure that subsampling of dried samples is conducted in a manner consistent with the appropriate guidelines (ASTM method D346).
- Approve laboratory data before reporting or transmittal to permanent storage. Responsible for retention of supporting information such as control charts and other performance indicators to demonstrate that the systems which produced the data were in control.
- Maintain an awareness of the entire laboratory operation to detect conditions which might directly or indirectly jeopardize controls of the various analytical systems.
- Supervise purchasing of laboratory materials, reagents, and chemicals to ensure that the supplies do not jeopardize the quality of analytical results.
- Maintain a log of analysts certification in the performance of specific analyses.

3.4 LABORATORY MANAGER

The Duties and Responsibilities of the Laboratory Manager are fully described in Standard Practice 16-22-001 (Ref. 3). The laboratory supervisor is responsible for daily operation of the laboratory. These duties include:

- Analysis schedule.
- Personnel assignments.
- Resolving out-of-control situations.

3.5 SECTION MANAGERS

The duties and responsibilities of the Section Managers overseeing organic and inorganic analyses are fully described in Standard Practice 16-22-002 (Ref. 3). The Section Managers are responsible for the following QA/QC functions:

- Assigning specific tasks to the analysts.
- Reviewing analysts' calculations and raw data.
- Informing the Laboratory Manager of production delays.
- Resolving analytical problems.
- Performing quality assurance/quality control checks including spot checks of analysts' calculations and techniques.

3.6 ANALYSTS

The duties and responsibilities of the analysts are fully described in Standard Practice 16-22-006 (Ref. 3). The analysts are required to perform the following quality assurance/quality control functions:

- Maintain a calibration and maintenance notebook for the instrument they are using in the specific analysis.
- Prepare calibration standards.
- Perform instrument calibration before beginning the analysis of samples each day, after every 10 samples, and at the end of the day's work.
- Maintain data notebooks and transfer each day's data to the laboratory computer.

- Follow the method procedures including glassware handling, and the use of proper reagents for the analysis being run.
- Report any unusual observations to the laboratory supervisor.
- Run solvent blanks after a high concentration analysis.
- Follow good analytical chemistry practices.

3.7 OTHER RESPONSIBILITIES

The duties and responsibilities of the following individuals are fully described in the referenced Standard Practice included in the Analytical Laboratory Quality Assurance Plan (Ref. 3):

Laboratory Support Manager	16-22-005
Document Control Officer	16-22-007
Sample Custodian	16-22-008

SECTION 4

QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives of this Plan have been divided into three groups and are described in this section. In summary, the three groups are:

- Precision - Determined by replicate measurements under identical experimental conditions.
- Accuracy - The nearness of a measurement to its accepted (or true) value.
- Completeness - A determination as to whether any significant data needs exist.

4.1 PRECISION

The first quality assurance objective is to obtain precise data and measurements. The term precision describes the reproducibility of data. The degree of agreement between the numerical values of two (or more) measurements performed in an identical fashion constitutes the precision of the measurement.

The priority pollutants plus 40 (PP+ 40) analyses will be employed extensively during the Ellis Property project. The precision objectives for the priority pollutant plus 40 analyses (including metals) are described in the Standard Operating Procedures, WESTON OP 16-22-014 for priority pollutant metals, Attachment E and WESTON OP 16-22-015, Attachment E for priority pollutant organics. The analytic precision of surface wipe samples for 2,3,7,8-TCDD will be measured by analysis of replicate samples of blank filters, which have been fortified with native 2,3,7,8-TCDD, using 10 ng. Precision objectives for 2,3,7,8-TCDD analysis require agreement of duplicates within 50 percent.

Precision data for petroleum hydrocarbon analysis have not been identified in the most recent revision of EPA Methods 3540 and 418.1, as described in References 11 and 12.

4.2 ACCURACY

The accuracy of a measurement, as expressed in terms of error, is the nearness to the accepted or true value. The absolute error is the difference between the observed value and the true value. Error may arise from personal, instrumental, or methods factors.

The accuracy objectives for priority pollutant plus 40 (including metals) are described in WESTON OP 16-22-014 for priority pollutant metals and WESTON OP 16-22-015 Attachment E for priority pollutant organics.

Accuracy data for petroleum hydrocarbon analysis have not been identified in the most recent revision of EPA Method 3540/418.1 as described in References 11 and 12.

The accuracy of the 2,3,7,8-TCDD analyses will be evaluated through the analysis of a blind performance evaluation (PE) sample supplied by the NJDEP. The sample will be assigned a fictitious name so that the laboratory is unaware that it is a PE sample. The true concentration of 2,3,7,8-TCDD will be known only to the NJDEP until hard copy data has been received.

4.3 COMPLETENESS

Completeness is a measure of the number of analyses performed for the designated parameters with respect to the number of compound specific analyses planned for the project. The level of completeness can be affected by loss or breakage of samples during transport, as well as external problems which prohibit collection of the samples. The completeness objective for the Ellis Property RI is 90 percent or greater. The only exception is the 2,3,7,8-TCDD analysis which has a completeness goal of 100 percent.

SECTION 5

SAMPLING PROCEDURES

Samples of soil, surface water, containerized waste, and groundwater will be collected during the RI. The following sampling types are discussed herein:

- Soil screening for organic vapor emissions and radioactivity.
- Surface soil samples from known waste handling areas.
- Surface soil samples from predesignated locations outside the known waste handling areas.
- Core samples of the soil from borings at designated depths along the profile.
- Surface water and sediment samples from the drainage ways.
- Groundwater samples at the monitoring well locations and from local potable wells.
- Containers which have residual materials.

Specific procedures for collecting these samples are presented in this plan. Decontamination procedures for sampling implements and sample containers are described in Subsection 5.8 of this plan. These procedures are also included in the Field Sampling Plan.

5.1 CONTAINER SAMPLING

Preparatory activities including staging and instituting an inventory control system are described in the field sampling plan.

A single drum containing what is believed to be compressor oil was observed on the site near the dirt driveway at the northwestern edge of a large brier patch. A sample from the container (and the adjacent soils, see Subsection 5.4) will be obtained and analyzed for the hazardous characteristics of ignitability, corrosivity, reactivity, toxicity (as described in 40 CFR 261 and NJAC 7.26), PCB's, and total petroleum hydrocarbons. The liquid drum will be sampled by a two-man team according to the following procedure:

1. Personnel protective equipment described in the Health and Safety Plan (HASP) will be donned. Opening and sampling of closed containers will be performed in Level B protective equipment, and real-time air monitoring will be performed.

2. If the drum is closed, the sampling team will attempt to open the drum using a bung wrench. A nonsparking brass wrench will be utilized to slowly turn the bung one-half turn. Sampling personnel will listen for pressure equalization and observe for vapor or liquid release. This procedure will be repeated until the bung is open.

3. If the bung or vent on a closed drum is not accessible, or cannot be turned, the sampling team will open the container using a brass chisel and hammer.

4. The opened drum will be sampled using open-end glass tubing fitted with approximately a 4-inch section of flexible tubing on the top end. The tube will be admitted to the drum and the sampler will crimp the tubing by hand to create a vacuum. The tube will be withdrawn from the drum and placed over the open sampling bottle. The flexible tubing will be released slowly to allow the sample to drain into the bottle. This will be repeated until approximately one-half quart of sample has been obtained.

5. During sampling, personnel will observe the color, texture, number of phases and other visible traits of the sampled material.

6. The Teflon-lined lid of the amber glass bottle will be secured. A label will be affixed to the bottle, which will then be placed in two plastic bags. All pertinent data will be recorded in the logbook and the sample request form/chain-of-custody record will be completed.

7. The sample will be placed on ice.

8. The sampling team will secure the bung if it was removed for sampling purposes.

9. The packaged sample will be delivered to the WESTON laboratory for analysis.

Other drums of liquid wastes will be sampled as directed by the NJDEP Site Manager in a manner consistent with that described above.

Drums of solids, powders, or heavy sludges will be sampled with stainless steel trowels prepared in accordance with the sampling implement decontamination protocol specified in Appendix A. Drums containing layered liquids or sludges will be sampled with a Coliwassa (or equivalent) sampler using the procedure described in EPA SW-846 (Ref. 9). Samples from nonempty containers will be analyzed for the RCRA characteristics of ignitability, reactivity, corrosivity, and EP toxicity (40 CFR 261; NJAC 7.26). Additionally, these samples will be analyzed for PCB's and total petroleum hydrocarbons. OK

5.2 SOIL SAMPLING

Soil sampling activities to be conducted at the Ellis Property Site have been divided into the following groups:

- Screening using real-time field instrumentation for volatile emissions.
- Soil borings.
- Surficial sampling in areas known to have been involved in the waste handling activities.
- Surficial sampling at predesignated locations outside areas known to have been involved in the waste-handling activities.

Summaries of the soil samples and associated quality assurance samples planned for this investigation are provided in Tables 5-1 and 5-2, respectively. The rationale for selecting the locations of the various samples is discussed in the Field Sampling Plan. Procedures for obtaining these samples are presented in the following paragraphs (as well as the Field Sampling Plan).

5.2.1 Soil Screening

5.2.1.1 Volatile Organic Screening

A total of 120 locations will be screened for volatile emissions. A photoionization detector (PID) will be utilized during the soil screening. Measurements using an HNu model 101 PID will be obtained within 1 inch of ground surface at the intersection of the grid lines shown on Drawing 102.

Table 5-1

Soil Sampling Summary

Source	Analysis	Bottle Size	Bottle Type	Test Samples
Screening - Grid Intersections	Ambient VO's	N/A	N/A	120
	Ground-Level VO's	N/A	N/A	120
	VO's by Slam Bar	N/A	N/A	60
	Radiation	N/A	N/A	185
Soil Near Oil Drum	RCRA Characteristics	1 qt.	AG	1
	TPH	1 qt.	AG	1
	PCB's	1 qt.	AG	1
Soils From Building Floors	PCB's	1 qt.	AG	4
	TPH	1 qt.	AG	4
Lime Tilled Disposal Area	Cr/Ba	1 qt.	P	14
	TPH	1 qt.	AG	2
	PP + 40			
	- VOA Fraction	40 ml	SV	1
	- Extractables	1 qt.	AG	1
	- Metals	1 qt.	P	1
PCB Disposal Area	PCB	1 qt.	AG	14
	TPH	1 qt.	AG	3
Predesignated Locations	PP + 40			
	- VOA Fraction	40 ml	SV	12
	- Extractables	1 qt.	AG	12
	- Metals	1 qt.	P	12
Soil Borings With Split Spoon	PP + 40			
	- VOA Fraction	40 ml	SV	8
	- Extractables	1 qt.	AG	8
	- Metals	1 qt.	P	8

Notes

PID = Photoionization Detector
AG = Wide-Mouth Amber-Glass Bottle
SV = Teflon Septum Vial
P = Wide-Mouth Polyethylene Bottle
TPH = Total Petroleum Hydrocarbons

Table 5-2

Summary of Soil QA/QC Samples

Source	Analysis	Trip Blanks	Blind Field Blanks	Blind Field Duplicates
Screening at Grid Intersections	PID	N/A	N/A	6
	Radiation			3
Split Spoon Sampler	PP + 40			
	- VOA Fraction	1	1	1
	- Extractables	-	1	1
	- Metals	-	1	1
Soil Near Oil Drum	RCRA	-	-	-
	PCB's	-	1	1
	TPH	-	1	1
Building Floors	PCB's	-	1	1
	TPH	-	1	1
Disposal Area 1	PP + 40			
	- VOA Fraction	1	1	1
	- Extractables	-	1	1
	- Metals	-	1	1
	Cr,Ba	-	1	1
	TPH	-	1	1
Disposal Area 2	PCB	-	1	1
	TPH	-	1	1
Hand Auger Samples From Predesignated Locations	PP + 40			
	- VOA Fraction	1✓	1	1
	- Extractables	-	1	1
	- Metals	-	1	1

In addition to the surface level measurements, a new technique developed by WESTON will be employed to detect volatile organic emissions from the undisturbed soils. Screening of the undisturbed soils provides information needed for evaluation of a "no action" remedial alternative and characterizes the potential for airborne transport under quiescent conditions. This technique involves an inverted cone which mimics a static flux chamber type of sampling device.

After the site reconnaissance team has staked a grid system on the site, the following procedures will be followed:

1. Calibrate the PID as described in Section 7 of this Plan.
2. Connect the funnel, tubing, and HNu.
3. Place the funnel on the ground at the desired grid point.
4. At the grid point, observe the PID measurements for approximately 2 minutes. Record the peak and stabilized measurements, if any.
5. Repeat steps 2, 3, and 4 at each of the screening points.

A third soil screening technique will be employed to detect volatile emissions from the soils under disturbed conditions. Screening of disturbed soils will characterize the potential for airborne transport under conditions such as soil boring and monitoring well installation. Additionally, information needed for evaluation of remedial alternatives involving excavation, tilling, drilling, or other earth-moving activities will be developed by screening the disturbed soils.

Screening of disturbed soils will be performed using a slam-bar technique. A slam bar is a device commonly utilized by natural gas utilities in detecting leaks throughout the distribution system. A slam bar consists of a four-to-five-foot long steel bar equipped with a sliding steel shoe at one end. The device is positioned vertically with the shoe at the top. The operator raises the shoe and slams it down onto the bar which is consequently driven into the soil. After the bar has been driven to a specified depth, it is removed and the gases in the soil matrix are evaluated using appropriate instrumentation. This technique will be applied at one-half of the grid modes screened using the inverted cone and ambient screening techniques.

Application of this technique at the Ellis Property will involve the following steps:

1. After completion of the ground level and flux cone screening techniques, the slam bar will be positioned vertically at the grid intersection. The moveable shoe will be used to drive the bar to a depth of approximately 36 inches (or until a maximum of 50 blows have been delivered).

2. The slam bar will be removed from the soil and the actual depth that is penetrated will be measured on the bar.

3. The PID probe, fitted with a 1-inch diameter rubber stopper, will be inserted into the hole. Care must be taken to avoid drawing soil particles into the PID probe.

4. The PID measurements will be observed for 2 minutes (or until the measurements have attained a constant value). The peak and stabilized measurements will be recorded.

5. The slam bar will be subjected to the equipment decontamination protocol after each use. The decontamination protocol presented in Subsection 5.8.1 will be modified to include only step numbers 1, 2, 3, and 5.

5.2.1.2 Radioactivity Screening

Soil screening for radioactivity will be conducted primarily to fulfill the requirements of WESTON's corporate health and safety policy, as well as U.S. EPA and NJDEP protocols. A technician carrying an APC Model 069-701 Beta-Gamma Survey Meter will traverse the site and obtain measurements at the designated grid intersections. The beta-gamma detector will be utilized since gamma radiation is highly energetic and the most damaging to biological tissues.

Prior to conducting the survey, the technician will check the calibration of the instrument (see Section 7) and determine background radiation for the area. Calibration of the instrument will be performed according to the manufacturer's instructions, using the check source provided on the instrument. Background radiation will be determined at three locations in the open fields north of the site (the same points to be utilized for determination of background magnetic field. Measurements at these three locations will be obtained according to the three-step procedure described below. The three background measurements will be averaged to give a mean background for each height and type of radiation (gamma and beta).

The technician will record the following information at each intersection point:

- Combined beta and gamma at a level of approximately 1 centimeter above the ground surface.
- Gamma measurement at a level of approximately 1 centimeter above the ground surface.
- Gamma measurement at a level of approximately 1 meter (waist level) above the ground surface.

All data will be recorded in the site logbook. Raw data will be tabulated for review by a health physicist. Any locations where measurements exceeding three times background radiation will be marked with a wooden surveyor's stake. The health physicist will be advised of any measurements exceeding three times background radiation before proceeding with other elements of the investigation.

5.3. SOIL BORINGS

Four soil borings will be installed using a drilling rig to investigate the lithology and characterize residual contamination that may exist around the site buildings and in the two known disposal areas. A total of eight samples for priority pollutant + 40 analyses will be collected. Procedures for installing the borings using a hollow-stem auger rig are described in the Field Sampling Plan.

The following soil sampling procedures will be followed:

1. Assemble the 2-inch split-spoon sampler by aligning both sides of the barrel and then screwing on the bit on the bottom and the heavier head piece on top.
2. Place the sampler in a perpendicular position on the material to be sampled.

3. Drive the sampler utilizing the drill rig. The sampler will be driven in accordance with ASTM Standard D1586-84, Method for Penetration Test and Split-Barrel Sampling of Soils. The standard involves the use of a 140±2-pound hammer dropped from a height of 30 inches until the split spoon reaches a depth of 24 inches (or for a maximum of 100 blows). The split spoon will not be driven past the bottom of the head piece as this will result in compression of the sample.

4. Record the length of the tube that penetrated the material being sampled and the number of blows required to obtain this depth.

5. Withdraw the sampler and open by unscrewing bit and head and splitting barrel. The sample will be scanned for volatile emissions using a PID immediately after opening the barrel.

6. Samples from the 1-to-2-foot depth interval will be collected as follows:

   a. After opening the split spoon device, transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, glass-septum vials. Fill each vial in an effort to minimize void space in the vial.

   b. Secure the Teflon-lined caps on the sample containers, implement the sample bottle decontamination protocol specified in Subsection 5.8, attach the labels and custody seals, place in double plastic bags, record all pertinent information in the site logbook, complete the sample analysis request form and chain of custody record.

   c. Transfer the acid/base/neutral extractable fractions sample into a laboratory-prepared, 1-quart, amber-glass, wide-mouth, bottle. Transfer the metals fraction sample into a laboratory-prepared, 1-quart, polyethylene, wide-mouth bottle.

   d. Perform step 6.c on the extractable and metal sample containers.

   e. Place the containers on ice.

   f. Deliver the samples to the WESTON laboratory for analysis.

7. Samples from the 4- to 6-foot depth interval (or above the water table, whichever is encountered first) will also be obtained as described in item 6.

8. Decontaminate the auger flights and split-spoon sampler according to the protocol in Subsection 5.8.

5.4 SURFICIAL SOIL SAMPLING

Soil samples will be obtained at or near the ground surface from several areas of the site. These samples have been grouped into the following classes:

- Samples on, around or under building floors.
- Samples from known disposal areas.
- Predesignated samples outside known disposal areas.
- Samples near leaking drums.

5.4.1 Sampling Near Building Floors

After removal of the dilapidated buildings, the floor area of each major building will be inspected in detail for the presence of drains, cracks, or stained areas. Final locations for soil samples from the buildings will be determined in the field based upon the detailed inspection. Final sampling locations will be selected based upon the following criteria:

- If floor drains are encountered, efforts will be made to sample the debris or sediments which may have accumulated in the drain.
- In the absence of floor drains, soils below cracked areas exhibiting heavy staining will be sampled.
- In the absence of both floor drains and heavy staining on cracked concrete, areas outside the building where runoff would flow (i.e., immediately outside downslope doorways) will be sampled.

A total of four samples will be collected from the buildings. Efforts will be made to split the samples equally between the two buildings; however, sampling can be focused on one building, if justified by the detailed floor inspection.

In the event that sampling locations below the floors are selected, the building removal contractor, BES, Inc., will use pneumatic jackhammers to break sampling holes (approximately 2 ft in diameter) in the concrete. Care will be taken to minimize any mixing or other turbulence in the subbase that the jackhammer may produce. The soil samples will then be obtained using a hand auger or trowel as close as possible to the concrete/soil interface. The soil samples obtained from the buildings will be analyzed for total petroleum hydrocarbons and PCB's.

5.4.2 Surficial Sampling in Known Disposal Areas

Two disposal areas were identified during the March 1983 NJDEP removal action. One area was found to be contaminated with hazardous levels of leachable chromium and barium. Fourteen samples in the first area will be analyzed for chromium and barium. One sample near the center of the disposal area will be analyzed for priority pollutants plus 40. Samples obtained from two of the grid intersections will be analyzed for petroleum hydrocarbons.

The procedures for the chromium, barium, and petroleum hydrocarbon sample collection will be as follows:

1. At the intersection points, use a decontaminated hand auger to remove soils to a depth of 2 feet. Use a second decontaminated auger for sample collection.
2. Use a decontaminated trowel or scoop to transfer the metals sample from the second auger into a laboratory-prepared, polyethylene wide-mouth container.
3. Secure the Teflon-lined cap on the sample containers, attach the label and custody seal, place in a double plastic bag, record all pertinent data in the field log book, and complete the sample analysis request form and chain-of-custody record before taking the next sample.
4. Place on ice.
5. Transfer the petroleum hydrocarbons sample into a laboratory-prepared, wide-mouth, amber-glass container.

6. Perform steps 3 and 4 on the amber-glass container.
7. After following the decontamination procedures specified in Subsection 5.8, deliver the samples to the WESTON laboratory for analysis.

The procedures for collecting the priority pollutants plus 40 sample will be as follows:

1. At the designated intersection point, use the decontaminated trowel or scoop to obtain the extractable and metal fraction samples from the 0- to 12-inch interval.
2. Transfer the acid/base/neutral extractable fractions sample . into a laboratory-prepared, 1-quart, amber-glass, wide-mouth bottle. Transfer the metal fraction sample into a laboratory-prepared, 1-quart polyethylene, wide-mouth bottle.
3. Secure the Teflon-lined caps on the sample containers, attach the labels and custody seals, implement the sample container decontamination protocol specified in Subsection 5.8, place in a double plastic bag, record all pertinent information in the site log book, complete the sample analysis request form, and chain-of-custody record.
4. Use the first decontaminated hand auger to bore to a depth of approximately 2 feet. After removing the auger from the bore hole, use a second decontaminated stainless steel auger for sample acquisition and a stainless steel trowel to transfer the volatile fraction sample from the soils recovered by the second auger.
5. Transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, glass septum vials. Fill each vial in an effort to minimize void space in the vial.
6. Perform step 3 on the vials. Measure the depth of the borehole and record in the site logbook.
7. Place the containers on ice.
8. Deliver the samples to the WESTON laboratory for analysis.

Soils in the second disposal area were found to be contaminated with PCBs. A total of 15 grid intersections positioned in and around this area will be sampled. Fourteen of the samples will be analyzed exclusively for PCBs. The remaining grid node will be covered by a PP + 40 analysis of a sample collected by the split-barrel sampler.

The procedures for PCB and petroleum hydrocarbon sample collection will be as follows:

1. At the intersection point, use the decontaminated hand auger to bore to a depth below the fill placed in the excavation. The interface between the fill and the underlying native soils will be determined by direct observation of the soils recovered by the auger.
2. After removing the auger from the bore hole, use a second decontaminated auger for sample collection.
3. Use a decontaminated trowel to transfer the sample from the native soil recovered by the second auger into a 1-quart, amber-glass, wide-mouth bottle.
4. Measure the depth to the sampling interval.
5. Secure the Teflon-lined cap on the bottle, attach the label and custody seal, place in a double plastic bag, record all pertinent information in the site log book, complete the sample analysis request and chain-of-custody form.
6. Place the container on ice.
7. Deliver the sample to the WESTON laboratory for analysis.

5.4.3 Surficial Sampling Outside Known Disposal Areas

Surficial soils outside the known disposal areas have been divided into two groups based on the planned depth of sampling. Samples from the 0- to 1-foot depth interval will be collected from areas of the site where the native soils have not been appreciably disturbed and aerial photography (Ref. 4) revealed only limited drum handling activity. A total of 12 locations outside the known disposal locations will be sampled. Samples from the 1- to 2-foot depth interval will be collected in areas that involved some drum activity. In both cases, the nonvolatile and metal fractions will be collected from the upper half of the depth interval and the volatile fraction from the bottom of the borehole.

The procedures for collecting the surficial soil samples from these locations are as follows:

1. At the designated location, use a decontaminated stainless steel trowel or scoop to obtain the extractable and metal fraction samples from the 0- to 12-inch interval. For the three deeper samples, a decontaminated hand auger will be used to sample near the 12-inch depth.

2. Transfer the acid/base/neutral extractable fractions sample into a laboratory prepared 1-quart, amber-glass, wide-mouth bottle. Transfer the metal fraction sample into a laboratory-prepared, 1-quart polyethylene, wide-mouth bottle.

3. Secure the Teflon-lined caps on the sample containers, implement the sample container decontamination protocol specified in Subsection 5.8, attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site log book, complete the sample analysis request form and chain-of-custody record.

4. Use the decontaminated hand auger to bore to a depth of 2 feet. For the shallow samples, use the hand auger to bore to a depth of one foot. After removing the auger from the bore hole, use a stainless steel trowel to obtain the volatile fraction sample from the bottom of the soils recovered by the auger.

5. Transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, glass septum vials. Fill each vial in an effort to minimize void space in the vial.

6. Perform step 3 on the vials.

7. Place the containers on ice.

8. Deliver the samples to the WESTON laboratory for analysis.

5.4.4 Surficial Sampling Near Leaking Drums

A surface soil sample from one location on the site will be analyzed for the hazardous waste characteristics of ignitability, corrosivity, reactivity, and toxicity, as described in 40 CFR 261 and corresponding New Jersey regulations. Additionally, the samples will be analyzed for PCB's and total petroleum hydrocarbons. The sample will be collected in the immediate vicinity of a single drum containing an oily waste. The drum is located near the dirt driveway at the edge of a brier patch. Surficial soils appear to have been impacted by the leaking container.

The procedure for obtaining this surficial soil sample is as follows:

1. In the vicinity of the drum, use a decontaminated stainless steel trowel or scoop to obtain the hazardous characteristics sample. Obtain the sample within 2 feet of the drum and from three to five discrete points around the drum.

2. Transfer the sample into a laboratory-prepared, 1-quart, amber, glass bottle.

3. Secure the Teflon-lined cap on the sample container. Implement the sample container decontamination protocol specified in Subsection 5.8. Attach the labels and custody seal to the bottle and place in two plastic gags. Record all pertinent information in the site logbook.

4. Complete the sample analysis request form and chain-of-custody record.

5. Perform Steps 1 through 4 for the PCB and TPH samples.

6. Place the sample on ice.

7. Deliver the sample to the WESTON laboratory for analysis.

5.5 GROUNDWATER SAMPLING

The groundwater investigations include the following components:

- Evaluation of the existing dug well located roughly between the two site buildings.
- Installing three shallow monitoring wells.
- Installing three deeper monitor wells.
- Evaluation of 10 nearby potable wells.

Summaries of the groundwater samples and the associated QA/QC samples to be collected or prepared as part of this remedial investigation are provided in Tables 5-3 and 5-4, respectively.

5.5.1 Sampling Procedures for the Dug Well

The procedure for collecting the one sample for priority pollutants + 40 analysis from the dug well will be as follows:

1. In the event that recharge to the well is observed, water recharging through the block wall will be sampled, if possible, by lowering the sample containers to the site of recharge. If sampling from the wall is not practical, samples will be obtained from the well after recharge has replenished the water level in the well. Preservatives will be added to the sample container after collection in case overfilling of the sample containers occurs.

2. In the event that recharge does not occur readily and sediment at the bottom is observed, a sample of the sediment at the bottom of the well will be obtained using a stainless steel dip sampler. The dip sampler will be decontaminated according to the protocol described in Subsection 5.8.

3. Transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, glass septum vials. For water samples, overfill each vial to eliminate void space (bubbles) in the vial. A convex miniscus should be present at the top of the vial. For sediment samples, fill the vial to minimize head space.

Table 5-3

Groundwater Sampling Summary

Source	Analysis	Bottle Size	Bottle Type	Test Samples
Dug Well	PP + 40			
	- VOA Fraction	40 ml	SV	1
	- Extractables	2 qt.	AG	1
	- Metals	1 liter	P	1
Monitoring Wells	PP + 40			
	- VOA Fraction	40 ml	SV	6
	- Extractables	2 qt.	AG	6
	- Metals	1 liter	P	6
Potable Wells	PP + 40			
	- VOA Fraction	40 ml	SV	10
	- Extractables	2 qt.	AG	10
	- Metals	1 liter	P	10

NOTES
SV = Septum Vial
AG = Amber-Glass Bottle
WMAG = Wide-Mouth Amber-Glass Bottle
P = Polyethylene Bottle

Table 5-4

Summary of Groundwater QA/QC Samples

Source	Analysis	Trip Blanks	Blind Field Blanks	Blind Field Duplicates
Monitoring Wells	PP + 40			
	- VOA Fraction	1	1	1
	- Extractables	-	1	1
	- Metals	-	1	1
Potable Wells	PP + 40			
	- VOA Fraction	1	1	1
	- Extractables	-	1	1
	- Metals	-	1	1
Dug Well	PP + 40			
	- VOA Fraction	1	1	1
	- Extractables	-	1	1
	- Metals	-	1	1

4. Transfer the acid/base/neutral fraction sample into a laboratory-prepared, 1-quart, amber-glass, wide-mouth bottle. Transfer the metal fraction sample into a laboratory-prepared, 1-quart polyethylene, wide-mouth bottle. The polyethylene bottle will include approximately 3 milliliters of concentrated nitric acid as preservative.

5. Secure the Teflon-lined caps on the sample containers, implement the sample container decontamination protocol specified in Subsection 5.8, attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site log book, complete the sample analysis request form and chain-of-custody record.

6. Perform step 4 on the vials. If a water sample is obtainable, invert the vial after the cap has been secured. Observe whether any bubbles are present after lightly tapping the side of the vial. If bubbles are observed, remove the cap, overfill the vial as described above, and reseal. Repeat this step until a single-phase sample with no bubbles has been obtained.

5.5.2 Monitoring Well Sampling

All groundwater sampling will be conducted after the installed and developed monitoring wells have been allowed to equilibrate for at least 2 weeks. One round of samples will be collected from the three shallow and three deeper monitoring wells for a total of six samples.

Prior to collecting samples from a given well, the static water level in the well will be measured. The well will be purged to ensure that a representative sample is collected during the sampling process. Monitoring well purging and sampling will follow these procedures:

1. Prior to placing any equipment into the well, the sampling equipment will be subjected to the decontamination protocol described in Subsection 5.8.

2. Unlock the security cap on the protective casing. Unscrew the well cap slowly while using a PID to monitor near the cap for volatile emissions.

3. Before purging, the depth to the static water level will be measured and recorded. For initial sampling of wells, measurements will also be taken to the bottom of the well.

4. Calculate the volume of water to be purged based on the amount of standing water in the well and the inside diameter of the casing.

5. Wells will be purged using a centrifugal or submersible pump with polyethylene tubing dedicated to each well. Submersible pumps will be decontaminated between wells by washing in a nonphosphate soap solution, rinsing with tap water, and running at least 20 gallons of the tap water through the pump. The unit will be rinsed with distilled/deionized water. Remove at least three to five times the calculated volume of standing water in the well. Wells which are quickly purged and take more than eight hours to recover will only be purged once and then sampled as soon as the well has recovered.

6. Sample the well using the bailer.

7. Transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, septum vials. Overfill each vial in an effort to eliminate void space in the vial. A convex miniscus should be present at the top of the vial.

8. Secure the Teflon-lined caps on the containers.

9. Invert the vial after the cap has been secured. Observe whether any bubbles are present after lightly tapping the side of the vial. If bubbles are observed, remove the cap, overfill the vial, as described in step 7, and reseal. Repeat this step for each vial until a single-phase sample with no bubbles has been obtained.

10. Attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site logbook, and complete the sample request/chain-of-custody form.

11. Place the containers on ice.

12. Transfer the acid/base/neutral fraction sample into laboratory-prepared, amber-glass bottles. Transfer the metals fraction into laboratory-prepared polyethylene bottles containing 3 milliliters of nitric acid as a fixing agent.

13. Perform steps 8, 10, and 11 on the extractable and metal samples.

14. Decontaminate the sample bottle and sampling equipment as prescribed in Subsection 5.8.

5.5.3 Potable Well Sampling

Ten local potable wells will be sampled according to the following procedures:

Upon arrival at each well sampling site, sampling personnel will meet with the owner and:

1. Review well records assembled by the owner.

2. Review completed questionnaire with the well owner.

3. Determine whether the sample can be obtained from the well head or waterline prior to any holding tank or treatment processes.

4. Samplers will run the water for 15 minutes to assure that the sample taken is from the first encountered potable aquifer. If the depth of water is known, the tap will be run until a minimum of three well volumes have been evacuated. If necessary, a garden hose will be used with the tap to divert runoff from the well head.

5. Hoses will be disconnected to allow sampling directly from the tap.

6. Obtain the volatile fraction sample from the well by directly dispensing well water into four 40-milliliter, laboratory-prepared, septum vials. Overfill each vial to eliminate void space in the vial. A convex miniscus should be present at the top of the vial.

7. Secure the Teflon-lined caps on the containers.

8. Invert the vial after the cap has been secured. Observe whether any bubbles are present after lightly tapping the side of the vial. If bubbles are observed, remove the cap, overfill the vial, as described in step 7, and reseal. Repeat this step for each vial until a single-phase sample with no bubbles has been obtained.

9. Attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site logbook, and complete the sample request/chain-of-custody form.

10. Place the containers on ice.

11. Obtain the acid/base/neutral fraction sample into laboratory-prepared, amber-glass bottles. Transfer the metals fraction into laboratory-prepared, polyethylene bottles containing 2 milliliters of nitric acid as a fixing agent.

12. Perform step 8, 10, and 11 on the extractable and metal fraction samples.

13. The field data sheet will be completed by the sampling team.

5.6 SURFACE WATER/SEDIMENT SAMPLING

Three surface water and four sediment samples will be obtained at the locations described in the Field Sampling Plan. A summary of the surface water and sediment samples and the associated QA/QC samples to be collected as part of this remedial investigation is provided in Table 5-5. These samples will be analyzed for priority pollutants plus 40.

Procedures for obtaining surface water samples are as follows:

1. Obtain the water sample prior to the sediment sample to minimize the amount of solids in the sample. Taking samples upstream of sampling personnel will also minimize solids in the sample.

2. Obtain the volatile fraction sample by directly dispensing the surface water into four 40-milliliter, laboratory-prepared, glass septum vials. Overfill each vial to eliminate any void space. A convex miniscus should be present at the top of the vial.

3. Secure the Teflon-lined lids on the containers.

4. Invert the vial after the cap has been secured. Observe whether any bubbles are present after lightly tapping the side of the vial. If bubbles are observed, overfill the vial as described in step 2 and reseal. Repeat this step for each vial until a single-phase sample has been obtained.

Table 5-5

Surface Water/Sediment Sampling Summary

Source	Analysis	Test Samples	Trip Blanks	Blind Field Blanks	Blind Field Duplicates
Surface Water Bodies	PP + 40				
	- VOA Fraction	3	1	1	1
	- Extractables	3	-	1	1
	- Metals	3	-	1	1
Sediment Samples	PP + 40				
	- VOA Fraction	4	*	1	1
	- Extractables	4	-	1	1
	- Metals	4	-	1	1

NOTES

*Trip blanks will be common to both surface water and sediment samples as all surface water and sediment samples will constitute one shipment.

5. Attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site logbook, complete the sample request/chain-of-custody form.

6. Place the containers on ice.

7. Obtain the acid/base/neutral extractable fraction sample by directly dispensing the surface water into the laboratory-prepared, amber-glass bottles.

8. Follow steps 5 and 6 for the extractable samples.

9. Obtain the metals fraction sample by directly dispensing the surface water into the laboratory-prepared polyethylene bottle. These bottles will not contain the nitric acid fixing agent because directly dipping the bottle in a surface water body can lead to overfilling and loss of preservative.

10. Slowly dispense 3 milliliters of the concentrated nitric acid fixing agent directly into the sample bottle, using a laboratory cleaned glass pipette.

11. Follow steps 5 and 6 for the metal samples.

Procedures for obtaining sediment samples are as follows:

1. Obtain the sediment sample from the same vicinity as the surface-water sample.

2. Select a location which contains a relatively fine-grained sediment. Avoid locations where large pebbles or significant amounts of leaves or humus are present.

3. Using a stainless steel trowel prepared in accordance with the decontamination protocol specified in Subsection 5.8, obtain sediment from the 0- to 6-inch interval.

4. Obtain the volatile fraction first.

5. Transfer the volatile fraction sample into four 40-milliliter, laboratory-prepared, glass septum vials. Fill each vial to minimize void space in the vial.

6. Secure the Teflon-lined caps on the sample containers, implement the sample container decontamination protocol specified in Subsection 5.8, attach the labels and custody seals, place in a double plastic bag, record all pertinent information in the site logbook. Complete the sample analysis request form and chain-of-custody record.

7. Place the containers on ice.

8. Transfer the acid/base/neutral fractions sample into a laboratory-prepared, 1-quart, amber-glass, wide-mouth bottle. Transfer the metal fraction sample into a laboratory-prepared, 1-quart, polyethylene, wide-mouth bottle.

9. Perform steps 6 and 7 on the vials.

10. Deliver the samples to the WESTON laboratory for analysis.

5.7 SAMPLING OF THE BOILER AND STACK

To evaluate the possible disposal of PCB-contaminated fluids in the boiler and the possible formation of dioxin combustion products, the remedial investigation has been designed to include sampling and analysis of the boiler and stack.

One wipe sample from the boiler and one wipe sample from the stack will be obtained. Additionally, the dioxin wipe sampling protocol requires a field blank for every 20 samples. The NJDEP has requested that a performance evaluation (PE) sample, supplied by the department, be submitted to the laboratory for analysis. Therefore, a total of four samples will be analyzed as part of this task. In the event that a substantial layer or coating of ash residue has built up on the boiler or stack, bulk samples will be collected in place of the wipe samples.

Wipe samples will be obtained in accordance with U.S. EPA Method 8701M72, "Sampling Procedures for Determination of 2,3,7,8-TCDD on Interior Surfaces," (Ref. 5) a copy of which is included in Appendix C of this plan.

The 1985 protocol includes the following major steps:

1. Sterile cotton gauze pads, 3 inches x 3 inches are generally used for rough surface.

2. The pads are removed, as needed, from the package and moistened with iso-octane.

50 x 50

3. A template covering 2500 cm^2 is marked on the surface using masking tape.

4. The area inside the template is wiped using the moistened pad.

5. The pad is placed in a 4-ounce, amber-glass jar with a Teflon lid liner.

6. The area inside the template is wiped, using a dry pad to absorb excess solvent and remove remaining particulate matter.

7. The dry pad is placed in the same jar as the moistened pad.

8. The sample is prepared for shipment.

PCB wipe samples will also be obtained using this methodology. An area adjacent to the dioxin sample template will be marked off in the same way. Iso-octane will be used as the solvent. One field blank will be prepared in accordance with the method. A performance evaluation sample will not be submitted for PCB analysis.

5.8 SAMPLE CONTAINER PREPARATION AND DECONTAMINATION PROTOCOLS

Decontamination protocols which will be implemented for the project will follow those specified in Field Sampling Procedures Manual (Ref. 6).

5.8.1 Preparation Protocol

Sampling containers and implements such as trowels and well bailers will be decontaminated prior to use according to the following protocols:

1 - Wash in tap water with nonphosphate detergent.
2 - Rinse with tap water.
3 - Rinse with distilled/deionized water.
4*- Rinse with 10 percent nitric acid solution.
5 - Rinse with distilled/deionized water.
6 - Rinse with pesticide grade acetone.
7 - Total air dry.
8 - Rinse with distilled/deionized water.

*Only if sample is to be analyzed for metals.

Sampling implements which have been subjected to these procedures will be wrapped in aluminum foil. Custody seals will be affixed to the foil for identification.

Well bailers will be dedicated equipment subjected to laboratory cleaning procedures prior to use. Well bailers will be decontaminated in the field prior to returning to the laboratory.

5.8.2 Decontamination Protocols

Sample containers will be wiped clean prior to packaging and shipping. Sample containers will be laboratory cleaned prior to use.

SECTION 6

SAMPLE CUSTODY

6.1 RESPONSIBILITY

The field supervisor is responsible for the samples until they are delivered to the laboratory. The sample custodian receives the samples at the laboratory and initiates the in-house custody procedures. The laboratory supervisor is responsible for the samples and the sample flow in the laboratory. See Figure 6-1.

6.2 SAMPLE DOCUMENTATION IN THE FIELD

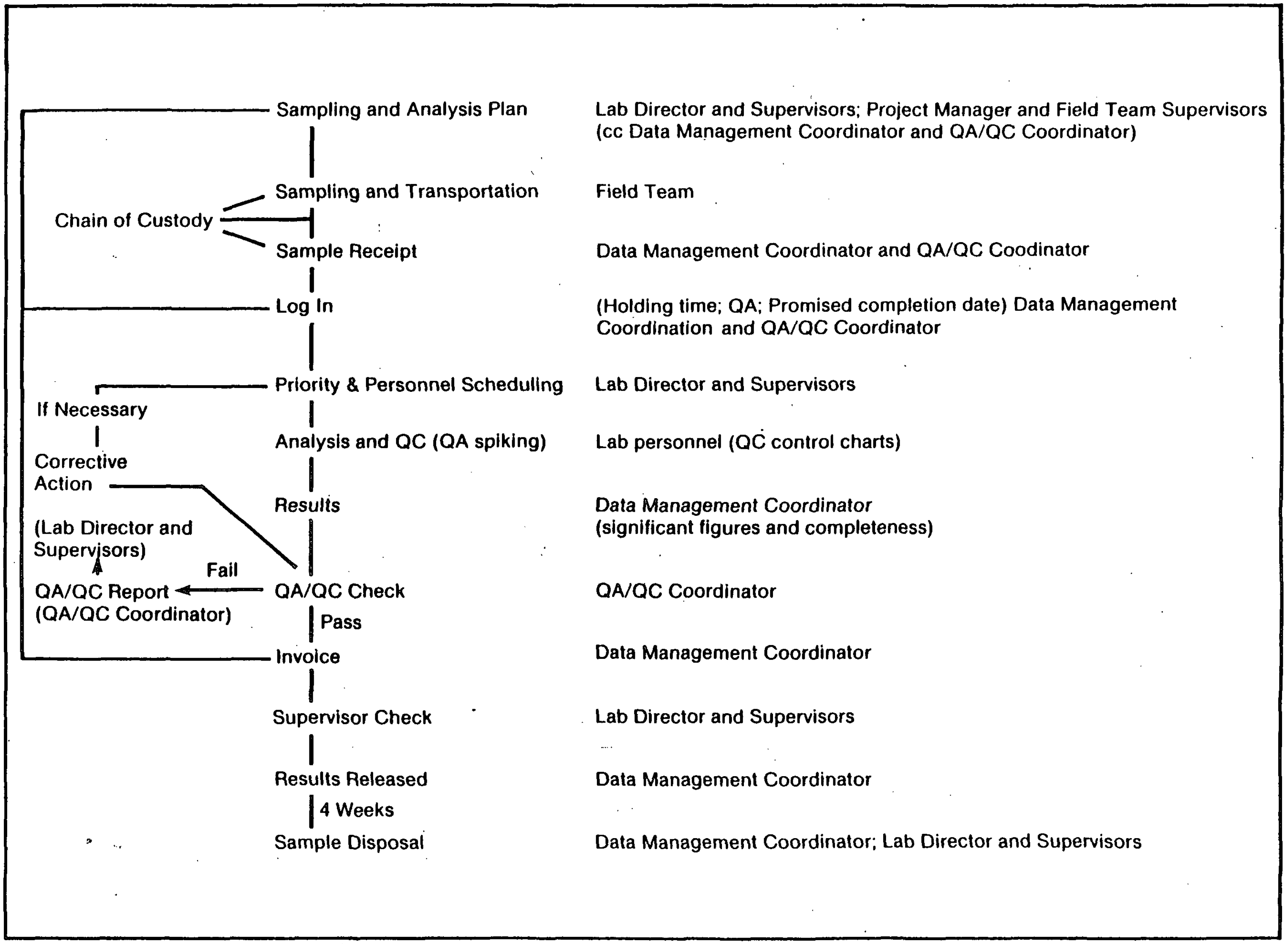
Chain-of-custody is a term which describes the sequential history of individuals who were in control or possession of a sample or group of samples. A written record of the chain-of-custody facilitates the identification and tracking of a sample from the time it is collected until the time it is analyzed.

Sample containers prepared and supplied by the WESTON laboratory will be accompanied by chain-of-custody forms illustrated in Figure 6-2. Individual samples will be entered on the forms following collection (and prior to sampling the next location). Information that will be entered includes:

- Date of collection.
- Sample identification number.
- Brief description/matrix.
- Type of container and preservative.
- Analyses requested.

Off-site potable wells will be sampled for priority pollutants plus 40 analysis. A previsit questionnaire and a field sampling data sheet, which will be used for documenting these samples, are illustrated in the Field Sampling Plan.

Each shipment of samples which leaves the site is accompanied by a completed, signed custody form. The back page of the multicopy form is retained by the field manager. The remaining copies of the form are placed in a waterproof bag inside the shipping container (usually a cooler). The cooler(s) are subsequently sealed with strapping tape. Sample custody is further guaranteed by securing the lid with custody tape on two opposing sides.



Sampling and Analysis Plan	Lab Director and Supervisors; Project Manager and Field Team Supervisors (cc Data Management Coordinator and QA/QC Coordinator)
Sampling and Transportation	Field Team
Sample Receipt	Data Management Coordinator and QA/QC Coodinator
Log In	(Holding time; QA; Promised completion date) Data Management Coordination and QA/QC Coordinator
Priority & Personnel Scheduling	Lab Director and Supervisors
Analysis and QC (QA spiking)	Lab personnel (QC control charts)
Results	Data Management Coordinator (significant figures and completeness)
QA/QC Check	QA/QC Coordinator
Invoice	Data Management Coordinator
Supervisor Check	Lab Director and Supervisors
Results Released	Data Management Coordinator
Sample Disposal	Data Management Coordinator; Lab Director and Supervisors

FIGURE 6-1 LABORATORY SAMPLE FLOW CHART

Custody Transfer Record/Lab Work Request

Received By ____________ Client ____________ RFW Contact ____________
Date ____________ Client Contact ____________ Date Due ____________
Assigned to ____________ Phone ____________ Project Number ____________

SAMPLE IDENTIFICATION					ANALYSES REQUESTED							
Sample No.	Client ID No.	Description	Date Collected	Container/Preservative								

SPECIAL INSTRUCTIONS:

Items/Reason	Relinquished By	Received By	Date	Time	Items/Reason	Relinquished By	Received By	Date	Time

RFW 16-23-001/A-2/85

FIGURE 6-2 CHAIN OF CUSTODY RECORD

6.3 SAMPLE CUSTODY IN THE LABORATORY

Each sample received from the site will be handled according to Standard Practice 16-22-010 governing Sample Receipt, 16-22-011 governing Sample Storage and 16-22-012, Sample Tracking. The sample will be logged into a bound log book with the following information:

- Field sample number.
- Time of receipt at the laboratory.
- Observations.
- Indication that the chain-of-custody document was received and signed.
- Indication that a lot chain-of-custody document has been attached to the properly completed request-for-analysis form.

The original signed chain of custody document is maintained in the laboratory files.

SECTION 7

CALIBRATION PROCEDURES AND FREQUENCY

7.1 GENERAL

Field personnel and laboratory personnel are responsible for the calibration of their respective equipment. A calibration procedures flow chart is summarized in Figure 7-1. The following subsections discuss typical calibration procedures which will be used.

7.2 FIELD INSTRUMENTS

Instrumentation which may affect the quality of the data generated during the RI is calibrated and maintained periodically to assure accuracy within specified limits. Instruments to be used in the field are calibrated by WESTON's equipment storeroom personnel. Details including date calibrated, serial number of the instrument, person performing the calibration, calibration standard used, and calibrated settings are recorded on a tag attached to the calibrated instrument. Calibrations will be checked by the Field Manager in the field prior to utilizing the instrument. Field checks will be documented in the site log scheduled for use during the Ellis Property RI.

Field verifications entered into the daily site log book will contain the following:

- Date of calibration and/or maintenance
- Data pertaining to the calibration and/or maintenance Procedure (not contained in specific equipment worksheets)
- Next calibration and/or maintenance due date
- Initials of individual performing the calibration and/or maintenance
- Adjustments made and the accuracy of the equipment prior to and following calibration (where applicable)
- Record of equipment failure or inability to meet specifications (where applicable)

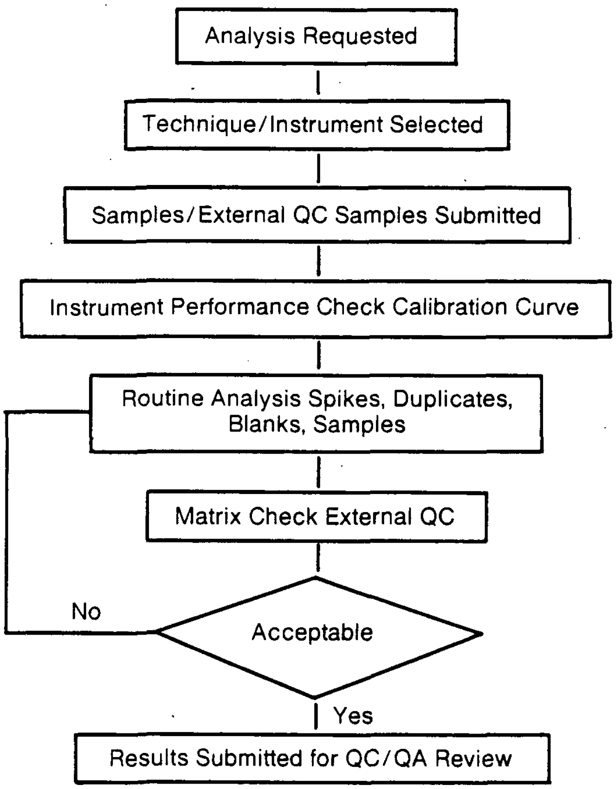


FIGURE 7-1 CALIBRATION PROCEDURES FLOW CHART

Specifications for each type of field equipment are available to participating personnel and include:

- Equipment identification
- Control number
- Calibration and/or maintenance schedule
- Equipment specification
- Specification verification (where applicable)

Instrumentation used in field analyses, screening or sampling have a documented maintenance and/or calibration procedure. These procedures include the following:

- Equipment identification
- Control number
- Calibration and/or maintenance schedule
- Equipment necessary to accomplish calibration (the applicable).
- Procedure for calibration and/or maintenance.

Individual analysts are assigned instruments for which they are responsible. Instruments requiring calibration and/or maintenance have a record which reflects the following information:

- Date of calibration and/or maintenance
- Next due date for calibration and/or maintenance
- Initials of personnel performing calibration and/or maintenance

If the calibration schedule for a particular field or laboratory instrument is not adequately maintained or accuracy as reported in the specifications cannot be attained, the specific instrument will not be utilized, until the specifications are attained.

7.2.1 Photoionization Detector

An HNu model PI-101 Photoionization Detector (PID) will be employed for screening soils for volatile emissions. Air monitoring in the breathing zone of site personnel will be conducted periodically (in accordance with the Health and Safety Plan) using this instrument. Chapter 3 of the Instruction Manual for Model PI-101 Photoionization Analyzer, (Ref. 7) which describes calibration procedures for this instrument, has been included in Appendix B.

7.2.2 Radiation Detector

A radiation survey will be conducted throughout the site to fulfill the requirements of WESTON's corporate health and safety policy, as well as U.S. EPA and NJDEP protocols. The policy and protocols require that a site be checked for radioactivity prior to initiating site work. An APC Model 069-701 Beta-Bamma Survey Meter will be employed to check for gamma radiation.

Prior to conducting the survey, the technician will check the calibration of the instrument and determine background radiation for the area. Calibration of the instrument will be performed according to the manufacturer's instructions (Ref. 8), using the check source provided on the instrument. Background radiation will be determined at three locations in the open fields north of the site (the same points to be utilized for determination of background magnetic field). Measurements at these three locations will be obtained according to the three-step procedure described below. The three background measurements will be averaged to give a mean background for each height and type of radiation (gamma and beta).

7.2.3 Ground Penetrating Radar (GPR)

A ground penetrating radar (GPR) survey will be conducted to evaluate the possibility of disturbed soils (or buried waste) and to provide information on site stratigraphy. The GPR survey will be conducted using a GSSI SIR-8 Model 4800-P radar unit. GPR surveys involve three stages -- unit start-up, calibration, and operation. The procedure for starting up the GPR unit is as follows:

- Ensure that all cable connections are complete.
- Set the radar control unit switches and adjustments.
- Set the graphic recorder switches and adjustments.
- Turn the radar control unit power ON.
- Turn the power switch on the graphic recorder ON. Program the scan speed to be the same as on the radar control unit.
- Wait approximately 5 minutes for warm-up and stabilization.
- Position the antenna within the area to be surveyed; adjust the radar control unit sensitivity control for a monitor display just under full screen deflection.
- Turn the radar control unit motion switch and graphic recorder switches to RUN.
- While observing the monitor screen, simultaneously adjust the sensitivity and range gain controls until the target reflection signals are as nearly equal in amplitude to the transmitted pulse as possible.
- Adjust the graphic recorder gain, contrast, chart rate, and threshold controls for the best printout.
- Adjust the range gain as necessary to optimize the printout for the intended purpose.

To calibrate the system, either the dielectric constant of the survey medium or the depth to a particular object must be known. Calibration of the radar system will be performed using a two-step operation. First, the calibration will be calculated using a dielectric constant which is representative of the on-site soil and moisture conditions. Second, calibration traverses will be run over a buried object at know depth (e.g., on-site drainage culverts) if such an object exists. From these calibration procedures, a vertical depth profile scale can be generated. The most appropriate antenna for the soil conditions will then be selected at the site by making trial GPR traverses.

7.2.4 Magnetometer

A magnetic survey will be conducted to identify ferrous metals or other magnetic sources beneath the surface of the site. Consolidation and staging of steel drums and other steel objects littered throughout the surface of the site (appliances, etc.), will be necessary to minimize surface magnetic interference. The staging of drums is described in Subsection 2.2.1 of the FSP.

The magnetic survey will be conducted using a Scintrix MF 2-100 portable fluxgate magnetometer. The magnetic survey calibration procedure is as follows:

- The instrument will be taken to three locations in the open fields to the north of the site. The gamma readings will be recorded and averaged to give a background magnetic field strength for the area. The open fields were selected for background determination because they are assumed to be free of foreign magnetic fields (e.g., overhead wires, buried steel pipelines).

7.2.5 Electromagnetic Conductivity

An electromagnetic terrain conductivity (EM) survey will be conducted to identify anomalies that may indicate the presence of leachate plumes. The survey will be conducted using a Geonics EM 34-3 conductivity meter and a 10-meter coil separator.

The survey calibration procedure is as follows:

- The transmitter and receiver meters will be connected to their respective coils and the two units linked with the 10-meter cable. Both meters will be set for a 10-meter coil separation and the normal transmission level.

- The power on both meters will be turned on and the power supply checked.

- Horizontal and vertical dipole EM measurements will be taken at the three base stations used during the magnetometer survey. These measurements will be repeated at least every four hours.

- Average the measurements to obtain the background reading.

7.3 LABORATORY EQUIPMENT

The following subsections describe the calibration procedures and frequency for the analysis of volatile (VOA) and semivolatile (B/N/A) priority pollutants (by GC/MS), PCB's (by GC/EC), priority pollutant metals (AA, ICP), 2,3,7,8-TCDD (by GC/MS), and petroleum hydrocarbons.

7.3.1 Gas Chromatography/Mass Spectrometry

7.3.1.1 Volatile and Semivolatile Organic Analysis

The calibration procedures and frequency for VOA and B/N/A analysis are described in OP-16-22-015, Attachment E (Ref. 3).

7.3.1.2 2,3,7,8-TCDD Analysis

The calibration procedures and frequency for the analysis of 2,3,7,8-TCDD by HRGC/LRMS are described in the attached OP-16-22-XXX, Section 9 (Ref. 3).

7.3.2 Priority Pollutant Metals Analysis

The calibration procedures and frequency for metals analysis by Atomic Absorption Spectrophotometry and/or Inductively Coupled Plasma Spectrometry are described in OP-16-22-014, Attachment E.

7.3.3 Petroleum Hydrocarbons

The infrared spectrophotometry will be calibrated daily with a calibration blank and five working standards with concentrations ranging from 0.1 mg/L to 10 mg/L. The correlation coefficient for linear regression analysis of the initial calibration must be equal to or greater than 0.996.

SECTION 8

ANALYTICAL PROCEDURES

The analyses for the various samples, which will be collected during the RI, were described in Section 5 of this Plan. Table 8-1 summarizes the various soil samples and provides references for the analyses to be conducted. Table 8-2 presents the same information for water samples planned for the RI. The methods listed in Tables 8-1, 8-2, and 8-3 are available at the WESTON laboratory for use and/or consultation by the analysts or supervisory personnel. Copies of EPA CLP methods and the method for low resolution determination of 2,3,7,8-TCDD are described in the Standard Practices Manual. Copies of EPA 3540 (Soxhlet extraction for solids, oil, and grease, Reference 9) and EPA 418.1 (oil and grease determination, Reference 10) are also available at the laboratory.

The priority pollutant plus 40 analysis will be employed extensively for the Ellis Property RI. This analytical method was selected for widespread use because it covers a broad range of chemical species including volatile organics, (CLP-VOA Method, Reference 11), acid/base/neutral extractable organics (CLP, BNA Method, Reference 11), and inorganic metals (CLP, Metals Method, Reference 12). The priority pollutant determination (Reference 11) is capable of detecting contaminants such as PCB and chromium, which were found at the site during previous studies. Additionally, the barium analyses planned for this investigation will be useful in determining the presence of this metal.

Areas of the site, which were found to have been contaminated with specific types of waste, will be sampled for the specific compound. For example, the samples from the PCB disposal area will be subjected to a PCB determination. Samples from the acid disposal area will be analyzed for chromium and barium.

Previous work documented the presence of oily wastes in containers and in the soils present at the site. Samples at both the PCB and acid disposal areas will include a select number of analyses for petroleum hydrocarbons.

Table 8-1

Analysis Plan for Soil/Sediment Samples and Wipes

Analyte	Method	Detection Limit[b]	Sample Container	Sample Weight	Preservation	Holding Time (days)	Reporting Units
Volatiles	Ref. 1	b	40-ml vial w/Teflon-lined silicon rubber septa	5 g	Cold, 4°C	7 days from receipt	ug/kg[d]
Base/Neutral/Acids	Ref. 1	b	Amber G, 1 L	10-30 g	Cold, 4°C	7/40[c]	ug/kg[d]
Pesticide/PCB	Ref. 1	b	Amber G, 1 L	10-30 g	Cold, 4°C	7/40[c]	ug/kg[d]
Metals[a]	Ref. 2	b	P, G, 1 L	1 g	---	180	mg/kg
Mercury	Ref. 2	b	P, G, 1 L	1 g	---	28	mg/kg
Cyanide	Ref. 2	b	G, 1 L	0.5 g	---	14	mg/kg
Petroleum Hydrocarbons	Ref. 4 with NJDEP modification	b	G, 1 L	30 g	Cold, 4°C	7	mg/kg
2,3,7,8-TCDD (wipes only)	Ref. 5	b	Amber G	NA	Cold, 4°C	7/40[c]	ngs[d]

[a] Does not include tin.
[b] See attached Tables 8-3, 8-4, and 8-5.
[c] Extract within 7 days, analysis within 40 days of extraction.
[d] Reported as dry weight, percent moisture reported separately.

Method Reference Sources:

1. U.S. EPA Statement of Work, "Organic Analyses Multi-Media, Multi-Concentration," July 1985.
2. U.S. EPA Statement of Work, "Inorganic Analyses Multi-Media, Multi-Concentration," SOW 785, July 1985.
3. Deleted.
4. "Methods for Chemical Analysis of Water and Wastewater," EPA-600/4-79-020, revised March 1983.
5. U.S. EPA Statement of Work, "Dioxin Analysis Soil/Sediment Matrix, Multi-Concentration Selected Ion Monitoring (SIM) GC/MS Analysis with Jar Extraction Procedure.

Table 8-2

Analysis Plan for Aqueous Liquids

Analyte	Method	Detection Limit[b]	Sample Container	Sample Volume	Preservation	Holding Time (days)	Reporting Units
Volatiles	Ref. 1	b	40-ml vial w/Teflon-lined septum cap	40 ml	Cold, 4°C	7 days from receipt	ug/L
Base/Neutral/Acids	Ref. 1	b	Amber G, 1 L	1 L	Cold, 4°C	7/40[d]	ug/L
Pesticide/PCB	Ref. 1	b	Amber G, 1 L	1 L	Cold, 4°C	7/40[d]	ug/L
Metals[a]	Ref. 2	b	P, G, 1 L	1 L	pH<2, w/HNO$_3$	180	ug/L
Mercury	Ref. 2	b	P, G, 1 L	1 L	pH<2, w/HNO$_3$	28	ug/L
Cyanide	Ref. 2	b	P, G, 1 L	0.5 L	pH>12, w/NaOH	14	ug/L
pH[c]	EPA 150.1	0.1 pH unit	P, G	NA	None	NA	pH unit
Petroleum Hydrocarbons	Ref. 4	0.2	1 L, G	1 L	pH<2 w/ H$_2$SO$_4$	14	mg/L
Temperature[c]	EPA 170.1	0.1	P,G	NA	None	NA	°C
Specific Conductivity[c]	EPA 120.1	1	P,G	NA	None	NA	umho

[a] Does not include tin.
[b] See Tables 8-4, 8-5, and 8-6
[c] Field measurements (instrument calibrated according to manufacturer's recommendations).
[d] Seven days to extraction, analysis within 40 days of extraction.

Table 8-3

Analysis Plan for Hazardous Waste Classification

Analyte	Method	Detection Limit	Sample Container	Sample Weight	Preservation	Holding Time	Reporting Units
Container Samples							
- Ignitability	40 CFR 261.21	NA	1 Liter WMAG	100 g	None	NA	°F
- Corrosivity	40 CFR 261.22	NA	1 Liter WMAG	100 g	None	NA	pH Units
- Reactivity	40 CFR 261.23	NA	1 Liter WMAG	100 g	None	NA	NA
- Toxicity	40 CFR 261.24	See Table 8-5	1 Liter WMAG	100 g	None	NA	mg/liter*
- PCBs	Ref. 1	See Table 8-4	1 Liter WMAG	100 g	None	NA	mg/kg
- TPH	Ref. 4	100 mg/kg	1 Liter WMAG	100 g	None	NA	mg/kg
Surrounding Soils							
- Ignitability	40 CFR 261.21	NA	1 Liter WMAG	100 g	None	NA	°F
- Corrosivity	40 CFR 261.22	NA	1 Liter WMAG	100 g	None	NA	pH Units
- Reactivity	40 CFR 261.23	NA	1 Liter WMAG	100 g	None	NA	NA
- Toxicity	40 CFR 261.24	See Table 8-5	1 Liter WMAG	100 g	None	NA	mg/liter*
- PCB's	Ref. 1	See Table 8-4	1 Liter WMAG	100 g	4°C	NA	mg/kg
- TPH	Ref. 4 with NJDEP modification	100 mg/kg	1 Liter WMAG	100 g	None	NA	mg/kg

NOTES

WMAG = Wide Mouth Amber Glass Bottle
TPH = Total Petroleum Hydrocarbons ✓
NA = Not Applicable
* = Concentration in the Extract

Table 8-4

Priority Pollutant Detection Limits

		Detection Limits*	
Volatiles	CAS Number	Low Water[a] ug/L	Low Soil/ Sediment[b] ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. 1,1-Dichloroethene	75-35-4	5	5
7. 1,1-Dichloroethane	75-35-3	5	5
8. trans-1,2-Dichloroethene	156-60-5	5	5
9. Chloroform	67-66-3	5	5
10. 1,2-Dichloroethane	107-06-2	5	5
11. 1,1,1-Trichloroethane	71-55-6	5	5
12. Carbon Tetrachloride	56-23-5	5	5
13. Bromodichloromethane	75-27-4	5	5
14. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
15. 1,2-Dichloropropane	78-87-5	5	5
16. trans-1,3-Dichloropropene	10061-02-6	5	5
17. Trichloroethene	79-01-6	5	5
18. Dibromochloromethane	124-48-1	5	5
19. 1,1,2-Trichloroethane	79-00-5	5	5
20. Benzene	71-43-2	5	5
21. cis-1,3-Dichloropropene	10061-01-5	5	5
22. 2-Chloroethyl Vinyl Ether	100-75-8	10	10
23. Bromoform	75-25-2	5	5
24. Tetrachloroethene	127-18-4	5	5
25. Toluene	108-88-3	5	5

Table 8-4
(continued)

Volatiles	CAS Number	Detection Limits* Low Water[a] ug/L	Detection Limits* Low Soil/ Sediment[b] ug/Kg
26. Chlorobenzene	108-90-7	5	5
27. Ethyl Benzene		5	5
28. 1,2-Dichlorobenzene		5	5
29. 1,3-Dichlorobenzene		5	5
30. 1,4-Dichlorobenzene		5	5
31. Trichlorofluoromethane		5	5

[a] Medium concentration water detection limits for volatile compounds are 100 times the individual low water detection limits.

[b] Medium concentration soil/sediment detection limits for volatile compounds are 100 times the individual low soil/ sediment detection limits.

Table 8-4
(continued)

			Detection Limits*	
Semi-Volatiles		CAS Number	Low Water[c] ug/L	Low Soil/ Sediment[d] ug/Kg
32.	N-Nitrosodimethylamine	62-75-9	10	330
33.	Phenol	108-95-2	10	330
34.	bis(2-Chloroethyl) Ether	111-44-4	10	330
35.	2-Chlorophenol	95-57-8	10	330
36.	1,3-Dichlorobenzene	541-73-1	10	330
37.	1,4-Dichlorobenzene	106-46-7	10	330
38.	1,2-Dichlorobenzene	95-50-1	10	330
39.	bis(2-Chloroisopropyl Ether	39638-32-9	10	330
40.	N-Nitroso-Dipropylamine	621-64-7	10	330
41.	Hexachloroethane	67-72-1	10	330
42.	Nitrobenzene	98-95-3	10	330
43.	Isophorone	78-59-1	10	330
44.	2-Nitrophenol	88-75-5	10	330
45.	2,4-Dimethylphenol	105-67-9	10	330
46.	bis(2-Chloroethoxy) Methane	111-91-1	10	330
47.	2,4-Dichlorophenol	120-83-2	10	330
48.	1,2,4-Trichlorobenzene	120-82-1	10	330
49.	Naphthalene	91-20-3	10	330
50.	Hexachlorobutadiene	87-68-3	10	330
51.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
52.	Haxachlorocyclopentadiene	77-47-4	10	330
53.	2,4,6-Trichlorophenol	88-06-2	10	330
54.	2-Chloronaphthalene	91-58-7	10	330
55.	Dimethyl Phthalate	131-11-3	10	330

Table 8-4
(continued)

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/ Sediment[d] ug/Kg
56. Acenaphthylene	208-96-8	10	330
57. Acenaphthene	83-32-9	10	330
58. 2,4-Dinitrophenol	51-28-5	50	1,600
59. 4-Nitrophenol	100-02-7	50	1,600
60. 2,4-Dinitrotoluene	121-14-2	10	330
61. 2,6-Dinitrotoluene	606-20-2	10	330
62. Diethylphthalate	84-66-2	10	330
63. 4-Chlorophenyl Phenyl Ether	7005-72-3	10	330
64. Fluorene	86-73-7	10	330
65. 4,6-Dinitro-2-methylphenol	534-52-1	50	1,600
66. N-nitrosodiphenylamine	86-30-6	10	330
67. 4-Bromophenyl Phenyl Ether	101-55-3	10	330
68. Hexachlorobenzene	118-74-1	10	330
69. Pentachlorophenol	87-86-5	50	1,600
70. Phenanthrene	85-01-8	10	330
71. Anthracene	120-12-7	10	330
72. Di-n-butylphthalate	84-74-2	10	330
73. Fluoranthene	206-44-0	10	330
74. Benzidine	92-87-5	50	1,600
75. Pyrene	129-00-0	10	330
76. Butyl Benzyl Phthalate	85-68-7	10	330
77. 3,3'-Dichlorobenzidine	91-94-1	20	660
78. Benzo(a)anthracene	56-55-3	10	330
79. bis(2-ethylhexyl)phthalate	117-81-7	10	330
80. Chrysene	218-01-9	10	330

Table 8-4
(continued)

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Detection Limits* Low Soil/ Sediment[d] ug/Kg
81. Di-n-octyl Phthalate	117-84-0	10	330
82. Benzo(b)fluoranthene	205-99-2	10	330
83. Benzo(k)fluoranthene	207-08-9	10	330
84. Benzo(a)pyrene	50-32-8	10	330
85. Indeno(1,2,3-cd) pyrene	193-39-5	10	330
86. Dibenz(a,h)anthracene	53-70-3	10	330
87. Benzo(g,h,i)perylene	191-24-2	10	330

[c] Medium concentration water detection limits for semi-volatile concentration compounds are 100 times the individual low water detection limits.

[d] Medium concentration soil/sediment detection limits for semi-volatile compounds are 60 times the individual low soil sediment detection limits.

Table 8-4
(continued)

Pesticides	CAS Number	Detection Limits* Low Water[e] ug/L	Detection Limits* Low Soil/ Sediment[f] ug/Kg
88. alpha-BHC	319-84-6	0.05	8.0
89. beta-BHC	319-85-7	0.05	8.0
90. delta-BHC	319-86-8	0.05	8.0
91. gamma-BHC (Lindane)	58-89-9	0.05	8.0
92. Heptachlor	76-44-8	0.05	8.0
93. Aldrin	309-00-2	0.05	8.0
94. Heptachlor Epoxide	1024-57-3	0.05	8.0
95. Endosulfan I	959-98-8	0.05	8.0
96. Dieldrin	60-57-1	0.05	8.0
97. 4,4'-DDE	72-55-9	0.10	16.0
98. Endrin	72-20-8	0.10	16.0
99. Endosulfan II	33213-65-9	0.10	16.0
100. 4,4'-DDD	72-54-8	0.10	16.0
101. Endrin Aldehyde	7421-93-4	0.10	16.0
102. Endosulfan Sulfate	1031-07-8	0.10	16.0
103. 4,4'=DDT	50-29-3	0.10	16.0
104. Chlordane	57-74-9	0.5	80.0
105. Toxaphene	8001-35-2	1.0	160.0

Table 8-4
(continued)

Pesticides	CAS Number	Detection Limits* Low Water[e] ug/L	Detection Limits* Low Soil/ Sediment[f] ug/Kg
106. AROCLOR-1016	12674-11-2	0.5	80.0
107. AROCLOR-1221	11104-28-2	0.5	80.0
108. AROCLOR-1232	11141-16-5	0.5	80.0
109. AROCLOR-1242	53469-21-9	0.5	80.0
110. AROCLOR-1248	12672-29-6	0.5	80.0
111. AROCLOR-1254	11097-69-1	1.0	160.0
112. AROCLOR-1260	11096-82-5	1.0	160.0

[e] Medium concentration water detection limits for pesticide compounds are 100 times the individual low water detection limits.

[f] Medium concentration soil/sediment detection limits for pesticide compounds are 60 times the individual low soil/ sediment detection limits.

*Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

**Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

Table 8-5

Elements Determined by Inductively Coupled Plasma Emission or Atomic Absorption Spectroscopy

Element	Detection Level (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Tin	40
Vanadium	50
Zinc	20

NOTE

Detection limits in soil/sediments are numerically equivalent to those listed above with concentration units of mg/kg.

Table 8-6

Inorganic and Other Parameters

Parameter	Method Detection Limit
Total Petroleum Hydrocarbons (solids)	100 mg/kg
Cyanide (water)	10 mg/L
Cyanide (solid)	0.5 ug/G

The analyses specified in Tables 8-1, 8-2, and 8-3 will be performed by WESTON's laboratory in Lionville, Pennsylvania. The only exception will be the wipe samples from the boiler and stack, which will be subjected to 2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCDD) determination. These analyses will be performed by California Analytical Laboratories in West Sacramento, California. The analysis will be performed in accordance with U.S. EPA methodology for low-resolution GC/MS determination for 2,3,7,8-TCDD (Reference 13). The method detection limit for this determination will be 10 ng or less.

SECTION 9

DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA LOGGING

The sample custodian, upon receipt of samples for analysis accompanied by a completed request for analysis and/or chain-of-custody form, will do the following:

- Verify completeness of submitted documents, including chain-of-custody forms.
- Log in samples, assign unique log numbers, and attach the numbers to the sample container(s).
- Open project file and enter data on lab computer.
- Assign priority and hazard rating criteria.
- Store samples in refrigerated sample bank.

9.2 DATA COLLECTION

In addition to the data collected in the field and recorded on the chain-of-custody forms, data describing the processing of samples will be accumulated in the laboratory and recorded in laboratory notebooks. Laboratory notebooks will contain:

- Date of processing.
- Sample numbers.
- Client (optional).
- Analyses or operation performed.
- Calibration data.
- Quality control samples included.
- Concentrations/dilutions required.
- Instrument readings.
- Special observations (optional).
- Analysts signature.

9.3 DATA REDUCTION

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction will be dependent on the specific analytical method and the number of discrete operations (extractions, dilutions, and concentrations) involved in obtaining a sample that can be measured.

For those methods utilizing a calibration curve, sample responses will be applied to the linear regression line to obtain an initial raw result, which is then factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two (2) significant figures.

Copies of all raw data and the calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date.

9.4 DATA VALIDATION

System reviews are performed at all levels. The individual analyst constantly reviews the quality of data through calibration checks, quality control sample results, and performance evaluation samples. These reviews are performed prior to submission to the Section Managers or to the Analytical Project Manager.

The Section Manager and/or the Analytical .Project Manager review data for reasonableness and consistency with CLP QC requirements. Selected hard copy output of data (chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a resolution will be made as to whether the analysis should be repeated. In addition, the Analytical Project Manager or Section Manager will recalculate selected results to verify the calculation procedure.

The Quality Assurance Officer will independently conduct a review of selected data to determine if CLP quality assurance/ quality control requirements have been met. Discrepancies will be reported to the appropriate Section Manager and/or Analytical Project Manager for resolution.

The final routine review is performed by the Laboratory Manager prior to reporting the results to the client. Nonroutine audits are performed by regulatory agencies and client representatives. The level of detail and the areas of concern during these reviews are dependent on the specific program requirements.

9.5 DATA REPORTING

Reports will be consistent with the CLP reporting deliverables cited in EPA Contract Laboratory Program SOP.

9.6 DATA ARCHIVING

The laboratory will maintain on file all of the raw data, laboratory notebooks, and other documentation pertinent to the work on a given project. This file will be maintained for five (5) years from the date of invoice unless a written request is received for an extended retention time.

Data retrieval from archives will be handled in a similar fashion, as a request for analysis. Specifically, a written work request to include a quotation must be submitted for retrieval of data.

Client confidentiality will be maintained with retrieved data. Consequently, the laboratory can honor only those requests for data authorized by the original client.

SECTION 10

QUALITY ASSURANCE CHECKS

10.1 OVERVIEW

Quality Assurance checks are usually divided into two groups:

- Internal checks including field activities and laboratory methods.
- External checks usually accomplished by multi-laboratory evaluation of split samples.

The internal checks described in this section will be employed specifically for the Ellis RI. Site-specific external quality assurance checks are not planned for extensive use during this project. However, WESTON has been subjected to periodic external performance audits. As part of those audits, the laboratory has participated in the analysis of performance evaluation samples for the U.S. EPA Contract Laboratory Program; quarterly for Blind Organics and Inorganics and semi-annually for the States of New York, New Jersey, Pennsylvania, and Illinois.

10.2 INTERNAL QUALITY ASSURANCE CHECKS

Internal quality assurance procedures are designed to assure the consistency and continuity of data. Internal quality assurance procedures include:

- Instrument performance checks.
- Instrument calibration.
- Retrieval of documentation pertaining to instrument standards, samples, and data.
- Documentation on analytical methodology and QC methodology (QC methodology includes spiked samples, duplicate samples, and split sample use of reference blanks and check standards for method accuracy and precision).
- Documentation on sample preservation and transport.

Internal quality assurance checks on field activities will be performed by the site manager. Internal quality assurance checks for laboratory activities are the responsibility of the laboratory manager.

10.3 FREQUENCY OF INTERNAL QUALITY CONTROL CHECKS

The frequency of quality control checks is based on the type of analysis. Specific frequency criteria for internal quality assurance checks are presented in the WESTON Standard Practices Manual. The following criteria and procedures apply to the generation of commercial level data. In cases where CLP and other methods are required, strict adherence to the procedures and criteria given in the corresponding method is maintained.

10.3.1 GC/MS Methods

During each operating shift, a midpoint calibration standard is analyzed to verify that the instrument responses are still within the initial calibration determinations. The calibration check compounds will be those analytes used in the EPA Contract Laboratory Program's multicomponent analyses (e.g., priority pollutants and hazardous substances list) with the exception that benzene is used in place of vinyl chloride (volatiles) and di-n-octyl phthalate is deleted from the semi-volatile list.

All GC/MS analyses will include analyses of a method blank, a method spike, and a method spike duplicate in each lot of samples. In addition, appropriate surrogate compounds specified in EPA methods will be spiked into each sample. Recoveries from method spikes and surrogate compounds are calculated and recorded on control charts to maintain a history of system performance.

Matrix spikes and duplicate matrix spikes will be fortified with selected target compounds, as specified in WESTON OP 16-22-015, Attachment E.

Audit samples will be analyzed periodically to compare and verify laboratory performance against standards prepared by outside sources.

10.3.2 Atomic Absorption/Inductively Coupled Plasma

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous media. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be analyzed to determine if contamination is being introduced in the laboratory. The method spikes will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. The recovery must be within the range 75-125 percent to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes. Results must agree within twenty (20) percent in order to be considered acceptable.

In addition, as specified by the procedures described in OP 16-22-014, a matrix spike and duplicate sample will be analyzed with each batch of samples. Acceptance criteria are specified in OP 16-22-014, Attachment E.

10.4 TYPES OF FIELD QC CHECKS

Standard analytical quality control checks to be instituted by field personnel include but are not limited to:

- Field Blanks - Samples prepared using analyte-free water supplied by the laboratory (or purchased from commercial sources which certify the quality of the water) by running the water through the decontaminated sampling implements and directly into a prepared sample container.
- Trip Blanks - Volatile organic samples prepared in the laboratory using analyte-free water. The trip blanks accompany the field samples during transport to the site, collection, packaging, transport to the lab, and analysis.
- Duplicate Samples - Samples collected from the same sampling location at the same time.

The number of blanks and duplicate samples to be prepared by field personnel are summarized in Tables 2-1 and 2-2 of the Field Sampling Plan. Field blanks and duplicates will be assigned fictitious names so that the laboratory is unaware that they are QC samples. It is noteworthy that certain samples collected on a common day and using common sampling implements will share common blanks and duplicates. For example, water samples collected on a given day will share a common trip blank, although differing matrices may be involved.

10.5 EXTERNAL QUALITY CONTROL CHECKS

One external quality control check, which will be instituted during this project, is the use of a performance evaluation (PE) sample in the 2,3,7,8-TCDD analyses. The PE sample will be supplied by the NJDEP in glassware prepared by the WESTON laboratory. Concentrations of 2,3,7,8-TCDD in the PE sample will be known only to the NJDEP until hard copy data have been received.

SECTION 11

PERFORMANCE AND SYSTEM AUDITS

11.1 GENERAL

Independent audits of field sampling, preservation, shipping, and equipment cleaning procedures conducted by a NJDEP representative are anticipated during the course of the project. Audits, if conducted, will be during actual field operations.

After such an audit has taken place, the NJDEP auditor will be requested to brief the site manager to discuss any nonconforming actions or procedures observed. Corrective action (if any) which may be taken as a result of the audit will be documented in the project files.

In addition to the NJDEP audit, the WESTON Quality Assurance Officer for the project may also perform an audit.

11.2 FIELD AUDITS

An unannounced audit of the Ellis Property RI pertaining to conformance with QA/QC procedures may be performed by the WESTON QA Officer. A written report on the results of this audit (and where necessary, a notice of nonconformance) would be submitted to the:

- NJDEP Site Manager
- Project Manager
- Quality Assurance Officer
- Field Team Leader (Site Project Engineer)
- Field QA/QC Coordinator (Site Geologist)

A nonconformance notice describes any nonconforming conditions and sets a date for response and corrective action. The response is reviewed by the site manager and if satisfactory, is approved in writing. Copies of the response and approval are sent to the Quality Assurance Officer.

At the completion of the investigation, a final quality assurance audit will be performed. A statement will be included in the RI report which summarizes any deviations from approved methods and their impacts on results. Data completeness, precision, and accuracy will be evaluated to determine sufficiency of the data obtained during the RI.

11.3 EXTERNAL AUDITS

Unannounced audits of the field procedures or laboratory may be conducted by the NJDEP. Written reports on the results of these audits will be distributed to the same individuals listed in Subsection 11.2. Nonconformances will be addressed in a similar manner to the procedures applicable to field audits.

Performance audits are conducted periodically to determine the accuracy of a measurement. These audits may include analysis of performance evaluation (PE) samples related to the specific project. A single PE sample to be supplied by the NJDEP will be submitted to California Analytical Laboratories along with two boiler wipe samples and a field blank. The four samples will be analyzed for 2,3,7,8-TCDD. WESTON plans to utilize a fictitious name and sample number for both the PE and field blank samples so that they will be analyzed as blind samples.

Other external performance audits are periodically conducted as requirements for formal laboratory certification programs, such as for analyzing public drinking water systems. WESTON participates in these audits and is currently certified by the State of New Jersey.

11.4 CORRECTIVE ACTION

When a nonconformance or deficiency is identified during a formal NJDEP audit or during a routine WESTON QA Officer inspection, corrective action will be initiated by the Quality Assurance Officer or the appropriate individual (laboratory quality assurance manager, etc.). The auditor will also be responsible for ensuring that corrective actions, which adequately address the nonconformance, have been taken. A nonconformance report form will be filed for non-laboratory related deficiencies.

Technical staff will be responsible for reporting suspected technical nonconformances by initiating a nonconformance report on any issue, deliverable or document. Project personnel will be responsible for reporting suspected quality assurance nonconformances by initiating a nonconformance report. The QA Officer will be responsible for ensuring that corrective actions for nonconformances are implemented by:

- Evaluating reported nonconformances.
- Controlling additional work on nonconforming items.
- Determining disposition or action to be taken.

- Maintaining a log of nonconformance.
- Reviewing nonconformance reports.
- Evaluation disposition or action taken.
- Ensuring conformance.

SECTION 12

PREVENTIVE MAINTENANCE

12.1 FIELD EQUIPMENT

An inventory control system governing field equipment and instrumentation is maintained by the equipment storeroom supervisor as the basis for maintenance and calibration control. The inventory control documentation includes the following:

- Description of instrument.
- Manufacturer, model number, and serial number.
- Identification number.
- Name, address, and telephone number of company which services the instrument or equipment.
- Type of service policy.
- Timing and frequency of routine maintenance, servicing, and calibration.

12.2 GENERAL EQUIPMENT MAINTENANCE, REPAIR, AND CALIBRATION

Standard procedures for field instrumentation and equipment maintenance, repair, and calibration are according to the manufacturer's specifications. The Field Manager will be responsible for implementing and documenting the calibration procedures used while on-site.

12.3 FIELD EQUIPMENT AND CRITICAL SPARE PARTS

- HNu photoanalyzer with 11.7 eV ionization potential lamp.
- APC Model 069-701 Beta-Gamma Survey Meter.
- Scintrix MF 2-100 portable fluxgate magnetometer.
- Geonics EM 34-3 conductivity meter with 10 meter coil separator.
- GSSI SIR-8 Model 4800-P ground penetrating radar unit.

12.4 LABORATORY EQUIPMENT

The following instrumentation will be utilized for priority pollutant analyses:

- Gas chromatograph with electron captive (ECD) - Data station with column and carrier gas conditions, as specified in the analytical methods.
- Gas chromatography/mass spectrometer - Data systems 70 eV nominal electron energy (Finnegan 1020 OWA's for volatile organic analysis, Finnegan 5100's and 4600's for base/neutral/acid extractable organic analysis).
- Inductively Coupled Plasma-Atomic Emission Spectrometer; Atomic Absorption Spectrophotometer.

Procedures for maintenance and calibration are according to the manufacturer's specifications and are described in the attached Laboratory Quality Assurance Plan for the WESTON Laboratory. Full Manufacturers' Service Agreements are maintained for all GC/MS, AA, and ICP instrumentation. Typical response to emergency repairs takes place within 24 to 48 hours. Spare parts are retained in the laboratory's inventory for routine repair. Trained service representatives may be consulted or utilized for more complex repairs.

SECTION 13

SPECIFIC ROUTINE PROCEDURES TO BE USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS OF SPECIFIC MEASUREMENT PARAMETERS INVOLVED

13.1 OVERVIEW

The reliability and credibility of analytical field measurements will be ensured by daily calibration of instrumentation. The manufacturers' recommended operating, maintenance, and calibration procedures will be followed for field equipment and laboratory instruments.

The reliability and credibility of analytical laboratory results is established by the inclusion of replicate analyses, analysis of standard or spiked samples, and the analysis of split samples.

Data reported by the laboratory will be evaluated against the precision, accuracy, and completeness criteria described in Section 4 to assess the validity of the measurements. The Laboratory QA Officer will perform this evaluation prior to releasing reports for NJDEP review.

13.2 GC/MS METHODS

During each operating shift, a midpoint calibration standard is analyzed to verify that the instrument responses are still within the initial calibration determinations. The calibration check compounds will be those analytes used in the EPA Contract Laboratory Program's multicomponent analyses (e.g., priority pollutants and hazardous substances list) with the exception that when commerical level data are required, benzene is used in place of vinyl chloride (volatiles) and di-n-octyl phthalate is deleted from the semi-volatile list. Procedures and criteria given in the CLP methods are strictly adhered to in cases where CLP methodology is specified.

The response factor drift (percent RDS) will be calculated and recorded and compared with method-required criteria as given in Attachment E of OP 16-22-015. If the RF drift is outside of the criteria, the instrument will be recalibrated prior to initiation of analysis.

All GC/MS analyses will include analyses of a method blank, a method spike, and a method spike duplicate in each lot of samples. In addition, appropriate surrogate compounds specified in OP 16-22-015 will be added into each sample. Recoveries from method spikes are calculated and recorded on control charts to monitor accuracy of the analytical method. Surrogate recoveries will be compared to the requirements in Attachment E of OP 16-22-015 and if the recoveries are outside of control limits, the corrective action required by that OP will be taken.

Audit samples will be analyzed periodically to compare and verify laboratory performance against standards prepared by outside sources.

13.3 AA/ICP METHODS

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous media. Method spikes will be at a concentration of approximately five times the detection limit. The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The method spikes are analyzed to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. The recovery must be within the 75-125 percent range to be considered acceptable.

In addition, a matrix spike and duplicate sample will be analyzed with each batch of samples of twenty (20) or less. The accuracy (recovery) and precision of these analyses will be compared to those given in Attachment E of QP 16-22-014. If any accuracy or precision data are outside these criteria, the corrective action required by that OP will be taken.

SECTION 14

CORRECTIVE ACTION

14.1 OVERVIEW

When a nonconformance or deficiency is identified during a formal audit or during a routine quality control audit of field activities, corrective action will be initiated by the Site Manager. The Site Manager will also be responsible for ensuring that the corrective action has actually been taken, and that it adequately addresses the nonconformance. When corrective actions are required in the laboratory, the Laboratory Manager will determine appropriate corrections. The Section Manager will be responsible for instituting corrective actions in the laboratory.

14.2 NON-LABORATORY ACTIVITIES

Participating staff will be responsible for reporting suspected quality assurance nonconformances by initiating a nonconformance report.

The Field Manager will be responsible for ensuring that corrective actions for nonconformances are implemented by:

- Evaluating reported nonconformances.
- Controlling additional work on nonconforming items.
- Determining disposition or action to be taken.
- Maintaining a log of nonconformances.
- Reviewing nonconformance reports.
- Evaluating disposition or action taken.
- Ensuring nonconformance reports are included in the final site documentation.

The Field Manger will ensure that additional work which is dependent on the nonconforming activity, is not performed until the nonconformance is corrected. The Site Manager will be responsible for evaluating each nonconformance and implementing corrective actions.

14.3 LABORATORY ACTIVITIES

14.3.1 Gas Chromatography/Mass Spectrometry (GC/MS)

The GC/MS instrumentation will be employed in the Ellis Property RI for the priority pollutant plus 40 analyses. During each operating shift, the analyst will verify that the instrument responses are within the initial calibration. The response factor drift (percent RSD) will be calculated and recorded. If calibration check compound (CCC) and system performance check compound (SPCC) criteria are not met, corrective action will be taken.

14.3.2 Gas Chromatography

A gas chromatograph with an electron capture detector will be used for analysis of polychlorinated biphenyls. The initial and continuing calibration criteria are those given in Attachment E of OP 16-22-014.

14.3.3 AA/ICP Spectroscopy

An inductively coupled plasma (ICP) spectrometer and an AA spectrometer will be employed for the analysis of metals. As described in Section 7 of this Plan, the calibration frequency and criteria are given in Attachment E of OP 16-22-014.

SECTION 15

QUALITY ASSURANCE REPORTS

The Quality Assurance Officer will prepare a report detailing the following information:

- Accuracy of the data.
- Precision of the data.
- Completeness with respect to planned analyses.
- Results of any performance or systems audits conducted during the project.
- Significant QA problems and recommended solutions.

This information will be made a part of the Remedial Investigation Report.

Comprehensive QA records will be maintained to provide evidence of the quality assurance activities. Records of the quality assurance program implementation will be written and retained on file. Quality assurance documents will be archived in the project file along with raw data, laboratory notebooks, and other information pertinent to the project.

The retention of quality assurance records is essential to provide support in evidentiary proceedings. The original quality assurance records including the front pages of the chain-of-custody forms for the Ellis Property RI will be retained in the project file. Long-term storage of these documents in archives is described in Subsection 9.6. Quality assurance evaluations prior to releasing data for NJDEP review are described in Section 13.

The Site Manager is responsible for ensuring that quality assurance records are properly filed and stored and that they can be readily retrieved.

SECTION 16

REFERENCES

1. Field Sampling Plan for the Ellis Property RI/FS Evesham Township, New Jersey, WESTON, June 1986.
2. "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," USEPA, 1980.
3. Analytical Laboratory Quality Assurance Plan, WESTON Standard Practices Manual, SP No. 16-06-010, 1 September 1985.
4. Report on Background Investigation, The Ellis Property RI/FS, Evesham Township, New Jersey, WESTON, June 1986.
5. Sampling Procedures for Determination of 2,3,7,8-TCDD on Interior Surfaces, U.S. EPA Method 8701M72, 1985.
6. "Field Sampling Procedures Manual," NJDEP, 1985.
7. Instruction Manual for Model PI-101 Photoionization Analyzer, HNu Systems, Inc., 1975.
8. Instrumentation Manual Model 069-701 Beta-Gamma Survey Meter, Atomic Products Corporation, New York.
9. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Second Edition, U.S. Environmental Protection Agency, July 1984.
10. "Methods for Chemical Analysis of Water and Wastewater," EPA-600/4-79-020, Revised March 1983.
11. U.S. EPA Statement of Work, "Organic Analyses Multimedia, Multiconcentration," July 1985.
12. U.S. EPA Statement of Work, "Inorganic Analyses Multimedia, Multiconcentration," SOW 785, July 1985.
13. U.S. EPA Statement of Work, "Dioxin Analysis Soil/Sediment Matrix, Multiconcentration Selected Ion Monitoring (SIM) GC/MS Analysis with Jar Extraction Procedure."

APPENDIX A

EPA WORK/QA PLAN
SHORT FORM

0179B

US EPA WORK/QA PLAN SHORT FORM

Ellis Property

New Jersey Department of Environmental Protection

Michael A. Turco
Project Manager

Bradford S. Cushing
Project QA Officer

Frank Richardson
NJ DEP Site Manager

NJ DEP QA Officer

1. **Project Name:** Ellis Property

2. **Project Requested By:** NJ DEP

3. **Date of Request:** 23 July 1985

4. **Date of Project Initiation:** 4 December 1985

5. **Project ~~Officer~~ Manager:** M. A. Turco

6. **Quality Assurance Officer:** B. S. Cushing

7. **Project Description**
OBJECTIVE, SCOPE, AND DATA USAGE STATEMENT:

A. To gather sufficient data to determine an appropriate remedial action, if any, required at the site. The subsequent Feasibility Study (FS) will use the data gathered during the RI to determine a cost-effective method of remediation and to develop a conceptual level design of that action. The RI program to be conducted at the Ellis Property site will focus on the following objectives:

- Characterize the nature, extent, and volume of residual contaminant, if any.
- Assess groundwater quality and the potential for subsurface contaminant migration.
- Determine the hydrodynamic parameters governing groundwater flow rates and directions.
- Provide the data needed to perform a Feasibility Study.
- Determine whether remedial action supplementing the previous removal action is warranted at the site.
- Assess alternative remedial technologies and determine a cost effective remedial action.
- Prepare conceptual designs of remedial actions found to be appropriate and prepare a work plan.

C. Monitoring Network Design and Rationale:

The portion of the Ellis Property which was utilized for drum recycling operations will be investigated via the following methods: container sampling, soil screening for volatile organics and radioactivity, geophysical surveys, soil core sampling, surface soil sampling, groundwater sampling, and surface water and sediment sampling. Details regarding location of monitoring points and analytical parameters are provided in the Field Sampling Plan.

D. Monitoring Parameters and their Frequency of Collection :

The field program involves obtaining a number of samples from various media. The number of samples and their respective analysis are included in the Parameter Table below. Groundwater, surface water and soil samples will be collected on a one-time basis. The Field Sampling Plan (FSP) describes the rationale for selecting monitoring parameters.

E. Parameter Table

Parameter	Number of Samples	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time
Volatile Organics	132 locations	Soil	FSP 2.3.1	N/A	N/A
Radioactivity	10m x 10m grid	Soil	FSP 2.3.2	N/A	N/A
Volatile Organics	8	Soil Borings	Ref. 1	$4^{\circ}C$	7 days
Extractable Organics	8	" "	Ref. 1	$4^{\circ}C$	7/40 days
Metals	8	" "	Ref. 2	$4^{\circ}C$	6 mo.
Volatile Organics	4	Soil - Bldg. Floors	Ref. 1	$4^{\circ}C$	7 days
Extractable Organics	4	" " "	Ref. 1	$4^{\circ}C$	7/40 days

(continued on attached page)

Parameter	Number of Samples	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time
Metals	4	Soil - Bldg.Floors	Ref. 2	4°C	6 mo.
Chromium	14	Soil - Area 1	Ref. 2	4°C	6 mo.
Barium	14	" "	Ref. 2	4°C	6 mo.
Oil/Grease	2	" "	Ref. 3 & 4	4°C	7 days
Volatile Organics	1	" "	Ref. 1	4°C	7 days
Extractable Organics	1	" "	Ref. 1	4°C	7/40 days
Metals	1	" "	Ref. 2	4°C	6 mo.
PCB	14	Soil - Area 2	Ref. 1	4°C	7/40 days
Oil/Grease	3	" "	Ref. 3 & 4	4°C	7 days
Volatile Organics	1	" "	Ref. 1	4°C	7 days
Extractable Organics	1	" "	Ref. 1	4°C	7/40 days
Metals	1	" "	Ref. 2	4°C	6 mo.
Volatile Organics	12	Surface Soils	Ref. 1	4°C	7 days
Extractable Organics	12	" "	Ref. 1	4°C	7/40 days
Metals	12	" "	Ref. 2	4°C	6 mo.
Volatile Organics	17[1]	Groundwater	Ref. 1	4°C	7 days
Extractable Organics	17[1]	"	Ref. 1	4°C	7/40 days
Metals	17[1]	"	Ref. 2	4°C, pH 2	6 mo.
Volatile Organics	3	Surface Water	Ref. 1	4°C	7 days
Extractable Organics	3	"	Ref. 1	4°C	7/40 days
Metals	3	"	Ref. 2	4°C, pH 2	6 mo.
Volatile Organics	4	Sediment	Ref. 1	4°C	7 days
Extractable Organics	4	"	Ref. 1	4°C	7/40 days
Metals	4	"	Ref. 2	4°C	6 mo.
2,3,7,8-TCDD	4	Surface Wipe	Ref. 5	4°C	7/90 days
Ignitability	1	Oil Drum	40 CFR 261.21	N/A	N/A
Corrosivity	1	" "	40 CFR 261.22	N/A	N/A
Reactivity	1	" "	40 CFR 261.23	N/A	N/A

Parameter	Number of Samples	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time
EP Toxicity	1	Oil Drum	40 CFR 261.24	N/A	N/A
Ignitability	1	Soil Near Drum	40 CFR 261.21	N/A	N/A
Corrosivity	1	" " "	40 CFR 261.22	N/A	N/A
Reactivity	1	" " "	40 CFR 261.23	N/A	N/A
EP Toxicity	1	" " "	40 CFR 261.24	N/A	N/A

References:

Method Reference Sources:

1. U.S. EPA Statement of Work, "Organic Analyses Multi-Media, Multi-Concentration," July 1985.
2. U.S. EPA Statement of Work, "Inorganic Analyses Multi-Media, Multi-Concentration," SOW 785, July 1985.
3. U.S. EPA Physical/Chemical Methods, "Test Methods for Evaluating Solid Waste," SW 846, Second Edition, revised July 1984.
4. "Methods for Chemical Analysis of Water and Wastewater," EPA-600/4-79-020, revised March 1983.
5. U.S. EPA Statement of Work, "Dioxin Analysis Soil/Sediment Matrix, Multi-Concentration Selected Iron Monitoring (SIM) GC/MS Analysis with Jar Extraction Procedure.

Notes:

[1] Include 6 on-site wells, 1 dug well and 10 off-site wells.

8. Project Fiscal Information (Optional):

A. Survey Costs

Salaries ____________

Supplies ____________

Equipment ____________

Mileage ____________ ____________

B. Laboratory Services ____________

C. Administrative Overhead ____________

D. Consultant Services ____________

Total Project Cost ____________

9. Schedule of Tasks and Products

Activity/Date

10. Project Organization and Responsibility

The following is a list of key project personnel and their corresponding responsibilities:

J. Claypool, Project Engineer - sampling operations

C. Kufs, Project Geologist - sampling QC

Organic Section Mgr. C. Nulton; Inorganic Section Mgr. L. Eng - laboratory analysis

D. Therry - laboratory QC

S. Dobbs - data processing activities

S. Dobbs - data processing QC

C. Nulton, L. Eng, E. Hanson - data quality review

M. Bhatla, Project Director - performance auditing

__________ - systems auditing

B. Cushing, Quality Assurance Officer - overall QA

M. Turco, Project Manager - overall project coordination

(Note: an organizational chart should be supplied with this plan)

11. Data Quality Requirements and Assessments

	Parameter	Sample Matrix	Detection Limit	Quantitation Limit	Estimated Accuracy	Accuracy Protocol	Estimated Precision	Preci Protc
1	Priority Pollutant Organics		Note 1	Note 1	OP 16-22-015	OP 16-22-015		OP 16-22-01
2.	Priority Pollutant Inorganics		Note 1	Note 1	OP 16-22-014	OP 16-22-014		OP 16-22-01
3	2, 3, 7, 8 TCDD		10 ngs	10 ngs		Blind PE Sample	50%	Ref. 5
4	Petroleum Hydrocarbons		2 mg/kg	2 mg/kg	Note 1	Note 1	Note 2	Note 2
5.								
6								
7.								
8								
9								
10.								

Data Representativeness: ______________________________

NOTES:

(1) Method detection limits are provided in Tables 8-3 thru 8-5 of the QA/QC Project Management Plan.

(2) Precision and accuracy requirements for EPA Methods 3540 and 418.1 have not been identified in the most recent revisions.

Data Comparability: The comparison of data is inlcuded in the internal quality assurance procedures. These procedures are designed to assure the consistency and continuity of data. If required, external quality assurance procedures are carried out for comparison of the data analysis. A blind performance evaluation sample will be submitted for 2,3,7,8-TCDD determination.

Data Completeness: Data reported by the laboratory will be calculated against the precision, accuracy, and completeness criteria given in Table 11. The completeness objective is 90 percent. The 2, 3, 7, 8 TCDD analysis has a completeness objective of 100 percent.

12. **Sampling Procedures:** Samples of soil, surface water, sediment, containerized waste, and groundwater will be collected during the RI. Specific procedures for collecting these samples are presented in the Field Sampling Plan and Section 5 of the QAPP.

13. **Sample Custody Procedures:** The field manager is responsible for the samples until they are delivered to the laboratory. The sample custodian is responsible for the samples and the sample flow in the laboratory. A chain-of-custody document will accompany the sample in the field until it arrives in the laboratory.

14. **Calibration Procedures and Preventive Maintenance:** Field personnel and laboratory personnel are responsible for the calibration of their respective equipment. A more detailed description is included in Section 7 of the QA/QC Project Management Plan.

15. Documentation, Data Reduction, and Reporting

A. Documentation: Documentation procedures are detailed in both the FSP and the QAPP. The chain-of-custody document that will accompany each sample, also serves as a laboratory analysis request. This will ensure that a designated analysis is performed on a specific sample. Each sample received from the site will be logged into a bound log book. Sample containers will be labelled.

B. Data Reduction and Reporting: Upon successful completion of the QA/QC process, the data will be submitted to the NJ DEP in final report form. Copies of the data and final reports will be retained by WESTON. A data management flow chart is included in Section 9.4 of the QA/QC Project Management Plan.

16. Data Validation: Upon completion of the analytical procedure, the WESTON laboratory manager and the project QA officer will do a QA/QC review of the data. The data will be reviewed for completeness, correctness, accuracy, precision, and representativeness.

17. Performance and Systems Audits: Audits of the field sampling, preservation, shipping, equipment cleaning, and laboratory procedures by a NJ DEP representative or the WESTON Quality Assurance Officer for the project are anticipated. When a deficiency is identified corrective action will be initiated by the appropriate individual.

18. **Corrective Action:** When a nonconformance or deficiency is identified during a formal audit or during a routine quality control audit, corrective action will be initiated by the Site Manager or the appropriate individual (laboratory quality assurance manager, etc.). The Site Manager will also be responsible for ensuring that the corrective action has actually been taken, and that it adequately addresses the nonconformance.

19. **Reports:** Comprehensive QA records will be maintained in the project file to provide evidence of the quality assurance activities. The site manager is responsible for ensuring that these records are properly filed and stored and that they can be readily retrieved.

APPENDIX B*

CALIBRATION PROCEDURES FOR THE HNu** MODEL PI-101 PHOTOIONIZATION DETECTOR

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*Excerpted from Instruction Manual for Model PI-101 Photoionization Analyzer, HNu Systems, Inc., 1975

**The HNu will be calibrated weekly with daily response checks. Calibrations will be performed using non-benzene calibration gases supplied by the manufacturer.

SECTION 3

CALIBRATION

Static or dynamic gas generation systems can be utilized for calibration of the instrument. A number of such systems for generating test atmospheres for various gases have been described by G. O. Nelson in "Controlled Test Atmospheres," Ann Arbor Science Publishers, Ann Arbor, Michigan (1971).

The most convenient packages for calibration are the non-toxic analyzed gas mixtures available from HNU Systems in pressurized containers (Catalogue #101-350).

A rapid procedure for calibration involves bringing the probe and readout in close proximity to the calibration gas, cracking the valve on the tank and checking the instrument reading. This provides a useful spot check for the instrument.

The recommended and most accurate procedure for calibration of the instrument from a pressurized container is to connect one side of a "T" to the pressurized container of calibration gas, another side of the "T" to a rotameter and the third side of the "T" directly to the 8" extension to the photoionization probe (see Figure 5). Crack the valve of the pressurized container until a slight flow is indicated on the rotameter. The instrument draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. Now adjust the span pot so that the instrument is reading the exact value of the calibration gas. (If the instrument span setting is changed, the instrument should be turned back to the standby position and the electronic zero should be readjusted, if necessary.)

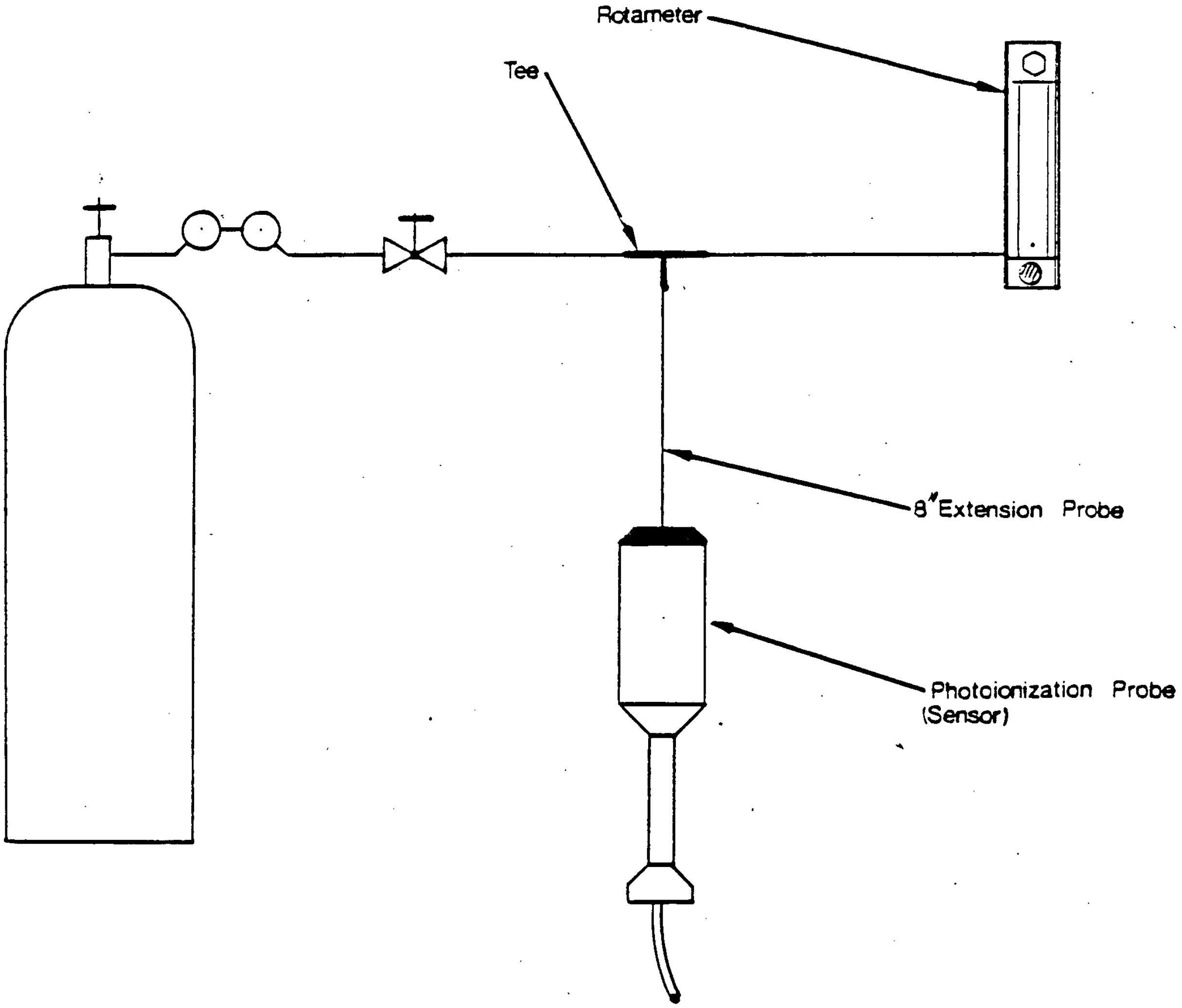

Figure 5. Recommended Calibration Procedure for Photoionization Analyzer

The calibration gas[*] should be prepared in the same matrix (air, nitrogen, hydrogen, etc.) in which it is to be measured, otherwise an inaccurate reading may be obtained. The increased response which is seen in oxygen free gases can be attributed to a reduction in the quenching of ions by oxygen (actually O_2^-) and is typical of any ionization detector. The quenching effect of oxygen is constant from about ten percent O_2 to very high levels.

If a gas standard prepared in nitrogen is to be used for measurements in air, fill a 0.5 or 1 liter bag with the standard then add 50 or 100 cc of pure oxygen to bring the level to 10-12%.

Any error between this value and 20% oxygen is quite small.

If the sample to be measured is in nitrogen, standards should be prepared in nitrogen. This will result in an increase in sensitivity of approximately 4.

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[*] Calibration with toxic gases should be performed in a hood since the 101 is a non-destructive analyzer.

APPENDIX C

SAMPLING PROCEDURES FOR DETERMINATION OF 2,3,7,8-TCDD ON INTERIOR SURFACES

SAMPLING PROCEDURES FOR DETERMINATION OF 2,3,7,8-TCDD ON INTERIOR SURFACES

August, 1985

Introduction

The purpose of this document is to describe the sampling and analytical requirements for the determination of 2,3,7,8-TCDD contamination of common residential surfaces in interior structures. The surfaces include non-fabric type surfaces such as uncarpeted flooring, furniture, walls, appliances, and ventilation ducts. The described procedures are not intended to measure "imbedded" contamination, but merely measure "available" surface contamination.

Wipe sampling is inappropriate for surfaces which are porous. These include wood, asphalt , and concrete. Where possible, a discrete object (e.g. concrete debris) may be removed. Otherwise, chisels, drills, saws, etc., may be used to remove a sufficient sample for anlaysis. Surface samples (less than 1 cm deep) should be collected.

Wipe Sampling Procedure

The routine wipe sampling procedure utilizes a sorbent pad which has been dampened with solvent before collecting the sample. Either cotton gauge or filter paper (Whatman #4) can be used as a sorbent. The sorbent can be either water or isooctane. Isooctane is a better solvent for dioxin, but may also damage the surface to which it is applied. A decision whether to use isooctane or water will depend on an evaluation of the benefits of using the more efficient solvent and the costs due to damage of the surface sampled. Wat er would be the solvent of choice when surface damage is unacceptable, while isooctane would be selected for most other situations.

The damp (wet) wipe sample pad will be hand held and the area to be wiped will be measured useing a 2,500 cm^2 template. Care must be taken to assure proper use of a sampling template. Different templates may be used for the variously shaped areas which must be sampled. A 2500 cm^2 area may be a 50cm x 50 cm square, a rectangle (e.g., 25 cm x 100 cm), or any other shape. The use of a template assists the sampler in the collection of a 2500 cm^2 sample and the selection of representative sampling sites. The template should be thoroughly cleaned between samples (by rising with methylene chloride) to prevent contamination of subsequent samples by the template.

A wet wipe procedure may result in material other than the analyte of interest being collected, such as wax, on surface floors, which could interfere with the sample analysis. Isooctane would be expected to extract more of these interferents than water. The potential for interferents is also a factor to consider in selecting a solvent. Because of the potential for these interferents, sampling personnel will carefully document all conditions that exist on each surface sampled.

As part of all sampling procedures, field blanks will be collected to determine if specific analytical interferences may be present in either the sorbent pads or as the solvent. The field blank will also determine whether procedures used to collect a wet wipe sample introduce any interferences to the samples, and will be included at a frequency of five percent (one per 20 samples collected; or one per sampling event).

The standard operating procedures established for collecting wet wipe samples are as follows:

1. Materials and Apparatus

- 3" x 3". sterile cotton guaze pads, individually wrapped or Whatman #4 filter aper
- Disposable latex or neoprene gloves
- Sample bottles, 240 ml, amber glass with teflon liners
- Water, glass distilled or isooctane, glass distilled*
- Templates (2500 cm^2)
- Sample labels
- Field log notebook/chain-of-custody records
- Floor plan map
- Indelible ink pen
- Metric ruler

* CAUTION - Isooctane is flammable and should be handled with care.

2. For each sampling event (or at least once for 20 samples collected), prepare a field blank using the following procedure:

- Put on a new pair of disposable gloves
- Remove cotton gauze pad or Whatman #4 filter paper from package with a pair of clean stainless steel forceps
- Soak pad with solvent (water or isooctane)
- Carefully place pad into a precleaned glass jar
- Add a 2nd dry pad to the precleaned glass jar in order to simulate the sampling procedure which requires 2 pads.
- Prepare sample label for collection bottle
- Record sample information

3. Select area for collecting a series of wet wipe samples. Ensure that the surface area is large enough to use with a 2500 cm^2 template.

4. Take a wipe sample using the following procedure:

- Put on a clean pair of disposable gloves
- Hold the template in position for sampling.
- Remove a sorbent pad (cotton gauge or Whatman #4 filter paper).
- Dampen the pad with solvent (water or isooctane). The amount of solvent should be enough to dampen the pad but not so much as to result in excess liquid that runs onto the surface being sampled.
- Thoroughly swab the area marked off by the template.
- Carefully place the damp pad into a precleaned glass jar.
- Immediately take a 2nd dry sobent pad and wipe the area marked by the template to remove any residual solvent and particulate matter.
- Carefully place this dry pad into the galss jar along with the damp pad, and close jar tightly.
- Store at 4°C until ready for analysis. Protect sample from light.

5. For each wipe sample, record the following information:

  - Sample number, both on bottle and data sheet
  - Sample location (include room number)
  - Description (of surface sampled)
  - Area sampled in square centimeters (should be 2500 cm^2)
  - Observations/problems, if pertinent
  - Names of sampling personnel

6. The final step in sampling a specific area is to clearly mark the sample location on the floor plan map. If appropriate, the sampling area will also be left outlined with duct, masking tape, or spray paint, with the sample number written on this "frame." This marking of the specific areas sampled may be used for future reference.

7. Change gloves or decontaminate gloves after taking each sample.

8. Upon completion of the day's sampling activities, samples should be removed from the site as directed by the on-scene coordinator.

9. Upon removal of samples from the site, a chain-of-custody form shall be established for the samples. The chain-of-custody will act as a transmittal form from sampling personnel to laboratory personnel, and will be signed at this time to document that samples are properly relinquished and received by appropriate staff members.

METHOD #: 8701M72

APPROVED FOR:

____ NPDES

____ DWR

TITLE: SAMPLING PROCEDURES FOR DETERMINATION OF 2,3,7,8-TCDD ON INTERIOR SURFACES

BRIEF SUMMARY: Filter/Wipe Samples

REVIEWER: ____________________ DATE: ____________

APPROVAL: William Bunn DATE: 12/17/85

(Acting) Chief, Analytical Section

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