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QUALITY ASSURANCE PROJECT PLAN
FOR THE
DRUM REMOVAL AT SITE #6
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

Contract Number N47408-92-D3042
Delivery Order 0032

Submitted to:

Commanding Officer
Atlantic Division
Naval Facilities Engineering Command
Norolk, VA 23511-2699

Submitted by:

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Project Number 15226

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1.0 INTRODUCTION

Quality Assurance/Quality Control (QA/QC) is an integrated program designed to ensure that all facets of a project adhere and conform to OHM Remediation Services Corp. (OHM) standards as well as to client and regulatory performance criteria. This Quality Assurance Project Plan (QAPP) contains policies, project objectives, specific responsibilities of personnel, and specific procedures necessary to ensure that the intended measurements are appropriate for achieving the project objectives. The procedures utilized are sufficient for obtaining data of known and adequate quality and ensures that the data collected will be defensible if challenged legally or technically.

The QAPP provides the requirements of all individuals involved along with unambiguous instructions to the sampling team, the analytical laboratory and other parties responsible for data generation. The QAPP will provide sufficient detail to allow a thorough, detailed review by an independent party not involved in the project implementation.

The QAPP, along with the Field Sampling Plan, comprises the Sampling and Analysis Plan as outlined in the specifications of Contract No. N47408-92-D-3042, Delivery Order No. 0032.

Implementation of QA/QC at all levels of the project is critical to ensuring that the client receives project information in a timely manner and that these data are of sufficient quality to meet or exceed the objectives and tasks specified in the Scope of Work. To achieve this objective, all personnel involved in this project are cognizant of and responsible for all of the site-specific QA/QC requirements.

OHM has identified the approach or approaches necessary to achieve the task objectives for each task listed in the Scope of Work. Strict adherence to established protocols and procedures will ensure an end result that meets or exceeds the task objectives. QA/QC policies are the expedient to a competent and satisfactory finished project.

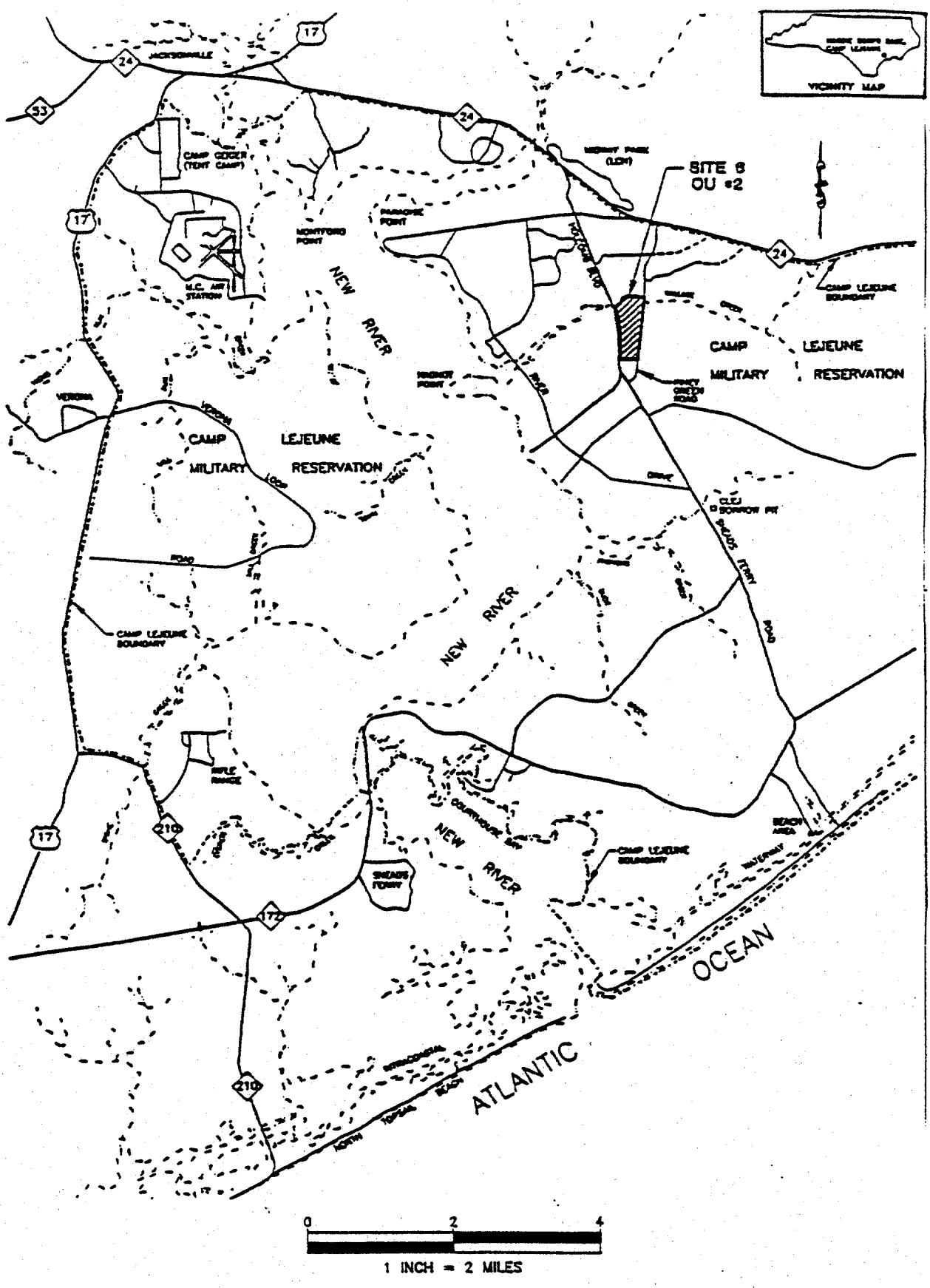
2.0 PROJECT DESCRIPTION

The primary objective of this project is to remove, transport, and dispose of all drums, storage tanks, and containers located at MCB Camp Lejeune. The scope includes the removal, transportation and disposal of all surficial and buried drums, storage tanks, containers, their associated contents, and any impacted soils.

MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Priorities List (NPL) that became effective on October 4, 1989. The United States Environmental Protection Agency (EPA) Region IV, the North Carolina Department Of Environmental, Health and Natural Resources (NCDEHNR) and the United States Department of the Navy (Navy) then entered into a Federal Facilities Agreement (FFA) for the site. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at the site were thoroughly investigated and appropriate CERCLA Response/ Resource Conservation and Recovery Act (RCRA) corrective actions alternatives were developed and implemented as necessary to protect public health and the environment.

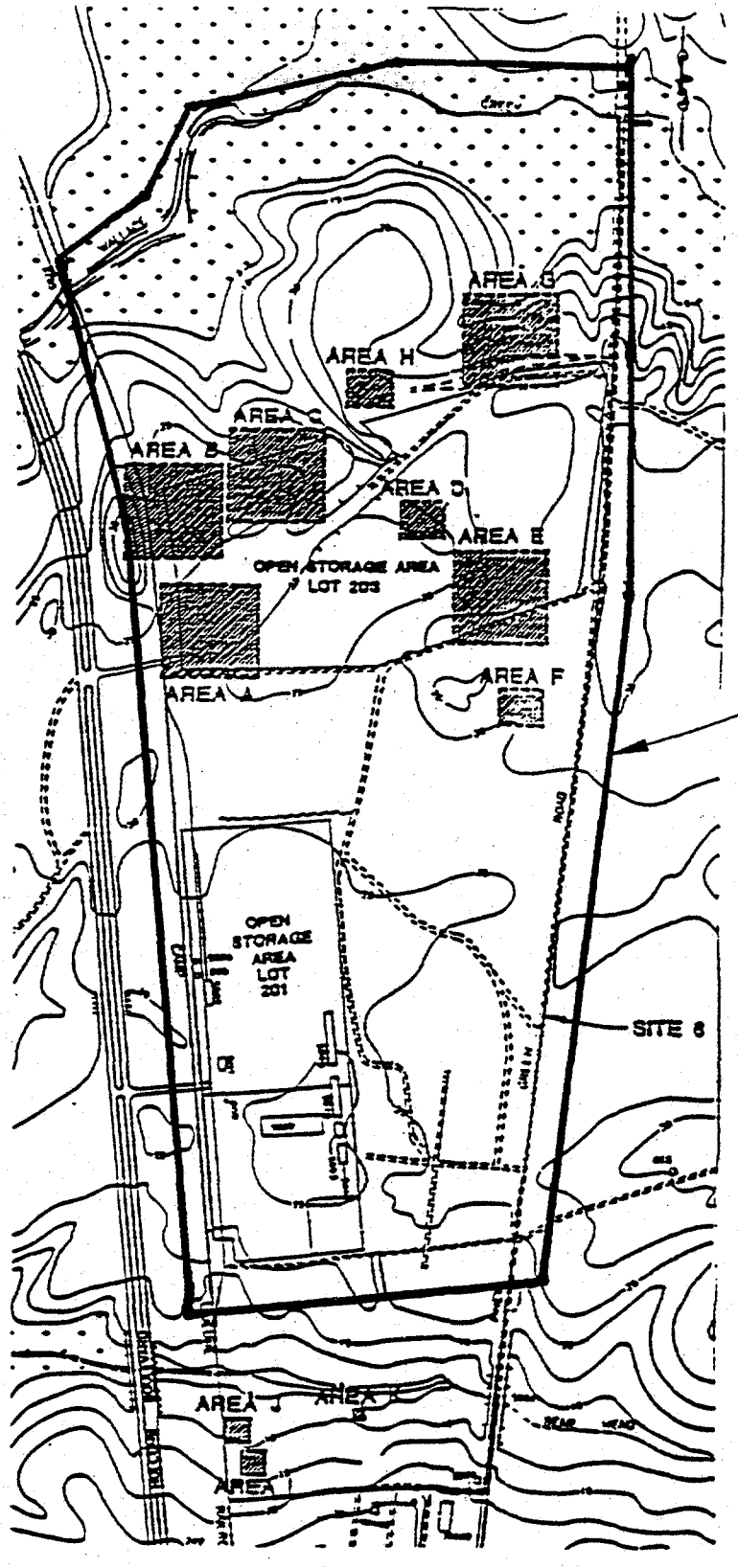
2.1 SITE LOCATION

Operable Unit No. 2 (OU No. 2) is located approximately 1.75 miles east of the New River and 2 miles south of State Route 24 on the main-side portion of MCB Camp Lejeune (see Figure 2.1). The unit is bordered by Holcomb Boulevard on the west, Sneads Ferry Road on the south, Piney Green Road on the east, and by Wallace Creek on the north. Camp Lejeune Railroad operates rail lines parallel to Holcomb Boulevard bordering OU No. 2 on the west. OU No. 2 covers an area of approximately 210 acres (see Figure 2.2). OU No. 2 consists of three sites: Sites 6, 9, and 82.



PROJECT: CAMP LEJEUNE REMEDIAL ACTION PROJECT No.: 15226 LOCATION: CAMP LEJEUNE, N.C.	FIGURE 2.1 GEOGRAPHIC LOCATION MAP	OHM Remediation Services Corp.

Figure 2.1



PROJECT: CAMP LEJEUNE REMEDIAL ACTION PROJECT No.: 15226 LOCATION: CAMP LEJEUNE, N.C.	FIGURE 2.2 SITE LOCATION MAP	OHM Remediation Services Corp.

Figure 2.2

Site 6 is bounded on the north by Site 82, by Piney Green Road on the east, by Site 9 on the south, and by Holcomb Boulevard on the west. Site 6 covers approximately 177 acres and includes Storage Lots 201 and 203, the wooded area between the storage lots, and a ravine, which begins at Site 6 and bisects Site 82. Three surface water bodies are associated with Site 6: Wallace Creek, Bear Head Creek, and a ravine located in the wooded area north of Lot 203 that drains to Wallace Creek.

Open Storage Lot 201 (Lot 201) is a fenced lot located in the south-central portion of Site 6. It is a flat area with sparse vegetation around the fence lines. Open Storage Lot 203 (Lot 203) is a fenced lot located in the northern portion of Site 6 covering approximately 46 acres. Lot 203 is a relatively flat area with elevation differences of approximately five feet. The ground surface is comprised of both naturally existing soil and fill material. Lot 203 is bordered by Site 82 to the north, Piney Green Road to the east, woods to the south, and by Holcomb Boulevard to the west. Lot 203 is currently inactive.

Woods and open fields surround both Storage Lots 201 and 203 and make up the remaining area of Site 6. The topography of the wooded area is relatively flat, but localized trenching and mounding is visible just north of Lot 203 and west of Piney Green Road.

2.2 SITE HISTORY

Site 6 has a long history of various uses including the disposal and storage of wastes and supplies. Approximately 200 drums and containers are present at Site 6. The majority of the drums, if labeled, were identified as containing lubricants, petroleum products, or corrosives. Empty storage tanks are also located at Site 6. They were labeled as containing diesel fuel, gasoline and kerosene.

The wooded areas of Site 6 are randomly littered with debris including spent aluminum casings, and empty or rusted drums. Markings were observed on a few drums (most drums did not contain markings due to their conditions and

age) located north of Lot 203. These drums were marked as "lubrication oils". Many of the drums observed were only shells or fragments of drums.

Lot 203 has been used as a disposal area since the 1940s. There is little documentation on the disposal activities at this lot. Lot 203 is not currently active as a storage or disposal area, but the ground surface is littered with various debris. Lot 203 was also used for the storage and disposal of radio and communications parts, shredded tires, lubricants, petroleum products, corrosives, expended demolition kit training materials, ordnance, sheet metal debris, wire cables and wooded pallets. Lot 203 is currently fenced.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The responsibilities of OHM's key personnel dedicated to the MCB Camp Lejeune project are described below. An organization chart is provided in Figure 3.1.

Program Manager – Barry Van Wagner

The Program Manager administers and manages all contract delivery orders for remedial action services. Other duties include monitoring and controlling project costs and quality control, understanding and enforcing all CERCLA regulations, and performing as the Contractor's chief representative.

Project Manager – Joseph Carris, P.E.

The Project Manager is responsible for directing all segments associated with the remedial action. Other duties include ensuring that all elements of the project plans and specifications are implemented within schedule and budget, recommending and justifying change orders, directing the procurements of subcontractors, and complying with normal safety procedures and regulatory requirements.

Additional responsibilities include the following tasks:

- Participating in the project quality assurance review;
- Communicating to the project staff of project-specific client and regulatory requirements and QA practices;
- Identifying, documenting, and notifying the client and project staff of changes in the scope of work, regulatory requirements, and QA practices;

Figure 3.1

- Notifying the Program Manager if the project cannot be completed as anticipated with regard to quality, schedule, or cost;

- Supervising the preparation and approval of project-specific procedures, work plans, and QAPPs; and

- Conducting a final review prior to the release of project information.

Project Superintendent – James Shepard

The Project Superintendent will supervise all on-site operations for the remedial action. Other duties include managing and administering material logistic procedures, coordinating all labors including direction of subcontractors, monitoring and control of project costs. The project superintendent will also perform the duties of the Contract Quality Control (CQC) representative. The CQC representative is responsible for developing, maintaining and enforcing the quality control inspection system.

Certified Industrial Hygienist, Angelo Liberatore

The certified industrial hygienist (CIH) is responsible for implementing and overseeing the health and safety program. Other duties include developing the Site Health and Safety Plans, ensuring proper maintenance of medical and training records for on-site personnel, interface with the Program Manager on health and safety issues, and reviewing health and safety monitoring results.

Site Safety Officer – John Rhyne

The site safety officer (SSO) is responsible for ensuring that all elements of the approved SHSP are implemented and enforced on-site. Other duties include monitoring field

procedures to ensure compliance with the SHSP and to brief all on-site personnel regarding special hazards that may occur on-site.

4.0 QUALITY ASSURANCE OBJECTIVES

The purpose of this QA/QC Program is to provide internal means for control and review so that the work performed by OHM and its subcontractors meets the highest professional standards. Project objectives are as follows:

- Data will be gathered or developed in accordance with procedures appropriate for the intended use of the data and will be of significant or greater quality to stand up to scrutiny.

- Data will be of known or acceptable precision, accuracy, representativeness, completeness, and comparability within the limits of the project.

The quality of the measurement data can be defined in terms of the following elements.

- **Completeness** – the adequacy in quantity of valid measurements to prevent misinterpretation.

- **Representativeness** – the extent to which discrete measurements accurately describe the greater picture which they are intended to represent. Good representativeness is achieved through careful, informed selection of sampling sites.

- **Accuracy and Precision** – the agreement between a measurement and the true value and the degree of variability in this agreement, respectively. Accuracy and precision of data collected in the remediation will depend upon the measurement standards used and the competent use of them by qualified personnel.

- **Traceability** – the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two essential forms: that which links quantitative to authoritative standards, and that which explicitly describes the history of each sample from collection to analysis.

The fundamental mechanism that will be employed to achieve these quality goals can be categorized as prevention, assessment and correction, as follows:

- Prevention of defects in the quality through planning and design, documented instruction and procedures, and careful selection and training of skilled, qualified personnel.

- Quality assessment through a program of regular audits and in expectation to supplement continual informal review.

- Permanent correction of conditions adverse to quality through a close-loop corrective action system.

The MCB Camp Lejeune Quality Assurance Project Plan has been prepared in direct response to these goals.

4.1 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are requirements needed to support decisions relative to the various stages of remedial actions. DQOs are based on the concept that different data uses may require different data quality. The categories of data quality include:

- Level C – allows the use of non-CLP methods but requires that the methods be accepted EPA methods. All methods used must be EPA methods or equivalent to EPA methods.

- Level D – provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost recovery documentation. Confirmational analyses require full Contractor Laboratory Program (CLP) analytical and data validation procedures.

- Level E – provides the use of non-standard and non-CLP methods. The methods used must be EPA-accepted methods, EPA methods, or EPA equivalents.

For the MCB Camp Lejeune Project, DQOs have been established to meet investigative data needs as follows:

Field Program: Photoionization detectors (PID), explosiometers and oxygen meters will be utilized in the field program for site health and safety monitoring and sample screening. These measurements are considered EPA DQO Level 1. EPA DQO Level 2 will be utilized throughout the project for initial characterization.

Analytical Laboratory: NFESC Level D will be provided for the analysis of the confirmation samples. A CLP-type data package will be supplied using SW-846 methods for the confirmation samples. NFESC Level C will be provided for the analysis of the remaining samples. The laboratories will follow established EPA methods when analyzing the samples. QA/QC protocols will follow established EPA and NFESC methods. The laboratories' QA/QC program will be provided as an appendix once a laboratory is selected.

4.2 FIELD MEASUREMENTS

OHM will utilize a PID, explosimeter and oxygen meter for field screening purposes and air monitoring only.

4.3 LABORATORY MEASUREMENTS

OHM will utilize the services of a NFESC – certified laboratory to analyze the samples from MCB Camp Lejeune. The selected laboratory's QA/QC plan will be included as Appendix B.

Table 4.1 outlines the analytical data quality assurance objectives for the proposed sample analyses.

Table 4.1

Summary of Quality Assurance Objectives

Sample Group	Sample Matrix	Analytical Parameter	Analytical Method	Precision % RPD	Accuracy % Recovery	Completeness %
Confirmation	Soil	TCLP Volatiles	SW-8240	0-50	75-125	90+
		TCLP Semi-volatiles	SW-8270	0-50	75-125	90+
		TCLP Pesticides	SW-8080	0-50	75-125	90+
		TCLP Herbicides	SW-8150	0-50	75-125	90+
		TCLP Metals	SW-6010/7470*	0-50	75-125	90+
		Total PCBs	SW-8080	0-50	75-125	90+
		Ignitability	SW-1010	0-20	27.8°C Flashpoint P-xylene	90+
		pH	SW-9045	NA	NA	90+
		Reactive CN	SW-9012	NA	NA	90+
		Reactive Sulfide	SW-9030	NA	NA	90+
		TPH by GC	SW-8015	NA	NA	90+
Drum		Hazardous Category	OHM	NA	NA	90+
		Drum Compatibility	OHM	NA	NA	90+
		Composite Wastestream				90+
		Volatiles	SW-8240	0-50	75-125	90+
		Semi-volatiles	SW-8270	0-50	75-125	90+
		Pesticides/PCBs	SW-8080	0-50	75-125	90+
		TAL Metals	SW-6010/7470*	0-50	75-125	90+
		Total Suspended Solids	SW-160.2	0-50	NA	90+
		Total Dissolved Solids	SW-160.1	0-50	NA	90+
		Percent Water	ASTM-095	0-50	NA	90+
		Acid ions (Cl, NO_3, SO_4, PO_4)	SW-300.1	0-50	NA	90+
		TCLP Volatiles	SW-8240	0-50	75-125	90+
		TCLP Semi-volatiles	SW-8270	0-50	75-125	90+
		TCLP Pesticides	SW-8080	0-50	75-125	90+
		TCLP Herbicide	SW-8150	0-50	75-125	90+
		TCLP Metals	SW-6060/7470*	0-50	75-125	90+
		BTU	ASTM-D240-76	0-50	75-125	90+
		Ignitability	SW-1010	0-50	75-125	90+
		Total/Amenable/Reactive CN-	SW-9012/9010	0-50	75-125	90+
		Total/Reactive Sulfide	SW-9030	0-50	75-125	90+

*Arsenic - 7060
Selenium - 7740
Lead - 7421

Table 4.1 – Continued

Summary of Quality Assurance Objectives

Sample Group	Sample Matrix	Analytical Parameter	Analytical Method	Precision % RPD	Accuracy % Recovery	Completeness %
Waste Character-ization	Soil/ Debris/ PPE	TCLP Volatiles	SW-8240	0-50	75-125	90+
		TCLP Semi-volatiles	SW-8270	0-50	75-125	90+
		TCLP Pesticides/PCBs	SW-8080	0-50	75-125	90+
		TCLP Herbicides	SW-8150	0-50	75-125	90+
		TCLP Metals	SW-6010	0-50	75-125	90+
		Ignitability	SW-1010	0-20	27.8°C Flashpoint P-xylene	90+
		pH	SW-9045	NA	NA	90+
		Reactive CN-	SW-9012	0-50	75-125	90+
		Reactive Sulfide	SW-9030	0-50	75-125	90+
		TPH by GC	SW-	0-50	75-125	90+
	Decon. Water	TCLP Volatiles	SW-8240	0-20	75-125	90+
		TCLP Semi-volatiles	SW-8270	0-20	75-125	90+
		TCLP Pesticides/PCBs	SW-8080	0-20	75-125	90+
		TCLP Herbicides	SW-8150	0-20	75-125	90+
		TCLP Metals	SW-6010	0-20	75-125	90+
		Ignitability	SW-1010	0-20	27.8°C Flashpoint P-xylene	90+
		pH	SW-9045	NA	NA	100
		Reactive CN-	SW-9012	0-20	75-125	90+
		Reactive S-	SW-9030	0-20	75-125	90+
		TPH by GC	SW-	0-20	75-125	90+
Disposal	Soil/ Debris	Volatiles	SW-8240	0-20	75-125	90+
		Semi-volatiles	SW-8270	0-20	75-125	90+
		Pesticides/PCBs	SW-8080	0-20	75-125	90+
		TAL Metals	SW-6010/7471	0-20	75-125	90+
		BTU	ASTMD240-76	NA	75-125	90+
		Specific Gravity	2710F	NA	75-125	90+
		Acid ions (Cl, SO_4, NO_3, PO_4)	SW-300.0	NA	75-125	90+
	Decon. Water	Volatiles	SW-8240	0-20	75-125	90+
		Semi-volatiles	SW-8270	0-20	75-125	90+
		Pesticides/PCBs	SW-8080	0-20	75-125	90+
		TAL Metals	SW-6010/7471	0-20	75-125	90+
		BTU	ASTMD240-76	NA	75-125	90+
		Specific Gravity	2710F	NA	75-125	90+
		Acid ions (Cl, SO_4, NO_3, PO_4)	SW-300.0	NA	75-125	90+

5.0 SAMPLING PROCEDURES

Sampling methodologies for this project will follow (at a minimum) the USEPA Region IV Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, February 1991. For each type sample proposed for collection at MCB Camp Lejeune, the procedures used are described to enable a sampling team unfamiliar with the site to gather the samples and necessary information.

5.1 CONFIRMATION SAMPLES

The confirmation soil samples collected at the site will consist solely of grab samples collected from the walls and floors of the trenches. The following procedures will be used to collect the confirmation soil samples:

1. Locate and flag (from the surface) the sampling locations in trenches.

2. Using a backhoe with a decontaminated bucket, retrieve the soil from the designated sample location.

3. Using a clean pair of sampling gloves and using a clean stainless steel spoon or a clean stainless steel auger, scrape the top layer of soil away.

4. With the spoon or auger, collect enough sample in a stainless steel or glass bowl to fill the sample jars.

5. Once enough soil has been collected, the sample jars should be filled. The volatile sample is transferred to the appropriate container first. After the volatile sample is collected, the remaining sample is thoroughly mixed in

the sample bowl. After thorough mixing, the remaining sample jars are filled and labeled.

5.2 DRUM SAMPLES

Drum samples will consist of grab samples taken from the drums unearthed at MCB Camp Lejeune. Opening and sampling of the drums will be done in Level B personal protective equipment (PPE). The following procedures will be used to open the drums:

1. Using an oxygen meter and a photoionization detector, scan the drum staging area for readings. Once the readings are determined to be satisfactory, proceed with the opening and sampling of the drums. If the readings are not satisfactory, evacuate the area and notify the site safety officer.

2. Using a brass tipped punch and/or brass tools, removed the bung from the drum.

3. If the drums are in bad condition, other methods will be used to open the drums, such as remote punch or using a pry bar. These methods will only be used after it is approved by the site safety officer.

5.2.1 Solid Drum Contents

1. Using a clean pair of gloves and clean stainless steel spoon, collect enough sample in a stainless steel or glass bowl to fill the sample jars.

2. For volatiles, the sample is transferred directly to the appropriate containers. After enough sample has been collected in the bowl, the contents of the bowl is thoroughly mixed.

3. Once thoroughly mixed, the sample is transferred to the remaining sample jars.

5.2.2 Liquid Drum Samples

1. Using a clean pair of gloves and a clean drum thief, lower the drum thief into the drum until it reaches the bottom of the drum, allowing the contents to flow into the drum thief.

2. Transfer the contents of the drum thief to the volatile sample jar.

3. After the volatile sample jar has been filled, the remainder of the sample jars are filled.

5.3 WASTE CHARACTERIZATION SAMPLES

Waste characterization samples will consist of grab samples taken from different matrices. These matrices are soil, debris, decontamination water, and PPE. The soil samples will be collected as described in Section 5.1. The debris, decontamination water, and PPE samples will be collected as described in the following procedures.

5.3.1 Debris Samples

1. Using a clean pair of gloves and a clean stainless steel or glass bowl, collect enough sample to fill the sample containers.

2. Depending upon the nature of the debris, it may need to be cut, crushed, or torn to accommodate the sample containers.

3. After enough sample has been collected, the volatile sample is transferred to the appropriate sample container.

4. After the volatile sample is transferred, the remainder of the sample is thoroughly mixed and transferred to the remainder of the sample containers.

5.3.2 Decontamination Water

1. Using a clean pair of gloves and a clean Teflon or stainless steel bailer, lower the bailer into the holding pond, or using the sample jar itself, lower the sample jar into the holding pond and fill the sample jars. When using the sample jars to collect the sample, the volatile sample is collected first, followed by the remaining jars.

2. Once the bailer is full, remove from the holding pond, and slowly pour the contents into the sample jars, beginning with the volatile jar first.

3. Once the jars are filled, the samples are preserved with the appropriate preservative. The volatile jar is preserved before the sample is collected.

5.3.3 PPE

1. Using a clean pair of gloves, collect enough sample to fill the sample jars.

2. Due to the nature of the material, the material may need to be cut, torn or shredded to accommodate the sample containers. If this situation occurs,

any instrument used will be of appropriate composition and decontaminated appropriately.

3. The volatile sample will be collected first, followed by the remaining sample jars.

5.4 DISPOSAL SAMPLES

Disposal samples will consist of grab samples of excavated soil from the trenches, grab samples of the debris removed from the trenches and grab samples from the decontamination water holding pool. Sampling procedures for the soil, debris and decontamination water will follow the procedures outlined in Sections 5.1, 5.3.1, and 5.3.2, respectively.

5.5 SAMPLING EQUIPMENT

Table 5.1 lists the equipment to be used to collect the samples at MCB Camp Lejeune along with the material composition of each piece of equipment.

5.5.1 Equipment Decontamination

The following steps will be used to decontaminate the sampling equipment utilized at MCB Camp Lejeune.

1. Clean with tap water and phosphate-free laboratory detergent (Liquinox), using brush, if necessary, to remove particulate matter and surface films.

2. Rinse thoroughly with tap water.

3. Rinse thoroughly with deionized water.

Table 5.1
Sample Equipment

Sample Group	Sample Type	Sample Equipment	Material Composition
Confirmation	Grab	Auger	Stainless Steel
		Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
Drum	Grab/Solid	Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
	Grab/Liquid	Drum Thief/Dip Tube	Glass
			Stainless Steel
		Bowl	Glass
Waste Characterization	Grab/Soil	Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
		Knife	Stainless Steel
	Grab/Debris	Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
		Knife	Stainless Steel
	Grab/Liquid	Bailer	Teflon
			Stainless Steel
		Sample Jar	Glass
			Plastic
	Grab/PPE	Spoon	Stainless Steel
		Knife	Stainless Steel
Disposal	Grab/Soil	Auger	Stainless Steel
		Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
	Grab/Debris	Spoon	Stainless Steel
		Bowl	Stainless Steel
			Glass
		Knife	Stainless Steel
	Grab/Liquid	Bailer	Teflon
			Stainless Steel
		Sample Jar	Glass
			Plastic

4. Rinse twice with pesticide-grade isopropanol.

5. Rinse thoroughly with organic-free water and allow to air dry as long as possible.

6. If organic-free water is not available, allow equipment to air dry as long as possible. Do not rinse with deionized or distilled water.

7. Wrap with aluminum foil, if appropriate, to prevent contamination if equipment is going to be stored or transported.

Decontamination fluids and PPE will be collected, containerized and disposed of properly.

Any heavy machinery brought onsite will require steam cleaning upon departure. The equipment will be decontaminated on the decontamination pad and decontamination fluids transferred to the appropriate pool.

5.6 SAMPLE ANALYSIS

Table 5.2 provides the analysis, sample containers, preservatives, and holding times for the samples collected at MCB Camp Lejeune. The disposal decontamination water samples will be preserved with HCl for the volatiles fraction and with HNO_3 for the metals fraction. Chemical preservatives are not required for soil samples. All samples will be stored and shipped at 4°C.

Samples will have analyses performed at QC Level C. EPA DQO Level A will be used when determining the hazardous category for the drums.

A standard 14-day turnaround time (TAT) will be needed at MCB Camp Lejeune.

Table 5.2
Sample Analysis, Containers, Preservation, Holding Times

Sample Group	Sample Matrix	Analysis	Sample Container	Preservation Method	Holding Time
Confirmation	Soil	TCLP Volatiles	4-ounce jar	None	28 days
		TCLP Semi-volatiles, Pesticides, Herbicides	8-ounce jar	None	54 days
		TCLP Metals	8-ounce jar	Cool, 4°C	6 months [1]
		Total PCBs	8-ounce jar	None	NA
		Ignitability	8-ounce jar	None	54 days
		pH	8-ounce jar	Cool, 4°C	NA
		Reactive CN-	8-ounce jar	Cool, 4°C	NA
		Reactive Sulfide	8-ounce jar	Cool, 4°C	54 days
		TPH by GC			
Drum	Solid/ Liquid	Hazardous Category	16-ounce jar	Cool, 4°C	NA
		Drum Compatibility	16-ounce jar	Cool, 4°C	NA
Drum	Com. Waste-streams	Total Suspended Solids Total Dissolved Solids Percent Water Acid Ions (Cl, NO_3, SO_4, PO_4) Volatiles Semi-volatiles Pesticides/PCBs TAL Metals BTU Ignitability Total/Amenable/ Reactive Cyanide Total/Reactive Sulfide	16-ounce jar	Cool, 4°C	NA
		TCLP Volatiles	4-ounce jar	None	28 days
		TCLP Semi-volatiles, Pesticides, Herbicides	8-ounce jar	None	54 days
		TCLP Metals Total PCBs	8-ounce jar	None	6 months [1]
Waste Characterization	Soil/ Debris/ PPE	TCLP Volatiles	4-ounce jar	None	28 days
		TCLP Semi-volatiles Pesticides Herbicides	8-ounce jar	None	54 days
		TCLP Metals	8-ounce jar	Cool, 4°C	6 months [1]
		Total PCBs	8-ounce jar	None	NA
		Ignitability	8-ounce jar	None	NA
		pH	8-ounce jar	None	NA
		Reactive CN-	8-ounce jar	None	NA
		Reactive Sulfide	8-ounce jar	None	54 days
		TPH by GC			

[1]Mercury has a holding time of 28 days

Table 5.2 - Continued
Sample Analysis, Containers, Preservation, Holding Times

Sample Group	Sample Matrix	Analysis	Sample Container	Preservation Method	Holding Time
	Decon. Water	TCLP Volatiles	3 40-ml vials with septums	None	28 days
		TCLP Semi-volatiles, Pesticides, Herbicides	1-gal amber glass jar	None	54 days
		TCLP Metals Total PCBs	1-gal. amber glass jar	None	6 months
		Ignitability	8-ounce jar	None	NA
		pH	8-ounce jar	None	NA
		Reactive CN-	8-ounce jar	None	NA
		Reactive Sulfide	8-ounce jar	None	NA
		TPH by GC	8-ounce jar	None	
Disposal	Soil/ Debris	Volatiles	4-ounce jar	Cool, 4°C	14 days
		Semi-volatiles, Pesticides/PCBs	8-ounce jar	Cool, 4°C	40 days
		TAL Metals Mercury	8-ounce jar 8-ounce jar	Cool, 4°C Cool, 4°C	6 months 28 days
		BTU	8-ounce jar	Cool, 4°C	28 days
		Specific Gravity	8-ounce jar	Cool, 4°C	NA
		Acid Ions, (Cl, SO_4, NO_3, PO_4)			14 days
Disposal	Decon. Water	Volatiles	3 40-ml vials with septums	HCl, pH, <2	14 days
		Semi-volatiles, Pesticides, PCBs	1-gal amber glass jar	Cool, 4°C	40 days
		TAL Metals Mercury	1-liter plastic 8-ounce jar	HNO3, pH <2 None	6 months 28 days
		BTU	8-ounce jar	None	28 days
		Specific Gravity	8-ounce jar	Cool, 4°C	NA
		Acid Ions (Cl, SO4, NO3, PO4)			14 days
QA/QC	Trip Blanks/ water	Volatiles	3 40-ml vials with septums	HCl, pH, <2	14 days
	Rinsate Blanks/ Water	Volatiles	3 40-ml vials with septums	HCl, pH <2	14 days
		Semi-volatiles; Pesticides/PCBs	1-gal. amber glass	Cool, 4°C	47 days
		TAL Metals Mercury	1 liter plastic	HNO3, pH <2	6 months 28 days
	Field Blanks/ Water	Volatiles	3 40-ml vials w/septums	HCl, pH <2	14 days
		Semi-volatiles Pesticides/PCBs	1-gal. amber glass	Cool, 4°C	40 days
		TAL Metals Mercury	1 liter plastic	HNO3, pH <2	6 months 28 days

6.0 SAMPLE CUSTODY

OHM will provide the NFESC the chain-of-possession and custody for any sample(s) which are collected on-site. Written procedures will be available and followed whenever samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record which can be used to trace the possession and handling of the sample from the moment of its collection, or, if precleaned sample jars are provided by the laboratory, through analysis and its introduction as evidence.

A sample is defined as being in someone's custody if:

a. It is in one's possession;

b. It is in one's view, after being in one's physical possession;

c. It is in one's physical possession and then stored in a secure facility or location so that no one can tamper with it; or

d. It is kept in a secured area, restricted to authorized personnel only.

The following sections outline the custody procedures used in both field sampling and mobile analytical laboratory operations. All records and documentation denoted in this section are kept on file in respective OHM project files for easy tracing to specific sampling events.

6.1 FIELD SAMPLING OPERATIONS

6.1.1 Field Logbook

To properly document all aspects of a sampling effort, a field logbook is used to record all pertinent information. The field logbook is a bound ledger, preferably with consecutively numbered pages, that is maintained for a single project. Information pertaining to all aspects of the sample collection (including documentation of reagent preparation for preservative, etc.) will be recorded in this document. At a minimum, the field logbook will contain the following information:

- Purpose of sampling (Contract Number)
- Project location
- Specific sample location description (referenced by station number or benchmark)
- Sample identification number
- Beginning and ending times for timed composite sampling (if applicable)
- Depths at which the sample was collected (if applicable)
- Sample volume
- Chain-of-custody document number
- Sampling methodology

- Date and time of collection
- Preservative (type and volume added)
- Signatures of sampler and witness
- All pertinent information/observations
- Analysis (to be performed)
- Method of shipment and shipper information (manifest numbers, waste profile numbering, date of shipment, etc.)
- Comments/Conditions

Any errors in the field logbook are noted with a single line through the error and initialized. The following additional information will be included in the field logbook if necessary: visitors to site, ambient field conditions, sample sequence, preservation, field cleaning documentation, pH of preserved samples, and locations of QC samples.

6.1.2 Sample Labels

After a sample is collected, a sample label (see Figure 6.1) is attached to the sample container. The field logbook and the sample label will contain the following information:

- Individual project number
- Sample identification number
- Time of collection

Figure 6.1

- Date of collection
- Description of sample
- Name of sampler
- Name of witness

6.1.3 Chain-of-Custody

Documentation of sample custody following collection is accomplished using a standard Chain-of-Custody Record. This document traces possession of every sample from the time of collection through sample analysis.

In general, chain-of-custody protocols follow those outlined in U.S. EPA guidelines. Documentation begins immediately following sample collection and proper labeling. The chain of custody provides information on the sealing, the sample I.D. number, sample description, date and time of collection, number of containers for the sample, type of analysis requested, and any pertinent remarks are entered onto the chain-of-custody record form, an example of which is shown in Figure 6.2. This form is filled out using water-proof black ink. The chain-of-custody record form also has a space for information pertaining to the condition of sample containers upon their receipt from the support laboratory.

The sampler is responsible for properly packaging and dispatching samples to the appropriate laboratory. This responsibility includes using the proper shipping container, shipping labels, shipping papers, and filling out, dating, and signing the appropriate portion of the chain-of-custody record. When transferring samples, the sampler must sign and record the date and time on the first "Relinquished By" line on the chain-of-custody record (Figure 6.2). The person to whom custody is being transferred signs on the first "Accepted By" line of the chain-of-custody record, indicating that custody is being accepted by that person for all the samples listed on the sheet. When samples are shipped via

Figure 6.2

common carrier, the chain-of-custody record form is attached to the inside of the shipping container and the shipping container is sealed using strapping tape. Custody seals (see Figure 6.3) are also affixed to the top and sides of the cooler so that the cooler cannot be opened without breaking the seal. The carrier accepting the samples and turning them over to the laboratory also signs the chain-of-custody record. For subsequent transfers of custody, the succeeding relinquish and receipt lines are used. To reduce custody records, the number of custodians in the chain-of-possession is minimized.

The chain-of-custody record contains the following information:

- Project number, site name, and address
- Sample number
- Date and time of sample collection
- Name of sampler responsible for sample transmittal
- Signatures of all persons involved in the chain-of-possession
- Inclusive dates of possession
- Analyses to be performed
- Preservation
- Comments about sample or sample conditions
- Number of samples

6.2 SAMPLE NUMBER ASSIGNMENT

Each type of sample collected at MCB Camp Lejeune will have a unique sample number to aid in identifying the sample. There are four types of samples that will be collected at the site. For each type of sample a discussion is provided on the sample designation scheme used to identify the samples.

6.3

6.2.1 Confirmation Samples

The confirmation samples will consist of only one matrix, soil, collected from the excavated trenches. The samples will be numbered consecutively, starting with the first soil sample. An example of a confirmation sample number is presented below with an explanation.

- CLJ-CSS-01(D)
  CLJ – Camp Lejeune
  CSS – Confirmation soil sample
  01 – Sample number
  D – Duplicate, if applicable

6.2.2 Drum Samples

The drum samples will consist of waste samples collected from the unburied drums. The samples will be numbered consecutively, starting with the first drum sample. An example of a drum sample number is presented below with an explanation.

- CLJ-DWS-01(D)
  CLJ – Camp Lejeune
  DWS – Drum waste sample
  01 – Sample number
  D – Duplicate, if applicable

6.2.3 Waste Characterization Samples

Waste characterization samples will consist of different matrices. The matrices are soil, debris, decontamination water and PPE. Sample identification numbers will be assigned to help distinguish between the matrices within the group. For waste characterization soil samples, the following designation will be used:

- CLJ - WCS-01(D)

For waste characterization debris samples, the following designation will be used:

- CLJ-WCD-01(D)

For waste characterization decontamination water samples, the following designation will be used:

- CLJ-WCW-01(D)

For waste characterization PPE samples, the following designation will be used:

- CLJ-WCP-01(D)

An explanation of the sample identification numbers are presented below.

- CLJ – Camp Lejeune
  WCS – Waste Characterization Soil
  WCD – Waste Characterization Debris
  WCW – Waste Characterization Water
  WCP – Waste Characterization PPE
  01 – Sample Number
  D – Duplicate, if applicable

6.2.4 Disposal Samples

Disposal samples will consist of different matrices also. The matrices are soil, debris and decontamination water. The sample identification numbers will be

assigned to help distinguish between the matrices within the group.

For disposal soil samples, the following designation will be used:

- CLJ-DS-01(D)

For disposal debris samples, the following designation will be used:

- CLJ-DD-01(D)

For disposal decontamination water samples, the following designation will be used:

- CLJ-DW-01(D)

An explanation of the sample identification number is presented below:

- CLJ – Camp Lejeune
  DS – Disposal Soil Sample
  DD – Disposal Debris Sample
  DW – Disposal Decontamination Water Sample
  01 – Sample Number
  D – Duplicate, if applicable

6.2.5 QA/QC Samples

QA/QC samples will consist of water samples. Sample identification numbers will be assigned to help distinguish between the different types of QA/QC samples. Duplicate samples have been described earlier.

For trip blank samples, the following designation will be used:

- CLJ-TB-01

For rinsate blank samples, the following description will be used:

- CLJ-RB-01

For field blank samples, the following designation will be used:

- CLJ-FB-01

An explanation of the sample identification numbers are presented below:

- CLJ – Camp Lejeune
  TB – Trip Blank
  RB – Rinsate Blank
  FB – Field Blank
  01 – Sample Number

6.3 TRANSFER OF CUSTODY AND SHIPMENT

Samples are accompanied by a chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, a mobile laboratory, or an analytical laboratory specified by the USEPA.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate record prepared for each laboratory. Shipping containers will be sealed for shipment to the laboratory. Custody seals will be used on the shipping container to verify the integrity of the sample.

Whenever samples are split with a facility or government agency, a separate chain-of-custody record is prepared for those samples and is marked to indicate with whom the samples are being split.

All packages will be accompanied by the chain-of-custody record showing identification of the contents. The original record will accompany the shipment, and a copy will be retained by the QA Supervisor.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, the carrier should be indicated on the chain-of-custody record as receiving the samples and, if possible, the bill of lading number should be recorded on the chain-of-custody form. Receipts from post offices and bills-of-lading will be retained as part of the permanent documentation.

6.4 SAMPLE PACKAGING AND HANDLING

Inert cushioning material, such as vermiculite, will be placed in the bottom of a waterproof ice chest or cooler. The samples will be labeled appropriately, enclosed in plastic Ziploc™ bags, and packed safely in coolers with blue ice or double-bagged ice. The bottles will be placed upright in the cooler in such a way that they do not touch during shipment. Additional inert packing material will be placed into the cooler to partially cover the sample bottles (more than halfway). Packets of blue ice, or double-bagged ice, will be placed around, among,

and on top of the sample bottles to assure a temperature of approximately 4 degrees Celsius. The cooler will then be filled with additional cushioning material. The completed chain-of-custody records will be enclosed in plastic Ziploc™ bags and taped to the underside of the lid of the cooler. The bottom most legible copy of the form will be retained on site and filed. The drain of the cooler will be taped shut. The lid will be taped shut, and the coolers will be shipped to the designated laboratory. Required collection, shipping, and analytical processes will be completed within the required maximum holding times.

6.5 SAMPLE SHIPMENT

Samples will be collected in the appropriate containers allowing approximately 10 percent air space so that the containers are not full at 130°F. If headspace is not desired for a particular analysis (i.e., volatile organic analysis), the container will be placed inside another container to provide the desired headspace. The sealed and labeled container will then be placed inside an ice chest and packed with vermiculite to prevent breakage. Custody seals will be placed on the cooler to prevent tampering. Appendix A contains additional shipping instructions to meet DOT and/or IATA regulations.

Sample packaging, shipping and chain-of-custody procedures will be performed in accordance with applicable USEPA guidelines. No samples will be held on-site for more than 24 hours.

7.0 CALIBRATION PROCEDURES

A calibration procedure establishes the relationship between a known calibration standard and the accuracy of a measurement made by an instrument according to that standard. Calibration indicates absolute physical or electronic calibration and is not to be confused with chemical standardization. Chemical standards are run each time an instrument is used, whereas instrument calibration is performed only at specified intervals.

Operating procedures are generally provided by the manufacturer in equipment manuals and will be available for all equipment and analytical instrumentation.

Records will be maintained for calibration procedures amenable to absolute physical and/or electronic calibration performed by the laboratory or by an outside laboratory on a contract basis.

Contracts for calibration services will require the contractor to supply records on traceability of calibration standards.

All equipment that can undergo absolute physical or electronic calibration will have a tag affixed to it, in plain sight, bearing the following information:

Description:	_____
Identification No.:	_____
Last Calibrated:	_____
Calibrated by:	_____
Calibration Expires:	_____

Note: Use of this instrument beyond the calibration expiration date is prohibited.

When the equipment size or its intended use limits the application of labels, an identifying code will be applied.

Equipment past due for calibration will be removed from service. If physical removal of the equipment is impractical, it will be impounded by tagging or by some other means that clearly indicates the equipment should not be used.

7.1 INSTRUMENTS COMMONLY USED BY OHM

Table 7.1 lists field screening methods which may be utilized on the MCB Camp Lejeune Project.

TABLE 7.1
FIELD SCREENING AND MEASUREMENT INSTRUMENTS

INSTRUMENT	MODEL NO.	MANUFACTURER
Oxygen Meter	261	MSA
Explosimeter	261	MSA
Gas Vapor Detector	---	Drager
Photoionization Detector	PI-101	HNU Systems
Monitox	4100	Compur

7.2 STANDARDS RECEIPT AND TRACEABILITY

All standards for calibrating field equipment will be supplemented with independent QC check standards, which are different from the calibration standards and are used to check initial calibration and as criteria for acceptance or rejection of data.

7.3 FIELD INSTRUMENT CALIBRATION

The following sections present narrative discussions of calibration procedures used for field monitoring equipment. All calibrations are performed in the field prior to use. Every calibration is recorded in the maintenance log book for each instrument. Quality control check standards are used to check initial calibration, and acceptance and rejection criteria. Vapor meters will be calibrated daily with one span gas. If OVAs are used, then carbon filters may be necessary. All analytical instrumentation will utilize continuing calibration standards in addition to the initial calibration curve. These will be run at varying concentrations including low, mid, and high range to assure continuation of the curve.

7.3.1 Photoionization Detector (PID)

If underground storage tank work is performed, the PID must be calibrated against an Organic Vapor Analyzer equipped with a Flame Ionization Detector (OVA-FID).

MATERIALS

HNU PID, rotameter, "T" connector, three pieces of 3/8" ID Tygon, Teflon or polypropylene tubing, HNU calibration gas and regulator.

PROCEDURE

A. Zero

1. Connect probe
2. Check battery and allow unit to warm up for 15 minutes on "standby".
3. Use zero pot to zero the instrument.

B. Set Up

1. While PID is warming up connect tubing to "T".
2. Connect rotameter to one piece of tubing and calibration gas to another piece.
3. When PID is zeroed, connect probe extension to last piece of tubing.
4. Note background measurement and record in maintenance log for background corrections.

C. Calibration

1. Crack valve on regulator until rotameter indicates a slight flow.
2. Recheck zero.
3. Switch to "0-200" scale.
4. Unlock span pot and adjust to ppm value of calibration gas.
5. Lock span pot.
6. Switch to "standby" and recheck zero.
7. If zero must be readjusted, return to step 6.
8. Turn PID off and put materials away.

7.3.2 Compur 4100 SD Monitox

To enhance the intrinsic accuracy of the detector for H_2S or HCN, it is necessary to calibrate the detector using either an H_2S - nitrogen mixture with definite concentration of H_2S, or make an electronic adjustment by means of the Compur current generator U 5900 023 for the H_2S Monitox or the HCN Monitox. This is carried out by a qualified service technician for the instrument approximately twice a year.

7.4 ANALYTICAL INSTRUMENT CALIBRATION PROCEDURES

Analytical calibration procedures used by the laboratory for the analytical instrumentation will follow at a minimum the USEPA prescribed protocol for the specific analytical method.

8.0 ANALYTICAL PROCEDURES

8.1 FIELD SCREENING AND ANALYTICAL INSTRUMENTATION

Step by step procedures for utilizing field screening and analytical instruments that are used by OHM are outlined in the following sections.

The following field screening methods do not require specific precision and accuracy targets nor do they reference a specific analysis method.

8.1.1 HNU Photoionization Detector

The following procedures are followed when using an HNU Photoionization Detector:

A. Unpack and Examine

1. Remove top from unit and open it. Remove probe, extension, charger, and any spare parts.

2. Make sure function switch is in OFF position.

3. Match alignment key in probe connector to slot in 12 pin connector on control panel.

4. Screw probe connector on until it locks into place.

5. Turn function switch to battery check position.

6. If red LED comes on or needle is in lower part of battery arc, recharge unit.

7. Turn function switch to ON position. Look briefly into end of probe to check for purple glow of UV source.

8. Turn function switch to STANDBY position and let unit warm up for 15 minutes; then zero. Zero is electronic. No zero gas is needed.

B. Operation

1. Switch function to "0-20" range and observe background reading.

2. Approach sampling point with probe, observing meter. When meter goes off scale, switch to next higher scale.

3. Repeat until you are just above sampling point. Observe reading.

4. Switch to "STANDBY" to check zero.

5. Let probe draw clean air until it clears itself.

8.1.2 Drager Tube

General operating procedures are as follows:

1. Check the pump for leaks before each series of measurements. Before the Drager pump is used, it must be leak tested using the following procedures:

   - Insert an unbroken tube into pump.

- Compress bellows.

- Lay pump on side and observe position of limit chain.

- Check limit chain after 5 minutes to see if bellows have expanded.

2. Break off both tips of the Drager tube in the break-off eyelet.

3. Tightly insert the Drager tube in the pump head with the arrow pointing towards the pump.

5. Fully compress the bellows.

6. Straighten the fingers. The suction process takes place automatically and is completed when the limit chain is taut.

7. Repeat the suction process as often as specified in the tube operating instructions.

8. Evaluate the indication as described in the tube operating instructions.

8.1.3 Compur 4100 Gas Detector (Monitox)

PRE-USE EXAMINATION PROCEDURE

1. Turn switch on gas detector to BATT. Listen for alarm.

2. Turn detector switch to ON position.

3. Fit detector upside down into socket on top of gas generator depressing actuator pin. Be sure that the two name plates face the same direction.

4. Detector should respond within 8 seconds. Remove as soon as it does. Do not hold detector on the gas generator for more than 10 seconds.

5. Failure means that the filter cap must be replaced. Follow manufacturer's instructions to perform this replacement.

6. Place detector in the area to be screened.

7. Turn off the instrument when screening is completed.

8.2 LABORATORY INSTRUMENTATION PROCEDURES

All analytical procedures will be preformed by the NFESC-certified laboratory. All analytical instrumentation procedures will be performed in accordance with the instrumentation procedures presented in the laboratory's QAPP.

8.3 LABORATORY ANALYTICAL METHODS

The analytical methods are included in Table 4.1.

9.0 DATA REDUCTION

OHM is responsible for data reduction, validation and reporting for the samples collected during this project. OHM is directly responsible for the field instrument readings.

9.1 FIELD INSTRUMENTATION DATA REDUCTION

Table 9.1 lists all direct reading field instruments currently used by OHM and the reporting parameters of the instrument. The on-site health and safety officer, sampling technician, or field chemist, is responsible for the proper use and calibration of these instruments. All raw data collected from these monitoring instruments are logged into the health and safety log book for the site by the previously mentioned personnel. All instruments that must have temperature compensation such as pH meter and dissolved oxygen meter must record any dialed temperature compensation adjustments.

TABLE 9.1
DIRECT READING FIELD INSTRUMENTS

INSTRUMENT	READING
Explosimeter/Combustible Gas Meter	% O_2 / % LEL
Monitox Gas Detector	>10ppm HCN or H_2S
Drager Tube Vapor Detector	ppm
PID	ppm
Thermometer	°C
Conductivity Meter	umhos
pH Meter	Standard Units

9.2 LABORATORY/FIELD DATA REDUCTION

Responsibilities of Analyst

Each analyst is responsible for converting raw data into reportable values. These specific duties include:

- Proper identification of the analyte
- Generation of calculations
- Checking all calibrations to ensure support of data
- All QA/QC checks are supportive of data
- All documentation is complete and accurate in respective log books
- All chromatograms and strip chart recordings are labeled with data, instrument number, run parameters, and analyst.

Analytical Records

The laboratory/field maintains a bound, numbered log book for all samples received/sent off by the laboratory. The following column headings are entered for each item of sample information:

1. Date--Date sample was collected and date received by the laboratory*.
2. Log Number--Consecutive series of number in which every sample is assigned (transferred to sample jar before analysis)*.

3. Location--Description of area sampled (abbreviated form if sampled twice or more--log explaining locations and abbreviations should be attached to or written in front of the log book) Also included is the field generated sample number*.

4. Time--Time sample was collected (military)*.

5. Samplers--Persons obtaining sample (always two--one at least witnessing even if not involved in actual act)*.

6. Type of Sample--Water, soil, air, sludge, etc.

7. Weight or volume--Size of sample (20 ml, 200 gram, 1 oz., etc.).

8. Released By--Person turning sample into lab for analysis.

9. Accepted By--Person in lab responsible once sampler has been released by field representative.

10. Date of Analysis--When sample is run through lab and result is determined.

11. Analysis By--Chemist who did analytical work.

12. Results--The drum log will consist of the parameters tested for, while the sample log book will vary depending on disposal requirements and classification of waste stream.

13. Additional Comments--Space reserved for any other information concerning particular sample or special procedure or analysis and chain of custody of samples that leave site.

* This information should be included on sample label.

Additional records maintained in the laboratory include:

Daily Log – A bound document of all laboratory activities; instrument maintenance, chemist working in lab, samples received; summary of sample analysis performed; problems encountered and solutions found; and QC sample preparation. This log is maintained on a daily basis by the QC Project Chemist.

9.3 FIELD DATA VALIDATION

All field equipment will be checked and calibrated prior to use. Each instrument calibrated is recorded in the field instrument calibration notebook. Field personnel using the equipment (sample technician, health and safety officer, or field chemist) are responsible for the following information:

- Internal calibration complete and accurate
- Duplicate measurements are accurate
- Independent QC checks performed and within QC limits
- Field data integrity
- All documentation complete and accurate in log book.
- Raw data calculations/entries
- Sample custody integrity
- Acknowledging historical data

All field-generated data is checked by the site supervisor or Site QA/QC Officer to ensure that all field instrumentation is calibrated and QC checks are within established limits.

9.4 PROJECT DATA VALIDATION

All data produced from a project are turned over to the Project Manager and QA/QC Officer for final data review. All log books, chain of custody, etc., are reviewed by a QA/QC review specialist to ensure all QA/QC protocols have been met. All information is then archived for data storage.

9.5 DATA REPORTING

Once the data has been validated it is ready for report production. The report will contain the following:

- Original chain-of-custody forms
- Description of sample types
- Tests performed, problems encountered during testing
- Dates sampled
- Date received
- Date extracted
- Analytical results
- Dual column confirmation
- Reportable limit
- QC information, including:
  - Percent recovery
  - Relative percent difference
  - Control limits-Blanks analyzed

  - Matrix spikes
  - Any other special QC information
- Methodology
- Initial and ongoing calibration

All data is entered and checked by the data entry technician. The hard copy report is checked by the on-site Project Chemist, QA/QC Officer, and the Project Manager before it is released. Data reports will be turned over to the OHM Project Manager and released to the respective clients and/or governmental agencies requesting copies.

The reports generated from the laboratory for the site work will also be reviewed by the QA/QC officer for any discrepancies. Figure 9.1 illustrates the general flow of data from analysis to reports.

9.6 DATA STORAGE

Typically, all documentation used and generated for a particular project site is turned over to the program manager at the completion of a project. All log books, chromatograms, and support documentation are then archived. The final report is usually generated by use of computer. A back-up copy of the report on diskette is filed along with the project file. The original report remains in the hard drive of the computer until such a time is required to download it on to a diskette. This diskette is also archived. All information under the corresponding project number is maintained in the archive system for eight years.

All archives are accessed by the archives file master list which is maintained in a separate location from the archives.

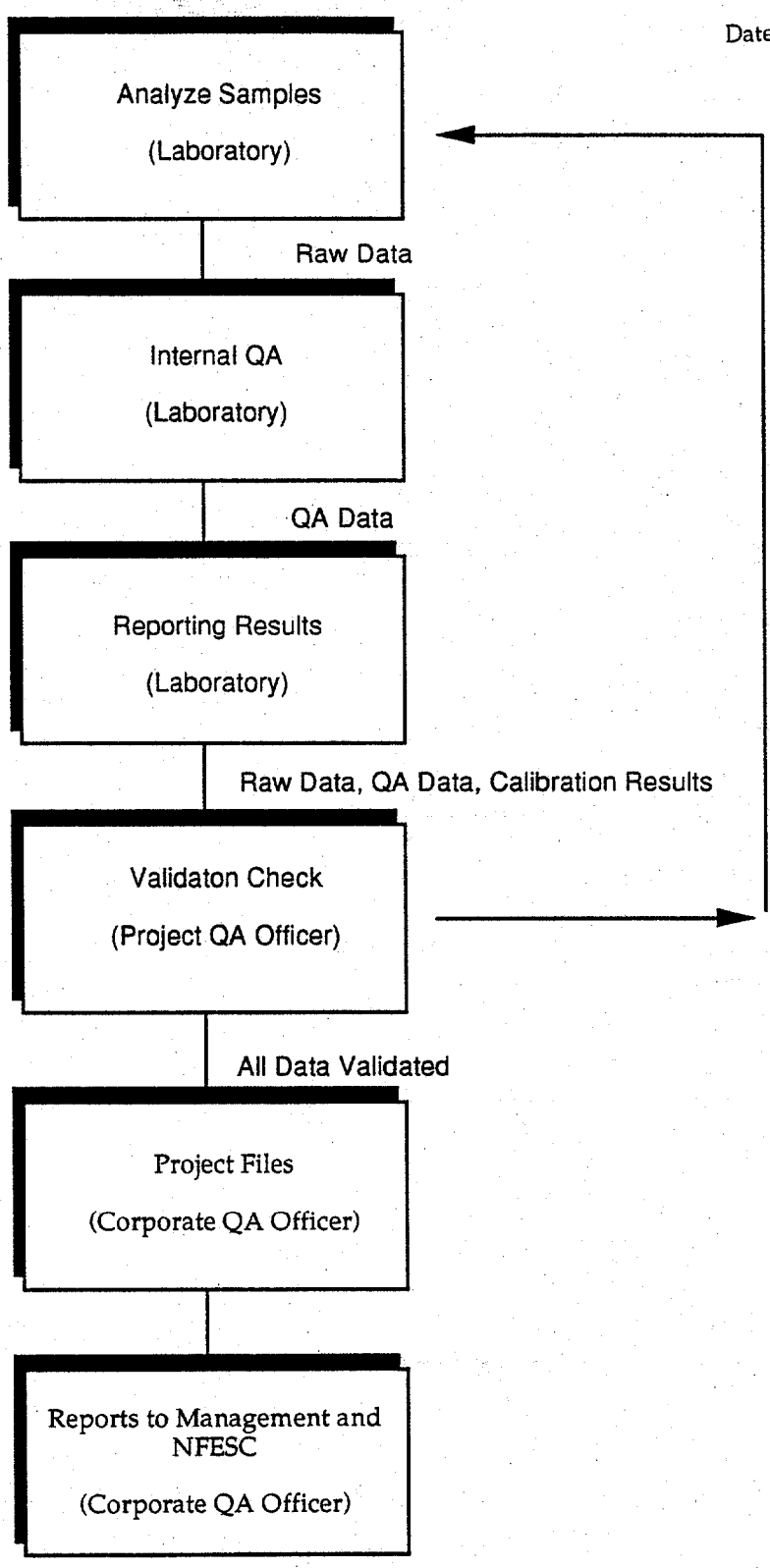


Figure 9.1
Camp Lejeune Remedial Action
Flow of Data

OHM Remediation Services Corp.

10.0 QUALITY CONTROL CHECKS

OHM's QA program is designed to assure that the data generated is comparable, accurate, reproducible, valid and defensible. The program is not restricted to field analytical QC, but is also designed to safeguard all aspects of sampling.

10.1 FIELD QUALITY CONTROL CHECKS

All field quality control checks will be performed at a rate of 10% of the samples to ensure accuracy of the data.

Field Method Blanks

Blanks which are collected in the field are an important link in the quality control data chain for a set of samples. The analytical data derived from these blanks are necessary to assess field sampling operations. Blanks are used to verify that sample containers, preserving reagents, and equipment are contaminant-free. Blanks are also used as a check for potential on-site environmental contamination, to evaluate personnel expertise in sample collection, and to reveal problems that may occur in sample storage and transport.

The field quality control blanks should not be isolated from actual samples. They must be considered as samples and treated identically (preserved with the same reagents, stored and transported in the same containers as the samples, etc.).

In cases where data quality objectives dictate more stringent controls, additional field quality control blanks may be required. The following protocol outlines the minimum field blank requirements necessary to assure the validity and integrity

of any sampling episode.

10.1.1 Equipment Blanks For Field Cleaned Equipment

PURPOSE: Equipment blanks are required if sampling equipment must be cleaned in the field and re-used for subsequent sample collection. These blanks are used to determine the effectiveness of field cleaning procedures as well as reveal those sources of contamination that may be found in a trip blank. Equipment blanks are recommended for all parameters.

PROCEDURE: The final rinse water (analyte-free) shall be rinsed on or through the sampling equipment, collected in appropriate sample containers and preserved in the same manner as samples. These blanks must be included in the same storage and transport containers as the samples.

FREQUENCY: At least one equipment blank must be submitted for each piece of equipment used in the sampling process that must be field cleaned. If a piece of equipment is cleaned more than 20 times in one sampling event, equipment blanks must be submitted at a rate of 5% for each equipment type. For each equipment blank collected, aliquots must be taken and properly preserved for each method group. Note: the water used for volatile organic equipment blanks should be from the same source as the trip blank water. For sampling events involving less than

10 samples of similar matrix, one for each parameter group is required.

10.1.2 Equipment Blanks For Pre-Cleaned Equipment

PURPOSE: To determine the effectiveness of in-house cleaning procedures as well as to reveal those sources of contamination that may be found in a trip blank. These are recommended for all parameters.

PROCEDURE: Follow the same procedure for attaining equipment blanks for equipment cleaned on-site prior to the collection of any samples.

FREQUENCY: One equipment blank for every piece of new pre-cleaned equipment or every 20 samples for all matrices. For sampling events involving less than 10 samples of similar matrix, one equipment blank which has been prepared on-site is required.

10.1.3 Trip Blanks

PURPOSE: The trip blank is to be used when sampling for volatile organics and other sensitive parameters. The purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transportation due to exposure to volatile organics (e.g., gasoline fumes), and other environmental conditions during the sampling event.

PROCEDURE: Trip blanks are prepared by the laboratory prior to shipment of bottles, coolers, and labels to OHM. The water must be free of volatile organic contaminants. Any appropriate preservatives must be added at the time that the blanks are prepared. The sample containers are sealed, labeled appropriately, and transported to the field in the same sampling kits as the sample vials. These blanks are not to be opened in the field. They are to be transferred to the sample container designated for volatile sample storage and transport, and accompany the samples to the laboratory. Subsequent blanks (field and equipment) for volatile organics should use the same source water as the trip blanks, unless the water used for field and equipment blanks can be proven equivalent.

FREQUENCY: One trip blank for each volatile organic analysis (601, 602, 624, etc.) shall be provided per cooler used for storing and transporting volatile sample vials. If a laboratory requires submission of multiple vials for a method, the same number of vials must be submitted for the trip blank.

10.1.4 Field Duplicates

PURPOSE: These are identical samples used to verify reproducibility of data. Field duplicates often check the reproducibility of the sampling procedure, especially in composite sampling.

PROCEDURE: Duplicate samples are collected by sampling from successively-collected volumes of a sample (i.e., samples

from the next bailer of sample water). These samples are contained, preserved, and transported in the same manner as the samples of interest. Field duplicates shall be collected and analyzed for the same parameter groups as the samples of interest.

FREQUENCY: At least one sample or 10 percent of the samples, whichever is greater, should be field duplicates. This requirement is for each independent sampling event. For sampling events involving between 5 to 10 samples, one field duplicate is required.

10.1.5 Split Samples

PURPOSE: Split samples are identical samples used to verify laboratory performance or provide the owner/operator with an independent source of analysis.

PROCEDURE: Split samples are collected from consecutive sample volumes using the same sampling procedures and equipment (i.e., the same bailer). If large sample volumes are required, consecutive samples will be collected and mixed in a large intermediate vessel. For large volume samples that may require more than one bailer full, the first half-volume of the first bailer full is poured into the first container (second half in the second container), the first half-volume of the second bailer full is poured into

the second container (second half in the first container), etc., until both containers are full.

FREQUENCY: As requested by the client, site supervisor, or project chemist.

10.2 QUALITY CONTROL SAMPLES

Table 10.1 presents the number of duplicates and field blanks prepared for collection during the implementation of the Field Sampling Plan.

Table 10.1

Quality Control Samples

Sample Group	Sample Matrix	No. of Samples	No. of Duplicates
Confirmation	Soil	38	4
Drum	Solid/Liquid	100	10
	Composite Wastestream (solid/liquid)	11	1
Waste Characterization	Soil/Debris/PPE	3/3/1	1/1/1
	Decontamination Water	1	1
Disposal	Soil/Debris	1/1	1/1
	Decontamination Water	1	1

Trip blanks will be shipped one per day of sampling. Rinsate blanks will be collected and shipped one per day decontamination occurs and field blanks will be collected and shipped one per day that samples are collected.

10.3 ANALYTICAL LABORATORY QUALITY CONTROL CHECKS

It will be the responsibility of the laboratory to document in each data package that both initial and ongoing instrument and analytical QC functions have been met. Any samples analyzed in non-conformance with the QC criteria for that method will be reanalyzed by the laboratory when sufficient sample volume is available.

The laboratory will also be responsible for fully complying with the final rule of the 40 CFR Part 300, "Amendments to the National Oil and Hazardous Substances Pollution Contingency Plan; Procedures for Planning and Implementing Off-Site Response Actions." The laboratory must also provide OHM with the name of the disposal facility it is currently using. The TSDF that the laboratory uses must be one of those listed in the following attachment.

Facilities Approved by OHM to Receive Waste from Government Sites

Facility Name	Comment and Conditions
All waste	All facilities
Aptus	Coffeyville, Kansas
Chambers Development Company	All facilities
Chemical Waste Management	All facilities, except Chicago and Sauget, Illinois
ChemNuclear	Barnwell, South Carolina
Concord Resources Group	All facilities
CyanoKEM	Detroit, Michigan
Disposal Systems, Inc.	Deer Park, Texas
ENSCO	All facilities
EnviroSafe	All facilities
EnviroTech – 1st Piedmont	Danville, Virginia
Georgia Recovery Systems	Fairburn, Georgia
Heritage Environmental Services	All facilities
Inmetco	Ellenwood City, Pennsylvania
Kedesh, Inc.	Jesup, Georgia
Laidlaw	All facilities, except Pinewood, South Carolina
Mercury Refining Company, Inc.	Albany, New York
MKC Enterprises, Inc.	Doraville, Georgia
ChemWaste	Morrow, Georgia
OSCO/Bryson	Nashville, Tennessee
Peoria Disposal Company	All facilities
Recycling Alternatives	All facilities
Rollins	All facilities
Soil Remediation Company, Inc.	All facilities
Systech, Inc.	All facilities
ThermalKEM	All facilities
USEPCI	All facilities
USEPCI – PPM	All facilities
UWT (Universal Waste Management)	Tampa, FL
Wadco	Camden, New Jersey or Baltimore, Maryland
Waste Management	All facilities

Note: Use of other facilities is not prohibited provided the facility is in good regulatory standing. Work performed for the EPA and on CERCLA sites requires CERCLA approved facilities. If you wish to propose other TSDFs, please include their name, address, phone number and EPA ID number.

11.0 PERFORMANCE AND SYSTEM AUDITS

Audit is defined as a systematic check to determine the quality of operation of field and laboratory activities, and is comprised of field system audits and laboratory system audits. These include a detailed review of each operating component of the network. Auditing will ultimately assist in determining if each element within a system is functioning appropriately per plan requirements.

11.1 INTERNAL FIELD SYSTEM AUDITS

System audits of site activities are accomplished by an inspection of all field audit activities by the OHM Project QA officer. This audit is composed of a comparison between current field practices and standard procedures. The following is a list of criteria to be used in the evaluation of field activities:

- Overall level of organization and professionalism
- All activities conducted in accordance with work plan
- All procedures and analyses conducted according to procedures outlined in this document
- Sample collection techniques versus the sampling and analysis plan
- Level of activity and sample documentation
- Working order of instruments and equipment

- Level of QA conducted per each field team
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding
- Decontamination procedures
- Level of efficiency with which each team conducts planned activities at the site
- Sample packaging and shipment
- Transportation and disposal documentation

11.2 EXTERNAL FIELD SYSTEMS AUDITS

OHM will submit to all requests by USEPA, or other clients for an external field systems audit.

11.3 INTERNAL LABORATORY SYSTEM AUDITS

The laboratory's QAPP will present their procedures for internal audits.

11.4 EXTERNAL LABORATORY SYSTEM AUDITS

The laboratory will submit to audits requested by OHM, NFESC, USEPA, or other parties.

12.0 PREVENTATIVE MAINTENANCE

Proper maintenance is critical to the performance and minimization of downtime of all equipment, whether it is to be used for measurement or support. Preventative maintenance will be performed as recommended by the manufacturer of the respective equipment. Table 12.1 lists the minimum preventative maintenance procedures conducted on OHM equipment.

12.1 DOCUMENTATION

All routine maintenance and major repairs performed on field screening or analytical equipment is recorded in a bound maintenance log book that has been specifically designated for that instrument.

12.2 PREVENTIVE MAINTENANCE ASSOCIATED WITH THE ANALYTICAL LABORATORY

The laboratory will be responsible for all preventative maintenance procedures as presented in their QAPP.

Table 12.1
Field Monitoring Equipment
Preventative Maintenance

Instrument	Activity	Frequency
Drager Pump	Check bellows pump for cracks	Each use
Photoionization Detector	Clean Probe	Each use
	Clean lamp	As needed
	Check for proper operation and response	Daily
Monitox	Keep foam cushions moist	As needed

13.0 DATA ASSESSMENT PROCEDURES

Laboratory data will be evaluated utilizing the data quality indicators identified in Section 3.0 (Quality Assurance Objectives). These indicators are used to determine the acceptance criteria of the quality control checks outlined in Section 9.0 (Quality Control Checks). Data will be assessed using the following equations below.

13.1 PRECISION

When duplicate measurements are made, the relative percent difference is the normal measurement of precision:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) \div 2}$$

Where: RPF = Relative percent difference

C_1 = Larger of the two observed values

C_2 = Smaller of the two observed values

13.2 ACCURACY

When matrix spikes are measured, the percent recovery is used as the measure of accuracy:

$$\%R = 100\% \times \frac{S - U}{C_s}$$

Where: %R = Percent recovery

S = Measured concentration in spiked aliquot

U = Measured concentration in unspiked aliquot

C_s = Actual concentration of spike added

13.3 COMPLETENESS

Completeness is defined as follows for all measurements:

$$\%C = 100\% \times \frac{V}{N}$$

Where:

%C = Completeness

V = Number of measurements judged valid

N = Total number of measurements necessary to achieve a specified level of confidence in decision-making

If values do not meet acceptable criteria, results in all samples processed as part of the same set must be labeled as suspect and the sample may be reported. The QA/QC Officer will be notified and the necessary corrective action implemented.

14.0 CORRECTIVE ACTION

The results of the following quality assurance activities may initiate a corrective action:

- Internal and external performance audits
- System audits
- Inter-laboratory comparison study
- Calibration data out of specified limits
- Failure to adhere to Quality Assurance plan
- Failure to adhere to standard operating procedure
- Data completeness below required limits

On notification of a problem, or when a potential problem is identified as the result of an audit of split samples, etc., the Project Manager notifies the QA Supervisor. NFESC will be notified and asked for their recommendations. At this time, a thorough investigation of the reported problem is immediately performed to determine if corrective action should be initiated. The problem is also reviewed with the Quality Assurance Officer. Follow-up procedures for this will not be considered complete until the problem has been effectively and permanently solved. These procedures will consist of, but not be limited to, the following:

- Determining when the problem occurred and determining which systems were affected by the problem

- Assigning responsibility and time schedule for implementing the corrective action

- Determining the desired effectiveness and implementing the corrective action

- Verifying and documenting that the corrective action has eliminated the problem

If, during system or performance audits, weaknesses or problems are uncovered, corrective action will be initiated immediately.

Corrective action will include, but is not necessarily limited to: modifications to sampling procedures, replacement of large quantities of solvent or other reagents that give unacceptable blank values, additional training of sampling personnel in correct implementation of sample collection and decontamination methods, and reassignment of personnel.

Whenever a long-term corrective action is necessary to eliminate the cause of non-conformance, the following closed-loop corrective-action system will be used. As appropriate, the OHM project chemist, OHM project QA officer, and the OHM corporate QA officer will ensure that each of these steps is followed:

1. The problem will be defined.

2. Responsibility for investigating the problem will be assigned.

3. The cause of the problem will be investigated and determined.

4. A corrective action to eliminate the problem will be determined.

5. Responsibility for implementing the corrective action will be assigned and accepted.

6. The effectiveness of the corrective action will be established and the correction implemented.

7. The fact that the corrective action has eliminated the problem will be verified.

14.1 ANALYTICAL LABORATORY CORRECTIVE ACTION

The laboratory's Corrective Action procedures will be presented in their QAPP.

15.0 QUALITY ASSURANCE REPORTS

The OHM Site Supervisor, the OHM Project Chemist, and the OHM QA Officer will converse on a regular basis to ensure that all QA/QC practices are being carried out and to review possible or potential problem areas. It is important that all data abnormalities be investigated to ensure that they are not a result of operator or instrument deviation, but are a true reflection of the methodology or task function. External reporting or the project final report, prepared for each project, will contain a separate section that covers the data quality and validity, and will be made available to NFESC and EPA. At a minimum, the following information will be included in the report:

- Changes in the QAPP
- Summary of QA/QC programs, training, and accomplishments
- Results of technical systems and performance evaluation audits
- Copies of documentation such as memos or reports will be included as applicable.
- Significant QA/QC problems, including: identifying the problem, identifying the individual who reported the problem, source of problem and corrective actions that need to be taken.
- Limitations on use of the measurement data
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability and MDL

- Decision as to whether the QA objectives were met and the resulting impact on decision-makers

The QA Officer will be responsible for preparing this report at the end of the project as well as monthly (internal) written QA reports to management and the on-site Project Chemist, depending on how long the project lasts. The QA Officer is responsible for reviewing and approving these monthly reports. Verbal reports will be made on a more frequent basis. These reports will be made available to the OHM project manager, NFESC or any parties requesting a copy of the information. If no project audits are performed for that particular project, and no significant QA/QC problems occur, a letter stating these facts will be submitted to the referenced parties in lieu of a QA Report.

Appendix A

Shipping Instructions

Appendix B

Acronym and Abbreviation List

ACRONYM AND ABBREVIATION LIST

AOC	Area of Concern
ARAR	Applicable of Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
cy	cubic yard
DoN	Department of the Navy
FDA	U. S. Food and Drug Administration
FFA	Federal Facilities Agreement
FS	Feasibility Study
gpm	gallons per minute
HI	Hazard Index
IAS	Initial Assessment Study
ICR	Incremental Cancer Risk
IRP	Installation Restoration Program
LEL	Lower Explosion Limit
MBI	Macroninvertebrates Biotic Index
MCB	Marine Corps Base
NCDEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCP	National Contingency Plan
NPL	National Priorities List
NPW	Net Present Worth
NTR	Navy Technical Representative
OHM	OHM Remediation Services Corp.
O&M	Operation and Maintenance
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
PRAP	Proposed Remedial Action Plan
RAA	Remedial Action Alternative
RI	Remedial Investigation

ROD	Record of Decision
ROICC	Resident Officer Charge of Construction
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TCLP	Toxicity Characteristics Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound