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A Member of The IT Group

the IT group

April 4, 2001

Mr. Kirk Stevens
Atlantic Division Code EV23KS
Naval Facilities Engineering Command
6506 Hampton Blvd.
Norfolk, VA 23508

Re: Contract N62470-97-D-5000
Revised Final Work Plan, Additional Investigation and Interim Measures
SWMU 291, 310, 358, and 359
MCB Camp Lejeune, NC

Dear Mr. Stevens:

Attached please find Revision 2 of the referenced submittal, incorporating the interim action tasks required for the newly identified SWMU 359. Since this SWMU is also a battery site and the project tasks are identical to SWMU 358 all Work Plans were revised as appropriate. However, OHM plans to incorporate any additional future SWMU work through the generation of an addendum to the Work Plans, which will be provided as an Appendix for insert into your existing document.

Should you have any additional questions or comment, please contact me at 77-663-1453 at your convenience.

Yours Truly,
OHM Remediation Services Corp.

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REVISED
WORKPLAN
SITE CHARACTERIZATION AND INTERIM MEASURES
FOR
SOLID WASTE MANAGEMENT UNITS 291, 310, 358 AND 359
MCB,CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Task Order 052

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March 2001
OHM Project No. 803538
Revision 2

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APPENDICES

1.0 INTRODUCTION

This document presents OHM Remediation Services Corp. (OHM's) approach to implementing Interim Measures at four Solid Waste Management Units (SWMUs) located at Marine Corps Base (MCB) Camp Lejeune, North Carolina. In accordance with the Statement of Work for this activity, the Site Characterization Work Plan and the Interim Measures Work Plan are combined in this document. This Work Plan covers activities at the following SWMUs:

- SWMU 291- 034 Ditch
- SWMU 310- Former Ponds
- SWMU 358- Sneads Ferry Road Battery Dump (Also referred to as "Borrow Pit")
- SWMU 359- Lot 201 Battery Dump

Subsequent to additional delineation activities at SWMU 291 and SWMU 310, excavation of impacted soils, followed by backfill and grading is selected as the appropriate interim measure for these sites. The soil that is removed will be transported to an appropriate landfill for disposal. This document is prepared by OHM for the Department of the Navy, Naval Facilities Engineering Command, Atlantic Division (LANTDIV) under Contract Number N62470-97-D-5000, Task Order 052.

Accompanying plans have been developed for this task order and are to be considered as complementary components to this work plan. They include:

- Environmental Protection Plan (EPP) (included in Section 4.0 of this document)
- Site Specific Health and Safety Plan (SSHSP) Addendum (Appendix A)
- Sampling and Analysis Plan (SAP) (Appendix B)
- Construction Quality Control Plan (CQCP) (Appendix C)

This Work Plan identifies and describes OHM proposed activities as included the following sections:

- Section 1.0 presents an Introduction and Background of the site.
- Section 2.0 presents a description of the Pre-construction Activities including pre-construction submittals and permits.
- Section 3.0 presents the Characterization Plan.

- Section 4.0 presents a description of Environmental Protection efforts that include temporary road construction, protection of trees, shrubs and grass, water resources protection and emission control.
- Section 5.0 presents a description of the Interim Measures Activities, which include mobilization and site presentation, source removal, contaminated soil excavation, backfilling, site restoration and demobilization.
- Section 6.0 presents the Transportation and Disposal efforts that include soil, decontaminated water and PPE disposal and waste disposal coordination.
- Section 7.0 presents the Reporting procedures.
- Section 8.0 presents the Project Schedule.

1.1 SITE DESCRIPTION AND BACKGROUND

1.1.1 SWMU 291- 034 Ditch

SWMU 291 is located in the Hadnot Point Industrial Area behind Building 1450, on Dogwood Street. The location of the site is shown on Figure 1. The SWMU is a drainage ditch measuring approximately 55 feet by 80 feet, that received runoff from Building 1450 and an associated oil/water separator. A portion of the ditch has been backfilled. The area immediately surrounding the ditch exhibits vegetative growth.

1.1.2 SWMU 310- Former Ponds

SWMU 310 consists of two shallow ponds, both approximately 70 feet by 30 feet in size. The depth of impacted sediments is estimated to be 12 to 18 inches. A former oil/water separator associated with the SWMU was removed in September 1998. Samples collected at the area after removal of the structure indicated the presence of TCE in the soils. Figure 2 presents the site location for SWMU 310.

1.1.3 SWMU 358- Sneads Ferry Road Battery Dump

SWMU 358 was identified for action in May 2000. The site is approximately 15 feet by 20 feet in size, and was known to contain numerous batteries including lithium, magnesium, and nickel-cadmium type batteries. The anticipated excavation depth at this site is six to eight feet below ground surface (bgs). The site location for SWMU 358 is shown as Figure 3.

1.1.4 SWMU 359- Lot 201 Battery Site

SWMU 359 is a recently discovered dump site near Lot 201, consisting of old office furniture, computer parts, wire, batteries and other assorted non-hazardous debris. It is currently not know how deep the debris may extend.

1.2 INTERIM ACTION OBJECTIVES

As indicated, the primary objectives of the interim action for these three SWMUs are additional delineation of impacted soils at two locations, followed by the removal of the delineated soil, proper disposal of the soil, and the subsequent backfilling and restoration of the area. Based on the results of the investigation sampling, any revisions to this Work Plan will be made and a revised submittal will be issued.

Section 3.0 summarizes the investigative activities proposed for SWMU 291 and SWMU 310. Additional detail for this activity is presented in the project SAP. Interim removal procedures for all of the SWMU's are discussed in Section 5.0.

2.0 *PRE-CONSTRUCTION ACTIVITIES*

2.1 PRE-CONSTRUCTION SUBMITTALS

The following plans have been developed for this task order and are to be considered as complementary components to this work plan:

- EPP (included in Section 4.0 of this document)
- SSHSP Addendum – Appendix A
- SAP – Appendix B
- CQCP – Appendix C

2.2 PERMITS

OHM will prepare all appropriate permit applications for submission by the base as required for the operation of the LTTD, and will coordinate with the state/federal agencies, Camp Lejeune personnel, and LANTDIV as needed. This will consist of utility clearance and base construction permits primarily.

2.3 PROCUREMENT

Upon approval of this work plan, OHM will complete procurement of equipment, materials, and subcontractors necessary for the execution of this project. Specialty subcontractors may be procured to execute certain portions of work. The following is a list of anticipated subcontractors procured for the project:

- Laboratory analytical services
- Transportation services

2.4 PRE-CONSTRUCTION MEETING

OHM will participate in a pre-construction meeting at MCB Camp Lejeune with Base, LANTDIV, and other parties prior to mobilization to the site. OHM representatives will include at a minimum the Project Manager and the Site Supervisor. The purpose of this meeting will be to:

- Confirm roles and responsibilities of key personnel and flow of communications for project execution
- Review project schedule, work hours, sequence of tasks and key milestones

- Identify and discuss Base-specific issues relative to the upcoming mobilization and construction activities
- Obtain any necessary security clearances for operations personnel

3.0 CHARACTERIZATION WORK PLAN

Additional characterization sampling will first be performed at SWMUs 291 and 310 prior to removal activities. At each SWMU site, four soil borings locations will be randomly selected and recorded on site maps. Three samples will be collected from each boring, at depth intervals of 0-1 foot, 1-2 feet, and 2-3 feet. SWMU 310 consists of two small ponds; four borings will be advanced in each pond. At SWMU 291, borings will be equally spaced along the ditch length. These characterization samples will be the basis for the initial limits of excavation, no additional confirmation samples will be collected if the at depth samples indicate that the contamination is below remedial goals.

There will not be a characterization sampling activity at SWMU 358 or SWMU 359. Removal of battery carcasses and visually impacted soil will be conducted followed by post-removal sampling. Additional detail is provided in the project SAP.

Summary of Investigative Sampling

Media/Location	Parameter	Sampling Method	Sampling Frequency
Soil/SWMU 291	VOCs SVOCs Pesticides/PCBs TAL Metals	Stainless steel Hand auger Encore sampler for VOCs	4 shallow borings. Sample at 0-1, 1-2, and 2-3 feet in each boring.
Soil/SWMU 310	VOCs SVOCs Pesticides/PCBs TAL Metals	Stainless steel Hand auger Encore sampler for VOCs	4 shallow borings in each pond. Sample at 0- 1, 1-2, and 2-3 feet intervals in each boring.

Upon receipt of the investigation sampling data, the any detectable results will be compared to an applicable action limit as determined using Guidelines for Determing Soil and Groundwater Clean-up Levels at RCRA Hazardous Waste Sites, September 2000, NCDENR, the final excavation limits will be set based on the accepted criteria.

As presented in the guidance, the lower value of either EPA Region IV Residential criteria or NC Site Screening Levels (SSL) will be used as the clean-up standard. The following analytes and clean-up levels have been identified for the project.

ANALYTE	REGION IV RESIDENTIAL (mg/kg)	NC SSL (mg/kg)
TCE	2.8 (2,800 ppb)	.0183 (18.3 ppb)
Cadmium	37	2.72
Nickel	1,600	56.4
Lead	400	270
Lithium	1,600	4380
Zinc	23,000	1,100

4.0 ENVIRONMENTAL PROTECTION

The Environmental Protection Plan (EPP) has been prepared in accordance with standard OHM procedures and policies. The EPP provides specific information relating to the scope of work under Task Order 052 of LANTDIV Contract No. N62470-97-D-5000 at SWMUs 291, 310, 358 and 359 MCB Camp Lejeune, North Carolina. The plan will provide site-specific information for:

- Land resources management
- Water resource management
- Air and noise pollution control
- Non-compliance/corrective action
- Post-excavation clean-up

The control of environmental pollution will consider air, water and land impacts as well as noise and solid waste management.

The land resources within the property of MCB Camp Lejeune, but outside the limits of permanent work, will be preserved in their condition or restored to a condition that does not detract from the appearance of the area after completion of construction. To the extent possible, construction activities will be limited to areas defined by the plans and specifications.

4.1 TEMPORARY ROAD CONSTRUCTION

In the event that temporary construction roads are required at the project site, road construction will be performed in a manner as to minimize the impact to the natural environment. Water will be used for dust control, as necessary.

4.2 PROCTECTION OF TREES, SHRUBS, AND GRASS

Prudent steps will be taken to protect trees and shrubs outside of the excavation zone as necessary. Trees and shrubs within the excavation zone will be cut down to ground level and removed by OHM. However, tree stumps or roots within the excavation activities will be cut into manageable pieces and moved from the project site as not to interfere with operations. Precautions will be taken to minimize the construction activities' impact on existing vegetation and will include but not limited to:

- Utilization of existing or temporary construction roads
- Closely supervise equipment operators with an emphasis place on preservation of vegetation in non-work area
- Proper guidance of heavy equipment and truck operators by site personnel to minimize damage to adjacent vegetation not directly affected by construction activities

4.3 WATER RESOURCES PROTECTION

4.3.1 Surface Water Management

To protect against damage, surface water run-off occasioned by storm flows leaving the site will be controlled by temporary erosion / sediment control techniques such as berms, silt fencing and grading. The area of bare soil at any time by construction activities will be minimized.

4.3.2 Erosion Control

Prior to disturbance of native vegetation and soils, temporary erosion/sediment control will be established on the down gradient side of each excavation. Control techniques to be utilized will involve silt fencing.

Silt fencing will be installed with the fabric a minimum of 6 inches below grade and extending 36 inches above grade and fastened to posts no more than 6 feet apart. The posts will be installed a minimum of 24 inches below grade and extend a minimum of 36 inches above grade. Fabric will be attached to the upslope side of the posts using 1-inch staples or tie wires. Silt fences will be inspected after every rain and daily during extended rainfall. Accumulated sediment will be removed before the thickness reaches 12 inches.

4.3.3 Spill and Discharge Control

Measures will be taken to prevent chemicals, fuels, oils, greases, bituminous materials and contaminated materials from entering streams, rivers and lakes. Absorbents will be available to solidify any leaks outside containment and any soil contaminated with fuel spills will be immediately removed and placed into appropriate containers and sampled to determine proper disposition.

4.4 EMMISSIONS CONTROL

4.4.1 Air and Noise Control

Personnel and ambient air monitoring will be conducted as necessary in order to determine airborne dust and contaminant levels at SWMU 358 and SWMU 359. This ensures that respiratory protection is adequate to protect personnel against the contaminants that are encountered.

OHM will also utilize PID or FID instrumentation to conduct daily monitoring for fugitive emissions of volatile organics from the SWMU 298 and SWMU 310 excavation areas.

OHM will only perform operation of heavy equipment during daylight hours to minimize the impact of off-site noise pollution. Noise exposure to off-site residents or personnel is expected to be minimal. Hearing protection for on-site workers will be implemented if necessary as specified in the SSHSP Addendum.

4.4.2 Particulate Emissions Control

Specific measures to be take to minimize particle emissions for major activities during site construction include the following:

4.5 SOIL EXCAVATION, HANDLING, SITE GRADING AND TRANSPORT

- Apply water to work and traffic areas as necessary to minimize dust emissions
- Cover stockpiles with sheeting to minimize wind and/or storm water erosion
- Move and load soil for transport within the site that limits free fall of material and is least likely to generate dust emissions
- Halt dust-generating work when on-site wind conditions exceed 35 miles per hour

4.6 MOVEMENT OF EQUIPMENT

- Water traffic areas as required to minimize dust emissions
- Designate equipment traffic patterns to minimize travel distance and vehicular dust emissions
- Limit vehicle speed to minimize dust emissions

4.7 SITE RESTORATION AND CLEANUP

All excavation equipment will be decontaminated prior to demobilizing from the site. Decontamination will consist of scraping and/or pressure washing to remove visible soil and debris from tires and undercarriage of vehicles and heavy equipment. Decontamination liquids will be containerized, sampled/analyzed (if required), and disposed.

4.8 SEEDING

Grass seed matching existing grass vegetation will be placed at a rate of 5 pounds per 1,000 square feet over topsoil areas. Fertilizer Type I, Class 2, 10-10-10 analysis will be applied at a rate of 25 pounds for 1,000 square feet.

5.0 *INTERIM MEASURES ACTIVITIES*

5.1 MOBILIZATION AND SITE PREPARATION

To augment the current workforce at Camp Lejeune, OHM may mobilize personnel and equipment as necessary from its attendant facilities including Covington, Georgia; Alpharetta, Georgia; and/or Clermont, Florida. Prior to beginning work on site, training will be conducted to brief all site personnel on the Site Health and Safety Plan, construction drawings, operation procedures, and other relevant site-specific plans. Site hazards and conditions will be discussed and all personnel will acknowledge their understanding and compliance with the plan by signing an approved acceptance form.

Project site setup and preparation will consist of the following main activities:

5.1.1 Utility Clearance

OHM will work with Base personnel to identify and mark all known utilities potentially within the work zones. OHM will exercise caution while performing ground-intrusive work and will implement its Standard Operating Procedures for excavation near utilities. Techniques for minimizing damage to existing utilities will include the use of location devices and hand digging. A Base issued dig permit or excavation permit will be obtained from the Public Works Officer, Utilities Division prior to beginning work.

5.1.2 Site Survey

OHM will mark the location for the utilities, the contaminated soil excavation area, and the excavated soil stockpile area. The locations will be marked using spray paint or wood stakes. The locations will be rechecked just prior to construction or as the need arises.

5.1.3 Environmental Protection

As previously discussed in Section 4, OHM will implement environmental protection measures at the site to prevent damage to the environment during the execution of this remedial action.

5.1.4 Fence Construction

OHM personnel will erect safety fencing around the designated work areas. Fencing will be 3-foot-high, bright orange, polyethylene-mesh to prevent unauthorized personnel from accidentally entering a working area.

5.1.5 Site Security

All persons entering the site will be required to sign in and out daily. OHM reserves the right to deny access to any individual not showing proper identification.

5.1.6 Health and Safety Zones

The site will be segregated into work areas based on degree of hazard and personal protective equipment (PPE) requirements. Personnel working within the Contamination Reduction Zones (CRZ) will be required to wear the appropriate PPE as outlined in the Site Specific Health and Safety Plan. Excavation areas within the CRZ will be designated the exclusion zone and will be delineated by orange safety fencing.

OHM health and safety personnel will monitor air quality during excavation of areas of contaminated soil and will adjust work zone boundaries as appropriate.

5.1.6.1 Decontamination Areas

In areas of excavation of contaminated soil, personnel and equipment decontamination areas will be provided within the CRZ upon exiting the contaminated working areas. The SSHSP addresses these areas in more detail.

5.1.6.2 Personnel Decontamination Facility

OHM will set up a personnel decontamination area at the site. The location will be near areas depending on the phase of remediation activities. All decontamination and cleaning water generated from decontamination will be collected, tested (if required) and treated at either the on-Base water treatment system, Site 89/Lot 203 Plant, or the Site 78 North Treatment Plant.

5.1.6.3 Equipment Decontamination Area

OHM will established a temporary equipment decontamination area at the site as needed. Any decontamination and cleaning water generated from decontamination will be collected and treated with on-Base water treatment system prior to disposal.

5.2 CONTAMINATED SOIL EXCAVATION

Final limits for excavation at each SWMU will be presented in the Site Characterization Report. Based on the intended depth of excavation and site access conditions, either a rubber tired backhoe or trackhoe/ excavator will be utilized to remove soil. A temporary soil staging area will be constructed adjacent to the removal area for stockpiling the excavated soils.

During deeper excavations, sidewalls may be sloped back as necessary to prevent collapse. Excavations will be secured using temporary construction fencing while awaiting analytical results or the importing of backfill soils.

5.3 CONFIRMATION SAMPLING

Confirmatory sampling will be conducted at SWMU 358 and SWMU 359 to determine if heavy metals-contaminated soil has been removed to the specified remediation goals. Samples will be collected at 50-foot intervals along the excavation sidewalls and on a 500-square-foot frequency on the bottom of the excavation, unless excavation proceeds to groundwater. The excavation will remain open while results of the laboratory confirmation testing are obtained.

Summary of Conformational Sampling

Media/Location	Parameter	Sampling Method	Sampling Frequency
Soil/SWMU 358	TAL Metals + Lithium	Stainless steel Hand auger	Every 50 feet along side walls. Every 500 ft^2 from bottom of excavation.
Soil/SWMU 359	TAL Metals + Lithium	Stainless steel Hand auger	Every 50 feet along side walls. Every 500 ft^2 from bottom of excavation.

Laboratories approved by the State of North Carolina will analyze all samples.

5.4 BACKFILL/COMPACTING/GRADING

Clean soil will be used to backfill the excavations. This will either be imported fill or fill from an on site source. Possible on-site sources include the on-site borrow pit.

Any off-site borrow material to be used as backfill will be sampled and analyzed for contaminants prior to transport and use on site.

After backfilling, the excavation areas will be compacted to pre-existing conditions using the equipment on site. The backfilled area will be graded to utilize existing drainage structures for surface water run-off.

At SWMU 291, additional clean backfill will be imported to not only backfill to the excavation limits, but to eliminate the drainage ditch topography altogether. It is estimated that five feet of backfill may be required. The fill soil will be placed in successive one-foot lifts and compacted with the site equipment before placing the next lift. The entire area will be graded to blend with the existing terrain.

5.5 SOIL STOCKPILE/STAGING AREA

A contaminated soil stockpile/ staging area may be established adjacent to each removal area for storage of excavated soil prior to transport. One composite sample of the stockpiled soil will be collected for disposal characterization.

The soil stockpile will be placed on a tarp to delineate its boundary and covered with a tarp to control dust.

5.6 DISPOSAL OF EXCAVATED MATERIAL

It is currently anticipated that soils excavated from each of the SWMUs will pass full TCLP analysis, rendering the soils non-hazardous and suitable for acceptance at the Base landfill.

5.7 MANAGEMENT OF CONTAMINATED WATER

Contaminated water may be generated from decontamination activities during implementation of the IM. The water collected from decontamination activities can be hauled via tank trucks and treated with the appropriate groundwater treatment plant.

5.8 DRUMS/TANKS/MISCELLANEOUS DEMOLITION AND REMOVAL

Demolition of structures is not anticipated for this project. No recyclable materials are expected to be excavated.

5.9 SITE RESTORATION

After confirmatory sampling results indicate that the contamination has been removed from the site, the excavated areas will be backfilled with treated soil or soil from off-site borrow sources. The backfill will be spread and compacted such that it will provide a surface suitable for paving. As discussed in the previous section, additional fill will be placed at SWMU 291 to eliminate the existing drainage contours and bring the ditch area up to match

existing site terrain.

Grass areas destroyed or disturbed during remediation activities will be seeded. OHM does not contemplate repair of asphalt pavement areas during this project activity.

5.10 DEMOBILIZATION

Upon completion of site restoration, all equipment, support trailers and personnel associated with this phase of work will be demobilized from the project site. Heavy equipment will be returned to the equipment yard where they originated, and the project personnel will return to their respective home offices.

6.0 TRANSPORTATION AND DISPOSAL

This section deals with the transportation and disposal of debris and PPE. Transportation and disposal of treated soil and contaminated water are described in earlier sections.

6.1 WASTE STREAMS

The waste streams identified for this project include battery debris and soils impacted with metals and VOCs.

6.1.1 Excavated Material

Debris will consist of excavated soils and batteries. The soils from Sites 291, 310 and 359 will be transported directly to the Base landfill if acceptable analytical results are obtained during characterization sampling. The batteries and associated soils may require transport to a hazardous waste landfill, operating under Subtitle C permit.

6.2 PPE

PPE will be placed on the debris pile or stored in plastic bags, tested for the on-Base Subtitle D landfill parameters, and transported to the Base landfill if acceptable analytical results are obtained.

6.3 DOCUMENTATION

OHM will aid in the preparation of, and maintain applicable copies of all documentation relating to the transportation and disposal of wastes from the project. This will include characterization analytical and facility acceptance paperwork relating to securing a proper disposal site as well as manifests, Bill of Ladings, and landfill weight tickets associated with transporting and eventual disposal of the wastes.

7.0 REPORTS AND SUBMITTALS

The following paragraphs discuss the reports OHM plans to prepare during this project.

7.1 AS-BUILT RECORDS

OHM will maintain two sets of full size drawings marked to show any deviations that have occurred, including buried or concealed construction and utility features revealed during the course of construction. OHM will record horizontal and vertical locations of buried utilities that differ from the contract drawings. These drawings will be available for review by the ROICC and NTR at any time. At the completion of the work, OHM will prepare final as-built drawings for inclusion in the Contractors Closeout Report.

7.2 ENVIRONMENTAL CONDITIONS REPORT

Prior to starting work, OHM will be available to perform a pre-construction survey with the ROICC and NTR. OHM will take photographs showing existing environmental conditions on and adjacent to the site.

7.3 QC MEETING MINUTES

The QC representative will document QC meetings by delivering copies of the minutes to the ROICC and NTR within 3 calendar days after each QC meeting.

7.4 TEST RESULTS SUMMARY REPORT

A summary report of field tests and laboratory analytical results will be submitted in the Contractors Closeout Report.

7.5 CONTRACTOR PRODUCTION REPORT (CPR)

The CPR will be prepared and submitted daily to the ROICC and NTR, as presented in the QC Plan provided as Appendix C.

7.6 QC REPORT

The QC Report will be submitted by the QC representative to the ROICC and NTR every day work is performed, material is delivered, direction is pending, or a labor force is present.

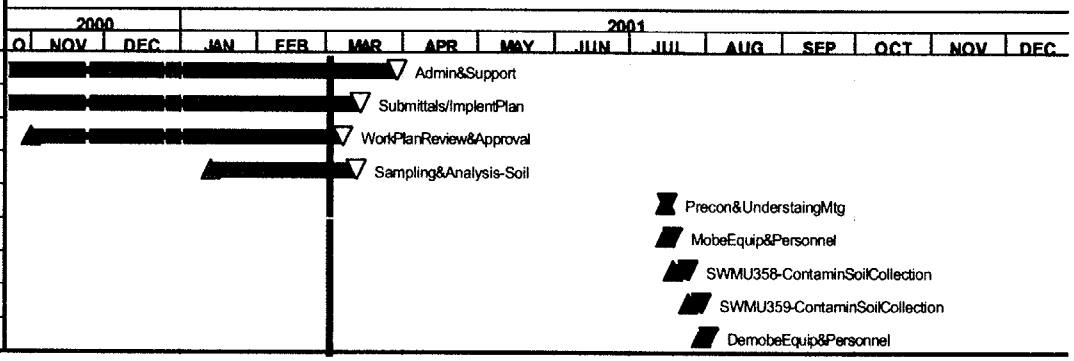
7.7 CONTRACTOR'S CLOSEOUT REPORT

An Interim Measures final report will be submitted upon completion of the project.

8.0 PROJECT SCHEDULE

The anticipated schedule for the SWMU removal work is shown in the attached chart.

Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish
99000100	Admin&Support	288*	19*	15	15FEB00A	28MAR01
01003000	Submittals/ImplentPlan	129	9	75	03APR00A	14MAR01
01003010	WorkPlanReview&Approval	16	4	0	01NOV00A	07MAR01
02006000	Sampling&Analysis-Soil	10	7	80	13JAN01A	12MAR01
01000010	Precon&UnderstaingMtg	1	1	0	16JUL01*	16JUL01
01001000	MobeEquip&Personnel	3	3	0	16JUL01*	18JUL01
08001200	SWMU358-ContaminSoilCollection	4	4	0	19JUL01	24JUL01
08001300	SWMU359-ContaminSoilCollection	4	4	0	25JUL01	30JUL01
21004000	DemobeEquip&Personnel	3	3	0	31JUL01	02AUG01



StartDate	01JAN00
FinishDate	02AUG01
DataDate	02MAR01
RunDate	08MAR0116:33

EarlyBar
ProgressBar
CriticalActivity

052X

Sheet1of1

ITCorporation

TO52-SWMU291SoilRemediation

ScheduleLayout

Date	Revision	Checked	Approved

APPENDIX A

SITE SPECIFIC HEALTH AND SAFETY PLAN

Table 1-1(a,b)
Chemical Hazard Tables
Project # 803538
SWMU 291, SWMU 310, SWMU 358 & SWMU 359

SWMU 291 and SWMU 310*:

Table 1-1 (a)

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Benzene	Skin, eye, inhalation, ingestion	0.5 ppm SKIN STEL 2.5 ppm	• Prolonged skin contact with Benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. A human carcinogen. • Extremely flammable, keep sources of ignition away. Incompatible with fluorides, chlorides, oxygen, permanganates, acids, and peroxides
Fuel Oil #6	Skin, eye, inhalation, ingestion	5mg/m^3 (mineral oil mist)	• Irritating to skin, eyes, respiratory tract; headache, dizziness, nausea, vomiting and loss of coordination; an acne like rash, pimples around hair follicles; ingredients of fuel oils may be carcinogens • Incompatible with strong oxidizing agents; thermal decomposition releases, toxic gases
Petroleum Hydrocarbons	Skin, eye, inhalation, ingestion	300 ppm	• Gasoline mixtures contain probable human carcinogens (benzene and toluene); a skin, sys, respiratory, mucus membrane irritant; headache, dizziness, nausea, staggering, unconsciousness, convulsions, chemical pneumonia, liver and kidney damage. • A flammable liquid, explosive vapors can flash back to fuel source; reacts violently with oxidizers, peroxides nitric acid, and perchlorates.
Trichloroethylene (TCE)**	Skin, eye, Inhalation, Ingestion	50 ppm	• A skin and eye irritant; dermatitis; headache, vertigo, visual distortion, fatigue, nausea, vomiting, irregular heart rhythm • A dangerous fire hazard, reacts with strong caustics and chemically reactive metals, will emit toxic phosgene gas when heated
Toluene	Skin, eye, inhalation, ingestion	50 ppm SKIN (500 ppm IDLH)	• White odorless powder. VP: 0, LEL/ UEL: NA • Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, insomnia, numbness/tingling in hands, feet, dermatitis • Reacts with strong oxidizers; flammable liquid; releases toxic gases during combustion
Xylene	Skin,eye, inhalation, ingestion	100 ppm	• Dizziness, excitement, drowsiness, incoherent, staggering walk; eye, nose, throat irritation; nausea, vomiting, dermatitis. • Flammable; reacts with strong oxidizers.

*- The chemical hazards for SWMU 291 and SWMU 358 are subject to change based on additional site characterization information.

** - TCE is a suspect site contaminant only at site SWMU 310

Site Specific Health & Safety Plan
Amendment Documentation

Project Name: SWMU 291
SWMU 310
SWMU 358
SWMU 359

Project No. 803538

Amendment No. 3

Date: November 3, 2000

Amendment Revises: No changes are required to the Basewide Health and Safety Plan

Reason for Amendment: OHM will collect hand auger soil samples from SWMU 291 and SWMU 310 to further characterize the sites. OHM will excavate contaminated soils and backfill areas at SWMU 291, SWMU-310 and SWMU 358.

Amendment:

Tables 1-1 (a-b) outlines the chemical hazards for SWMU 291, SWMU 310 and SWMU 358. (Note: The chemical hazards, personal protective equipment and air monitoring requirements for SWMU 291 and SWMU 358 are subject to change based on additional site characterization information.)

Tables 1-2 (a,b) outlines air monitoring and action levels.

Activity Hazard Analyses (AHAs) have been developed for the following site tasks:

SWMU 291 & SWMU 310:
- Collecting hand auger samples
- Excavation and backfill
- Soil loadout and disposal

SWMU-358 & SWMU-359
- Excavation and backfill
- Sampling
- Soil loadout and disposal

OHM will comply with all emergency procedures and Hazard Communication Procedures outlined in the Basewide Health and Safety Plan. OHM will review the chemical hazards present at each site and will comply with the critical safety practices, personal protective equipment, air monitoring, equipment inspections and training requirements as outlined to the AHAs provided for each task.

Completed by: Alison Harwood
Alison Harwood
Health and Safety Coordinator

Approved by:
James Dunn
Project Manager

APPENDIX B

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS PLAN
SITE CHARACTERIZATION AND INTERIM MEASURES
FOR
SOLID WASTE MANAGEMENT UNITS 291, 310, 358 AND 359
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Task Order 052

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TABLES

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents in specific terms, the policies, organization, functions, and Quality Assurance/Quality Control (QA/QC) requirements designed to achieve the data quality goals for the investigation, excavation and disposal of contaminated soils at Sites SWMU 291, 310, 358 and 359 MCB Camp Lejeune, North Carolina. This work will be performed under Task Order 052 of Contract Number N62470-97-D-5000.

This SAP integrates the required components of a generic Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP), and serves as a companion document to the project Work Plan. The Project Manager, Project QC Manager, Project Chemist, Field Chemist/Scientist, and Sample Technicians shall implement this document. Any field changes shall be approved by the Navy's Technical Representative (NTR), the OHM Remediation Services Corp. (OHM) Project Manager, and the OHM Project Chemist. These changes shall be documented by the Field Chemist/Scientist and distributed to the appropriate persons as amendments to the SAP.

2.0 *PROJECT MANAGEMENT*

2.1 PROJECT OBJECTIVES AND SCOPE OF WORK

The scope of work for Task Order No. 052 for Sites SWMU 291, 310, and 358 contains several activities:

- Delineate, remove, and dispose of contaminated soil from SWMU 291 and SWMU 310
- Remove and dispose of batteries and contaminated soil from SWMU 358 and SWMU 359
- Conduct confirmation sampling at SWMU 358
- Backfill SWMU 291, SWMU 358, SWMU 310 and SWMU 359

2.2 DESCRIPTION OF CONTAMINANTS PRESENT

Site description and the description of contaminants present is provided in Section 1.0 of the Work Plan.

2.3 PROJECT TASK DESCRIPTIONS

The following tasks will be performed in support of the remediation:

SWMU 291

- Sample and delineate excavation limits
- Excavate contaminated soil
- Provide analytical data to support success of clean-up activities
- Backfill the entire ditch with clean soil

SWMU 310

- Sample and delineate excavation limits
- Remove contaminated soil from two former ponds
- Provide analytical data to support success of clean-up activities
- Dispose of contaminated soil in an appropriate manner
- Regrade the area of both former ponds

SWMU 358

- Remove batteries from site
- Excavate contaminated soil
- Provide analytical data to support success of clean-up activities
- Backfill the excavated area with clean soil

SWMU 359

- Remove batteries from site
- Excavate contaminated soil
- Provide analytical data to support success of clean-up activities
- Backfill the excavated area with clean soil

2.4 PROJECT ORGANIZATION

The Project Manager is the primary focal point for control of the project activities. The Project Manager will be supported by the QA Management team, which will provide reviews, guidance, and technical advice on project execution issues. Members of this staff will be available on an "as-needed" basis to assist in smooth project execution. The project team consisting of supervisory, health and safety, and technical personnel will support the Project Manager. A QA/QC staff will ensure that the project is safely executed in compliance with applicable laws, regulations, statutes, and industry codes. Individuals of the project team are responsible for fulfilling appropriate portions of the project QA program, in accordance with assignments made by the Project Manager. The Project Manager is responsible for satisfactory completion of the project QA program. The Project Manager may assign specific responsibilities to the Technical Lead and other members of the project staff.

The responsibilities of the key members in the project organization are as follows:

Project Manager – James A. Dunn, Jr., P.E.
The Project Manager is responsible for the overall direction of this project executed under his supervision. He provides the managerial administrative skills to ensure that resource allocations, planning, execution, and reporting meet contract requirements. He is ultimately accountable for all work activities undertaken on this project. Some of these responsibilities

may be assigned by the Project Manager to the Site Supervisor, who will remain on site throughout the project field activities.

Technical Lead – Ron Kenyon
The Technical Lead reports directly to the Project Manager and provides technical support and advice regarding project execution. He ensures communication between other members of the project team to allow for effective and efficient compliance with the site remediation plans.
Site Supervisor – Randy Smith
The Site Supervisor is responsible for the day-to-day management of this specific delivery order. He will ensure sufficient resource allocations to maintain project schedule and budget. He will provide daily feedback to the Project Manager on project progress.

Project Chemical QA Officer - Terence A. Whitt
The Chemical QA Officer is responsible for implementing the project chemical QA program. He is responsible for informing the Project Manager of any site-specific QA issues such as non-conformance, identifying appropriate corrective actions, and performing follow-up audits to ensure that the corrective actions were successful.

Laboratory Coordinator - Betsy McDaniel
The Laboratory Coordinator is responsible for procuring a certified laboratory based on the requirements needed for the project.

Sample Technician – Mark Martin
The Sample Technician will be responsible for carrying out all sampling in accordance with approved procedures and methodologies as defined in the SAP.

- Generating equipment rinsate blanks and acquiring field duplicate samples as required by the SAP.
- Completing sampling logbooks, sampling forms, labels, custody seals, and chain-of-custody forms and other paperwork as required by the SAP.
- Packaging and Shipping of samples to appropriate laboratories.

2.5 DATA QUALITY OBJECTIVES FOR MEASUREMENTS DATA

Data generated from those tasks described in Section 2.3 will be used to verify the removal of all contaminated materials and for the disposal of the removed soil. Project specific

quality objectives are listed in Table A-2. These include the limits for quantitation, project action, accuracy, precision, and completeness by which the data will be evaluated.

A Naval Facilities Engineering Service Center (NFESC)-certified or US Army Corps of Engineers-Missouri River Division (USACE-MRD)-approved laboratory will be used for all sample analyses. The laboratory will also be North Carolina-approved. Branches of STL and Mitkem have been qualified for this work. A copy of the laboratories's QA Manuals, statements of qualifications, and appropriate certificates of approval are kept on file in OHM's Alpharetta, Georgia office and are available upon request from the NTR, LANTDIV, or other regulatory agencies. A copy of the approved Sampling and Analysis Plan will be forwarded to the laboratories selected to perform chemical analysis of the samples.

All off-site confirmation samples will meet OHM's requirements for QA/QC. Disposal analysis is required, and OHM minimum data packages will be required with no duplicates or rinsate blanks collected. All sampling and analytical activities will be in accordance with federal, state, and local regulations. A summary of the field sampling requirements is shown in Table A-1.

The Project Chemist will perform data evaluation before any analytical information is used. Third party data validation will not be performed on the final data. Data evaluation results will be provided in the project closeout report.

3.0 SAMPLING PROCEDURES

3.1 SAMPLING METHODS AND PROCEDURES

The following section describes the major sampling and analytical tasks, frequencies, sample matrices, and measurements of contaminants of interest. Table A-1 presents a summary of these items.

3.1.1 Soil/Sediment Sampling

Four soil borings at each of three depths (0-1', 1-2', and 2-3') will be collected from the ditch at SWMU 291. The locations will be an equal distance apart along the approximate 85 feet of ditch. Samples from the same depths will be collected from four points in each of the two former ponds at SWMU 310. These soil samples will be sent to an off-site laboratory for analysis of VOCs, SVOCs, Pesticides, PCBs, and Metals. Soil will be sampled at 50' intervals along the side walls and 500 square foot intervals at the bottom of the excavation at SWMU 358 after removal of the batteries. The excavation at SWMU 358 is expected to be 15' x 20' x 8'. Soil will be sampled at the same intervals from the former ponds at SWMU 310 which are each anticipated to be 55' x 80' x 1'. All of these excavation samples will be analyzed for TAL metals. The samples from SWMU 358 and SWMU 359 will also be tested for lithium.

Procedure for collecting grab samples using EnCore soil samplers:

1. Don clean sampling gloves.
2. Open the EnCore reusable package and remove the core device and cap.
3. Place into the T-handle with the plunger pulled back.
4. Push into the soil to be sampled, packing the soil into the sampler.
5. Remove from the soil, brush off the sides, and put the cap seal onto the sampler.
6. Label and reseal in the original package.
7. Place into the cooler for shipment.

Procedure for collecting composite samples for the off-site laboratory:

1. Subdivide the area into five to six equally sized subareas.
2. Don clean sampling gloves.
3. Collect random grab samples within the subareas using normal grab procedures with stainless steel augers and spoons.
4. Homogenize the samples thoroughly in a stainless steel bowl.

5. Fill the required sample containers, label, and place into the cooler for shipment.

3.1.2 Disposal Sampling

One sample of the excavated material from each SWMU will require full TCLP analysis including the RCRA characteristics for off-site disposal. Before sampling for disposal contact the T&D Coordinator for verification of analytical parameters. Follow sampling procedures in Section 3.1.1 with exception of the subdivided areas.

3.2 SAMPLING IDENTIFICATION SYSTEM

Sample identification names (sample Ids) are assigned based on the following combination of sample identifiers.

CLJ-XX-NNN-DD

Where:

CLJ = Camp Lejeune
XX= Task Order for the project (52)
NNN = Sequential number starting at 001, including QC samples such as field blank, equipment blanks, duplicates etc.
DD = Matrix identifier and QC identifier

e.g. SC for soil confirmation
DS for Disposal Soils
EQ for equipment rinsate blank
TB for trip blank

Other representative designations may be used, as needed based on field conditions. Duplicates will not be identified to the laboratory.

Sample location information will be included in the sample description area of the Chain-of-Custody (COC). Sample sequential numbers are not to be duplicated.

3.3 SAMPLE PRESERVATION AND HOLDING TIMES

Samples collected for off-site analyses will be sent to the laboratory within 24 hours after collection to ensure that the most reliable and accurate answers will be obtained as a result of the analysis. The holding time begins from the date and time of collection in the field.

All environmental samples will be preserved to a temperature of 4°C ± 2 prior to shipment to the analytical laboratory, using ice or refrigeration. This temperature should be maintained during shipment by placing ice in leak-proof containers, and placing it above and below the sample containers. Other sample preservation requirements and holding times applicable to the sample matrix and analyses are listed in Table A-1.

3.4 FIELD QC SAMPLES

The appropriate number of field QC samples, as specified in the NFESC 1996 document, will be collected during this project. These samples will include equipment rinsate blanks, trip blanks, and field duplicate samples. These samples will be collected at the following frequencies and analyzed for the parameters listed in Table A-2.

Equipment Rinsate Blank

Equipment rinsate blanks are the final analyte-free water rinse from equipment cleaning collected daily for each matrix sampled. An equipment rinsate blank is collected in the same type of sample containers, and in all other ways is handled in the same manner as other field samples. The equipment rinsate blank must be collected during the sampling event (after collection of at least one field sample) after the sampling equipment has been decontaminated and prior to collection of the next field sample.

All equipment that comes into contact with field samples must be decontaminated prior to use. The use of disposable equipment is acceptable, but does not obviate the requirement for decontamination prior to use, or the requirement for collection of equipment rinsate blanks. Equipment rinsate blanks for disposable equipment are collected by passing contaminant-free medium through or over the decontaminated equipment. One equipment rinsate blank is collected per day, per sampling event for each matrix sampled that day. Equipment rinsates are analyzed for the same parameters as the sample collected that day.

Field Duplicate

Duplicates for soil samples are collected, homogenized, and split. All samples except volatiles are homogenized and split. Volatiles are not mixed, but select segments of soil are taken from the length of the core and placed in 4-oz glass jars. The duplicates for water samples are collected simultaneously. Field duplicates must be collected at a frequency of one sample per day per matrix or 10% of the field samples per matrix. All the duplicates should be sent to the primary laboratory responsible for analysis, along with the samples. Duplicates will be sent blind to the off-site laboratory.

Trip Blank

Trip blanks are defined as samples that originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile samples. One trip blank should accompany each cooler containing volatile samples and should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for volatile organic compounds and will not be required for disposal samples. Trip blanks will accompany all soil samples to be analyzed for VOCs.

3.5 DECONTAMINATION

All sampling equipment (hand augers, spoons, stainless steel bowls, etc.) will be decontaminated before sampling commences, between each sample location, and prior to leaving the site.

- Remove gross contamination by scraping or brushing.
- Clean with tap water and phosphate-free laboratory detergent using a stiff brush to remove all surface contaminants.
- Rinse thoroughly with tap water.
- Rinse with 1:1 nitric acid (HNO_3) metals grade (only when samples are to be analyzed for metals).
- Rinse thoroughly with tap water.
- Rinse thoroughly with deionized/distilled water.
- Rinse twice with reagent grade isopropanol or methanol.
- Rinse thoroughly with organic-free water and allow to air dry. (Do not rinse with deionized/distilled water. If organic-free water is not available, allow equipment to air dry.)
- Wrap equipment with aluminum foil prior to storage or transportation to sample locations.

Decontamination fluids will be collected, properly labeled and staged in a secure area until final disposal unless other arrangements are made.

3.6 SAMPLE LOGBOOK

It is necessary for the sampling crew to maintain daily field notes. Items that must be included are sampling protocol, any changes to the procedures, meetings, instructions, safety precautions, personnel protection, and activities pertaining to the samples. The

person taking notes must be knowledgeable enough about these activities to know which details are important.

Repetition of information recorded in other permanent logs should be minimized, but enough should be recorded to present a clear and accurate picture of technical activities. At a later date, should a question arise concerning a specific event or a procedure used, it will be answered from these notes. The following information should be logged into the logbooks and/or database:

- Date and time of sampling
- Sample number, locations, type, matrices, volumes, sample ID and descriptions, type and number of sample containers, names and signatures of individuals performing sampling tasks, Chain-of-Custody (COC) and air bill numbers, preservatives, and date samples were sent
- Name of laboratories and contacts to which the samples were sent, turn around time (TAT) requested
- Termination of a sample point or parameter and reasons
- Unusual appearance or odor of a sample
- Measurements, volume of flow, temperature, and weather conditions
- Additional samples and reasons for collecting them
- Levels of protection used (with justification)
- Meetings and telephone conversations held with LANTDIV, NTR, regulatory agencies, Project Manager, or Site Supervisor
- Details concerning any samples split with another agency
- Details of QC samples collected

3.7 SAMPLE LABELS

Any samples placed into a sample container will be identified by a sample label. The Sample label will identify the following information:

- PROJECT NUMBER
- DATE- Month, day, year
- TIME- Military time
- SAMPLE NUMBER- See Section 3.2 for designations

- SAMPLE DESCRIPTION
- SAMPLER- Sampler's name
- PRESERVATIVES
- ANALYSIS REQUIRED

The information described above should be printed neatly using an indelible marker. After the sample is taken and the label is securely attached, the sample is logged into the sample logbook.

3.8 CHAIN-OF-CUSTODY PROCEDURES

In order to generate legally defensible data of the samples collected throughout the project, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To maintain and document sample possession, chain-of-custody procedures are followed as described below:

A sample is under your custody if:

- It is in your actual possession
- It is in your view, after being in your physical possession
- It was in your physical possession and then you locked it up to prevent tampering
- It is in a designated secure area

The following information is required on the COC:

- Project Name
- Project Location - City and State in which the project site is located
- Project Number
- Project Contact - OHM employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results are given (Project Manager, Site Supervisor, Project Chemist, or Laboratory Coordinator)
- Site Telephone Number - The telephone number of on-site office trailer or number where person responsible for samples can be contacted.
- Sample Date - Month, Day, Year
- Sample Time - Military time

- Sample Identification - Sample number and location
- Sample Type - Designation of sample as grab or composite
- Sample Description - Sample matrix, and a brief description of the sampling location
- Sample Preservation - Preservatives used
- Analytical Parameters Requested - Name of analytical parameter, method numbers, and specific compounds of interest, if applicable.
- Air bill Number
- Laboratory - Laboratory name where samples are to be sent
- Laboratory Phone - Telephone number of laboratory
- Laboratory Contact - Contact person for laboratory
- Relinquished By - Signature of sender (OHM)
- Date Relinquished - Date and military time samples were relinquished
- Accepted By - Signature of acceptor
- Date Received - Date and military time samples were accepted
- Turnaround Time - Turnaround times requested or date the results are required from the lab
- Sampler's Signature - Signature of sampler

The COC will be sealed in a ziploc bag and taped in place on the underside of the lid of the sample transport container (cooler).

3.9 PACKAGING, HANDLING, AND SHIPMENT OF SAMPLES

Samples will be packaged as to minimize shifting of the samples during shipment. An absorbent material, such as vermiculite or kitty litter, will be placed at the bottom of the shipment container in order to absorb any liquids in the event of sample breakage. All samples will be individually placed into appropriately sized ziploc bags and sealed.

Samples, which must be kept at 4°C $\pm$ 2, will be shipped on ice in insulated containers. Ice will be placed in a container such as a ziploc bag and sealed so that water will not fill the shipping container as the ice melts. The ice will be double bagged to insure the ice does not leak.

Samples will be shipped via an overnight shipping agency to the appropriate laboratory. IATA regulations will be followed, as they are more applicable to OHM's method of sample shipment. These instructions are for shipping samples with unknown or limited hazards. All information will be entered as directed. No changes or substitutions to these instructions will be made irrespective of their significance.

4.0 ANALYSIS PROCEDURES

4.1 ANALYTICALS METHODS REQUIREMENTS

Analytical requirements for this project are listed in Tables A-1 and A-2. All samples will be analyzed according to USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, whenever possible. Alternative methods of analysis from other sources (ASTM, NIOSH, Standard Methods, etc.) may also be used.

4.2 QUALITY CONTROL REQUIREMENTS

Project Quality Control (QC) requirements for precision, accuracy, completeness, and quantitation limits are listed in Table A-2. QC procedures and acceptance limits must be met as specified in the individual methods. In addition, the laboratory must meet the specification and requirements as described in the NFESC, 1996 document.

4.3 INSTRUMENTS TESTING, INSPECTION, AND MAINTENANCE

Proper maintenance is critical to the performance and minimization of downtime of all equipment, whether it is for measurement or support. Inspection will be performed prior to use of the instruments. Preventive maintenance will be performed as recommended by the manufacturer of the respective equipment. All routine maintenance and major repairs performed on field screening or analytical equipment will be recorded in bound maintenance logbooks that have been specifically designated for that instrument. Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent use, or will be tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated or completely replaced.

4.4 INSTRUMENT CALIBRATION

All calibrations on field instruments will be performed, as a minimum, on a daily basis. Every calibration will be recorded in the maintenance logbook for each instrument. Quality control check standards from a separate source will be used to check initial calibration, and acceptance and rejection criteria.

Monitoring instruments, such as the OVA or FID, O_2/LEL meter, Monitox, etc. will be calibrated as specified in the SSHASP. Off-site analytical instruments will be calibrated according to the method specifications and the laboratory's QA Manual.

5.0 *DATA MANAGEMENT*

Data management is the system by which data is reduced, reviewed, validated, reported, distributed, and finally archived. The criteria in this system are designed to meet the project objectives for both on-site and off-site laboratory generated data

5.1 LABORATORY DATA REDUCTION

Data reduction includes the identifications and calculations necessary to convert the raw instrument readings to the final reported compounds and their respective concentrations.

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 associated calibrations to ensure support of data
- Associated QA/QC checks are supportive of data
- Associated documentation is complete and accurate in respective logbooks
- Associated chromatograms and strip chart recordings are labeled with data, instrument number, parameters run and identification of the analyst

5.2 LABORATORY DATA VALIDATION

All data generated for the project within the laboratory will be extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and three levels of review.

The analyst who generates the raw data has the prime responsibility for the correctness and completeness of the data. All data generated and reduced will follow protocols specified in the laboratory SOP. Each analyst reviews the quality of his/her work based on an established set of guidelines. The guidelines are:

- Sample preparation information is correct and complete
- Analysis information is correct and complete
- The appropriate Standard Operating Procedures have been followed
- Analytical results are correct and complete

- Analysis is performed within prescribed holding times.
- QC sample results are within established control limits
- Blank sample results are within appropriate QC limits
- Special sample preparation and analytical requirements have been met
- Documentation is complete

The next level of review is performed by the section supervisor or data review specialist. The review is structured to ensure that:

- Calibration data are scientifically sound, appropriate to method, and completely documented.
- QC results are within established limits.
- Reporting units are consistent with the method and the matrix.
- Quantitative results are correct.
- Data results are consistent with information on the COC.
- Documentation is complete.
- The data is ready for incorporation into a final report.
- The data package is complete and ready for data archive.

Finally, the laboratory manager, laboratory project manager, or quality assurance officer will perform a 100% review of all data packages for this project.

5.3 PROJECT DATA REVIEW

Project Chemist Data Review Responsibilities

The project chemist is responsible for initial review of the data from the laboratory. This review includes:

- Verifying that all requested data are reported
- Verifying that samples are analyzed according to the contract specified method
- Verifying that all analytes requested are reported
- Verifying that holding times are not exceeded

- Verifying that quality control and surrogate recoveries fall within the laboratory's acceptance criteria
- Reviewing blank data for contamination
- Reviewing field quality control results for inconsistencies
- Verifying that the data generated meet the project Data Quality Objectives specified in the SAP.

The project chemist is responsible for informing the Project Manager and Project Chemical QA/QC Officer of any laboratory and/or sampling deficiencies or issues. These issues and subsequent decisions will be documented on the data evaluation report produced by the Project Chemist for each data package.

5.4 DATA DELIVERABLES

Data deliverables will be in the electronic and hard copy format. Electronic deliverables will consist of Excel spreadsheets formatting sampling information with analytical results. The requirements for hard copy deliverables are discussed below:

5.4.1 Hard Copy Data Deliverables

The preliminary data will be faxed to the Project Chemist or Laboratory Coordinator based on personnel availability. This data may or may not have undergone the full laboratory review process and may contain errors and discrepancies. Prior to the use of data results for any decisions, the data will be reviewed by the Project Chemist and assessed against the project goals and data quality objectives. A copy of the preliminary data, including review comments from the Project Chemist will be submitted to the site and/or the Project Manager.

The hard copy data will be submitted within prescribed time as defined by the Terms and Conditions of the laboratory contract document. The hard and final copy data will be evaluated by the Project Chemist and assessed against the preliminary data, project goals and data quality objectives. Any errors, discrepancies, and non-conformances will be brought to the laboratory's and Project Manager's attention.

When QA issues have been satisfactorily settled and data evaluation has been completed, the Project Manager may release the data to the client and/or regulating agencies.

5.5 DATA STORAGE AND ARCHIVE

After OHM has completed its work for the project, all documents generated will be assembled in the project file. Individuals may retain clean (no handwritten comments) copies of documents for their personal files but only after personally verifying that the original or similar copy is in the project file. The Project Manager is responsible for ensuring the collection, assembly, and inventory of all documents relative to the project at the time the objectives are met. The file then becomes accountable. Any records leaving the file must be signed out.

6.0 *DATA ASSESSMENT PROCEDURES*

Reliability in analytical determination is maintained through strict adherence to quality control procedures. Procedures are designed to control both the accuracy and precision of analytical results. For the validation of the data, a known method spike is routinely analyzed to ensure the accuracy of results. The procedure is to run the laboratory control sample with each lot of samples sent to the laboratory. If more than twenty individual analyses are made, additional standards will be analyzed at a minimum of one standard per twenty analyses. Some procedures call for the use of either a surrogate spike or the standard addition of a known quantity of the analyte to a split of the sample being analyzed.

Control charts will be prepared using an estimate of the spike recovery obtained from the literature or determined by repeated analyses run in the laboratory. Each time the analyst runs a method spike, the result is entered on the control table. If a standard addition technique is used, a plot of instrument response versus added analyte concentration is made in order to determine analyte concentration in the original sample. These are further explained in the laboratory's QAM.

Replicate analyses will be performed on at least 10 percent of the samples processed by the laboratory. Blanks are also run with each batch of samples or individual sample analyzed regardless of the level of certification of the data.

The purpose of spikes, blanks, and replicates is to provide a sound scientific basis from which the degree of certification of the resultant data can be objectively concluded. These are not management decisions, but follow naturally from the results of the above QC procedures.

6.1 ACCURACY

Data accuracy is a reflection of the efficiency of the analytical procedure. It is determined by use of spiked samples and standard reference materials or laboratory control samples performed at the rate of one set every 20 samples. A control chart is generated using historical laboratory data where warning and control limits are established to assess data accuracy.

The accuracy (check standards) samples will have concentration values of the mid-standard. During analysis, a minimum of 10 percent of samples are accuracy samples. The accuracy

samples are staggered through the analysis, not placed one after another. After a minimum of seven accuracy samples are analyzed, the percent recovery is calculated for each sample.

The accuracy criteria is determined by calculating the standard deviation of seven or more percent recovery values and setting the upper and lower control limits using the following equations:

Upper control limit = p + 3 SD
Lower control limit = p - 3 SD

Where:
p = Average percent recovery
SD = Standard deviation

After the standard deviation, for the seven or more samples has been calculated, the accuracy control limits are generated and are then used to determine if the analysis is out of control. This is done by checking the results against the control limits. If any values are above the upper control limit or below the lower control limit, all sample results after the last qualifying accuracy sample must be repeated or discarded. If seven consecutive values fall below the lower control limit, new limits are calculated using the new accuracy check values. If the values fall between the upper and lower limits, then conditions are reported as "within limits."

6.2 PRESISION

Duplicate and replicate samples analyzed by the laboratory assess the precision of the sampling effort. Control limits for duplicate/replicate Relative Percent Difference (RPD)s are listed in Table A-2. Once a sufficient amount of replicate data becomes available, field precision control charts are constructed similar to the laboratory accuracy charts. For any given concentration, the mean and the standard deviation(s) of the replicates are calculated. Data from each sample set are pooled with the previous sample sets to generate control and warning limits for the next set. Control and warning limits for water samples are set at ± 2s and ± 3s, respectively. Control limits for solid samples are more liberally established due to matrix heterogeneity. Data outside any control limit are subject to QA review.

Precision is based upon the results of the RPDs as calculated from the recoveries of the duplicate samples. The control limits for precision are based on historical laboratory data.

MS and MSD samples on a per batch or a minimum frequency of 5 percent may be analyzed to assess precision. Duplicate results are compared and the RPD is then determined. The RPD will be entered into the laboratory's data system and will be used to define the precision of the analysis.

6.3 COMPLETENESS

The Site Supervisor must ensure all sites are sampled for all the specified analyses, that sufficient sample volume has been provided to complete those analyses, and that all of the QC samples have been included with each sample set. The goal for completeness for each sample set shipped to the laboratory is 100 percent.

Completeness is expressed as the percentage of the amount of valid data obtained to the total amount of data expected. For a set of data to be considered complete, it must include all QC data verifying its accuracy and precision.

If samples analyzed do not meet all QC requirements in terms of accuracy and precision for any specific parameter, the sample preparation and analysis will be repeated pending adequate volume or data flagged appropriately.

6.4 METODS DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

Method detection limits (MDLs) must be established by the laboratory. This should, at a minimum, be done on a yearly basis. MDL is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero.

Practical quantitation limit (PQL) is the lowest level that can be reliably determined within the specified limits of precision and accuracy during routine laboratory operating conditions. The PQLs are generally 5-10 times the MDL. The PQL is the most applicable limit of reporting for this program.

6.5 LABORATORY AND FIELD CONTAMINATION

It is not unusual to find the following analytes at trace levels in the samples:

- Methylene chloride
- Acetone

- Freon (1,1,2-trichlorotrifluorethane)
- Bis(2-ethylhexyl)phthalate
- Hexane
- Isopropanol
- 2-Butanone

These are common solvents used in the field and in the laboratory.

To fully evaluate data containing trace levels of these contaminants, one must have data from trip blanks, equipment blanks, and all applicable laboratory blanks for that batch of samples.

The determination on the use of the data will be made during the Data Validation process.

7.0 PERFORMANCE AND SYSTEM AUDITS

An audit is defined as a methodic check to determine the quality of operation of field and laboratory activities. It is comprised of the following:

- Performance audit
- 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 the QA program requirements.

7.1 FIELD PERFORMANCE AUDITS

Field performance audits are performed on an on-going basis during the project as field data are generated, reduced, and analyzed. All numerical analyses, including manual calculations are documented. All records of numerical analysis are legible, of reproduction quality, and allow for complete logical reconstruction by a qualified individual other than the originator.

Other indicators of the level of field performance are the analytical results of the blank, duplicate, and replicate samples. Each blank analysis is an indirect audit of effectiveness of measures taken in the field to ensure sample integrity. The results of the field duplicate and replicate analysis are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

7.2 FIELD SYSTEMS AUDITS

System audits of site activities are accomplished by an inspection of all field activities by the Project Chemical QC Officer. This audit is composed of comparisons between current field practices and standard procedures.

After the audit, any deficiencies are discussed with the field staff, and corrections are identified. If any of these deficiencies might affect the integrity of the samples being collected, the QA Officer informs the field staff immediately, so corrections can be made. The field performance audit will be conducted at the start of the project, one before the end of the project, and as directed by the Project Manager. OHM will also submit to all requests by regulatory agencies, or other clients for external field systems audits.

7.3 LABORATORY PERFORMANCE AUDITS

The laboratory performance audit verifies the ability of the laboratory to correctly identify and quantify compounds in blind check samples submitted by an auditing agency. Results from Performance Evaluation (PE) programs such as USEPA WS/WP studies, AIHA, PAT studies, etc., will be generally acceptable by OHM. However, during the course of the project, it may be necessary for the Project QA/QC Officer to send PE samples to the laboratory to evaluate specific parameters.

The contracted laboratories will undergo performance audits consisting of field QC samples throughout the project. Occasionally PE samples supplied by the client or external organizations will be spiked with the same analytical parameters that are being investigated on site. External laboratory performance audits by auditing agencies such as the USEPA, USACE-MRD, DOD, NFESC, etc., are not routinely scheduled. However, OHM and its subcontracted laboratories will submit to any external audit upon request by the USEPA or the client.

7.4 LABORATORY SYSTEM AUDITS

The laboratory system audit is a review of analytical laboratory operations to verify that the facility has the necessary equipment, staff, and procedures in place to generate acceptable data. It is also to determine that each element within an activity is functioning appropriately and within the guidelines of applicable methodology, approved procedures, and the site QAPP. An on-site inspection is routinely performed by the laboratory's QA Manager and may also be performed by the OHM Project Chemical QA/QC Officer. If the laboratory participates in certification programs, audits performed by the certifying agencies may satisfy the criteria of systems audits for the project.

If the laboratory is in question, a system audit can be directed by the client and performed by OHM or the client's representative. Any recommendations made will be considered for implementation, and corrective actions will be taken to correct any deficiencies found. Project-specific audit reports will be placed in the project files and laboratory audit reports will be kept by the laboratory for future reference.

8.0 CORRECTIVE ACTION

Corrective action may be necessary as a result of the following QA activities:

- Field and laboratory performance audits
- Field and laboratory system audits
- Inter-laboratory comparison studies
- Calibration data fall out of specified limits
- Failure to adhere to the CQMP
- Failure to adhere to the site requirements
- Failure to adhere to standard operating procedures and methods
- Data completeness below required limits
- Control limits are exceeded for QC samples

If, during system and performance audits, deficiencies or problems are discovered, corrective action will be initiated immediately. The appropriate field and laboratory personnel will be notified immediately and an investigative process will be implemented immediately to find solutions to these issues. The investigative process will consist, but is not limited to, the following:

- Determining when the problem occurred
- Determining which systems were affected by the problem
- Determining the cause of the problem
- Determining a corrective action to eliminate the problem
- Assigning the responsibility for implementing the corrective action
- Implementing the corrective action
- Evaluating the effectiveness of the corrective action
- Investigating alternative corrective actions, if the original action was not sufficient in eliminating the problem
- Documenting that the corrective action has eliminated the problem

The Project Chemical QC Officer has the authority to require that all site activities threatened by the problem be stopped or limited until the corrective action has been implemented and satisfactorily verified to eliminate the problem.

Corrective actions may include, but are not limited to:

- Modifications to procedures
- Recalibration of instruments
- Replacement of solvents, reagents, and/or standards
- Additional training of personnel
- Reassignment of personnel

8.1 CORRECTIVE ACTION REPORT

A Corrective Action Report (CAR) is necessary documentation of the investigative process. Depending on the issues, the CAR may be generated by the laboratory or the field personnel. Copies of the CAR will be given to the Project QC Officer and Project Manager, who will distribute them to the client. A copy of the CAR will be placed in the project files for future reference.

The CAR should include, but is not limited to:

- A description of the problem, deficiency, or issue
- Proposed resolutions
- Resulting actions
- Effectiveness of the resolutions
- Personnel responsible for implementation of the corrective actions
- Personnel responsible for monitoring the effectiveness of the actions.

TABLE A-1
SAMPLING AND ANALYTICAL SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Remedial Actions													
Characterization of Soil Borings	SWMU 291	Soil	Four borings at three depths	12 + 2 Dup	Grab for Volatiles	SS Auger	14 days	OHM Minimum	VOCs	5035/8260B	14 days	Cool to 4°C	(3) 5 g Encore Sampler (1) 4 oz Glass Jar
					Composite for remaining analyses	SS Spoon SS Bowl			SVOCs	8270C	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									Pesticides	8081A	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									PCBs	8082	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									TAL Metals	6010B/7000	180 days	Cool to 4°C	(1) 4 oz Jar
	SWMU 310	Soil	Four borings at three depths	12 + 2 Dup	Grab for Volatiles	SS Auger	14 days	OHM Minimum	VOCs	5035/8260B	14 days	Cool to 4°C	(3) 5 g Encore Sampler (1) 4 oz Glass Jar
					Composite for remaining analyses	SS Spoon SS Bowl			SVOCs	8270C	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									Pesticides	8081A	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									PCBs	8082	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									TAL Metals	6010B/7000	180 days	Cool to 4°C	(1) 4 oz Jar
Battery Removal	SWMU 358	Soil	Excavation side walls and base	[15' x 20' x 8']	Composite	SS Auger, SS Spoon, SS Bowl	14 days	OHM Minimum	TAL Metals Lithium	6010B/7000 Flame AA	180 days	Cool to 4°C	(1) 8 oz Jar
Blanks	Equipment Rinsate Blank	Water	1 per distinct area	3	Prepared in the Field	N/A	14 days	OHM Minimum	VOCs	5030B/8260B	14 days	HCl pH< 2 Cool to 4°C	(3) 40 ml vial
									SVOCs	8270C	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 1L Amber Glass
									Pesticides	8081A	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 1L Amber Glass
									PCBs	8082	14 days to Extraction 40 days to Analysis	Cool to 4°C	(1) 1L Amber Glass
									TAL Metals	6010B/7000	180 days	Cool to 4°C	(1) 250 mL HDPE
	Trip Blank	Water	1 per VOC cooler	2	Prepared by Lab	N/A	14 days	OHM Minimum	VOCs	5030B/8260B	14 days	HCl pH< 2 Cool to 4°C	(3) 40 ml vial
Excavation Confirmation Sampling													
Determination of Heavy Metal Contamination	SWMU 310 Former Ponds	Soil	Every 50 feet along side walls, Every 500 square feet from bottom excavation	[2 ponds - 55' x 80']	Composite	SS Auger, SS Spoon, SS Bowl	14 days	OHM Minimum	TAL Metals	6010B/7000	180 days	Cool to 4°C	(1) 4 oz Jar

TABLE A-1
SAMPLING AND ANALYTICAL SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Disposal Sampling													
Disposal of Excavated Material	SWMU 291	Soil	Once	1	Composite	SS Spoons or Shovels; SS Bowls	14 days	OHM Minimum	TCLP Volatiles	1311/8260B	14 days to Leaching 14 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									TCLP Semi- Volatiles	1311/8270C	14 days to Leaching 14 days to Extraction 40 days to Analysis	Cool to 4°C	(2) 16 oz Glass Jar
									TCLP Pesticides	1311/8081A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Herbicides	1311/8151A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Metals	1311/6010B;7470A	14 days to Leaching 180 days to Analysis	Cool to 4°C	(1) 4 oz Jar
									pH	9045C	None	Cool to 4°C	(1) 8 oz Jar
									Ignitability	1010	None		
									Total Cyanide	9010B	None		
									Total Sulfide	9030	None		
	SWMU 310	Soil	Once	1	Composite	SS Spoons or Shovels; SS Bowls	14 days	OHM Minimum	TCLP Volatiles	1311/8260B	14 days to Leaching 14 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									TCLP Semi- Volatiles	1311/8270C	14 days to Leaching 14 days to Extraction 40 days to Analysis	Cool to 4°C	(2) 16 oz Glass Jar
									TCLP Pesticides	1311/8081A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Herbicides	1311/8151A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Metals	1311/6010B;7470A	14 days to Leaching 180 days to Analysis	Cool to 4°C	(1) 4 oz Jar
									pH	9045C	None	Cool to 4°C	(1) 8 oz Jar
									Ignitability	1010	None		
									Total Cyanide	9010B	None		
									Total Sulfide	9030	None		
	SWMU 358	Soil	Once	1	Composite	SS Spoons or Shovels; SS Bowls	14 days	OHM Minimum	TCLP Volatiles	1311/8260B	14 days to Leaching 14 days to Analysis	Cool to 4°C	(1) 4 oz Glass Jar
									TCLP Semi- Volatiles	1311/8270C	14 days to Leaching 14 days to Extraction 40 days to Analysis	Cool to 4°C	(2) 16 oz Glass Jar
									TCLP Pesticides	1311/8081A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Herbicides	1311/8151A	14 days to Leaching 14 days to Extraction 40 days to Analysis		
									TCLP Metals	1311/6010B;7470A	14 days to Leaching 180 days to Analysis	Cool to 4°C	(1) 4 oz Jar
									pH	9045C	None	Cool to 4°C	(1) 8 oz Jar
									Ignitability	1010	None		
									Total Cyanide	9010B	None		
									Total Sulfide	9030	None		