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MCB CAMP LEJUENE
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FINAL SITE SPECIFIC FIELD SAMPLING AND ANALYSIS PLAN RCRA FACILITY
INVESTIGATION SOLID WASTE MANAGEMENT UNIT 177 (SWMU 177) MCB CAMP
LEJEUNE NC
9/1/2006
CH2M HILL

Final
Site Specific Field Sampling and Analysis Plan
RCRA Facility Investigation
SWMU 177

Marine Corps Base
Camp Lejeune, North Carolina

Contract Task Order 041
September 2006

Prepared for
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Prepared by



Charlotte, North Carolina

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List of Acronyms and Abbreviations

Baker	Baker Environmental, Inc.
bls	Below land surface
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSI	Confirmatory Sampling Investigation
CTO	Contract Task Order
DoN	United States Department of the Navy
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ERA	Ecological risk assessment
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
IDW	Investigative-Derived Waste
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAVFAC	Naval Facilities Engineering Command
NCDENR	North Carolina Department of Environment and Natural Resources
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
ORP	Oxidation-Reduction Potential
PRG	Preliminary Remediation Goals
pH	Hydrogen Ion Concentration of a Solution
PID	Photo-ionization detector
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SLERA	Screening level ecological risk assessment
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
USEPA	United States Environmental Protection Agency
UST	Under ground storage tank
VOCs	Volatile Organic Compounds
WP	Work Plan
WQP	Water Quality Parameters

1.0 Introduction

This Site-Specific Work Plan presents the strategy and technical approach for a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Solid Waste Management Unit (SWMU) 177 - Building 333 Underground Storage Tank (UST) at Marine Corps Base (MCB) Camp Lejeune, North Carolina (the Base). A general location/Index map of the Base showing the location of SWMU 177 is provided as **Figure 1-1**.

This Site-Specific Work Plan was prepared by CH2M HILL under Contract Task Order (CTO) 041 of the Department of the Navy's (DoN's) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program. CH2M HILL is responsible for implementation of this project. It should be noted that this Site-Specific Work Plan is to be used in conjunction with the Master Project Plans, which include the Master Work Plan, Master Quality Assurance Project Plan (QAPP), and Master Health and Safety Plan (HASP) (CH2M HILL, 2005). The Master Project Plans will be referenced to the greatest extent possible.

2.0 Background Information

Background information for the Base, including location, topography, geology, and regulatory history, is presented in the Master Work Plan and is not repeated herein. Site-specific background information for SWMU 177 is presented below.

SWMU 177 has been identified as the former 550-gallon UST “C” located near Building 333 in the Hadnot Point area of MCB Camp Lejeune. SWMU 177 is located on the north side of H Street west of McHugh Boulevard in the Hadnot Point area of Camp Lejeune. The adjacent buildings are used for office and classroom. **Figure 2-1** shows the general SWMU area.

The UST 333-C, which was historically used for storing kerosene for heat production, was removed in March 1993. Soil sampling during removal indicated the presence of petroleum hydrocarbons. After removal, Law Engineering and Environmental Services (Law) and Baker Environmental (Baker) performed UST program site assessments (March 1996) and a Phase II CSI (March-April 2002), respectively, at SWMU 177.

2.1 LUST Site Assessment, Law, 1997

In March 1996, Law conducted a series of soil and groundwater samples in response to the report of elevated oil and grease concentrations in the UST excavation during UST closure sampling. Samples were collected by Geoprobe and hydropunch, and five permanent monitoring wells were installed in the shallow zone, screened 7 to 17 feet below land surface (bls), and two wells were installed in a deeper aquifer, screened 42 to 47 feet bls. **Figure 2-2** shows the monitoring wells at the site. No contaminants were identified in soil at concentrations above State criteria. Various volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) were detected above State criteria in groundwater samples, although many were also detected in rinse and trip blanks. Because some of the VOCs identified in the groundwater were not related to petroleum contamination, the site was moved to the RCRA program.

2.2 Confirmatory Sampling Investigation, Baker, 2005

In 2002 and 2003, Baker conducted a CSI at the site, and was directed to call the site SWMU 361. (The site identification has reverted back to the original number, SWMU 177). Soil was collected from 10 soil borings and groundwater was collected from five temporary wells and the five permanent shallow wells installed in 1996. Soil and groundwater samples were analyzed for VOCs, SVOCs, pesticides, and metals.

Detected analytes in soil samples were compared to EPA Region IX Preliminary Remediation Goals (PRGs) for residential exposure, NC soil-to-groundwater migration criteria, and base background concentrations for metals. Attachment 1 of this site-specific work plan includes Figure 2 from the 2005 CSI report, which shows the locations where constituents were detected at concentrations exceeding the comparison criteria. Arsenic, alpha-and gamma-chlordane, and methylene chloride were identified as soil contaminants, although methylene chloride was also identified in quality control (QC) blanks.

Detected analytes in groundwater were compared to EPA Region IX PRGs for tap water, North Carolina 2L Standards, and background concentrations for metals. Figure 3 from the CSI report, included in Attachment 1, shows the locations where constituents were detected at concentrations exceeding comparison criteria. In only one location were petroleum hydrocarbons indicated as contaminants of potential concern (COPCs), at relatively low concentrations. At two other locations pesticides were identified as COPCs in groundwater.

The CSI concluded that the petroleum hydrocarbons detected at the site were likely related to the SWMU operation (kerosene UST), and the pesticides were not related to the SWMU operation. The pesticides were likely a result of historical landscaping activities. An RFI was recommended in order to evaluate risk to human health and the environment from the SWMU.

3.0 Data Quality and Sampling Objectives

The site-specific objectives presented in this section have been developed using the U.S. Environmental Protection Agency (USEPA) seven-step data quality objectives (DQOs) process, as presented in the USEPA Guidance for the Data Quality Objectives Process (USEPA, 2000a) and USEPA Data Quality Objectives Process for Hazardous Waste Site Investigations (USEPA, 2000b).

DQOs are qualitative and quantitative statements, developed using the USEPA DQO process, that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support decisions. DQOs define the performance criteria that limit the probabilities of making decision errors by considering the purpose of collecting data, defining the appropriate type of data needed, and specifying tolerable probabilities of making decision errors. The seven-step DQO process is as follows:

- Step 1 – State the Problem
- Step 2 – Identify the Decision
- Step 3 – Identify the Inputs to the Decision
- Step 4 – Define the Boundaries of the Study
- Step 5 – Develop a Decision Rule
- Step 6 – Specify Tolerable Limits on Decision Errors
- Step 7 – Optimize the Design for Obtaining Data

The following sections present the seven-step DQO process developed for the RFI at SWMU 177.

3.1 Step 1 – State the Problem

The first activity associated with this step is to establish the planning team. The planning team will include the North Carolina Department of Natural Resources (NC DENR), Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, MCB, Camp Lejeune, and CH2M HILL. These team members are decision-makers for the DQO Process.

The planning team's primary goal is to determine the potential for future corrective action at SWMU 177. Specifically, the objectives of the RFI are as follows:

- Characterize the sources via the collection of analytical data, and evaluate the migration and dispersal characteristics of the release.
- Review the risk of contaminants associated with the SWMU to human health and ecological environment.
- Provide recommendations for site management.

The final activity associated with this step is to identify available resources, constraints, and deadlines. The project team organization and project schedule are presented in Sections 5.0 and 6.0 of this Site-Specific Work Plan, respectively. The schedule presents the anticipated completion and/or submittal dates for specific tasks or documents.

3.2 Step 2 – Identify the Decision

The principal study question identified is:

- What is the nature of contamination in the vicinity of SWMU 177?

Before a decision statement can be formulated, a definition of “contaminated” must be clarified. For the RCRA program, soil and groundwater will be considered “contaminated” if concentrations of COPCs exceed the applicable North Carolina 2L Standards, NC DENR soil to groundwater screening criteria and/or USEPA Region IX Preliminary Remediation Goals (PRGs) and the established background/secondary criteria (for metals only). It has been determined that the COPCs at this site are SVOCs and pesticides.

Considering the principal study question and definition of “contaminated,” the decision statement is as follows:

- Define the nature of contamination in the vicinity of the SWMU by determining whether or not the concentration of a given COPC at any given sampling point exceeds the regulatory driven criteria.

3.3 Step 3 – Identify the Inputs to the Decision

Existing information regarding the nature and extent of contamination in the vicinity of SWMU 177 comes from previous investigations performed by Law and Baker. The results of these assessments are described in the Baker report *Final Phase II Confirmatory Sampling Report; Marine Corps Base Camp Lejeune (2005)*. However, in order to determine the potential for future corrective action or additional actions, additional data is required to characterize and define the extent of contamination at the SWMU.

The type of data and sources used to resolve the decision statement include the following:

Kinds of Information	Sources of Information
Nature of contaminated groundwater	Existing analytical data and new analytical data from groundwater samples from monitoring wells
Groundwater flow/hydrogeologic characteristics	Existing and new groundwater elevation data

The criterion for determining the presence of contamination will be based on analytical results and applicable regulatory driven criteria as described in Section 3.1.2. Groundwater samples will be analyzed for SVOCs and pesticides using a fixed-based laboratory.

3.4 Step 4 – Define the Boundaries of the Study

Groundwater samples will be collected at the locations shown in **Figure 2-2**. The estimated depth of groundwater sampling ranges from 7 to 9 feet.

It is understood that the extent of SVOC contamination has been determined from previous investigations. However, the extent of pesticide contamination has not been bounded. Because pesticides are not related to SWMU operation, this study will not attempt to identify the extent of pesticide contamination.

Temporal changes in the extent of contamination are expected to be limited. Loss of contaminant mass does occur through natural attenuation processes (e.g., dilution, biodegradation, dispersion). As a result, data collection is not time dependent and the decision regarding the nature and extent of contamination will be based on existing conditions at the time of the investigations.

Practical constraints to sample collection are minor to moderate. Weather conditions (such as heavy rain or lightning) can delay the field activities, but is not a serious constraint.

3.5 Step 5 – Develop a Decision Rule

The decision rule developed for the RFI at SWMU 177 is as follows:

- If a given concentration at a given sampling point exceeds the regulatory driven criteria for that contaminant, then that sampling point will be considered to be within the contaminant plume.

3.6 Step 6 – Specify Tolerable Limits on Decision Errors

Specification of tolerable limits on the decision errors will not be performed at this time. The sampling scheme is flexible and will include points inside and outside the suspected contaminant source area/plume so that the extent of contamination should be sufficiently defined. Specification of tolerable limits on the decision errors may be developed at a later date as determined by the planning team.

3.7 Step 7 – Optimize the Design for Obtaining Data

There are two fundamental goals for Step 7, and both rely on review of existing data and information:

- To evaluate the decision rule
- To design and optimize the sampling and analysis program

The decision rule developed in Step 5 has been shown to be valid following review of existing data. In this case, a simple statistical hypothesis test, broadly classified as a one-sample test was used. The test involved comparison of individual analytical data to a known value (regulatory driven criteria and established background/secondary criteria).

Existing information/data has been reviewed to evaluate and develop the data collection strategy for the field program. The development of alternate sampling plans is not practical given the nature of the RFI.

4.0 RFI Tasks and Responsibilities

4.1 Project Management

Project management activities include such items as daily technical support and oversight; budget and schedule review and tracking; preparation and review of invoices; personnel resource planning and allocation; and coordination with NAVFAC Mid-Atlantic, MCB, Camp Lejeune, and subcontractors.

4.2 Subcontractor Procurement

This task includes procurement, scheduling and coordination of subcontractors. The primary subcontractors required for the RFI include a fixed-base analytical and independent data validator. Miscellaneous subcontractors may also be procured for various support services.

4.3 Field Activities

The field activities for the RFI at SWMU 177 will include the following subtasks:

- Mobilization/Demobilization
- Monitoring Well Sampling
- Laboratory Analytical Program
- Quality Assurance/Quality Control (QA/QC)
- Sample Handling
- Investigative Derived Waste (IDW) Management

The following subsections present a discussion of the proposed field activities.

4.3.1 Mobilization/Demobilization

Mobilization/demobilization consists of securing equipment and supplies necessary for the field activities and shipping or transporting those items both to and from the field. Travel time to and from the Base, location of IDW storage areas, and field establishment of sampling locations. Activity personnel will be consulted during mobilization efforts.

4.3.2 Monitoring Well Purging and Sampling

All 7 existing site wells (SWMU177-MW01, SWMU177-MW02, SWMU177-MW03, SWMU177-MW04, SWMU177-MW05, SWMU177-MW06, and SWMU177-MW07) will be sampled. The wells will be purged and sampled using peristaltic pumps and low-flow purging/sampling methods in accordance with Navy CLEAN SOPs, CH2M HILL SOPs, and the Master Plans. New disposable tubing will be used for each well. Specific sampling procedures are presented in the Master Plans and summarized below:

- The well cap will be removed and escaping gasses will be measured at the wellhead using a photo-ionization detector (PID). This will determine the need for respiratory protection.
- After proper respiratory protection has been donned, as necessary, the static water level will be measured. The total depth of the monitoring well will not be measured, as not to stir up any sediment. The total well depth will be obtained from Well Construction Records. The water volume in the well will then be calculated.
- The sampling device intake will be slowly lowered until the bottom end is two to three feet below the top of the well screen or the top of the water level, whichever is greater. Next, the water level probe will be placed into the monitoring well just above the water.
- Purging will begin. The pumping rate will be set to create a sustainable flow (approximately 0.3 liters/minute or less) without causing a significant drop in water level in the well. The static water level will be periodically measured throughout purging to verify that a significant drop in water level has not occurred.
- Water Quality Parameters (WQPs), including pH, specific conductance, temperature, oxidation-reduction potential (ORP), turbidity, and dissolved oxygen will be measured frequently.
- Purging will be complete when three successive readings of pH, specific conductance, and temperature have stabilized within 10 percent (0.1 Standard Units for pH), turbidity is less than 10 NTUs, or there is no further discernable upward or downward trend. However, a minimum of one well volume will be removed prior to sampling. If a well is purged dry, the well will be allowed to recharge (preferably to 70 percent of the static water level) prior to sampling.
- Upon WQP stabilization, groundwater samples will be collected and placed into the appropriate sample container(s).

4.3.3 Field Quality Assurance/Quality Control

Specific Quality Assurance/Quality Control (QA/QC) requirements are presented in the Master QAPP, which is contained in the Master Project Plans. The Master QAPP describes the different levels of sample analysis and the associated QC procedures required with each. Adherence to established USEPA chain-of-custody (COC) procedures during the collection, transport, and analyses of the samples will be maintained throughout the project. Laboratory analyses of the samples will conform to accepted QA requirements.

The following QA/QC samples will be collected/prepared during the field activities to ensure precision, accuracy, representativeness, completeness, and comparability:

- Equipment rinsate blanks
- Field blanks
- Field duplicates
- Matrix Spike/Matrix Spike Duplicates (MS/MSDs)

Equipment rinsate blanks will be collected by running laboratory-supplied de-ionized water over/through the sampling equipment and placing it into the appropriate sample containers for laboratory analyses. Equipment rinsate blanks will be collected from selected disposable sampling equipment (i.e., roll of tubing, stainless steel spoon, etc.); one equipment rinsate blank will be

collected each day for reusable sampling equipment. The results will be used to verify that the sampling equipment has not contributed to contamination of the samples.

One field blank will be collected from each source of water used in decontamination. The field blanks will be collected by pouring the water from the original container or spigot directly into the sample bottle set. Field blanks will not be collected in dusty environments. The results will be used to verify that the water used in decontamination has not contributed to contamination of the samples.

Field duplicate samples will consist of one unique sample, split into two aliquots, and analyzed independently. Duplicate soil samples analyzed for parameters other than VOCs will be homogenized and split. Samples for VOC analyses will not be mixed, but select segments of the soil will be collected. Duplicate water samples will be collected simultaneously. The duplicate samples will be analyzed to verify the reproducibility of the laboratory results and degree of variability of reported concentrations. Duplicate samples will be collected at a frequency of 10 percent; the samples will be taken from locations anticipated to be contaminated.

MS/MSD samples will be prepared in the field to address aliquoting reproducibility and to provide information on matrix reproducibility otherwise unobtainable from samples reported below analytically reproducible and statistically valid levels. MS/MSD samples will be prepared at a frequency of 5 percent for each group of samples of a similar matrix; the samples will be taken from locations anticipated to be contaminated.

4.3.4 Sample Handling and Analysis

Samples for chemical analyses will be placed into laboratory-prepared sample containers with the appropriate preservatives and stored on ice in a cooler at approximately 4° Celsius (or less) until shipped to the laboratory.

Sample preservation details are presented in the Master Project Plans. The type of container used for each sampling effort, as well as a summary of preservation requirements is described in the Master QAPP.

Proper COC documentation will be maintained for all samples from the time of collection until they are shipped to the analytical laboratory. The COC forms will contain the following information: project number (CTO), sampler names, sample numbers, number of containers, methods of preservation, date and time of sample collection, analysis requested, date and time of transportation to the laboratory, method of transportation, and any other information pertinent to the samples. Specific COC procedures are presented in the Master Project Plans.

Samples will either be hand delivered to the laboratory via courier or shipped via overnight courier.

4.3.5 Investigation Derived Waste Management

IDW will be managed in accordance with Section 4.20 of the Master Project Plans. IDW will consist of health and safety disposables, decontamination fluids, and purged groundwater. Health and safety disposables, such as sampling gloves, will be placed in plastic bags and disposed in an on-site dumpster. Water IDW will be placed in poly-tanks or 55 gallon drums, or, if low volumes are

expected, in 5-gallon containers. The drums and poly-tanks will be transported to and staged at a designated 90-day storage pending final disposition.

4.4 Data Management and Validation

It is anticipated that data management activities will consist primarily of entering field and laboratory data onto computerized spreadsheets using database software and tabulating field and analytical results for preparation of the report.

An independent data validator will be subcontracted for data validation. The laboratory analytical results will be evaluated to assess the technical adequacy and usability of the data. The data will be technically reviewed based on specifications set forth in the Naval Energy and Environmental Support Activity (NEESA) and USEPA guidance documents.

4.5 Data Evaluation

The laboratory analytical results for the new groundwater data will be compared to the North Carolina 2L standards, USEPA Maximum Contaminant Levels (MCLs), and the USEPA Region IX Preliminary Remediation Goals (PRGs) for tap water.

4.6 Risk Assessment

An ecological risk assessment (ERA) and a Human Health Risk Assessment (HHRA) will be conducted after data evaluation. The HHRA and ERA will identify existing or potential risks that may be posed to human health and/or the environment and will serve to support the evaluation of the threats posed by a site with respect to current and future potential exposure scenarios. Soil data collected during the CSI will be used to evaluate exposure to soils, and CSI groundwater data along with newly collected groundwater data will be used to evaluate groundwater exposure.

4.6.1 Ecological Risk Assessment

The ERA task includes completing an ecological checklist and a screening-level ERA (SLERA). The checklist and SLERA documentation will be compliant with *Guidelines for Performing Screening Level Ecological Risk Assessments Within the North Carolina Division of Waste Management* (NC DENR, 2003). The SLERA will be completed and documented through Step 2 of the ERA process. Up to three conference calls with the North Carolina Department of Environment and Natural Resources (NCDENR) are anticipated to discuss the approach to the SLERA, the results at the conclusion of Step 2, and the initial comments on the SLERA portion of the RFI report. If Step 3a is required, based on the results of Step 2, then it will be conducted in accordance with current EPA guidance.

4.6.2 Human Health Risk Assessment

The HHRA will be conducted in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990a). The primary guidance document for the HHRA will be the *Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A) Interim Final* (USEPA, 1989). Additional guidance documents will be consulted, including the following:

- U.S. Environmental Protection Agency (USEPA). *Supplemental Guidance to RAGS: Region 4 Bulletins*, Human Health Risk Assessment Bulletins. EPA Region 4, originally published November 1995, Website version last updated May 2000: <http://www.epa.gov/region4/waste/oftecser/healthbul.htm> Office of Technical Services, USEPA Region 4. 2000.
- U.S. Environmental Protection Agency (USEPA). *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments*. Office of Solid Waste and Emergency Response. EPA 540-R-97-033. OSWER 9285.7-01D. December 2001.
- U.S. Environmental Protection Agency (USEPA). *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final*. OSWER 9285.7-02EP. July 2004.

The primary objective of the human health risk assessment is to assess the health risks associated with exposure to SWMU 177 groundwater for human receptors under current site conditions. The risk assessment will be comprised of the following components:

- **Identification of Chemicals of Potential Concern**—Identification of the contaminants found onsite and selection of the COPCs. COPCs represent the subset of all chemicals detected at the site that provides the largest contribution to total site risks. COPCs in soil and groundwater will be identified using USEPA Region 9 PRGs.
- **Exposure Assessment**—Identification of the potential pathways of human exposure, and estimation of the magnitude, frequency, and duration of these exposures.
- **Toxicity Assessment**—Assessment of the potential adverse effects of the COPCs and compilation of the toxicity values used for developing numerical risk estimates.
- **Risk Characterization**—Integration of the results of the exposure and toxicity assessments to develop numerical estimates of health risks, and characterization of the potential health risks associated with potential exposure to site-related contamination.
- **Uncertainty Assessment**—Identification and discussion of sources of uncertainty in the risk assessment.

The HHRA will utilize all available data to date that has been properly validated in accordance with USEPA guidelines plus data that is collected and validated from additional sampling during the RFI. Included in the RAGS Part D 2.x tables will be a column listing 2L standards and MCLs. Constituents exceeding ARARs (MCLs and 2L standards) will be presented in a table in the risk assessment write-up.

4.7 Report Preparation

An RFI Report will be prepared detailing the new sampling results and evaluation of risk associated with the COPCs identified at the site. The report will include, but not be limited to, the following:

- Information to supplement and/or verify the environmental setting of the SWMU including geology and hydrogeology
- A summary of the investigation/sampling activities

- Characterization of the source(s)
- Evaluation of the nature and extent of contamination
- Human health risk assessment
- Ecological risk assessment
- Conclusions and recommendations

A draft RFI report will be submitted to MCB, Camp Lejeune and NC DENR for comments and approval. Response to comments and necessary revisions will be made to the draft report before issuing a final report.

5.0 Project Management and Staffing

The proposed management and staffing for the amended RFI at SMWU 177 is shown on **Figure 5-1**. CH2M Hill's primary participants for this project (CTO-041) are as follows:

- Mr. Matt Louth - Activity Coordinator
- Mr. Dan Tomczak - Project Manager
- Ms. Louise Palmer - Senior Consultant
- Task Managers

Mr. Tomczak and the Task Managers will have the overall responsibility for conducting the field activities and completing the reports associated with this CTO. They will be supported by geologists, engineers, scientists, biologists, and clerical personnel, as needed. The Task Managers will report to Mr. Tomczak and Mr. Louth who will then relay pertinent issues and maintain close contact with NAVFAC Mid-Atlantic and the Base.

6.0 Project Schedule

The project schedule is presented in **Figure 6-1**. The schedule presents the anticipated completion and/or submittal dates for specific tasks or documents.

7.0 References

CH2M HILL, 2005. Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina. 2005

Baker Environmental, Inc. (Baker). 2005. *Final Phase II Confirmatory Sampling Report; Marine Corps Base Camp Lejeune*. April, 2005.

Law Engineering and Environmental Services, Inc., (Law). 1997. *Leaking Underground Storage Tank Site Assessment Report; UST-333C*. September, 1997.

North Carolina Department of Environment and Natural Resources (NCDENR). 2003. *Guidelines for Performing Screening Level Ecological Risk Assessments Within the North Carolina Division of Waste Management* (2003).

Peele's Pump and Tank Company. 1995. *Initial Site Assessment Report; UST Closure by Removal; 2-500 Gallon Heating Oil Tanks, Building 333*.

United States Environmental Protection Agency. 2000a. *Guidance for Data Quality Objectives Process*. 2000.

United States Environmental Protection Agency. 2000b. *Data Quality Objectives Process for Hazardous Waste Site Investigations*. 2000.

Figures



Legend

-  Deep Monitoring Well
-  Shallow Monitoring Well
-  Buildings
-  Road

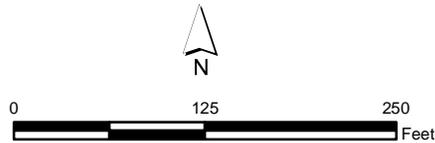


Figure 2-2
Existing Monitoring Wells
SWMU 177 RFI Work Plan
Marine Corps Base, Camp Lejeune
North Carolina



- Legend**
- Installation Area
 - SWMU Boundary
 - Limited Access Highway
 - Highway
 - Local Roads
 - Cities

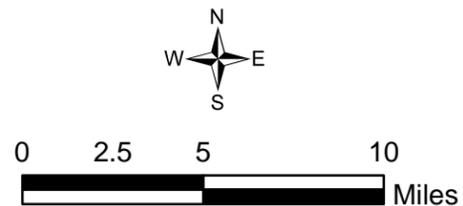


Figure 1-1
Base Location Map
SWMU 177 RFI Work Plan
Marine Corps Base, Camp Lejeune
North Carolina

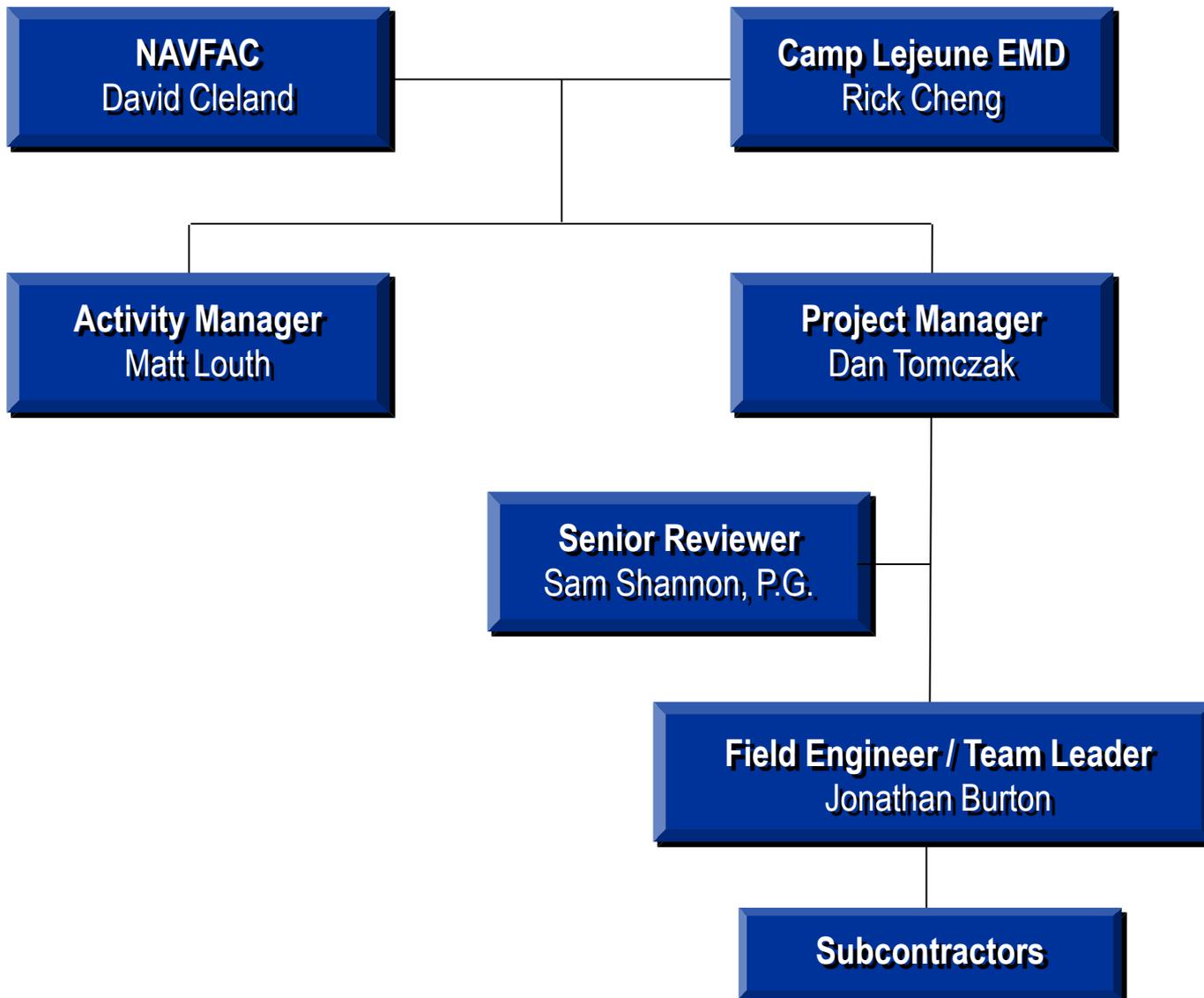


Figure 5-1
Project Organization
Site Specific Work Plan
SWMU 177

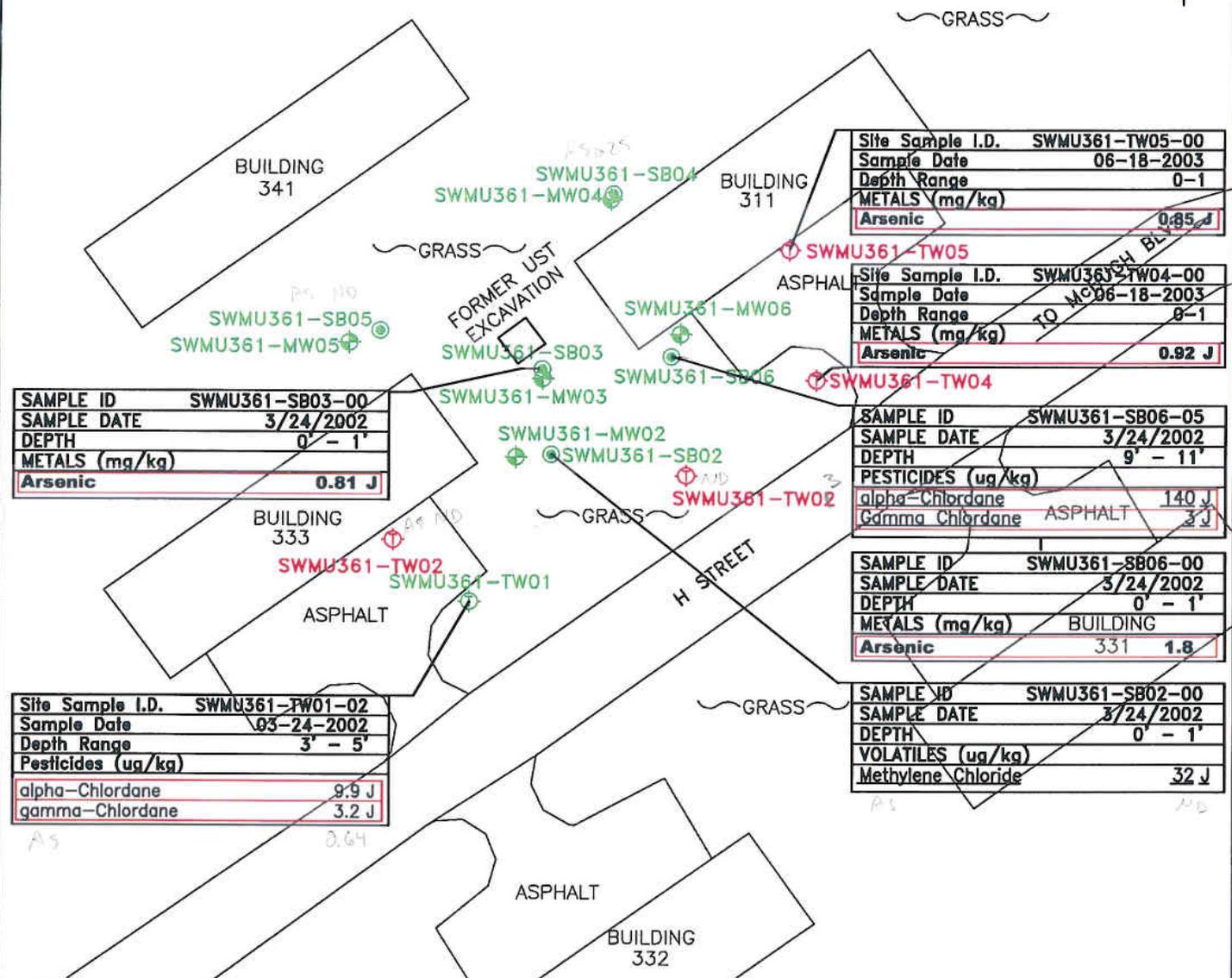
**FIGURE 6-1
 PROPOSED PROJECT SCHEDULE
 SWMU 177 RFI WORK PLAN
 MCB, CAMP LEJEUNE, NORTH CAROLINA**

TASK NAME	DURATION (days)	Start Date
Draft Site-Specific Work Plan	45	1 day after contract award
Final Site-Specific Work Plan	30	1 day after comments received
RFI Field Work	15	1 day after Final Work Plan submittal
Laboratory Analysis/Data Validation	60	3 days after start of field work
Draft RFI Report	90	90 days after completion of fieldwork
Agency Review	40	1 day after Draft Report submittal
Final RFI Report	30	30 days after comments received

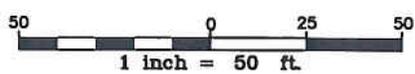
Attachment 1

Excerpts from Phase II CSI Report, Baker, 2005

As = Surface issue only



NOTE:
 Bold - Exceeds base background concentrations
 Underline - Exceeds NC DENR soil to groundwater comparison criteria
 Boxed - Exceeds USEPA Region IX PRGs



LEGEND

- ⊕ - PHASE II TEMPORARY WELL
- ⊕ - ADDITIONAL PHASE II TEMPORARY WELL
- ⊕ - SOIL BORING
- ⊕ - EXISTING MONITORING WELL

FIGURE 2
 PHASE II CONFIRMATORY INVESTIGATION
 CONSTITUENTS EXCEEDING SCREENING
 CRITERIA IN SOIL
 SWMU 361
 CTO-143
 MARINE CORPS BASE, CAMP LEJEUNE
 NORTH CAROLINA

SOURCE: MCB CAMP LEJEUNE MARCH 2000

SAMPLE ID	SWMU361-MW06
SAMPLE DATE	04-07-2002
PESTICIDES (ug/L)	
4,4'-DDE	0.84 J
alpha-Chlordane	5.8 J
gamma-Chlordane	1.9 J
Heptachlor epoxide	3.3 J

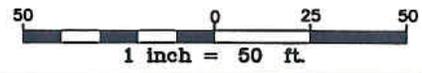
SAMPLE ID	SWMU361-MW04
SAMPLE DATE	04-07-2002
SEMIVOLATILES (ug/L)	
Naphthalene	16
2-Methylnaphthalene	27

Site Sample I.D.	SWMU361-MW06
Sample Date	06-26-2003
PESTICIDES (ug/L)	
alpha-Chlordane	1.1 J
gamma-Chlordane	1.5 J

Site Sample I.D.	SWMU361-MW06D
Sample Date	06-26-2003
PESTICIDES (ug/L)	
alpha-Chlordane	1.2 J
gamma-Chlordane	1.2 J

SAMPLE ID	SWMU361-MW02
SAMPLE DATE	04-07-2002
PESTICIDES (ug/L)	
Heptachlor epoxide	0.023 J

NOTE:
Bold - Exceeds NC 2L standards
Underline - Exceeds USEPA Region IX PRGs
J - Analyte detected - Reported value is estimated

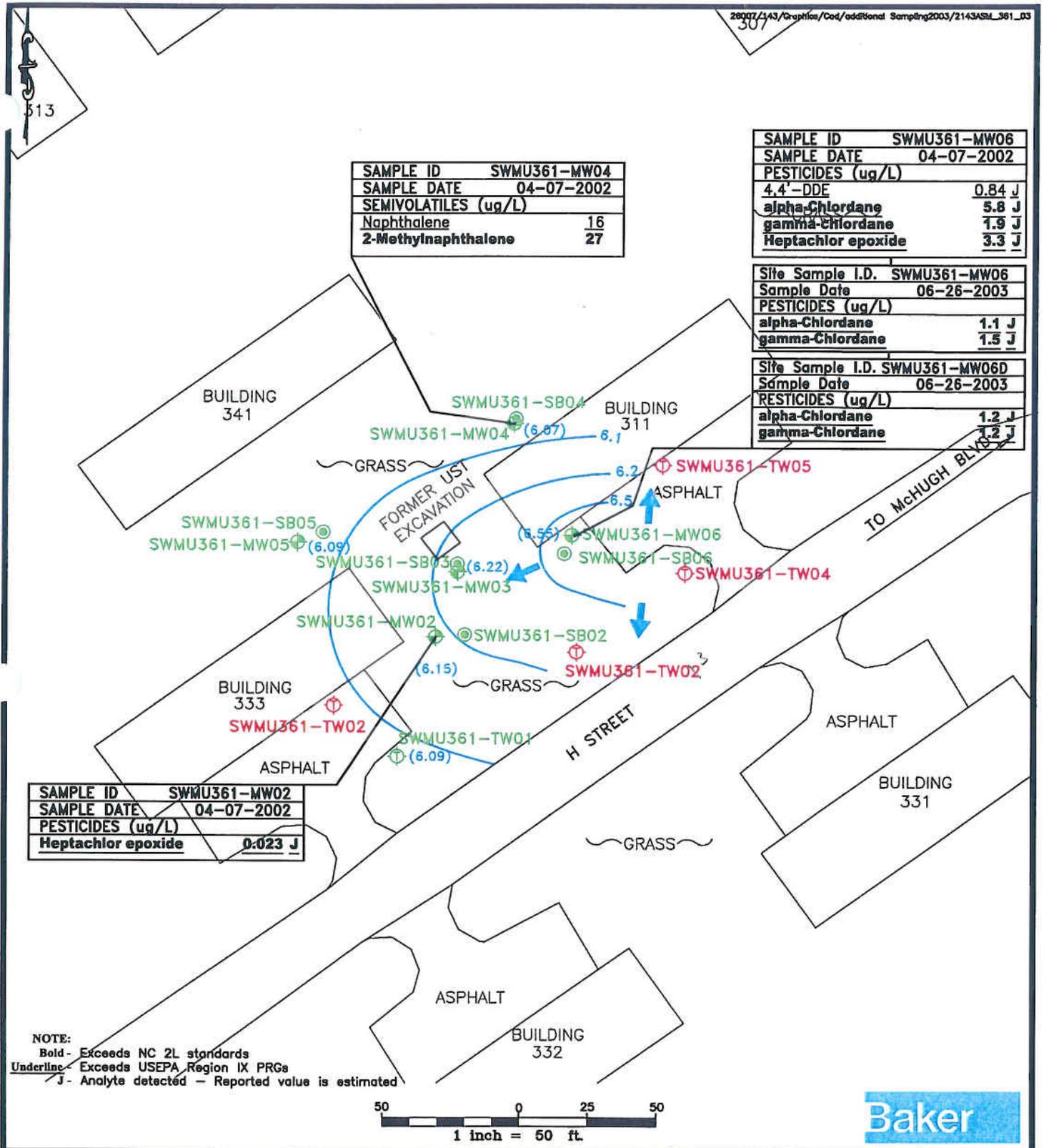


LEGEND

- PHASE II TEMPORARY WELL
- ADDITIONAL PHASE II TEMPORARY WELL
- SOIL BORING
- EXISTING MONITORING WELL
- GROUNDWATER FLOW DIRECTION
- 6.1 - GROUNDWATER CONTOUR

SOURCE: MCB CAMP LEJEUNE MARCH 2000

FIGURE 3
 PHASE II CONFIRMATORY INVESTIGATION
 CONSTITUENTS EXCEEDING SCREENING
 CRITERIA IN GROUNDWATER
 SWMU 361
 CTO-143
 MARINE CORPS BASE, CAMP LEJEUNE
 NORTH CAROLINA



**Site Specific Quality Assurance Project Plan
RCRA Facility Investigation
SWMU 177**

**Marine Corps Base
Camp Lejeune, North Carolina**

**Contract Task Order 041
September 2006**

Prepared for
**Department of the Navy
Mid-Atlantic Division
Naval Facilities Engineering Command**

Under the
**LANTDIV CLEAN III Program
Contract N62470-02-D-3052**

Prepared by



Charlotte, North Carolina

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Acronyms and Abbreviations

AM	Activity Manager
COC	Chain of Custody
DQO	Data Quality Objective
ER	Equipment Rinse blank
FB	Field Blank
FTL	Field Team Leader
MCB	Marine Corps Base
MS/MSD	Matrix Spike/Matrix Spike Duplicate
PM	Project Manager
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Project Plan
RFI	RCRA Field Investigation
RTL	Review Team Leader
SSC	Site Safety Coordinator
SWMU	Solid Waste Management Unit
TB	Trip Blank

1.0 Introduction

This site-specific *Quality Assurance Project Plan* (QAPP) is meant to serve in conjunction with the Marine Corps Base (MCB) Camp Lejeune Master Project QAPP (CH2M HILL, 2005). The specific information contained in this site-specific QAPP supplements the general information contained in the Master QAPP. This document applies only to the RCRA Facility Investigation (RFI) at Solid Waste Management Unit (SWMU) 177. The QAPP describes the data quality objectives, specific quality assurance (QA) and quality control (QC) activities, and laboratory activities necessary to achieve the data quality objectives (DQOs) of the project. Subcontractors will be required to review both the Master QAPP and the site-specific QAPP. Subcontractors will be expected to adhere to the procedures specified in these documents. All field activities will be conducted by CH2M HILL or subcontractors under the direct supervision of CH2M HILL.

Sections 1 and 2 of the Site-Specific Work Plan provide a detailed project description and site history for SWMU 177.

2.0 Project Organization and Responsibilities

This section identifies key team members for each project; lists the QA/QC responsibilities associated with each position; and describes communication procedures that will be followed throughout the specific project.

2.1 Project Team Members

The organizational structure and responsibilities are designed to provide project QA/QC for the field investigation activities at SWMU 177. Each position is described in the MCB Camp Lejeune Master QAPP. The project team for the RFI is:

Project Manager (PM)	Dan Tomczak
Activity Manager (AM)	Matt Louth
Senior Consultant	Louise Palmer
Review Team Leader (RTL)	Sam Shannon
Lead Data Manager	Felicia Arroyo
Field Team Leader (FTL) & Site Safety Coordinator (SSC)	James Frank
Field Engineer	Erin Must
Health and Safety Manager	Michael Goldman
Project Accountant	Katya Maltseva
Project Delivery Leader	JoLee Gardner

2.2 Subcontractors

Subcontractors will be used for the RFI activities at SWMU 177. The following services will be provided by subcontractors:

- Fixed base analytical laboratory services
- Data validation services

Procurement of subcontractors will be performed in accordance with the Navy CLEAN Contract Procurement Manual.

2.3 Project Communication

Communications among all project personnel will be conducted in accordance with the MCB Camp Lejeune Master QAPP.

3.0 Sample Identification and Custody

An electronic sample tracking program will be used to manage the flow of information from the field sampling team to the laboratory and to internal and external data users.

The method of sample identification used depends on the type of sample collected and the sample container.

- The field analysis data are recorded in field logbooks or on data sheets, along with sample identity information, while in the custody of the sampling team.
- Labels for samples sent to a laboratory for analysis will be produced electronically. If they cannot be produced electronically, they must be written in indelible ink. The following information typically is included on the sample label:
 - Site name or identifier
 - Sample identification number
 - Date and time of sample collection
 - Sample matrix or matrix identifier
 - Type of analyses to be conducted

Each analytical sample will be assigned a unique number of the following format:

Site # - Media-Station # -QA/QC - Year/Round or Depth Interval

An explanation of each identifier is provided below:

Site #	SWMU 177
Media	GW – Groundwater WT – Water (rinsate, decontamination fluid, ambient potable water)
QA/QC	FB = Field blank DUP = Duplicate sample (following sample type/number) TB = Trip blank ER = Equipment rinsate
Depth/Round	The number will reference the depth interval of the sample. For example, "0-1" = 0 to 1 feet below ground surface (bgs), "1-2" = 1 to 2 feet bgs, "2-3" = 2 to 3 feet bgs, etc.

All matrix spike/matrix spike duplicate (MS/MSD) samples will be entered in the same line on the chain of custody as the field sample. The total number of sample containers submitted will be entered on the chain of custody and "MS/MSD" will be indicated in the comments section.

Using this sample designation format, the sample designation SWMU177-GW-MW01-12-15 refers to:

The sample designation SWMU177-GW02-8-12 refers to:

<u>SWMU177-GW02-8-12</u>	SWMU 177
SWMU177- <u>GW02-8-12</u>	Groundwater sample collected from monitoring well MW02
SWMU177-GW02- <u>8-12</u>	Collected from the depth of 8 to 12 ft bgs

For QA/QC samples that include TB, ER, and FB, the date of collection is included in the sample designation. For example, the sample designation SWMU360-TB081505 refers to:

<u>SWMU177-TB081506</u>	SWMU 177
SWMU177- <u>TB081506</u>	Trip blank for the day of August 15, 2006

This sample designation format will be followed throughout the RFI for SWMU 177. Table 3-1 lists all of the sample designations and QA/QC samples for the sampling at SWMU 177. Required deviations to this format will be documented in the field logbook.

Sample custody and COC records will be maintained in accordance with the MCB Camp Lejeune Master QAPP.

Table 3-1
Sample Analysis Summary
 SWMU 177 RFI
 MCB Camp Lejeune, North Carolina

Well/Station ID	Sample ID	Sample Depth (ft bgs)	SVOCs (SW846 8270)	TCL Pesticides
SWMU177-MW01	SWMU177-GW01-43-44		1	1
SWMU177-MW02	SWMU177-GW02-12-13		1	1
SWMU177-MW03	SWMU470-GW03-12-13		1	1
SWMU177-MW04	SWMU470-GW04-12-13		1	1
SWMU177-MW05	SWMU470-GW05-12-13		1	1
SWMU177-MW06	SWMU470-GW06-12-13		1	1
SWMU177-MW07	SWMU470-GW07-43-44		1	1
Total Samples			7	7
Field Duplicate Samples			1	1
Matrix Spike Samples			1	1
Matrix Spike Duplicate Samples			1	1
Field Blanks			1	1
Equipment Rinse Blanks			1	1
Trip Blanks			0	
Total Number of Samples:			12	12

**Site Specific Health and Safety Plan
For SWMU 177**

**Marine Corps Base
Camp Lejeune, North Carolina**

**Contract Task Order 041
September 2006**

**Prepared for
Department of the Navy
Atlantic Division
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**Under the
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Charlotte, North Carolina

Introduction

The health and safety of site personnel and the public are a primary concern during investigative and remedial activities at potentially hazardous sites. This Site Specific Health and Safety Plan (HASP) template is to be used in the formation of site specific HASP's.

CH2M HILL SITE SPECIFIC HEALTH AND SAFETY PLAN

(Reference CH2M HILL SOP 19, *Health and Safety Plans*)

This health and safety plan will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOP) in the CH2M HILL *Corporate Health and Safety Program*, as appropriate. The site safety coordinator (SC-HW) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment 1. In addition, this plan adopts procedures in the work plan for the project.

1. PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

PROJECT NO: 184582

CH2M HILL PROJECT MANAGER: Dan Tomczak

OFFICE: RDU

SITE NAME: Marine Corps Base, Camp Lejeune, SWMU 177

SITE ADDRESS: Jacksonville, North Carolina

DATE HEALTH AND SAFETY PLAN PREPARED: June 19, 2006

DATE(S) OF INITIAL VISIT:

DATE(S) OF SITE WORK: July 10 through December 30, 2006

SITE ACCESS: good.

SITE SIZE: The site is approximately one acre.

SITE TOPOGRAPHY: flat

SITE DESCRIPTION AND HISTORY:

SWMU 177, previously reported as SWMU 361, is a former UST located near Building 333. The building is currently utilized as an office and classroom building and is located on the west side of "H" Street. A 550-gallon UST, used to store kerosene, was removed in 1993. During the tank removal, the presence of volatile organic vapors was reported at levels generally less than 200 ppm. Confirmatory soil samples collected from the tank pit were tested and found oil and grease at concentrations in excess of state action levels. As a result, a site assessment was conducted. Results of sampling showed elevated concentrations of chlorinated compounds in the soil and groundwater.

A Phase II Confirmatory Sampling Investigation (CSI) was conducted between March and April 2002 in order to evaluate potential impacts to soil at the SWMU and determine if groundwater has been impacted as a result of a release(s) from the SWMU. Several compounds were detected in soil and/or groundwater at concentrations exceeding the applicable screening criteria. Compounds that exceeded both the AOC and Base background criteria (metals only) and the NC DENR soil to groundwater criteria and/or the USEPA Region IX residential PRG in soil included the following:

- VOCs - methylene chloride
- Pesticides - alpha-chlordane and gamma-chlordane
- Metals - arsenic

Compounds that exceeded both the established background criteria (metals only) and NC DENR 2L standards in groundwater include the following:

- Semivolatiles - Naphthalene and 2-Methylnaphthalene
- Pesticides - 4,4'-DDE, alpha-chlordane, gamma-chlordane and heptachlor epoxide

For the following discussion, contamination is defined as exceedances of base background (metals only) and state and federal screening criteria.

Surface and subsurface soil contamination in the vicinity of SWMU 177 is primarily related to organic and inorganic pesticides. The variety of pesticides detected and locations are consistent with historical pest control application and are not likely related to SWMU 177 operation (petroleum UST).

Groundwater contamination in the vicinity of SWMU 177 is related to organic pesticides and fuel. The presence of pesticides (alpha-chlordane, gamma-chlordane, and heptachlor epoxide) in the groundwater sample from well SWMU177-MW06 seems to be related to the soil contamination. Naphthalene and 2-methylnaphthalene contamination in well SWMU177-MW04 is likely related to SWMU 177; both of these SVOCs are fuel-related. Other VOCs detected during the UST investigation (ethylbenzene, isopropylbenzene, methylcyclohexane and total xylenes) are also fuel-related.

Figure 1-1

THIS PAGE IS RESERVED FOR SITE MAP.

2. PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

CLIENT: David Cleland
Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

CH2M HILL: Activity Manager: Matt Louth / VBO
Project Manager: Dan Tomczak / RDU
Health and Safety Manager: Mike Goldman / ATL
Field Team Leader: Jonathan Burton / CLT
Field Staff: Jonathan Burton / CLT

CONTRACTORS and SUBCONTRACTORS: Not Applicable.

2.2 DESCRIPTION OF TASKS (Reference CH2M HILL SOP HS-19, Written Plans)

Refer to site-specific addenda (i.e., work plan, field sampling plan) for detailed task information. A health and safety risk analysis has been performed for each task and is incorporated into this HASP through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below and in the Master HASP require an approved amendment before additional work begins.

2.2.1 HAZWOPER-REGULATED TASKS

- Groundwater sampling
- Groundwater level measurement

2.2.2 NON-HAZWOPER-REGULATED TASKS

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.**

2.3 TASK HAZARD ANALYSIS

Engineering and administrative controls are to be implemented by the party in control of the site or the hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees and subcontractors must, at a minimum, remain aware of hazards affecting them regardless of who is responsible for controlling the hazards. Specialty subcontractors are responsible for the safe operation of their equipment (e.g., drill rig, heavy equipment). CH2M HILL employees are not to operate, or assist in the operation of, any subcontractor or contractor equipment.

Tasks

Potential Hazard (Refer to SOP, or HSP Section)	Engineering Controls, Administrative Controls, and Work Practices	Surveying	Groundwater Monitoring
Flying debris/ objects	Wear safety eyewear and hardhat		
Noise > 85dBA	Wear ear plugs/ muffs		
Electrical	Locate underground and overhead utilities prior to task		X
Suspended Loads	Wear hardhat, Be aware of location of overhead hazards		
Buried Utilities, drums, tanks	Locate underground utilities prior to task. Stop if object is encountered		
Slip, trip, fall	Be sure of footing, especially in wet or muddy conditions	X	X
Back injury	Be careful when lifting and use proper lifting techniques	X	X
Visible lightning	Discontinue task if lightening is observed	X	X

3.1 HAZARDS POSED BY CHEMICALS BROUGHT ON THE SITE

This section discusses hazards posed by chemicals commonly used during RI/FS and other environmental investigation activities. Additional chemicals may be needed for future tasks.

3.1.1 HAZARD COMMUNICATION

(Reference CH2M HILL SOP HS-05, *Hazard Communication*)

The project manager is to request Material Safety Data Sheets (MSDSs) from the client or from the contractors and the subcontractors for chemicals to which CH2M HILL employees potentially are exposed. The SC-HW is to do the following:

Give employees required site-specific HAZCOM training.

Confirm that the inventory of chemicals brought on the site by subcontractors is available.

Before or as the chemicals arrive on the site, obtain an MSDS for each hazardous chemical.

Label chemical containers with the identity of the chemical and with hazard warnings, if any.

The chemical products listed below will be used on the site. Refer to Master HASP for MSDSs.

Chemical	Quantity	Location
----------	----------	----------

3.1.2 SHIPPING AND TRANSPORTATION OF CHEMICAL PRODUCTS

(Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods)

Nearly all chemicals brought to the site are considered hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive the CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.2 CONTAMINANTS OF CONCERN					
Contaminant	Location and Highest Concentration	NCOSHA Exposure Limit ^a	IDLH ^b	Symptoms and Effects of Exposure	PIP ^c (eV)
Methylene chloride	SB02: 32 µg/kg	25 ppm	2300 ppm	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	11.3 2
Trichloroethene	TW01: 10 µg/kg	50 ppm	1000 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	9.45
Bis(2-Ethylhexyl)phthalate	SB04: 7600 µg/kg	5 mg/m ³	5,000 Ca	Eye and mucous membrane irritant	UK
Di-n-octyl phthalate	SB03: 98 µg/kg	5 mg/m ³	5000 mg/m ³	Irritation eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]	uk
Alpha-chlordane	SB06: 140 µg/kg MW06: 5.8 µg/L	0.5 mg/m ³	100 Ca	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremors anuria	UK
Gamma-chlordane	SB06: 37 µg/kg MW06: 1.9 µg/L	0.5 mg/m ³	100 Ca	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremors anuria	UK
Heptachlor epoxide	MW06: 3.3 µg/L				
Arsenic	SB06: 1.8 mg/kg	0.01 mg/m ³	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
Barium	SB02: 29 mg/kg MW02: 138 µg/L	0.5 mg/m ³	50 mg/m ³	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia	UK
Chromium	SB02: 22.3 mg/kg	0.5 mg/m ³	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Lead	SB04: 9.5 mg/kg GW01: 10.4 µg/L	0.05 mg/m ³	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA

3.2 CONTAMINANTS OF CONCERN					
Contaminant	Location and Highest Concentration	NCOSHA Exposure Limit^a	IDLH^b	Symptoms and Effects of Exposure	PIP^c (eV)
Mercury	SB04: 0.04 mg/kg	0.05 mg/m ³	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumonitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	NA
Ethylbenzene	MW04: 1 µg/L	100 ppm	800	Eye, skin, and mucous membrane irritation; headache; dermatitis; narcotic; coma	8.76
Isopropylbenzene	MW04: 3 µg/L	100	700	Irritation eyes, skin, nose, throat; drowsiness; dermatitis	8.35
Methylcyclohexane	MW04: 1 µg/L	400	1200	Irritation eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis	9.85
Xylenes	MW04: 52 µg/L	100 ppm	900	Irritated eyes, skin, nose, and throat; dizziness; excitement; drowsiness; incoherence; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	8.56
2-methylnapthalene	MW04: 27 µg/L	3 mg/m ³	100 mg/m ³	Irritated eyes, skin, nose, and throat;	UK
4,4-DDE	MW06: 0.84 µg/L	1 mg/m ³	500 mg/m ³	CNS effects, such as headaches, nausea, and convulsions.	UK
Naphthalene	MW04: 16 µg/L	10 ppm	250	Eye irritation, headache, confusion, excitement, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, dermatitis, corneal damage, optical neuritis	8.12
<p>Footnotes:</p> <p>a: Appropriate value of PEL, REL, or TLV listed</p> <p>b: IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant)</p> <p>c: PIP = photoionization potential</p> <p>GW - Groundwater</p> <p>SD - Sediment</p> <p>SW - Surface Water</p> <p>J - Estimated concentration</p> <p>D - Compound identified in analysis at a secondary dilution factor</p> <p>B - Analyte found in associated blank as well as in sample</p>					

3.3 POTENTIAL ROUTES OF EXPOSURE

DERMAL: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.

INHALATION: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in sections 5 and 6, respectively.

OTHER: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

4 PERSONNEL

4.1 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES

4.1.1 CLIENT

Client Contact

David Cleland
NAVFAC Engineering Command
Code: OPCEV
6506 Hampton Blvd
Norfolk, Virginia 23508-1278
757-322-4630
757-322-4805 fax

Base Contact

Bob Lowder
Camp Lejeune - EMD
Building 12
Marine Corps Base
Camp Lejeune, NC 28542-0004
(910) 451-9607
(910) 451-5997

4.1.2 CH2M HILL

Activity Manager/Phone: Matt Louth / VBO (757) 671-8311 ext 417
Project Manager/Phone: Dan Tomczak / RDU (919) 875-4311 ext 19
Health and Safety Manager (HSM)/Phone: Mike Goldman / ATL (770) 604-9182 ext 396
Field Team Leader/Phone: Jonathan Burton / CLT (704)-329-0073 ext 216
Site Safety Coordinator/Phone: Jonathan Burton / CLT (704)-329-0073 ext 216

The SC-HW is responsible for contacting the field team leader and the project manager. In general, the project manager either will contact or will identify the client contact. The Health and Safety Manager (HSM) should be contacted as appropriate. The SC-HW or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by OSHA or other agencies are conducted. Refer to Master HASP sections 11 and 12 for emergency procedures and phone numbers.

4.1.3 SUBCONTRACTORS

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

When specified in the project documents (e.g., contract), this plan may cover CH2M HILL subcontractors. However, this plan does not address hazards associated with tasks and equipment that the subcontractor has expertise in (e.g., operation of drill rig). Specialty subcontractors are responsible for health and safety procedures and plans specific to their work. Specialty subcontractors are to submit plans to CH2M HILL for review and approval before the start of fieldwork. Subcontractors must comply with the established health and safety plan(s). CH2M HILL must monitor and enforce compliance with the established plan(s).

Subcontractor: Not Applicable
Subcontractor Contact:
Telephone:

4.1.4 CONTRACTORS

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for directing contractor personnel and is not to assume responsibility through their actions. When the contractor is in control of the site, ask the contractor to conduct a briefing of their health and safety practices and to describe how they apply to CH2M HILL's activities. Request a copy of the contractor's health and safety plan.

Contractor: None Covered
Contact Name:
Telephone:

5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

(Reference CH2M HILL SOPs HS-07, Personal Protective Equipment, and HS-08, Respiratory Protection)

5.1 PPE SPECIFICATIONS^a

Task	Level	Body	Head	Respirator ^b
General site entry Surveying Observation of material loading for offsite disposal Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat ^c Safety glasses Ear protection ^d	None required
Surface water sampling Aquifer testing Sediment sampling Surface soil sampling Hand augering Geoprobe boring	Modified D	Work clothes or cotton coveralls Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Safety glasses Ear protection ^d	None required
Groundwater sampling Soil boring Investigation-derived waste (drum) sampling and disposal	Modified D	Coveralls: Uncoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Safety glasses Ear protection ^d	None required.
General site entry Surveying Observation of material loading for offsite disposal Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat ^c Safety glasses Ear protection ^d	None required

Reasons for Upgrading or Downgrading Level of Protection

Upgrade ^f	Downgrade
<ul style="list-style-type: none"> Request from individual performing tasks. Change in work tasks that will increase contact or potential contact with hazardous materials. Occurrence or likely occurrence of gas or vapor emission. Known or suspected presence of dermal hazards. Instrument action levels (Section 5) exceeded. 	<ul style="list-style-type: none"> New information indicating that situation is less hazardous than originally thought. Change in site conditions that decreases the hazard. Change in work task that will reduce contact with hazardous materials.

^a Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SSC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

^e Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

^f Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SSC qualified at that level is present.

6 AIR MONITORING SPECIFICATIONS

(Reference CH2M HILL SOP HS-06, *Air Monitoring*)

FID: OVA model 128 or equivalent	Groundwater sampling	<1 ppm 1 to 10 ppm >10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
PID: OVM with 10.6eV lamp or equivalent	Groundwater sampling	<1 ppm 1 to 10 ppm >10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent	Groundwater sampling	0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
O₂Meter: MSA model 260 or 261 or equivalent	Groundwater sampling	>25% ^c O ₂ : 20.9% ^c O ₂ : <19.5% ^c O ₂ :	Explosion hazard; evacuate or vent Normal O ₂ O ₂ deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily

Notes:

a: Action levels apply to sustained breathing-zone measurements above background.

b: The exact frequency of monitoring depends on field conditions and is to be determined by the SC-HW; generally, every 5 to 15 minutes is acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time and measurement result, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3," "at surface/SB-2," etc.).

6.1 CALIBRATION SPECIFICATIONS

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing

6.2 AIR SAMPLING

Sampling may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description:

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: Michael Goldman / ATL

Other:

This site-specific health and safety plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

7.1 ORIGINAL PLAN

WRITTEN BY: Jonathan Burton/CLT

DATE: 6/20/06

APPROVED BY: Michael Goldman CIH, CSP, CHMM

DATE: June 27, 2006

7.2 REVISIONS

REVISIONS MADE BY: Michael Goldman

DATE: September 1, 2006

REVISIONS TO PLAN: Updated pre client comments

REVISIONS APPROVED BY: Michael Goldman CIH, CSP, CHMM **DATE:** September 1, 2006

9 EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification **MUST** be made within 24 hours of the injury.

24-Hour CH2M HILL Emergency Beeper - 1 (888) 444-1226

Medical Emergency - 911 or		CH2M HILL Medical Consultant Dr. Jerry Berke
Hospital ER (On-Base)#:	(910) 451-4840 (910) 451-4841 (910) 451-4842	Health Resources, Woburn, MA (888) 631-0129 (After hours calls will be returned within 20 minutes)
Onslow County ER (Off-Base)#:	(910) 577-2240	
Ambulance (On-Base)#:	(910) 451-3004 (910) 451-3005	
Ambulance (Public) #:	(910) 451-9111	
LEPC (Poison Control) #:	(800) 222-1222	
Fire/Spill Emergency - 911 or		Local Occupational Physician
Base Fire Response #:	(910) 451-9111	Occupational Medicine Specialists 4815 Oleander Dr. Wilmington, NC 28403 (910) 451-1111
Security & Police - 911 or		Corporate Director Health and Safety
Base Security #:	(910) 451-2555	Name: Millie Grinell/DEN Phone: (715) 682-9334 24-hour emergency beeper: 888-444-1226
On-Scene Coordinator		Environmental Management Division (EMD)
Name: Fire Chief		Name: Bob Lowder
Phone: (910) 451-5815		Phone: (910) 451-9607
Utilities Emergency		Health and Safety Manager (EMD)
Water		Name: Michael Goldman/ATL
Gas: Contact Base EMD		Phone: (770) 604-9182 x396
Electric		
Designated Safety Coordinator (DSC) see Site-Specific HASP		Regional Human Resources Department
Name: Jonathan Burton		Name: Mary Jo Jordan/GNV
Phone: 704-329-0073 x216		Phone: (352) 355-2867
Project Manager see Site Specific HASP		Corporate Human Resources Department
Name: Dan Tomczak		Name: John Monark/COR
Phone: 919-875-4311 x19		Phone: (303) 771-0900
Federal Express Dangerous Good Shipping		Workers' Compensation and Auto Claims
Phone: (800) 238-5355		Sterling Administration Services
CH2M HILL Emergency # for Shipping Dangerous Goods		Phone: (800) 420-8926 After hours: (800) 497-4566
Phone: (800) 255-3924		Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars
Facility Alarms: TBD		Evacuation Assembly Area(s): TBD by the SC-HW; will probably be the local hotel where the field team is staying
Facility/Site Evacuation Route(s): follow main roads towards access gates and off the Base		

Route to Hospital: (Refer to Figure 12-1) Depends on location within base area

Directions to **Onslow County Memorial Hospital** from SWMU 177

Head toward Main Service Rd

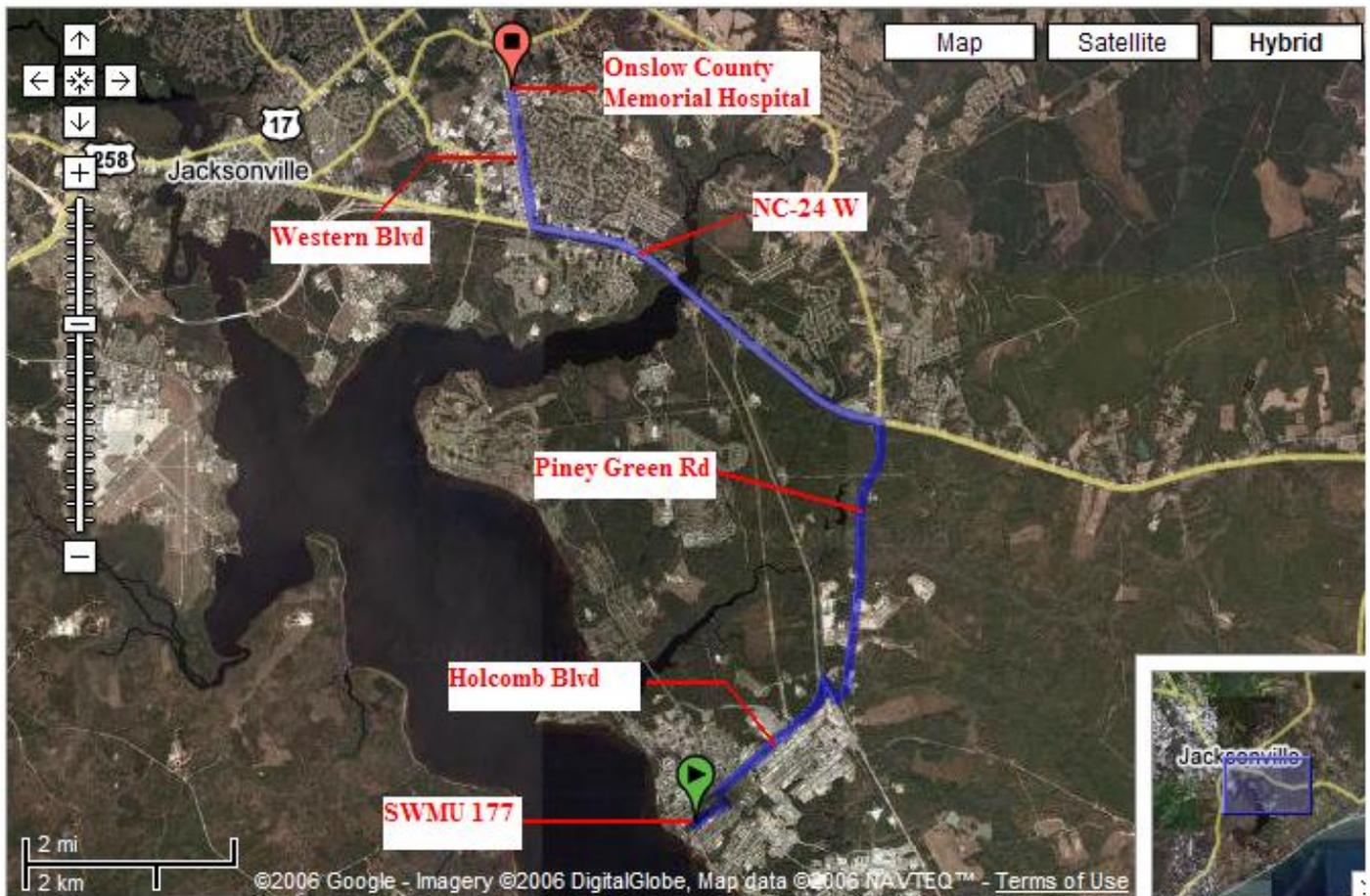
Turn right on Holcomb Blvd and follow for approx 1.5 mi

Turn right on Sneads Ferry Rd and follow for approx 0.2 mi

Turn left on Piney Green Rd and follow for approx 2.7 mi

Turn left at NC 24 W and follow for approx 4 mi.

Turn right on Western Blvd and follow for approx. 1.3 miles until you reach the hospital at **317 Western Blvd.**



10 GOVERNMENTAL AGENCIES INVOLVED IN PROJECT

Contact the project manager. Generally, the Project Manager will contact relevant government agencies.

