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SITE SPECIFIC FIELD SAMPLING AND ANALYSIS PLAN RCRA FACILITY INVESTIGATION SOLID WASTE MANAGEMENT UNIT 307 (SWMU 307) MCB CAMP LEJEUNE NC

6/1/2007

CH2M HILL

Site Specific Field Sampling and Analysis Plan
RCRA Facility Investigation
SWMU 307

Marine Corps Base
Camp Lejeune, North Carolina

Prepared for

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

Under the

CLEAN III Program
Contract N62470-02-D-3052

Contract Task Order 0134

June 2007

Prepared by

Raleigh, North Carolina

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List of Acronyms and Abbreviations

CLEAN	Comprehensive Long-Term Environmental Action Navy
CSM	Conceptual Site Model
CTO	Contract Task Order
DoN	Department of Navy
DPT	Direct Push Technology
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EIMS	Environmental Information Management System
ERA	Ecological Risk Assessment
GPS	Global Positioning System
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MSL	Mean Sea Level
NAVFAC	Naval Facilities Engineering Command
NCDENR	North Carolina Department of Environment and Natural Resources
NEESA	Naval Energy and Environment Support Activity
PCB	polychlorinated Biphenyls
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAC	Remedial Action Contractor
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SOP	Standard Operating Procedures
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

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) 307 – Oil/Water Separator and Vehicle Wash Rack at Marine Corps Base (MCB) Camp Lejeune, North Carolina (the Base). A general location/Index map of the Base showing the location of SWMU 307 is provided as **Figure 1-1**.

This Site-Specific Work Plan was prepared by CH2M HILL under Contract Task Order (CTO) 0134 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 Project Plans and is not repeated herein. Site-specific background information for SWMU 307 is presented below.

SWMU 307 has been identified as an area of impacted soils near an oil/water separator at the Camp Geiger portion of MCB Camp Lejeune. The site is located southwest of building G650, along F Street between 6th and 7th Streets. **Figure 2-1** shows the general SWMU area.

2.1 Phase I CSI (Baker, 1997)

Baker Environmental performed a Comprehensive Site Investigation (CSI) in September 1997 to identify if operations of the oil/water separator connected to the wash rack contaminated soils in the area. Four soil borings (SWMU307-IS01 through -IS04) were performed in the vicinity of the oil/water separator. Surface and subsurface soil samples were collected at 0-2 and 4-6 ft below ground surface (bgs), respectively. Samples were analyzed for volatile and semi-volatile organic compounds (VOCs, SVOCs) and RCRA Metals.

Mercury was reported in one soil sample, SWMU307-IS02-02 (4-6 ft bgs). No further action was recommended for this site as VOCs and SVOCs did not exceed screening criteria. However, soils in the vicinity of the former wash rack were never sampled.

2.2 Phase II CSI (Baker, 2002)

Baker Environmental conducted a Phase II CSI on March 21 and April 3, 2002. Surface and subsurface soils and groundwater samples (from three temporary wells) were collected during the initial sampling. As a result of lead concentrations observed in the initial Phase II groundwater sampling, additional groundwater sampling was conducted in June 2003.

Several metals were detected in soil and/or groundwater during the Phase II CSI. In soil samples, arsenic, barium, chromium and mercury concentrations exceeded both Base background screening criteria and North Carolina Department of Environmental and Natural Resources (NCDENR) soil to groundwater screening criteria. In groundwater, the lead concentrations from two of the temporary wells, TW03 and TW07, exceeded both the Base background screening criteria and the North Carolina 2L Groundwater Quality Standard. Based on these analytical results from the CSIs an RFI was recommended for SWMU 307.

The Phase I and II analytical results are displayed in **Tables 2-1** through **2-3**, for surface soils, subsurface soils, and groundwater respectively. The data collected were compared to the most current regulatory criteria for the analytes sampled. Figure 1 from the Baker Phase II CSI (**Appendix A**) shows both the sampling locations from the Phase I and II CSI in addition to the potentiometric surface at SWMU 307. Mercury and silver concentrations in surface and/or subsurface soils in addition to lead concentrations in groundwater exceed the most current Base background and NC DENR soil to groundwater screening criteria.

3.0 Preliminary Conceptual Site Model

The preliminary Conceptual Site Model (CSM) is an essential element of a results-based corrective action program. It is an important assessment tool that integrates the information needed to understand how COPCs move through the environment and potentially come in contact with human and ecological receptors. Development of a CSM is an iterative process; the model is refined as new information becomes available. The CSM is an effective tool in identifying additional data needs, and supporting management decisions regarding sampling strategies, project constraints, and regulatory compliance. Key elements of the CSM are grouped into major categories identifying potential sources, extent of contaminant migration, constituent fate and transport, as well as potential exposure pathways and receptors.

3.1 Source

The source of soil and groundwater contamination at this SWMU is thought to be the oil/water separator associated with the former wash rack.

3.2 Fate and Transport Mechanisms

Fate and transport analysis can improve understanding of the distribution of observed constituents, support risk assessments, and aid in identifying potential remedial alternatives, if necessary. A transport pathway describes the mechanisms whereby SWMU-related constituents, once released, can be transported from a source to an exposure media.

3.2.1 Soil

Concentrations of several metals in surface and subsurface soil samples were caused by outward migration from the source areas. Different contaminants sorb to soil particles as a function of the soil characteristics (for example, organic content and clay percentage), as a function of soil conditions (such as pH and temperature), and as a function of the chemical properties of the contaminant (for example, solubility and partitioning coefficient). The extent of soil impacts both vertically and horizontally, relative to the source area is a data need for this RFI. This work plan proposes the collection of soil data to better define the extent of soil impacts, which will also assist in the assessment of fate and transport mechanism likely operating at this SWMU.

3.2.2 Groundwater

Groundwater flow and depth information was collected for this SWMU during the Phase II CSI performed in 2002-2003. Groundwater in the vicinity of SWMU 307 flows southeasterly (**Appendix A**). Depth to groundwater below ground surface (bgs) averaged 3.2-4.0 feet. Previous groundwater investigations have been conducted at SWMU 307; lead concentrations above the NC DENR 2L standards have been observed. Further delineation, both vertically and horizontally is needed for this RFI. This work plan proposes the collection of groundwater data to make these determinations.

3.3 Exposure Pathways and Receptors

An exposure pathway links a source of contamination with one or more receptors through exposure via one or more media and exposure routes. An exposure pathway must be complete for exposure to occur. The preliminary exposure pathways identified for this SWMU are described below.

3.3.1 Human Health Exposures

Potential inhalation of VOCs and particulates emitted from soils and VOCs emitted from groundwater could be a complete exposure pathway during current site operations, potential future construction activities, and hypothetical future residences. In addition, direct contact with contaminants in subsurface soil or groundwater could be a complete exposure pathway for human receptors during future construction. Direct contact with exposed surface soil could be a current and future exposure pathway for receptors. The most likely human receptors for contact with constituents in soil or groundwater are construction workers or facility workers.

3.3.2 Ecological Exposures

The on-site terrestrial habitat that presents a potentially complete exposure pathway is limited to surface soils (i.e., 0 to 6 inches) in the source areas. Lower trophic level receptors (e.g., plants, earthworms and insects) could be directly exposed to constituents that are present in surface soils. Exposure via the ingestion of contaminated prey (i.e., lower trophic level organisms) by upper trophic level receptors is most likely a complete exposure pathway for birds, mammals, and reptiles exposed to bioaccumulative compounds (e.g., some SVOCs). The exposure areas are very small, thus, exposure to most of the wide-ranging mobile receptors such as carnivorous birds and mammals is likely minimal and would not be of concern.

Exposure to wildlife via dermal and inhalation pathways may be complete for upper trophic level wildlife within all of the exposure areas discussed. There is limited data available to evaluate these pathways quantitatively. Furthermore, although limited data is available, exposure via these pathways is generally thought to be much lower than the pathways discussed above, i.e. direct contact and ingestion. Inhalation of volatile compounds within confined areas such as animal burrows can be an exception; however, no animal burrows were observed onsite. For these reasons, the work plan does not specify collecting data to evaluate these pathways.

4.0 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).

4.1 Data Quality Objectives Process

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 307.

4.1.1 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.

As the first step in the DQO process, the problem is to evaluate the extent to which soil and groundwater are impacted at SWMU 307. The planning team's primary goal is to address the problem through this investigation. Specifically, the objectives of the RFI are as follows:

- Collect basic information regarding the environmental setting at the SWMU, including hydrogeology, geology, hydrology, topography, aquifer characteristics, and any other anthropogenic influences that may affect the hydrology or contaminant pathways at the site.
- Characterize the extent of the contaminated soils via the collection of analytical data.

- Evaluate if contaminates have leached to groundwater via the collection of analytical data. If contaminates have leached to groundwater, characterize the extent of impact.
- 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.

4.1.2 Step 2 – Identify the Decision

The principal study question identified is:

- What is the nature and extent of contamination in the vicinity of SWMU 307?

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 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).

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

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

4.1.3 Step 3 – Identify the Inputs to the Decision

Existing information regarding the nature of contamination in the vicinity of SWMU 307 comes from analytical samples collected by Baker in 1998, 2002 and 2003. However, extent of contamination was not fully delineated. Furthermore, extent of contamination was not determined visually or through analytical sampling around the associated wash rack area of SWMU 307; therefore 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 and extent of contaminated soil	New analytical soil data
Define the nature and extent of groundwater contamination.	New analytical groundwater data
Groundwater flow/hydrogeologic characteristics	New groundwater elevation data, slug tests and Shelby Tube sample testing

The criterion for determining the presence of contamination will be based on analytical results and applicable regulatory driven criteria as described in Section 4.1.2. Groundwater and soil will be analyzed for VOCs, SVOCs, and/or total RCRA Metals. All samples will be submitted to a fix-based analytical laboratory.

4.1.4 Step 4 – Define the Boundaries of the Study

Soil and groundwater samples will be collected at the locations shown in **Figure 4-1** and at monitoring wells locations.

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.

4.1.5 Step 5 – Develop a Decision Rule

The decision rule developed for the RFI at SWMU 307 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 extent of contamination.

4.1.6 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 contaminated area 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.

4.1.7 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.

5.0 RFI Tasks and Responsibilities

5.1 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.

5.2 Subcontractor Procurement

This task includes procurement, scheduling and coordination of subcontractors. The primary subcontractors required for the RFI include a utility locator, land surveyor, DPT sampling subcontractor, well driller, a fixed-base analytical laboratory and an independent data validator. Miscellaneous subcontractors may also be procured for various support services.

5.3 Field Activities

The field activities for the RFI at SWMU 307 will include the following subtasks:

- Mobilization/Demobilization
- Soil Sampling by Macrocore, Shelby Tubes, and split-spoon
- Monitoring Well Installation, Groundwater Sampling, and Aquifer Testing
- Laboratory Analytical Program
- Quality Assurance/Quality Control (QA/QC)
- Sample Handling
- Investigative Derived Waste (IDW) Management
- Surveying

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

5.3.1 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, construction of decontamination areas, location of IDW storage areas, field establishment of sampling locations, and subsurface utility clearance are all included under this task. Activity personnel will be consulted during mobilization efforts.

5.3.2 Soil Investigation

The data presented in **Tables 2-1** through **2-3**, in addition to **Appendix A** (Baker Figure 1) identifies the lack of delineation by previous investigations. As part of the RFI field investigation, surface and subsurface soil samples will be collected from five (5) soil borings (SWMU307-IS05 through SWMU307-IS09) in order to delineate soils impacted by metals. Surface and subsurface soil

samples will also be collected from 2 locations (SWMU307-IS10 and -IS11) in the approximate vicinity of the former vehicle wash rack and analyzed for VOCs, SVOCs and RCRA Metals (**Figure 5-1**). Continuous soil samples will be collected from the borings at 4–foot intervals using a Macrocore sampler and screened using a flame ionization detector (FID) or photo-ionization detector (PID). Each boring will be advanced from the ground surface down to the water table (estimated to be approximately 4-5 ft bgs). Soil sampling procedures are described in the Master FSAP.

Soil samples will also be collected during the monitoring well installation activities for the RFI. Split-spoon samples will be conducted at each monitoring well boring to characterize site lithology and screen for the presence of VOCs.

5.3.3 Shelby Tube Sampling for Geotechnical Parameters

Three undisturbed soil samples will be collected using Shelby tubes within the vicinity of SWMU 307 for the determination of grain size and vertical permeability analyses. All three samples will be collected from new monitoring well borings. The three samples will be collected from the depths of 1-3 ft bgs, 3-5 ft bgs, and 5-7 ft bgs. Once collected, the undisturbed Shelby tube samples will be submitted to a fixed-base geotechnical laboratory for analyses.

5.3.4 Monitoring Well Installation and Development

Data gathered during the SWMU 307 Phase II CSI reported lead in groundwater that exceeded screening criteria. The source area may be near the oil/water separator and/or the former wash rack. In order to evaluate the lateral extent of groundwater contamination at SWMU 307, five (5) Type II permanent monitoring wells will be installed in the shallow aquifer (approximately 15-20 ft bgs) using hollow stem auger (HSA) drilling techniques (**Figure 5-1)**.

The exact screened interval of each well will be placed on the basis of the lithology data collected during the borehole installations. In general, layers having assumed higher permeability than adjacent layers will be selected for screening. This is consistent with well installations at other MCB Camp Lejeune Installation Restoration Program (IRP) sites and with the Master Project Plans (CH2M HILL, 2005). Precise well construction depths will be determined in the field following review of the boring logs. Boring logs and well completion diagrams will be provided in the RFI Report.

The monitoring wells will be constructed using 2-inch diameter Schedule 40 polyvinyl chloride (PVC) riser and 10-feet (shallow wells) of ten-slot (0.010-inch) PVC screen. Each monitoring well will be completed at the surface with either an 8-inch diameter steel, manhole type, protective cover with concrete pad or a steel, stick-up protective cover with concrete pad (depending on the location of the well). The drilling and well installation activities will be conducted by a North Carolina licensed well driller under the supervision of a CH2M HILL engineer or hydrogeologist in accordance with the Well Construction Standards provided in the North Carolina Administrative Code (NCAC) 15A Subchapter 2C Section 0100.

Each new monitoring well will be developed within 48 hours after installation depending on scheduled field activities. Wells will be developed in accordance with Navy CLEAN SOPs, CH2M HILL SOPs, and the Master Project Plans (CH2M HILL, 2005). Well development will include surging and over pumping with a submersible pump across the length of the well screen. With respect to the volume of groundwater removed, adequate well development is normally achieved

when the column of water in the well is free of visible sediment. With respect to groundwater geochemical parameters, adequate development is achieved when the pH, specific conductance, and temperature of the groundwater have stabilized and the turbidity has either stabilized or is below 10 Nephelometric Turbidity Units (NTUs). Stabilization occurs when pH measurements remain constant within 0.1 standard unit (SU), specific conductance varies no more than 10 percent, and the temperature is constant for three consecutive readings.

5.3.5 Monitoring Well Purging and Sampling

All five (5) new monitoring wells (SWMU307-MW01 through SWMU307-MW05) 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 Project Plans (CH2M HILL, 2005). New disposable tubing will be used for each monitoring well. SWMU307-MW01-MW04 groundwater samples will be submitted to a fixed-based laboratory for RCRA Metals SWMU307-MW05, south of the former vehicle wash rack, will be sampled for VOC, SVOC, and RCRA Metal analysis with a standard turnaround time. Specific sampling procedures are presented in the Master Project Plans and summarized below:

- The well cap will be removed and escaping gasses will be measured at the wellhead using a 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).

5.3.6 Slug Testing

Rising head slug tests will be performed on three of the groundwater monitoring wells. The slug test will consist of submerging a poly bailer or solid cylinder (PVC or stainless-steel) of known

volume (slug) in a test well, allowing the static water level time to equilibrate, rapidly removing the slug (and not allowing leakage out of the bottom of the bailer), and recording the changes in head over time. The test will be allowed to continue until the water level returns to within 10 percent of the original static water level.

Slug test equipment will be used in accordance with Navy CLEAN SOPs, CH2M HILL SOPs, and the Master Project Plans (CH2M HILL, 2005) and will include a data logger and pressure transducer, a nylon rope, and a bailer or solid PVC or stainless-steel slug. Prior to the initial slug test and between each well tested, all downhole equipment will be decontaminated according to the procedures described in this Work Plan.

Slug testing will be completed using the following procedure:

1. Remove the well cap or cover and monitor for volatile organic vapors using the appropriate instrument listed in the Health and Safety Plan.
2. Measure the depth to water in the well and the total well depth using a clean electronic water level indicator. Calculate the groundwater elevation and the height of the water column. If the well screen is not fully submerged in the water column, then the data reduction methods must be modified accordingly. If the pressure transducer and slug cannot be fully submerged in the water column, then the well should be evaluated for slug response. If a non-fully submerged slug will result in adequate drawdown, then the test should be performed. Otherwise, the well should not be used to perform a slug test.
3. Lower the pressure transducer into the well and suspend in the water column in the screened interval.
4. Lower the slug into the well and suspend in the water column above the pressure transducer.
5. Enter the appropriate test parameters into the data logger and set the zero reference point after the water column has stabilized to near original static conditions. The transducers should be programmed to record water level data on a logarithmic time scale with the maximum time interval of 2 minutes (the minimum time interval should be automatically determined by the datalogger, but should not exceed 0.05 seconds).
6. Start the pressure transducer and immediately remove the slug from the water column. Be careful not to bump the pressure transducer.
7. Record the change in head over time until readings have stabilized. After the instantaneous extraction of water from the well during the bail-down slug test, groundwater stored in the filter pack around the well screen will drain rapidly into the well. Once the water level in the filter pack equals the water level in the well, the rise in the water level within the well becomes a function of the hydraulic conductivity of the aquifer formation around the well. Therefore, the water level should be allowed to recover a sufficient amount of time to allow the rate of inflow into the well to be controlled by the formation rather than by storage in the filter pack.

Reduce the data by plotting the change in head versus time on semi-logarithmic paper using the Bouwer and Rice method of analysis (Bouwer, 1989) or other appropriate data reduction method.

5.3.7 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 (CH2M HILL, 2005). 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
- Trip 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.

5.3.8 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.

5.3.9 Investigation Derived Waste Management

IDW will be managed in accordance with Section 4.20 of the Master Project Plans. IDW will consist of soil cuttings, 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.

5.3.10 Surveying

All soil boring locations and monitoring wells will be surveyed by a subcontractor licensed in the State of North Carolina for topographic elevation relative to mean sea level (MSL) and horizontal position within the North Carolina State Plane Coordinate System. The elevation point for the monitoring wells will be established at the top of the PVC well casing. The vertical accuracy of the survey will be within 0.01 feet and the horizontal accuracy will be within 0.1 feet. Surveying procedures are presented in the Master Project Plan.

5.4 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.

5.5 Data Evaluation

The laboratory analytical results for soil and groundwater will be compared with the applicable North Carolina 2L Groundwater Quality Standards, NC DENR soil to groundwater screening criteria and/or USEPA Region IX PRGs and the established background/secondary criteria (for metals only). Because the SWMU and its surroundings are not used for military housing, industrial PRGs will be used as comparison criteria.

5.6 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. Only RFI data that has been validated will be used in the risk assessments.

5.6.1 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 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.

5.6.2 Human Health Risk Assessment

The baseline 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 HHRAs 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/region 4/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 baseline human health risk assessment is to assess the health risks associated with exposure to SWMU 307 soil and groundwater for human receptors under current and future 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 will be identified using USEPA Region 9 PRGs. Groundwater data will also be compared to North Carolina 2L concentrations.
- **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.

5.7 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.

6.0 Project Management and Staffing

The proposed management and staffing for the amended RFI at SMWU 307 is shown on **Figure 6-1**. CH2M Hill's primary participants for this project (CTO-0134) 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.

7.0 Project Schedule

The project schedule is presented in **Figure 7-1**. The schedule presents the anticipated completion and/or submittal dates for specific tasks or documents.

8.0 References

Baker Environmental, Inc. 1998. *Phase I Confirmatory Sampling Report, MCB Camp Lejeune, North Carolina.* Contract N62470-89-D-4814. January 1998.

Baker Environmental, Inc. 2002. *Phase II SWMU Confirmatory Sampling Report, MCB Camp Lejeune, North Carolina.* Contract N62470-95-D-6007. November 2002.

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

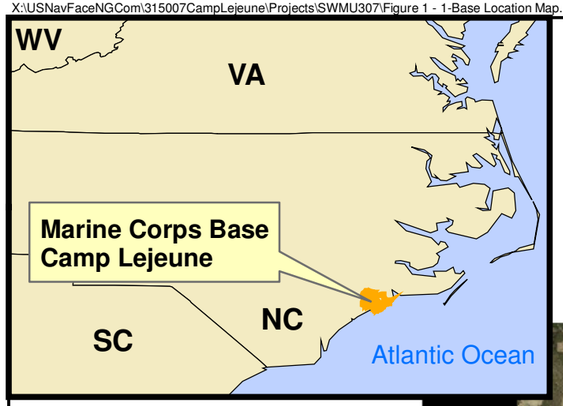
North Carolina Department of Natural Resources (NC DENR), 2003. *Guidelines for Performing Screening Level Ecological Risk Assessments Within the North Carolina Division of Waste Management*. October 2003.

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

X:\USNavFaceNGCom\315007CampLejeune\Projects\SWMU307\Figure 1 - 1-Base Location Map.mxd



Legend
Installation Area

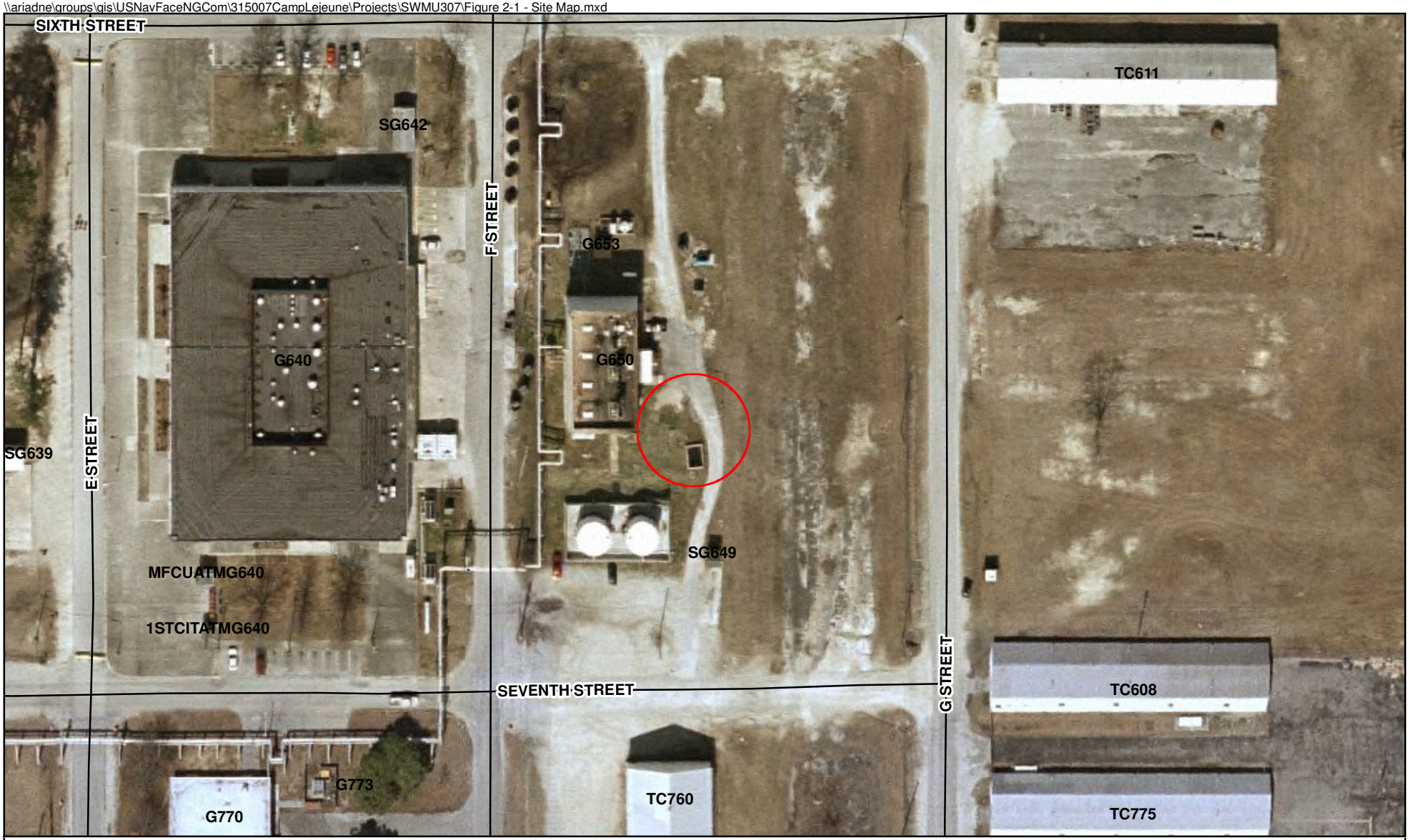
N
W E
S

0 2.5 5
Miles

Figure 1-1
Base Location Map
Marine Corps Base, Camp Lejeune
North Carolina

CH2MHILL

\\ariadne\groups\gis\USNavFaceNGCom\315007CampLejeune\Projects\SWMU307\Figure 2-1 - Site Map.mxd



Legend

— Road Line

▭ Approximate SWMU 307

N
W E
S

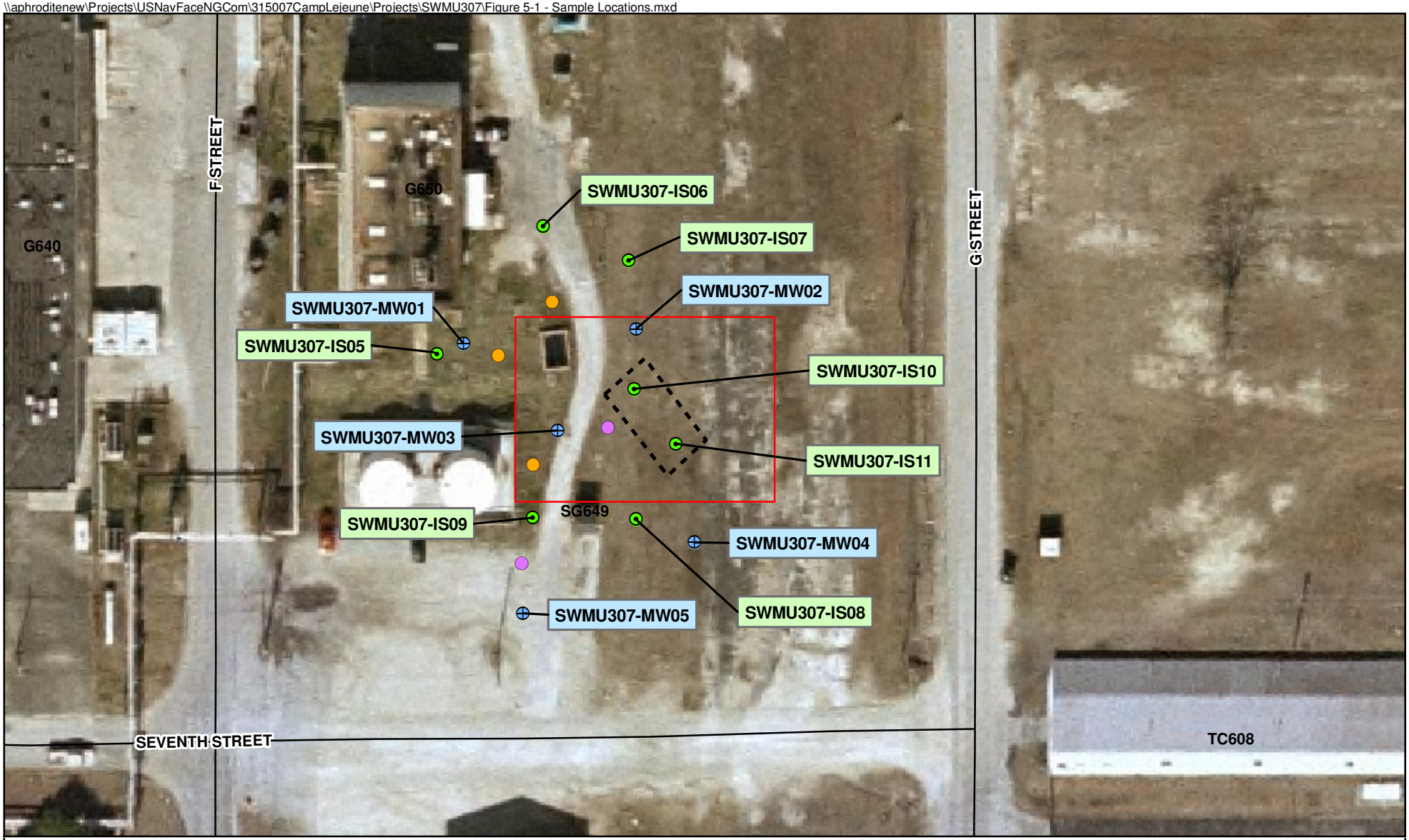
0 50 100
Feet

Coordinate System:
NAD 1983 UTM Zone 18N

Figure 2-1
Site Map
SWMU 307 RFI
MCB Camp Lejeune, North Carolina

CH2MHILL

\\aphroditenew\Projects\USNavFaceNGCom\315007CampLejeune\Projects\SWMU307\Figure 5-1 - Sample Locations.mxd



Legend

- Proposed Monitoring Well
- Proposed Soil Boring
- Road Line
- Approximate SWMU 307
- Former Wash Rack
- Approximate CSI sampling location with reported soil detections exceeding criteria
- Approximate CSI sampling location with reported groundwater detections exceeding criteria

N
W E
S

0 30 60
Feet

Coordinate System: NAD 1983 UTM Zone 18N

Figure 5-1
Proposed Sample Locations
SWMU 307 RFI
MCB Camp Lejeune, North Carolina

CH2MHILL

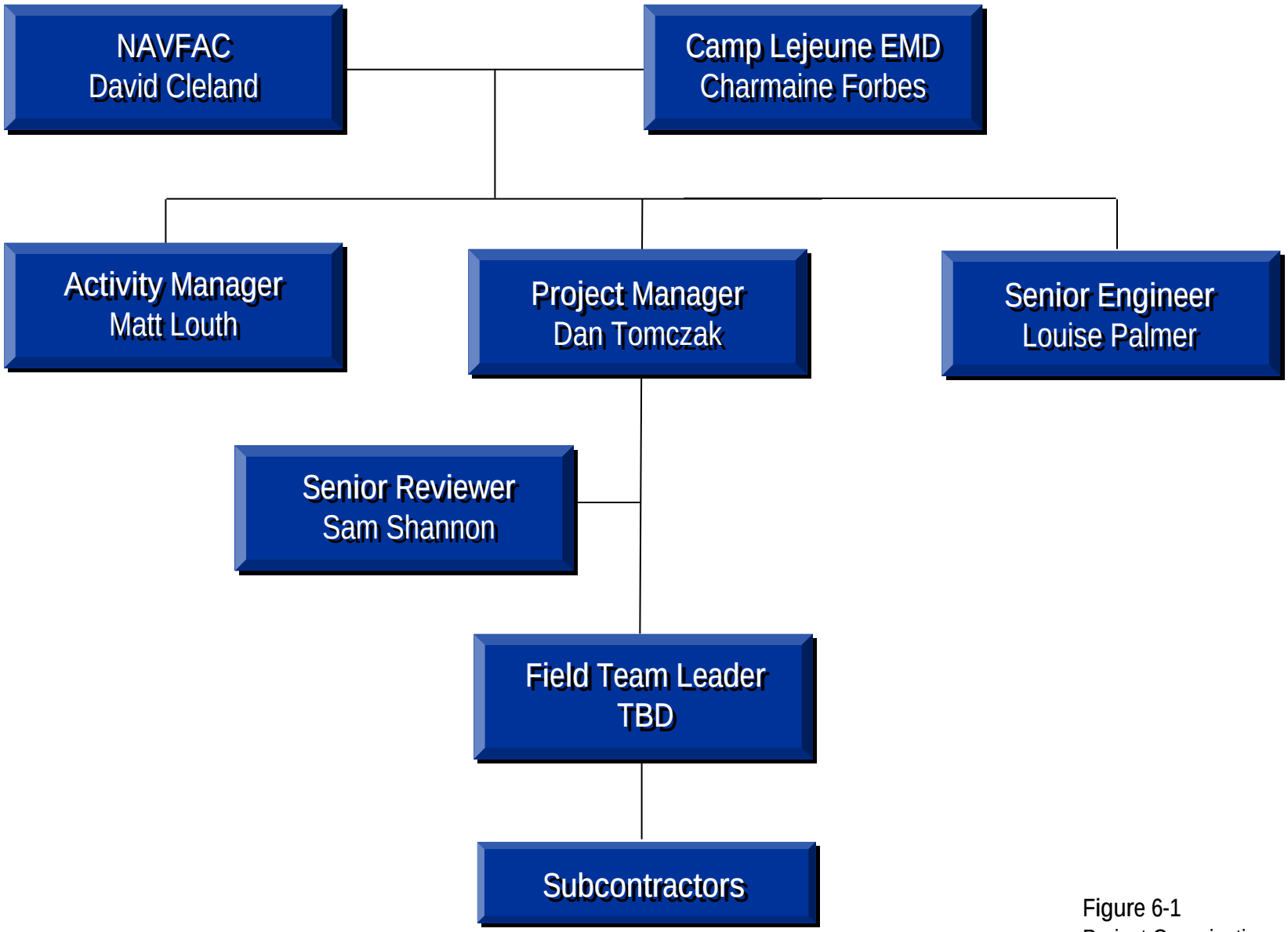


Figure 6-1
Project Organization
SWMU 307 Work Plan
MCB Camp Lejeune

FIGURE 7-1
PROPOSED PROJECT SCHEDULE
SWMU 307 RFI
MCB CAMP LEJEUNE, NORTH CAROLINA

TASK NAME	DURATION (days)	Start Date
Draft RFI Work Plan	90	1 day after contract award
Final RFI Work Plan	60	1 day after comments received
RFI Field Work	30	1 day after Final Work Plan submittal
Laboratory Analysis/Data Validation	60	3 days after start of field work
Draft RFI Report	210	1 day after receiving validated data
Agency Review	40	1 day after Draft Report submittal
Final RFI Report	30	30 days after comments received

Tables

Table 2-1
Surface Soil Detection Summary
SWMU 307 CSI (Baker)
September 1997 and March-April 2002
MCB Camp Lejeune, North Carolina

Compound or Analyte	Base Background	NC DENR Soil to Groundwater	USEPA Region IX PRGs Residential	SWMU307-IS01 0'-2' Phase 1	SWMU307-IS02 0'-2' Phase 1	SWMU307-IS03 0'-2' Phase 1	SWMU307-IS04 0'-2' Phase 1	SWMU307-TW01 0'-1' Phase 2	SWMU307-TW02 0'-1' Phase 2	SWMU307-TW03 0'-1' Phase 2
Volatiles (8260A) ug/kg										
Acetone	NA	2,810	14,000,000	ND	ND	ND	ND	NA	NA	NA
Methylene Chloride	NA	20.2	9,100	ND	3 J	1.8 J	ND	NA	NA	NA
Trichloroethene	NA	18.3	53	ND	1.9 J	ND	2.1 J	NA	NA	NA
Volatiles (8020) ug/kg										
1,3-Dichlorobenzene	NA	6,500	530,000	ND	ND	ND	7.4	NA	NA	NA
1,4-Dichlorobenzene	NA	23	3,400	ND	ND	4.9	ND	NA	NA	NA
Semivolatiles (8270) ug/kg										
bis(2-Ethylhexyl)phthalate	NA	6,670	35,000	59 J	77 J	76 J	72 J	NA	NA	NA
Total Metals (6010/7410) mg/kg										
Arsenic	0.879	5.24	0.39	ND	ND	**2.3**	ND	ND	ND	ND
Barium	19.4	848	5,400	**28.9**	ND	ND	ND	**20.6**	**59.8**	13.2
Cadmium	0.053	0.95	37	ND	ND	ND	ND	**0.25 J**	**0.12**	ND
Chromium	8.93	27.2	210	**14.1**	**22.8**	**11**	1.8	7.2	6.1	4.8
Lead	21	270	400	**25.8**	**86.2**	11.9	1.9	31.2 J	**68.1**	4.6 J
Mercury	0.0961	0.015	23	ND	ND	ND	ND	**0.11**	**1.4**	0.04
Silver	0.372	0.217	390	ND	ND	ND	ND	**0.43 J**	ND	ND

bold- exceeds Base Background

underlined- exceeds NC DENR soil to groundwater

italic - exceeds EPA Region IX PRGs Residential

J- Detection value is estimated

ND- Non detect

NA- Not applicable/not sampled

Table 2-2
Subsurface Soil Detection Summary
SWMU 307 CSI (Baker)
September 1997 and March-April 2002
MCB Camp Lejeune, North Carolina

Analyte	Base Background	NC DENR Soil to Groundwater	USEPA Region IX PRGs Residential	SWMU307-IS01 6'-8' Phase 1	SWMU307-IS02 4'-6' Phase 1	SWMU307-IS03 4'-6' Phase 1	SWMU307-IS04 4'-6' Phase 1	SWMU307-TW01 3'-5' Phase 2	SWMU307-TW02 5'-7' Phase 2	SWMU307-TW03 5'-7' Phase 2
Volatiles (8260A) ug/kg										
Acetone	NA	2,810	14,000,000	32 J	30 J	ND	ND	NA	NA	NA
Methylene Chloride	NA	20.2	9,100	ND	ND	ND	ND	NA	NA	NA
Trichloroethene	NA	18.3	53	ND	ND	1.9 J	ND	NA	NA	NA
Volatiles (8020) ug/kg										
1,3-Dichlorobenzene	NA	6,500	530,000	ND	ND	1.1	8.7	NA	NA	NA
1,4-Dichlorobenzene	NA	23	3,400	ND	2.5	5.6	ND	NA	NA	NA
Semivolatiles (8270) ug/kg										
bis(2-Ethylhexyl)phthalate	NA	6,670	35,000	64 J	230 J	57 J	280 J	NA	NA	NA
Total Metals (6010/7410) mg/kg										
Arsenic	5.29	5.24	0.39	ND	ND	ND	ND	ND	ND	ND
Barium	21.66	848	5,400	**31.1**	ND	ND	ND	**23.6**	17.2	17.2
Cadmium	0.0129	0.95	37	ND	ND	ND	ND	**0.04 J**	ND	ND
Chromium	19.7	27.2	210	13.5	6.8	6.4	4.7	8.5	7.3	7.4
Lead	9.84	270	400	9	**12.5**	**10.5**	3.9	**12.5 J**	6.0 J	7.2 J
Mercury	0.086	0.015	23	ND	**0.14**	ND	ND	**0.09**	0.04	0.08
Silver	0.18	0.217	390	ND	ND	ND	ND	ND	ND	ND

bold- exceeds Base Background

underlined- exceeds NC DENR soil to groundwater

italic - exceeds EPA Region IX PRGs Residential

J- Detection value is estimated

ND- Non detect

NA- Not applicable/not sampled

Table 2-3
Groundwater Detection Summary
SWMU 307 CSI (Baker)
March-April 2002 and June 2003
MCB Camp Lejeune, North Carolina

Analyte	Base Background	NCAC 2L Groundwater Standards	SWMU307-GW01 (2002)	SWMU307-GW02 (2002)	SWMU307-GW03 (2002)	SWMU307-TW04 (2003)	SWMU307-TW04D (2003)	SWMU307-TW05 (2003)	SWMU307-TW06 (2003)	SWMU307-TW07 (2003)
Total Metals (6010/7410) ug/L										
Arsenic	12.1	10	ND	ND	ND	ND	ND	ND	ND	5.6 J
Barium	109.4	2,000	49 J	72.8 J	106 J	71.8 J	74.9 J	**145 J**	31.2 J	107 J
Chromium	5.76	50	2.2 J	**7.1 J**	**42.3 J**	1 J	1.2 J	3.7 J	ND	5.4 J
Lead	3.61	15	ND	**7.7 J**	**27.7 J**	2.5 J	1.7 J	2.4 J	ND	**24.4**
Mercury	0.05	1.05	ND	ND	**0.12 J**	ND	ND	ND	ND	ND

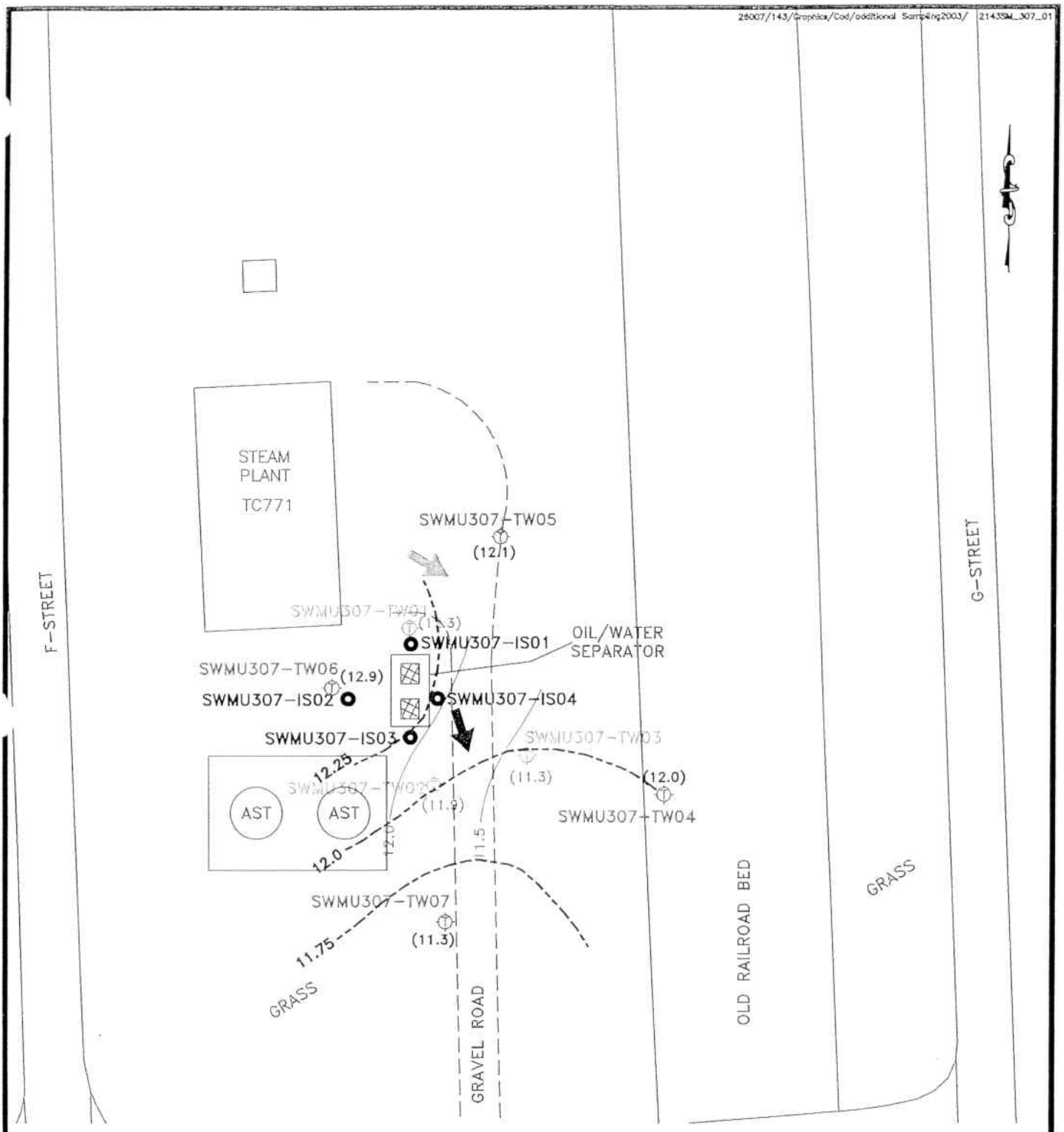
bold- exceeds Base Background

underlined- exceeds North Carolina Administrative Code (NCAC) 2L Groundwater Quality Standard

J- Detection value is estimated

ND- Non detect

Appendix A



NOTE:
Phase I sample locations were not surveyed, locations are approximate.

Baker

LEGEND

- ⊕ – PHASE II CSI TEMPORARY WELLS
- ● – PHASE I CSI SOIL BORING
- ⊕ – ADDITIONAL PHASE II CSI TEMPORARY WELLS
- ⇨ – GROUNDWATER FLOW DIRECTION (APRIL 2002)
- –12.0– – GROUNDWATER CONTOUR (APRIL 2002)
- ➡ – GROUNDWATER FLOW DIRECTION (JULY 2003)
- –12.0– – GROUNDWATER CONTOUR (JULY 2003)

SOURCE: MCB CAMP LEJEUNE MARCH 2000

FIGURE 1
PHASE II CONFIRMATORY SAMPLING INVESTIGATION
SWMU 307
CTO–143

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

Site Specific Quality Assurance Project Plan
RCRA Facility Investigation
SWMU 307

Marine Corps Base
Camp Lejeune, North Carolina

Prepared for

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

Under the

CLEAN III Program
Contract N62470-02-D-3052

Contract Task Order 134

June 2007

Prepared by

Raleigh, North Carolina

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3.0 SAMPLE IDENTIFICATION AND CUSTODY **3-1**

Acronyms and Abbreviations

AM	Activity Manager
COC	Chain of Custody
RFI	RCRA Facility Investigation
DPT	Direct Push Technology
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
RCRA	Resource Conservation and Recovery Act
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 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Solid Waste Management Unit (SWMU) 307. 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 307.

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 SWMUs 307. Each position is described in the MCB Camp Lejeune Master QAPP. The project team for the RFI investigation is:

Project Manager (PM)	Dan Tomczak
Activity Manager (AM)	Matt Louth
Senior Engineer	Louise Palmer
Senior Consultant and Review Team Leader (RTL)	Sam Shannon
Lead Data Manager	Ryan Van Oosten
Field Team Leader (FTL) & Site Safety Coordinator (SSC)	James Frank
Field Engineer	David Seed
Health and Safety Manager	Michael Goldman
Project Accountant	Katya Maltseva
Project Delivery Leader	Bill McElroy

2.2 Subcontractors

Subcontractors will be used for the RFI activities at SWMU 307. The following services will be provided by subcontractors:

- Utility location
- Soil sampling and monitoring well installation
- Surveying
- 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 307
Media	SS – Surface soil SB – Subsurface soil GW – Groundwater SW – Surface Water SD - Sediment WT – Water (rinsate, decontamination fluid, ambient potable water)
Station	IS – in situ soil sample collected by DPT
QA/QC	FB = Field blank DUP = Duplicate sample (following sample type/number) TB = Trip blank ER = Equipment rinsate
Depth	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.
Round	The two-digit number and letter (A, B, C, D) will indicate the year and quarter, respectively, at which the samples were collected. For example, “06D” is for fourth quarter 2006, “07A” is first quarter 2007, “07B” is second quarter 2007, “07C” is third quarter 2007, 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 SWMU307-IS05-0-1-07A refers to:

SWMU307-IS05-0-1-07A	SWMU 307
SWMU307-IS05-0-1-07A	Soil sample collected from location IS05
SWMU307-IS05-0-1-07A	Collected from the depth of 0 to 1 ft bgs
SWMU307-IS05-0-1-07A	Sample collected from the first quarter in 2007

The sample designation SWMU307-GW03-07A refers to:

SWMU307-GW03-07B	SWMU 307
SWMU307-GW03-07B	Groundwater sample collected from new monitoring well MW03
SWMU307-GW03-07B	Sample collected from the second quarter in 2007

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 SWMU307-TB041507 refers to:

SWMU307-TB041507	SWMU 307
SWMU307-TB041507	Trip blank for the day of April 15, 2007

This sample designation format will be followed throughout the RFI for SWMU 307, where applicable. **Table 3-1** and **3-2** list all of the sample designations and QA/QC samples for the soil and groundwater sampling at SWMU 307. Soil and groundwater sampling depths determined in the field are identified by "X-Y". Monitoring well soil borings from which Shelby Tube samples will be collected will be determined in the field and are therefore identified as SB0X, SB0Y, and SB0Z. 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
Soil Sample Analysis Summary
SWMU 307 RFI
CTO-134
MCB Camp Lejeune, North Carolina

Well/Station ID	Sample ID	Sample Depth (ft bgs)	Soil Sample			Shelby Tube Sample	
			VOCs	SVOCs	RCRA Metals	Grain Size	Vertical Permeability
DPT Location							
SWMU307-IS05	SWMU307-IS05-0-1-07A	0 - 1			1		
	SWMU307-IS05-X-Y-07A	X - Y			1		
SWMU307-IS06	SWMU307-IS06-0-1-07A	0 - 1			1		
	SWMU307-IS06-X-Y-07A	X - Y			1		
SWMU307-IS07	SWMU307-IS07-0-1-07A	0 - 1			1		
	SWMU307-IS07-X-Y-07A	X - Y			1		
SWMU307-IS08	SWMU307-IS08-0-1-07A	0 - 1			1		
	SWMU307-IS08-X-Y-07A	X - Y			1		
SWMU307-IS09	SWMU307-IS09-0-1-07A	0 - 1			1		
	SWMU307-IS09-X-Y-07A	X - Y			1		
SWMU307-IS10	SWMU307-IS10-0-1-07A	0 - 1	1	1	1		
	SWMU307-IS10-X-Y-07A	X - Y	1	1	1		
SWMU307-IS11	SWMU307-IS11-0-1-07A	0 - 1	1	1	1		
	SWMU307-IS11-X-Y-07A	X - Y	1	1	1		
Total Soil Samples			4	4	14		
Field Duplicate Samples			1	1	2		
Matrix Spike Samples			1	1	1		
Matrix Spike Duplicate Samples			1	1	1		
Field Blanks			1	1	1		
Equipment Rinse Blanks			1	1	1		
Trip Blanks			2				
		Total Number of Samples:	**10**	**10**	**20**		
Geotech Parameters							
SWMU307-MW0X	SWMU307-SB0X-1-3	1 - 3				1	1
SWMU307-MW0Y	SWMU307-SB0Y-3-5	3 - 5				1	1
SWMU307-MW0Z	SWMU307-SB0Z-5-7	5 - 7				1	1
		Total Number of Samples:				**3**	**3**

Table 3-2
Groundwater Analysis Summary
Sampling for RFI for SWMU 307
CTO-134
MCB Camp Lejeune, North Carolina

Well/Station ID	Sample ID	Sample Depth (ft bgs)	Groundwater		
			VOCs	SVOCs	Total RCRA Metals
New Monitoring Well					
SWMU307-MW01	SWMU307-GW01-07B	X - Y	1	1	1
SWMU307-MW02	SWMU307-GW02-07B	X - Y	1	1	1
SWMU307-MW03	SWMU307-GW03-07B	X - Y	1	1	1
SWMU307-MW04	SWMU307-GW04-07B	X - Y	1	1	1
SWMU307-MW05	SWMU307-GW05-07B	X - Y	1	1	1
Total Soil Samples			5	5	5
Field Duplicate Samples			1	1	1
Matrix Spike Samples			1	1	1
Matrix Spike Duplicate Samples			1	1	1
Field Blanks			1	1	1
Equipment Rinse Blanks			1	1	1
Trip Blanks			2		
		Total Number of Samples:	**12**	**10**	**10**

Site Specific Health and Safety Plan
SWMU 307

Marine Corps Base
Camp Lejeune, North Carolina

Prepared for

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

Under the

CLEAN III Program
Contract N62470-02-D-3052

Contract Task Order 0134

June 2007

Prepared by

Raleigh, 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.

1.0 PROJECT INFORMATION AND DESCRIPTION

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

PROJECT NO: 347342

CH2M HILL PROJECT MANAGER: Dan Tomczak

OFFICE: RDU

SITE NAME: Marine Corps Base, Camp Lejeune; SWMU 307

SITE ADDRESS: Jacksonville, North Carolina

DATE HEALTH AND SAFETY PLAN PREPARED: March 28, 2007

DATE(S) OF SITE WORK: January through August 2007

SITE ACCESS: good.

SITE SIZE: Approximately 2.00 acres

SITE TOPOGRAPHY: flat

SITE DESCRIPTION AND HISTORY:

SWMU 307 has been identified as an area of impacted soils near an oil/water separator at the Camp Geiger portion of MCB Camp Lejeune. The site is located southwest of building G650, along F Street between 6th and 7th Streets.

Baker Environmental performed a CSI in September 1997 to identify if operations of the oil/water separator connected to the wash rack contaminated soils in the area. Four soil borings (SWMU 307IS01-IS04) were collected in the vicinity of the oil/water separator. Surface and subsurface samples were collected at 0-2 and 4-6 ft bgs, respectively. Samples were analyzed for VOCs, SVOCs and RCRA Metals.

Mercury was reported in one soil sample, SWMU307-IS02-02 (4-6 ft bgs), at 0.14 mg/kg which was above the NC Category S-3: G-1 Target Concentration (0.0154 mg/kg).(Attachment 1). No further action was recommended for this site as VOCs and SVOCs did not exceed screening criteria, however, soils in the area around the wash rack were never sampled. Several samples collected currently exceed NC DENR soil to groundwater comparison criteria and one exceeds USEPA Region IX PRGs.

Baker Environmental conducted a Phase II CSI on March 21 and April 3, 2002. Surface, subsurface and groundwater samples (three temporary wells) were collected during the initial sampling. As a result of lead concentrations observed in the initial Phase II sampling, additional groundwater sampling was conducted in June 2003.

Several metals were detected in soil and/or groundwater during the Phase II. Arsenic, Barium, Chromium and Mercury exceeded both AOC, Base background screening criteria and NC DENR soil to groundwater screening criteria. Lead exceeded both the Base background screening criteria and the 2L standard. Based on these analytical results an RFI was recommended for SWMU 307.

2.0 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

CLIENT: Dave Cleland
Department of the Navy
NAVFAC Mid-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: James Frank / RDU
Field Staff: Erin Must, David Seed (field geologist/engineer)

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

- Subsurface utility locating
- Soil and Groundwater sampling
- Groundwater level measurement
- Hollow Stem Auger drilling
- Mud Rotary drilling

2.2.3 Drilling

(Reference CH2M HILL SOP HS-35, *Drilling*)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should have it restrained.

- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.

2.2.4 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.**

- None
-

TABLE 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.

Potential Hazard (Refer to SOP, or HSP Section)	Engineering Controls, Administrative Controls, and Work Practices	Drilling, Well Installation, soil sampling	Groundwater Monitoring	Surveying
Flying debris/objects	Wear safety eyewear and hardhat	X		
Noise > 85dBA	Wear ear plugs/muffs	X		
Electrical	Locate underground and overhead utilities prior to task	X	X	X
Suspended Loads	Wear hardhat, Be aware of location of overhead hazards	X		
Buried Utilities, drums, tanks	Locate underground utilities prior to task. Stop if object is encountered	X		
Slip, trip, fall	Be sure of footing, especially in wet or muddy conditions	X	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	X
Drilling	Be careful of equipment and pinch points	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
Methane	1 liter, compressed	Support Zone
Isobutylene	1 liter, compressed	Support Zone
Pentane	1 liter, compressed	Support Zone
Hydrochloric acid	< 500 ml	Support Zone / sample bottles
Nitric acid	< 500 ml	Support Zone / sample bottles
Sulfuric Acid	< 500 ml	Support Zone / sample bottles
Sodium hydroxide	< 500 ml	Support Zone / sample bottles
Methanol	< 1 Gallon	Support/Decon Zones
Hexane	< 1 Gallon	Support/Decon Zones
pH buffers	< 500 ml	Support Zone
MSA Sanitizer	< 1 liter	Support/Decon Zones
Alconox/Liquinox	< 1 liter	Support/Decon Zones
Isopropanol	< 1 Gallon	Support/Decon Zones

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.

TABLE 3.2
CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration (ppm)	Exposure Limit[a]	IDLH[b]	Symptoms and Effects of Exposure	PIP[c] (eV)
Barium	GW: TW05- 145 S: TW02- 59.8 SB: 31.1	0.5 mg/m^3	50 mg/m^3	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia	NA
Lead	GW: GW03- 27.7 S: IS02- 86.2 SB: TW01- 12.5	0.050 mg/m^3	100 mg/m^3	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension	NA
Chromium	GW: GW03- 42.3 S: IS02- 22.8 SB: IS02- 12.5	1 mg/m^3	250 mg/m^3	Irritation eyes, skin; lung fibrosis (histologic)	NA
Arsenic	GW: TW07- 5.6 S: IS03- 2.3 SB: ND	0.010 mg/m^3	5 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]	NA

Footnotes:
[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

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).

4.0 PERSONNEL

4.1 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES

4.1.1 CLIENT

Client Contact	Base Contact
David Cleland	Charmaine Forbes
NAVFAC	Camp Lejeune - EMD
Code: OPCEV	Building 12
6506 Hampton Blvd	Marine Corps Base
Norfolk, Virginia 23508-1278	Camp Lejeune, NC 28542-0004
757-322-4813	(910) 451-5836
757-322-4805 fax	(910) 451-5997 fax

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 (770) 604-9182 ext 396
Field Team Leader/Phone:	James Frank / RDU (919) 875-4311 ext 15
Site Safety Coordinator/Phone:	James Frank / RDU (919) 875-4311 ext 15

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: Utility location, drilling, TBA
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:

Table 5
PPE Specifications [a]

Task	Level	Required PPE	Head	Respirator [b]
General site entry Surveying	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Drilling Operations	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.
Tasks requiring upgrade	C	Coveralls: Polycoated 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] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e].

Reasons for Upgrading or Downgrading Level of Protection

Upgrade[f]	Downgrade
• 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.	• 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 hazard

[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 SC.

[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 SC qualified at that level is present.

6.1 Air Monitoring Specifications

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

Instrument	Tasks	Action Levels[a]		Frequency [b]	Calibration
PID: OVM with 10.6eV lamp or equivalent	All intrusive work including excavation.	<1 ppm 1 to 10 ppm >10 ppm	Level D Level C Evacuate the work are and contact the HSM	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent	All intrusive work including excavation.	0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard. Contact HSM in case the work area needs to be reclassified re Dow Hot Work Standard. Explosion hazard; evacuate or vent.	Continuous during advancement of boring or trench	Daily
O_2Meter: MSA model 260 or 261 or equivalent	All intrusive work including excavation.	>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

[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; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).

[d] Refer to SOP HSE-10 for instructions and documentation on radiation monitoring and screening.

[e] Noise monitoring and audiometric testing also required.

6.2 Calibration Specifications

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

Instrument	Gas	Span	Reading	Method
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5% LEL	1.5 lpm reg direct tubing

6.3 Air Sampling

Sampling, in addition to real-time monitoring, 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

None Anticipated

Personnel and Areas

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

HSM: Michael Goldman/ATL

7.0 APPROVAL

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: James Frank **DATE:** 2/28/2006

APPROVED BY: **DATE**:

7.2 REVISIONS

REVISIONS MADE BY: **DATE:**

REVISIONS TO PLAN:

REVISIONS APPROVED BY: **DATE:**

8.0 ATTACHMENTS

Attachment 1: Employee Signoff

12.0 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	Health Resources, Woburn, MA
	(910) 451-4841	(888) 631-0129
	(910) 451-4842	(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**
		Occupational Medicine Specialists
Base Fire Response #:	(910) 451-9111	4815 Oleander Dr.
		Wilmington, NC 28403
		(910) 451-1111
Security & Police – **911 or**		**Corporate Director Health and Safety**
		Name: Mollie Grinell/DEN
Base Security #:	(910) 451-2555	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 Name: James Frank		**Regional Human Resources Department**
Phone: 919-875-4311 x 15 cell: 919-414-5960		Name: Mary Jo Jordan/GNV
		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

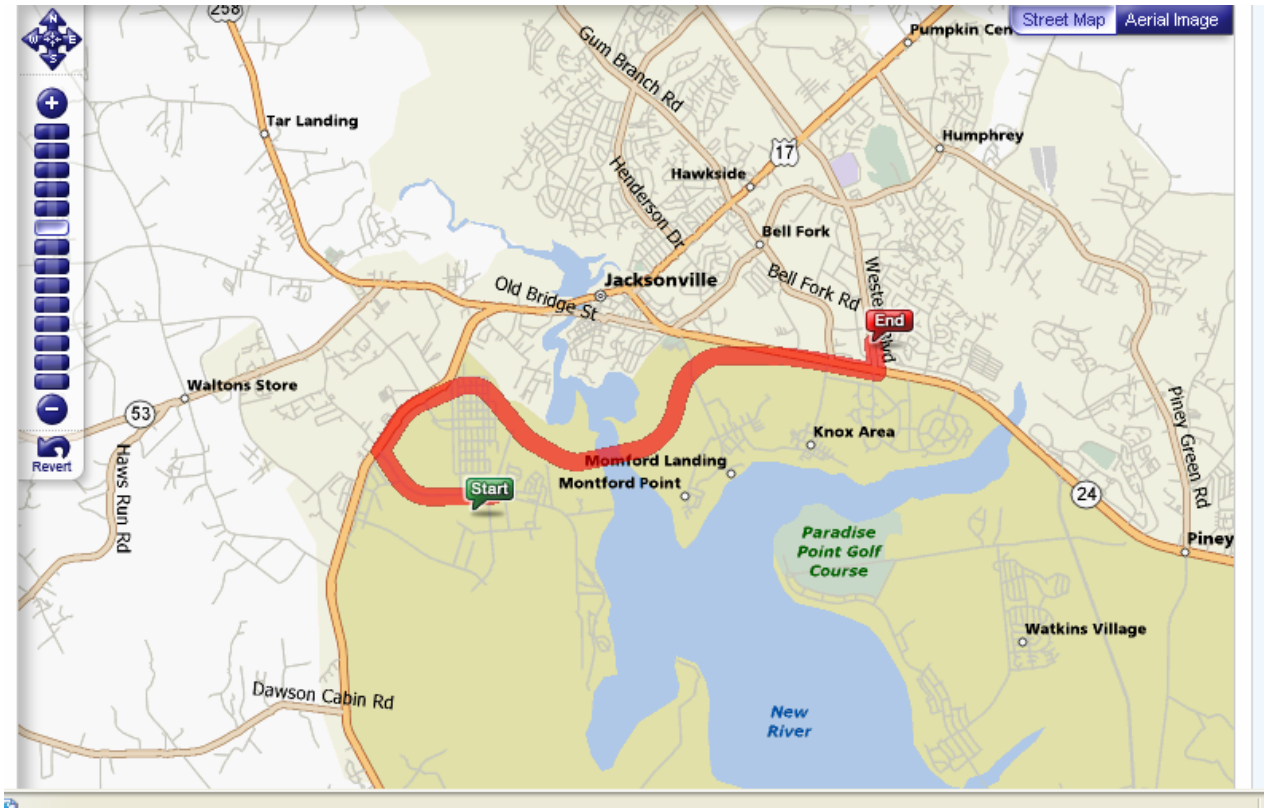
Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

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:

Directions to **Onslow County Memorial Hospital** from SWMU 307
Start out going WEST on 7th Street toward A ST. for approximately 1.0 miles
Make left (south) onto A Street towards Curtis Rd, approximately 1.0 miles
Make right (west) onto Curtis Rd toward US-17, approximately 1.0 miles
Turn RIGHT onto WILMINGTON HWY/ US-17 N for approximately 0.8 miles
Merge onto NC-24 toward CAMP LEJEUNE/ MOREHEAD CITY for approximately 5.5 miles
Turn Left onto Western BLVD and end at 317 Western BLVD. Across from IHOP.



12.2 GOVERNMENTAL AGENCIES INVOLVED IN PROJECT

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

EMPLOYEE SIGNOFF

The employees listed below have been given a copy of this health and safety plan, have read and understood it, and agree to abide by its provisions.

EMPLOYEE NAME	EMPLOYEE SIGNATURE AND DATE

CH2MHILL

HS&E Self-Assessment Checklist - DRILLING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's written safety plan.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to drilling hazards, 2) CH2M HILL staff are providing support function related to drilling activities, and/or 3) CH2M HILL oversight of a drilling subcontractor is required.

Safety Coordinator may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately, or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to drilling hazards (complete Section 1).
☐ Evaluate CH2M HILL support functions related to drilling activities (complete Section 2)
☐ Evaluate a CH2M HILL subcontractor's compliance with drilling safety requirements (complete entire checklist).
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in SOP HSE-35.

SECTION 1 - SAFE WORK PRACTICES (4.1)

	Yes	No	N/A	N/O
1. Personnel cleared during rig startup	☐	☐	☐	☐
2. Personnel clear of rotating parts	☐	☐	☐	☐
3. Personnel not positioned under hoisted loads	☐	☐	☐	☐
4. Loose clothing and jewelry removed	☐	☐	☐	☐
5. Smoking is prohibited around drilling operation	☐	☐	☐	☐
6. Personnel wearing appropriate personal protective equipment (PPE), per written plan	☐	☐	☐	☐
7. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐

SECTION 2 - SUPPORT FUNCTIONS (4.2)

FORMS/PERMITS (4.2.1)

8. Driller license/certification obtained	☐	☐	☐	☐
9. Well development/abandonment notifications and logs submitted and in project files	☐	☐	☐	☐
10. Water withdrawal permit obtained, where required	☐	☐	☐	☐
11. Dig permit obtained, where required	☐	☐	☐	☐

UTILITY LOCATING (4.2.2)

12. Location of underground utilities and structures identified	☐	☐	☐	☐

SECTION 2 (Continued) WASTE MANAGEMENT (4.2.3)	Yes	No	N/A	N/O
13. Drill cuttings and purge water managed and disposed properly	☐	☐	☐	☐
DRILLING AT HAZARDOUS WASTE SITES (4.2.4)				
14. Waste disposed of according to project's written safety plan	☐	☐	☐	☐
15. Appropriate decontamination procedures being followed, per project's written safety plan	☐	☐	☐	☐
DRILLING AT ORDNANCE EXPLOSIVES (OE)/UNEXPLODED ORDNANCE (UXO) SITES (4.2.5)				
16. OE plan prepared and approved	☐	☐	☐	☐
17. OE/UXO avoidance provided, routes and boundaries cleared and marked	☐	☐	☐	☐
18. Initial pilot hole established by UXO technician with hand auger	☐	☐	☐	☐
19. Personnel remain inside cleared areas	☐	☐	☐	☐
SECTION 3 - DRILLING SAFETY REQUIREMENTS (4.3)				
GENERAL (4.3.1)				
20. Only authorized personnel operating drill rigs	☐	☐	☐	☐
21. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
22. Daily inspection of drill rig and equipment conducted before use	☐	☐	☐	☐
DRILL RIG PLACEMENT (4.3.2)				
23. Location of underground utilities and structures identified	☐	☐	☐	☐
24. Safe clearance distance maintained from overhead power lines	☐	☐	☐	☐
25. Drilling pad established, when necessary	☐	☐	☐	☐
26. Drill rig leveled and stabilized	☐	☐	☐	☐
27. Additional precautions taken when drilling in confined areas	☐	☐	☐	☐
DRILL RIG TRAVEL (4.3.3)				
28. Rig shut down and mast lowered and secured prior to rig movement	☐	☐	☐	☐
29. Tools and equipment secured prior to rig movement	☐	☐	☐	☐
30. Only personnel seated in cab are riding on rig during movement	☐	☐	☐	☐
31. Safe clearance distance maintained while traveling under overhead power lines	☐	☐	☐	☐
32. Backup alarm or spotter used when backing rig	☐	☐	☐	☐
DRILL RIG OPERATION (4.3.4)				
33. Kill switch clearly identified and operational	☐	☐	☐	☐
34. All machine guards are in place	☐	☐	☐	☐
35. Rig ropes not wrapped around body parts	☐	☐	☐	☐
36. Pressurized lines and hoses secured from whipping hazards	☐	☐	☐	☐
37. Drill operation stopped during inclement weather	☐	☐	☐	☐
38. Air monitoring conducted per written safety plan for hazardous atmospheres	☐	☐	☐	☐
39. Rig placed in neutral when operator not at controls	☐	☐	☐	☐
DRILL RIG SITE CLOSURE (4.3.5)				
40. Ground openings/holes filled or barricaded	☐	☐	☐	☐
41. Equipment and tools properly stored	☐	☐	☐	☐
42. All vehicles locked and keys removed	☐	☐	☐	☐
DRILL RIG MAINTENANCE (4.3.6)				
28. Defective components repaired immediately	☐	☐	☐	☐
29. Lockout/tagout procedures used prior to maintenance	☐	☐	☐	☐
30. Cathead in clean, sound condition	☐	☐	☐	☐
31. Drill rig ropes in clean, sound condition	☐	☐	☐	☐
32. Fall protection used for fall exposures of 6 feet (U.S.) 1.5 meters (Australia) or greater	☐	☐	☐	☐
33. Rig in neutral and augers stopped rotating before cleaning	☐	☐	☐	☐
34. Good housekeeping maintained on and around rig	☐	☐	☐	☐

SECTION 4

Complete this section for all items checked "No" in previous sections. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____