

Work Plan Addendum
for
SWMU 9 (Pesticide Control Area)
Naval Surface Warfare Center
Crane, Indiana

Comprehensive Long-Term
Environmental Action Navy (Clean)
Contract



Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0376

February 2005

WORK PLAN ADDENDUM

FOR

**SWMU 9 (PESTICIDE CONTROL AREA)
NAVAL SURFACE WARFARE CENTER CRANE, INDIANA**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406**

**Submitted by:
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**CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0376**

FEBRUARY 2005

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WORK PLAN ADDENDUM FOR SWMU 9 (PESTICIDE CONTROL AREA)

Introduction

This document has been prepared as an addendum to the *Work Plan for Risk Assessment at SWMUs 4, 5, 9, and 10 Naval Surface Warfare Center Crane, Indiana, Tetra Tech NUS, August 2000*). The Work Plan was reviewed and approved by USEPA Region 5 in October 2000.

Fieldwork for SWMU 9 was conducted in 2001. Figure 1 shows the sampling locations immediately north of Building 150 where nine borings and three ground water monitoring wells were installed during this fieldwork and previous field activities. The RFI Report (final version) describing the results of this investigation was prepared in December 2004. During a subsequent Navy review of the Corrective Measures Study (CMS) being prepared as part of another project, a data gap was identified for the work conducted at the former Building 55, which is located within SWMU 9. Building 55 is one of three areas of concern within SWMU 9. It is now believed that the actual location of the former Building 55 is greater than 200 feet south of the original Building 55 sampling locations. Building 55 was originally used for the management of pesticides but was demolished and, other than a concrete slab, there is no physical evidence of the former building. Prior to the field investigation of this SWMU, the location of former Building 55 was thought to be located immediately north of Building 150. It has recently been determined that the actual location of this building was further to the south and within the footprint of Building 2454.

In order to confirm the actual location of the former Building 55, the Base Historian (Mr. John Allen) was interviewed in December 2004. He provided the following observations. "Building 55 was used as the Pest Control Shop. It was located in the northwest corner of Building 2454 toward the boiler house (Building 150). Building 2189 (located north of Building 150) was used as a carpenter shop - in fact he worked there. At that time, the lead pest controller was Mr. Walter Berry and Mr. Dale Bledsoe was his assistant. They worked in a small area in Building 55. Mr. Allen called Mr. Bledsoe who said they moved into Building 55 in early 1952. Pest Control then moved into Building 2189 in late 1957 to early 1958. After they moved out, Building 55 was used for equipment storage and hose drying." Neither of them knew when Building 55 was torn down. Following this interview, Mr. Tom Brent (Crane Environmental Site Manager) went to the Building 55 area and observed that the former Building 55 was currently being used as for forklift training and crane testing. The only structure remaining on site is the Building 150 boiler house. No remaining structure of Building 2454 exists now. However, the pad for Building 55 is evident, albeit crumbling.

Proposed Field Activities

In order to fill data gaps from the previous sampling at SWMU 9 and to meet the objectives as described in the Work Plan, additional sampling and analysis is required. These activities will include sampling and analysis of surface and subsurface soils, perched water, ground water, and surface water and sediment. The following sections describe the details of this sampling and analysis. A summary of the objectives of the proposed sampling plan is described in Table 1. All previous and proposed borings, ground water monitoring wells, and surface water and sediment locations are shown on Figure 1. It should be noted that field activities, including methods of sample collection and analysis, will be conducted as described in the approved Work Plan (TtNUS, August 2000).

Soils

Objective- to evaluate contaminant concentrations at varying depths at the former location of Building 55 and along migration pathways. Proposed soil depths for sample collection reflect the exposure pathways for the identified receptors.

In order for the stated objectives for these locations to be achieved it will be necessary to collect additional samples as follows.

09SB12 - North edge Building 2454 (former Building 55) - Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09SB13 - East edge Building 2454 (former Building 55) - Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09SB14 - South edge Building 2454 (former Building 55) - Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09SB15 - West edge Building 2454 (former Building 55) - Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09SB16 - Within the former floor or within the former footprint of Building 55 - Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09SB17 – Within the former floor or within the former footprint of Building 55 – Collect samples at three depths (0 to 2 feet, 2 - 4 feet (or at a depth based on PID readings, visual staining, or field judgment), and just above the water table- assumed to be 10 to 15 feet bgs).

09TW01 - Perched water sample from one of the above-listed soil boring, if encountered - Collect one sample.

This is a total of 19 samples (18 soils and 1 water), all of which will be collected via a DPT sampling device. It should be noted that in the event bedrock is encountered before reaching 15 feet bgs, three soil samples will still be collected. The depths of sampling will adhere to the above-listed plan if possible or will be determined in the field based on PID readings, visual staining, or field judgment

Groundwater

Objective – Evaluate groundwater at a location immediately upgradient of the former location of Building 55. Evaluate downgradient groundwater quality at locations potentially affected by site activities at the former location of Building 55.

The previously established objectives of the groundwater investigation (i.e., to establish groundwater quality immediately upgradient of the former location of Building 55 (09T05) and to evaluate downgradient groundwater quality at locations potentially affected by site activities at the location of former Building 55 (09T03 and 09T04) have not been achieved. Well 09T05 is not immediately upgradient of the actual location of former Building 55. Wells 09T03 and 09T04 are actually upgradient of the actual former location of Building 55. Even though the stated objectives have not been achieved, results of ground water data within this general area indicate there is no evidence to suggest that pesticides have contaminated soils or ground water within the area of former Building 55. Nonetheless, to confirm this, two temporary ground water monitoring wells will be installed. A water sample will be collected from either a perched zone or the water table. This is assuming that water will be encountered prior to hitting bedrock. If bedrock is encountered prior to water, a water sample will not be collected. If laboratory results of soil or perched water indicate the presence of pesticides, two permanent ground water monitoring wells will be installed during a future phase of field work. The following provides further support to this rationale.

Upgradient Well: Pesticides are not naturally occurring and were detected in only one groundwater sample collected over 1000 feet to the north of Building 55 during the RFI sampling. It can be assumed pesticides are not present in the upgradient ground water. Therefore it is not necessary to have an upgradient well above the actual former location of Building 55.

Downgradient Wells: As a class of compounds pesticides are not very mobile in soils. Pesticides would have to pass through the soil column in order to contaminate groundwater. If soils do not have pesticides, or if pesticides are only present in the surface soils and not in deeper layers, it would be reasonable to assume that ground water could not have been contaminated with pesticides. The decision to install permanent ground water monitoring well(s) will therefore be based on whether pesticides (and other compounds) are present in soil and at which depths. Collection/analysis of perched water samples will also provide useful information. A deliberate attempt will be made to collect up to three perched water (or ground water if encountered) samples via DPT.

Additionally, some specific information is available regarding the types of pesticides stored at Building 55. Pesticides and herbicides stored at Building 55 included, but were not limited to, 2,4-D, 2,4,5-T, silvex (a mixture of 2,4-D and 2,4-T), fenac, monuron, ureabor, carbaryl, chlordane, DDT, diazinon, dieldrin, lindane, malathion, and pyrethrum. In addition to the chemicals stored and used at Building 55, the pesticide krovar (a mixture of duron and bromac) was added to the chemical inventory when pesticide control operations were moved from Building 55 to Building 2189.

Generally speaking, most pesticides are relatively immobile in soil and are preferentially bound to soil, particularly soils with a high organic content. The partition coefficient for organic carbon, or K_{oc} (in liters per kilogram [L/kg]) is defined as the ratio of the amount of chemical adsorbed per unit weight of organic carbon in the soil to the concentration of the chemical in solution in equilibrium. This parameter (K_{oc}) is one indicator of chemical mobility. As a general rule, pesticides are not subject to groundwater transport to the same extent as volatile organic compounds. The majority of compounds previously stored at Building 55 have published K_{oc} values. Most have reported K_{oc} values greater than 2,000 L/kg and, thus, by at least one reference, would be described as relatively immobile in the soil matrix. Two of the chemicals (2,4-D and lindane) have K_{oc}s between 150 and 2000 L/kg and, thus, would be described as having intermediate to low mobility in the soil matrix. Based on the results of previous laboratory analysis of groundwater at SWMU 9 which indicated that only dieldrin was found at a low concentration (0.03 ug/L) in only one well (09T01- located east of Building 2189 which is over 1000 feet north of Building 55), it is unlikely that the pesticides/herbicides are a groundwater problem. The K_{oc} reported for dieldrin in at least one reference (10,700 L/kg) indicates that dieldrin is a relatively immobile chemical.

Surface Water / Sediment

Objective- Evaluate surface water / sediment quality at a location affected by site activities

The previously stated objectives have not been achieved for Building 55 activities. The previous sample collected (09SW/SD05) is upstream of the locations which could have been impacted by runoff from Building 55 activities. It is therefore necessary to collect the following additional sample.

09SWSD06 – Surface water and sediment sample(s) downstream of Building 55 - Collect sediment grab sample at a depth of 0-6" bgs.

Laboratory Analyses

Analytical results are available from previous investigations conducted at SWMU 9 including the results of the 2004 RFI Report. As part of the RFI, all ground water samples were analyzed for Appendix IX VOCs, Appendix IX SVOCs, Appendix IX pesticides, Appendix IX PCBs, Appendix IX herbicides, total TAL metals (plus tin), and cyanide. Based on the results of this analytical information and the historical operations conducted at SWMU 9, the Navy and the USEPA Region 5 have agreed that only pesticides and PCBs will be analyzed for all proposed media in the proposed data gap investigation for Building 55. Additionally, miscellaneous parameters will be analyzed including total organic carbon (TOC); pH; and cation exchange capacity (CEC).

The primary objective of the proposed field investigation is to collect field and laboratory data needed to evaluate the potential risks for those human health and ecological receptors identified in the CMS. Table 1 summarizes the proposed sampling and analysis for SWMU 9, the Pesticide Control Area, including overall objectives and sampling rationale for the selection of a particular sampling point. Sampling and analysis will be conducted as described in Section 7.5.2 of the Work Plan (TtNUS, August 2000).

TABLE 1
SUMMARY OF OBJECTIVES/PROPOSED SAMPLING
SWMU 9 - PESTICIDE CONTROL / R-150 TANK AREA
NSWC CRANE, INDIANA

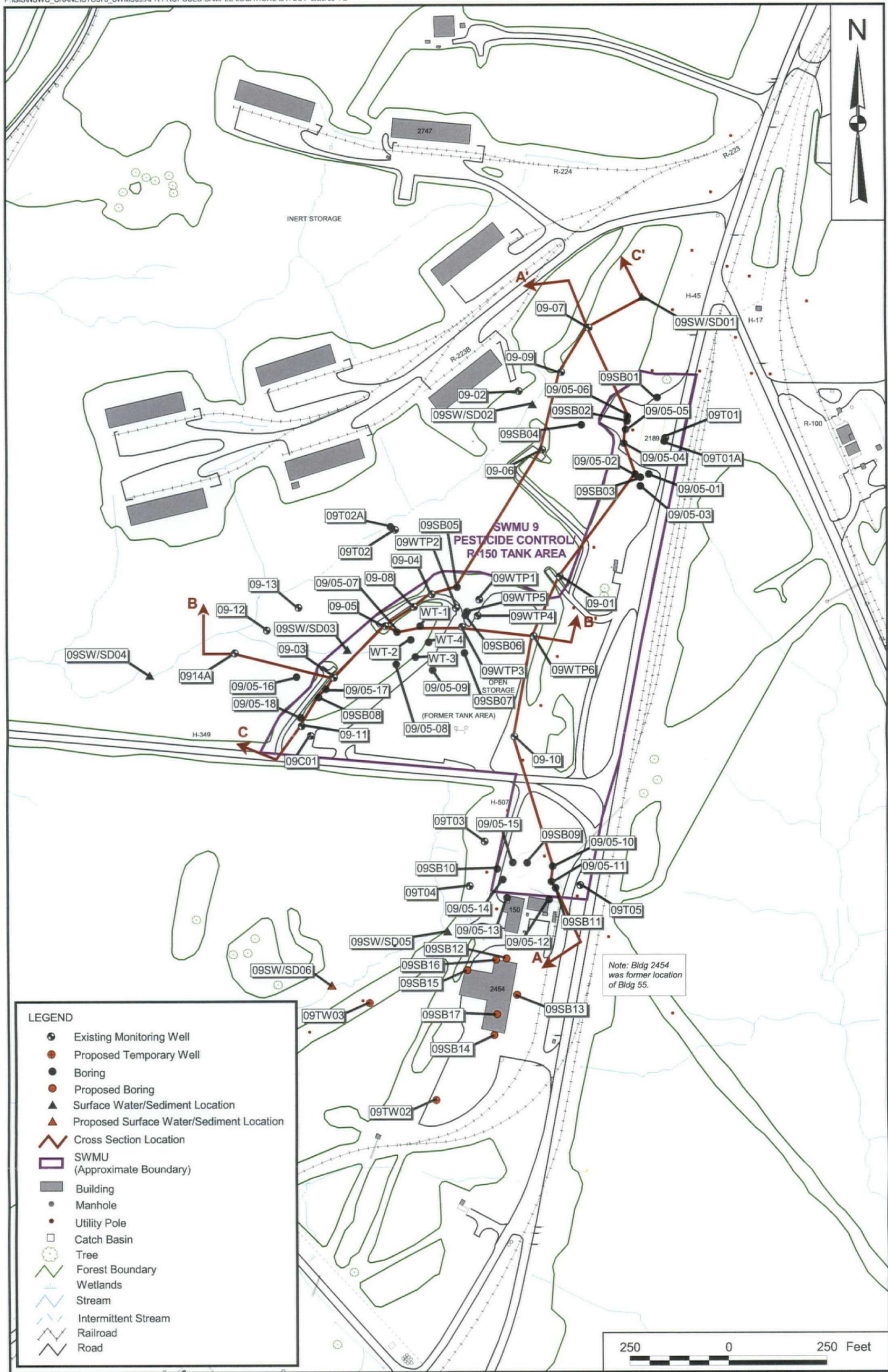
OVERALL OBJECTIVES FOR SAMPLING PROGRAM					
TYPE OF PROGRAM / SAMPLING OBJECTIVE	PARAMETER TYPE	TARGET CONSTITUENTS ⁽¹⁾⁽²⁾	OBJECTIVE FOR ANALYSIS	LIMIT OF DETECTION	EVALUATIONS TO BE PERFORMED
Type: RCRA Risk Assessment to fulfill requirements of RCRA Part B permit. Objectives: Determine human health and ecological risks for potential receptors exposed to site media under current and future land use. Determine if there has been a release of hazardous constituents to SWMU soil and groundwater or off-SWMU surface water and sediment.	Field (Soil, Ground Water and Surface Water)	Dissolved Oxygen Oxidation Reduction Potential pH Specific Conductivity Temperature Turbidity PID Reading ⁽³⁾	Evaluate general water quality ⁽⁴⁾ . Determine if well water is equivalent to formation water (i.e., stability). To determine the appropriate subsurface soil interval (PID reading).	As per selected field instrumentation. Instrumentation will be calibrated according to the manufacturer's manuals.	Qualitatively used to evaluate general water quality.
	Laboratory (Soil, Ground Water, Surface Water, and Sediment)	Appendix IX Pesticides/PCBs	To obtain a representative presentation of the nature and quantity of constituents that were released to media by past operational activities.	Reporting limit low enough to meet Federal/State ARARs/TBCs and evaluate adverse human health and environmental impacts.	Comparison of constituents found in site media to risk-based screening criteria to determine if these media were affected by past site activities. Comparison of inorganic site soil data to established Basewide background levels for similar soil types. Estimate human health risks, as outlined in Section 10.0, Figure 10-1 of the Work Plan (TiNUS, August 2000). Estimate ecological risks, as outlined in Section 11.0, Figure 11-1 of the Work Plan (TiNUS, August 2000).
		CEC ⁽⁷⁾ pH ⁽⁷⁾ TOC ⁽⁷⁾⁽⁸⁾	Evaluate soil and/or sediment conditions.	As per chosen laboratory methods.	For soil, evaluate the potential for contaminant migration from the site and the potential for risks outside the site boundaries. For sediment, to be used to assess potential risks for ecological receptors.
SPECIFIC OBJECTIVES FOR SAMPLING LOCATIONS					
MEDIUM	SAMPLE COLLECTION TECHNIQUE	SAMPLE LOCATION	COMMENT	SAMPLING POINT ⁽⁹⁾	OBJECTIVE OF LOCATION
Surface/Subsurface Soil	Grab surface soil sample; specific collection technique identified in FSP, Section 2.4.2.1 of the Work Plan (TiNUS, August 2000). Grab subsurface soil sample; specific collection technique identified in FSP, Section 2.4.2.3 of the Work Plan (TiNUS, August 2000).	09SB12 through 09SB15	Three locations surrounding Building 2454 and 1 location west of Building 2454 where ground surface slopes towards an unnamed tributary. Samples collected at ground surface (0 to 2 feet bgs) and at two discrete depths from 2 to 15 feet (interval based on PID readings) ⁽¹⁰⁾ . Three samples per location for a total of 12 samples.		Evaluate contaminant concentrations at varying depths at Building 2454 and along migration pathways. Soil depths reflect the exposure pathways for the identified potential receptors.
		09SB16 and 09SB17	Two locations within the (former) floor or within the former footprint of Building 55 (biased toward cracked areas of concrete). Three samples per location for a total of 6 samples.		Evaluate contaminant concentrations at varying depths in the general vicinity of the R-150 Tank area. Soil depths reflect the exposure pathways for the identified potential receptors. Evaluate contaminant concentrations at varying depths at Building 2454 and along migration pathways. Soil depths reflect the exposure pathways for the identified receptors.
Surface Water/Sediment ⁽¹¹⁾	Grab sample; specific collection technique identified in the FSP, Section 2.4.3 (surface water) and 2.4.4 (sediment) of the Work Plan (TiNUS, August 2000).	09SW/SD06	Location in unnamed tributary southwest of Building 2454.		Evaluate surface water/sediment quality at a location immediately downstream of the site.
Ground Water ⁽⁵⁾	Grab sample; specific collection technique identified in FSP, Section 2.4.1 of the Work Plan (TiNUS, August 2000).	09TW01	Perched water if encountered.		Evaluate ground water quality at a location immediately downgradient of Building 2454. Evaluate ground water quality at locations affected by site activities downgradient of Building 2454.
		09TO6 and 09T07	Install and sample two new temporary monitoring wells west and southwest of Building 2454.		Evaluate ground water quality at a location immediately upgradient of Building 2454.

ARARs Applicable, Relevant, and Appropriate Requirements
 CEC Cation Exchange Capacity
 FSP Field Sampling Plan
 QAPP Quality Assurance Project Plan

PCBs Polychlorinated biphenyls
 PID Photoionization detector
 TBCs To Be Considered Values

TOC Total Organic Carbon
 VOCs Volatile Organic Compounds

- The list of specific chemicals included as target constituents is identified in the QAPP, Section 1.0, Table 1-1 of the Work Plan (TiNUS, August 2000). Constituents to be analyzed for all samples, all matrices collected, unless otherwise noted.
- VOCs, SVOCs, herbicides, inorganics, cyanide, and tin were not included in the list of target constituents for this site since these chemicals have not been detected during historical site investigations. Associated sample quantitation limits for the historical data were less than human health and ecological criteria, indicating that if these chemicals were present at concentrations of potential concern they would have been detected at the site during historical investigations.
- Soil samples only will be monitored with a PID. The other identified field parameters will be collected for ground water and surface water.
- Analyzed by field tests.
- Two temporary wells will be installed only if soil or perched water sample laboratory results indicate contamination.
- Analyses to be performed on 30 percent of the soil samples collected.
- TOC analyses will be conducted for all sediment samples.
- Proposed sampling locations are identified on Figure 7-8 of the Work Plan (TiNUS, August 2000).
- If ground water is encountered prior to 15 feet bgs, a soil sample will be collected from a depth above the water table.
- Due to the intermittent flow, surface water may not be available at all sample locations.



DRAWN BY	DATE
K. PEILA	2/15/05
CHECKED BY	DATE
R. CLARK	2/25/05
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

Tetra Tech NUS, Inc.

PROPOSED SAMPLE LOCATIONS
SWMU 9 - PESTICIDE CONTROL/R-150 TANK AREA
NSWC CRANE, INDIANA

CONTRACT NUMBER	
0042	
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FIGURE 1	0

Health and Safety Plan
for
Risk Assessment and CMS
at
Solid Waste Management Unit
(SWMU) 9

Naval Surface Warfare Center
Crane Division
Crane, Indiana



Southern Division
Naval Facilities Engineering Command
Contract No. N62467-94-D-0888
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HEALTH AND SAFETY PLAN
FOR
RISK ASSESSMENT AND CMS
AT
SOLID WASTE MANAGEMENT UNIT (SWMU) 9

NAVAL SURFACE WARFARE CENTER
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TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION	1-1
1.1 KEY PROJECT PERSONNEL AND ORGANIZATION	1-1
1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS	1-3
2.0 EMERGENCY ACTION PLAN	2-1
2.1 INTRODUCTION	2-1
2.2 PRE-EMERGENCY PLANNING	2-1
2.3 EMERGENCY RECOGNITION AND PREVENTION	2-2
2.3.1 Recognition	2-2
2.3.2 Prevention	2-3
2.4 EVACUATION ROUTES, PROCEDURES AND PLACES OF REFUGE	2-3
2.5 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT	2-4
2.6 EMERGENCY ALERTING AND ACTION / RESPONSE PROCEDURES	2-7
2.7 PPE AND EMERGENCY EQUIPMENT	2-9
2.8 EMERGENCY CONTACTS	2-9
2.9 EMERGENCY ROUTE TO HOSPITAL	2-9
3.0 SITE BACKGROUND	3-1
3.1 SITE HISTORY AND INVESTIGATION AREAS	3-1
3.2 SWMU 9 – Pesticide Control/R-150 Tank Area	3-1
4.0 SCOPE OF WORK	4-1
5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES	5-1
6.0 HAZARD ASSESSMENT	6-1
6.1 CHEMICAL HAZARDS	6-1
6.2 PHYSICAL HAZARDS	6-2
6.2.1 Heavy Equipment Hazards	6-2
6.2.2 Drilling Safe Work Practices	6-3
6.2.3 Energized Systems	6-5
6.2.3 Ambient Temperature Extremes	6-6
6.3 NATURAL HAZARDS	6-6
6.3.1 Insect/Animal Bites and Stings	6-6
6.3.2 Poisonous Plants	6-8
6.3.3 Inclement Weather	6-9
7.0 AIR MONITORING	7-1
7.1 INSTRUMENTS AND USE	7-1
7.1.1 Photoionization Detector and Flame Ionization Detector	7-1
7.1.2 Hazard Monitoring Frequency	7-1
7.2 INSTRUMENT MAINTENANCE AND CALIBRATION	7-2

TABLE OF CONTENTS (continued)

<u>SECTION</u>	<u>PAGE</u>
8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS	8-1
8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING	8-1
8.1.1 Requirements for TtNUS Personnel.....	8-1
8.1.2 Requirements for Subcontractors.....	8-1
8.2 SITE-SPECIFIC TRAINING	8-3
8.3 MEDICAL SURVEILLANCE	8-3
8.3.1 Medical Surveillance Requirements for TtNUS Personnel.....	8-3
8.3.2 Medical Surveillance Requirements for Subcontractors.....	8-5
8.3.3 Requirements for All Field Personnel.....	8-5
8.4 SUBCONTRACTOR EXCEPTIONS	8-5
9.0 SPILL CONTAINMENT PROGRAM	9-1
9.1 SCOPE AND APPLICATION.....	9-1
9.2 POTENTIAL SPILL AREAS.....	9-1
9.2.1 Site Drums/Containers	9-1
9.3 LEAK AND SPILL DETECTION	9-1
9.4 PERSONNEL TRAINING AND SPILL PREVENTION	9-2
9.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT	9-2
9.6 SPILL CONTROL PLAN.....	9-2
10.0 SITE CONTROL	10-1
10.1 EXCLUSION ZONE.....	10-1
10.1.1 Exclusion Zone Clearance.....	10-1
10.2 CONTAMINATION REDUCTION ZONE	10-2
10.3 SUPPORT ZONE	10-2
10.4 SITE VISITORS.....	10-2
10.5 SITE SECURITY	10-3
10.6 SITE MAPS	10-3
10.7 BUDDY SYSTEM	10-4
10.8 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS	10-4
10.9 COMMUNICATION	10-4
10.10 SAFE WORK PERMITS.....	10-4
11.0 CONFINED SPACE ENTRY	11-1
12.0 MATERIALS AND DOCUMENTS	12-1
12.1 MATERIALS TO BE POSTED AT THE SITE.....	12-1
13.0 GLOSSARY	13-1

ATTACHMENT I - INJURY/ILLNESS PROCEDURE AND REPORT FORM

ATTACHMENT II - TICK CONTROL AND LYME DISEASE

ATTACHMENT III – EQUIPMENT INSPECTION CHECKLIST

ATTACHMENT IV – SAFE WORK PERMITS

ATTACHMENT V – UTILITY LOCATING SOP

TABLES

<u>NUMBER</u>	<u>PAGE</u>
2-1 Emergency Contacts.....	2-8
5-1 Tasks/Hazards/Control Measures Compendium.....	5-3
6-1 Chemical, Physical, and Toxicological Data.....	6-10

FIGURES

<u>NUMBER</u>	<u>PAGE</u>
2-1 Emergency Response Protocol.....	2-5
2-2 Bloomington Hospital Route Map.....	2-11
2-3 Bedford Hospital Route Map.....	2-12
7-1 Documentation of Field Calibration.....	7-3
8-1 Training Letter.....	8-2
8-2 Site Specific Training Documentation.....	8-4
8-3 Subcontractor Medical Approval Form.....	8-6
8-4 Medical Surveillance Letter.....	8-8
10-1 Safe Work Permit.....	10-6

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide practices and procedures for Tetra Tech NUS, Inc. (TtNUS) and subcontractor personnel engaged in investigatory activities at Solid Waste Management Unit (SWMU) 9 at the Naval Surface Warfare Center Crane (NSWC Crane), located in Crane, Indiana. This HASP is to be used in conjunction with the TtNUS Health and Safety Guidance Manual. Both of these documents must be present at the site during the performance of all site activities. The Guidance Manual provides supporting information pertaining to the HASP as well as applicable TtNUS Standard Operating Procedures (SOPs). This HASP and the contents of the Guidance Manual were developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard).

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work at the site. The HASP will be modified if new information becomes available. All changes to the HASP will be made with the approval of the TtNUS Project Health and Safety Officer (PHSO) and the TtNUS CLEAN Health and Safety Manager (HSM). Requests for modifications to the HASP will be directed to the PHSO, who will determine if the changes are necessary. The PHSO will notify the Task Order Manager (TOM), who will notify all affected personnel of changes.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for TtNUS and subcontractor employees engaged in onsite activities. Personnel assigned to these positions will exercise the primary responsibility for all onsite health and safety. These persons will be the primary point of contact for any questions regarding the safety and health procedures and the selected control measures that are to be implemented for onsite activities.

- The TtNUS TOM is responsible for the overall direction of health and safety for this project.
- The PHSO is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:
 - i. Providing information regarding site contaminants and physical hazards associated with the site.

- ii. Establishing air monitoring and decontamination procedures.
 - iii. Assigning personal protective equipment based on task and potential hazards.
 - iv. Determining emergency response procedures and emergency contacts.
 - v. Stipulating training requirements and reviewing appropriate training and medical surveillance certificates.
 - vi. Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste work.
 - vii. Modify this HASP, as it becomes necessary.
- The TiNUS Field Operations Leader (FOL) is responsible for implementation of the HASP with the assistance of an appointed SSO. The FOL manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.
 - The SSO supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include:
 - i. Coordinates all health and safety activities with the FOL.
 - ii. Selects, applies, inspects, and maintains personal protective equipment.
 - iii. Establishes work zones and control points in areas of operation.
 - iv. Implements air monitoring program for onsite activities.
 - v. Verifies training and medical clearance of onsite personnel status in relation to site activities.
 - vi. Implements Hazard Communication, Respiratory Protection Programs, and other associated health and safety programs as they may apply to site activities.
 - vii. Coordinates emergency services.
 - viii. Provides site-specific training for all onsite personnel.
 - ix. Investigates all accidents and injuries (see Attachment I - Illness/Injury Procedure and Report Form)
 - x. Provides input to the PHSO regarding the need to modify, this HASP, or applicable health and safety associated documents as per site-specific requirements.
 - Compliance with the requirements stipulated in this HASP is monitored by the SSO and coordinated through the TiNUS CLEAN HSM.

Note: In some cases one person may be designated responsibilities for more than one position. For example, at the NSWC, the FOL may also be responsible for SSO duties. This action will be performed only as credentials, experience, and availability permit.

1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Naval Surface Warfare Center
Address: 300 Highway 361
Crane, IN 47522-5001

Client Contact: Mr. Thomas Brent
Phone Number: (812) 854-6160

Alternate Contact: Ms. Chris Freeman
Phone Number: (812) 854-4423

Project Team:

Tetra Tech NUS Personnel:	Discipline/Tasks Assigned:	Phone No.
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<u>Matthew M. Soltis, CIH, CSP</u>	<u>CLEAN Health and Safety Manager</u>	<u>(412) 921-8912</u>
<u>James K. Laffey</u>	<u>Project Health and Safety Officer</u>	<u>(412) 921-8678</u>
<u>TBD</u>	<u>FOL/SSO</u>	<u></u>
<u>TBD</u>	<u>Field Technician</u>	<u></u>
<u>Tom Patton</u>	<u>Equipment Manager</u>	<u>(412) 262-4583</u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>

Tetra Tech NUS Subcontractors	Discipline/Tasks Assigned	Phone No.
<u>TBA</u>	<u>Drilling subcontractor</u>	<u></u>
<u>TBA</u>	<u>Analytical Laboratory</u>	<u></u>
<u>TBA</u>	<u>Surveyor</u>	<u></u>
<u>FedEx</u>	<u>Sample/Parcel Delivery</u>	<u>(800) 463-3339</u>

Hazard Assessments for purposes of OSHA 29 CFR 1910.132 and HASP preparation conducted by:
James K. Laffey

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an emergency. All site activities (including responding to emergency incidents) will be coordinated with the client contact, Thomas Brent. In the event of an emergency which cannot be mitigated using onsite resources, personnel will evacuate to a safe place of refuge and the appropriate emergency response agencies will be notified. It has been determined that the majority of potential emergency situations would be better supported by outside emergency responders. Based on this determination, TtNUS and subcontractor personnel will not provide emergency response support beyond responding to easily-controlled, minor incidents. Workers who are ill or who have suffered a non-serious injury may be transported by site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of site operations, which ensures adequate emergency response time. NSWC contact Thomas Brent will be notified anytime outside response agencies are contacted. This Emergency Action Plan conforms to the requirements of 29 CFR 1910.38(a), as allowed in 29 CFR 1910.120(l)(1)(ii).

TtNUS will, through necessary services, provide the following emergency action measures:

- Incipient stage fire fighting support and prevention
- Incipient spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Initial medical support for injuries or illnesses requiring basic first-aid
- Site control and security measures as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, emergencies resulting from chemical, physical, or fire hazards are the types of emergencies which could be encountered during site activities.

To minimize and eliminate the potential for these emergency situations, pre-emergency planning activities will include the following (which are the responsibility of the SSO and/or the FOL):

- Coordinating with local Emergency Response personnel to ensure that TtNUS emergency action activities are compatible with existing emergency response procedures. Base Fire Protection and Emergency Services will be notified of scheduled events and activities. This is most imperative in situations where their services may be required.
- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:
 - Chemical Inventory (of chemicals used onsite), with Material Safety Data Sheets.
 - Onsite personnel medical records (Medical Data Sheets).
 - A log book identifying personnel onsite each day.
 - Hospital route maps with directions (these should also be placed in each site vehicle).
 - Emergency Notification - phone numbers.

The TtNUS FOL will be responsible for the following tasks:

- Identifying a chain of command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.
- Periodically performing practice drills to ensure site workers are familiar with incidental response measures.
- Providing the necessary equipment to safely accomplish identified tasks.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Emergency situations that may be encountered during site activities will generally be recognized by visual observation. To adequately recognize chemical exposures, site personnel must have a clear knowledge of signs and symptoms of exposure associated with site contaminants. This information is provided in Table 6-1. Tasks to be performed at the site, potential hazards associated with those tasks and the recommended control methods are discussed in detail in Sections 5.0 and 6.0. Additionally, early recognition of hazards will be supported by daily site surveys to eliminate any situation predisposed to an

emergency. The FOL and/or the SSO will be responsible for performing surveys of work areas prior to initiating site operations and periodically while operations are being conducted. Survey findings will be documented by the FOL and/or the SSO in the Site Health and Safety logbook, however, all site personnel will be responsible for reporting hazardous situations. Where potential hazards exist, TtNUS will initiate control measures to prevent adverse effects to human health and the environment.

The above actions will provide early recognition for potential emergency situations, and allow TtNUS to instigate necessary control measures. However, if the FOL and the SSO determine that control measures are not sufficient to eliminate the hazard, TtNUS will withdraw from the site and notify the appropriate response agencies listed in Table 2-1.

2.3.2 Prevention

TtNUS and subcontractor personnel will minimize the potential for emergencies by following the Health and Safety Guidance Manual and ensuring compliance with the HASP and applicable OSHA regulations. Daily site surveys of work areas, prior to the commencement of that day's activities, by the FOL and/or the SSO will also assist in prevention of illness/injuries when hazards are recognized early and control measures initiated.

2.4 **EVACUATION ROUTES, PROCEDURES, AND PLACES OF REFUGE**

An evacuation will be initiated whenever recommended hazard controls are insufficient to protect the health, safety or welfare of site workers. Specific examples of conditions that may initiate an evacuation include, but are not limited to the following: severe weather conditions; fire or explosion; monitoring instrumentation readings which indicate levels of contamination are greater than instituted action levels; and evidence of personnel overexposure to potential site contaminants.

In the event of an emergency requiring evacuation, all personnel will immediately stop activities and report to the designated safe place of refuge unless doing so would pose additional risks. When evacuation to the primary place of refuge is not possible, personnel will proceed to a designated alternate location and remain until further notification from the TtNUS FOL. Safe places of refuge will be identified prior to the commencement of site activities by the SSO and will be conveyed to personnel as part of the pre-activities training session. This information will be reiterated during daily safety meetings. Whenever possible, the safe place of refuge will also serve as the telephone communications point for that area. During an evacuation, personnel will remain at the refuge location until directed otherwise by the TtNUS FOL or the on-site Incident Commander of the Emergency Response Team. The FOL or the SSO will perform a

head count at this location to account for and to confirm the location of all site personnel. Emergency response personnel will be immediately notified of any unaccounted personnel. The SSO will document the names of all personnel onsite (on a daily basis) in the site Health and Safety Logbook. This information will be utilized to perform the head count in the event of an emergency.

Evacuation procedures will be discussed during the pre-activities training session, prior to the initiation of project tasks. Evacuation routes from the site and safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) may dictate evacuation routes. As a result, assembly points will be selected and communicated to the workers relative to the site location where work is being performed. Evacuation should always take place in an upwind direction from the site.

2.5 DECONTAMINATION PROCEDURES / EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

TtNUS personnel will perform removal of personnel from emergency situations and may provide initial medical support for injury/illnesses requiring only first-aid level support. Medical attention above that level will require assistance and support from the designated emergency response agencies. Attachment I provides the procedure to follow when reporting an injury/illness, and the form to be used for this purpose. **If the emergency involves personnel exposures to chemicals, follow the steps provided in Figure 2-1.**

**FIGURE 2-1
EMERGENCY RESPONSE PROTOCOL**

The purpose of this protocol is to provide guidance for the medical management of injury situations. In the event of a personnel injury or accident:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, and shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the injured person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the WorkCare physician. WorkCare will contact the medical facility and request specific testing which may be appropriate. WorkCare physicians will monitor the care of the victim. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
- Call WorkCare at 1-800-455-6155 and enter Extension 109, being prepared to provide:
 - Any known information about the nature of the injury.
 - As much of the exposure history as was feasible to determine in the time allowed.
 - Name and phone number of the medical facility to which the victim(s) has/have been taken.
 - Name(s) of the involved Tetra Tech NUS, Inc. employee(s).
 - Name and phone number of an informed site officer who will be responsible for further investigations.
 - Fax appropriate information to WorkCare at (714) 456-2154.
- Contact Corporate Health and Safety Department (Matt Soltis) at 1-800-245-2730.

As data is gathered and the scenario becomes more clearly defined, this information should be forwarded to WorkCare.

WorkCare will compile the results of all data and provide a summary report of the incident. A copy of this report will be placed in each victim's medical file in addition to being distributed to appropriately designated company officials.

Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. A personalized letter describing the individual findings/results will accompany this generalized summary. A copy of the personal letter will be filed in the continuing medical file maintained by WorkCare.

**FIGURE 2-1 (continued)
POTENTIAL EXPOSURE REPORT**

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

Client Contact: _____ Phone No.: _____

Company Name: _____

I. Exposing Agent

Name of Product or Chemicals (if known): _____

Characteristics (if the name is not known)

Solid Liquid Gas Fume Mist Vapor

II. Dose Determinants

What was individual doing? _____

How long did individual work in area before signs/symptoms developed? _____

Was protective gear being used? If yes, what was the PPE? _____

Was there skin contact? _____

Was the exposing agent inhaled? _____

Were other persons exposed? If yes, did they experience symptoms? _____

III. Signs and Symptoms (check off appropriate symptoms)

Immediately With Exposure:

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath

Chest Tightness / Pressure
Nausea / Vomiting
Dizziness
Weakness

Delayed Symptoms:

Weakness
Nausea / Vomiting
Shortness of Breath
Cough

Loss of Appetite
Abdominal Pain
Headache
Numbness / Tingling

IV. Present Status of Symptoms (check off appropriate symptoms)

Burning of eyes, nose; or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Cyanosis

Nausea / Vomiting
Dizziness
Weakness
Loss of Appetite
Abdominal Pain
Numbness / Tingling

Have symptoms: (please check off appropriate response and give duration of symptoms)

Improved: _____ Worsened: _____ Remained Unchanged: _____

V. Treatment of Symptoms (check off appropriate response)

None: _____ Self-Medicating: _____ Physician Treated: _____

2.6 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

TiNUS personnel will be working in close proximity to each other at NSWC. As a result, hand signals, voice commands, and line of site communication will be sufficient to alert site personnel of an emergency. When project tasks are performed simultaneously on different sites, vehicle horns will be used to communicate emergency situations.

If an emergency occurs on Base, the following procedures are to be initiated:

- Initiate an emergency notification by hand signals, voice commands, air horn, or two-way radios to the FOL/SSO. Describe to the FOL/SSO (who will serve as the Incident Coordinator) what has occurred and as many details as possible.
- Have your partner evacuate non-essential persons from the incident scene, engage initial response measures given the emergency type (i.e., spill response, fire extinguisher, first-aid)

In the event that site personnel cannot control the incident through offensive and defensive measures, the FOL/SSO will enact the emergency notification procedures to secure additional outside assistance in the following manner:

- On Base, call 854-3300 or 854-1333* and other appropriate emergency contacts (Table 2-1) and report the emergency. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of what occurred. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies.

***NOTE:** On-base extensions 3300 and 1333 are the primary emergency phone numbers. From an NSWC Crane phone, on Base extensions must be preceded by "854". Off-base numbers can only be reached by dialing "990" or "991" first. Furthermore, all emergencies involving site activities should subsequently be reported to the Environmental Office (x6160).

Evacuate all Tetra Tech NUS and subcontractor personnel to the identified safe place of refuge. Conduct a head count of site personnel using the site logbook.

TABLE 2-1
EMERGENCY REFERENCES
NSWC CRANE, CRANE, INDIANA

AGENCY	TELEPHONE
Base Emergency Number (Fire Department, Base Security, Ambulance) <ul style="list-style-type: none"> • If dialing from an on-base phone: • If dialing from cell or off-base phone: 	911 854-3300 or 854-1333
Base Environmental Office	(812) 854-3114
Railroad Dispatch (for access/clearance to R.R. Tracks)	(812) 854-1613
Bedford Ambulance	(812) 279-6545
Bloomington Hospital (Bloomington, IN)	(812) 336-9515
Hospital, Bedford Medical Center (Bedford, IN)	(812) 275-1200
Poison Control Center	(800)-222-1222
National Response Center	(800)-424-8802
Base Contact, Thomas Brent	(812) 854-6160
Task Order Manager, Roger Clark	(412) 921-8415
TtNUS Crane Field Office Building 3245/ Field Operations Leader	(812) 854-0280
TtNUS Office, Pittsburgh	1-800-245-2730 (412) 921-7090
CLEAN Health and Safety Manager, Matthew M. Soltis, CIH, CSP	(412) 921-8912

NOTE: All emergency contacts to emergency services off base require the notification of NSWC Emergency Dispatch. Information to be provided will include the type and extent of the emergency and agencies notified.

2.7 PPE AND EMERGENCY EQUIPMENT

A first-aid kit, eye wash units (or bottles of disposable eyewash solution) and fire extinguishers (strategically placed) will be maintained onsite and shall be immediately available for use in the event of an emergency. This equipment will be located in the field office as well as in each site vehicle. At least one first aid kit supplied with equipment to protect against blood borne pathogens will also be available on site. Personnel identified within the field crew with blood borne pathogen and first-aid training will be the only personnel permitted to offer first-aid assistance.

2.8 EMERGENCY CONTACTS

Prior to initiating field activities, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to all site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

2.9 EMERGENCY ROUTE TO HOSPITAL

Directions to the Bloomington Hospital:

601 W. 2nd St.
P.O. Box 1149
Bloomington, IN 47402

Exit NSWC Crane on H-45 through the Bloomington Gate. Follow Highway 45 North to Bloomington at Highway 45 and Highway 37. Continue going straight over the overpass (Bloomfield Road). Follow Bloomfield Road North; this road turns into 2nd Street. Follow 2nd Street, hospital will be on the right (601 West 2nd Street)

Directions to Bedford Medical Center:*

2900 16th Street
Bedford, IN 47421

Exit the base on H-58, through the Bedford Gate. Head West on State Highway 158. State Highway 158 becomes 16th Street upon entering the City of Bedford. The medical center is on the right shortly after Plaza Drive.

***NOTE:** The Bedford Gate is open only from 0600 - 0830 and 1500 - 1800 hours, whereas the Bloomington Gate is open 24 hours. A map indicating the travel route from the site to the hospitals are included as Figures 2-2 and 2-3.

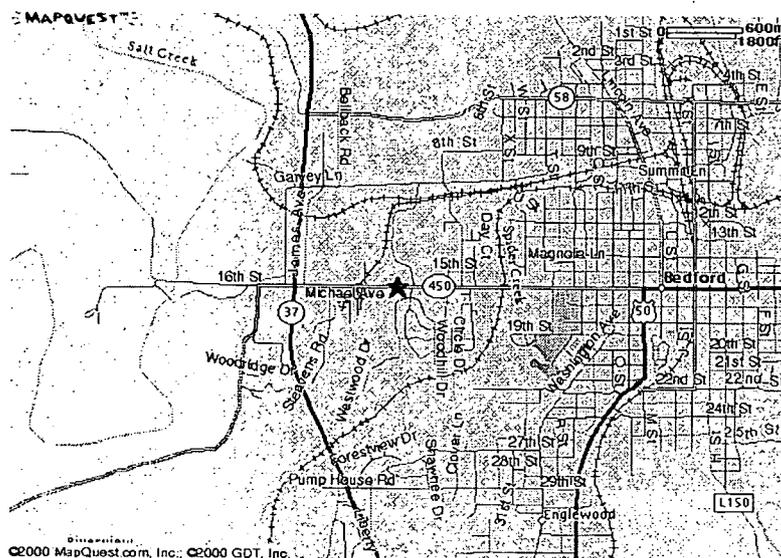
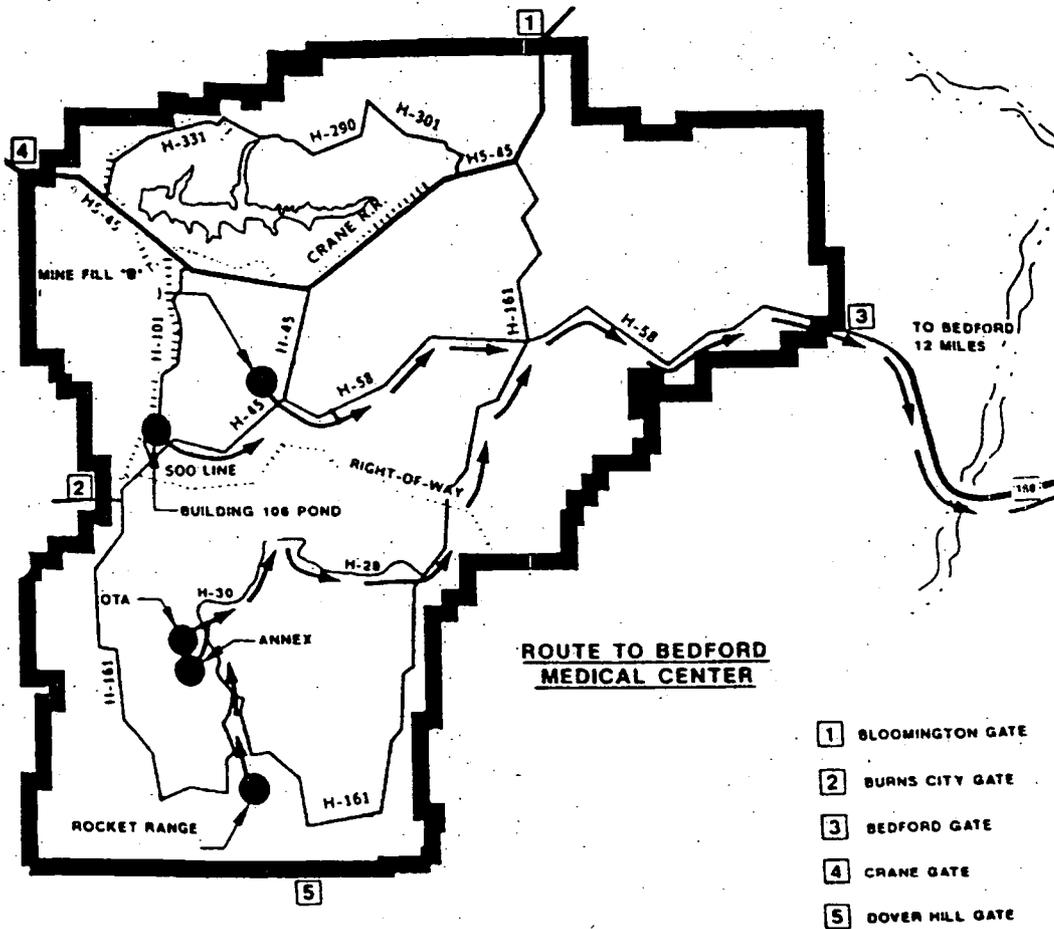
As soon as possible, Navy contact Thomas Brent must be informed of any incident or accident that requires medical attention.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide hazard information from Table 6-1 to medical service personnel.

Figure 2-3

Bedford Regional Medical Center Route Map (Bedford Gate)

*Note: The Bedford Gate is open only from 0600 - 0830 and 1500 - 1800 hours.



3.0 SITE BACKGROUND

This section provides information pertaining to NSWC Crane and the specific sites that are to be investigated. This information will be revised if additional information becomes available or if additional sites are added to the scope of work.

3.1 SITE HISTORY

NSWC Crane is located in Crane, Indiana approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky. The facility encompasses more than 100 square miles (64,463 acres) in Davies, Greene, Lawrence, and Martin Counties. It is located in a rural, sparsely populated area. The acreage surrounding the Base is either wooded or farmed land. The facility, originally called Naval Ammunition Depot (NAD), Burns City, was opened in 1941 to serve as an inland ammunition production and storage center. The Depot's name was changed to NAD, Crane in 1943. In 1975, the name was changed to Naval Weapons Support Center, Crane and in 1992, the name was again changed to Naval Surface Warfare Center, Crane. Today NSWC Crane's mission is to "provide quality and responsive engineering, technical and material support to the Fleet for combat subsystems, equipment and components, microelectronic technology, microwave components, electronic warfare, acoustic sensors tests, engineering pyrotechnics, small arms, electronic module test and system command." Under the Single Service Management Program, a segment of the Center's mission is to provide support (including environmental protection) to the Crane Army Ammunition Activity (CAAA). The Army is tasked with the production and renovation of conventional ammunition and related items, the performance of manufacturing, engineering, and product quality assurance to support production; and the storage, shipment, demilitarization, and disposal of conventional ammunition and related components. Because of the nature of the Army's operations, CAAA contributes significant financial support for the environmental program through an Inter-service Support Agreement.

3.2 SWMU 9 – PESTICIDE CONTROL/R-150 TANK AREA

The Pesticide Control/R-150 Tank Area is located in the central portion of the NSWC Crane, approximately 5 miles northeast of the Burns City Gate No. 2. The site (including space between the three distinct area where site operation did not occur) occupies approximately 11 acres. Site operations were centered around the three areas (Building 55, Building 2189, and the R-150 Tank area) previously identified. The site is bounded on the east by Highway 45.

SWMU 9 is an inactive site composed of three distinct areas: Building 55, Building 2189, and the R-150 Tank area. Pesticide control activities occurred at Buildings 55 and 2189 (which are no longer present at

the site). Waste solvents were stored at the R-150 Tank area; the tank has been removed from the site. The three areas are located near each other in a triangular configuration. Building 2189 is 1150 feet north of Building 55. The R-150 Tank area is approximately 800 feet southwest of Building 2189 and 700 feet northwest of Building 55.

Pesticides control activities, which were conducted at the site from 1950 to 1974, consisted of the storage and management of various types and quantities of pesticides and herbicides. The original Pesticide Control Building was Building 55. Around 1970, pesticide control operations were moved from Building 55 to Building 2189. Pesticide spray tanks and containers were reportedly rinsed in the vicinity of Building 2189 on the west side of the building. It is not known whether rinsing activities occurred outside Building 55.

Pesticides control operations ceased at the site around 1974. Buildings 55 and 2189 have since been demolished. Concrete pads are not apparent at the former building locations. Prior sampling activities identified VOCs, Semi-Volatile Organic Compounds (SVOCs), PCBs, pesticides, and metals at the site.

In order to fill data gaps from the previous sampling at SWMU 9 and to meet the objectives as described in the 2000 Work Plan, additional sampling and analysis is required. These activities will include sampling and analysis of surface and subsurface soils, perched water, ground water, and surface water and sediment. It should be noted that all field activities, including methods of sample collection and analysis, will be conducted as described in the approved Work Plan (TtNUS, August 2000) with the exception of additional updated information as described in this HASP Addendum (February 2005).

Additionally, some specific information is available regarding the types of pesticides stored at Building 55. Pesticides and herbicides stored at Building 55 included, but were not limited to, 2,4-D, 2,4,5-T, silvex (a mixture of 2,4-D and 2,4-T), fenac, monuron, ureabor, carbaryl, chlordane, DDT, diazinon, dieldrin, lindane, malathion, and pyrethrum. In addition to the chemicals stored and used at Building 55, the pesticide krovar (a mixture of duron and bromac) was added to the chemical inventory when pesticide control operations were moved from Building 55 to Building 2189.

4.0 SCOPE OF WORK

This section describes the project tasks that will be performed at NSWC. Additionally, each task has been evaluated and the associated hazards and recommended control measures are listed in Table 5-1 of this HASP. The planned activities involved in this effort are presented in detail in the Work Plan (WP) developed for the project. If new tasks are to be performed at the site, Table 5-1 and this section will be modified accordingly.

Field investigations to be performed by TtNUS are designed to collect field and laboratory data needed to evaluate the potential risks for human and ecological receptors at SWMUs 4, 5, 9, and 10. Specific tasks to be conducted include the following:

- Mobilization and demobilization
- Multi-media sampling, including:
 - Soil (surface)
 - Groundwater
 - Surface water
 - Sediment
 - Investigation derived waste (IDW)
- Soil borings (using hollow-stem augers and direct-push technology)
- Temporary monitoring well installation, purging, and development
- Topographic surveying
- Decontamination of sampling and heavy equipment

For more detailed description of the associated tasks refer to the WP. If additional tasks are determined to be necessary, this HASP will need to be amended and a hazard evaluation of the additional tasks performed.

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES

Table 5-1 of this section is intended to assist project personnel in the recognition of hazards and recommended control measures necessary for each planned task to minimize potential exposure or injuries related to those hazards. The table also assists field team members in determining which personal protective equipment (PPE) and decontamination procedures are to be used as well as appropriate air monitoring techniques and action levels. This table must be updated if the scope of work, contaminants of concern, or pertinent conditions change.

Safe Work Permits (SWP) will be issued for all site activities (See Section 10.10). The FOL and/or the SHSO are responsible for completing for each site task that will be performed, and then reviewing the task-specific SWPs with all task participants prior to the initiation of each site task. The FOL/SHSO will prepare each SWP using the information presented in Table 5-1 as the primary reference, adding additional information as warranted.

As discussed earlier, the Health and Safety Guidance Manual supports this table and HASP. The manual is designed to further explain supporting programs and elements for other site-specific aspects as required by regulatory requirements. The Guidance Manual should be referenced for additional information regarding air monitoring instrumentation, decontamination activities, emergency response, hazard assessments, hazard communication and hearing conservation programs, medical surveillance, PPE, respiratory protection, site control measures, standard work practices, and training requirements. Many of Tetra Tech NUS' SOPs are also provided in this Guidance Manual.

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**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
NAVAL SURFACE WARFARE CENTER – CRANE DIVISION, CRANE INDIANA**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	<p>Chemical hazards:</p> <p>Exposure to potential site contaminants during this activity is unlikely given the nature of the work and the limited contact with potentially contaminated media.</p> <p>Physical Hazards</p> <p>1) Lifting (strain/muscle pulls) 2) Pinches and compressions 3) Slip, trips, and falls 4) Heavy equipment hazards (rotating equipment, hydraulic lines, etc.) 5) Vehicular and foot traffic 6) Ambient temperature extremes (heat stress)</p> <p>Natural hazards</p> <p>7) Insect/animal bites and stings (including fire ants and Eastern diamondback rattlesnakes) 8) Inclement weather</p>	<p>1) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Keep any machine guarding in place. Avoid moving parts. Use tools or equipment where necessary to avoid contacting pinch points. 3) Preview work locations for unstable/uneven terrain. 4) All equipment will be - Inspected in accordance with OSHA, and manufacturer's design. - Operated by knowledgeable operators, and knowledgeable ground crew. 5) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the Base requirements. 6) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in Section 4 of the TINUS Health and Safety Guidance Manual. 7) Avoid potential nesting areas of biting/stinging insects and snakes. Use commercially available insect repellents. Wear appropriate clothing, including snake chaps where warranted. Tape ankle and wrists areas to prevent fire ants, ticks, chiggers, etc. from attaching themselves to your skin. Wear light colored clothing so that biting insects can be easily visible and be removed. Follow directions as specified in Section 6.3 and Attachment II concerning natural hazards. 8) Suspend or terminate operations until directed otherwise by SSO.</p>	<p>Not required</p>	<p>Level D - (Minimum Requirements)</p> <ul style="list-style-type: none"> - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Coveralls may be worn to protect exposed skin from insects, ticks, etc. Joints (ankles and wrists) should be taped. - Snake chaps shall be worn in areas of known or suspected snake infestation. <p><i>(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)</i></p>	<p>Not required</p>
Topographic surveying	<p>Chemical hazards:</p> <p>Exposure to potential site contaminants during this activity is unlikely given the nature of the work and the limited contact with potentially contaminated media.</p> <p>Physical hazards:</p> <p>1) Slip, trips, and falls</p> <p>Natural Hazards:</p> <p>2) Insect/animal bites and stings (including fire ants and Eastern diamondback rattlesnakes) 3) Inclement weather</p>	<p>1) Preview work locations and site lines for uneven and unstable terrain. Clear necessary vegetation, establish temporary means for traversing hazardous terrain(i.e., rope ladders, etc.) 2) Avoid potential nesting areas of biting/stinging insects and snakes. Use commercially available insect repellents. Wear appropriate clothing, including snake chaps where warranted. Tape ankle and wrists areas to prevent fire ants, ticks, chiggers, etc. from attaching themselves to your skin. Wear light colored clothing so that biting insects can be easily visible and be removed. Follow directions as specified in Section 6.3 and the Health and Safety Guidance Manual concerning natural hazards. 3) Suspend or terminate operations until directed otherwise by SSO.</p>	<p>No air monitoring is needed given the unlikelihood that volatile contaminants are present during surveying activities and the non-intrusive nature of the task. The potential for exposure to site contaminants during this activity is considered minimal.</p> <p>Minimize the generation of airborne dusts since most site contaminants are in the form of a particulate or may be bound to particulates.</p>	<p>These miscellaneous activities will be performed in Level D protection (unless otherwise indicated) consisting of the following:</p> <ul style="list-style-type: none"> - Standard field dress including sleeved shirt and long pants - Steel-toe work boots or shoes - Safety glasses and hard hats (if working near machinery) - Coveralls may also be worn to protect exposed skin from insects, ticks, etc. Joints (ankles and wrists) should be taped. - Snake chaps shall be worn in areas of known or suspected snake infestation. <p><i>(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)</i></p>	<p>Personnel Decontamination - A structured decontamination is not required as the likelihood of encountering contaminated media is considered remote.</p> <p>Workers should inspect themselves and one another for the presence of fire ants, ticks, and other insects when exiting wooded areas, grassy fields, etc. This action will be employed to stop the transfer of these insects into vehicles, homes, and offices.</p>

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
NAVAL SURFACE WARFARE CENTER – CRANE DIVISION, CRANE INDIANA**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
<p>Multi-media sampling, including soil, surface water, groundwater, sediment, and IDW sampling.</p>	<p><i>Chemical Hazards</i></p> <p>1) Primary contaminants include VOCs, SVOCs, (including general PAHs), metals, PCBs, and pesticides.</p> <p>Specific compounds of concern are discussed in Section 6.1 and Table 6-1 of the HASP. Table 6-1 provides more detailed information regarding the toxicological, chemical, and physical properties of these compounds. Note that many of these contaminants may be bound to particulates (dusts, soils, etc.) and contact with dusts should be avoided whenever possible. Many of these contaminants are non-volatile, and none of these contaminants are anticipated to be encountered in significant concentrations to present an inhalation hazard.</p> <p>2) Transfer of contamination into clean areas</p> <p><i>Physical hazards</i></p> <p>3) Noise in excess of 85 dBA 4) Lifting (strain/muscle pulls) 5) Pinches, cuts and compressions 6) Slip, trips, and falls 7) Ambient temperature extremes (heat stress) 8) Vehicular and foot traffic</p> <p><i>Natural hazards</i></p> <p>9) Insect/animal bites and stings (including fire ants and Eastern diamondback rattlesnakes) 10) Inclement weather</p>	<p>1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (e.g. air, water, soils). Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, termination of activities may be used to minimize exposure to observed airborne dusts.</p> <p>2) Decontaminate all equipment and supplies between sampling locations and prior to leaving the site.</p> <p>3) When sampling at the drilling equipment use hearing protection. The use of hearing protection outside of 25 feet from the drilling equipment should be incorporated under the following condition:</p> <p style="padding-left: 40px;">If you have to raise your voice to talk to someone who is within 2 feet of your location, hearing protection must be worn.</p> <p>4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.</p> <p>5) Use GeoProbe Sampling Kit to obtain samples from DPT activities. Kit consists of holding trough (for acetate sleeve) that can be clamped to truck bed gate, and hand knife containing double, recessed blades. Keep any machine guarding in place. Avoid moving parts. Use tools or equipment where necessary to avoid contacting pinch points. The equipment operator shall be directed to shut down machinery if the sampler is near moving machinery parts.</p> <p>6) Preview work locations for unstable/uneven terrain.</p> <p>7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in Section 4 of the TtNUS Health and Safety Guidance Manual.</p> <p>8) Traffic and equipment considerations are to include the following:</p> <ul style="list-style-type: none"> - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the Base requirements. <p>9) Avoid potential nesting areas of biting/stinging insects and snakes. Use commercially available insect repellents. Wear appropriate clothing, including snake chaps where warranted. Tape ankle and wrists areas to prevent fire ants, ticks, chiggers, etc. from attaching themselves to your skin. Wear light colored clothing so that biting insects can be easily visible and be removed. Follow directions as specified in Section 6.3 and Attachment II concerning natural hazards.</p> <p>11) Suspend or terminate operations until directed otherwise by SSO</p>	<p>It is not anticipated that potential contaminant concentrations at outdoor sample locations will present an inhalation hazard.</p> <p>Many anticipated site contaminants are non-volatile and are not expected to be present as an inhalation hazards. Nonetheless, a direct reading Photoionization Detector (PID) with an 10.6 eV (or higher) lamp or Flameionization Detector (FID) will be used to screen samples and to detect the presence of any potential volatile organics. Source monitoring of the borehole will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions:</p> <ul style="list-style-type: none"> - Monitor the breathing zone of at-risk and downwind employees. Any sustained readings (greater than 1 minute in duration) above background in the breathing zone of the at-risk employees requires site activities to be suspended and site personnel to retreat to an unaffected area. <p>Work may only resume if airborne readings in worker breathing zone areas return to background levels. If elevated readings in worker breathing zone persist, the PHSO and HSM will be contacted to determine necessary actions and levels of protection.</p> <p>Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides.</p>	<p>Level D protection will be utilized for the initiation of all sampling activities.</p> <p>Level D - (Minimum Requirements)</p> <ul style="list-style-type: none"> - Standard field attire (Sleeved shirt; long pants) - Safety shoes (steel toe/shank) - Safety glasses - Surgical style gloves (double-layered if necessary) - Reflective vest for high traffic areas - <i>Hardhat (when overhead hazards exists, or identified as a operation requirement)</i> - <i>Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential exists for soiling work attire. Coveralls may also be worn to protect exposed skin from insects, ticks, etc. Joints (ankles and wrists) should be taped.</i> - <i>Snake chaps shall be worn in areas of known or suspected snake infestation.</i> <p>Use GeoProbe Sampling Kit for obtaining subsurface soil samples from DPT activities.</p> <p><i>(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)</i></p> <p>Note: The Safe Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.</p>	<p>Personnel Decontamination will consist of a removal and disposal of non-reusable PPE (gloves, coveralls, etc., as applicable). The decon function will take place at an area adjacent to the site activities. This procedure will consist of:</p> <ul style="list-style-type: none"> - Equipment drop - Outer coveralls, boot covers, and/or outer glove removal (as applicable) - Removal, segregation, and disposal of non-reusable PPE in bags/containers provided - Soap/water wash and rinse of reusable PPE (e.g., hardhat) if potentially contaminated - Wash hands and face, leave contamination reduction zone. <p>In addition, workers should inspect themselves and one another for the presence of fire ants, ticks, and other insects when exiting wooded areas, grassy fields, etc. This action will be employed to stop the transfer of these insects into vehicles, homes, and offices.</p>

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
NAVAL SURFACE WARFARE CENTER – CRANE DIVISION, CRANE INDIANA**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
<p>Temporary Monitoring well installation via DPT</p> <p>This task also includes monitoring well installation, development, and purging.</p>	<p>Chemical Hazards</p> <p>1) Primary contaminants include VOCs, SVOCs, (including general PAHs), metals, PCBs, and pesticides.</p> <p>Specific compounds of concern are discussed in Section 6.1 and Table 6-1 of the HASP. Table 6-1 provides more detailed information regarding the toxicological, chemical, and physical properties of these compounds. Note that many of these contaminants may be bound to particulates (dusts, soils, etc.) and contact with dusts should be avoided whenever possible. Many of these contaminants are non-volatile, and none of these contaminants are anticipated to be available in significant concentrations to present an inhalation hazard.</p> <p>2) Transfer of contamination into clean areas or onto persons</p> <p>Physical hazards</p> <p>3) Heavy equipment hazards (pinch/compression points, rotating equipment, hydraulic lines, etc.)</p> <p>4) Noise in excess of 85 dBA</p> <p>5) Energized systems (contact with underground or overhead utilities)</p> <p>6) Lifting (strain/muscle pulls)</p> <p>7) Slip, trips, and falls</p> <p>8) Vehicular and foot traffic</p> <p>9) Ambient temperature extremes (heat stress)</p> <p>Natural hazards</p> <p>10) Insect/animal bites and stings (including fire ants and Eastern diamondback rattlesnakes)</p> <p>11) Inclement weather</p>	<p>1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.). Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, termination of activities may be used to minimize exposure to excessive airborne dusts.</p> <p>2) Decontaminate all equipment and supplies between boreholes and prior to leaving the site.</p> <p>3) All equipment to be used will be</p> <ul style="list-style-type: none"> - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600, .601, .602), and manufacturers design and documented as such using Equipment Inspection Sheet (see Attachment III of this HASP). - Operated by knowledgeable operators and ground crew. - Repaired using only manufacturer approved parts and equipment <p>In addition to the equipment considerations, the following standard operating procedures will be employed:</p> <ul style="list-style-type: none"> - All personnel not directly supporting the drilling operation will remain at least 25 feet from the point of operation. - All loose clothing/protective equipment will be secured to avoid possible entanglement. - Hand signals will be established prior to the commencement of drilling activities. - A remote sampling device must be used to sample drill cuttings near rotating tools. - Work areas will be kept clear of clutter. - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to insure its operational status. - Areas will be inspected prior to the movement of drilling equipment and support vehicles to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. <p>4) Hearing protection will be used during all subsurface activities.</p> <p>5) Follow the TtNUS Utility Locating and Excavation Clearance SOP (Attachment V). All utility clearances must be obtained, in writing, prior to subsurface activities (contact Thomas Brent). Prior to any subsurface investigations, the locations of all underground utilities must be identified and marked.</p> <p>6) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.</p> <p>7) Preview work locations for unstable/uneven terrain.</p> <p>8) Traffic and equipment considerations are to include the following:</p> <ul style="list-style-type: none"> - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the Base requirements. <p>9) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat stress concerns is provided in Section 4 of the TtNUS Health and Safety Guidance Manual.</p> <p>10) Avoid potential nesting areas of biting/stinging insects and snakes. Use commercially available insect repellents. Wear appropriate clothing, including snake chaps where warranted. Tape ankle and wrists areas to prevent fire ants, ticks, chiggers, etc. from attaching themselves to your skin. Wear light colored clothing so that biting insects can be easily visible and be removed. Follow directions as specified in Section 6.3 and Attachment II concerning natural hazards.</p> <p>11) Suspend or terminate operations until directed otherwise by SSO</p>	<p>It is not anticipated that potential contaminant concentrations at outdoor sample locations will not present an inhalation hazard.</p> <p>Many anticipated site contaminants are non-volatile and are not expected to be present as an inhalation hazards. Nonetheless, a direct reading Photoionization Detector (PID) with a lamp strength of more than 10.9 eV or Flameionization Detector (FID) will be used to screen samples and to detect the presence of any potential volatile organics. Source monitoring of the borehole will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions:</p> <ul style="list-style-type: none"> - Monitor the breathing zone of at-risk and downwind employees. Any sustained readings (greater than 1 minute in duration) above background in the breathing zone of the at-risk employees requires site activities to be suspended and site personnel to retreat to an unaffected area. - Work may only resume if airborne readings in worker breathing zone area return to background levels. If elevated readings in worker breathing zone persist, the PHSO and HSM will be contacted to determine necessary actions and levels of protection. <p>Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides.</p> <p>Where the utility clearance cannot be determined, subsurface activities shall proceed with extreme caution using hand digging to at least below frost-line depth (no less than 4 feet BGS). Also a magnetometer must be used for periodic down-hole surveys every 2 feet to a depth of at least 10 feet.</p>	<p>All subsurface operations are to be initiated in Level D protection. Level D protection constitutes the following minimum protection</p> <ul style="list-style-type: none"> - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Nitrile gloves or leather gloves with surgical style inner gloves - Hardhat - Reflective vest for traffic areas - <i>Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential exists for soiling work attire. Coveralls may also be worn to protect exposed skin from insects, ticks, etc. Joints (ankles and wrists) should be taped.</i> - <i>Snake chaps shall be worn in areas of known or suspected snake infestation.</i> - <i>Hearing protection during drilling or for other high noise areas as directed by the SSO.</i> <p><i>(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)</i></p> <p>Note: The Safe Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.</p>	<p>Personnel Decontamination - Will consist of a soap/water wash and rinse for reusable protective equipment (e.g., gloves). This function will take place at an area adjacent to the drilling operations bordering the support zone.</p> <p>This decontamination procedure for Level D protection will consist of</p> <ul style="list-style-type: none"> - Equipment drop - Soap/water wash and rinse of reusable outer gloves, as applicable - Outer coveralls, boot covers, and/or outer glove removal - Removal, segregation, and disposal of non-reusable PPE in bags/containers provided - Wash hands and face, leave contamination reduction zone. <p>In addition, workers should inspect themselves and one another for the presence of fire ants, ticks, and other insects when exiting wooded areas, grassy fields, etc. This action will be employed to stop the transfer of these insects into vehicles, homes, and offices.</p>

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
NAVAL SURFACE WARFARE CENTER – CRANE DIVISION, CRANE INDIANA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
<p>Decontamination of Sampling and Heavy Equipment</p>	<p>Chemical Hazards</p> <p>1) Primary contaminants include VOCs, SVOCs, (including general PAHs), metals, PCBs, and pesticides.</p> <p>Specific compounds of concern are discussed in Section 6.1 and Table 6-1 of the HASP. Table 6-1 provides more detailed information regarding the toxicological, chemical, and physical properties of these compounds. Note that many of these contaminants may be bound to particulates (dusts, soils, etc.) and contact with dusts should be avoided whenever possible. Many of these contaminants are non-volatile, and none of these contaminants are anticipated to be available in significant concentrations to present an inhalation hazard.</p> <p>2) Decontamination fluids - Liquinox (detergent), acetone or isopropanol</p> <p>Physical Hazards</p> <p>3) Lifting (strain/muscle pulls) 4) Noise in excess of 85 dBA 5) Flying projectiles 6) Vehicular and foot traffic 7) Ambient temperature extremes (heat stress) 8) Slips, trips, and falls</p>	<p>1) and 2) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination solvents used onsite. These must be used in well-ventilated areas such as outdoors. Use appropriate PPE as identified on MSDS. All chemicals used must be listed on the Chemical Inventory for the site, and site activities must be consistent with the Hazard Communication section of the Health and Safety Guidance Manual (Section 5).</p> <p>3) Use multiple persons where necessary for lifting and handling sampling equipment for decontamination purposes.</p> <p>4) Wear hearing protection when operating pressure washer.</p> <p>5) Use eye and face protective equipment when operating pressure washer. All other personnel must be restricted from the area.</p> <p>6) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the Base requirements.</p> <p>7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in Section 4 of the TINUS Health and Safety Guidance Manual.</p> <p>8) Preview work locations for unstable/uneven terrain.</p>	<p>Use visual observation, and real-time monitoring instrumentation to ensure all equipment has been properly cleaned of contamination and dried. After decon is completed, screen equipment with a PID/FID. If any elevated readings (i.e., above background) are observed, perform decon again and rescreen. Repeat until no elevated PID/FID readings are noted.</p>	<p>For Heavy Equipment This applies to high pressure soap/water, steam cleaning wash and rinse procedures.</p> <p>Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Chemical resistant boot covers - Nitrile outer gloves - <i>PVC Rainsuits or PE or PVC coated Tyvek</i> - <i>Safety glasses underneath a splash shield</i> - <i>Hearing protection (plugs or muffs)</i></p> <p><i>Items in italics are at the discretion of the SSO.</i></p> <p>For sampling equipment (trowels, MacroCore Samplers, bailers, etc.), the following PPE is required</p> <p>NOTE: Consult MSDS for PPE guidance. Otherwise, observe the following:</p> <p>Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Nitrile outer gloves - Safety glasses</p>	<p>Personnel Decontamination will consist of a soap/water wash and rinse for reusable outer protective equipment (boots, gloves, PVC splash suits, as applicable). The decon function will take place at an area adjacent to the site activities. This procedure will consist of: - Equipment drop - Soap/water wash and rinse of outer boots and gloves, as applicable - Soap/water wash and rinse of the outer splash suit, as applicable - Disposable PPE will be removed and bagged.</p> <p>Equipment Decontamination - All heavy equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. The drill rig will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will have restricted access to exclusion zones, and have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the onsite activity.</p> <p>Sampling Equipment Decontamination</p> <p>Sampling equipment will be decontaminated as per the requirements in the Sampling and Analysis Plan and/or Work Plan.</p> <p>MSDS for any decon solutions (Alconox, isopropanol, etc.) will be obtained and used to determine proper handling / disposal methods and protective measures (PPE, first-aid, etc.).</p> <p>All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site.</p> <p>The FOL or the SSO will be responsible for evaluating equipment arriving onsite and leaving the site. No equipment will be authorized access or exit without this evaluation.</p>

6.0 HAZARD ASSESSMENT

The following section provides information regarding the chemical, physical, and natural hazards anticipated to be present during the activities to be conducted. Table 6-1 provides information related to chemical constituents that have been identified by analysis or are suspected to be present at the site based on historical data. Specifically, toxicological information, exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data are discussed in the table.

6.1 CHEMICAL HAZARDS

Based on historical information, the predominant chemical substances that could be encountered at SWMU 9 at NSWC predominantly involve pesticides. However, based on previous investigations at SWMU 9, other contaminants have also been detected including metals, PCBs, volatile organic compounds, and PAHs in surface soils, sediments, surface water, and groundwater. Potential routes of exposure to these substances can include inhalation, ingestion, and dermal contact. However, evaluations of that previously-collected data demonstrate that **none of the previously-detected contaminants are likely to be encountered in airborne concentrations that would represent an inhalation concern to onsite workers.** This route of exposure will be monitored through the use of direct-reading monitoring instruments, action levels, and other controls specified in this HASP. The other potential routes of exposure will be controlled through the use of appropriate PPE, good personal hygiene and decontamination activities, and by observing site requirements and prohibitions specified in this HASP.

Based on historical uses for SWMU 9 and prior sampling results, the types of contaminants that may be anticipated include the following:

- Volatile Organic Compounds (VOCs), including low concentrations of chlorinated solvents such as 1,1-Dichloroethane, 1,1- and 1,2-Dichloroethylene, methylene chloride, 1,1,1-Trichloroethane, and trichloroethylene.
- Semi-Volatile Organic Compounds (SVOCs), including waste oils and general Polynuclear Aromatic Hydrocarbons (PAHs)
- Metals (e.g., arsenic, chromium, and lead)
- Polychlorinated Biphenyls (PCBs)
- Pesticides and Herbicides (e.g., 4,4'-DDT, Methoxychlor, 2,4-D, DINOSEB, and Pentachlorophenol)

None of these contaminants are anticipated to be available in significant concentrations to present an inhalation hazard. Further, significant potential for occupational exposures to field crews via ingestion and

skin contact are also not anticipated given the proposed site activities and previously detected very low concentrations of site contaminants, and assuming that the requirements and restrictions specified in this HASP are observed and enforced. Table 6-1 provides information on these compounds and individual substances. Included is information on the toxicological, chemical, and physical properties of these substances. It is anticipated that the greatest potential for exposure to site contaminants is during intrusive activities (drilling, soil sampling, etc.). Exposure to these compounds is most likely to occur through ingestion and inhalation of contaminated soil or water, or hand-to-mouth contact during soil disturbance activities. For this reason, PPE and basic hygiene practices (washing face/hands before leaving site) will be extremely important.

6.2 PHYSICAL HAZARDS

The physical hazards that may be present during the performance of site activities are summarized below:

- Heavy equipment hazards (pinch/compression points, rotating equipment, etc.).
- Slips, trips, and falls
- Energized systems (contact with underground or overhead utilities)
- Lifting (strain/muscle pulls)
- Noise in excess of 85 decibels (dBA)
- Flying projectiles
- Ambient temperature extremes (heat stress)
- Pinches and compressions
- Vehicular and foot traffic
- Contact with explosives (considered a potential site hazard as there is a report that small arms ammunition may have been buried at SWMU 4 and explosives were detected in prior sampling at SWMU 10.)

These physical hazards are discussed in Table 5-1 as applicable to each site task. Further, many of these hazard are discussed in detail in Section 4.0 of the Health and Safety Guidance Manual. Specific discussions on some of these hazards are presented below.

6.2.1 Heavy Equipment Hazards (Pinch/compression points, rotating equipment, etc.)

Often the hazards associated with drilling operations are the most dangerous to be encountered during site activities. The SSO will thoroughly discuss safe drilling procedures during the pre-activities training session. All site personnel will sign the form in Figure 8-2 documenting that they received the training and understand the procedures.

6.2.2 Drilling Safe Work Practices

The following Safe Work Practices are to be followed when working in or around the HSA Drill Rig Operations.

Before Drilling

- Identify all underground utilities and buried structures before drilling. This service is provided by the NAS Pensacola and Sunshine State One Call of Florida. In addition, Tetra Tech NUS, Inc. personnel will use the Utility Locating and Excavation Clearance Standard Operating Procedure provided in Attachment II.
 - 1) A request is submitted to Sunshine State One Call of Florida (1-800-432-4770) for clearance of a location(s). Often times intersections, building numbers, or other location identifiers are provided. It is best to provide as much assistance as possible. Ensure that marks are on the ground using white paint or flagging. Sunshine State One Call of Florida then notifies members within this cooperative. This is sometimes where problems arise. Not all utilities are required to be members. Provisions to accommodate this shortfall are provided in the Tetra Tech NUS, Inc. Utility Locating and Excavation Clearance Standard Operating Procedure provided in Attachment II.
 - 2) Typical timeline for marking and providing clearances is 48-hrs. A ticket or ticket number will be provided referring to your clearance. This will have a timeline, generally 14-days. Again problems sometime arise here because site personnel allow their tickets to expire, then accidentally encounter a utility. Tickets must be maintained valid by asking for a re-issue or extension, when necessary, prior to expiration.
 - 3) Another problem that occurs with time is that utility locations marked on the ground may not remain visible. The FOL is responsible for ensuring that utility locations/marks on the ground are maintained so they remain visible (repaint, pin flags, etc.), and to annotate maps with these locations so they may be incorporated into the GIS system.
 - 4) Lastly, once marks are placed on the ground and have been cleared, only limited leeway (2-feet) exists to stray from the planned and approved intrusive locations.
- All drill rigs will be inspected by the SHSO or designee, prior to the acceptance of the equipment at the site and prior to the use of the equipment. All repairs or deficiencies identified will be corrected prior to use. The inspection will be accomplished using the Equipment Inspection Checklist for Drill Rigs

provided in Attachment III. Additional inspections will be performed at least once every 10-day shift or following repairs.

- Check operation of the Kill Switch (initially, then periodically thereafter). See section 5.2 concerning these testing of the emergency stop devices and the other required precautions.
- Insure all machine guarding is in place and properly adjusted.
- Block drill rig and use levelers to prevent movement of the drill.
- The work area around the point of operation will be graded to the extent possible to remove any trip hazards near or surrounding operating equipment.
- The driller's helper will establish an equipment staging and laydown plan. The purpose of this is to keep the work area clear of clutter and slips, trips, and fall hazards. Mechanisms to secure heavy objects such as drill flights will be provided to avoid the collapse of stacked equipment.
- All potentially contaminated tooling will be wrapped in polyethylene sheeting for storage and transport to the centrally located equipment decontamination unit.

During Drilling

- Minimize contact to the extent possible with contaminated tooling and environmental media.
- Support functions (sampling and screening stations) will be maintained a minimum distance from the drill rig of the height of the mast plus five feet or 35-feet for HSA, 25-feet for DPT operations whichever is greater to remove these activities from within physical hazard boundaries. These boundaries because they are in areas where the general population exists will be strictly enforced by site personnel.
- Only qualified operators and knowledgeable ground crew personnel will participate in the operation of the drill rig.
- During maintenance, use only manufacturer provided/approved equipment (i.e. auger flight connectors, etc.)

- In order to minimize contact with potentially contaminated tooling and media and to minimize lifting hazards, multiple personnel should move auger flights and other heavy tooling.
- Only personnel absolutely essential to the work activity will be allowed in the exclusion zone. Site visitors will be escorted at all times.

After Drilling

- All equipment used within the exclusion zone will undergo a complete decontamination and evaluation by the SHSO to determine cleanliness prior to moving to the next location, exiting the site, or prior to down time for maintenance.
- All motorized equipment will be fueled prior to the commencement of the days activities. During fueling operations all equipment will be shutdown and bonded to the fuel source.
- When not in use all drill rigs will be shutdown, and emergency brakes set and wheels will be chocked to prevent movement.
- All areas subjected to subsurface investigative methods will be restored to equal or better condition than original to remove any contamination brought to the surface and to remove any physical hazards. In situations where these hazards cannot be removed these areas will be barricaded to minimize the impact on field crews working in the area.

6.2.3 Energized Systems (Contact with Underground or Overhead Utilities)

Underground utilities such as pressurized lines, water lines, telephone lines, buried utility lines, and high voltage power lines may be present throughout the facility. Clearance of underground and overhead utilities for each sample location will be coordinated with NSWC personnel. Additionally, drilling operations will be conducted at a safe distance (>20 feet) from overhead power lines. Whenever underground utilities are suspected to be close to subsurface sampling locations, the borehole will be advanced to a minimum of five (5) feet with a hand auger prior to drilling. As built drawings may also be utilized for additional clarification. In certain cases, Base personnel may need to deenergize electrical cables using facility lockout/tagout procedures to insure electrical hazards are eliminated.

6.2.4 Ambient Temperature Extremes

Overexposure to high ambient temperatures (heat stress) may exist during performance of this work depending on the project schedule. Extremely cold temperatures are not expected to be encountered due to project location. Work performed when ambient temperatures exceed 70°F may result in varying levels of heat stress (heat rash, heat cramps, heat exhaustion, and/or heat stroke) depending on variables such as wind speed, humidity, and percent sunshine, as well as physiological factors such as metabolic rate and skin moisture content. Additionally, work load and level of protective equipment will affect the degree of exposure. Site personnel will be encouraged to drink plenty of fluids to replace those lost through perspiration. Additional information such as Work-Rest Regimens and personnel monitoring may be found in Section 4.0 of the Health & Safety Guidance Manual. The SSO will recommend additional heat stress control measures as they are deemed necessary as per ACGIH guidelines.

6.3 NATURAL HAZARDS

Insect/animal bites and stings, poisonous plants, inclement weather, and other natural hazards must be considered given the location of activities to be conducted. In general, avoidance of areas of known infestation or nesting will be the preferred exposure control. Use of additional PPE with joints (ankles and wrists) taped, such as long pants tucked into boots or coveralls, is also recommended. Specific discussion on principle hazards of concern follows:

6.3.1 Insect/Animal Bites and Stings

Ticks, insect/animal bites, and stings are difficult to control given the climate and environmental setting of NSW Crane. However, in an effort to minimize this hazard the following control measures will be enacted where possible.

- Commercially available bug sprays and repellents will be used whenever possible – TCLP Pesticides analytical screening includes chlordane, endrin, lindane, methoxychlor, toxathene and heptachlor. Commercially available repellants may be used providing these components are not part of this analyte listing. Products such as DEET should not be applied directly to the skin due to potential irritation. This product, when permitted for use, should be applied over clothing articles.
- Loose fitting light colored clothing with long sleeves, where possible should be worn. This will also aid in insect control by providing a barrier between the field person and the insects and to provide easy recognition of crawling insects against the lighter background. Pant legs should be secured to the work-boots using duct tape to prevent access by ticks. Mosquito nets are also recommended for use when commercially available repellents are not permitted.

- Clothing/limited body checks for ticks and other crawling insects should be conducted upon exiting heavily vegetated areas. Workers should perform a more detailed check of themselves when showering in the evening. Ticks prefer moist areas of the body (arm-pits, genitals, etc.) and will migrate to those locations.
- The FOL/SSO will preview all access routes and work areas in an effort to identify physical hazards including nesting areas in and around the work sites. These areas will be flagged and communicated to all site personnel.
- The FOL/SSO must determine if site personnel (through their Medical Data Sheets), suffer allergic reactions to bee and other insect stings and bites. When personnel are on-site who are predisposed to these conditions, the FOL/SSO will take the appropriate measures to secure physician directed antidotes.

Note to all personnel: It is imperative that any allergies be reported on the Medical Data Sheets and to the SSO.

Tick and Mosquito Transmitted Illnesses And Diseases

Ticks and mosquitoes have been identified in the transmission of diseases including Lyme's disease and malaria. Warm months (Spring through early Fall) are the most predominant time for this hazard. However, due to the climate and environmental setting of NSWC Crane, this hazard may occur year round. Information concerning transmitted Lyme's Disease including recognition, evaluation, tick removal, and control is provided in Attachment II of this HASP or Section 4.0 of the Health and Safety Guidance Manual.

Malaria may occur when a mosquito or other infected insect sucks blood from an infected person, and the insect becomes the carrier to infect other hosts. The parasite reproduces within the mosquito, and is then passed on to another person through the biting action. Acute symptoms include chills accompanied by fever and general flu like symptoms. This generally terminates in a sweating stage. These symptoms may recur every 48 to 72 hours.

Conditions such as this should not be taken for granted and should be reported to the SSO immediately.

Snakes And Other Wild Animal Encounters

Indigenous animals including snakes (poisonous and non-poisonous varieties), raccoons, and other animals native to the region may have to be contended with. These animals may be encountered if work locations encroach on nesting or territories claimed by these animals.

To avoid the obvious hazards conveyed as part of a direct encounter, the following actions will be taken to minimize impact on the field crews and/or operations.

- FOL/SSO will preview access routes and work locations for nesting areas or signs of animal activities (tracks, foraging areas, etc.). All identified suspect areas will be communicated to the field crews. To the extent possible, suspected nesting/habitat areas are to be avoided. Otherwise, snake chaps will be required as a precaution.

6.3.2 Poisonous Plants

Various plants that can cause allergic reactions may be encountered during fieldwork. These include, but may not be limited to, poison ivy, poison oak, and poison sumac. Contact of field personnel with previous plants may occur when clearing vegetation for access to work areas, or through movement through these plants. An irritating, allergic reaction can occur when direct contact is achieved between the plant and the bare skin of a field person, or the plant and some piece of equipment or clothing article that then later comes in contact with the bare skin of a field person. Oils are transferred from the plant to exposed skin, clothing, or piece of equipment. The degree of the irritating, allergic reaction can vary significantly from one person to the next.

Protective measures to control and minimize the effects of this hazard may include, but not limited to, the following:

- Identify plants for field personnel.
 - Poison Ivy - Characterized by climbing vines, three leaf configuration ovate to elliptical in shape, deep green leaves with a reddish tint, greenish flowers, and white berries.
 - Poison Sumac - Characterized as a tall bush of the sumac family bearing compound leaves (7-13 entire leaflets), branched from a central axis, drooping, with auxiliary clusters of white fruit.

NOTE: These white fruits and berries may exist only during pubescent stages.

- Poison oak - Characterized as similar to poison ivy consisting of a shrub, stems erect, 0.3 to 2.0 meters tall, leaflets consist of broad thick lobes coarsely serrated configuration, denser at the base, less so than the top.
- Protective measures may include wearing disposable garments such as Tyvek when clearing brush. These may be carefully removed and disposed of along with any oils accumulated from the plants.
- Personal Hygiene - The oils obtained from the plants will only elicit an allergic response when the person's bare skin layer is contacted. This can be aggravated through skin pores open when perspiring, or through breaks in the skin such as cuts, nicks, scratches, etc.. This can also be accomplished when using excessively hot water for cleaning the skin, which also causes pores to open. Prior to break time, lunchtime, etc. personnel should wash with cool water and soap to remove as much of the oils as possible. In heavily vegetated areas of these plants, additional measures including barrier creams and blocks may be used to prevent the oils from accessing and penetrating the skin.

All of these plants present an airborne sensitization hazard when burned. This is not to occur as part of this scope of work and therefore will not be addressed.

6.3.3 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors and near water. As a result, inclement weather may be encountered. In the event that adverse weather conditions arise (electrical storms, hurricanes, etc.), the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NAVAL SURFACE WARFARE CENTER - CRANE DIVISION
CRANE, INDIANA

Substance	CAS No.	Air Monitoring/Sampling Information	Exposure Limits	Warning/Property Rating	Physical Properties	Health Hazard Information	
General PAHs / Coal Tar Pitch Volatiles / Creosote / cresol (Fluoranthene, pyrene, benzo(a)anthracene, benzo(a)pyrene, benzo(f)fluoranthene, benzo(k)fluoranthene, etc.)	(CAS Numbers vary depending on specific compound)	PID: I.P. of 8.97 eV, relative response ratio unknown. FID: Response factor unknown but given the substances flammability, detection by FID can be anticipated.	Refer to NIOSH methods for each specific compound for appropriate air sampling protocols. Many PAHs can be sampled using <u>NIOSH Method 5506</u> or <u>5515</u> - Teflon filter with support ring - High pressure liquid chromatography with UV detector. For cresol (a major constituent of creosote) by silica gel or xad-7 sorbent tube; Acetone desorption and analysis by gas chromatography - flame ionization detector or high-pressure liquid chromatography. (NIOSH Method #2001, or OSHA Method #32)	General PAHs: Most PAHs have no established exposure limits. Other Coal Tar Pitch Volatiles / PAHs such as chrysene and benzo(a)pyrene have an exposure limit of 0.2 mg/m ³ (OSHA and ACGIH). 0.1 mg/m ³ - (NIOSH) Creosote / Cresol: OSHA; ACGIH: 5 ppm NIOSH: 2.3 ppm IDLH: 80 mg/m ³	Adequate - use a full-face air-purifying respirator with organic vapor / dust/mist cartridge up to 250 ppm. Cresol has an Odor Threshold of 0.00005-0.0079 ppm. Recommended gloves: Viton >96.00 hrs; butyl rubber >90.00 hrs; neoprene >4.50 hrs	Properties of various PAHs/Coal Tar Pitch Volatiles vary depending upon the specific compound. <u>For Creosote/Cresol:</u> Boiling Pt: 376-397°F; 191-203°C Melting Pt: 52-96°F; 10.9-35.5°C Solubility: Insoluble Flash Pt: 178°F; 81°C LEL/LFL: Not available UEL/UFL: Not available Vapor Density: 3.72 Vapor Pressure: 1 mmHg @ 100-127°F; 38-53°C Specific Gravity: 1.030-1.038 Incompatibilities: Nitric acid, oleum, chlorosulfonic acid, oxidizers Appearance and Odor: Yellowish or colorless, flammable, oily liquid (often brownish because of impurities or oxidation)	Regulated based on effects on respiratory tract and skin irritation Other effects may include eye irritation and central nervous system, disturbances. Acute exposures may result in difficulty breathing, respiratory failure and skin and eye irritation and burns. Chronic exposure may damage the liver, kidneys, lungs and skin and cause photosensitivity. IARC, NTP, NIOSH, ACGIH, and the EPA list some PAHs such as benzo(a)pyrene as a potential carcinogen (ARC 2A, NTP-2, ACGIH TLV-A2, NIOSH-X, EPA-B2).
Waste Oils All information is based on mineral oil	N.E. 8012-95-1 for mineral oil	Varies between fractions however waste oils tend to be less volatile. The FID tends to handle the longer chained aliphatic hydrocarbons more efficiently than its PID counterpart and would be selected as the instrument of choice.	Sampling and analytical protocol shall be in accordance with NIOSH Method #5026 is the recommended method for mineral oil mist. ACGIH; NIOSH: 5 mg/m ³ (Oil mists); 10 mg/m ³ STEL OSHA: 5 mg/m ³ (Oil mists)	Non-volatile substance, therefore no respiratory protection is required. In an aerosol form dust and mist respirator would be considered acceptable for up to 500 mg/m ³ . Recommended gloves: Any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances, and will be acceptable).	Boiling Pt: 680°F; 360°C Melting Pt: Not available Solubility: Insoluble Flash Pt: 275-500°F; 135-260°C depends on the distillation fraction LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: <0.5 mmHg Specific Gravity: 0.90 Incompatibilities: None reported Appearance and odor: Colorless, oily, with an odor of burned lubricating oil.	Minor irritation to the eyes, skin, and respiratory system.	

TABLE 6-1
 CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
 NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA
 PAGE 2

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Lead	7439-92-1	Particulate form - Unable to be detected by either PID or FID.	Air sample using a mixed cellulose ester filter; or HNO ₃ or H ₂ O ₂ desorption; or Atomic absorption detection. NIOSH Method #7082 or #7300.	OSHA: 0.05 mg/m ³ ACGIH: 0.05 mg/m ³ NIOSH: 0.10 mg/m ³ IDLH: 100 mg/m ³ as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m ³ . Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 3164°F; 1740°C Melting Pt: 621°F; 327°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 11.34 Incompatibilities: Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids Appearance and Odor: Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps, headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.
Chromium Compounds	7440-47-3 (Element)	Not detectable by PID. Not detectable by FID.	Air sample using mixed cellulose ester filter; acid desorption and analysis by atomic absorption. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7024.	OSHA & NIOSH: (Chromium II, III) 0.5 mg/m ³ (Chromium VI) 0.1 mg/m ³ (Ceiling) ACGIH: 0.5 mg/m ³ (Chromium II, III compounds), 0.05 mg/m ³ (Chromium VI compounds) IDLH: 30 mg/m ³ (Chromium VI compounds)	The use of a air purifying, full face-piece respirator with a high efficiency particulate filter for concentrations up to 0.1 mg/m ³ . Recommended Gloves: This is in particulate form. Therefore any glove suitable to prevent skin contact.	Boiling Pt: 4788°F; 2642°C Melting Pt: 3452°F; 1900°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: Not available Vapor Pressure: 0 mmHg Specific Gravity: 7.14 Incompatibilities: Strong oxidizers, peroxides, and alkalis Appearance and Odor: Appearance and odor vary depending upon the specific compound.	Health hazards are characterized normally through chronic exposure manifesting as histologic fibrosis of the lungs and ulceration of the nasal septum and skin. IARC, NTP and ACGIH list various chromium compounds as possessing carcinogenic properties.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA
PAGE 3**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Arsenic	7440-38-2	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using a particulate filter; acid desorption; AAS detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7900.	OSHA: Organic compounds 0.5 mg/m ³ Inorganic compounds 0.01 mg/m ³ NIOSH: (Ceiling) 0.002 mg/m ³ ACGIH: 0.01 mg/m ³ IDLH: 5 mg/m ³ as arsenic	No identifiable warning properties to indicate presence and thereby detection. Recommended APR Cartridge: Suitable for dust and fume. Organic vapor acid gases with HEPA filter. This substance may be presented as a pesticide, therefore a cartridge suitable for pesticides (MSA-GMP). Recommended Gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: sublimation @ 1134°F; 612°C Melting Pt: 1497°F; 814°C @ 36 atm Solubility: Insoluble in water; soluble in nitric acid Flash Pt: Nonflammable, however, airborne in the form of a dust this substance will support combustion LEL/LFL: Nonflammable UEL/UFL: Nonflammable Vapor Density: Not available Vapor Pressure: 1 mmHg @ 372°C (sublimes) Specific Gravity: 5.73 Incompatibilities: Oxidizers, halogens, zinc, lithium, azides, and acetylides Appearance and odor: Gray to black, brittle, crystalline, amorphous, odorless.	Overexposure to this substance through inhalation or ingestion may result in ulceration of the nasal septum, GI disturbances resulting in violent purging and vomiting, hoarse voice, sore throat, excessive salivation, peripheral neuropathy (numbness and burning sensations beginning at the extremities followed by motor weakness), respiratory irritation leading to possible pulmonary edema. Skin or eye contact may result in irritation, conjunctiva, dermatitis, and hyperpigmentation (darkening of the areas exposed) of the skin. This substance has been judged to be a Human carcinogen by NTP, and IARC.
Aroclor-1260 (Polychlorinated Biphenyl, PCB) It should be noted that this substance is representative of the more common isomers Aroclor - 1242, 1254, which may be encountered.	11096-82-5 53469-21-9 (42%) 11097-69-1 (54%)	Substance is not volatile (VP=0.00006 mmHg), I.P. is unknown however is anticipated to be elevated, therefore, PID is not anticipated to detect substance. Substance is non combustible and as a result will not be detected by FID.	Air sample using a particulate filter, Florisil sorbent tube with glass fiber filter; hexane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5503 (PCBs).	OSHA: ACGIH: 0.5 mg/m ³ (skin) NIOSH: 0.001 mg/m ³ IDLH: 5 mg/m ³	Inadequate - However due to the low volatility it is assumed unless agitated this substance does not present a volatile vapor or gas respiratory threat. For dusty conditions where this material may cling to particulates, use a HEPA filter. APRs are approved for escape only when concentrations exceed the exposure limits. Concentrations greater than the exposure limits require PAPP or supplied air respirators. Recommended glove: Butyl rubber >24 hrs; Neoprene rubber >24.00 hrs; Silver shield or Viton (for pure product).	Boiling Pt: distillation range 689- 734°F; 365-390° C Melting Pt: -2 to 50°F; -19 to 10°C Solubility: Insoluble Flash Pt: Not applicable LEL/LFL: Not applicable UEL/UFL: Not applicable Nonflammable liquid, however, exposure to fire results in black soot containing PCBs, dibenzofurans, & chlorinated dibenzo-p-dioxins Vapor Density: Not available Vapor Pressure: 0.00006 - 0.001 mmHg Specific Gravity: 1.566 @ 60°F; 15.5°C Incompatibilities: Strong oxidizers Appearance and Odor: Colorless to pale yellow, viscous liquid or solid (Aroclor 54 below 50°F) with a mild, hydrocarbon odor	This substance is irritating to the eyes and skin. Chronic effects of overexposure may include potential to cause liver damage, chloracne, and reproductive effects. Recognized as possessing carcinogenic properties by NIOSH, and NTP.

TABLE 6
 CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
 NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA
 PAGE 4

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning/Property Rating	Physical Properties	Health Hazard Information
DDT and the major metabolites; DDD and DDE.	50-29-3 72-54-8 72-55-9	Substance is not volatile, I.P. is unknown, detection by PID is unknown. Substance non-combustible, therefore a FID is anticipated to have reduced response to DDT.	Air sample using a binder free, glass fiber filter; isooctane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol will proceed in accordance with NIOSH Method #3(S274).	OSHA; ACGIH: 1 mg/m ³ NIOSH: 0.5 mg/m ³	Adequate - Can use air purifying respirator with high efficiency particulate air filter (HEPA). Recommended glove: Nitrile acceptable for incidental contact.	Boiling Pt: 230°F; 110°C Melting Pt: 226°F; 108°C Solubility: Insoluble Flash Pt: 162-171°F; 72-77°C LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: Low Specific Gravity: 0.99 Incompatibilities: Strong oxidizers and alkalis Appearance and Odor: Colorless crystals or off-white powder with a slight aromatic odor	Large doses are followed by vomiting due to gastric irritation; diarrhea may follow. Numbness and paresthesias of the lips tongue and face associated with malaise, headache, sorethroat, fatigue and weakness. Coarse tremors (usually first of the neck, head, and eyelids). This may be accompanied by confusion, apprehension, and depression. Convulsions may result and death may occur from respiratory failure. DDT is absorbed and retained in the fat of humans. Chronic exposure may result in damage to the liver, kidneys and Peripheral Nervous System. DDT is recognized as possessing carcinogenic properties by IARC and NTP.
1,1 Dichloroethene See also vinylidene chloride	75-34-4	PID: I.P. 10.00 eV, relative response ratio is 80%. FID: Relative response ratio for detection with the FID is 40%.	Air sample using a charcoal filter tube; carbon disulfide desorption; GC/FID detection in accordance with NIOSH Method #1015.	ACGIH: 5 ppm, STEL 20 ppm NIOSH & OSHA have not established exposure limits.	Odor threshold - 190 ppm. An air purifying respirator equipped with a organic vapors filter is acceptable for escape purposes only. For exposures greater than the recommended exposures limits should employ supplied air respirators. Recommended glove: Butyl, nitrile, or neoprene.	Boiling Pt: 89°F; 32°C Melting Pt: -188°F; -122°C Solubility: Slight (0.04%) Flash Pt: -2°F; -19°C LEL/LFL: 6.5% UEL/UFL: 15.5% Vapor Density: 3.25 Vapor Pressure: 500 mmHg @ 68°F; 20°C Specific Gravity: 1.21 @ 20°F; 4°C Incompatibilities: Aluminum, air, copper, and heat. Polymerization may occur if exposed to oxidizers. Appearance and Odor: Colorless liquid with a slight sweet chloroform odor.	Overexposure to this substance may result in irritation to the eyes, nose, throat, and respiratory system. Dermal contact with concentrated solutions may cause slight irritation, redness and inflammation. Systemically, headaches, dizziness, nausea, and difficulty in breathing. Chronic effects may include kidney and liver dysfunction, and pneumonitis. This material has expressed cancer causing potential in laboratory animals including liver and kidney tumors.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA
PAGE 5**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1-Dichloroethane	75-34-3	PID: I.P. 11.06 eV, relative response ratio unknown. FID: 80% relative response ratio with FID.	Air sample using charcoal tube; carbon disulfide desorption. Sampling and analytical protocol shall proceed in accordance with OSHA Method #07-B or NIOSH Method #1003	OSHA; NIOSH; ACGIH: 100 ppm IDLH: 4000 ppm	Questionable warning properties - Odor threshold 49 - 1359 ppm. APRs may be employed for escape only. Exceedances over the exposure limits are recommended to use airline or airline/APR combination type respirator. Recommended glove: Butyl; Polyvinyl alcohol; Viton	Boiling Pt: 135°F; 57°C Melting Pt: -143°F; -97°C Solubility: 0.6% Flash Pt: 2°F; -17°C LEL/LFL: 5.6% UEL/UFL: 11.4% Vapor Density: 3.42 Vapor Pressure: 182 mmHg Specific Gravity: 1.18 Incompatibilities: Strong oxidizers, strong caustics Appearance and odor: Colorless, oily liquid with a chloroform-like odor.	Overexposure may result in CNS depression, skin and eye irritation, and damage to the liver, kidneys, and lungs.
Methylene chloride	75-09-2	PID: I.P. 11.32 eV, High response with PID and 11.7 eV lamp. FID: 100% response with FID.	Air sample using charcoal or Anasorb CMS sorbent tube; carbon disulfide desorption; gas chromatography-flame ionization detector; Sampling and analytical protocol shall proceed in accordance with OSHA Method #59, 80, or NIOSH Method #1005.	OSHA: 50 ppm, 100 ppm (Ceiling) ACGIH: 50 ppm NIOSH: Lowest feasible concentration IDLH: 2300 ppm	Inadequate - Odor threshold 160 ppm. Use a gas mask with a Type N canister for concentrations up to 25 ppm. In excess of 25 ppm, use a supplied air respirator (airline respirator with emergency escape cylinder or a Self-Contained Breathing Apparatus - (SCBA). Recommended gloves: Nitrile rubber latex glove 3.00 hrs (vendor specific); supported Polyvinyl alcohol glove, unsupported 1-8 hrs; Silver shield 1.90 hrs	Boiling Pt: 104°F; 39.8°C Melting Pt: -141°F; -96°C Solubility: 2% Flash Pt: Not available LEL/LFL: 13% UEL/UFL: 12% Vapor Density: 2.93 Vapor Pressure: 380 mmHg @ 72°F; 22°C Specific Gravity: 1.33 Incompatibilities: Strong oxidizers, caustics, metals (i.e. aluminum, magnesium, potassium, sodium, lithium), and concentrated acids Appearance and Odor: Colorless liquid with a chloroform-like odor. (Note: A gas above 104°F; 40°C).	Effects of overexposure may include CNS effects - cause sleepiness, fatigue, weakness, lightheadedness, numbness of the limbs, altered cardiac rate and incoordination. These signs and symptoms may be accompanied by nausea, gastric and pulmonary irritation leading possibly to pulmonary edema. In addition to the narcosis long term effects may include liver injury. Listed as possessing carcinogenic properties by NTP, IARC, and ACGIH.
1,2-Dichloroethylene	540-59-0	PID: I.P. 9.65 eV, high response with PID and 10.2 eV lamp. FID: 50% response with FID.	Air sample using charcoal tube; and carbon disulfide desorption; Sampling and analytical protocol in accordance with OSHA Method #07; and NIOSH Method #1003.	OSHA; NIOSH; ACGIH: 200 ppm IDLH: 1000 ppm	Adequate- odor threshold 0.085-17 ppm. Use organic vapor/acid gas cartridges for exceedances above the TWA up to 1,000 ppm. >1,000 ppm should use pressure-demand supplied air respirator above exposure limits. Recommended glove: nitrile - 0.12 hrs; viton - 0.95 hrs	Boiling Pt: 117°F; 47°C Melting Pt: 7°F; -13.8°C Solubility: 0.4% Flash Pt: 36°F; 2.2°C LEL/LFL: 5.6% UEL/UFL: 12.8% Vapor Density: 2.0 Vapor Pressure: 180-260 mmHg Specific Gravity: 1.27 @ 90°F; 32°C Incompatibilities: Strong oxidizers, alkalis, potassium hydroxide, and copper. When heated to decomposition temperatures will emit toxic fumes of phosgene. Appearance and Odor: Colorless liquid with an acrid odor.	Overexposure may result in CNS depression with potential to cause sleepiness, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, liver, kidney, and lung damage.

TABLE 6-1
 CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
 NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA
 PAGE 6

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1,1-Trichloroethane	71-55-6	PID: I.P. 11.0 eV, Relative response ration unknwn FID: 105% relative response ration with FID	Air sample using charcoal tube; carbon disulfide desorption. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #1003.	OSHA; ACGIH: 350 ppm NIOSH: 350 ppm ceiling limit.	Odor Threshold 22.4 ppm. APRs may be used however they have a very short service life. Recommended glove: Butyl; Polyvinyl alcohol; Viton	Boiling Pt: 165°F; 74°C Melting Pt: Unkown Solubility: 0.4% Flash Pt: Unknown LEL/LFL: 7.5% UEL/UFL: 12.5% Vapor Density: Unknown Vapor Pressure: 100 mmHg Specific Gravity: 1.34 Incompatibilities: Strong oxidizers, strong caustics, chemically active metals (zinc, aluminum, magnesium powders, sodium and potassium). Appearance and odor: Colorless liquid with a mild, chloroform-like odor.	Overexposure may result in CNS depression, headache, loss of balance, irritation to the skin and eyes, dermatitis, cardiac arrhythmia, and liver damage.
Trichloroethylene	79-01-6	PID: I.P. 9.45 eV, High response with PID and 10.2 eV lamp. FID: 70% Response with FID.	Air sample using charcoal tube; carbon disulfide desorption; Sampling and analytical protocol shall proceed in accordance with OSHA Method #07, or NIOSH Method #1022 or #1003.	OSHA: 50 ppm 200 ppm (Ceiling) ACGIH: 50 ppm 100 ppm STEL NIOSH: 25 ppm IDLH: 1000 ppm	Inadequate - Odor threshold 82 ppm. APRs with organic vapor/acid gas cartridges may be used for escape purposes. Exceedances over the exposure limits require the use of positive pressure-demand supplied air respirator. Recommended gloves: PV Alcohol unsupported >16.00 hrs; Silver shield >6.00 hrs; Teflon >24.00 hrs; or Viton >24.00 hrs; Nitrile (Useable time limit 0.5 hr, complete submersion for the nitrile selection)	Boiling Pt: 188°F; 86.7°C Melting Pt: -99°F; -73°C Solubility: 0.1% @ 77°F; 25°C Flash Pt: 90°F; 32°C LEL/LFL: 8% @ 77°F; 25°C UEL/UFL: 10.5 @ 77°F; 25°C Vapor Density: 4.53 Vapor Pressure: 100 mmHg @ 90°F; 32°C Specific Gravity: 1.46 Incompatibilities: Strong caustics and alkalis, chemically active metals (barium, lithium, sodium, magnesium, titanium, and beryllium) Appearance and Odor: Colorless liquid with a chloroform type odor. Combustible liquid, however, burns with difficulty.	Central nervous system effects including euphoria, analgesia, anesthesia, paresthesia, headaches, tremors, vertigo, and somnolence. Damage to the liver, kidneys, heart, lungs, and skin have also been reported. Contact may result in irritation to the eyes, skin, and mucous membranes. Ingestion may result in GI disturbances including nausea, and vomiting. NIOSH lists this substance a potential human carcinogen.

7.0 AIR MONITORING

Direct Reading Instruments (DRIs) will be used to screen source areas (sample locations, wells, etc.) and worker breathing zones for volatile and detectable site contaminants. Some of the anticipated site contaminants, however, are not volatile and are unable to be detected with the use of DRIs. Specifically, the PAHs, metals, and pesticides are unable to be detected due to their solid nature, low vapor pressure, and/or non-ionizing properties. Action levels are discussed in Table 5-1 as they may apply to a specific task or location. The use of personal protective equipment and the observance of the other control requirements presented in this HASP has been selected to minimize potential for personnel exposures to hazardous concentrations (known or unknown) of airborne contaminants. Additionally, the Health and Safety Guidance Manual, Section 1.0, contains detailed information regarding direct reading instrumentation, as well as general calibration procedures of various instruments.

7.1 INSTRUMENTS AND USE

Instruments will be used primarily to monitor source points and worker breathing zone areas, while observing instrument action levels. Action levels are discussed in Table 5-1 as they may apply to a specific task or location.

7.1.1 Photoionization Detector or Flame Ionization Detector

In order to accurately monitor for any substances which may present an exposure potential to site personnel, a Photoionization Detector (PID) using a lamp energy of 10.9 eV or higher will be used. This instrument will be used to monitor potential source areas and to screen the breathing zones of employees during site activities. The PID has been selected because it is capable of detecting the organic vapors of concern (NOTE: A Flame Ionization Detector [FID] may be used as an alternative to the PID, and may be preferable to use of a PID).

Prior to the commencement of any field activities, the background levels of the site must be determined and noted. Daily background readings will be taken away from any areas of potential contamination. These readings, any influencing conditions (i.e., weather, temperature, humidity) and site location must be documented in the field operations logbook or other site documentation (e.g., sample log sheet).

7.1.2 Hazard Monitoring Frequency

Table 5-1 presents the frequencies that hazard monitoring will be performed as well as the action levels which will initiate the use of elevated levels of protection. The SSO may decide to increase these

frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO or HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the TtNUS Equipment Manager. Operational checks and field calibration will be performed on all instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations (for example, the PID must be field calibrated daily and an additional field calibration must be performed at the end of each day to determine any significant instrument drift). These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (copies of which can be found in the Health & Safety Guidance Manual which will be maintained on site for reference). All calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that all of the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for both TtNUS and subcontractor personnel participating in site activities.

8.1.1 Requirements for TtNUS Personnel

All TtNUS personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at NSWC. Additionally, TtNUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel.

Documentation of TtNUS introductory, supervisory, and refresher training as well as site-specific training will be maintained at the project. Copies of certificates or other official documentation will be used to fulfill this requirement.

TtNUS will conduct a pre-activities training session prior to initiating site work. Additionally, a brief meeting will be held daily to discuss operations planned for that day. At the end of the workday, a short meeting will be held to discuss the operations completed and any problems encountered. This activity will be supported through the use of a Safe Work Permit System (See Section 10.10).

8.1.2 Requirements for Subcontractors

All TtNUS subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at NSWC. TtNUS subcontractors must certify that each employee has had such training by sending TtNUS a letter, on company letterhead, containing the information in the example letter provided in Figure 8-1 and by providing copies of certificates for all subcontractor personnel participating in site activities.

FIGURE 8-1

TRAINING LETTER

The following statements must be typed on company letterhead, signed by an officer of the company and accompanied by copies of personnel training certificates:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Roger A. Clark, Ph.D.
Task Order Manager
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: HAZWOPER Training for NSWC, Crane, Indiana

Dear Dr. Clark:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 1926.

I also understand that Title 29 CFR 1910.120, entitled "Hazardous Waste Operations and Emergency Response," requires an appropriate level of training for certain employees engaged in hazardous waste operations. In this regard, I hereby state that the following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as requested by 29 CFR 1910.120(e) and have had 8 hours of refresher training as applicable and as required by 29 CFR 1910.120(e)(8) and that site supervisory personnel have had training in accordance with 29 CFR 1910.120(e)(4).

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

8.2 SITE-SPECIFIC TRAINING

TtNUS will provide site-specific training to all site personnel who will perform work on this project. Site-specific training will also be provided to all personnel [U.S. Department of Defense (DOD), EPA, etc.] who may enter the site to perform functions that may or may not be directly related to site operations. Site-specific training will include:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of the contents of relevant Material Safety Data Sheets

Site-specific documentation will be established through the use of Figure 8-2. All site personnel and visitors must sign this document upon receiving site-specific training.

8.3 MEDICAL SURVEILLANCE

8.3.1 Medical Surveillance Requirements for TtNUS Personnel

All TtNUS personnel participating in project field activities will have had a physical examination meeting the requirements of TtNUS's medical surveillance program and will be medically qualified to perform hazardous waste site work using respiratory protection

Documentation for medical clearances will be maintained in the TtNUS Pittsburgh office and made available, as necessary.

8.3.2 Medical Surveillance Requirements for Subcontractors

Subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" provided in Figure 8-3 shall be used to satisfy this requirement, providing it is properly completed and signed by a licensed physician.

Subcontractors who have a company medical surveillance program meeting the requirements of paragraph (f) of OSHA 29 CFR 1910.120 can substitute "Subcontractor Medical Approval Form" with a letter, on company letterhead, containing all of the information in the example letter presented in Figure 8-4 of this HASP.

8.3.3 Requirements for All Field Personnel

Each field team member (including subcontractors) and visitors entering the exclusion zone(s) shall be required to complete and submit a copy of Medical Data Sheet presented in Section 7 of the Health and Safety Guidance Manual. This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

8.4 SUBCONTRACTOR EXCEPTIONS

Subcontractors who will not enter the exclusion zone during intrusive operations, and whose activities involve no potential for exposure to site contaminants, will not be required to meet the requirements for training/medical surveillance other than those stated for site-specific training (see Section 8.2).

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR 1910.120, paragraph (f), and was found to be medically -

- () qualified to perform work at the NSWC work site
() not qualified to perform work at the NSWC work site

and,

2. Undergone a physical examination in accordance with OSHA 29 CFR 1910.134(b)(10) and was found to be medically -

- () qualified to wear respiratory protection
() not qualified to wear respiratory protection

My evaluation has been based on the following information, as provided to me by the employer.

- () A copy of OSHA Standard 29 CFR 1910.120 and appendices.
() A description of the employee's duties as they relate to the employee's exposures.
() A list of known/suspected contaminants and their concentrations (if known).
() A description of any personal protective equipment used or to be used.
() Information from previous medical examinations of the employee that is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (print) Participant's Name (print)

and have determined the following information:

**FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM
PAGE TWO**

- 1. Results of the medical examination and tests (excluding finding or diagnoses unrelated to occupational exposure):

- 2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:

- 3. Recommended limitations upon the employee's assigned work:

I have informed this participant of the results of this medical examination and any medical conditions which require further examination of treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the NSWG work site, this participant

- may
- may not

perform his/her assigned task.

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at:

Address

FIGURE 8-4

MEDICAL SURVEILLANCE LETTER

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Roger A. Clark, Ph.D.
Task Order Manager
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance for NSWC, Crane, Indiana

Dear Dr. Clark:

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response: Final Rule." I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a licensed physician, to perform hazardous waste site work and to wear positive- and negative-pressure respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the NSWC, Crane, Indiana site.

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

9.0 SPILL CONTAINMENT PROGRAM

9.1 SCOPE AND APPLICATION

It is anticipated that quantities of bulk potentially hazardous materials (greater than 55-gallons) may be handled during some of the site activities conducted as part of the scope of work (specifically Investigative-Derived Wastes [IDW]). It is not anticipated, however, that spillage of these materials would constitute a significant danger to human health or the environment. Further, it is possible that as the job progresses disposable PPE and other non-reusable items may be generated. As needed, 55 -gallon drums will be used to contain waste waters, IDW, and other unwanted items generated during investigatory activities. These drums will be labeled with the site name and address, the type of contents, and the date the container was filled as well as an identified contact person. Samples will be collected and analyzed to characterize the material and determine appropriate disposal measures. Once characterized they can be removed from the staging area and disposed of in accordance with Federal, State, and local regulations. Table 5-1 contains detailed information about handling IDW at NSWC.

9.2 POTENTIAL SPILL AREAS

Potential spill areas will be monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, there are various areas vulnerable to this hazard including the areas used for central staging and decontamination activities. Additionally, areas designated for handling, loading, and unloading of potentially contaminated soils, waters, and debris present limited potential for leaks or spills. It is anticipated that all IDW generated as a result of this scope of work will be containerized, labeled, and staged to await chemical analyses. The results of these analyses will determine appropriate disposal methods.

9.2.1 Site Drums/Containers

All drums/containers used for containing soils and liquids will be sealed, labeled, and staged within a centralized area awaiting shipment or disposal.

9.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, periodic inspections by the SSO will be conducted during working hours to visually determine that containers are not leaking. If a leak is detected,

the first approach will be to transfer the container contents using a hand pump into a new container. Other provisions for the transfer of container contents will be made and appropriate emergency contacts will be notified, if necessary. In most instances, leaks will be collected and contained using absorbents such as Oil-dry, vermiculite, or sand, which will be stored at the staging area in a conspicuously marked drum. This material too, will be containerized for disposal pending analyses. All inspections will be documented in the Project Logbook.

9.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed on the procedures for spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and/or the SSO will serve as the Spill Response Coordinator for this operation should the need arise.

9.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the types of equipment that may be maintained at the staging area for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other noncombustible absorbent (oil-dry);
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Labels

9.6 SPILL CONTROL PLAN

This section describes the procedures the TtNUS field crewmembers will employ upon the detection of a spill or leak.

- 1) Notify the SSO or FOL immediately.
- 2) Employ the personnel protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the drum or raising the leak to the highest point. Spread the absorbent material in the area of the spill covering completely.
- 3) Transfer the material to a new container, collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment or disposal options.

- 4) All spills will be recontainerized with 2-inches of top cover, and await test results for treatment or disposal options.

It is not anticipated that a spill will occur in which the field crews cannot handle. Should this occur; however, notification of appropriate emergency response agencies will be carried out by the FOL or SSO.

10.0 SITE CONTROL

This section outlines the means by which TtNUS will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a three-zone approach will be used during work at this site. This three zone approach will utilize an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this control measure will be used to control access to site work areas. Use of such controls will restrict the general public, minimize the potential for the spread of contaminants, and protect individuals who are not cleared to enter work areas.

10.1 EXCLUSION ZONE

The exclusion zone will be considered those areas of the site of known or suspected contamination. It is not anticipated that significant amounts of surface contamination are present in the proposed work areas of this site. It is anticipated that this will remain so until/unless contaminants are brought to the surface by intrusive activities, such as soil boring or sampling operations. Furthermore, once intrusive activities have been completed and surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. Therefore, the exclusion zones for this project will be limited to those areas of the site where active work is being performed plus a designated area surrounding the point of operation (see Table 5-1 for specific operation). When possible, exclusion zones will be delineated using barrier tape, cones and/or drive poles, and postings to inform site personnel.

10.1.1 Exclusion Zone Clearance

Prior to the initiation of site activities, utility locations will be identified by utility companies contacted through the NSWC Base Contact – Thomas Brent at (812) 854-6160. Additional utility surveys may be conducted by TtNUS through the use of available documentation provided by NSWC and/or local utility companies. The positions of identified utilities will be field located and staked to minimize the potential for damage during intrusive activities. Sample locations can be located to avoid buried utilities. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Table 2-1 will be notified.

Access to work areas will be controlled by TtNUS personnel. No personnel will be permitted to enter site exclusion zones without site-specific training. Site visitors will be provided site-specific training and will be escorted by TtNUS personnel at all times (see section 10.4).

10.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. The personnel and equipment decontamination will not take place in this area, but will take place at a central location established for this project. This area instead will serve as a focal point in supporting exclusion zone activities. When applicable, this area will be delineated using barrier tape, cones and/or drive poles, and postings to inform and direct facility personnel.

10.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. In all cases, the support zones will be established at areas of the site where exposure to site contaminants would not be expected during normal working conditions or foreseeable emergencies.

10.4 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by TtNUS
- Regulatory personnel (EPA, OSHA, etc.)
- NSWC personnel
- Other authorized visitors

All personnel working on this project are required to gain initial access to the site by coordinating with the TtNUS FOL or designee and following established site access procedures.

Upon gaining access to the site, all site visitors wishing to observe operations in progress will be escorted by a TtNUS representative (arranged for by the FOL) and shall be required to meet the minimum requirements discussed below:

- All site visitors will be routed to the FOL, who will sign them into the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.

- All site visitors will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training (40-hours of HAZWOPER training) and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, all visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP.

Once the site visitors have completed the above items, they will be permitted to enter the operational zone. All visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Any and all visitors not meeting the requirements stipulated in this plan will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of all onsite activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from the FOL, SSO or on-site security personnel.

10.5 SITE SECURITY

Site security will be accomplished using existing base security resources and procedures, supplemented by TtNUS or subcontractor personnel, if necessary. TtNUS will retain control over active operational areas. The first line of security will take place at the base boundaries restricting the general public. The second line of security will take place at the work site referring interested parties to the FOL. The FOL will serve as a focal point for site personnel, and will serve as the final line of security and the primary enforcement contact.

10.6 SITE MAPS

Once the areas of contamination, access routes, utilities, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will show utility locations, potential points of contact with the public, roadways, and other significant characteristics that may impact site operations and safety. Site maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

10.7 BUDDY SYSTEM

Personnel engaged in onsite activities will practice the "buddy system" to ensure the safety during this operation.

10.8 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

TiNUS and subcontractor personnel will provide MSDSs for all chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of all chemicals used on site will be developed using Section 5.0 of the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location and will be available for anyone to review upon request.

10.9 COMMUNICATION

TiNUS personnel will be working in close proximity to each other at NSWC. As a result and since two way radio communication will not be available, hand signals, voice commands, and line of site will provide sufficient means of communication. When project tasks are performed simultaneously on different sites, vehicle horns will be used to communicate emergency situations per Section 2.6 of this HASP.

External communication will be accomplished by using provided telephones at the site. External communication will primarily be used for the purpose of resource and emergency resource communications.

10.10 SAFE WORK PERMITS

All exclusion zone work conducted in support of this project will be performed using Safe Work Permits to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used is illustrated in Figure 10-1. Partially completed Permits for exclusion zone tasks are included as Attachment IV of this HASP. These work permits will be further supported by the daily meetings conducted during their generation. This effort will ensure all site-specific considerations and changing conditions are incorporated into the planning effort.

Use of these permits will provide the communication line for reviewing protective measures and hazards associated with each operation. This HASP will be used as the primary reference for selecting levels of protection and control measures. The work permit will take precedence over the HASP when more conservative measures are required based on specific site conditions.

The FOL and/or the SSO will be responsible for completing the safe work permit and issuing them to the appropriate parties. Site personnel at the end of each days activity will turn in the permit(s) used for that day to the SSO. All permits will be maintained as part of the permanent project files attesting to safety and health measures employed for a given task at a given time and place. Any problems encountered

02/25/05

with the protective measures required should be documented on the permit and brought to the attention of the SSO.

FIGURE 10-1
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

I. Work limited to the following (description, area, equipment used): _____

II. Primary Hazards: Potential hazards associated with this task: _____

III. Field Crew: _____

IV. On-site Inspection conducted [] Yes [] No Initials of Inspector _____ TtNUS
Equipment Inspection required [] Yes [] No Initials of Inspector _____ TtNUS

V. Protective equipment required Level D [x] Level B [] Level C [] Level A []
Respiratory equipment required Yes [] Specify on the reverse No [x]

Table with 4 columns: Chemicals of Concern, Hazard Monitoring, Action Level(s), Response Measures. Includes a row for Modifications/Exceptions.

Primary Route(s) of Exposure/Hazard: _____

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes, No, or NA)

VII. Additional Safety Equipment/Procedures
Hard-hat [] Yes [] No
Safety Glasses [] Yes [] No
Chemical/splash goggles [] Yes [] No
Splash Shield [] Yes [] No
Splash suits/coveralls [] Yes [] No
Impermeable apron [] Yes [] No
Steel toe Work shoes or boots [] Yes [] No
High Visibility vest [] Yes [] No
First Aid Kit [] Yes [] No
Safety Shower/Eyewash [] Yes [] No
Hearing Protection (Plugs/Muffs) [] Yes [] No
Safety belt/harness [] Yes [] No
Radio/Cellular Phone [] Yes [] No
Barricades [] Yes [] No
Gloves (Type - _____) [] Yes [] No
Work/rest regimen [] Yes [] No
Chemical Resistant Boot Covers [] Yes [] No
Tape up/use insect repellent [] Yes [] No
Fire Extinguisher [] Yes [] No
Other [] Yes [] No

VIII. Site Preparation
Utility Locating and Excavation Clearance completed [] Yes [] No [] NA
Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place [] Yes [] No [] NA
Physical Hazards Identified and Isolated (Splash and containment barriers) [] Yes [] No [] NA
Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc.) [] Yes [] No [] NA

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) [] Yes [] No
If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____

11.0 CONFINED SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces.** A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

A Permit-Required Confined Space is one that:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed.

12.0 MATERIALS AND DOCUMENTATION

The TtNUS FOL shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- MSDSs for all chemicals brought onsite, including decon solutions, fuels, lime, sample preservatives, calibration gases, etc.
- A full-size OSHA Job Safety and Health Poster (posted in the site trailers)
- Training/Medical Surveillance Documentation Form (Blank)
- Emergency Reference Information (Section 2.0, extra copy for posting)

12.1 MATERIALS TO BE POSTED OR MAINTAINED AT THE SITE

The following documentation is to be posted or maintained at the site for quick reference purposes. In situations in which posting these documents is not feasible (such as no office trailer), these documents should be separated and immediately accessible.

Chemical Inventory Listing (posted) - This list represents all chemicals brought onsite, including decontamination solutions, sample preservations, fuel, etc. This list should be posted in a central area.

Material Safety Data Sheets (MSDSs) (maintained) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances used onsite. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster (posted) - This poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. Each FOL shall ensure that this poster is not defaced, altered, or covered by other material.

Site Clearance (maintained) - This list is found within the training section of the HASP (See Figure 8-2). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. The lists indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) (posted) - This list of numbers and directions will be maintained at all phone communications points and in each site vehicle.

Medical Data Sheets/Cards (maintained) - Medical Data Sheets will be completed by onsite personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to carry at all times.

Hearing Conservation Standard (29 CFR 1910.95) (posted) - This standard will be posted any time hearing protection or other noise abatement procedures are used.

Personnel Monitoring (maintained) - All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.

Placards and Labels (maintained) - Where chemical inventories have been separated because of quantities and incompatibilities, these areas will be conspicuously marked using Department of Transportation (DOT) placards and acceptable (Hazard Communication 29 CFR 1910.1200(f)) labels.

The purpose, as stated above, is to allow site personnel quick access to this information. Variations concerning location and methods of presentation are acceptable as long as the objection is accomplished.

13.0 GLOSSARY

ACGIH	American Conference of Governmental Industrial Hygienists
APR	Air Purifying Respirators
AOC	Area of Concern
CFR	Code of Federal Regulations
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
DOD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
eV	electron Volts
FID	Flame Ionization Detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
LEL/O ₂	Lower Explosive Limit/Oxygen
N/A	Not Available
NIOSH	National Institute Occupational Safety and Health
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photo Ionization Detector
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
SAP	Sampling and Analysis Plan
SCBA	Self Contained Breathing Apparatus
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TOM	Task Order Manager
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
UV	Ultraviolet
WP	Work Plan

ATTACHMENT I

INJURY/ILLNESS PROCEDURE AND REPORT FORM

TETRA TECHNUS, INC.

INJURY/ILLNESS PROCEDURE WORKER'S COMPENSATION PROGRAM

WHAT YOU SHOULD DO IF YOU ARE INJURED OR DEVELOP AN ILLNESS AS A RESULT OF YOUR EMPLOYMENT:

- Stop work as needed to ensure no further harm is done.
- If injury is minor, obtain appropriate first aid treatment.
- If injury or illness is severe or life threatening, obtain professional medical treatment at the nearest hospital emergency room. Check with your office location or project health and safety plan for specific instructions.
- If incident involves an injury, illness, or chemical exposure on a project work site, follow instructions in the Health & Safety Plan.
- Immediately report any injury or illness to your supervisor or office manager. In addition, you must contact your Human Resources representative, Marilyn Duffy at (412) 921-8475, and the Corporate Health and Safety Manager, Matt Soltis at (412) 921-8912 within 24 hours of the injury. You will be required to complete an Injury/Illness Report. You may also be required to participate in a more detailed investigation with the Health Sciences Department.
- In the event of a serious near-miss incident, a "Serious Near Miss Report" (Form AR-2, available online at <https://go2.tetratech.com> under "Departments", "Health and Safety", "Accident Reporting Procedures", hyperlink for "Serious Near Miss Report") must be completed and faxed to the Corporate Health and Safety Manager within 48 hours.
- If further medical treatment is needed, our insurance carrier, ACE, will provide information on the authorized providers customized to the location of the injured employee. You can find this information by accessing the website of ACE's claims handler, ESIS, at : www.esis.com. These providers are to be used for treatment of Worker's Compensation injuries subject to the laws of the state in which you work.

ADDITIONAL QUESTIONS REGARDING WORKER'S COMPENSATION:

Contact your local Human Resources representative (Marilyn Duffy), Corporate Health and Safety Manager (Matt Soltis), or Corporate Administration in Pasadena, California, at (626) 351-4664.

Worker's compensation is a state-mandated program that provides medical and disability benefits to employees who become disabled due to job related injury or illness. Tetra Tech, Inc. and its subsidiaries pay premiums on behalf of their employees. This program is based on a no-fault system, and benefits are provided for covered events as an exclusive remedy to the injured employee regardless of fault. The types of injuries or illnesses covered and the amount of

benefits paid are regulated by the state worker's compensation boards and vary from state to state. Corporate Administration in Pasadena is responsible for administering the Company's worker's compensation program. The following is a general explanation of worker's compensation provided in the event that you become injured or develop an illness as a result of your employment with Tetra Tech or any of its subsidiaries. Please be aware that the term used for worker's compensation varies from state to state.

WHO IS COVERED:

All employees of Tetra Tech, whether they are on a full-time, part-time or temporary status, working in an office or in the field, are entitled to worker's compensation benefits from the first day of work. All employees must follow the above injury/illness reporting procedures. If you are working out-of-state and away from your home office, you are still eligible for worker's compensation benefits.

Consultants, independent contractors, and employees of subcontractors and employees from temporary employment agencies are not covered by Tetra Tech's Worker's Compensation plan.

WHAT IS COVERED:

If you are injured or develop an illness caused by your employment, worker's compensation benefits are available to you subject to the laws of the state you work in. Injuries do not have to be serious; even injuries treated by first aid practices are covered and must be reported.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT

To: _____
Subsidiary Health and Safety Representative

Prepared by: _____

cc: _____
Workers Compensation Administrator

Position: _____

Project name: _____

Office: _____

Project number: _____

Telephone number: _____

Fax number: _____

Information Regarding Injured or Ill Employee

Name: _____

Office: _____

Home address: _____

Gender: M F No. of dependents: _____

Marital status: _____

Home telephone number: _____

Date of birth: _____

Occupation (regular job title): _____

Social security number: _____

Department: _____

Date of Accident: _____

Time of Accident: _____ a.m. p.m.

Time Employee Began Work: _____

Check if time cannot be determined

Location of Incident

Street address: _____

City, state, and zip code: _____

County: _____

Was place of accident or exposure on employer's premises? Yes No

Information About the Incident

What was the employee doing just before the incident occurred? Describe the activity as well as the tools, equipment, or material the employee was using. Be specific. Examples: "Climbing a ladder while carrying roofing materials"; "Spraying chlorine from hand sprayer"; "Daily computer key-entry"

What Happened? Describe how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time"

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

Information About the Incident (Continued)

What was the injury or illness? Describe the part(s) of the body affected and how it was affected. Be more specific than "hurt," "pain," or "sore." Examples "Strained back"; "Chemical burn, right hand"; "Carpal tunnel syndrome, left wrist"

Describe the Object or Substance that Directly Harmed the Employee: Examples: "Concrete floor"; "Chlorine"; "Radial arm saw." If this question does not apply to the incident, write "Not applicable."

Did the employee die? Yes No Date of death: _____

Was employee performing regular job duties? Yes No

Was safety equipment provided? Yes No Was safety equipment used? Yes No

Note: Attach any police reports or related diagrams to this report.

Witness (Attach additional sheets for other witnesses.)

Name: _____

Company: _____

Street address: _____

City: _____ State: _____ Zip code: _____

Telephone number: _____

Medical Treatment Required? Yes No First aid only

Name of physician or health care professional: _____

If treatment was provided away from the work site, provide the information below.

Facility name: _____

Street address: _____

City: _____ State: _____ Zip code: _____

Telephone number: _____

Was the employee treated in an emergency room? Yes No

Was the employee hospitalized over night as an in-patient? Yes No

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

Corrective Action(s) Taken by Unit Reporting the Accident:

Corrective Action Still to be Taken (by whom and when):

Name of Tetra Tech employee the injury or illness was first reported to: _____

Date of Report: _____ Time of Report: _____

I have reviewed this investigation report and agree, to the best of my recollection, with its contents.

Printed Name of Injured Employee _____

Telephone Number _____

Signature of Injured Employee _____

Date _____

The signatures provided below indicate that appropriate personnel have been notified of the incident.

Title	Printed Name	Signature	Telephone Number	Date
Office Manager				
Project Manager				
Site Safety Coordinator or Office Health and Safety Representative				

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



TETRA TECH, INC.

ACCIDENT AND ILLNESS INVESTIGATION REPORT (Continued)

To Be Completed by the Subsidiary Health and Safety Representative

Classification of Incident:

Injury Illness

Result of Incident:

- First aid only
- Days away from work
- Remained at work but incident resulted in job transfer or work restriction
- Incident involved days away and job transfer or work restriction
- Medical treatment only

No. of days away from work _____

Date employee left work _____

Date employee returned to work _____

No. of days placed on restriction or job transfer: _____

OSHA Recordable Case Number _____

To Be Completed by Human Resources

Social security number: _____

Date of hire: _____ Hire date for current job: _____

Wage information: \$ _____ per Hour Day Week Month

Position at time of hire: _____

Current position: _____ Shift hours: _____

State in which employee was hired: _____

Status: Full-time Part-time Hours per week: _____ Days per week: _____

Temporary job end date: _____

To Be Completed during Report to Workers Compensation Carrier

Date reported: _____ Reported by: _____

Confirmation number: _____

Name of contact: _____

Field office of claims adjuster: _____

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.

ATTACHMENT II

TICK CONTROL AND LYME DISEASE

TICK CONTROL AND LYME DISEASE

The occurrence of Lyme disease has become a worldwide problem since its identification in 1976. This disease is characteristically recognized as being transmitted by ticks, which may be encountered by field personnel while working at this site. As a result, this discussion has been included with this Health and Safety Plan to provide for adequate recognition, evaluation, and control efforts to minimize the occurrence and effects of this potential hazard.

The discovery of Lyme disease is credited to Dr. Allen Steere of Yale University Medical School, and is named after the community where it was (reportedly) first encountered, Lyme, Connecticut. This disease can be transmitted to man through the bite of ticks that are infected with a cork screw-shaped microbe (spirochete). The spread of this disease has been so rapid that in 1984 it surpassed Rocky Mountain Spotted fever as the most common tick-borne disease in the United States. In this country, most of the incidents of this disease have been recorded in the Northeast, and the tick species most commonly attributed with its spread is the deer tick.

Recognition

This hazard potential exists primarily in the spring and summer months, as these are the seasons that tick populations and activity flourish. In fact, 90 percent of the reported cases have occurred from early June through September. Also, this concern exists primarily in heavily vegetated areas. Therefore, recognition of these factors can aid in the awareness and control of this threat.

To aid in the recognition and identification of these insects, an example illustration of the tick species common to the region where this site is located has been included with this discussion. This species (the American Dog tick) is common in the eastern half of the United States, and typically exists in areas covered with grass or underbrush. These insects will attach themselves to animals (including man) that pass through the area and rub against them. After finding a host, the tick inserts its mouthparts and sucks blood until it is fully engorged. This requires a time period of three to twelve days, then the tick will drop off. In addition to Lyme disease concerns, this tick has also been identified as a transmitter of Rocky Mountain Spotted Fever, and the organisms of tularemia and possibly relapsing fever. The wounds left by tick bites can be painful, and can also have a paralyzing effect commonly referred to as tick paralysis.

The earliest symptom of the onset of this disease is the occurrence of an unusual red skin rash. This is commonly the first indication since it has been evidenced that many persons who have contracted this disease were, in fact, unaware that they had been bitten. This rash can appear at the site of the bite anywhere from several days to a few weeks after the bite. It typically starts as a small red spot, and then expands as the spirochetes expand from the bite location. Rash sizes can vary, but have been most commonly associated in a 2 to 3 inch diameter size range. This rash will fade (with or without treatment) after a few weeks. Close inspection is necessary to detect this symptom as the rashes are easy to miss because they're often very faint. Body sites where rashes frequently occur include the thigh areas, groin, and armpits. Also, it is not uncommon for a rash to develop in more than one place.

Other early symptoms include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Recognition of the onset of any of these symptoms is important since tick bites do not always produce a rash. If left untreated, the disease will progress to its second stage within weeks or months after the infection. This stage involves affects to the heart and nervous system. A common second stage symptom is a paralysis on one or both sides of the face. Others include severe headache, encephalitis, or meningitis. The third and final stage involves the development of chronic inflammatory arthritis, which can occur up to a year or more after the bite.

Evaluation

Evaluation of this hazard potential principally involves field personnel performing close self-inspections for the presence of ticks each time they leave the site. This should involve careful examination, especially of the individuals' heads. Personnel should be aware that when a tick attaches itself to its host, it inserts its entire head under the surface of the skin.

Control

Control of this threat involves several components. First, field personnel must be aware of the climate and area conditions which are commonly associated with being conducive to tick infestation. Second, when working in or walking through potential infested areas, personnel must ensure that they do not have exposed body parts (i.e. at least long sleeved shirts and long pants, particularly when protective coveralls are not worn). In heavily vegetated areas where infestation is likely, Tyvek coveralls will be required to minimize this hazard potential. Also, several commercial products have been demonstrated as being effective in repelling ticks. Examples include Permanone, Off!, and Cutter. These types of repellents will be used at the direction and discretion of the Tetra Tech NUS Health and Safety Officer, and only in accordance and observation of manufacturer's recommendations. In most instances, however, such repellents are typically applied to the

outside surfaces of clothing (and not directly onto the skin), and should be applied also to shoe tops, socks, pants cuffs, and other areas most susceptible to ticks.

Tick Removal

In the event that a tick is discovered to be attached to a member of the field team, timely removal of the insect is critical to reducing the potential for contracting the disease. According to available information and research, there is apparently a grace period of at least a few hours from the time of the bite before the tick transmits the microbe (the spirochetes are not present in the mouth parts of the tick). However, the incident of a tick bite is frequently unnoticed, and the discovery of the tick may not occur until after this suspected grace period has already elapsed. Therefore, timely removal is very important. The preferred method of tick removal is to pull it out using tweezers or small forceps. In this method, the tick should be grasped as close to the mouth as possible, and then pulled steadily upward. Care must be exercised so as not to pull in a jerking motion as this can result in the head becoming detached. After the tick has been removed, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). The tick must not be handled as the microbes can enter the body through any breaks in intact skin. The bite should be checked occasionally for at least a two-week period to see if a rash forms. If it does, medical attention must be promptly sought.

In order to provide for proper and timely response to the occurrence of a tick bite, the SSO will ensure that the site First Aid kit is properly equipped with medical forceps and rubbing alcohol, in addition to the standard kit contents. Also, an adequate supply of commercial insect (tick) repellents will be maintained on-site, and all personnel will be trained in its proper application and will be required to use it, at the direction of FOL.

ATTACHMENT III

EQUIPMENT INSPECTION CHECKLIST

EQUIPMENT INSPECTION

COMPANY: _____ **UNIT NO.** _____

FREQUENCY: Inspect at the initiation of the project, after repairs, once every 10-day shift.

Inspection Date: ____/____/____ Time: _____ Equipment Type: _____
(e.g., bulldozer, generator)

	Good	Need Repair	N/A
Tires or tracks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hoses and belts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cab, mirrors, safety glass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Is the equipment equipped with audible back-up alarms and back-up lights?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horn and gauges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brake condition (dynamic, park, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire extinguisher (Type/Rating - _____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fluid Levels:			
- Engine oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Transmission fluid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Brake fluid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Cooling system fluid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Windshield wipers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Hydraulic oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil leak/lube	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coupling devices and connectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exhaust system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blade/boom/ripper condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access-ways: Frame, hand holds, ladders, walkways (non-slip surfaces), guardrails?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power cable and/or hoist cable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steering (standard and emergency)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Safety Guards:

	Yes	No
- Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact? _____	<input type="checkbox"/>	<input type="checkbox"/>
- Hot pipes and surfaces exposed to accidental contact? _____	<input type="checkbox"/>	<input type="checkbox"/>
- All emergency shut offs have been identified and communicated to the field crew? _____	<input type="checkbox"/>	<input type="checkbox"/>
- Have emergency shutoffs been field tested? _____	<input type="checkbox"/>	<input type="checkbox"/>
- Results? _____	<input type="checkbox"/>	<input type="checkbox"/>
- Are any structural members bent, rusted, or otherwise show signs of damage? _____	<input type="checkbox"/>	<input type="checkbox"/>
- Are fueling cans used with this equipment approved type safety cans? _____	<input type="checkbox"/>	<input type="checkbox"/>

EQUIPMENT INSPECTION (Continued)

- Have the attachments designed for use (as per manufacturer's recommendation) with this equipment been inspected and are considered suitable for use? _____

Portable Power Tools:

- Tools and Equipment in Safe Condition? _____
- Saw blades, grinding wheels free from recognizable defects (grinding wheels have been sounded)? _____
- Portable electric tools properly grounded? _____
- Damage to electrical power cords? _____
- Blade guards in place? _____
- Components adjusted as per manufacturers recommendation? _____

Cleanliness:

- Overall condition (was the decontamination performed prior to arrival on-site considered acceptable)? _____
- Where was this equipment used prior to its arrival on site? _____
- Site Contaminants of concern at the previous site? _____
- Inside debris (coffee cups, soda cans, tools and equipment) blocking free access to foot controls? _____

Operator Qualifications (as applicable for all heavy equipment):

- Does the operator have proper licensing where applicable, (e.g., CDL)? _____
- Does the operator, understand the equipment's operating instructions? _____
- Is the operator experienced with this equipment? _____
- Does the operator have emotional and/or physical limitations which would prevent him/her from performing this task in a safe manner? _____
- Is the operator 21 years of age or more? _____

Identification:

- Is a tagging system available, for positive identification, for tools removed from service? _____

Additional Inspection Required Prior to Use On-Site

- | | Yes | No |
|---|--------------------------|--------------------------|
| - Does equipment emit noise levels above 90 decibels? | <input type="checkbox"/> | <input type="checkbox"/> |
| - If so, has an 8-hour noise dosimetry test been performed? | <input type="checkbox"/> | <input type="checkbox"/> |
| - Results of noise dosimetry: _____ | | |
| - Defects and repairs needed: _____ | | |
| - General Safety Condition: _____ | | |
| - Operator or mechanic signature: _____ | | |

Site Safety Officer Signature: _____

Approved for Use: Yes No

ATTACHMENT IV
SAFE WORK PERMITS

**SAFE WORK PERMIT
MOBILIZATION/DEMobilIZATION ACTIVITIES
NSWC CRANE**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

- I. **Work limited to the following (description, area, equipment used):** Mobilization and demobilization activities. These activities include site reconnaissance/site characterization, site preparation including the layout of sampling locations, securing the necessary utility clearances, and identifying/isolating physical hazards; Secure, construct, or equip decontamination facilities to support the field activities; Secure, construct, or equip IDW storage facilities to support the field activities.
- II. **Primary Hazards:** Potential hazards associated with this task are primarily physical in nature including lifting, cuts and lacerations, pinches and compressions; flying projectiles; slips, trips, and falls; insect and animal bites. The direction provided in this HASP, Table 5-1 and this Safe Work Permit are directed at controlling these hazards. It should be noted that not every situation can be anticipated. Site personnel will therefore have to conduct on-site hazard assessments on a per task basis and employ controls as necessary.
- III. **Field Crew:** _____
- IV. **On-site Inspection conducted** Yes No Initials of Inspector _____ TINUS
Equipment Inspection required Yes No Initials of Inspector _____ TINUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

- V. **Protective equipment required** **Respiratory equipment required**
 Level D Level B Yes See Reverse
 Level C Level A No

Modifications/Exceptions: None anticipated

VI. Chemicals of Concern	Hazard Monitoring	Action Level(s)	Response Measures
<u>None anticipated</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>

Primary Route of Exposure/Hazard: None

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes or No)

VII. Additional Safety Equipment/Procedures

Hard-hat	<input type="checkbox"/> Yes <input type="checkbox"/> No	Hearing Protection (Plugs/Muffs)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Safety Glasses	<input type="checkbox"/> Yes <input type="checkbox"/> No	Safety belt/harness	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Chemical/splash goggles	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Radio/Cellular Phone	<input type="checkbox"/> Yes <input type="checkbox"/> No
Splash Shield	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Barricades	<input type="checkbox"/> Yes <input type="checkbox"/> No
Splash suits/coveralls	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Gloves (Type - <u>Leather/Cotton</u>)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Impermeable apron	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Work/rest regimen	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Steel toe Work shoes or boots ...	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Chemical Resistant Boot Covers	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
High Visibility vest	<input type="checkbox"/> Yes <input type="checkbox"/> No	Tape up/use insect repellent	<input type="checkbox"/> Yes <input type="checkbox"/> No
First Aid Kit	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Fire Extinguisher	<input type="checkbox"/> Yes <input type="checkbox"/> No
Safety Shower/Eyewash	<input type="checkbox"/> Yes <input type="checkbox"/> No	Other	<input type="checkbox"/> Yes <input type="checkbox"/> No

Modifications/Exceptions: If there are Flying projectiles- Safety glasses and/or splash shield (i.e., hammering, power tool operation); If you have to raise your voice to be heard by someone within 2-feet of you hearing protection is required (i.e., equipment/power tool operation); If overhead hazards or bump hazards or you are working near operating equipment hard hats will be employed. If you are working in or near traffic patterns then wear High Visibility Vests. Use insect repellent and tape up to protect against insects and insect bites. Wear snake chaps in high brush areas.

VIII. Site Preparation

	Yes	No	NA
Utility Locating and Excavation Clearance completed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical Hazards Identified and Isolated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- IX. **Additional Permits required** (Hot work, confined space entry, excavation etc.)..... Yes No
If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090

- X. **Special instructions, precautions:** Suspend site activities in the event of inclement weather. Employ proper lifting techniques as described on Table 5-1 for this task. Caution should be exercised if working along the water. The potential for natural hazards including snakes, alligators may exist given the region.

Permit Issued by: _____ Permit Accepted by: _____

**SAFE WORK PERMIT
MULTI-MEDIA SAMPLING ACTIVITIES
NSWC CRANE**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

- I. Work limited to the following (description, area, equipment used):** Multi-media sampling includes Soil sampling collected using a MacroCore Sampler spoon/disposable trowels; Monitoring well development/hydraulic conductivity testing/groundwater sampling using 1-inch Whale pumps/surge blocks and peristaltic pumps.
- II. Primary Hazards:** Potential hazards associated with this task include lifting (buckets of purge waters and moving drums), cuts and lacerations (cutting tubing), pinches and compressions opening MacroCore Samplers and handling containers; contact with contaminated media. The direction provided in this HASP, Table 5-1 and this Safe Work Permit are directed at controlling these hazards.
- III. Field Crew:** _____
- IV. On-site Inspection conducted** Yes No Inspector Initials TINUS
- Equipment Inspection required** Yes No Inspector Initials TINUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

- V. Protective equipment required** Level D Level B Level C Level A
- Respiratory equipment required** Yes No See Reverse

Modifications/Exceptions: _____

VI. Chemicals of Concern	Hazard Monitoring	Action Level(s)	Response Measures
VOCs	PID w/ 1o.2 or FID	>Background in BZ	Retreat upwind
Dust (Particulates – Lead)	Visual observation	Visible dust	Employ dust suppression –Wet it down

Primary Route of Exposure/Hazard: Inhalation, ingestion, skin contact. Inhalation exposure concerns are not likely to be encountered. Wear PPE, follow good personal hygiene and decontamination practices, and good site work practices (e.g., no hand-to-mouth actions on site, etc.) to control ingestion and skin contact routes of entry.

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes or No)

VII. Additional Safety Equipment/Procedures

- | | | | |
|-------------------------------|---|----------------------------------|---|
| Hard-hat | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hearing Protection (Plugs/Muffs) | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Safety Glasses | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Safety belt/harness | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Chemical/splash goggles | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Radio/Cellular Phone | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash Shield | <input type="checkbox"/> Yes <input type="checkbox"/> No | Barricades | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash suits/coveralls | <input type="checkbox"/> Yes <input type="checkbox"/> No | Gloves (Type – Nitrile surgeons) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Impermeable apron | <input type="checkbox"/> Yes <input type="checkbox"/> No | Work/rest regimen | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Steel toe Work shoes or boots | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Chemical Resistant Boot Covers | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| High Visibility vest | <input type="checkbox"/> Yes <input type="checkbox"/> No | Tape up/use insect repellent | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| First Aid Kit | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Fire Extinguisher | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Safety Shower/Eyewash | <input type="checkbox"/> Yes <input type="checkbox"/> No | Other | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Modifications/Exceptions: Hard hat, hearing protection, and safety glasses for sampling at the DPT rig; High Visibility Vests for high traffic areas; Tape up and use insect repellent; Spiders and bees prefer well protective casings as nesting areas; Open wells and allow to vent/off gas 3-5 minutes while preparing your equipment from an upwind position. Wear snake chaps in high brush areas. Tyveks and boot covers at SSO's discretion.

VIII. Site Preparation

- | | Yes | No | NA |
|---|--------------------------|--------------------------|--------------------------|
| Utility Locating and Excavation Clearance completed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Vehicle and Foot Traffic Routes Cleared and Established | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Physical Hazards Barricaded and Isolated | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Emergency Equipment Staged | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- IX. Additional Permits required (Hot work, confined space entry, excavation etc.)** Yes No
If yes, complete permit required or contact Health Sciences, Pittsburgh Office

- X. Special instructions, precautions:** Personal sampling at remote locations will bag contaminated PPE and reusable sampling tools. Use hygienic wipes for hands and face until persons can reach the structured decontamination unit. Minimize contact with potentially contaminated media. Suspend site activities in the event of inclement weather. Employ proper lifting techniques as described on Table 5-1 for mobilization/demobilization. For remote locations pack glass ware in hard sided containers to prevent falls breakage of glassware and possible lacerations. Provisions for protection against the sun should be provided to site personnel including shade providing devices requirements for hats, sun block, wrap around sun glasses.

Permit Issued by: _____ Permit Accepted by: _____

**SAFE WORK PERMIT
TEMPORARY MONITORING WELL INSTALLATION VIA DPT
NSWC CRANE**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Installation will be accomplished using DPT Soil samples collected during DPT activities will require observance of both the Safe Work Permit for Multi-media sampling and this Safe Work Permit.

II. Primary Hazards: Potential hazards associated with this task include injury due to improper lifting and carrying, cuts and lacerations (cutting bags, well riser, etc.), cuts, pinches and compressions; and contact with contaminated media.

III. Field Crew: _____

IV. On-site Inspection conducted Yes No Inspector Initials _____ TtNUS
Equipment Inspection required Yes No Inspector Initials _____ TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

V. Protective equipment required

Level D Level B
 Level C Level A

Respiratory equipment required

Yes See Reverse
 No

Modifications/Exceptions: _____

VI. Chemicals of Concern	Hazard Monitoring	Action Level(s)	Response Measures
Dust (sand, grout, bentonite)	Visual observation	Visible dust	Employ dust suppression -Wet it down
VOCs	PID w/ 1o.2 or FID	>Background in BZ	Retreat upwind

Primary Route of Exposure/Hazard: Inhalation, ingestion, skin contact. Inhalation exposure concerns are not likely to be encountered. Wear PPE, follow good personal hygiene and decontamination practices, and good site work practices (e.g., no hand-to-mouth actions on site, etc.) to control ingestion and skin contact routes of entry.

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes or No)

VII. Additional Safety Equipment/Procedures (Note to FOL and/or SHSO: Each item must be checked Yes or No)

Hard-hat	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Hearing Protection (Plugs/Muffs)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Safety Glasses	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Safety belt/harness	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Chemical/splash goggles	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Radio/Cellular Phone	<input type="checkbox"/> Yes <input type="checkbox"/> No
Splash Shield	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Barricades	<input type="checkbox"/> Yes <input type="checkbox"/> No
Splash suits/coveralls	<input type="checkbox"/> Yes <input type="checkbox"/> No	Gloves (Type - See Note)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Impermeable apron	<input type="checkbox"/> Yes <input type="checkbox"/> No	Work/rest regimen	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Steel toe Work shoes or boots	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Chemical Resistant Boot Covers	<input type="checkbox"/> Yes <input type="checkbox"/> No
High Visibility vest	<input type="checkbox"/> Yes <input type="checkbox"/> No	Tape up/use insect repellent	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
First Aid Kit	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Fire Extinguisher	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Safety Shower/Eyewash	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Other	<input type="checkbox"/> Yes <input type="checkbox"/> No

Modifications/Exceptions: **USE GEOPROBE SAMPLING KIT AND CUT-RESISTENT GLOVES WHEN OBTAINING SAMPLES DURING DPT OPERATIONS.** High Visibility Vests for high traffic areas; Tape up and use insect repellent to combat insect bites in forested or areas of heavy vegetation; Fire extinguisher for all vehicles in excess of 1-ton; Nitrile or neoprene supported gloves and impermeable aprons for handling DPT flights, nitrile surgeon gloves for handling sampling tools and well screens and risers.

VIII. Site Preparation	Yes	No	NA
Utility Locating and Excavation Clearance completed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicle and Foot Traffic Routes Cleared and Established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical Hazards Barricaded and Isolated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Equipment Staged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

IX. Additional Permits required (Utility Locating and Excavation Clearance - Attachment V) Yes No
 If yes, SHSO complete permit or contact Health Sciences, Pittsburgh Office (412) 921-7090

X. Special instructions, precautions: Follow the safe work practices for drilling specified in Section 5.9 of this HASP. Use proper lifting techniques defined in Table 5-1. Test all emergency stop devices initially then periodically to ensure operational status. Identify a person on the field crew as the Emergency Stop Operator. Visually insure all persons are removed from rotating apparatus. Verbally alert all persons as to the activation of the DPT rig. Remove jewelry, loose clothing and other entanglement hazards. Personnel decontamination will consist of disposing of single use PPE and washing hands and face prior to breaks or meals. The potential for exposure can occur only through mechanical dispersion (inhalation) or hand to mouth contact (ingestion) through poor work hygiene practices. Utility clearance will proceed all subsurface installation.

Permit Issued by: _____ Permit Accepted by: _____

**SAFE WORK PERMIT
TOPOGRAPHIC SURVEYING
NSWC CRANE**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

- I. **Work limited to the following (description, area, equipment used):** Topographic surveying and associated activities such as site reconnaissance and site preparation including the layout of control station and shooting vertical and horizontal control lines and fixed features such as intersections
- II. **Primary Hazards:** Potential hazards associated with this task are primarily physical in nature including lifting, cuts and lacerations, pinches and compressions; flying projectiles; slips, trips, and falls; insect and animal bites
- IV. **Field Crew:** _____
- IV. **On-site Inspection conducted** Yes No Initials of Inspector _____ TINUS
Equipment Inspection required Yes No Initials of Inspector _____ TINUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

- V. **Protective equipment required:** Level D Level B
 Level C Level A
 Modifications/Exceptions: None anticipated
- Respiratory equipment required** Yes No See Reverse

VI. Chemicals of Concern	Hazard Monitoring	Action Level(s)	Response Measures
<u>None anticipated</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>

Primary Route of Exposure/Hazard: None

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes or No)

VII. Additional Safety Equipment/Procedures

- | | | | |
|--|---|---|---|
| Hard-hat..... | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hearing Protection (Plugs/Muffs)..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Safety Glasses..... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Safety belt/harness..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Chemical/splash goggles..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Radio/Cellular Phone..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash Shield..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Barricades..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Splash suits/coveralls..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Gloves (Type - <u>Leather/Cotton</u>)..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Impermeable apron..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Work/rest regimen..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Steel toe Work shoes or boots... <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | | Chemical Resistant Boot Covers..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| High Visibility vest..... | <input type="checkbox"/> Yes <input type="checkbox"/> No | Tape up/use insect repellent..... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| First Aid Kit..... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Fire Extinguisher..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Safety Shower/Eyewash..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Other..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Modifications/Exceptions: Pant legs are to be taped to work boots to prevent entry under the clothing by ticks and other insects when working in heavy brush and wooded areas. Use insect repellants according to manufacturers recommendations. Tyvek coveralls may be used in heavy brush to protect against natural hazards (e.g., ticks) and also to make identification easier. If working in areas where snakes may be a threat, wear snake chaps. Surveyors working along highways and traffic pathways shall wear high visibility vests to increase visual recognition. Safety glasses and Hard Hats should be worn when cutting sight lines; leather or cotton work gloves when cutting brush.

VIII. Site Preparation

- | | Yes | No | NA |
|--|--------------------------|--------------------------|--------------------------|
| Utility Locating and Excavation Clearance completed..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Physical Hazards Identified and Isolated..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc.)..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- IX. **Additional Permits required (Hot work, confined space entry, excavation etc.).....** Yes No
 If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090

- X. **Special instructions, precautions:** Suspend site activities in the event of inclement weather. Employ proper lifting techniques as described on Table 5-1 for this task. Employ sharp tools for cutting brush, when not in use keep the sheath on the blade.

Permit Issued by: _____ Permit Accepted by: _____

**SAFE WORK PERMIT
IDW MANAGEMENT ACTIVITIES
NSWC CRANE**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

- I. **Work limited to the following (description, area, equipment used):** IDW management activities includes containerization, staging, monitoring for leaks of IDW accumulated wastes. Wastes types include soil cutting, purge and decontamination wash waters.
- II. **Primary Hazards:** Potential hazards associated with this task are primarily physical in nature including lifting, pinches and compressions; flying projectiles; slips, trips, and falls.
- V. **Field Crew:** _____
- IV. **On-site Inspection conducted** Yes No Initials of Inspector _____ TtNUS
Equipment Inspection required Yes No Initials of Inspector _____ TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

- V. **Protective equipment required** **Respiratory equipment required**
 Level D Level B Yes See Reverse
 Level C Level A No
- Modifications/Exceptions: None anticipated

VI. Chemicals of Concern	Hazard Monitoring	Action Level(s)	Response Measures
<u>None anticipated</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>

Primary Route of Exposure/Hazard: None

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes or No)

VII. Additional Safety Equipment/Procedures

- | | | | |
|----------------------------------|---|---|---|
| Hard-hat..... | <input type="checkbox"/> Yes <input type="checkbox"/> No | Hearing Protection (Plugs/Muffs) ... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Safety Glasses | <input type="checkbox"/> Yes <input type="checkbox"/> No | Safety belt/harness | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Chemical/splash goggles | <input type="checkbox"/> Yes <input type="checkbox"/> No | Radio/Cellular Phone | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash Shield | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Barricades..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash suits/coveralls | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Gloves (Type – <u>Leather/Cotton</u>)..... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Impermeable apron..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Work/rest regimen..... | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Steel toe Work shoes or boots... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Chemical Resistant Boot Covers | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| High Visibility vest | <input type="checkbox"/> Yes <input type="checkbox"/> No | Tape up/use insect repellent | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| First Aid Kit..... | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Fire Extinguisher | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Safety Shower/Eyewash | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Other..... | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Modifications/Exceptions: If you are using pneumatic/electric power to open drums – Safety glasses are required; If power equipment is employed to move drums or you are working near operating equipment hard hats will be employed.

VIII. Site Preparation

	Yes	No	NA
Utility Locating and Excavation Clearance completed.....	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical Hazards Identified and Isolated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- IX. **Additional Permits required** (Hot work, confined space entry, excavation etc.)..... Yes No
If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090

- X. **Special instructions, precautions:** Suspend site activities in the event of inclement weather. Employ proper lifting techniques as described on Table 5-1. When/where possible use heavy equipment to move and place containers. When placing drums – Place the label and retention ring nut on the outside where it is readily visible. Place 4-drums to a pallet. Maintain a minimum distance of 4-feet between pallet rows. An IDW inventory shall be generated to provide the number of drums, contents, and volumes. This inventory should be provided to the facility contact

Permit Issued by: _____ Permit Accepted by: _____

ATTACHMENT V
UTILITY LOCATING SOP



TETRA TECH NUS, INC.

STANDARD OPERATING PROCEDURES

Number	HS-1.0	Page	1 of 15
Effective Date	12/03	Revision	2
Applicability	Tetra Tech NUS, Inc.		
Prepared	Health & Safety		
Approved	D. Senovich <i>[Signature]</i>		

Subject
UTILITY LOCATING AND EXCAVATION CLEARANCE

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1.0 PURPOSE	2
2.0 SCOPE	2
3.0 GLOSSARY	2
4.0 RESPONSIBILITIES	3
5.0 PROCEDURES	3
5.1 BURIED UTILITIES	3
5.2 OVERHEAD POWER LINES	5
6.0 UNDERGROUND LOCATING TECHNIQUES	5
6.1 GEOPHYSICAL METHODS	5
6.2 PASSIVE DETECTION SURVEYS	6
6.3 INTRUSIVE DETECTION SURVEYS	6
7.0 INTRUSIVE ACTIVITIES SUMMARY	7
8.0 REFERENCES	8

ATTACHMENTS

1	Listing of Underground Utility Clearance Resources	9
2	Frost Line Penetration Depths by Geographic Location	11
3	Utility Clearance Form	12
4	OSHA Letter of Interpretation	13

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 2 of 15
	Revision 2	Effective Date 12/03

1.0 PURPOSE

Utilities such as electric service lines, natural or propane gas lines, water and sewage lines, telecommunications, and steam lines are very often in the immediate vicinity of work locations. Contact with underground or overhead utilities can have serious consequences including employee injury/fatality, property and equipment damage, substantial financial impacts, and loss of utility service to users.

The purpose of this procedure is to provide minimum requirements and technical guidelines regarding the appropriate procedures to be followed when performing subsurface and overhead utility locating services. It is the policy of Tetra Tech NUS, Inc. (TtNUS) to provide a safe and healthful work environment for the protection of our employees. The purpose of this Standard Operating Procedure (SOP) is to aid in achieving the objectives of this policy, to present the acceptable procedures pertaining to utility locating and excavation clearance activities, and to present requirements and restrictions relevant to these types of activities. This SOP must be reviewed by any employee potentially involved with underground or overhead utility locating and avoidance activities.

2.0 SCOPE

This procedure applies to all TtNUS field activities where there may be potential contact with underground or overhead utilities. This procedure provides a description of the principles of operation, instrumentation, applicability, and implementability of typical methods used to determine the presence and avoidance of contact with utility services. This procedure is intended to assist with work planning and scheduling, resource planning, field implementation, and subcontractor procurement. Utility locating and excavation clearance requires site-specific information prior to the initiation of any such activities on a specific project. This SOP is not intended to provide a detailed description of methodology and instrument operation. Specialized expertise during both planning and execution of several of the methods presented may also be required.

3.0 GLOSSARY

Electromagnetic Induction (EMI) Survey - A geophysical exploration method whereby electromagnetic fields are induced in the ground and the resultant secondary electromagnetic fields are detected as a measure of ground conductivity.

Magnetometer - A device used for precise and sensitive measurements of magnetic fields.

Magnetic Survey - A geophysical survey method that depends on detection of magnetic anomalies caused by the presence of buried ferromagnetic objects.

Metal Detection - A geophysical survey method that is based on electromagnetic coupling caused by underground conductive objects.

Vertical Gradiometer - A magnetometer equipped with two sensors that are vertically separated by a fixed distance. It is best suited to map near surface features and is less susceptible to deep geologic features.

Ground Penetrating Radar - Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture.

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 3 of 15
	Revision 2	Effective Date 12/03

4.0 RESPONSIBILITIES

Project Manager (PM)/Task Order Manager (TOM) - Responsible for ensuring that all field activities are conducted in accordance with this procedure.

Site Manager (SM)/Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved SOPs or as otherwise directed by the approved project plan(s).

Site Health & Safety Officer (SHSO) - Responsible to provide technical assistance and verify full compliance with this SOP. The SHSO is also responsible for reporting any deficiencies to the Corporate Health and Safety Manager (HSM) and to the PM/TOM.

Health & Safety Manager (HSM) - Responsible for preparing, implementing, and modifying corporate health and safety policy and this SOP.

Site Personnel - Responsible for performing their work activities in accordance with this SOP and the TtNUS Health and Safety Policy.

5.0 PROCEDURES

This procedure addresses the requirements and technical procedures that must be performed to minimize the potential for contact with underground and overhead utility services. These procedures are addressed individually from a buried and overhead standpoint.

5.1 Buried Utilities

Buried utilities present a heightened concern because their location is not typically obvious by visual observation, and it is common that their presence and/or location is unknown or incorrectly known on client properties. This procedure must be followed prior to beginning any subsurface probing or excavation that might potentially be in the vicinity of underground utility services. In addition, the Utility Clearance Form (Attachment 3) must be completed for every location or cluster of locations where intrusive activities will occur.

Where the positive identification and de-energizing of underground utilities cannot be obtained and confirmed using the following steps, the PM/TOM is responsible for arranging for the procurement of a qualified, experienced, utility locating subcontractor who will accomplish the utility location and demarcation duties specified herein.

1. A comprehensive review must be made of any available property maps, blue lines, or as-builts prior to site activities. Interviews with local personnel familiar with the area should be performed to provide additional information concerning the location of potential underground utilities. Information regarding utility locations shall be added to project maps upon completion of this exercise.
2. A visual site inspection must be performed to compare the site plan information to actual field conditions. Any findings must be documented and the site plan/maps revised. The area(s) of proposed excavation or other subsurface activities must be marked at the site in white paint or pin flags to identify those locations of the proposed intrusive activities. The site inspection should focus on locating surface indications of potential underground utilities. Items of interest include the presence of nearby area lights, telephone service, drainage grates, fire hydrants, electrical service vaults/panels, asphalt/concrete scars and patches, and topographical depressions. Note the location of any emergency shut off switches. Any additional information regarding utility

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 4 of 15
	Revision 2	Effective Date 12/03

locations shall be added to project maps upon completion of this exercise and returned to the PM/TOM.

3. If the planned work is to be conducted on private property (e.g., military installations, manufacturing facilities, etc.) the FOL must identify and contact appropriate facility personnel (e.g., public works or facility engineering) before any intrusive work begins to inquire about (and comply with) property owner requirements. It is important to note that private property owners may require several days to several weeks advance notice prior to locating utilities.

4. If the work location is on public property, the state agency that performs utility clearances must be notified (see Attachment 1). State "one-call" services must be notified prior to commencing fieldwork per their requirements. Most one-call services require, by law, 48- to 72-hour advance notice prior to beginning any excavation. Such services typically assign a "ticket" number to the particular site. This ticket number must be recorded for future reference and is valid for a specific period of time, but may be extended by contacting the service again. The utility service will notify utility representatives who then mark their respective lines within the specified time frame. It should be noted that most military installations own their own utilities but may lease service and maintenance from area providers. Given this situation, "one call" systems may still be required to provide location services on military installations.

5. Utilities must be identified and their locations plainly marked using pin flags, spray paint, or other accepted means. The location of all utilities must be noted on a field sketch for future inclusion on project maps. Utility locations are to be identified using the following industry-standard color code scheme, unless the property owner or utility locator service uses a different color code:

white	excavation/subsurface investigation location
red	electrical
yellow	gas, oil, steam
orange	telephone, communications
blue	water, irrigation, slurry
green	sewer, drain

6. Where utility locations are not confirmed with a high degree of confidence through drawings, schematics, location services, etc., the work area must be thoroughly investigated prior to beginning the excavation. In these situations, utilities must be identified using safe and effective methods such as passive and intrusive surveys, or the use of non-conductive hand tools. Also, in situations where such hand tools are used, they should always be used in conjunction with suitable detection equipment, such as the items described in Section 6.0 of this SOP. Each method has advantages and disadvantages including complexity, applicability, and price. It also should be noted that in some states, initial excavation is required by hand to a specified depth.

7. At each location where trenching or excavating will occur using a backhoe or other heavy equipment, and where utility identifications and locations cannot be confirmed prior to groundbreaking, the soil must be probed using a device such as a tile probe which is made of non-conductive material such as fiberglass. If these efforts are not successful in clearing the excavation area of suspect utilities, hand shoveling must be performed for the perimeter of the intended excavation.

8. All utilities uncovered or undermined during excavation must be structurally supported to prevent potential damage. Unless necessary as an emergency corrective measure, TtNUS shall not make any repairs or modifications to existing utility lines without prior permission of the utility owner, property owner, and Corporate HSM. All repairs require that the line be locked-out/tagged-out prior to work.

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 5 of 15
	Revision 2	Effective Date 12/03

5.2 Overhead Power Lines

If it is necessary to work within the minimum clearance distance of an overhead power line, the overhead line must be de-energized and grounded, or re-routed by the utility company or a registered electrician. If protective measures such as guarding, isolating, or insulating are provided, these precautions must be adequate to prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

The following table provides the required minimum clearances for working in proximity to overhead power lines.

<u>Nominal Voltage</u>	<u>Minimum Clearance</u>
0-50 kV	10 feet, or one mast length; whichever is greater
50+ kV	10 feet plus 4 inches for every 10 kV over 50 kV or 1.5 mast lengths; whichever is greater

6.0 UNDERGROUND LOCATING TECHNIQUES

A variety of supplemental utility locating approaches are available and can be applied when additional assurance is needed. The selection of the appropriate method(s) to employ is site-specific and should be tailored to the anticipated conditions, site and project constraints, and personnel capabilities.

6.1 Geophysical Methods

Geophysical methods include electromagnetic induction, magnetics, and ground penetrating radar. Additional details concerning the design and implementation of electromagnetic induction, magnetics, and ground penetrating radar surveys can be found in one or more of the TINUS SOPs included in the References (Section 8.0).

Electromagnetic Induction

Electromagnetic Induction (EMI) line locators operate either by locating a background signal or by locating a signal introduced into the utility line using a transmitter. A utility line acts like a radio antenna, producing electrons, which can be picked up with a radiofrequency receiver. Electrical current carrying conductors have a 60HZ signal associated with them. This signal occurs in all power lines regardless of voltage. Utilities in close proximity to power lines or used as grounds may also have a 60HZ signal, which can be picked up with an EM receiver. A typical example of this type of geophysical equipment is an EM-61.

EMI locators specifically designed for utility locating use a special signal that is either indirectly induced onto a utility line by placing the transmitter above the line or directly induced using an induction clamp. The clamp induces a signal on the specific utility and is the preferred method of tracing since there is little chance of the resulting signals being interfered with. A good example of this type of equipment is the Schonstedt® MAC-51B locator. The MAC-51B performs inductively traced surveys, simple magnetic locating, and traced nonmetallic surveys.

When access can be gained inside a conduit to be traced, a flexible insulated trace wire can be used. This is very useful for non-metallic conduits but is limited by the availability of gaining access inside the pipe.

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 6 of 15
	Revision 2	Effective Date 12/03

Magnetics

Magnetic locators operate by detecting the relative amounts of buried ferrous metal. They are incapable of locating or identifying nonferrous utility lines but can be very useful for locating underground storage tanks (UST's), steel utility lines, and buried electrical lines. A typical example of this type of equipment is the Schonstedt® GA-52Cx locator. The GA-52Cx is capable of locating 4-inch steel pipe up to 8 feet deep.

Non-ferrous lines are often located by using a typical plumbing tool (snake) fed through the line. A signal is then introduced to the snake that is then traced.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture. In general, an object which is harder than the surrounding soil will reflect a stronger signal. Utilities, tunnels, UST's, and footings will reflect a stronger signal than the surrounding soil. Although this surface detection method may determine the location of a utility, this method does not specifically identify utilities (i.e., water vs. gas, electrical vs. telephone); hence, verification may be necessary using other methods. This method is somewhat limited when used in areas with clay soil types or with a high water table.

6.2 Passive Detection Surveys

Acoustic Surveys

Acoustic location methods are generally most applicable to waterlines or gas lines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. Acoustics may also be applicable to determine the location of plastic gas lines.

Thermal Imaging

Thermal (i.e., infrared) imaging is a passive method for detecting the heat emitted by an object. Electronics in the infrared camera convert subtle heat differentials into a visual image on the viewfinder or a monitor. The operator does not look for an exact temperature; rather they look for heat anomalies (either elevated or suppressed temperatures) characteristic of a potential utility line.

The thermal fingerprint of underground utilities results from differences in temperature between the atmosphere and the fluid present in a pipe or the heat generated by electrical resistance. In addition, infrared scanners may be capable of detecting differences in the compaction, temperature and moisture content of underground utility trenches. High-performance thermal imagery can detect temperature differences to hundredths of a degree.

6.3 Intrusive Detection Surveys

Vacuum Excavation

Vacuum excavation is used to physically expose utility services. The process involves removing the surface material over approximately a 1' x 1' area at the site location. The air-vacuum process proceeds with the simultaneous action of compressed air-jets to loosen soil and vacuum extraction of the resulting

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 7 of 15
	Revision 2	Effective Date 12/03

debris. This process ensures the integrity of the utility line during the excavation process, as no hammers, blades, or heavy mechanical equipment comes into contact with the utility line, eliminating the risk of damage to utilities. The process continues until the utility is uncovered. Vacuum excavation can be used at the proposed site location to excavate below the "utility window" which is usually 8 feet.

Hand Excavation

When the identification and location of underground utilities cannot be positively confirmed through document reviews and/or other methods, borings and excavations may be cleared via the use of non-conductive hand tools. This should always be done in conjunction with the use of detection equipment. This would be required for all locations where there is a potential to impact buried utilities. The minimum hand-excitation depth that must be reached is to be determined considering the geographical location of the work site. This approach recognizes that the placement of buried utilities is influenced by frost line depths that vary by geographical region. Attachment 2 presents frost line depths for the regions of the contiguous United States. At a minimum, hand excavation depths must be at least to the frost line depth (see Attachment 2) plus two (2) feet, but never less than 4 feet below ground surface (bgs). For hand excavation, the hole created must be reamed large enough to be at least the diameter of the drill rig auger or bit prior to drilling. For soil gas surveys, the survey probe shall be placed as close as possible to the cleared hand excavation. It is important to note that a post-hole digger must not be used in this type of hand excavation activity.

Tile Probe Surveys

For some soil types, site conditions, and excavation requirements, non-conductive tile probes may be used. A tile probe is a "T"-handled rod of varying lengths that can be pushed into the soil to determine if any obstructions exist at that location. Tile probes constructed of fiberglass or other nonconductive material are readily available from numerous vendors. Tile probes must be performed to the same depth requirements as previously specified. As with other types of hand excavating activities, the use of a non-conductive tile probe, should always be in conjunction with suitable utility locating detection equipment.

7.0 INTRUSIVE ACTIVITIES SUMMARY

The following list summarizes the activities that must be performed prior to beginning subsurface activities:

1. Map and mark all subsurface locations and excavation boundaries using white paint or markers specified by the client or property owner.
2. Notify the property owner and/or client that the locations are marked. At this point, drawings of locations or excavation boundaries shall be provided to the property owner and/or client so they may initiate (if applicable) utility clearance.

Note: Drawings with confirmed locations should be provided to the property owner and/or client as soon as possible to reduce potential time delays.

3. Notify "One Call" service. If possible, arrange for an appointment to show the One Call representative the surface locations or excavation boundaries in person. This will provide a better location designation to the utilities they represent. You should have additional drawings should you need to provide plot plans to the One Call service.
4. Implement supplemental utility detection techniques as necessary and appropriate to conform utility locations or the absence thereof.

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 8 of 15
	Revision 2	Effective Date 12/03

5. Complete Attachment 3, Utility Clearance Form. This form should be completed for each excavation location. In situations where multiple subsurface locations exist within the close proximity of one another, one form may be used for multiple locations provided those locations are noted on the Utility Clearance Form. Upon completion, the Utility Clearance Form and revised/annotated utility location map becomes part of the project file.

8.0 REFERENCES

OSHA Letter of Interpretation, Mr. Joseph Caldwell, Attachment 4
OSHA 29 CFR 1926(b)(2)
OSHA 29 CFR 1926(b)(3)
TtNUS Utility Locating and Clearance Policy
TtNUS SOP GH-3.1: Resistivity and Electromagnetic Induction
TtNUS SOP GH-3.2: Magnetic and Metal Detection Surveys
TtNUS SOP GH-3.4: Ground-penetrating Radar Surveys

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 9 of 15
	Revision 2	Effective Date 12/03

**ATTACHMENT 1
LISTING OF UNDERGROUND UTILITY CLEARANCE RESOURCES**



American Public Works Association
 2345 Grand Boulevard, Suite 500, Kansas City, MO 64108-2625
 Phone (816) 472-6100 • Fax (816) 472-1610
 Web www.apwa.net • E-mail apwa@apwa.net

**ONE-CALL SYSTEMS INTERNATIONAL
CONDENSED DIRECTORY**

- | | | |
|---|--|--|
| Alabama
Alabama One-Call
1-800-292-8525 | Iowa
Iowa One-Call
1-800-292-8989 | New Jersey
New Jersey One-Call
1-800-272-1000 |
| Alaska
Locate Call Center of Alaska, Inc.
1-800-478-3121 | Kansas
Kansas One-Call System, Inc.
1-800-344-7233 | New Mexico
New Mexico One-Call System, Inc.
1-800-321-2537
Las Cruces- Dona Ana Blue Stakes
1-888-526-0400 |
| Arizona
Arizona Blue Stake
1-800-782-5348 | Kentucky
Kentucky Underground Protection Inc.
1-800-752-6007 | New York
Dig Safely New York
1-800-882-7962
New York City- Long Island One-Call
Center
1-800-272-4480 |
| Arkansas
Arkansas One-Call System, Inc.
1-800-482-8998 | Louisiana
Louisiana One-Call System, Inc.
1-800-272-3020 | North Carolina
The North Carolina One-Call Center,
Inc.
1-800-632-4949 |
| California
Underground Service Alert North
1-800-227-2600
Underground Service Alert of Southern
California
1-800-227-2600 | Maine
Dig Safe System, Inc.
1-888-344-7233 | North Dakota
North Dakota One-Call
1-800-785-0555 |
| Colorado
Utility Notification Center of Colorado
1-800-922-1987 | Maryland
Miss Utility
1-800-257-7777
Miss Utility of Delmarva
1-800-282-8555 | Ohio
Ohio Utilities Protection Service
1-800-362-2764
Oil & Gas Producers Underground
Protect'n Svc
1-800-925-0888 |
| Connecticut
Call Before You Dig
1-800-922-4455 | Massachusetts
Dig Safe System, Inc.
1-888-344-7233 | Oklahoma
Call Okle
1-800-522-6543 |
| Delaware
Miss Utility of Delmarva
1-800-282-8555 | Michigan
Miss Dig System, Inc.
1-800-482-7171 | Oregon
Oregon Utility Notification Center/One
Call Concepts
1-800-332-2344 |
| Florida
Sunshine State One-Call of Florida, Inc.
1-800-432-4770 | Minnesota
Gopher State One-Call
1-800-252-1168 | Pennsylvania
Pennsylvania One-Call System, Inc.
1-800-242-1776 |
| Georgia
Underground Protection Center, Inc.
1-800-282-7411 | Mississippi
Mississippi One-Call System, Inc.
1-800-227-6477 | Rhode Island
Dig Safe System, Inc.
1-888-344-7233 |
| Hawaii
Underground Service Alert North
1-800-227-2600 | Missouri
Missouri One-Call System, Inc.
1-800-344-7483 | South Carolina
Palmetto Utility Protection Service Inc.
1-888-721-7877 |
| Idaho
Dig Line Inc.
1-800-342-1585
Kootenai County One-Call
1-800-428-4950
Shoshone - Benewah One-Call
1-800-398-3285 | Montana
Utilities Underground Protection Center
1-800-424-5555
Montana One-Call Center
1-800-551-8344 | South Dakota
South Dakota One-Call
1-800-781-7474 |
| Illinois
JULIE, Inc.
1-800-892-0123
Digger (Chicago Utility Alert Network)
312-744-7000 | Nebraska
Diggers Hotline of Nebraska
1-800-331-5668 | Tennessee
Tennessee One-Call System, Inc.
1-800-351-1111 |
| Indiana
Indiana Underground Plant Protection
Service
1-800-382-5544 | Nevada
Underground Service Alert North
1-800-227-2600 | |
| | New Hampshire
Dig Safe System, Inc.
1-888-344-7233 | |

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1:0	Page 10 of 15
	Revision 2	Effective Date 12/03

ATTACHMENT 1 (Continued)

Texas

Texas One Call System
1-800-245-4545
Texas Excavation Safety System, Inc.
1-800-344-8377
Lone Star Notification Center
1-800-669-8344

Utah

Blue Stakes of Utah
1-800-662-4111

Vermont

Dig Safe System, Inc.
1-888-344-7233

Virginia

Miss Utility of Virginia
1-800-552-7001
Miss Utility (Northern Virginia)
1-800-257-7777

Washington

Utilities Underground Location Center
1-800-424-5555
Northwest Utility Notification Center
1-800-553-4344
Inland Empire Utility Coordinating
Council
509-456-8000

West Virginia

Miss Utility of West Virginia, Inc.
1-800-245-4848

Wisconsin

Diggers Hotline, Inc.
1-800-242-8511

Wyoming

Wyoming One-Call System, Inc.
1-800-348-1030
Call Before You Dig of Wyoming
1-800-849-2478

District of Columbia

Miss Utility
1-800-267-7777

Alberta

Alberta One-Call Corporation
1-800-242-3447

British Columbia

BC One Call
1-800-474-6886

Ontario

Ontario One-Call System
1-800-400-2255

Quebec

Info-Excavation
1-800-663-9228

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number: HS-1.0	Page 12 of 15
	Revision 2	Effective Date: 12/03

**ATTACHMENT 3
UTILITY CLEARANCE FORM**

Client: _____ Project Name: _____
 Project No.: _____ Completed By: _____
 Location Name: _____ Work Date: _____
 Excavation Method/Overhead Equipment: _____

1. **Underground Utilities** Circle One
- a) Review of existing maps? yes no N/A
 - b) Interview local personnel? yes no N/A
 - c) Site visit and inspection? yes no N/A
 - d) Excavation areas marked in the field? yes no N/A
 - e) Utilities located in the field? yes no N/A
 - f) Located utilities marked/added to site maps? yes no N/A
 - g) Client contact notified yes no N/A
 Name _____ Telephone: _____ Date: _____
 - g) State One-Call agency called? yes no N/A
 Caller: _____
 Ticket Number: _____ Date: _____
 - h) Geophysical survey performed? yes no N/A
 Survey performed by: _____
 Method: _____ Date: _____
 - i) Hand excavation performed (with concurrent use of utility
 detection device)? yes no N/A
 Completed by: _____
 Total depth: _____ feet Date: _____
 - j) Trench/excavation probed? yes no N/A
 Probing completed by: _____
 Depth/frequency: _____ Date: _____

2. **Overhead Utilities** Present Absent
- a) Determination of nominal voltage yes no N/A
 - b) Marked on site maps yes no N/A
 - c) Necessary to lockout/insulate/re-route yes no N/A
 - d) Document procedures used to lockout/insulate/re-route yes no N/A
 - e) Minimum acceptable clearance (SOP Section 5.2): _____

3. Notes:

Approval:
 Site Manager/Field Operations Leader _____ Date _____

c. PM/Project File
 Program File

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 13 of 15
	Revision 2	Effective Date 12/03

**ATTACHMENT 4
OSHA LETTER OF INTERPRETATION**

Mr. Joseph Caldwell
Consultant
Governmental Liaison
Pipeline Safety Regulations
211 Wilson Boulevard
Suite 700
Arlington, Virginia 22201

Re: Use of hydro-vacuum or non-conductive hand tools to locate underground utilities.

Dear Mr. Caldwell:

In a letter dated July 7, 2003, we responded to your inquiry of September 18, 2002, regarding the use of hydro-vacuum equipment to locate underground utilities by excavation. After our letter to you was posted on the OSHA website, we received numerous inquiries that make it apparent that aspects of our July 7 letter are being misunderstood. In addition, a number of industry stakeholders, including the National Utility Contractors Association (NUCA), have provided new information regarding equipment that is available for this work.

To clarify these issues, we are withdrawing our July 7 letter and issuing this replacement response to your inquiry.

Question: Section 1926.651 contains several requirements that relate to the safety of employees engaged in excavation work. Specifically, paragraphs (b)(2) and (b)(3) relate in part to the safety of the means used to locate underground utility installations that, if damaged during an uncovering operation, could pose serious hazards to employees.

Under these provisions, what constitutes an acceptable method of uncovering underground utility lines, and further, would the use of hydro-vacuum excavation be acceptable under the standard?

Answer

Background

Two sections of 29 CFR 1926 Subpart P (Excavations), 1926.651 (Specific excavation requirements), govern methods for uncovering underground utility installations. Specifically, paragraph (b)(2) states:

When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours * * * or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used. (emphasis added)

Paragraph (b)(3) provides:

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 14 of 15
	Revision 2	Effective Date 12/03

ATTACHMENT 4 (Continued)

When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means (emphasis added).

Therefore, "acceptable means" must be used where the location of the underground utilities have not been identified by the utility companies and detection equipment is not used.

Subpart P does not contain a definition of either "other acceptable means" or "safe and acceptable means." The preambles to both the proposed rule and the final rule discussed the rationale behind the wording at issue. For example, the preamble to the proposed rule, 52 Fed. Reg. 12301 (April 15, 1987), noted that a 1972 version of this standard contained language that specified "careful probing or hand digging" as the means to uncover utilities. The preamble then noted that an amendment to the 1972 standard later deleted that language "to allow other, *equally effective means* of locating such installations." The preamble continued that in the 1987 proposed rule, OSHA again proposed using language in section (b)(3) that would provide another example of an acceptable method of uncovering utilities that could be used *where the utilities have not been marked and detection equipment is not being used* - "probing with hand-held tools." This method was rejected in the final version of 29 CFR 1926. As OSHA explained in the preamble to the final rule, 54 Fed. Reg. 45916 (October 31, 1989):

OSHA received two comments * * * and input from ACCSH [OSHA's Advisory Committee on Construction Safety and Health] * * * on this provision. All commenters recommended dropping 'such as probing with hand-held tools' from the proposed provision, because this could create a hazard to employees by damaging the installation or its insulation.

In other words, the commenters objected to the use of hand tools being used unless detection equipment was used in conjunction with them. OSHA then concluded its discussion relative to this provision by agreeing with the commentators and ultimately not including any examples of "acceptable means" in the final provision.

Non-conductive hand tools are permitted

This raises the question of whether the standard permits the use of hand tools alone -- without also using detection equipment. NUCA and other industry stakeholders have recently informed us that non-conductive hand tools that are appropriate to be used to locate underground utilities are now commonly available.

Such tools, such as a "shooter" (which has a non-conductive handle and a snub nose) and non-conductive or insulated probes were not discussed in the rulemaking. Since they were not considered at that time, they were not part of the class of equipment that was thought to be unsafe for this purpose. Therefore, we conclude that the use of these types of hand tools, when used with appropriate caution, is an "acceptable means" for locating underground utilities.

Subject UTILITY LOCATING AND EXCAVATION CLEARANCE	Number HS-1.0	Page 15 of 15
	Revision 2	Effective Date 12/03

ATTACHMENT 4 (Continued)

Hydro-vacuum excavation

It is our understanding that some hydro-vacuum excavation equipment can be adjusted to use a minimum amount of water and suction pressure. When appropriately adjusted so that the equipment will not damage underground utilities (especially utilities that are particularly vulnerable to damage, such as electrical lines), use of such equipment would be considered a "acceptable means" of locating underground utilities. However, if the equipment cannot be sufficiently adjusted, then this method would not be acceptable under the standard.

Other technologies

We are not suggesting that these are the only devices that would be "acceptable means" under the standard. Industry stakeholders have informed us that there are other types of special excavation equipment designed for safely locating utilities as well.

We apologize for any confusion our July 7 letter may have caused. If you have further concerns or questions, please feel free to contact us again by fax at: U.S. Department of Labor, OSHA, Directorate of Construction, Office of Construction Standards and Compliance Assistance, fax # 202-693-1689. You can also contact us by mail at the above office, Room N3468, 200 Constitution Avenue, N.W., Washington, D.C. 20210, although there will be a delay in our receiving correspondence by mail.

Sincerely,

Russell B. Swanson, Director
Directorate of Construction

NOTE: OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov>.