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WORK PLAN FOR SOURCE AREA DELINATION AT SITE 11 NSB KINGS BAY GA

10/1/2000

CH2M HILL

Work Plan

Revision No. 00

Source Area Delineation at Site 11 Old Camden County Landfill

Naval Submarine Base Kings Bay

Kings Bay, Georgia

Contract No. N62467-98-D-0995
Contract Task Order No. 0047

October 2000

PREPARED FOR

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Work Plan
Source Area Delineation at Site 11
Old Camden County Landfill

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Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

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Acronym List

AFCEE	Air Force Center for Environmental Excellence
AOC	Area of Contamination
BEI	Bechtel Environmental, Inc.
Bls	below land surface
CCI	CH2M HILL Constructors, Inc.
CFR	Code of Federal Regulations
CTO	Contract Task Order
CO	Contracting Officer
CPM	Critical Path Method
DCE	Dichloroethene
DPT	direct-push technology
EPCRA	Emergency Planning and Community Right-to-Know Act
J.A. Jones	J.A. Jones Environmental Services Company
LDR	Land Disposal Restriction
MSDS	Material Safety Data Sheets
µg/L	micrograms per liter
NRC	National Response Center
NAVFAC	Naval Facilities Engineering Command
NPDES	National Pollutant Discharge Elimination System
NSB	Naval Submarine Base
NTR	Navy Technical Representative
PPE	personal protective equipment
QA	Quality Assurance
QC	Quality Control
ROICC	Resident Officer in Charge of Construction
SAP	Sampling and Analysis Plan
SOPs	standard operating procedures
PCE	Tetrachloroethene
T&D	Transportation and Disposal
TCLE	total chlorinated ethenes
TCE	Trichloroethene
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound

1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) with J.A. Jones Environmental Services Company (J.A. Jones) has been contracted by the Department of the Navy, Southern Division Naval Facilities Engineering Command (NAVFAC), to prepare this Work Plan under the Remedial Action Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0047. The purpose of this Work Plan is to outline the procedures to be used to perform source area delineation at Site 11, Old Camden County Landfill (Site 11) located at Naval Submarine Base (NSB) Kings Bay, Georgia.

The scope of work under this CTO is to delineate the horizontal and vertical extent of the potential source area tetrachloroethene (PCE) contamination (and its degradation products) beneath the existing Phase III chemical oxidation treatment injectors for future chemical oxidation injections and site remediation activities.

This Work Plan is organized into six sections of text and three appendices as follows.

Section 1.0 Introduction includes the site history and project objectives.

Section 2.0 Project Execution Plan details the required scope of work, and the project schedule, the communications plan, and the traffic control plan. A detailed project schedule is provided in **Appendix A** of this Work Plan.

Section 3.0 Sampling and Analysis Plan (SAP) provides project sample locations, sample collection frequency, and the required laboratory analyses for samples collected during project activities.

Section 4.0 Waste Management Plan discusses the characterization, disposal, onsite management, and transportation of wastes (i.e., well development water, decontamination water, etc.) encountered or generated during project activities. Waste management forms are provided in **Appendix B**.

Section 5.0 Environmental Protection Plan addresses environmental protection for all work completed at NSB Kings Bay.

Section 6.0 Quality Control Plan includes the testing requirements for work described in this Work Plan. The site-specific project organization for this CTO is also included in this section. The QC attachments (i.e., the submittal register, testing plan and log, etc.) are provided in **Appendix C**.

The **Site Health and Safety Plan**, provided as a standalone document in **Appendix D**, addresses project-specific health and safety issues for the remediation activities to be completed at NSB Kings Bay.

1.1 Site History

NSB Kings Bay occupies approximately 16,168 acres in Camden County, Georgia. Site 11 is identified as the Old Camden County Landfill, which is now incorporated in

NSB Kings Bay. The Old Camden County Landfill was used for municipal solid waste disposal in the 1960s and 1970s. Waste was disposed of by digging trenches, filling the trenches with waste, and then backfilling the trenches with fill. PCE was disposed in the landfill at some point during waste disposal activities, which resulted in groundwater contamination at the site. The contaminants of concern at Site 11 include chlorinated volatile organic compounds (VOCs), specifically PCE, and its degradation constituents trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride (VC).

Bechtel Environmental, Inc. (BEI), with Geo-Cleanse International, Inc., performed three phases of chemical oxidation treatment during August 1998 through April 2000. During the entire treatment program, a total of 54 injectors were installed and an approximate total of 34,850 gallons of 50 percent hydrogen peroxide and an equivalent amount of ferrous iron catalyst were delivered to the subsurface.

Phase I chemical oxidation treatment was performed from August 1998 through February 1999. Because of a concentration increase in three piezometers and Injector I-14 following Phase I treatment, BEI conducted a cone penetration testing program in April 1999 to confirm and delineate the horizontal extent of dissolved groundwater contamination.

Phase II chemical oxidation treatment was performed from May 1999 to July 1999 on areas east and west of the Phase I area of concern. Because of a concentration rebound in Injector I-14 following the Phase II treatment, BEI conducted a geoprobe investigation in August 1999 to investigate and locate the potential new source of PCE at Injector I-14. Excavation of the suspected source area near Injector I-14 was conducted in September 1999. The excavation yielded several 5-gallon containers, one containing a gray-colored, paint looking waste, and one approximate 20-gallon container containing a black sludge type waste. The black waste showed PCE with the highest concentration of all compounds tested.

Phase III chemical oxidation treatment was performed from January 2000 to April 2000 on the delineated source area southeast of Injector I-14. Based on the analytical results from the post-Phase III sampling event conducted on May 30, 2000, a source area of PCE contamination appears to remain beneath the Phase III injectors.

The post-Phase III sampling event analytical results are summarized in Table 1-1.

TABLE 1-1
Post-Phase III Sampling Event Analytical Results

	Concentration in micrograms per liter (µg/L)				
Injector ID	PCE	TCE	cis-1,2-DCE	VC	Total Chlorinated Ethenes (TCLE)
I-11	170.0	7.0	6.5I	5U	177.0
I-12	47.0	1.8I	1U	1U	47.0
I-13	41.0	5U	5U	5U	41.0
I-14	32.0	2.8	1.6I	1U	34.8
I-18	99.0	1.6I	1U	1U	99.0
I-24	13.0	1.4I	1.3I	1U	13.0
I-25	81.0	1U	2.0	1U	83.0
I-26	49.0	1U	1.5I	1U	49.0
I-60	10,000.0	100U	100U	100U	10,000.0
I-61	820.0	20U	20U	20U	820.0
I-62	120.0	5U	5U	5U	120.0
I-63	130.0	5U	5U	5U	130.0
I-64	92.0	5U	5U	5U	92.0
I-65	210.0	5U	5U	5U	210.0
I-66	260.0	5U	5U	5U	260.0
I-67	72.0	5U	5.2I	5U	72.0
I-68	4.0	1U	1U	1U	4.0
I-69	36.0	1.8I	1U	1U	36.0

U denotes compound was analyzed for but not detected to the level shown.
µg/L – micrograms per liter
I denotes analyte detected, however the value is between the method detection limit and the practical quantitation limit.

1.2 Project Objectives

The project objective is to delineate the horizontal and vertical extent of the potential source area PCE contamination (and its degradation products) beneath the Phase III chemical oxidation treatment injectors through the use of direct-push technology (DPT) and an onsite mobile laboratory.

The following document prepared by BEI was utilized by CCI/J.A. Jones in its preparation of this Work Plan:

- Bechtel Environmental, Inc., July 2000; Completion Report for In Situ Chemical Oxidation, July 1998 - July 2000, Site 11, Old Camden County Landfill; NSB Kings Bay, Georgia.

2.0 Project Execution Plan

The scope of work, project schedule, communications plan and traffic control plan are described in this section.

2.1 Scope of Work

The scope of work for this project includes the following activities:

- Mobilization and Setup of Temporary Facilities and Site Controls
- Source Area Delineation
- Site Restoration
- Decontamination
- Demobilization

2.1.1 Mobilization and Setup of Temporary Facilities and Site Controls

This task will consist of the mobilization of personnel and equipment to the work site and the establishment of temporary facilities, consisting of portable sanitary facilities, a decontamination area, site refuge area, and equipment laydown area. Project management and scheduling activities, including contractor coordination, will be achieved from the CCI/J.A. Jones office trailer located at NSB Kings Bay and equipped with telephone and facsimile capabilities. CCI/J.A. Jones will utilize the existing office trailer located at the site. Office supplies, field equipment, and personal protective equipment (PPE) will be stored in the office.

Prior to the commencement of DPT delineation boring, site controls including construction barricades will be installed and the decontamination area, site refuge area, and equipment laydown area will be prepared. If necessary, security fencing will also be installed. CCI/J.A. Jones will coordinate with both the NSB Kings Bay Public Works Center and the Resident Officer in Charge of Construction (ROICC) to acquire utility layout plans of the area. Utilities in the area will be marked with paint and stakes, as appropriate. All marked utility lines in construction areas will be uncovered with hand tools. In addition, the progress of DPT delineation boring will be continuously monitored for evidence of subsurface obstructions.

Any damage to underground utilities or subsurface structures will be immediately reported to the ROICC and subsequently repaired by CCI/J.A. Jones via methods approved by the ROICC.

2.1.2 Source Area Delineation

Source area delineation will be performed at Site 11 for the area surrounding existing Injector I-60 using a DPT rig (i.e., geoprobe) and an onsite mobile laboratory. Delineation will be completed in the horizontal and vertical directions from Injector I-60 until borings located upgradient, downgradient, and crossgradient of the delineated source area contain concentrations less than 100 μg/L of total chlorinated ethenes (TCLE) (i.e., summation of

PCE, TCE, DCE, and VC). The source area will be delineated with a minimum of nine boring locations, with one located adjacent to Injector I-60 and others spaced 10 feet apart in each direction from I-60. Samples will initially be collected from each boring at depths of 35 to 38 feet below land surface (bls), 40 to 43 feet bls, 44 to 47 feet bls, and 48 to 51 feet bls using the DPT rig with peristaltic sampling pump and analyzed by the onsite mobile laboratory for United Stated Environmental Protection Agency (USEPA) SW-846 Method 8021B in accordance with Section 2.0 Sampling and Analysis Plan of this Work Plan. A DPT rig capable of collecting samples to a depth of 60 feet bls will be utilized because additional deeper samples may be required to fully define the extent of the source area. If no TCLE concentrations above 100 $\mu g/L$ are noted at a particular sampling location, the boring will be terminated at a depth of 51 feet bls, unless previous samples indicate a deeper source area. Following groundwater sample collection and analysis, each DPT delineation boring will be abandoned by sealing the boring with grout from the bottom of the boring to the ground surface using a tremie pipe.

2.1.3 Site Restoration

Areas disturbed during source area delineation will be restored to previous condition. Restoration of disturbed areas of asphalt or concrete will include subgrade compaction to prevent subsidence, followed by the replacement of like-material asphalt or concrete.

2.1.4 Decontamination

Personnel and equipment will be properly decontaminated to remove all contamination that may be adhering to personnel or equipment as a result of source area delineation activities. Any water accumulated during the decontamination process will be containerized in 55-gallon drums, sampled in accordance with Section 2.0 Sampling and Analysis Plan of this Work Plan, and managed, transported, and disposed in accordance with Section 3.0 Waste Management Plan of this Work Plan. All debris generated by remediation activities will be properly contained and disposed of at a facility permitted to accept the waste. Section 3.0 Waste Management Plan of this Work Plan describes requirements for onsite management and offsite disposal of all wastestreams, including drill cuttings and purge water. Decontamination of personnel and equipment will be performed in accordance with the site-specific Health and Safety Plan provided in Appendix D and the applicable provisions of 29 Code of Federal Regulations (CFR) 1910.120.

2.1.5 Demobilization

During demobilization, temporary facilities, utilities, and equipment will be removed from the site. In addition, any debris or solid waste material remaining from construction activities will be removed and properly disposed of offsite in accordance with Section 3.0 Waste Management Plan of this Work Plan.

2.2 Project Schedule

The major project activities and estimated durations for each are outlined below.

- Pre-construction Meeting/Submittal Preparation/Reviews 30 days
- Mobilization 2 days
- Source Area Delineation 10 days
- Source Area Delineation Status Report 10 days

CCI/J.A. Jones anticipates the total project duration (from pre-construction conference through submittal of the Source Area Delineation Status Report) will be approximately 52 days. This proposed schedule may vary depending on the actual conditions encountered in the field. Appendix A provides a schedule for the work to be performed.

2.3 Communications Plan

A communication matrix outlining the lines of communications for Southern Division, NAVFAC and CCI/J.A. Jones is presented in Table 2-1. Table 2-2 provides a project personnel directory.

TABLE 2-1
Communications Matrix

CCI/J.A. Jones Position	Navy Direct Report
Executive Sponsor Ray Tyler	Contracting Officer (CO) Eva Clement
Program Manager Scott Newman	Jimmy Jones, COTR David Pilarski, ACO
Senior Project Manager Flip Altman	Jimmy Jones, COTR David Pilarski, ACO
CTO Project Manager Sam Ross	Anthony Robinson, RPM Larry Blackburn, NTR/ROICC John Garner, NSB Kings Bay

TABLE 2-2
Project Personnel Directory

Contact	Company
Mr. R. Scott Newman, Program Manager Mr. Flip Altman, Senior Project Manager Ms. Marsha Robinson, Contracts Administration Manager Mr. Bob Nash, Health and Safety Manager Ms. Theresa Rojas, QA/QC Manager	CH2M HILL Constructors, Inc 115 Perimeter Center Place, N.E. Suite 700 Atlanta, GA 30346-1278 770/604-9095
Mr. Sam Ross, Project Manager	J.A. Jones Environmental Services Company 8936 Western Way, Suite 10 Jacksonville, FL 32256 904/363-0911
Ms. Eva Clement, CO	Southern Division Naval Facilities Engineering Command P.O. Box 190010 North Charleston, SC 29419-9010 843/820-5518
Mr. David Pilarski, ACO	843/820-5928
Mr. Jimmy Jones, COTR	As above 843/820-5544
Mr. Anthony Robinson, RPM	As above 843/820-7339
Mr. Larry Blackburn, NTR/ROICC	Southern Division Naval Facilities Engineering Command Resident Officer in Charge of Construction P. O. Box 139, Building 13 NAS Jacksonville, FL 32212-0139 904/542-5571, ext. 117 904/237-1868 (mobile)
Mr. John Garner, NSB Kings Bay Environmental Director	Facilities and Environmental 1063 USS Tennessee Street Building 2015 NSB Kings Bay, Georgia 31547-2606 912/673-2001, ext. 4048

2.4 Traffic Control Plan

Traffic control at the site will be the responsibility of the CCI/J.A. Jones Site Superintendent. CCI/J.A. Jones will minimize disturbance to facility operations during project activities. CCI/J.A. Jones will consult with onsite Navy personnel to evaluate site access, placement of equipment, and traffic flow to minimize the impact of this work to Base operations. CCI/J.A. Jones will review all Navy regulations and standard operating procedures regarding vehicle movement and control inside the Base.

3.0 Sampling and Analysis Plan

The SAP provided in this Work Plan outlines the required sampling activities associated source area delineation at Site 11 located at NSB Kings Bay, Georgia. This plan outlines the required locations, frequency, and analyses, through the use of DPT and an onsite mobile laboratory, to delineate the horizontal and vertical extent of the potential source area PCE contamination (and its degradation products) beneath the Phase III chemical oxidation treatment injectors at the site for future chemical oxidation injections and site remediation activities. In addition, this plan provides the required analyses for disposal characterization for wastes generated during delineation activities.

Samples will be collected and analyzed in accordance with USEPA Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, May 1996 (includes 1997 revisions).

3.1 Data Quality Objectives for Measurement Data

The data quality objectives for each sampling task described above are listed in Table 3-1. The sampling and analytical requirements, along with the required level of QC and data packages are listed in Table 3-2. The project-specific QC objectives for the data are listed in Tables 3-3, 3-4, and 3-5. These include the quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated. A Navy-, United States Army Corps of Engineers- (USACE)-, or Air Force Center for Environmental Excellence (AFCEE)-approved laboratory will be used for any offsite sample analyses, if necessary.

TABLE 3-1
Data Quality Objectives

Sampling Activity	Data Quality Objective Category
Delineation of the source area using the mobile lab	Screening
Waste characterization of the drill cutting soils and aqueous waste (offsite laboratory analyses)	Definitive

Contaminants of concern include PCE and its degradation constituents, TCE, cis-1,2-DCE, and VC. The source area will be delineated in the vertical and horizontal directions from Injector I-60 until borings located upgradient, downgradient, and crossgradient of the delineated source area contain concentrations less than 100 $\mu g/L$ of TCLE. A summary of Post-Phase III detected compounds and their concentrations are listed in Table 1-1.

TABLE 3-2
Sampling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT	DQO Level/ Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers/ Laboratory
Plume Delineation using DPT and Mobile Laboratory													
Plume Delineation using DPT	Borings will start adjacent to injector I-60 and spaced 10 ft apart in each direction from I-60 (min of 9 borings). Samples will be collected from at least 4 depths.	Water	Once	As required for delineation	DPT rig	DPT rig/Peristaltic Pump/Teflon tubing	**ASAP Mobile Lab**	DQO Level III, CCI Level A	Volatiles	8021B	14 days	HCl pH<2; Cool to 4°C	(2) 40 mL amber glass
	Equipment Rinsate Blank	Water	Once at beginning - if [conc] detected, taken @ 10%. If [conc] not detected, once per day	1 per day for as long as sampling lasts	Prepared in Field	Analyte-free water, SS funnel	**ASAP Mobile Lab**	DQO Level III, CCI Level A	Volatiles	8021B	14 days	HCl pH<2; Cool to 4°C	(2) 40 mL amber glass
	Split sample with off site lab	Water	Once per day	1 per day for as long as sampling lasts	DPT rig	DPT rig/Teflon tubing	**3 day**	DQO Level III, CCI Level C	Volatiles	8021B	14 days	HCl pH<2; Cool to 4°C	(2) 40 mL amber glass
Disposal Waste Characterization													
Liquids Disposal (decon and misc water)	Drums	Water	Once	1	Grab	Drum thief or Teflon bailer	**14 days**	DQO Level III, CCI Level A	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	14 days ext; 40 days analysis	Cool to 4°C	(3) 1L amber glass
									TCL Pesticides	8081A	14 days ext; 40 days analysis		
									TCL PCBs	8082	14 days ext; 40 days analysis		
									TAL Metals	6010B/7470A	6 months; Hg = 28 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
									Cyanide	335.3	14 days	Cool to 4°C NaOH pH>12	(1) 200ml glass
									Ignitabiltiy	1030	ASAP	Cool to 4°C	(3) 1L amber glass
									Corrosivity	9045A	ASAP		
									Reactivity	Chapter 7.3	ASAP		

TABLE 3-3

Project QC Objectives for TAL and TCL Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
TCL VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8260B	Chloromethane	NS	NS	1.3	10	60-140	20-150	<30	<50	38-116	38-116	<50	<75	95	90
8260B	Bromomethane	NS	NS	1.1	10	60-140	20-150	<30	<50	49-117	49-117	<50	<75	95	90
8260B	Vinyl Chloride	NS	NS	1.1	10	60-140	20-150	<30	<50	31-121	31-121	<50	<75	95	90
8260B	Chloroethane	NS	NS	1	10	60-140	20-150	<30	<50	62-116	62-116	<50	<75	95	90
8260B	Methylene Chloride	NS	NS	0.3	10	60-140	20-150	<30	<50	55-126	55-126	<50	<75	95	90
8260B	Acetone	NS	NS	10	10	60-140	20-150	<30	<50	43-165	43-165	<50	<75	95	90
8260B	Carbon Disulfide	NS	NS	10	10	60-140	20-150	<30	<50	76-119	76-119	<50	<75	95	90
8260B	1,1-Dichloroethene	NS	NS	1.2	10	60-140	20-150	<30	<50	54-128	54-128	<50	<75	95	90
8260B	1,1-Dichloroethane	NS	NS	0.4	10	60-140	20-150	<30	<50	62-141	62-141	<50	<75	95	90
8260B	cis-1,2-Dichloroethene	NS	NS	1.2	10	60-140	20-150	<30	<50	70-131	60-141	<50	<75	95	90
8260B	trans-1,2-Dichloroethene	NS	NS	0.6	10	60-140	20-150	<30	<50	61-138	51-148	<50	<75	95	90
8260B	Chloroform	NS	NS	0.3	10	60-140	20-150	<30	<50	65-129	65-129	<50	<75	95	90
8260B	1,2-Dichloroethane	NS	NS	0.6	10	60-140	20-150	<30	<50	68-135	68-135	<50	<75	95	90
8260B	2-Butanone	NS	NS	10	10	60-140	20-150	<30	<50	50-163	50-163	<50	<75	95	90
8260B	1,1,1-Trichloroethane	NS	NS	0.8	10	60-140	20-150	<30	<50	68-135	68-135	<50	<75	95	90
8260B	Carbon Tetrachloride	NS	NS	2.1	10	60-140	20-150	<30	<50	67-125	67-125	<50	<75	95	90
8260B	Bromodichloromethane	NS	NS	0.8	10	60-140	20-150	<30	<50	68-135	58-145	<50	<75	95	90
8260B	1,2-Dichloropropane	NS	NS	0.4	10	60-140	20-150	<30	<50	76-132	76-132	<50	<75	95	90
8260B	Cis-1,3-Dichloropropene	NS	NS	1	10	60-140	20-150	<30	<50	70-122	70-122	<50	<75	95	90
8260B	Trichloroethylene	NS	NS	1	10	60-140	20-150	<30	<50	67-137	67-137	<50	<75	95	90
8260B	Dibromochloromethane	NS	NS	0.5	10	60-140	20-150	<30	<50	64-120	64-120	<50	<75	95	90
8260B	1,1,2-Trichloroethane	NS	NS	1	10	60-140	20-150	<30	<50	70-141	70-141	<50	<75	95	90
8260B	Benzene	NS	NS	0.4	10	60-140	20-150	<30	<50	51-139	51-139	<50	<75	95	90
8260B	trans-1,3-Dichloropropene	NS	NS	1.4	10	60-140	20-150	<30	<50	42-154	42-154	<50	<75	95	90
8260B	Bromoform	NS	NS	1.2	10	60-140	20-150	<30	<50	67-129	67-129	<50	<75	95	90
8260B	4-Methyl-2-Pentanone	NS	NS	10	10	60-140	20-150	<30	<50	77-119	77-119	<50	<75	95	90
8260B	2-Hexanone	NS	NS	10	10	60-140	20-150	<30	<50	47-165	47-165	<50	<75	95	90
8260B	Tetrachloroethylene	NS	NS	1.4	10	60-140	20-150	<30	<50	67-131	67-131	<50	<75	95	90
8260B	Toluene	NS	NS	1.1	10	60-140	20-150	<30	<50	31-137	31-137	<50	<75	95	90
8260B	1,1,2,2-Tetrachloroethane	NS	NS	0.4	10	60-140	20-150	<30	<50	55-138	55-138	<50	<75	95	90
8260B	Chlorobenzene	NS	NS	0.4	10	60-140	20-150	<30	<50	69-140	69-140	<50	<75	95	90
8260B	Ethylbenzene	NS	NS	0.6	10	60-140	20-150	<30	<50	59-140	59-140	<50	<75	95	90
8260B	Styrene	NS	NS	0.4	10	60-140	20-150	<30	<50	71-133	71-133	<50	<75	95	90
8260B	Xylenes, Total	NS	NS	1.3	10	60-140	20-150	<30	<50	68-133	68-133	<50	<75	95	90
8260B	4-Bromofluorobenzene (Surr)					75-125	65-135								
8260B	1,2-Dichloroethane-d4 (Surr)					62-139	52-149								
8260B	Toluene-d8 (Surr)					75-125	65-135								
TCL SEMI-VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%
8270C	Phenol	NS	NS	10	330	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270C	Bis (2-chloroethyl) ether	NS	NS	10	330	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270C	2-Chlorophenol	NS	NS	10	330	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270C	1,3-Dichlorobenzene	NS	NS	10	330	60-140	20-150	<30	<50	36-125	26-135	<50	<75	95	90
8270C	1,4-Dichlorobenzene	NS	NS	10	330	60-140	20-150	<30	<50	30-125	25-135	<50	<75	95	90
8270C	1,2-Dichlorobenzene	NS	NS	10	330	60-140	20-150	<30	<50	42-155	32-135	<50	<75	95	90
8270C	2-Methylphenol	NS	NS	10	330	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270C	2,2'-Oxybis (1-Chloropropane) [bis (2-Chloroisopropyl) ether]	NS	NS	10	330	60-140	20-150	<30	<50	36-166	26-175	<50	<75	95	90
8270C	4-Methylphenol	NS	NS	10	330	60-140	20-150	<30	<50	33-125	25-135	<50	<75	95	90
8270C	N-Nitroso-di-n-propylamine	NS	NS	10	330	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270C	Hexachloroethane	NS	NS	10	330	60-140	20-150	<30	<50	25-153	25-163	<50	<75	95	90
8270C	Nitrobenzene	NS	NS	10	330	60-140	20-150	<30	<50	46-133	36-143	<50	<75	95	90

TABLE 3-3

Project QC Objectives for TAL and TCL Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8270C	Isophorone	NS	NS	10	330	60-140	20-150	<30	<50	26-175	25-175	<50	<75	95	90
8270C	2-Nitrophenol	NS	NS	10	330	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270C	2,4-Dimethylphenol	NS	NS	10	330	60-140	20-150	<30	<50	45-139	35-149	<50	<75	95	90
8270C	Bis (2-chloroethoxy) methane	NS	NS	10	330	60-140	20-150	<30	<50	49-125	39-135	<50	<75	95	90
8270C	2,4-Dichlorophenol	NS	NS	10	330	60-140	20-150	<30	<50	46-125	36-135	<50	<75	95	90
8270C	1,2,4-Trichlorobenzene	NS	NS	10	330	60-140	20-150	<30	<50	44-142	34-152	<50	<75	95	90
8270C	Naphthalene	NS	NS	10	330	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270C	4-Chloroaniline	NS	NS	10	330	60-140	20-150	<30	<50	45-136	35-146	<50	<75	95	90
8270C	Hexachlorobutadiene	NS	NS	10	330	60-140	20-150	<30	<50	25-125	25-135	<50	<75	95	90
8270C	4-Chloro-3-methylphenol	NS	NS	10	330	60-140	20-150	<30	<50	44-125	34-135	<50	<75	95	90
8270C	2-Methylnaphthalene	NS	NS	10	330	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270C	Hexachlorocyclopentadiene	NS	NS	10	330	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270C	2,4,6-Trichlorophenol	NS	NS	10	330	60-140	20-150	<30	<50	39-128	29-138	<50	<75	95	90
8270C	2,4,5-Trichlorophenol	NS	NS	25	800	60-140	20-150	<30	<50	25-175	25-175	<50	<75	95	90
8270C	2-Chloronaphthalene	NS	NS	10	330	60-140	20-150	<30	<50	60-125	50-135	<50	<75	95	90
8270C	2-Nitroaniline	NS	NS	25	800	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270C	Dimethyl phthalate	NS	NS	10	330	60-140	20-150	<30	<50	25-175	25-175	<50	<75	95	90
8270C	Acenaphthylene	NS	NS	10	330	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270C	2,6-Dinitrotoluene	NS	NS	10	330	60-140	20-150	<30	<50	51-125	41-135	<50	<75	95	90
8270C	3-Nitroaniline	NS	NS	25	800	60-140	20-150	<30	<50	51-125	41-135	<50	<75	95	90
8270C	Acenaphthene	NS	NS	10	330	60-140	20-150	<30	<50	49-124	39-135	<50	<75	95	90
8270C	2,4-Dinitrophenol	NS	NS	25	800	60-140	20-150	<30	<50	30-151	25-161	<50	<75	95	90
8270C	4-Nitrophenol	NS	NS	25	800	60-140	20-150	<30	<50	25-131	25-141	<50	<75	95	90
8270C	Dibenzofuran	NS	NS	10	330	60-140	20-150	<30	<50	52-125	42-135	<50	<75	95	90
8270C	2,4-Dinitrotoluene	NS	NS	10	330	60-140	20-150	<30	<50	39-139	29-149	<50	<75	95	90
8270C	Diethyl phthalate	NS	NS	10	330	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270C	4-Chlorophenyl-phenyl ether	NS	NS	10	330	60-140	20-150	<30	<50	51-132	41-142	<50	<75	95	90
8270C	Fluorene	NS	NS	10	330	60-140	20-150	<30	<50	48-139	38-149	<50	<75	95	90
8270C	4-Nitroaniline	NS	NS	25	800	60-140	20-150	<30	<50	40-143	30-153	<50	<75	95	90
8270C	4,6-Dinitro-2-methylphenol	NS	NS	25	800	60-140	20-150	<30	<50	26-134	25-144	<50	<75	95	90
8270C	N-Nitrosodiphenylamine	NS	NS	10	330	60-140	20-150	<30	<50	27-125	25-135	<50	<75	95	90
8270C	4-Bromophenyl-phenyl ether	NS	NS	10	330	60-140	20-150	<30	<50	53-127	43-137	<50	<75	95	90
8270C	Hexachlorobenzene	NS	NS	10	330	60-140	20-150	<30	<50	46-133	36-143	<50	<75	95	90
8270C	Pentachlorophenol	NS	NS	25	800	60-140	20-150	<30	<50	28-136	38-146	<50	<75	95	90
8270C	Phenanthrene	NS	NS	10	330	60-140	20-150	<30	<50	54-125	44-135	<50	<75	95	90
8270C	Anthracene	NS	NS	10	330	60-140	20-150	<30	<50	45-165	35-175	<50	<75	95	90
8270C	Carbazole	NS	NS	10	330	60-140	20-150	<30	<50	34-132	34-132	<50	<75	95	90
8270C	Di-n-butylphthalate	NS	NS	10	330	60-140	20-150	<30	<50	34-126	25-136	<50	<75	95	90
8270C	Fluoranthene	NS	NS	10	330	60-140	20-150	<30	<50	47-125	37-135	<50	<75	95	90
8270C	Pyrene	NS	NS	10	330	60-140	20-150	<30	<50	47-136	37-146	<50	<75	95	90
8270C	Butylbenzylphthalate	NS	NS	10	330	60-140	20-150	<30	<50	26-125	25-135	<50	<75	95	90
8270C	3,3'-Dichlorobenzidine	NS	NS	10	330	60-140	20-150	<30	<50	29-175	25-175	<50	<75	95	90
8270C	Benzo (a) anthracene	NS	NS	10	330	60-140	20-150	<30	<50	51-133	41-143	<50	<75	95	90
8270C	Chrysene	NS	NS	10	330	60-140	20-150	<30	<50	55-133	45-143	<50	<75	95	90
8270C	bis (2-Ethylhexyl) phthalate	NS	NS	10	330	60-140	20-150	<30	<50	33-129	25-139	<50	<75	95	90
8270C	Di-n-octylphthalate	NS	NS	10	330	60-140	20-150	<30	<50	38-127	28-137	<50	<75	95	90
8270C	Benzo (b) fluoranthene	NS	NS	10	330	60-140	20-150	<30	<50	37-125	27-135	<50	<75	95	90
8270C	Benzo (k) fluoranthene	NS	NS	10	330	60-140	20-150	<30	<50	37-123	37-123	<50	<75	95	90
8270C	Benzo (a) pyrene	NS	NS	10	830	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8270C	Indeno (1,2,3-cd) pyrene	NS	NS	10	330	60-140	20-150	<30	<50	27-160	25-170	<50	<75	95	90
8270C	Dibenzo (a,h) anthracene	NS	NS	10	330	60-140	20-150	<30	<50	50-125	40-135	<50	<75	95	90
8270C	Benzo (g,h,i) perylene	NS	NS	10	330	60-140	20-150	<30	<50	34-149	25-159	<50	<75	95	90
8270C	Nitrobenzene-d5					35-114	23-120								
8270C	2-Fluorobiphenyl					43-116	30-115								

TABLE 3-3

Project QC Objectives for TAL and TCL Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8270C	Terphenyl-d14					33-141	18-137								
8270C	Phenol-d5					10-110	24-113								
8270C	2-Fluorophenol					21-110	25-121								
8270C	2,4,6-Tribromophenol					10-123	19-122								
8270C	2-Chlorophenol-d4					33-110	20-130								
8270C	1,2-Dichorobenzene-d4					16-110	20-130								
TCL PESTICIDES/AROCHLORS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8081A	alpha-BHC	NS	NS	0.050	1.7	60-140	20-150	<30	<50	75-125	65-135	<50	<75	95	90
8081A	beta-BHC	NS	NS	0.050	1.7	60-140	20-150	<30	<50	51-125	41-133	<50	<75	95	90
8081A	delta-BHC	NS	NS	0.050	1.7	60-140	20-150	<30	<50	75-126	65-136	<50	<75	95	90
8081A	gamma-BHC (Lindane)	NS	NS	0.050	1.7	60-140	20-150	<30	<50	73-125	63-130	<50	<75	95	90
8081A	Heptachlor	NS	NS	0.050	1.7	60-140	20-150	<30	<50	45-128	35-138	<50	<75	95	90
8081A	Aldrin	NS	NS	0.050	1.7	60-140	20-150	<30	<50	47-125	37-126	<50	<75	95	90
8081A	Heptachlor epoxide	NS	NS	0.050	1.7	60-140	20-150	<30	<50	53-134	43-144	<50	<75	95	90
8081A	Endosulfan I	NS	NS	0.050	1.7	60-140	20-150	<30	<50	49-143	39-153	<50	<75	95	90
8081A	Dieldrin	NS	NS	0.10	3.3	60-140	20-150	<30	<50	42-132	32-142	<50	<75	95	90
8081A	4,4'-DDE	NS	NS	0.10	3.3	60-140	20-150	<30	<50	45-139	35-149	<50	<75	95	90
8081A	Endrin	NS	NS	0.10	3.3	60-140	20-150	<30	<50	43-134	33-144	<50	<75	95	90
8081A	Endosulfan II	NS	NS	0.10	3.3	60-140	20-150	<30	<50	75-159	65-169	<50	<75	95	90
8081A	4,4'-DDD	NS	NS	0.10	3.3	60-140	20-150	<30	<50	48-136	38-146	<50	<75	95	90
8081A	Endosulfan sulfate	NS	NS	0.10	3.3	60-140	20-150	<30	<50	46-141	36-151	<50	<75	95	90
8081A	4,4'-DDT	NS	NS	0.10	3.3	60-140	20-150	<30	<50	34-143	25-153	<50	<75	95	90
8081A	Methoxychlor	NS	NS	0.50	17	60-140	20-150	<30	<50	73-142	63-152	<50	<75	95	90
8081A	Endrin ketone	NS	NS	0.10	3.3	60-140	20-150	<30	<50	43-134	33-144	<50	<75	95	90
8081A	Endrin aldehyde	NS	NS	0.10	3.3	60-140	20-150	<30	<50	75-150	35-160	<50	<75	95	90
8081A	alpha-Chlordane	NS	NS	0.050	1.7	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90
8081A	gamma-Chlordane	NS	NS	0.050	1.7	60-140	20-150	<30	<50	41-125	31-133	<50	<75	95	90
8081A	Toxaphene	NS	NS	5.0	170	60-140	20-150	<30	<50	41-126	31-136	<50	<75	95	90
8081A	Decachlorobiphenyl (DCBP) (Surr)					34-133	25-143								
8081A	Tetrachloro-m-xylene (TCMX) (Surr)					45-125	35-135								
8082	Arochlor-1016	NS	NS	1.0	33	60-140	20-150	<30	<50	54-125	44-127	<50	<75	95	90
8082	Arochlor-1221	NS	NS	2.0	67	60-140	20-150	<30	<50	41-126	31-136	<50	<75	95	90
8082	Arochlor-1232	NS	NS	1.0	33	60-140	20-150	<30	<50	41-126	31-136	<50	<75	95	90
8082	Arochlor-1242	NS	NS	1.0	33	60-140	20-150	<30	<50	39-150	29-160	<50	<75	95	90
8082	Arochlor-1248	NS	NS	1.0	33	60-140	20-150	<30	<50	41-126	31-136	<50	<75	95	90
8082	Arochlor-1254	NS	NS	1.0	33	60-140	20-150	<30	<50	29-131	25-141	<50	<75	95	90
8082	Arochlor-1260	NS	NS	1.0	33	60-140	20-150	<30	<50	41-126	31-136	<50	<75	95	90
8082	Decachlorobiphenyl (DCBP) (Surr)					34-133	25-143								
8082	Tetrachloro-m-xylene (TCMX) (Surr)					45-125	35-135								
TAL METALS BY ICP		mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%
6010B	Aluminum	NS	NA	0.2	22.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Antimony	NS	NA	0.06	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Arsenic	NS	NA	0.01	40.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Barium	NS	NA	0.2	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Beryllium	NS	NA	0.005	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Cadmium	NS	NA	0.005	0.50	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Calcium	NS	NA	5	100	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Chromium	NS	NA	0.01	20	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Cobalt	NS	NA	0.05	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Copper	NS	NA	0.025	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90

TABLE 3-3

Project QC Objectives for TAL and TCL Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
6010B	Iron	NS	NA	0.1	3.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Lead	NS	NA	0.003	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Magnesium	NS	NA	5	100	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Manganese	NS	NA	0.015	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Nickel	NS	NA	0.04	2.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Potassium	NS	NA	5	600	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Selenium	NS	NA	0.005	3.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Silver	NS	NA	0.01	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Sodium	NS	NA	5	10.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Thallium	NS	NA	0.01	6.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Vanadium	NS	NA	0.05	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
6010B	Zinc	NS	NA	0.02	1.0	50-150	30-170	<30	<50	80-120	80-120	<50	<75	95	90
TAL METALS BY GFAA		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7041	Antimony	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7060A	Arsenic	NS	NA	0.005	0.5	50-150	30-170	<30	<50	74-120	74-1120	<50	<75	95	90
7091	Beryllium	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7131A	Cadmium	NS	NA	0.001	0.1	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7191	Chromium	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7421	Lead	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7740	Selenium	NS	NA	0.005	0.5	50-150	30-170	<30	<50	70-125	70-125	<50	<75	95	90
7761	Silver	NS	NA	0.005	0.5	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
7841	Thallium	NS	NA	0.001	0.1	50-150	30-170	<30	<50	75-125	75-125	<50	<75	95	90
MERCURY BY COLD VAPOR		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7470	Mercury	NS	NA	0.001	NA	50-150	NA	<30	NA	70-130	NA	<50	NA	95	NA
7471	Mercury	NA	NS	NA	NA	50-150	NA	<30	NA	70-130	NA	<50	NA	95	NA
CYANIDE		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
9010A/9012	Cyanide	NS	NA	0.010	NA	50-150	NA	<30	NA	75-125	NA	<30	NA	95	NA
9013	Cyanide	NA	NS	NA	0.020	NA	30-170	NA	<50	NA	75-125	NA	<50	NA	90

1. SW-846 Methods unless otherwise noted
2. Includes sediments, waste, solids

NS = Not Specified
NA = Not Applicable

TABLE 3-4
Project QC Objectives for Wet Chemistry Methods

		Project Action Limits		Minimum PQL		Accuracy Limits[3] MS/MSD recoveries		Precision Limits[3] MS/MSD deviation		Accuracy Limits[3] LCS recoveries		Precision Limits[3] Field Dup deviation		Completeness Limits	
Method Number [1]	Analyte / Component	Water mg/L	Soil[2] mg/kg	Water mg/L	Soil[2] mg/kg	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %
WET CHEMISTRY															
305.1	Acidity		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
310.1	Alkalinity		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
350.2	Ammonia		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9056	Bromide		N/A		N/A	70-130	70-130	<30	<50	70-130	70-130	<30	<50	95	90
5050	Chloride		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
325.3	Chloride		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
300.0	Chloride		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9252	Chloride		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
SM 3500D	Chromium, Hexavalent		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9010	Cyanide, Amenable		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
7.3.3.2	Cyanide, Reactive		N/A		N/A	70-130	70-130	<30	<50	70-130	70-130	<30	<50	95	90
9010	Cyanide, Total		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9010A	Cyanide, Total	N/A		N/A		N/A	70-130	N/A	<50	N/A	70-130	N/A	<50	N/A	90
1010	Flash Point, Pensky-Martens		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
1020	Flash Point, SetaFlash		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
340.2	Fluoride		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9056	Nitrate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9056	Nitrite		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
	o-Phosphate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
	Sulfate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
353.2	Nitrate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
353.2	Nitrite		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
	o-Phosphate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
	Sulfate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9095	Paint Filter Test	N/A		N/A		N/A	N/A	N/A	<50	N/A	N/A	N/A	<50	N/A	90
9040	pH, Electrometric		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9045	pH, Electrometric	N/A		N/A		N/A	70-130	N/A	<50	N/A	70-130	N/A	<50	N/A	90
9065	Phenolics, Tot Recov		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
365.2	Phosphorus, Total		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
160.1	Residue, Filterable		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
160.2	Residue, Nonfilterable		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
160.3	Residue, Total		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
120.1	Specific Conductance		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
SM 4500D	Sulfate		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
7.3.4.2	Sulfide, Reactive		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
7.3.4.2	Sulfide, Reactive	N/A		N/A		N/A	70-130	N/A	<50	N/A	70-130	N/A	<50	N/A	90
SM 5310C	Total Organic Carbon		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
9060	Total Organic Carbon		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
180.1	Turbidity		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
SM 214A	Turbidity		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A

TABLE 3-4
Project QC Objectives for Wet Chemistry Methods

		Project Action Limits		Minimum PQL		Accuracy Limits[3] MS/MSD recoveries		Precision Limits[3] MS/MSD deviation		Accuracy Limits[3] LCS recoveries		Precision Limits[3] Field Dup deviation		Completeness Limits	
Method Number[1]	Analyte / Component	Water mg/L	Soil[2] mg/kg	Water mg/L	Soil[2] mg/kg	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %	Water %	Soil[2] %
SM 209B	Solids, Total Dissolved		N/A		N/A	70-130	N/A	<30	N/A	70-130	N/A	<30	N/A	95	N/A
METALS															
200.7	Aluminum					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Antimony					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Arsenic					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Barium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Beryllium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Cadmium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Calcium					30-150		<30		30-150	30-150	<30	<50	95	90
200.7	Chromium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Cobalt					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Copper					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Iron					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Lead					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Magnesium					50-130		<30		50-130	50-130	<30	<50	95	90
200.7	Manganese					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Molybdenum					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Nickel					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Potassium					50-130		<30		50-130	50-130	<30	<50	95	90
200.7	Selenium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Sodium					30-150		<30		30-150	30-150	<30	<50	95	90
200.7	Thallium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Tin					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Vanadium					70-130		<30		70-130	70-130	<30	<50	95	90
200.7	Zinc					70-130		<30		70-130	70-130	<30	<50	95	90

1. SW-846 Methods unless otherwise noted

2. Includes sediments, waste, solids

NS = Not Specified

NA = Not Applicable

TABLE 3-5
Project QC Objectives for USEPA SW-846 Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8260B	1,1,1,2-Tetrachloroethane	NS	NS	2.5	15	60-140	20-150	<30	<50	62-108	62-108	<50	<75	95	90
8260B	1,1,1-Trichloroethane	NS	NS	4	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,1,2,2-Tetrachloroethane	NS	NS	2	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	1,1,2-Trichloroethane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,1-Dichloroethane	NS	NS	2	10	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	1,1-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,1-Dichloropropane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2,3-Trichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-147	65-147	<50	<75	95	90
8260B	1,2,3-Trichloropropane	NS	NS	16	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2,4-Trichlorobenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-145	65-145	<50	<75	95	90
8260B	1,2,4-Trimethylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2-Dichloroethane	NS	NS	3	15	60-140	20-150	<30	<50	58-137	58-137	<50	<75	95	90
8260B	1,2-Dichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,2-Dibromo-3-chloropropane	NS	NS	13	50	60-140	20-150	<30	<50	49-135	49-135	<50	<75	95	90
8260B	1,2-Dichloropropane	NS	NS	2	10	60-140	20-150	<30	<50	60-135	60-135	<50	<75	95	90
8260B	1,2-Ethylene Dibromide	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,3,5-Trimethylbenzene	NS	NS	2.5	15	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	1,3-Dichlorobenzene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,3-Dichloropropane	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1,4-Dichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	1-Chlorohexane	NS	NS	2.5	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	2,2-Dichloropropane	NS	NS	17.5	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	2-Chlorotoluene	NS	NS	2	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	4-Chlorotoluene	NS	NS	3	15	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Benzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromochloromethane	NS	NS	2	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	Bromodichloromethane	NS	NS	4	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromoform	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Bromomethane	NS	NS	5.5	25	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260B	Carbon Tetrachloride	NS	NS	10.5	50	60-140	20-150	<30	<50	52-135	52-135	<50	<75	95	90
8260B	Chlorobenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Chloroethane	NS	NS	5	25	60-140	20-150	<30	<50	55-135	55-135	<50	<75	95	90
8260B	Chloroform	NS	NS	1.5	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Chloromethane	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Cis-1,2-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Cis-1,3-Dichloropropene	NS	NS	5	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Dibromochloromethane	NS	NS	2.5	15	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260B	Dibromomethane	NS	NS	12	50	60-140	20-150	<30	<50	59-137	59-137	<50	<75	95	90
8260B	Dichlorodifluoromethane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Ethylbenzene	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Hexachlorobutadiene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Isopropylbenzene	NS	NS	2.5	40	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	m-Xylene	NS	NS	2.5	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Methylene Chloride	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	n-Butylbenzene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90

TABLE 3-5
Project QC Objectives for USEPA SW-846 Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8260B	n-Propylbenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Naphthalene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	o-Xylene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	p-Isopropyltoluene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	p-Xylene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Sec-Butylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Styrene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Trichloroethylene	NS	NS	5	50	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260B	Tert-Butylbenzene	NS	NS	7	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Tetrachloroethylene	NS	NS	7	35	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260B	Toluene	NS	NS	5.5	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260B	Trans-1,2-Dichloroethene	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260B	Trans-1,3-Dichloropropene	NS	NS	5	25	60-140	20-150	<30	<50	56-135	56-135	<50	<75	95	90
8260B	Trichlorofluoromethane	NS	NS	4	20	60-140	20-150	<30	<50	57-135	57-135	<50	<75	95	90
8260B	Vinyl Chloride	NS	NS	5.5	45	60-140	20-150	<30	<50	36-144	36-144	<50	<75	95	90
8260B	Dibromofluoromethane (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	Toluene-d8 (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	4-Bromofluorobenzene (surr)	NS	NS	NA	NA	75-1225	65-135	NA	NA	NA	NA	NA	NA	95	90
8260B	1,2-Dichloroethane-d4 (surr)	NS	NS	NA	NA	62-139	52-149	NA	NA	NA	NA	NA	NA	95	90
VOLATILES BY GC		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8021B	Allyl chloride	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Benzene	NS*	NS	2	2	40-140	30-170	<30	<50	76-125	76-125	<50	<75	95	90
8021B	Benzyl chloride	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Bis(2-chloroisopropyl) ether	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Bromoacetone	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Bromobenzene	NS*	NS	5	50	40-140	30-170	<30	<50	89-105	89-105	<50	<75	95	90
8021B	Bromodichloromethane	NS*	NS	1	5	40-140	30-170	<30	<50	61-135	61-135	<50	<75	95	90
8021B	Bromoform	NS*	NS	2	50	40-140	30-170	<30	<50	58-129	58-129	<50	<75	95	90
8021B	Bromomethane	NS*	NS	10	10	40-140	30-170	<30	<50	68-125	68-125	<50	<75	95	90
8021B	Carbon tetrachloride	NS*	NS	1	5	40-140	30-170	<30	<50	69-139	69-139	<50	<75	95	90
8021B	Chlorobenzene	NS*	NS	2.5	5	40-140	30-170	<30	<50	83-137	83-137	<50	<75	95	90
8021B	Dibromochloromethane	NS*	NS	1	5	40-140	30-170	<30	<50	81-131	81-131	<50	<75	95	90
8021B	Chloroethane	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	2-Chloroethanol	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	2-Chloroethyl vinyl ether	NS*	NS	10	10	40-140	30-170	<30	<50	61-140	61-140	<50	<75	95	90
8021B	Chloroform	NS*	NS	0.5	5	40-140	30-170	<30	<50	49-133	49-133	<50	<75	95	90
8021B	Chloromethyl methyl ether	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Chloroprene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Chloromethane	NS*	NS	1	10	40-140	30-170	<30	<50	59-154	59-154	<50	<75	95	90
8021B	4-Chlorotoluene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	1,2-Dibromo-3-chloropropane	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	1,2-Dibromoethane	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Dibromomethane	NS*	NS	5	5	40-140	30-170	<30	<50	50-130	50-130	<50	<75	95	90
8021B	1,2-Dichlorobenzene	NS*	NS	2	5	40-140	30-170	<30	<50	65-129	65-129	<50	<75	95	90
8021B	1,3-Dichlorobenzene	NS*	NS	3	5	40-140	30-170	<30	<50	63-137	63-137	<50	<75	95	90
8021B	1,4-Dichlorobenzene	NS*	NS	2	5	40-140	30-170	<30	<50	66-135	66-135	<50	<75	95	90
8021B	Dichlorodifluoromethane	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90

TABLE 3-5
Project QC Objectives for USEPA SW-846 Methods

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8021B	1,1-Dichloroethane	NS*	NS	1	5	40-140	30-170	<30	<50	64-127	64-127	<50	<75	95	90
8021B	1,2-Dichloroethane	NS*	NS	1	5	40-140	30-170	<30	<50	68-137	68-137	<50	<75	95	90
8021B	1,1-Dichloroethene	NS*	NS	1	5	40-140	30-170	<30	<50	53-147	53-147	<50	<75	95	90
8021B	cis-1,2-Dichloroethene	NS*	NS	1	5	40-140	30-170	<30	<50	80-120	80-120	<50	<75	95	90
8021B	trans-1,2-Dichloroethene	NS*	NS	1	5	40-140	30-170	<30	<50	78-130	78-130	<50	<75	95	90
8021B	1,2-Dichloropropane	NS*	NS	1	5	40-140	30-170	<30	<50	73-124	73-124	<50	<75	95	90
8021B	1,3-Dichloro-2-propanol	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	cis-1,3-Dichloropropene	NS*	NS	5	5	40-140	30-170	<30	<50	79-130	79-130	<50	<75	95	90
8021B	trans-1,3-Dichloropropene	NS*	NS	3	5	40-140	30-170	<30	<50	42-156	42-156	<50	<75	95	90
8021B	Epichlorhydrin	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Ethylbenzene	NS*	NS	2	2	40-140	30-170	<30	<50	71-129	71-129	<50	<75	95	90
8021B	Hexachlorobutadiene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Methylene chloride	NS*	NS	2	5	40-140	30-170	<30	<50	42-176	42-176	<50	<75	95	90
8021B	Naphthalene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	Styrene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	1,1,1,2-Tetrachloroethane	NS*	NS	5	5	40-140	30-170	<30	<50	92-106	92-106	<50	<75	95	90
8021B	1,1,2,2-Tetrachloroethane	NS*	NS	1	5	40-140	30-170	<30	<50	30-166	30-166	<50	<75	95	90
8021B	Tetrachloroethene	NS*	NS	1	5	40-140	30-170	<30	<50	75-142	75-142	<50	<75	95	90
8021B	Toluene	NS*	NS	2	2	40-140	30-170	<30	<50	70-125	70-125	<50	<75	95	90
8021B	1,2,4-Trichlorobenzene	NS*	NS	5	5	40-140	30-170	<30	<50	80-130	80-130	<50	<75	95	90
8021B	1,1,1-Trichloroethane	NS*	NS	1	5	40-140	30-170	<30	<50	69-134	69-134	<50	<75	95	90
8021B	1,1,2-Trichloroethane	NS*	NS	1	5	40-140	30-170	<30	<50	61-130	61-130	<50	<75	95	90
8021B	Trichloroethene	NS*	NS	1	5	40-140	30-170	<30	<50	83-141	83-141	<50	<75	95	90
8021B	Trichlorofluoromethane	NS*	NS	1	5	40-140	30-170	<30	<50	79-130	79-130	<50	<75	95	90
8021B	1,2,3-Trichloropropane	NS*	NS	10	10	40-140	30-170	<30	<50	92-106	92-106	<50	<75	95	90
8021B	Vinyl Chloride	NS*	NS	2	5	40-140	30-170	<30	<50	47-142	47-142	<50	<75	95	90
8021B	Xylenes	NS*	NS	2	2	40-140	30-170	<30	<50	71-133	71-133	<50	<75	95	90
8021B	Bromochloromethane (Surr)	NS*	NS			37-137	37-137								

1. SW-846 Methods unless otherwise noted
2. Includes sediments, waste, solids

NS = Not Specified
NS* = Not Specified specifically - limits = 100 ug/L for total chlorinated ethenes
NA = Not Applicable

3.2 Source Area Delineation using DPT and Onsite Screening

Source area delineation will be performed at Site 11 for the area surrounding existing Injector I-60 using a DPT rig (i.e., geoprobe) and an onsite mobile laboratory. The source area will be delineated with a minimum of nine boring locations, with one located adjacent to Injector I-60 and others spaced 10 feet apart in each direction from I-60. Samples will initially be collected from each boring at depths of 35-38 feet bls, 40 to 43 feet bls, 44 to 47 feet bls, and 48 to 51 feet bls using the DPT rig with peristaltic sampling pump and analyzed by the onsite mobile laboratory for USEPA SW-846 Method 8021B. If no TCLE concentrations above 100 $\mu g/L$ are noted at a particular sampling location, the boring will be terminated at a depth of 51 feet bls, unless previous samples indicate a deeper source area.

3.3 Waste Characterization and Incidental Wastestream Sampling and Analyses

3.3.1 Water Characterization

Waste characterization samples will be collected to evaluate the handling, transportation, and disposal requirements of generated decontamination water and other miscellaneous water. It is anticipated that the aqueous wastestream will be containerized in drums. Water samples will be collected as follows and delivered to a Navy-, USACE-, or AFCEE-approved laboratory, and analyzed for the parameters listed in Table 3-2.

A sample will be collected from the drums using either a drum thief or bailer. The 40-ml vials will be filled first and care will be taken that there is no headspace in each vial. The sample containers for the remaining analyses will then be filled.

Navy Level B QC and CCI Level B package will be required along with appropriate QC samples for the required waste characterization and incidental wastestream samples. All analytical data will be submitted by both hard copy and electronic files.

3.4 Field Activities

Field activities will be performed as described in Table 3-6.

TABLE 3-6
Field Activities

Field Activity	Frequency	Equipment
Collection of groundwater samples	As needed	DPT rig and peristaltic pump
Screening of groundwater	During delineation of source area using DPT	Mobile laboratory
Split samples with offsite lab	One per day	Offsite laboratory

3.4.1 Field QC for DPT Sampling

Field duplicate samples will be collected at a minimum frequency of 10 percent times the total number of samples collected for an analysis for each site and rounded to the nearest whole number. One equipment blank sample will be collected at the beginning of the sampling event. If no concentrations are detected, equipment blanks will be collected once per day. If concentrations are detected, equipment blanks will be collected at a minimum frequency of 10 percent.

One duplicate (split) sample will be collected per day. One sample will be given to the onsite mobile lab and the split sample will be delivered to a Navy-, AFCEE-, or USACE-approved laboratory for analysis of USEPA SW-846 Method 8021B.

3.5 Mobile Laboratory Methodology

An onsite mobile laboratory, including a power source, will be mobilized to the site to analyze the groundwater samples collected from the DPT delineation borings for USEPA SW-846 Method 8021B as specified in Table 3-2 of this Work Plan. The onsite mobile laboratory will be provided with a fume hood or other means of ventilation in the sample preparation area.

The onsite mobile laboratory will comply with the methodology as well as with the calibration acceptance criteria for all analyses and analyze QC samples at the frequency specified outlined in the SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Third Edition and Updates, and this Work Plan.

Unless otherwise specified, each batch of samples will be accompanied by its associated calibrations, instrument performance checks, laboratory blanks, laboratory control samples/blank spikes, matrix spike duplicates, and laboratory duplicates as specified in the SW-846 Methods.

The onsite mobile laboratory will complete sample preparation, analyses, re-analyses, and any necessary dilutions within a minimum of one to two hours and a maximum of 12 hours of laboratory sample receipt. CCI/J.A. Jones will coordinate with the onsite mobile laboratory on the prioritizing of samples.

The onsite mobile laboratory will provide the analytical results and required supporting QC data in hard copy format on a daily basis and in electronic format at the completion of the source area delineation.

The onsite mobile laboratory personnel will comply with the health and safety requirements outlined in the project Health and Safety Plan provided in Appendix D. The onsite mobile laboratory facility, equipment, supplies, and personnel will be fully decontaminated and demobilized at the close of the project.

3.6 Analytical Methods

3.6.1 Analytical Methods

Samples will be collected for analytical methods summarized in Table 3-2.

3.6.2 Analytical QC

QC and minimum reporting or practical quantitation limit requirements are specified in Tables 3-3, 3-4, and 3-5.

4.0 Waste Management Plan

The Waste Management Plan, provided in this Work Plan describes the waste management requirements and procedures for remediation activities at NSB Kings Bay under CTO No. 0047. The scope of work of this project is to delineate the horizontal and vertical extent of the potential source area PCE contamination (and its degradation products) beneath the Phase III chemical oxidation treatment injectors at Site 11 located at NSB Kings Bay. DPT and an onsite mobile laboratory will be used in the delineation activities. Wastes generated from these activities will be managed and disposed in accordance with State of Georgia and federal hazardous and solid waste regulations.

4.1 Wastestreams

The wastestreams associated with this scope of work may include:

- Clean and contaminated drill cuttings
- Clean and contaminated purge water
- PPE
- Decontamination wastes/wastewater
- Uncontaminated general construction debris (such as caution tapes, barricades, signs, packing materials).

4.2 Waste Characterization

The SAP provides detailed information on the waste sampling requirements. However, in some cases, offsite facilities may require additional analyses to evaluate the wastestream prior to acceptance. All wastes will be classified per 40 CFR 261, and Subchapter 391-3-11-07 of the Georgia Rules and Regulations, to determine if they are hazardous. It is understood that the PCE contained in soil and/or groundwater at Site 11 are not listed wastes under the hazardous waste regulations.

Typically, uncontaminated wastes such as general construction debris will be characterized using process knowledge and generally will be classified as municipal solid waste. Waste characterization information for wastes will be documented on a waste profile form provided by the offsite treatment or disposal facility as part of the waste acceptance process. An approved copy of the waste profile will be received prior to offsite transportation of the material. If generator certification and/or signature are required, Navy personnel will provide.

The profile typically requires the following information:

- Generator (Navy) information including name, address, contact, and phone number
- Site name including street/mailing address
- Activity generating waste (PCE source area delineation)

- Source of contamination (Site 11, Old Camden Landfill, NSB Kings Bay)
- Historical chemical use for area
- Physical state of waste (e.g., soil, groundwater, etc.)

4.3 Waste Management

4.3.1 Waste Storage Time Limit

It is CCI policy that hazardous wastes be removed from NSB Kings Bay within 45 days from the date of generation. In any case, hazardous wastes will be removed within 90 days from generation and other wastes will be removed from the site as soon as possible. The date of generation is the day that a waste is **first** placed in a container, tank, roll-off box, or stockpile.

4.3.2 Labels

The labeling of waste containers will be in accordance with 49 CFRs 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date. In specific, containers, roll-off boxes, and tanks used to store/accumulate waste (including soil and groundwater) will include one of the following labels:

- "Analysis Pending" – pre-printed labels to be used until analytical results are received and reviewed, and a waste designation determined. This label will include the accumulation start date.
- "Hazardous Waste" - pre-printed hazardous waste labels that include the following information:
  - Accumulation start date
  - Generator Name: U.S. Navy
  - Site USEPA ID number (GA4170090001)
  - Hazardous waste codes
  - For containers of less than 110 gallons, the **manifest number must be on the label before transporting.**
- "Non-Hazardous Waste" – pre-printed labels with the following information:
  - Accumulation start date
  - Generator Name: U.S. Navy
  - Site USEPA ID Number (GA4170090001)
  - Waste-specific information (e.g., contaminated soil)

Where applicable, the major hazards on the label (e.g., flammable, oxidizer, and carcinogen) will be included on the label.

4.3.3 General Waste Management Requirements

Hazardous wastes will be segregated from non-hazardous wastes. Additionally, wastes that could be flammable (such as some pure product solvents) will be segregated. Wastes of the same matrix, contamination, and the same source may be aggregated to

facilitate storage and disposal. Hazardous wastes will only be aggregated if from the same source and if they carry the same hazardous waste codes. In any case, hazardous wastes will not be diluted.

All wastes will be contained. Soil from drill cuttings will be contained in drums, roll-off boxes or stockpiles as described below. Discharge of any water is prohibited unless approved by the CCI Compliance Coordinator, the Project Manager, and the Navy. The following sources of wastewater will be contained in either drums or tanks, as described below:

- Purge water
- Decontamination water
- Water accumulated in open excavations and is assumed contaminated until analytical data indicate otherwise
- Contaminated water accumulated in secondary containment

Waste Storage Areas

Roll-off boxes, containers, and tanks of hazardous wastes will be stored in a temporary accumulation area designated by the Navy. If the Navy has not designated an accumulation area, CCI will temporarily store hazardous wastes in a secure area.

Hazardous waste storage areas will contain emergency equipment including fire extinguishers, decontamination equipment, and an alarm system (if radio equipment is not available to all staff working in storage area). Spill control equipment (e.g., sorbent pads) will be available in all waste storage areas, and where liquids are transferred from one vessel to another.

NSB Kings Bay wastes will be stored in one of the following settings and according to the following requirements:

Drums/Small Containers

- Drums and small containers of hazardous waste will be transported to the temporary accumulation areas on wood pallets and will be secured together with non-metallic bonding.
- Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration.
- Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide.
- Each drum will be provided with its own label.
- Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday.
- Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated prior to re-use or before leaving the site.

- Secondary containment will be provided for drums of liquid hazardous waste or hazardous wastes that are incompatible with other wastes or materials stored nearby.

Portable Tanks

- Only non-stationary tanks (such as cargo tank or other wheeled tank) will be used to accumulate hazardous waste.
- Tanks will be provided with secondary containment.
- Tanks will be inspected upon arrival onsite for signs of deterioration and contamination. Any tank arriving onsite with contents will be rejected.
- Tanks will be provided with covers.
- Each tank will be labeled.

Stockpiles

Because the soil and groundwater may contain a hazardous waste (PCE and TCE), CCI will only use stockpiles within an Area of Contamination (AOC). Prior to using stockpiles for hazardous waste, CCI will obtain approval of the AOC from the Navy. The following procedures will be followed when stockpiling soils:

- Stockpiles will be located near the excavation areas and within the AOC.
  - Stockpiles will be provided with a liner, cover, and perimeter berm to prevent release or infiltration of liquids.
  - The perimeter berm, typically hay bales placed beneath the liner, will be constructed to allow for collection of any free liquids draining from the stockpile.
  - Accumulated free liquids will be pumped (or otherwise removed) to a container.
  - Covers will be provided as necessary to prevent wind dispersion or run-on/run-off from precipitation events.
  - Minimum 6-mil polyethylene sheeting will be used for liners and covers.
- Covers and perimeter berms will be secured in-place when not in use and at the end of each workday.
- Construction materials for the stockpiles that contact waste will be disposed of as contaminated debris.
- A log documenting accumulation dates will be maintained for soils and other waste stored onsite in stockpiles.

Roll-off Boxes

- Roll-off boxes will be inspected upon arrival onsite. Any roll-off containers arriving with contents will be rejected.
- Roll-off boxes for hazardous soils will be provided with covers and disposable liners. Liners will be disposed of as contaminated debris.
- When not in use, securely fastened covers will be installed on all roll-off boxes.
- Old labels will be removed.

- Roll-off containers will be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

Waste/Fuel Storage Area Inspections

Areas used for waste and fuel storage will be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. The following inspection schedule will be followed:

- Daily inspection of containers, tanks, and roll-off boxes (for leaks, signs of corrosion, or signs of general deterioration).
- Daily inspection of stockpiles (for liner and berm integrity).
- Daily inspection of fuel storage areas (e.g., look for eroding containment systems and rusting tanks/ancillary equipment)

Inspections will be recorded in the Daily QC Report, and copies of the report will be maintained onsite, and available for review.

4.4 Transportation

Each transportation vehicle and load of waste will be inspected before leaving the site. The quantities of waste leaving the site will be recorded. A contractor licensed for commercial transportation will transport non-hazardous wastes. For hazardous waste, the transporter will have a USEPA Identification number, and will comply with transportation requirements of 49 CFR 171-179 (Department of Transportation) and 40 CFR 263.11 and 263.31 (Hazardous Waste Transportation). A copy of the documentation indicating that the selected transporter has appropriate licenses and identification numbers will be received prior to transport of any waste material.

4.4.1 Manifests/Shipping Documentation

Each load of waste material will be manifested prior to leaving the site. At a minimum, the manifest form will include the following information:

- Transporter information including name, address, contact and phone number
- Generator information including name, address, contact, and phone number
- Site name including street/mailing address
- Description of waste (e.g.: hazardous waste, liquid)
- Type of container
- Quantity of waste (volumetric estimate)
- Additionally, each shipment of waste will also have a waste profile, a Land Disposal Restriction (LDR) notification/certification for hazardous wastes, and a haul ticket.

If the signed hazardous waste manifest from the designated offsite facility is not received within 35 days, CCI will contact the transporter or the designated facility to determine the status of the waste. If the signed hazardous waste manifest has not been

received within 45 days, CCI will prepare an "Exception Report" for the Navy to submit to the State of Georgia, as required under 40 CFR 262.42.

4.4.2 Transporter Responsibilities

The transporter will be responsible for weighing loads at a certified scale. For each load of material, weight measurements will be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights will be recorded on the waste manifest. The transporter will provide copies of weight tickets with the final manifest to CCI.

The transporter will observe the following practices when hauling and transporting wastes offsite:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Clean-up material spilled in transit.
- Line and cover trucks/trailers used for hauling contaminated materials to prevent releases and contamination.
- Seal trucks transporting liquids.
- Decontaminate vehicles prior to re-use, other than hauling contaminated material.

All personnel involved in offsite disposal activities will follow safety and spill response procedures outlined in the Health and Safety Plan. No materials from other projects will be combined with materials from NSB Kings Bay.

In the event of a spill or release of hazardous wastes, the transporter must immediately notify CCI/J.A. Jones and local authorities. The transporter must clean up any hazardous waste spill or release that occurs during transportation, or take such action as may be required or approved by Federal, State, or local officials.

The transporter will report any spill or release of hazardous waste, if required by 49 CFR 171.15, to the National Response Center (NRC) at 800-424-8802 or 202-426-2675. The transporter must also report in writing, as required by 49 CFR 171.16, to the Director, Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590.

For any spill of hazardous waste water from a bulk shipment (e.g., tanker), the transporter will immediately notify the NRC (800-424-8802 or 202 - 267-2675), as required in 40 CFR 263.30.

4.4.3 Transportation and Disposal Log

Transportation of wastes will be inventoried the day of transportation from the site using the Transportation and Disposal Log provided in Appendix B. A carbon copy of the initial manifest form for each load will be retained onsite and attached to the Daily Production Report (Appendix C). All required transportation manifests will be prepared by CCI and signed by an NSB Kings Bay representative.

4.5 Disposal of Wastestreams

Offsite treatment or disposal facilities will use the waste profile and supporting documentation (e.g., analytical data) to determine if they will accept a waste. Hazardous wastes will be sent to the appropriate, permitted RCRA Subtitle C treatment, storage, or disposal facility. Non-hazardous wastes will be disposed at a Subtitle D facility or a municipal landfill, as appropriate. The treatment or disposal facility will be responsible for providing a copy of the final waste manifest and for a certificate of treatment or disposal for each load of waste received. Section 4.4.1 describes the required actions if the signed manifest is not received within 35 days.

4.6 Training

Training requirements for onsite personnel, including subcontractors, is provided in the site-specific Health and Safety Plan provided in Appendix D.

4.7 Records/Reporting

The following records and documents will be maintained:

- Transportation and offsite disposal records, including:
  - Profiles and associated characterization data
  - Manifests, LDR notifications/certifications, bills of lading, and other shipping records
  - Offsite facility waste receipts and certificates of disposal/destruction
- Training records
- Inspection records

CCI will maintain Material Data Safety Sheets (MSDS) for chemicals and/or hazardous materials brought onsite, including the MSDS for chemicals brought onsite by subcontractors.

5.0 Environmental Protection Plan

The scope of this plan includes general controls implemented during remediation-related construction activities at NSB Kings Bay to prevent pollution and protect the environment. These controls and procedures also ensure that work is performed in a manner that meets the intent of federal, Georgia EPD, and local environmental regulations. The work plan addenda will provide task-specific requirements for environmental protection and pollution control.

5.1 Regulatory Drivers

The following environmental laws and regulations are the anticipated drivers for the remediation activities at NSB Kings Bay:

- RCRA/Georgia EPD Hazardous waste regulations
- The Clean Water Act, National Pollutant Discharge Elimination System (NPDES) General Storm Water Permit for Construction Activities - any construction activity, including grading, clearing, excavation, or other earth moving process which disturbs more than 5 acres would require coverage under the general permit. It is currently not anticipated that construction activities at NSB Kings Bay will disturb 5 or more acres.

5.2 Protection of Air Resources

Construction activities will be kept under surveillance, management, and control to minimize the discharge of any air pollutants. The following general practices will be implemented to protect air resources:

- Construction equipment will be maintained within manufacturer's design limits to ensure minimal discharge of exhaust emissions.
- Dust emissions will be controlled during earth disturbing activities using water truck or hose nozzle spray applications of water.
- Traffic routes will be designated to limit the area that is disturbed.
- Haul roads will be maintained and watered to reduce dust, as necessary.
- Travel speeds over unpaved areas will be limited to reduce dust levels.
- Completed areas will be seeded or otherwise stabilized to reduce dust levels.
- Burning will not be allowed as a means of clearing.
- Equipment will be operated in such a manner as to minimize airborne particulates whenever possible (e.g., the drop height of excavators will be limited).

Emission controls that are required by state or federal permits or to protect the environment during a particular remediation activity (e.g., carbon filters on treatment units) will be discussed in the task-specific workplan.

5.3 Protection of Water Resources

The primary water resource concern during construction activities is the control of stormwater run-on and run-off. Other water resource issues such as discharges to a waterway, construction activities in a floodplain, wetlands, or streambed (and associated permits and permitting requirements) will be discussed in the task-specific work plans.

To reduce erosion, and control stormwater run-on and run-off during any activity that will disturb that land, the following structural and non-structural controls will be implemented as appropriate:

- Minimizing the area of bare soil exposed at one time (i.e., phased grading)
- Stabilizing cut-and-fill slopes
- Perimeter controls (e.g., drainage diversions)
- Stormwater retention basins
- Sediment basins and traps
- Silt fences at excavations
- Covers for stockpiles (to prevent leaching of contaminants from stockpiles)
- Site restoration (e.g., regrading, mulching, and seeding, or repaving with asphalt or concrete)

5.4 Protection of Land Resources

Land resources (e.g., trees and shrubs) will be preserved in their present condition or restored as near as possible to their natural appearance. Trees outside of any clearing limits will be protected during excavation or filling activities within the root zone, wherever possible. No ropes, cables, or guy lines will be fastened to or attached to any existing trees for anchorage unless specifically authorized by the Navy. Where authorized, the trunk will be wrapped with sufficient thickness of a material such as burlap or rags over which softwood cleats will be tied before any rope, cable, or wire is placed. Where trees may be defaced, bruised, injured, or otherwise damaged by equipment or construction operations, boards, planks, or poles may be placed around them for protection. Rocks that are displaced into uncleared areas will be removed. Monuments, markers, or other similar structures will be protected before beginning construction operations.

5.5 Protection of Fish and Wildlife

Construction operations will be managed in such a manner as to minimize interference with fish and/or wildlife habitat. Care will be taken to ensure that temporary erosion and sediment controls are installed to prevent storm water discharges to any adjacent ponds or wetlands. Construction operations will be monitored and reorganized as necessary to prevent negative effects to identifiable wildlife activity.

5.6 Chemical Inventory and Control

Consistent with the requirements of Section 311 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 4.8.7 of the contract, CCI will maintain an inventory of chemicals and hazardous materials brought onsite.

The project manager is to request MSDSs from the client or from the contractors and the subcontractors for chemicals to which CCI employees potentially are exposed. The Site Health and Safety Supervisor performs the following activities:

- Give employees required site-specific hazard communication (HAZCOM) training.
- Confirm that the inventory of chemicals brought on the site by subcontractors is available.
- Before or as the chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, if any.

More detailed procedures for chemical and hazardous material inventory and control are provided in the Health and Safety Plan.

5.7 Spill/Release Prevention, Control, and Reporting

To prevent and control spills and releases, hazardous materials will be handled in accordance with CCI procedures outlined in the Health and Safety Plan (Appendix D).

In the event of a 'release' of any potentially hazardous waste, chemical, or material, CCI will report any release of to the Contracting Officer or designated representative as indicated in the Health and Safety Plan, and document the release. The definition of release includes any "spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed containers)" of any potentially hazardous chemical, substance, and/or material. The Health and Safety Plan identifies the hazardous chemicals and materials anticipated to be used in work at NSB Kings Bay. The CCI Regulatory Compliance Coordinator shall be contacted for questions on other chemicals and/or materials.

5.8 Site Restoration

The specific requirements for restoring a construction area will be described in the workplan addenda. In general, site restoration activities will include the following activities:

- Decontaminate facilities, equipment, and materials prior to final removal from the site.

- Upon completion of final decontamination, remove any decontamination support features (such as a pad, wash units). Properly dispose of any items that cannot be decontaminated and/or materials (such as plastic sheeting) used in decontamination activities.
- Remove all temporary construction features, such as haul roads, work areas, stockpiles, structures, fencing, and waste staging or storage areas in accordance with project requirements and directions provided by Navy representative.

The physical restoration of the construction area generally involves the following activities:

- Backfill placement
- Finish filling and grading
- Topsoil placement and amendments
- Seeding

If necessary, CCI may consult the county extension office for direction on appropriate seed mixtures and soil amendments for NSB Kings Bay.

5.9 Environmental Conditions Report

CCI and the Resident Officer in Charge of Construction (ROICC) will conduct an environmental conditions survey for each project site prior to the commencement of construction. The pre-construction condition of the facilities, including grassy areas, trees, shrubs, paving, gutters, curbs, buildings, and facilities, will be photographed. A written report describing the pre-construction condition of the project site, including copies of the photographs and comments on the condition of existing paved areas, will be submitted to the ROICC within 2 weeks from the construction start date.

6.0 Quality Control Plan

The Submittal Register, included in Appendix C of this Work Plan, documents submittals in accordance with Appendix B of CCI's Contract Management Plan (dated July 1998). CCI, the Navy, or others will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by CCI to the appropriate Navy personnel (Contracting Officer [CO], ROICC [in duplicate], etc.), to the project site, and to the project file.

The site-specific project organization chart presented in Figure 6-1 depicts the chain-of-command for this CTO and the individuals responsible for executing the work as indicated. Individual roles and responsibilities of CTO personnel are summarized in Table 6-1.

6.1 Project QC Manager

The Project QC Manager for this work will be Mr. Scott Sloan. A copy of the letter appointing Mr. Sloan as the Project QC Manager is presented in Appendix C.

6.2 Testing Requirements

Construction testing and environmental analysis laboratories and their certifications; construction testing and environmental sampling and analysis; and test control are described in this section. The Testing Plan and Log is provided in Appendix C.

6.2.1 Identification and Certification of Testing Laboratories

Construction testing and environmental testing laboratories utilized for this CTO project will function as subcontractors, and have not yet been identified.

6.2.2 Construction

No construction testing is anticipated for this work. However, if construction testing becomes necessary, the construction testing laboratory(ies) will be National Institute of Standards and Technology-, National Voluntary Laboratory Accreditation Program-, American Association of State Highway and Transportation Officials-, or American Association for Laboratory Accreditation-certified.

Figure 6-1
Project Organization Chart
Contract Task Order No. 0047
Source Area Delineation at Site 11, Old Camden County Landfill

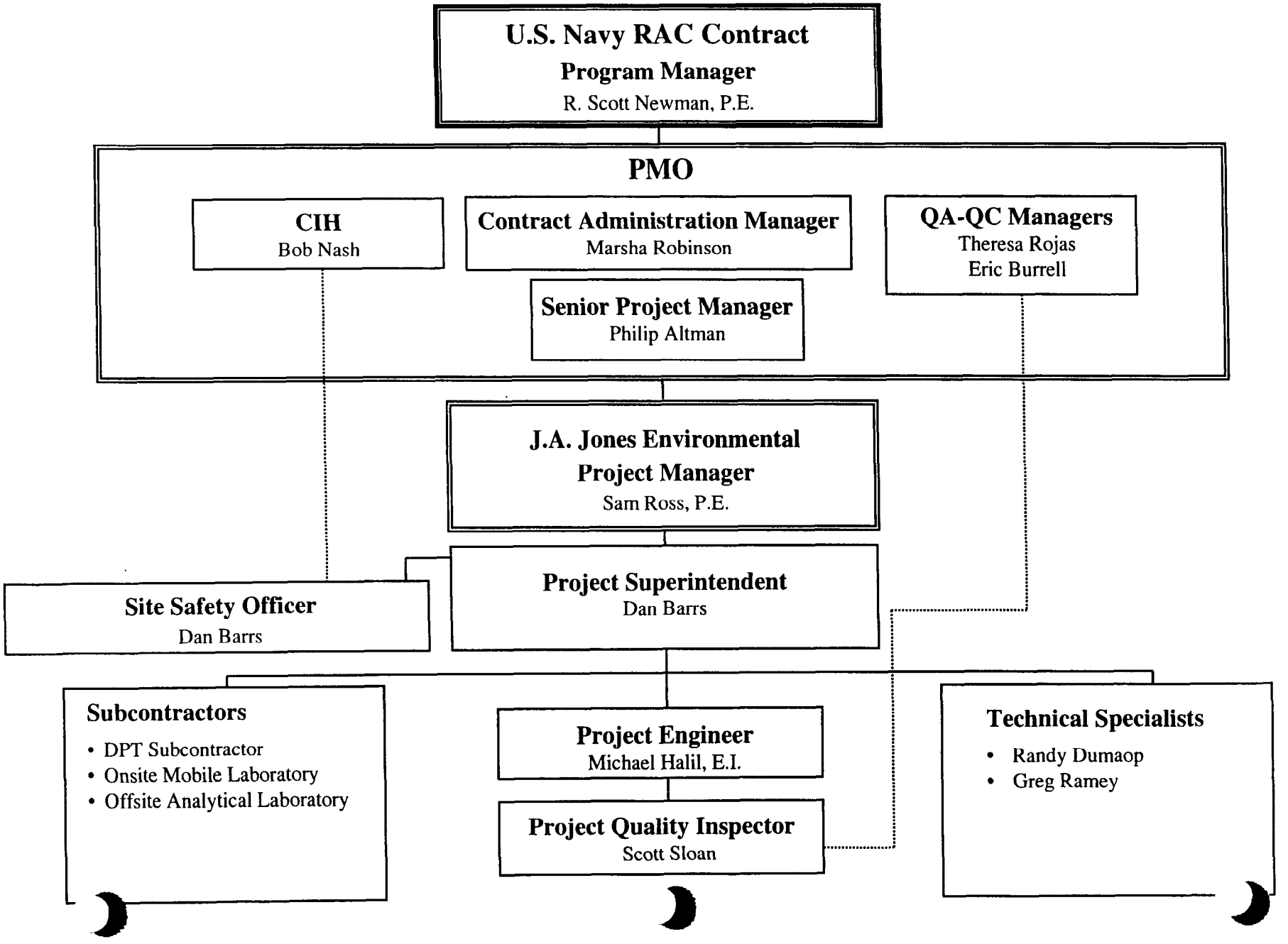


TABLE 6-1
Roles, Responsibilities, and Authorities of Individuals Assigned to a Contract Task Order

Role	Responsibility	Authority
Project Manager	• Management and technical direction of work • Communication with Southern Division RPM and NTR • Overview subcontractor performance • Select CTO staff • Develop CTO Work Plan and supporting plans • Meet CTO performance objectives • Prepare status reports	• Approve subcontractor selection • Approve invoices to Southern Division • Approve CTO baseline schedule • Stop work at the site for any reason • Approve payment to vendors and suppliers • Approve payment to subcontractors
Site Superintendent	• Responsible for all site activities • Provide direction to subcontractors • Act for Project Manager • Provide daily status reports • Prepare CTO Work Plan • Conduct daily safety meetings • Review subcontractor qualifications • Stop work for unsafe conditions or practices	• Stop work for subcontractors • Approve corrective action for site work-arounds • Approve materials and labor costs for site operations • Resolve subcontractor interface issues • Approve daily and weekly status reports
Resident Engineer	• Monitor and oversee subcontractor compliance with scope of work • Review requests for changes in scope of work • Review technical qualifications of subcontractors • Prepare Field Change Requests • Respond to Design Change Notices • Recommend improvements in work techniques or metrics • Recommend work-around to Site Superintendent	• Approve Field Change Requests below ceiling amount • Complete daily compliance report
Field Accountant	• Provide project scheduling coordination • Responsible for site cost tracking and reporting • Maintain record of site purchases • Maintain government property records	• Approve payables for disposable items •
Transportation and Disposal Coordinator	• Develop site specific procedures for transport and disposal practices • Plan and coordinate the transport and disposal of waste • Review subcontractor qualifications • Audit T&D subcontractors compliance with contract requirements	• Approve subcontractors daily report of waste material removed from the site • Approve corrective action plans from T&D subcontractor

TABLE 6-1
Roles, Responsibilities, and Authorities of Individuals Assigned to a Contract Task Order

Role	Responsibility	Authority
Project Assistant	• Maintain CTO files and correspondence • Coordinate CTO schedule and monitor deliverables • Maintain change management records • Maintain Action Tracking System log	• Submit Action Tracking System log • Assign correspondence log numbers
QC Inspector(s)	• Monitor and report on subcontractor quality and quantities • Audit subcontractors offsite fabrication • Maintain Submittal Register • Participate in Continuous Improvement Team • Stop work for non-compliant operations • Maintain Lessons Learned Log	• Stop work for non-compliant operations • File daily quantities report • File Lessons Learned Log Sheet • Approve resumption of work for resolved quality issues
Site Health and Safety Specialist	• Monitor and report on subcontractor safety and health performance • Record and report safety statistics • Conduct needed site safety and health orientation • Maintain Environmental Log • Stop work for unsafe practices or conditions	• Stop work for unsafe practices or conditions • Approve subcontractor site specific health and safety plan • Set weekly safety objectives • Approve resumption of work for resolved safety issues
Subcontract Specialist	• Prepare bid packages • Purchase disposable materials • Maintain subcontract log	

6.2.3 Environmental

Offsite laboratories performing analysis of environmental samples will be Navy-, USACE-, or AFCEE-approved. Onsite mobile laboratory analysis will be used for screening purposes only and will not necessarily be Navy-, USACE-, or AFCEE-approved.

6.2.4 Testing and Sampling

Delineation groundwater, well development and purge water, decontamination liquids, and soil will be sampled by CCI/J.A. Jones.

Construction Testing

No construction testing is anticipated for this work.

Environmental Sampling and Analysis

Environmental sampling and analysis, including QC sampling and analysis, is specified in Section 2.0 Sampling and Analysis Plan of this Work Plan. Samples will be collected in accordance with USEPA Methods and industry standards of practice. Additionally,

personnel that perform sampling will meet the requirements stated in the Navy Installation Restoration Chemical Data Quality Manual – September 1999.

6.2.5 Test Control

Environmental samples will be collected in accordance with USEPA Methods and procedures. Other controls will include, but are not limited to, maintaining a chain of custody; proper handling, packing, and shipping; and the use of qualified laboratories. The QC reports required for this project are listed in Table 6-2.

TABLE 6-2
Test Control

QC Report/Log	Submittal Frequency
Contractor Production Report	Daily
Contractor QC Report	Daily
Testing Plan and Log	Monthly
QC Meeting Minutes	As Performed
Rework Items List	Monthly
Submittal Register	As Updated

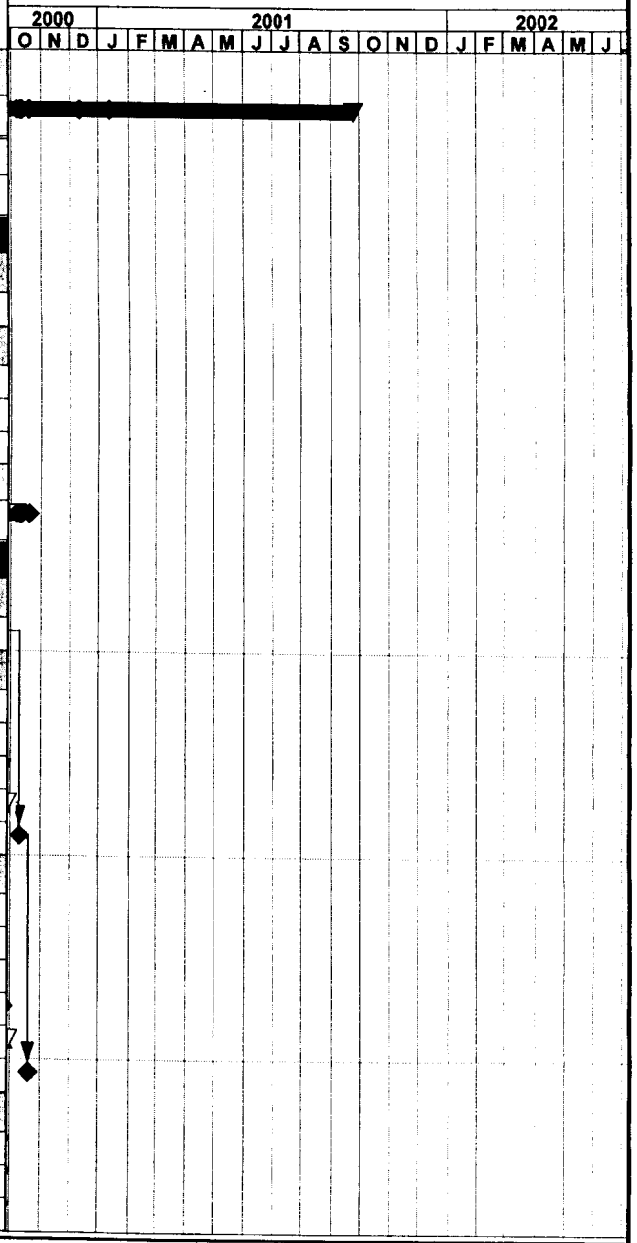
6.3 CTO Support Organizations

The supporting organizations are yet to be determined.

Appendix A

CPM Project Schedule

Activity ID	WBS	Activity Description	% Comp	Orig Dur	Rem Dur	Early Start	Early Finish
CTO #0047 - 160027 - NSB Kings Bay							
Subtotal			3	290	270	28JUL00A	24SEP01
PHASE 1A							
Subtotal			100	20	0	28JUL00A	24AUG00A
PHASE 1							
FUNDING AUTHORIZATION							
BK100000	10.01	Project Authorization	100	0	0	28JUL00A	
CTO SETUP/SITE VISIT							
BK10010290	10.01.02.90	CTO Setup	100	1	0	28JUL00A	28JUL00A
BK10010291	10.01.02.91	Site Visit Preparation	100	1	0	21AUG00A	21AUG00A
BK10010292	10.01.02.92	Perform Site Visit	100	3	0	22AUG00A	24AUG00A
PHASE 2							
Subtotal			14	59	39	28JUL00A	20OCT00
PHASE 2							
PROJECT MANAGEMENT							
BK20010399	20.01.03.99	PROJECT MANAGEMENT	100	1	0	28JUL00A	28JUL00A
COST PROPOSAL PREPARATION							
BK20010326	20.01.03.26	DEVELOP COST ESTIMAT	100	15	0	21AUG00A	21AUG00A
BK20010327		Submit Cost Proposal to Client	0	0	0		11SEP00
BK20187		Negoiate CTO with Client	0	2	2	15SEP00	18SEP00
BK20199		Submit Final/Negoiated Estimate/Schedule	0	5	5	19SEP00	25SEP00
BK2000001		Phase 3 Award	0	0	0		10OCT00
BID PACKAGE PREP/AWARD							
BK20010391	20.01.03.91	Prepare Bid Packages	0	10	7	22AUG00A	05SEP00
BK20150		Issue RFB to Subcontractors	0	0	0		08SEP00
BK20010392	20.01.03.92	Subcontractor Pre-Bid Meeting/Site Visit	0	2	2	13SEP00	14SEP00
BK20165		Subcontractor Bids Due	0	0	0		21SEP00
BK20010393	20.01.03.93	Evaluate Bid Packages	0	5	5	22SEP00	28SEP00
BK20188		Issue Letter of Intent to Award	0	0	0		20OCT00
WORK PLANS PREPARATION							
BK20010301	20.01.03.01	SAMPLING & ANALYSIS	0	10	10	05SEP00*	18SEP00
BK20010304	20.01.03.04	ENVIRONMENTAL PROTEC	0	10	10	05SEP00	18SEP00
BK20010306	20.01.03.06	Pollution Control Plan	0	10	10	05SEP00	18SEP00



Start Date 25JUL00
Finish Date 24SEP01
Data Date 25AUG00
Run Date 05OCT00 06:39

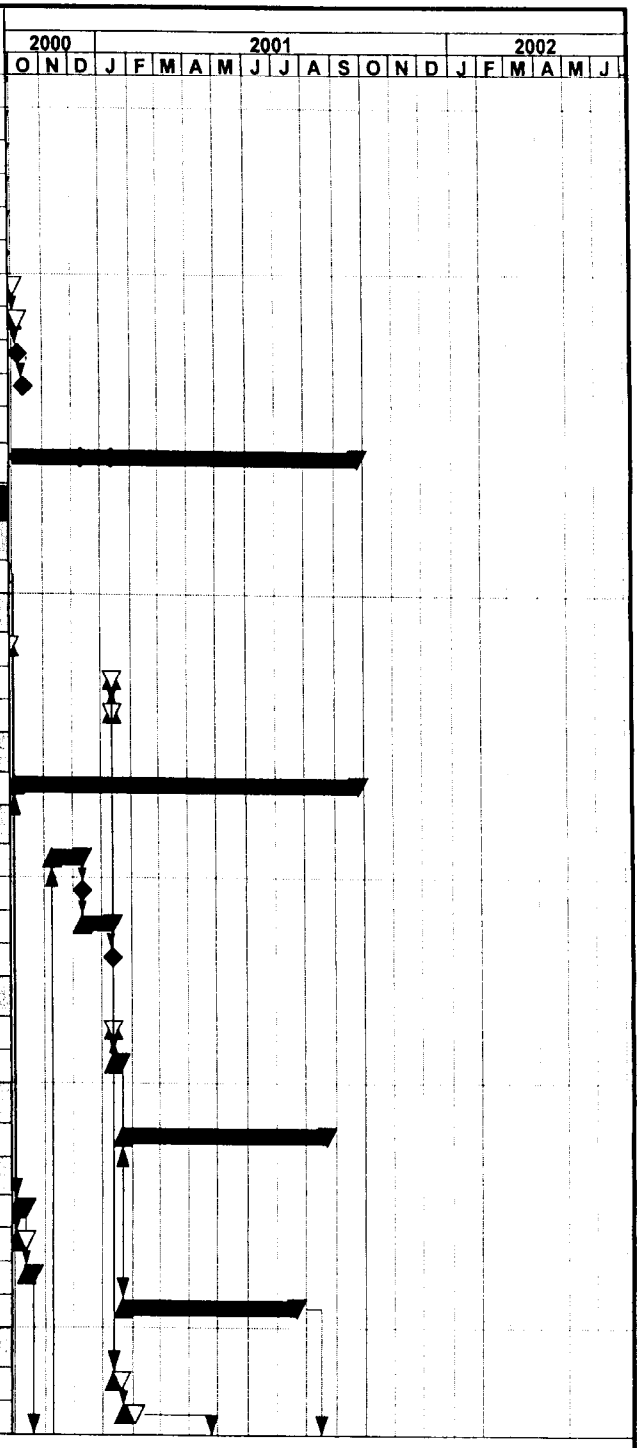
Early Bar
Progress Bar
Critical Activity

NFAC - CO47

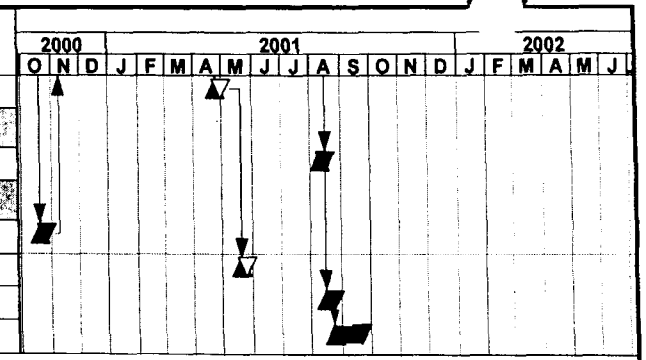
CTO #0047 - 160027 - NSB Kings Bay
CTO COMPLETION SCHEDULE
NAVY RAC SOUTHERN DIVISION

CH2MHILL Constructors, Inc.

Activity ID	WBS	Activity Description	% Comp	Orig Dur	Rem Dur	Early Start	Early Finish
BK20010308	20.01.03.08	SITE SPECIFIC HEALTH	0	10	10	05SEP00	18SEP00
BK20010313	20.01.03.13	GENERAL SITE WORK PL	0	10	10	05SEP00	18SEP00
BK20010314	20.01.03.14	QUALITY CONTROL PLAN	0	10	10	05SEP00	18SEP00
BK20010315	20.01.03.15	Transportation & Disposal Plan	0	10	10	05SEP00	18SEP00
BK20010390	20.01.03.90	HAZARDOUS WASTE PLAN	0	10	10	05SEP00	18SEP00
BK20290		Submit Draft Work Plans	0	0	0		18SEP00
BK20185		Southern Division WP Comment Period	0	10	10	19SEP00	02OCT00
BK20190		Incorporate WP Comments	0	3	3	03OCT00	05OCT00
BK20191		Submit Final WP to Southern Division	0	0	0		05OCT00
BK2095		Work Plan Approval Received	0	0	0		11OCT00
SITE 3/AREA G-OU 3 CHEM. OXIDATION INJ. REMOVAL							
Subtotal			0	255	255	18SEP00	24SEP01
PHASE 3							
FUNDING AUTHORIZATION							
BK99229291		Authorization Received	0	1	1	18SEP00*	18SEP00
CTO SETUP/SITE VISIT							
BK99229292	99.01.02.90	CTO Pre-Construction Meeting	0	1	1	25SEP00*	25SEP00
BK99229293	99.01.02.91	CCI Mobilization	0	1	1	12JAN01	12JAN01
BK99229294	99.01.04.01	Initiate Job-Site Presence	0	1	1	12JAN01	12JAN01
PROJECT MANAGEMENT							
BK99229295	99.22.01.01	Project Management	0	245	245	02OCT00	24SEP01
BID PACKAGE PREP/AWARD							
BK99229296	32.01.03.94	Submit Subcontractors Plans & Submittals	0	20	20	10NOV00	11DEC00
BK99229298		Subcontractor Plans Due	0	0	0		11DEC00
BK99229299		Review Subcontractors Plans & Submittals	0	20	20	12DEC00	11JAN01
BK99229300		Award Subcontracts	0	0	0		11JAN01
MOBILIZATION & PREPARATORY WORK							
BK99229297	32.22.12.09	Subcontractor Bonds	0	1	1	12JAN01	12JAN01
BK99229301	32.01.02.92	Subcontractor Mobilization	0	5	5	12JAN01	19JAN01
DATA EVALUATION & MANAGEMENT							
BK99229306	31.02.14.91	Data Evaluation & Management	0	150	150	22JAN01	22AUG01
TESTING & ANAYLSIS							
BK99229302	31.02.06.01	Geoprobe Sampling	0	8	8	02OCT00	12OCT00
BK99229303	31.02.06.02	On-Site Lab for Geoprobe	0	8	8	02OCT00	12OCT00
BK99229305	31.02.06.04	Waste Charactarization	0	5	5	13OCT00	19OCT00
BK99229304	31.02.06.03	Monthly Laboratory Analysis - Groundwater	0	127	127	22JAN01	20JUL01
GROUNDWATER TREATMENT							
BK99229307	32.13.32.92	Injection Point Installation	0	5	5	12JAN01	19JAN01
BK99229308	32.13.32.93	Primary Treatment	0	10	10	22JAN01	02FEB01



Act ID	WBS	Activity Description	% Comp	Orig Dur	Rem Dur	Early Start	Early Finish
BK99229309	32.13.32.94	First Polish Treatment	0	5	5	24APR01	30APR01
SITE RESTORATION							
BK99229310	32.20.04.02	Site Restoration	0	5	5	10AUG01	16AUG01
POST CONSTRUCTION							
BK99229313	31.21.06.91	Status Reports for Delineation	0	5	5	20OCT00	26OCT00
BK99229314	31.21.06.91	Status Reports for Injection	0	5	5	21MAY01	25MAY01
BK99229311	32.21.05.91	Subcontractor Demobilization	0	5	5	17AUG01	23AUG01
BK99229312	31.21.06.05	Construction Documentation Reports	0	20	20	24AUG01	21SEP01



Appendix B

Waste Management Attachments

- Waste Inventory Tracking Form
- Transportation and Disposal Log

WASTE INVENTORY TRACKING FORM

LOCATION : _____

PROJECT NAME:_____

ACTIVITIES: _____

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: _____

Transportation and Disposal Log
NSB Kings Bay, Georgia

Load	Container			Wastestream	Transportation & Disposal					
Load Number	Accumulation Date	Serial/License No.	Type	ID & Description	Transport Date	Manifest No.	Quantity (& Units)	Hauler	Disposal Facility	Comments

Wastestream	Total by Type

Appendix C

Quality Control Attachments

- Contractor Production Report
- Daily Contractor Quality Control Report
- Submittal Register
- Testing Plan and Log
- QC Manager Appointing Letter

CONTRACTOR PRODUCTION REPORT

(Attach Additional Sheets If Necessary)

Date

Contract No.	CTO #	Location	Report No.
Navy Contract # N62467-98-D-0995	CTO 0047	NSB Kings Bay, Georgia	

Contractor: CH2M HILL Constructors, Inc.

Superintendent: Dan Barrs

AM Weather / PM Weather

Max Temp °F / Min Temp °F

JOB SAFETY

Was A Job Safety Meeting Held This Date? (If Yes, attach copy of the meeting minutes)	☐ Yes	☐ No	Total Worked Hours On Job Site This Date	
Were There Any Lost Time Accidents This Date? (If Yes, attach copy of completed OSHA report)	☐ Yes	☐ No	Cumulative Total Of Work Hours From Previous Report	
Was Trenching/Scaffold/HV Electrical/High Work Done? (If Yes, attach statement or checklist showing inspection performed)	☐ Yes	☐ No	Total Work Hours From Start Of Construction	
Was Hazardous Material/Waste Released Into The Environment? (If Yes, attach description of incident and proposed action)	☐ Yes	☐ No		

List Safety Actions Taken Today/Safety Inspections Conducted

☐ Safety Requirements Have Been Met

Equipment/Material Received Today to be Incorporated in Job

Construction and Plant Equipment of Job Site Today. Include Number of Hours Used Today.

Work Performed Today

Work Location and Description	Employer	Number	Trade	Hrs

Remarks

Contractors Superintendent

Date

CONTRACTOR QUALITY CONTROL REPORT

DATE

PREPARATORY PHASE

Preliminary Tasks	Yes	No	N/A	Remarks
1. Plans and specs review complete?	☐	☐	☐	
2. Submittals have been reviewed and approved?	☐	☐	☐	
3. Stored/delivered materials comply with submittals and are properly stored?	☐	☐	☐	
4. Testing plan has been developed and reviewed?	☐	☐	☐	
5. Work method and schedule discussed with Contracting Officer Rep.?	☐	☐	☐	
6. Other preliminary work completed correctly?	☐	☐	☐	

Definable Feature of Work

Work Location:

Personnel Present:

INITIAL PHASE

Preliminary and Ongoing Tasks	Yes	No	N/A	Remarks
1. Sample has been prepared and approved?	☐	☐	☐	
2. Workmanship complies with specifications/industry standards?	☐	☐	☐	
3. Test results are acceptable?	☐	☐	☐	
4. Work complies with contract requirements?	☐	☐	☐	
5. Preliminary work completed correctly?	☐	☐	☐	

Definable Feature of Work

Work Location:

Personnel Present:

Sampling/Testing Performed	Sampling/Testing Company	Site Technician

FOLLOW-UP PHASE

Preliminary and Ongoing Tasks	Yes	No	N/A	Remarks
1. Work complies with contract requirements as approved in initial phase?	☐	☐	☐	

Definable Feature of Work

Work Location:

Personnel Present:

Sampling/Testing Performed	Sampling/Testing Company	Site Technician

CONTRACTOR QUALITY CONTROL REPORT

DATE

Rework items identified today which were not corrected by close of business:

Rework items corrected today which were on the rework items list:

COMMENTS:

On behalf of the contractor, I certify that this report is complete and correct, and equipment and material used, and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report.

QC Inspector _____ Date _____

CONTRACTOR QUALITY CONTROL REPORT

DATE

Quality assurance representative's remarks and/or exceptions to this report:

Government Quality Control Manager _____ Date _____

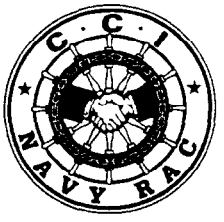
CTO No. 0047
Site 11, Old Camden County Landfill
NSB Kings Bay, Georgia
Submittal Register

Contract Number: N62467-98-D-0995			CTO No.: 0047		CTO Title: Source Area Delineation at Site 11, Old Camden County Landfill						Location: NSB Kings Bay, Georgia				Contractor: CH2M HILL Constructors, Inc./ J.A. Jones Environmental Services Company		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Item Number	Spec Section	Item Description	Para. Number	Approving Authority	Other Reviewers	Submittal Number	Scheduled Submission Date	CCI/JAJ Review Date	CCI/JAJ Disposition	CCI/JAJ Transmit Date	QC Admin Received Date	QC Disposition	QC Admin Transmit Date	Contracting Officer Received	Contracting Officer Disposition	Contracting Officer Return	Remarks
		General Paragraphs															
		SD-09, Reports	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1	--	A Work Plan	--	CO/COTR		1	10/04/2000										
2	--	B Narrative	--	CO/COTR		1	10/04/2000										
3	--	C Technical Specifications	--	CO/COTR		1	10/04/2000										
4	--	D Manufacturer's Catalog Data	--	CO/COTR		1	10/04/2000										
5	--	E Health and Safety Plan	--	CO/COTR		1	10/04/2000										
6	--	F QA/QC Plan	--	CO/COTR		1	10/04/2000										
7	--	G Sampling and Analysis Plan	--	CO/COTR		1	10/04/2000										
8	--	H Decontamination Procedures	--	CO/COTR		1	10/04/2000										
9	--	I Material Safety Data Sheets	--	CO/COTR			As Required										
		SD-18, Records	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	A As Built Records	--	ROICC			12/01/2000										
11	--	B Environmental Conditions Report	--	ROICC			10/11/2000										
12	--	C Test Results Summary Report	--	ROICC			Monthly										
13	--	D Daily Production Report	--	ROICC			Daily										
14	--	E Daily QC Report	--	ROICC			Daily										
15	--	F Rework Items List	--	ROICC			Monthly										
16	--	G Permits	--	ROICC			As Required										
17	--	H Source Area Delineation Completion Report	--	ROICC			12/01/2000										
		Waste Sampling Requirements															
		SD-08, Statements	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
18	--	A Sample Log	--	ROICC			Monthly										
		SD-12, Field Test Reports	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	--	A Disposal Sample Analytical Results	--	ROICC			As Required										
20	--	B Groundwater Screening Sample Analytical Results	--	ROICC			As Required										
21	--	C Electronic Copy of All Analytical Results	--	ROICC			As Required										
		SD-13, Certification	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22	--	A Laboratory Certification	--	ROICC			As Required										
		Transportation and Disposal of Contaminated Material															
		SD-08, Statements	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
23	--	A Treatment Facility Permit	--	ROICC			As Required										
		SD-18, Records	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	--	A Shipment Manifests	--	ROICC			As Required										
25	--	B Delivery Certificates	--	ROICC			As Required										
26	--	C Treatment and Disposal Certificate	--	ROICC			As Required										

0546 B012

Testing Plan and Log

Contract Number: N62467-98-D-0995		CTO No.: 0047		CTO Title: Source Area Delineation at Site 11, Old Camden County Landfill				Location: NSB Kings Bay, Georgia		
A	B	C	D	E	F	G	H	I	J	K
Spec Section and Paragraph	Test Required	Proposed Lab	Sampled By	Tested By	Test Location	Frequency	Date Test Made	Test Results	Date Results Forwarded	Remarks
DELINEATION ANALYSES										
SAP	Water	Mobile Lab			I-60	1				Injector I-60
SAP	Water	Mobile Lab			GP-01	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-02	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-03	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-04	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-05	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-06	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-07	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-08	4/boring				See Sections 1.2.2&2.2
SAP	Water	Mobile Lab			GP-09	4/boring				See Sections 1.2.2&2.2
DISPOSAL ANALYSES										
SAP	Water				Waste	As Req.				Purge/Decon/Etc.
SAP	Solids				Waste	As Req.				DPT IDW



CCI NAVY RAC

CH2MHill Constructors Inc.
115 Perimeter Center Place, NE
Suite 700
Atlanta, GA 30346-1278
TEL 770.604.9182
FAX 770.604.9282

October 4, 2000

Mr. Scott Sloan
J.A. Jones Environmental Services Company
8936 Western Way, Suite 10
Jacksonville, Florida 32256

Subject: Contract No. N62467-98-D-0995
Contract Task Order No. 0047, NSB Kings Bay, Georgia
Quality Control Manager Letter of Authority

Dear Mr. Sloan:

Herein describes the responsibilities and authority delegated to you in your capacity as the Project QC Manager on the NSB Kings Bay site, Contract Task Order No. 0047 under the Navy RAC Contract No. N62467-98-D-0995.

In this position, you assist and represent the QC Program Manager in continued implementation and enforcement of the Project QC Plans. You are responsible for implementing the QC program as described in the Navy RAC contract. You are responsible for managing the site-specific QC requirements in accordance with the Project QC Plans. You are required to attend the coordination and mutual understanding meeting, conduct QC meetings, perform the three phases of control, perform submittal review, perform submittal approval, ensure testing is performed, and prepare QC certifications and documentation required in the Navy RAC Contract.

Your responsibilities further include identifying and reporting quality problems, rejecting nonconforming materials, initiating corrective actions, and recommending solutions for nonconforming activities.

You have the authority to control or stop further processing, delivery, or installation activities until satisfactory disposition and implementation of corrective actions are achieved.

You have the authority to direct the correction of non-conforming work.

Sincerely,

CH2M HILL Constructors, Inc.

R. Scott Newman, P.E.
Program Manager

Appendix D

Health and Safety Plan

Health and Safety Plan
Old Camden Landfill
Source Area Delineation at Site 11
Old Camden County Landfill
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Revision No. 00

Contract No. N62467-98-D-0995
Contract Task Order No. 0047

Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

CH2MHILL
Constructors, Inc.
115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

October 2000

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Acronyms

°F	degrees Fahrenheit
ALARA	as low as reasonably achievable
APR	air-purifying respirator
ATL	Atlanta
CCI	CH2M HILL Constructors, Inc.
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CTO	Contract Task Order
dBA	decibel A-rated
DOT	Department of Transportation
FA	first aid
FID	flame ionization detector
GFCI	ground fault circuit interrupter
HAZCOM	hazard communication
HR	heart rate
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDLH	immediately dangerous to life and health
IDW	investigation-derived waste
JAX	Jacksonville
lb	pound
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
mW/cm^2	milliwatt per square centimeter
NAS	Naval Air Station
NDG	nuclear density gauge
NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
PAPR	powered air-purifying respirator
PDF	personal flotation device
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
RMSF	Rocky Mountain Spotted Fever
SAR	supplied-air respirator
SCBA	self-contained breathing apparatus
SHSS	Site Health and Safety Specialist
SOP	standard of practice
SZ	support zone
TBD	to be determined
TMCC	truck-mounted crash cushion
TSDF	treatment, storage, and disposal facility

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

1.0 Project Information and Description

Client or Owner: Southern Division, Navy RAC

Project No: CTO-0047

CCI Project Manager: Mike Halil/J.A. Jones

Office: Jacksonville, Florida

Site Name: Naval Submarine Base Kings Bay

Site Address: Kings Bay, Georgia

Date Health and Safety Plan Prepared: October 2000

Date(s) of Initial Visit: September 2000

Date(s) of Site Work: October – December 2000

Site Access: Access is the Main Gate on Kings Bay Road

Site Size: The site occupies 16,168 acres in Camden County Georgia.

Site Topography: flat coastal plain

Prevailing Weather: hot humid summers with the potential for hurricanes

Site Description and History: The Naval Submarine Support Base Kings Bay was commissioned in July of 1978. In May of 1980, Kings Bay was named the Atlantic Fleet homeport of the next generation of fleet ballistic submarines, Trident and Ohio-class SSBN.

The old Camden County Landfill was incorporated into the Base. The landfill was used for municipal solid waste disposal in the 1960s and 1970s. Perchloroethylene was disposed of in the landfill, which resulted in groundwater contamination.

2.0 Project Organization and Tasks to be Performed under this Plan

2.1 Project Organization

Client: Southern Division, Naval Facilities Engineering Command

CCI:
Project Manager: Mike Halil/ J.A. Jones/ Jacksonville, FL
Field Team Leader: TBD/ATL
Refer to Section 4.0 for field staff.
Contractors and Subcontractors: Refer to Section 4.2.

2.2 Description of Tasks

Refer to project documents (i.e., work plan) for detailed task information. A health and safety risk analysis has been performed for each task and is incorporated in this HSP through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below require an approved amendment to this plan before additional work begins. Refer to Section 10.2 for procedures related to tasks that do not involve hazardous waste operations and emergency response (HAZWOPER).

2.2.1 HAZWOPER-Regulated Tasks

HAZWOPER-regulated tasks include:

- Drilling, direct push (Geoprobe) well installation
- Groundwater monitoring

2.2.2 Non-HAZWOPER-Regulated Tasks

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

A task hazard analysis is provided in Table 2-1.

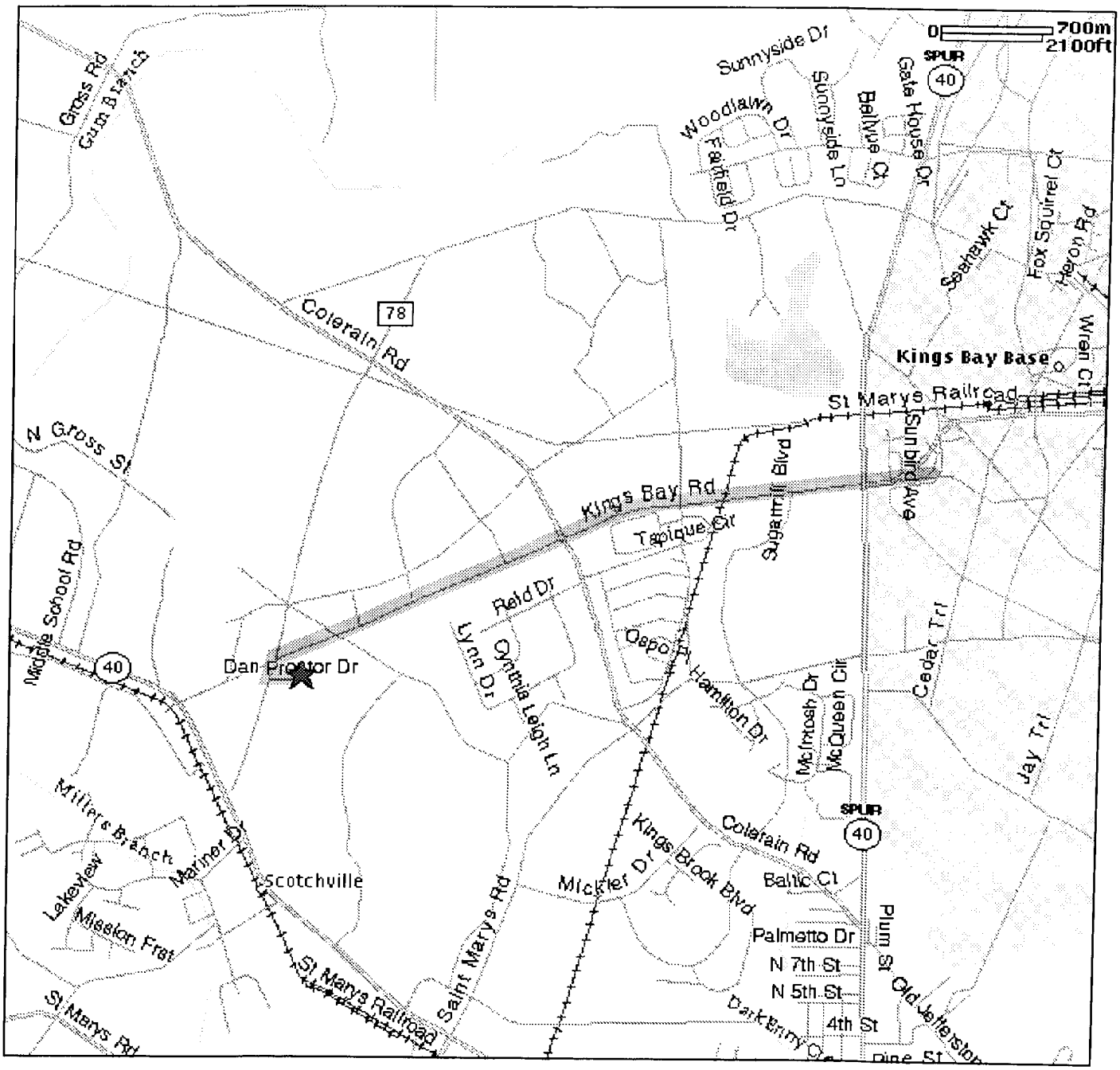
TABLE 2-1
Task Hazard Analysis

Potential Hazards	Tasks	
	Drilling, Direct Push	Groundwater monitoring, Aquifer testing
Compressed Gas HS-63	X	
Drilling HS-35	X	
Fire Protection HS-22	X	X
Hand and Power Tools HS-50	X	X
Laboratory, Field, HS-37	X	X
Manual Lifting HS-29	X	X
Noise >85dBa HS-39	X	X
Welding and Cutting HS-63	X	

2.2.3 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. Table 2-2 lists safe work practices and control measures used to reduce or eliminate potential hazards for the activities associated with this project. Inspection and training requirements for equipment are listed in Table 2-3. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CCI employees and subcontractors must remain aware of the hazards affecting them regardless of the party responsible for controlling the hazards. CCI employees and subcontractors who do not understand any of these provisions should contact the SHSS for clarification.

In addition to controls specified in this section, activity Self-Assessment Checklist is provided in Attachment 5. This checklist is to be used to assess the adequacy of CCI and subcontractors site-specific safety requirements. Objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing gaps. A Self-Assessment Checklist will be completed weekly and returned to the Senior Project Manager, with a copy to HSM.



CH2MHILL

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Figure 11-1
Hospital Location Map

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CCI project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: Naval Sub Base Kings Bay **Project Number:**

EMPLOYEE NAME (Please print)	EMPLOYEE SIGNATURE	COMPANY	DATE

3.6.2 Shipping and Transportation of Chemical Products

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

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

3.7 Contaminants of Concern

Reference Project Files for More-Detailed Contaminant Information

Contaminants of concern are listed in Table 3-5.

TABLE 3-5
Contaminants of Concern

Contaminant	Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
1,2-Dichloroethene	GW: 2 µg/L	200 ppm	1,000 ppm	CNS depression, eye irritation	9.65
Tetrachloroethylene (PCE)	GW: 10,000 µg/L	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
Trichloroethylene (TCE)	GW: 7 µg/L	50 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Vinyl Chloride	GW: 120 µg/l	1 ppm	NL Ca	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	9.99

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

3.8 Potential Routes of Exposure

Potential routes of exposure include:

- **Dermal:** Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.0.
- **Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 5.0 and 6.0, respectively.

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

TABLE 2-2
Activity Hazard Analysis

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
General Hazards	Reduce general safety hazards found at most sites referenced CH2M HILL SOP HS-20	Site work will be performed during daylight hours whenever possible. Work conducted during hours of darkness will require enough illumination intensity to read a newspaper without difficulty. Hearing protection worn in areas where you need to shout to hear someone within 3 feet. Good housekeeping must be maintained at all times in project work areas. Common paths of travel established and kept free from accumulation of materials. Provide slip-resistant surfaces, ropes, and /or other devices to be used. Specific areas should be designated for the proper storage of materials. Tools, equipment, materials, and supplies will be stored in an orderly manner. As work progresses, scrap and unessential materials must be neatly stored or removed from the work area. Containers should be provided for collecting trash and other debris and will be removed at regular intervals. Spills will be cleaned up. Oil and grease will be cleaned from walking and working surfaces.
Hazard Communication	Comply with the Hazard Communication Standard informing worker about the chemical to which they may be exposed referenced 29 CFR 1926 and CH2M HILL SOP HS-05	Complete an inventory of chemicals brought on site by CCI using the Project-Specific Chemical Hazard Communication Form provided in Attachment 2. Confirm inventory of chemicals brought on site by CCI subcontractors is available. Confirm locations of Material Safety Data Sheets (MSDSs) from client, contractors, and subcontractors for chemicals to which CCI employees potentially are exposed. Before or as the chemicals arrive onsite, obtain an MSDS for each hazardous chemical. Label chemical containers with the identity of the chemical and with hazard warnings, and store properly. Give employees required chemical-specific HAZCOM training using the Chemical-Specific Tracking Form provided in Attachment 3.
Physical Conditions		
Compressed gasses	Reduce the hazards when working with compressed gasses	Valve caps must be in place when cylinders are transported, moved, or stored. Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved. Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved. Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources. Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

TABLE 2-2
Activity Hazard Analysis

Drilling	Reduce the hazards from drilling operations as referenced in CH2M HILL SOP HS-35	Only authorized personnel are permitted to operate drill rigs. Stay clear of areas surrounding drill rigs during every startup. Stay clear of the rotating augers and other rotating components of drill rigs. Stay clear of hoisting operations. Loads will not be hoisted overhead of personnel. Do not wear loose-fitting clothing or items such as rings or watches that could get caught in moving parts. Long hair should be restrained. If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior to approaching the equipment. Smoking around drilling operations is prohibited.
Fire Protection	To reduce the incidents of fires and provide resources to fight fires referenced in 29 CFR 1926.150 and CH2M HILL SOP-22	Fire extinguishers will be provided so travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must: 1) be maintained in a fully charged and operable condition, 2) be visually inspected each month, and 3) undergo a maintenance check each year. The area in front of extinguishers must be kept clear. Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations. Combustible materials stored outside should be at least 10 feet from any building. Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site. Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.
Laboratories, Field	Reduce the hazards from operation of a Field Laboratory as referenced 29 CFR 1910.1450 and CH2M HILL SOP HS-37	Personnel must complete the computer-based Laboratory Safety training module. Personnel must complete the general laboratory medical monitoring protocol and be approved for such activities. Personnel must receive chemical-specific hazard communication training on the chemicals to which they are exposed. Personnel who are exposed to methylene chloride must complete the computer-based Methylene Chloride training module. Personnel must read and follow the requirements of the Chemical Hygiene Plan.

TABLE 2-2
Activity Hazard Analysis

Manual Lifting	Reduce hazards encountered when lifting loads as referenced by CH2M HILL SOP HS-29	Proper lifting techniques must be used when lifting any object. Plan storage and staging to minimize lifting or carrying distances. Split heavy loads into smaller loads. Use mechanical lifting aids whenever possible. Have someone assist with the lift especially for heavy or awkward loads. Ensure that the path of travel is clear prior to the lift.
Noise	Reduce the exposure to noise as referenced by 29 CFR 1926.101 and 29CFR 1910.95, and CH2M HILL SOP HS-39	Noise areas will be evaluated at the start of the project and at any time new machinery is added to the process. Hearing protection will be worn whenever levels in excess of 85 dBA are exceeded as in areas where you must raise your voice to communicate at a distance of 3 feet or less. Personnel will be trained in the proper installation techniques for ear protection that fits in the ear canal. Hearing protective devices will be kept clean and sanitary be between uses. Noise measurements may be required by the SSHS to determine protection areas. These areas need to be posted with appropriate warning signs.
Radiation	Reduce the potential for ionizing radiation exposure referenced 29 CFR 192.53 and CH2M HILL SOP HS-10	Do not enter restricted work areas unless training, medical monitoring, personal monitoring equipment, and PPE requirements established by the radiation protection competent person have been met. Know your quarterly dose margin and do not exceed your personal limits. Assure personal monitoring devices are worn properly. Always calibrate pocket dosimeters prior to entering and exiting restricted areas. Plan activities to minimize exposure, i.e., as low as reasonably achievable (ALARA) and waste generation. Limit the amount of potential waste (e.g., packaging, boxes, paperwork, etc.) brought into restricted areas. Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in restricted areas. Promptly report any condition which may lead to or cause a violation of radiation protection standards. Assure radioactive sources, containers, and the area are properly labeled and posted. Protective clothing and other exposure controls will be based on the most recent survey results obtained from the radiation protection competent person. Know the emergency evacuation warning signals and be prepared to respond. Do not leave radioactive source materials and equipment unattended.

TABLE 2-2
Activity Hazard Analysis

Welding and Cutting	Reduce the physical hazards from welding and cutting referenced 29 CFR 1926, Subpart J and CH2M HILL SOP HS-63	Only authorized/trained personnel are permitted to operate welding/cutting equipment. Do not enter areas where welding/cutting operations are taking place unless completely necessary and only after receiving permission from the welding/cutting operator. If you must be present in an area during welding/cutting operations, position yourself behind flash screens or wear glasses/goggles with lenses of appropriate darkness. Do not look directly at the welding/cutting flash or at reflective surfaces surrounding welding/cutting operations.

TABLE 2-3
Equipment Inspection and Training Requirements

Equipment To Be Used	Inspection Requirements	Training Requirements
Drill Rigs HS-27	Maintain safe distance from operating equipment and stay alert of equipment movement. Avoid positioning between fixed objects and operating equipment and equipment pinch points, remain outside of equipment swing/turning radius. Pay attention to backup alarms, but not rely on them for protection. Never turn your back on operating equipment. Approach operating equipment only after receiving the operator's attention. The operator will acknowledge your presence and stop movement of the equipment. Caution will be used when standing next to idle equipment; when equipment is placed in gear it can lurch forward or backward. Never approach operating equipment from the side or rear where the operator's vision is compromised. When required to work in proximity to operating equipment, wear high-visibility vests to increase visibility to equipment operators. For work performed after daylight hours, vests will be made of reflective material or include a reflective stripe or panel. If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior to approaching the equipment.	Only authorized and trained personnel are permitted to operate earthmoving equipment.

3.0 Hazard Evaluation and Control

3.1 Heat and Cold Stress

Reference CH2M HILL SOP HS-09, Heat and Cold Stress

3.1.1 Preventing Heat Stress

The following guidelines relate to heat stress prevention:

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50 to 60 degrees Fahrenheit (°F) should be available. Under severe conditions, drink one to two cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

3.1.2 Symptoms and Treatment of Heat Stress

The symptoms of heat stress are listed in Table 3-1.

TABLE 3-1
Symptoms and Treatment of Heat Stress

	Heat Syncope	Heat Rash (*miliaria rubra*, "prickly heat")	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical attention immediately!

3.1.3 Heat-Stress Monitoring

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (greater than 50 percent), or when the workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute, or 20 beats per minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats per minute, or 20 beats per minute above resting pulse.

3.1.4 Preventing Cold Stress

The following guidelines relate to cold stress prevention:

- Be aware of the symptoms of cold-related disorders, and ***wear proper clothing for the anticipated fieldwork.***
- Consider monitoring the work conditions and adjusting the work schedule, using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- ***Wind-Chill Index.*** This measure relates the dry bulb temperature and the wind velocity. It is used only to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index sometimes is limited in its usefulness because the index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it is used only as a guideline to warn workers when they are in a situation that can cause cold-related illnesses. Used in conjunction with the NSC guidelines, the wind-chill index provides a starting point for adjusting work and warm-up schedules.
- ***NSC Guidelines for Work and Warm-Up Schedules.*** The cold-exposure limits recommended by the NSC can be used in conjunction with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; ***workers should be monitored for symptoms of cold-related illness.*** If symptoms are not observed, the work duration can be increased.
- The wind-chill index and the NSC guidelines are in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* SOP HS-09.

3.1.5 Symptoms and Treatment of Cold Stress

The symptoms and treatment of cold stress are listed in Table 3-2.

TABLE 3-2
Symptoms and Treatment of Cold Stress

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Rewarm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

3.2 Locating Buried Utilities

3.2.1 Local Utility Mark-Out Service

The Base Civil Engineer will be responsible for marking utilities.

3.2.2 Procedures for Locating Buried Utilities

Procedures for locating buried utilities are listed as follows:

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural-gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary, clear locations with a utility-locating instrument (e.g., metal detector).
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually. Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SHSS should confirm that arrangement.

3.3 Biological Hazards and Controls

Biological hazards and controls are listed in Table 3-3.

TABLE 3-3
Biological Hazards and Controls

Hazard and Location	Control Measures
Snakes typically are found in underbrush and tall grassy areas.	If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings.
Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.	Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.
Exposure to **bloodborne pathogens** may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material, or when coming into contact with landfill waste or waste streams containing such infectious material.	Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

TABLE 3-3 CONTINUED
Biological Hazards and Controls

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.	Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SHSS and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.
Other potential biological hazards	None anticipated.

3.4 Tick Bites

Reference CH2M HILL HS-03, Tick Bites

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

Prevention against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permanone, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

If bitten by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF): Lyme - a rash that looks like a bullseye with a small welt in the center; RMSF - a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

3.5 Radiological Hazards and Controls

Refer to CH2M HILL's Corporate Health and Safety Program, Program and Training Manual, and Corporate Health and Safety Program, Radiation Protection Program Manual, for standards of practice for operating in contaminated areas. There are no known radiological hazards associated with this project.

3.6 Hazards Posed by Chemicals Brought on the Site

3.6.1 Hazard Communication

Reference CH2M HILL Hazard Communication Manual

CH2M HILL's *Hazard Communication Program Manual,* which is available from area or regional offices and from the Corporate Human Resources Department in Denver,

Colorado. The project manager is to request MSDSs from the client or from the contractors and the subcontractors for chemicals to which CCI employees potentially are exposed. The SHSS is to do the following:

- Give employees required site-specific hazard communication (HAZCOM) training.
- Confirm that inventory of chemicals brought on the site by subcontractors is available.
- Before or as chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with identity of chemical and with hazard warnings, if any.

The chemical products listed in Table 3-4 will be used on the site. Refer to Attachment 2 for MSDSs.

TABLE 3-4
Chemical Hazards

Chemical	Quantity	Location
Isobutylene (calibration gas)	1 liter, compressed gas	Support Zone

3.6.2 Shipping and Transportation of Chemical Products

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

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

3.7 Contaminants of Concern

Reference Project Files for More-Detailed Contaminant Information

Contaminants of concern are listed in Table 3-5.

3.8 Potential Routes of Exposure

Potential routes of exposure include:

- **Dermal:** Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.0.
- **Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 5.0 and 6.0, respectively.
- **Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

TABLE 3-5
Contaminants of Concern

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Tetrachloroethylene (PCE)	GW: 10 mg/L	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
Trichloroethylene (TCE)	GW: 0.007 mg/L	50 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Vinyl Chloride	GW: Non-Detect	1 ppm	NL Ca	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	9.99

Footnotes:
[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.
ppm = parts per million
mg/m^3 = milligram per cubic meter
eV – electron volt

4.0 Personnel

4.1 CCI Employee Medical Surveillance and Training

Reference CH2M HILL SOP HS-01, Medical Surveillance, and HS-02, Health and Safety Training

The employees listed in Table 4-1 are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SHSS" have received 8 hours of supervisor and instrument training and can serve as SHSS for the level of protection indicated. An SHSS with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and cardiopulmonary resuscitation (CPR). At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities, before being assigned fieldwork.

TABLE 4-1
Project Personnel Safety Certifications

Employee Name	Office	Responsibility	SHSS/FA-CPR
Mike Halil	JAX	Project Manager	FA-CPR
TBD		Site Superintendent	
TBD		SHSS	
Eric Burrell	ATL	QC Manager	Level C SHSS; FA-CPR
Robert Nash	ATL	H&S Manager	Level B SHSS; FA-CPR

4.2 Field Team Chain of Command and Communication Procedures

4.2.1 Client

Contact Name: Eva Clement, Naval Facilities Engineering Command, North Charleston, South Carolina

4.2.2 CCI

Project Manager: Mike Halil/J.A. Jones/ JAX

Health and Safety Manager: Robert Nash/ATL

Site Superintendent: TBD

Site Health and Safety Specialist: TBD

The SHSS is responsible for contacting the site superintendent and the project manager. In general, the project manager either will contact or will identify the client contact. The HSM should be contacted as appropriate. The SHSS or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by OSHA or other agencies are conducted. Refer to Sections 10 through 12 for emergency procedures and phone numbers.

4.2.3 Subcontractors

Reference Section 3, Corporate Health and Safety Program Manual

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

General health and safety communication with subcontractors contracted with CCI and covered by this plan is to be conducted as follows:

- Request that the subcontractor, if a specialty subcontractor, submit a safety or health plan applicable to their expertise (e.g., drill-rig safety plan or nuclear density gauge [NDG] health plan); attach the reviewed plan.
- Supply subcontractors with a copy of this plan, and brief them on its provisions.
- Direct health and safety communication to the subcontractor-designated safety representative.
- Notify the subcontractor-designated representative if a violation of the plan(s) is observed. Specialty subcontractors are responsible for mitigating hazards in which they have expertise.
- If a hazard condition persists, inform the subcontractor. If the hazard is not mitigated, stop affected work as a last resort and notify the project manager.
- When an apparent imminent danger exists, promptly remove all affected personnel. Notify the project manager.
- Make clear that consistent violations of the health and safety plan by a subcontractor may result in termination of the subcontract.

5.0 Personal Protective Equipment

Reference CH2M HILL SOP HS-07, Personal Protective Equipment; HS-08, Respiratory Protection

5.1 PPE Specifications

PPE specifications are listed in Table 5-1.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator[b]
General work uniform when no chemical exposure is anticipated	D	Work clothes; steel-toe, steel-shank leather work boots; work gloves	Hardhat[c] Safety glasses Ear protection[d]	None required
Drilling	Modified D	**COVERALLS:** Uncoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant leather or arimid-fiber glove.	Hardhat[c] Splash shield[c] Safety glasses Ear protection[d]	None required
NOT APPROVED FOR THIS ACTIVITY	C	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H[e] cartridges or equivalent
NOT APPROVED FOR THIS ACTIVITY	B	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA): MSA Ultralite, or equivalent

[a] Modifications are as indicated. CCI will provide PPE to only CCI employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to determined by the SHSS.
[d] Ear protection should be worn while working around drill rigs or other noise-producing equipment or when conversations cannot be held at distances of 3 feet or less without shouting. Refer to Section 6 for other requirements.
[e] The GME-H cartridge is the new standard-issue cartridge. Available stock of the previously standard GMC-H cartridges may be used for tasks covered by this plan.

5.2 Upgrading or Downgrading Level of Protection

The reasons for upgrading or downgrading the PPE level are as follows:

- Upgrade
  - Request from individual performing task
  - Change in work task that will increase contact or potential contact with hazardous materials
  - Occurrence or likely occurrence of gas or vapor emission
  - Known or suspected presence of dermal hazards
  - Instrument action levels (Section 6) exceeded
- Downgrade
  - New information indicating that situation is less hazardous than originally thought
  - Change in site conditions that decreases the hazard
  - Change in work task that will reduce contact with hazardous materials

Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been specified in Section 5.0 and an SHSS who meets the requirements specified in Section 4.1 is present.

6.0 Air Monitoring Specifications

Reference CH2M HILL SOP HS-06, Air Monitoring

Air monitoring specifications are listed in Table 6-1.

TABLE 6-1
Air Monitoring Specifications

Instrument	Action Levels[a]	Frequency[b]	Calibration
PID MiniRAE with 10.6eV lamp or equivalent	0 – 15 ppm – Level D > 15 ppm – Stop Work	Initially and periodically during task	Daily

[a] Action levels apply to sustained breathing-zone measurements above background.
[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SHSS; generally, every 5 to 15 minutes is acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time and measurement result, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3," "at surface/SB-2," etc.).
ppm = parts per million
Action Levels will be established in Site Specific HSP, when concentrations for Contaminants of Concern are evaluated.

6.1 Calibration Specifications

Calibration specifications are listed in Table 6-2. Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures.

TABLE 6-2
Calibration Specifications

Instrument	Calibration Gas	Span	Reading	Method
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF=53	53 ppm ±5 ppm	1.5 lpm REG T-Tubing

ppm = parts per million

6.2 Air Sampling

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

6.2.1 Method Description

Real time air monitoring will be performed. Contact HSM if assistance is required.

6.2.2 Personnel and Areas

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

7.0 Decontamination

Reference CH2M HILL SOP HS-13, Decontamination

The SHSS must monitor the effectiveness of the decontamination procedures. Decontamination procedures found to be ineffective will be modified by the SHSS.

7.1 Decontamination Specifications

Decontamination specifications are listed in Table 7-1.

TABLE 7-1
Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse • Glove wash/rinse • Body-suit removal • Hand wash/rinse • Face wash/rinse • Shower ASAP • **PPE-disposal method** Dispose in drums • **Water-disposal method** Dispose in drums	• Wash/rinse equipment • Solvent-rinse equipment • **Solvent-disposal method** Dispose in drums	• Power wash • Steam clean • **Water-disposal method** Dispose in drums

7.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SHSS should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a typical establishment of work zones, including the decontamination line. Work zones are to be modified by the SHSS to accommodate task-specific requirements.

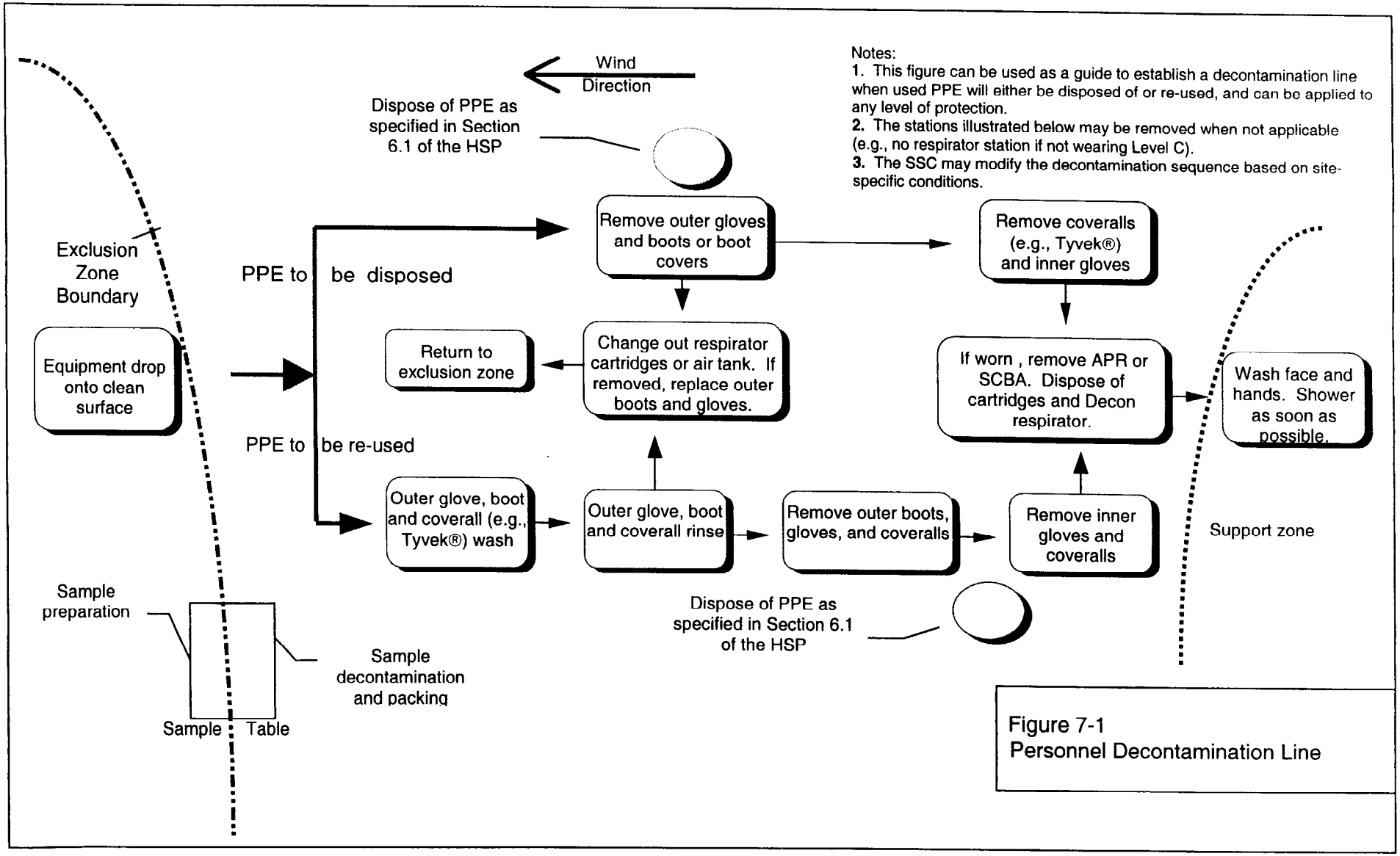


Figure 7-1
Personnel Decontamination Line

8.0 Spill Prevention and Control Plan

This Spill Prevention and Control Plan establishes minimum site requirements. Subcontractors are responsible for spill prevention and control related to their operations. Subcontractors written spill prevention and control procedures must be consistent with this plan. Spills must be reported to your supervisor, the site manager, and the Contract Manager.

8.1 Spill Prevention

Fuel and chemical storage areas will be properly protected from onsite and offsite vehicle traffic. Fuel storage tanks must be equipped with secondary containment. Fuel tanks must be inspected daily for signs of leaks. Accumulated water must be inspected for signs of product before discharge.

Incidental chemical products must be properly stored, transferred, and used in a safe manner. Should chemical product use occur outside areas equipped with spill control materials, adequate spill control materials must be maintained.

8.2 Spill Containment and Control

Spill control materials will be maintained in the support zone and at fuel storage and dispensing locations. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include:

- Immediately warn any nearby personnel and notify the work supervisor.
- Assess the spill area to ensure that it is safe to approach.
- Activate site evacuation signal if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.
- If it can be done safely, stop the source of the spill.
- Establish site control for the spill area.
- Use proper PPE in responding to the spill.
- Contain and control spilled material through the use of sorbent booms, pads, or other materials.

8.3 Spill Cleanup and Removal

Spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be drummed, labeled, and properly stored until material is disposed of. Contaminated material will be disposed of according to applicable federal, state, and local requirements. Contact the regulatory compliance person for the project or the program for assistance.

9.0 Confined-Space Entry

Reference CH2M HILL SOP HS-17, Confined Space Entry

Confined-space entry requires health and safety procedures, training, and a permit.

When planned activities include confined-space entry, permit-required confined spaces accessible to CCI personnel are to be identified before the task begins. The SHSS will confirm that permit spaces are properly posted or that employees are informed of their locations and informed of their hazards.

When confined space entry is required, the SSHS will maintain a copy of SOP HS-17 onsite.

10.0 Site Control Plan

10.1 Site Control Procedures

The following site control procedures will be implemented for this CTO:

- SHSS will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of health and safety plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- SHSS records attendance at safety briefings in logbook and documents topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location at sites where project field offices, trailers, or equipment storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones. Delineate work zones with flags or cones as appropriate. The support zone (SZ) should be upwind of the site.
- Establish decontamination procedures, including respirator-decontamination procedures, and test the procedures.
- Use access control at the entry and exit from each work zone.
- Store chemicals in appropriate containers.
- Make MSDSs available for onsite chemicals to which employees are exposed.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Establish procedures for disposing of material generated on the site.
- Initial air monitoring is conducted by the SHSS in appropriate level of protection.

- SHSS is to conduct periodic inspections of work practices to determine the effectiveness of this plan -- refer to CH2M HILL SOP 18, *Health and Safety* Checklist. Deficiencies are to be noted, reported to the HSM, and corrected.

10.2 HAZWOPER Compliance Plan

Reference CH2M HILL SOP HS-17, Health and Safety Plans

The following procedures are to be followed when certain activities do not require 24- or 40-hour training. Note that prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.

- Certain parts of the site work may be covered by state or federal HAZWOPER standards and therefore require training and medical monitoring. Anticipated tasks must be included in Section 2.2.1.

- Air sampling must confirm that there is no exposure to gases or vapors before non-HAZWOPER-trained personnel are allowed on the site. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to Sections 3.8 and 6.2 for contaminant data and air sampling requirements, respectively.

- Non-HAZWOPER-trained personnel must be informed of the nature of the existing contamination and its locations, the limits of their access, and the emergency action plan for the site. Non-HAZWOPER-trained personnel also must be trained in accordance with other state and federal OSHA requirements, including 29 CFR 1910.1200 (HAZCOM). Refer to Section 3.7.1 for hazard communication requirements.

- Air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-HAZWOPER-trained personnel (e.g., in an adjacent area) are not exposed to volatile contaminants. Non-HAZWOPER-trained personnel should be monitored whenever the belief is that there may be a possibility of exposure (e.g., change in site conditions), or at some reasonable frequency to confirm that there is no exposure. Refer to Section 6.1 for air monitoring requirements.

- Treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the HAZWOPER standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only HAZWOPER-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-HAZWOPER-trained personnel must leave the site.

If HAZWOPER-regulated tasks are conducted concurrently with nonregulated tasks, non-HAZWOPER-trained subcontractors must be removed from areas of exposure. If non-HAZWOPER-trained personnel remain on the site while a HAZWOPER-regulated task is conducted, the contaminant/exposure area (exclusion zone) must be posted, non-HAZWOPER-trained personnel must be reminded of the locations of restricted areas and the limits of their access, and real-time monitoring must be conducted. Non-HAZWOPER-trained personnel at risk of exposure must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

11.0 Emergency Response Plan

Reference CH2M HILL SOP HS-12, Emergency Response

11.1 Pre-Emergency Planning

SHSS performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Locate the nearest telephone; determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Identify and communicate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Post site map marked with locations of emergency equipment and supplies, and post OSHA job-site poster. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Evaluate capabilities of local response teams where applicable.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases.
- Review notification procedures for contacting CCI's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin, including driving the route to the hospital.

- Brief new workers on the emergency response plan.
- The SHSS will evaluate emergency response actions and initiate appropriate follow-up actions.

11.2 Emergency Equipment and Supplies

The SHSS should mark the locations of emergency equipment on the site map and should post the map. Emergency equipment and its location are listed in Table 11-1.

TABLE 11-1
Emergency Equipment

Emergency Equipment and Supplies	Location
20 lb (or two 10-lb) fire extinguisher (A, B, and C classes)	In Field Vehicle
First aid kit	In Field Vehicle
Eye wash	In Field Vehicle
Potable water	In Field Vehicle
Bloodborne-pathogen kit	In Field Vehicle
Additional equipment (specify)	

11.3 Emergency Medical Treatment

Emergency medical treatment procedures are as follows:

- Notify appropriate emergency response authorities listed in Sections 11.9 and 11.11 (e.g., 911).
- During a time of no emergency, contact CCI's medical consultant for advice and guidance on medical treatment.
- The SHSS will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Notify the field team leader and the project manager of the injury.
- Make certain that the injured person is accompanied to the emergency room.
- Notify the health and safety manager.
- Notify the injured person's human resources department within 24 hours.

- Prepare an incident report -- refer to CH2M HILL SOP 12, *Emergency Response and First Aid*. Submit the report to the corporate director of health and safety and the corporate human resources department within 48 hours.
- When contacting the medical consultant, state that you are calling about a CCI matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.

11.4 Non-emergency Procedures

The procedures listed above may be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CCI medical consultant.

When contacting the medical consultant, state that the situation is a CCI matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken. Follow these procedures as appropriate.

11.5 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CCI operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Notify appropriate response personnel.
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

11.6 Evacuation

Evacuation procedures are as follows:

- Evacuation routes will be designated by the SHSS before work begins.
- Onsite and offsite assembly points will be designated before work begins.
- Personnel will leave the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation.
- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- SHSS and a "buddy" will remain on the site after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- SHSS accounts for all personnel in the onsite assembly zone.

- A person designated by the SHSS before work begins will account for personnel at the offsite assembly area.
- The SHSS will write up the incident as soon as possible after it occurs and will submit a report to the corporate director of health and safety.

11.7 Evacuation Routes and Assembly Points

Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map posted at the site.

11.8 Evacuation Signals

Evacuation signals are listed in Table 11-2.

TABLE 11-2
Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency–help me
Thumbs up	OK; understood
Grasping buddy's wrist	Leave area now
Continuous sounding of horn	Emergency; leave site now

11.9 Emergency Response Telephone Numbers

Emergency response telephone numbers are listed in Table 11-3.

TABLE 11-3
Emergency Response Telephone Numbers

Site Address:	Phone: Cellular Phone:
Police: Base Security	**Phone:** 911 or 673-4256
Fire: Base Fire Department	**Phone:** 911
Ambulance: Base Fire Department	**Phone:** 911
Hospital: Camden Medical Center	**Phone:** 912/576-4200
Address: 2000 Dan Proctor Dr, St. Marys, Georgia	

*When using a cellular phone outside the telephone's normal calling area, exercise caution in relying on the cellular phone to activate 911. When the caller is outside the normal calling area, the cellular service carrier should connect the caller with emergency services in the area where the call originated, but this may not occur. Telephone numbers of backup emergency services should be provided if a cellular phone is relied on to activate 911.

Route to Hospital: Proceed directly out Kings Bay Road	1.6 miles
Turn LEFT onto Highway 78	0.1 miles
Turn LEFT onto Dan Proctor Drive	0.2 miles

Distance 1.9 miles

The hospital location map is provided in Figure 11-1.

11.10 Government Agencies Involved in Project

Federal Agency and Contact Name: Naval Facilities Engineering Command

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

11.11 Emergency Contacts

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury. Emergency contacts are listed in Table 11-4.

TABLE 11-4
Emergency Contacts

CCI Medical Consultant Dr. Peter P Greany WorkCare Inc.,333 S. Anita Drive Orange, CA 92868,800/455-6155 (After-hours calls will be returned within 20 minutes.)	**Occupational Physician (Local)**
CCI Drug-Free Workplace Program Administrator Alicia Sweeney/ATL 770/604-9095	**Site Safety and Health Specialist (SHSS)** TBD
Navy RAC Health and Safety Manager (HSM) Robert Nash/ATL 770/604-9095	**Project Manager** Mike Halil 904/777-4812
Radiation Health Manager (RHM) Dave McCormack/SEA 206/453-5000	**Human Resources Manager** Nancy Orr /DEN 303/771-0925
Client Eva Clements Naval Facilities Engineering Command	**Corporate Human Resources Department** Julie Zimmerman/COR 303/771-0900
Federal Express Dangerous Goods Shipping 800/238-5355 CH2M HILL Emergency Number for Shipping Dangerous Goods 800/255-3924	**Worker's Compensation and Auto Claims** Sterling Administrative Services 800/420-8926 After hours 800/497-4566 Report fatalities & report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

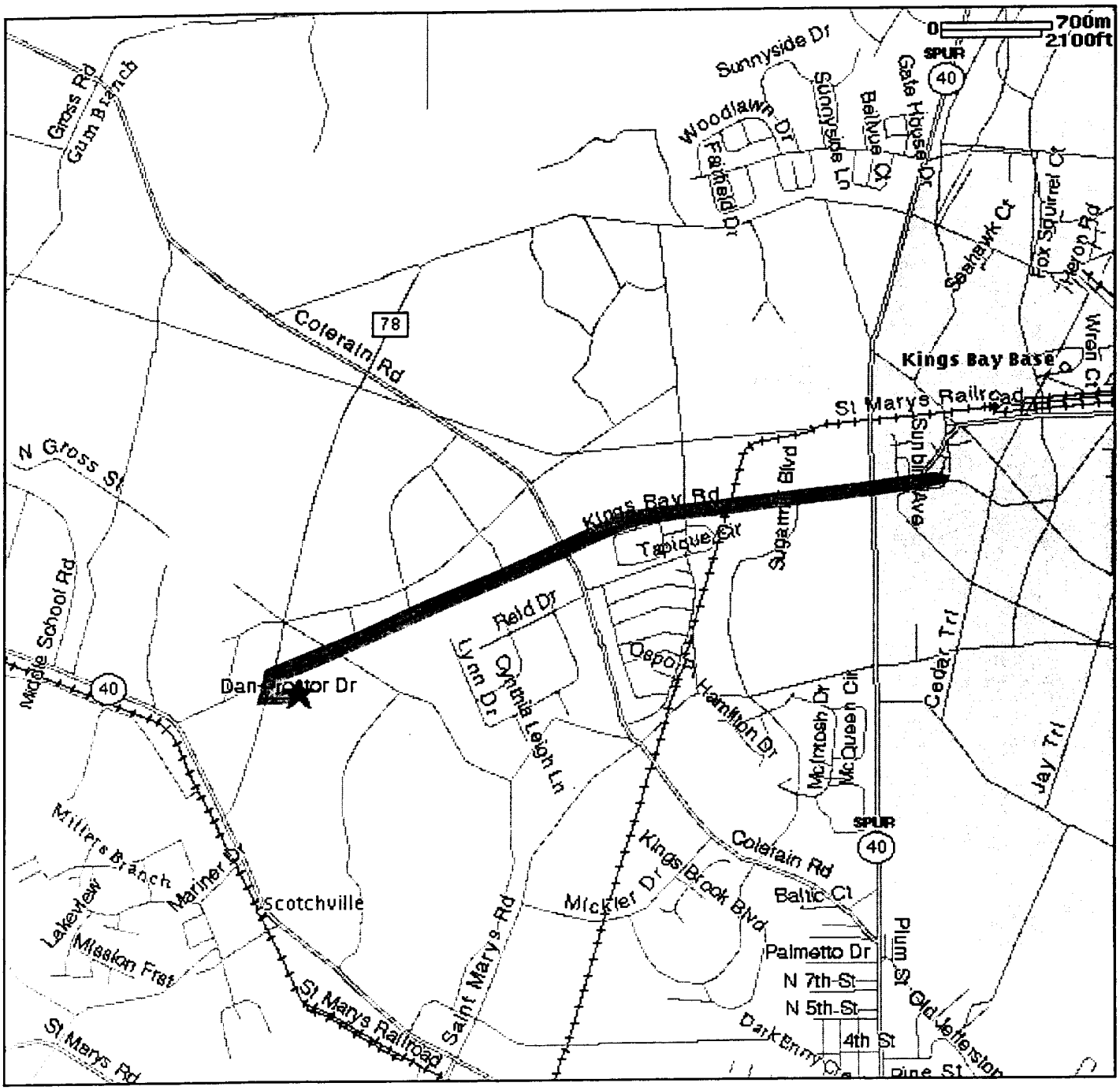


Figure 11-1
Hospital Location Map

12.0 Approval

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

12.1 Original Plan

Written by: Date:

Approved by: Robert Nash Date: October 2000

12.2 Revisions

Revisions Made by: Date:

Revisions to Plan:

Revisions Approved by: Date:

13.0 Distribution

Distribution for this plan is listed in Table 13-1.

TABLE 13-1
Distribution List

Name	Office	Responsibility	Number of Copies
Robert Nash	ATL	Health and Safety Manager/Approver	1
Mike Halil	JAX	Project Manager	1
TBD		Site Superintendent/Field Team	
TBD		Site Safety and Health Specialist	1
Client	NA	Client Project Manager	

Attachment 1

Employee Signoff

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CCI project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: Naval Sub Base Kings Bay **Project Number:**

EMPLOYEE NAME (Please print)	**EMPLOYEE SIGNATURE**	**COMPANY**	**DATE**

Attachment 2

Project Specific Chemical Product Hazard Communication Form

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SSC will verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: Naval Sub Base Kings Bay **Project Number:**

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	*Container labels* Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrogen	1 Cylinder	Support/Decon Zones			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
Ph buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

Attachment 3

Chemical-Specific Training Form

CCI CHEMICAL-SPECIFIC TRAINING FORM

Location: Naval Sub Base Kings Bay	Project # :
SSHS:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC will use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants will have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program will be made available for employee review in the facility/project hazard communication file.

Attachment 4

Material Safety Data Sheets

SCOTT SPECIALTY GASES -- ISOBUTYLENE IN AIR - CALIBRATION GAS CYL
MATERIAL SAFETY DATA SHEET
NSN: 6665012148247
Manufacturer's CAGE: 51847
Part No. Indicator: A
Part Number/Trade Name: ISOBUTYLENE IN AIR

General Information

Item Name: CALIBRATION GAS CYL
Company's Name: SCOTT SPECIALTY GASES
Company's Street: ROUTE 611 NORTH
Company's City: PLUMSTEADVILLE
Company's State: PA
Company's Country: US
Company's Zip Code: 18949
Company's Emerg Ph #: 215-766-8861; 908-754-7700
Company's Info Ph #: 215-766-8861
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 005
Status: SMJ
Date MSDS Prepared: 23APR92
Safety Data Review Date: 27SEP94
MSDS Serial Number: BVRGC
Hazard Characteristic Code: G3

Ingredients/Identity Information

Proprietary: NO
Ingredient: PROPENE, 2-METHYL-; (ISOBUTYLENE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: UD0890000
CAS Number: 115-11-7
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: AIR, REFRIGERATED LIQUID; AIR COMPRESSED (UN1002, DOT); AIR REFRIGERATED LIQUID (CRYOGENIC LIQUID) (UN1003) (DOT)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: AX5271000
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS GAS W/POSSIBLE SLIGHT OLEFINIC ODOR.
Boiling Point: -318F,-194C
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): 1.2
Specific Gravity: 0.88 (H*2O=1)
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: INSOLUBLE
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: NONFLAMMABLE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: USE WHAT IS APPROPRIATE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N). USE WATER SPRAY TO KEEP FIRE EXPOSED CYLINDERS COOL.
Unusual Fire And Expl Hazrds: COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF FLAMMABLE MATERIALS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: NONE.
Hazardous Decomp Products: NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE:CONCENTRATION OF ISOBUTYLENE IS THIS MIXTURE SHOULD NOT PRESENT ANY SYMPTOMS OF TOXICITY. CHRONIC:NONE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: NONE SPECIFIED BY MANUFACTURER.
Med Cond Aggravated By Exp: NONE.
IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINUTES, SEEK ASSISTANCE FROM MD (FP N). SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. CALL MD (FP N). INHAL:IMMEDIATELY REMOVE VICTIM TO FRESH AIR. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE & VENTILATE AREA. REMOVE LEAKING CYLINDER TO EXHAUST HOOD OR SAFE OUTDOORS AREA IF THIS CAN BE DONE SAFELY.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). RETURN CYLS TO SUPPLIER FOR PROPER DISP W/ANY VALVE OUTLET PLUGS/CAPS SECURED & VALVE PROT CAP IN PLACE. ALLOW GAS TO DISCHARGE AT SLOW RATE TO ATM IN UNCONFINED AREA/EXHST HOOD.
Precautions-Handling/Storing: STORE IN WELL VENTILATED AREAS ONLY. KEEP VALVE PROT CAP ON CYLS WHEN NOT IN USE & SECURE CYL WHEN USING TO PROT FROM FALLING.
Other Precautions: USE SUITABLE HAND TRUCK TO MOVE CYLS. PROT CYLS FROM PHYSICAL DMG. DO NOT DEFACE CYLS/LBLS. MOVE CYL W/ADEQ HAND TRUCK. CYL SHOULD BE REFILLED BY QUALIFIED PRODUCERS OF COMPRESSED GAS. SHIPMENT OF COMPRESSED GAS CYL WHICH HAS NOT (SUPDAT)

Control Measures

Respiratory Protection: USE NIOSH/MSHA APPROVED SCBA IN CASE OF EMERGENCY OR NON-ROUTINE USE.
Ventilation: PROVIDE ADEQUATE GENERAL & LOCAL EXHAUST VENTILATION.
Protective Gloves: RUBBER GLOVES.
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: WEAR SAFETY SHOES. A SAFETY SHOWER & EYEWASH STATION SHOULD BE READILY AVAILABLE.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: OTHER PREC:BEEN FILLED BY OWNER OR WITH HIS WRITTEN CONSENT IS A VIOLATION OF FEDERAL LAW (49 CFR).

Transportation Data

Trans Data Review Date: 94269

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 27SEP94
Label Date: 26SEP94
Label Status: G
Common Name: ISOBUTYLENE IN AIR
Chronic Hazard: NO
Signal Word: NONE
Acute Health Hazard-None: X
Contact Hazard-None: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE:CONCENTRATION OF ISOBUTYLENE IS THIS MIXTURE SHOULD NOT PRESENT ANY SYMPTOMS OF TOXICITY. CHRONIC:NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: SCOTT SPECIALTY GASES
Label Street: ROUTE 611 NORTH
Label City: PLUMSTEADVILLE
Label State: PA
Label Zip Code: 18949
Label Country: US
Label Emergency Number: 215-766-8861; 908-754-7700

Attachment 5

Self Assessment Checklist

CH2MHILL ***JOBSITE SAFETY INSPECTION CHECKLIST*** Revision.: 03

STANDARD OF PRACTICE HS-18 - HEALTH AND SAFETY CHECKLIST Date: 05/01/98

Note: The following jobsite safety inspection checklist is to be used only at locations where CCI controls the work. It is not to be used at locations where others control the work.

Project Name: Naval Sub Base Kings Bay Project No.: _____

Location: Kings Bay Georgia Project Manager: Mike Halil

Inspector: _____ Date: _____

This checklist has been divided into two sections. The first section (I through XXVI) are applicable to all projects. The second section (XXVII through XXIX) addresses specific situations such as hazardous waste, construction activities, and office trailers. There may be some duplication between the first and second sections.

If an item is not applicable, the column titled "N/A" should be checked. If an item is applicable but the auditor does not observe it during the inspection, the "N/O" column should be checked. For each deficiency noted, a Health and Safety Audit Finding Form must be completed. The Corporate Health and Safety Director must be copied on the results of all audits.

Check "Yes" for Items Completed	Yes	No	N/A	N/O
I. JOBSITE OFFICE				
1. Posters and safety signs in place:				
a. OSHA safety poster	☐	☐	☐	☐
b. Emergency Telephone Number Form	☐	☐	☐	☐
c. Workers Compensation Form	☐	☐	☐	☐
2. First aid kit:				
a. Fully stocked/sufficient supply	☐	☐	☐	☐
b. First-aid administered by a person with a valid certificate	☐	☐	☐	☐
3. Bloodborne-pathogen kit	☐	☐	☐	☐
4. Accident/injury reporting:				
a. Employees briefed	☐	☐	☐	☐
b. Forms available	☐	☐	☐	☐
c. Injuries and illnesses reported and logged	☐	☐	☐	☐
d. Accidents investigated and properly followed up to prevent	☐	☐	☐	☐
e. Accident reports and logs submitted promptly as required	☐	☐	☐	☐

5.	Job safety rules and regulations available/posted	☐	☐	☐	
II.	**HAZARD COMMUNICATION**				
1.	Employee training:				
	a. Employees' signed training certificates on file	☐	☐	☐	☐
2.	Material safety data sheets (MSDSs):				
	a. MSDSs on file	☐	☐	☐	☐
	b. Log assigned to competent person	☐	☐	☐	☐
	c. Log complete and up to date	☐	☐	☐	☐
3.	Written program on file	☐	☐	☐	☐
III.	**EMPLOYEE TRAINING**				
1.	Safety indoctrination held for new employees	☐	☐	☐	☐
2.	Sufficient instruction given in recognition and avoidance of job hazards; unsafe conditions; and job rules, regulations, and procedures	☐	☐	☐	☐
3.	Sufficient instruction in proper use and maintenance of tools, equipment, and personal protective equipment	☐	☐	☐	☐
4.	Employees instructed to report unsafe or hazardous conditions to proper job supervisor	☐	☐	☐	☐
5.	Employees instructed to promptly report injury, illness, and accidents involving damage to equipment and materials	☐	☐	☐	
6.	All site personnel have read the job safety rules and regulations and have signed the "Employee Signoff Sheet"	☐	☐	☐	☐
IV.	**JOBSITE LOGISTICS AND LAYOUT**				
1.	Traffic routes around construction areas:				
	a. Warning signs, flagging in place	☐	☐	☐	☐
2.	Trucks and heavy equipment:				
	a. Good mechanical conditions	☐	☐	☐	☐
	b. Backup signals working	☐	☐	☐	☐
	c. Seat belts installed and used	☐	☐	☐	☐
V.	**PUBLIC PROTECTION**				
1.	Warning signs in place around site	☐	☐	☐	☐
VI.	**HOUSEKEEPING**				
1.	Material storage yard:				
	a. Stacked neatly and properly	☐	☐	☐	☐
2.	Check work areas for:				
	a. Loose and waste materials	☐	☐	☐	☐
	c. Empty bottles, containers, papers, trash, bands, etc.	☐	☐	☐	

d. Trash cans, dumpsters available and emptied regularly	☐	☐	☐	☐
e. Trash receptacles provided for drinking cups	☐	☐	☐	☐
VII. PERSONAL PROTECTIVE EQUIPMENT (PPE)				
1. Hard hats	☐	☐	☐	☐
2. Safety shoes/boots	☐	☐	☐	☐
3. Eye/face protection	☐	☐	☐	☐
4. Ear protection:				
a. Noise level areas of 90 dBA and above identified	☐	☐	☐	☐
b. Signs notifying personnel of "Hearing Protection Required" posted	☐	☐	☐	☐
6. Specialized equipment:				
a. Gloves	☐	☐	☐	☐
7. Tools:				
a. Handles in good shape	☐	☐	☐	☐
b Tool guards in place	☐	☐	☐	☐
c. Proper tools used for the job	☐	☐	☐	☐
d. Tools maintained in functional condition (hammer heads not mushroomed)	☐	☐	☐	☐
VIII. SANITATION				
1. Temporary toilets:				
a. Serviced regularly	☐	☐	☐	☐
b. Sufficient Quantity (20 or fewer employees - 1 required; 20 or more employees - 1 toilet and 1 urinal per 40 workers	☐	☐	☐	☐
2. Potable Water:				
a. Tightly closed containers	☐	☐	☐	☐
b. Equipped with tap	☐	☐	☐	☐
c. Paper cups available	☐	☐	☐	☐
d. Containers labeled "Drinking Water"	☐	☐	☐	☐
IX. FLOOR AND WALL OPENINGS GUARDS				
XI. SCAFFOLDING				
XII. ELECTRICAL				
1. Cords/devices have current inspection color code tape installed	☐	☐	☐	☐
2. Frayed cords, broken plugs fixed	☐	☐	☐	☐
3. Temporary wiring:				
a. Panels secured and GFCIs working	☐	☐	☐	☐

b.	Away from vehicle pathways	☐	☐	☐	☐
c.	Out of water/moisture	☐	☐	☐	☐
d.	No broken receptacles found	☐	☐	☐	☐
e.	Sufficient outlets for all crafts	☐	☐	☐	☐
4.	Assured equipment grounding conductor program in place, if not using GFCIs	☐	☐	☐	☐
5.	Lock-out or tag-out system used when necessary	☐	☐	☐	☐

XIII. TEMPORARY HEATERS

XIV. FIRE PROTECTION

1.	Office fire extinguisher in working order and inspected regularly	☐	☐	☐	☐
2.	One extinguisher, 2A rating, for each 3,000 square feet of protected area	☐	☐	☐	☐
3.	One extinguisher, 2A rating, on each floor adjacent to each stairway	☐	☐	☐	☐
4.	Trash, paper, other combustibles picked up	☐	☐	☐	☐
5.	Welders/roofers have extinguishers nearby and a fire watch is available if needed	☐	☐	☐	☐

XV. MATERIAL STORAGE AND HANDLING

1.	Neat storage area, clear passageways	☐	☐	☐	☐
2.	Materials spotted to minimize rehandling and reduce transport distances	☐	☐	☐	☐
3.	Power equipment used to handle heavy/awkward loads	☐	☐	☐	☐
4.	Employees using proper lifting methods, picking up loads correctly	☐	☐	☐	☐

XVI. DEMOLITION WORK

XVII. STEEL ERECTION

XX. FLAMMABLE AND COMBUSTIBLE LIQUIDS

1.	All containers clearly marked to show contents (gas cylinders, cans, drums, fuel tanks, etc.)	☐	☐	☐	☐
2.	Proper storage practices observed:				
a.	Storage areas enclosed or protected from heat and mobile equipment exposure	☐	☐	☐	☐
b.	Fire hazards checked	☐	☐	☐	☐
c.	Sufficient fire extinguishers	☐	☐	☐	☐
d.	UL approved safety cans for 1 to 5 gallons of flammable liquids	☐	☐	☐	☐

e.	Approved cabinet for indoor storage of liquids in excess of 25-gallons, but not more than 120-gallon storage	☐	☐	☐	☐
f.	Sign labeled "Flammable - Keep Fire Away" posted on cabinet	☐	☐	☐	☐

XXI. FLAMMABLE GAS (Oxygen/Acetylene)

1.	Cylinders:				
a.	Away from heat	☐	☐	☐	☐
b.	Stored upright (secured)	☐	☐	☐	☐
c.	Valves closed on empty cylinders	☐	☐	☐	☐
d.	Valve protection caps in place if cylinder not in use	☐	☐	☐	☐
e.	Valve key wrench available	☐	☐	☐	☐
f.	Portable rack with bottles secured	☐	☐	☐	☐
g.	Instruct project staff to never drag or slide bottles	☐	☐	☐	☐
h.	Designated storage area	☐	☐	☐	☐
i.	"No Smoking" signs posted	☐	☐	☐	☐
j.	Oxygen bottles stored 20' from acetylene bottles or 1/2-hour fire barrier installed between them	☐	☐	☐	☐
2.	Gauges/valves/hoses:	☐	☐	☐	☐
a.	Good condition	☐	☐	☐	☐
b.	Fire arresters installed (both hoses)	☐	☐	☐	☐
3.	Eye protection available	☐	☐	☐	☐
4.	Ventilation adequate	☐	☐	☐	☐
5.	When in use, gas lines properly located to prevent tripping and falling	☐	☐	☐	☐
6.	All burning torches bled and free of oxygen and acetylene and/or other gases during lunch breaks and other extended periods of time	☐	☐	☐	☐

XXII. WELDING OPERATIONS

1.	Performed by qualified personnel	☐	☐	☐	☐
2.	Screens, shields, or eye protection provided and used to protect employees from welding operation	☐	☐	☐	☐
3.	Employees wear sufficient clothing and PPE	☐	☐	☐	☐
4.	Equipment checked before use and in operative conditions	☐	☐	☐	☐

5.	Electrical equipment grounded	☐	☐	☐	
6.	Power cables protected and in good repair	☐	☐	☐	☐
7.	Power cables properly located to prevent tripping and falling hazards	☐	☐	☐	☐
8.	Dry chemical fire extinguisher within 30 feet	☐	☐	☐	☐
9.	Exposed combustible materials removed to safe location or properly protected from sparks and slag	☐	☐	☐	☐
10.	Valid hot work permit required or provided	☐	☐	☐	☐
11.	Overhead protection provided where required	☐	☐	☐	☐
12.	"Danger - No Smoking, Matches or Open Lights" signs posted when required	☐	☐	☐	☐
13.	Adequate lighting and ventilation provided	☐	☐	☐	☐
14.	Machines turned off at end of shift or when not in use for extended periods	☐	☐	☐	☐

XXIII. HOISTS

XXIV. BLASTING

XXV. HAZARDOUS WASTE

Certification and Training of Personnel

1.	Medical exam within last 12 months	☐	☐	☐	☐
2.	40-hour initial training, 3 days supervised field activities, 8-hour Annual refresher	☐	☐	☐	☐
3.	First aid and CPR certification	☐	☐	☐	☐
4.	Attend pre-entry safety meeting	☐	☐	☐	☐

Site Safety Documentation

1.	Site health and safety plan (HSP) prepared and approved	☐	☐	☐	☐
2.	HSP onsite	☐	☐	☐	☐
3.	All personnel onsite identified in HSP	☐	☐	☐	☐
4.	Documentation of safety briefing	☐	☐	☐	☐
5.	Hospital map posted	☐	☐	☐	☐
6.	Phone numbers posted	☐	☐	☐	☐
7.	Emergency vehicle identified	☐	☐	☐	☐
8.	Material Safety Data Sheets (MSDSs) onsite	☐	☐	☐	☐

9.	Work zones delineated (How? _____)	☐	☐	☐	☐
10.	Wind direction flags in use	☐	☐	☐	☐
11.	Documentation of calibration of monitoring equipment in Clean environment	☐	☐	☐	☐
12.	Monitoring conducted and recorded as specified in HSP (Frequency? _____)	☐	☐	☐	☐
13.	Monitoring for heat/cold stress	☐	☐	☐	☐
14.	Buddy system in use	☐	☐	☐	☐
15.	Decontamination procedures established as specified in HSP	☐	☐	☐	☐
16.	No eating, drinking, or smoking in exclusion and contamination Reduction zones	☐	☐	☐	☐
17.	Toilet facilities provided	☐	☐	☐	☐
18.	No contact lenses	☐	☐	☐	☐
19.	Work conducted during daylight hours only	☐	☐	☐	☐

Safety Briefing

1.	All personnel attended (including new personnel)	☐	☐	☐	☐
2.	Documentation of meetings	☐	☐	☐	☐
3.	Chemical hazards and toxicology reviewed	☐	☐	☐	☐
4.	Physical hazards reviewed	☐	☐	☐	☐
5.	Biological hazards reviewed	☐	☐	☐	☐
6.	Heat/cold stress information reviewed	☐	☐	☐	☐
7.	Air monitoring requirements	☐	☐	☐	☐
8.	Levels of protection reviewed	☐	☐	☐	☐
9.	Work zones reviewed	☐	☐	☐	☐
10.	Decontamination procedures reviewed	☐	☐	☐	☐
11.	Emergency response procedures reviewed	☐	☐	☐	☐

12. Site communications ☐ ☐ ☐ ☐

Personal Protective Equipment (PPE)

1. Levels of protection being worn as specified in HSP ☐ ☐ ☐ ☐
2. All appropriate PPE available onsite ☐ ☐ ☐ ☐
3. Hard hats being worn ☐ ☐ ☐ ☐
4. Appropriate hand protection being used ☐ ☐ ☐ ☐
   (What? _____)
5. Appropriate body protection being used ☐ ☐ ☐ ☐
   (What? _____)
6. Appropriate eye protection being used ☐ ☐ ☐ ☐
   (What? _____)
7. Appropriate ear protection being used ☐ ☐ ☐ ☐
8. If PPE is not onsite, prepared to halt work ☐ ☐ ☐ ☐
9. Disposal methods in place for disposable PPE ☐ ☐ ☐ ☐

Decontamination Procedures

1. Decontamination procedure established as specified in the HSP ☐ ☐ ☐ ☐
2. Decontamination zone clearly defined ☐ ☐ ☐ ☐
3. PPE properly decontaminated ☐ ☐ ☐ ☐
   (How? _____)
4. Sampling equipment properly decontaminated ☐ ☐ ☐ ☐
   (How? _____)
5. Monitoring equipment properly decontaminated ☐ ☐ ☐ ☐
   (How? _____)
6. Heavy equipment properly decontaminated ☐ ☐ ☐ ☐
   (How? _____)
7. Samples properly decontaminated ☐ ☐ ☐ ☐
   (How? _____)
8. Decontamination fluids appropriately disposed of ☐ ☐ ☐ ☐

XXVI. CONSTRUCTION INSPECTIONS
XXVII. OFFICE TRAILERS/BUILDINGS

Employer Posting

1. Is the OSHA (or state) job safety poster displayed in a prominent location where all employees are likely to see it? ☐ ☐ ☐ ☐

2. Are emergency telephone numbers posted where they can be readily found in case of emergency? ☐ ☐ ☐ ☐
3. Where employees may be exposed to any toxic substances or harmful physical agents, has appropriate information concerning employee access to medical and exposure records and Material Safety Data Sheets been posted or otherwise made readily available to affected employees? ☐ ☐ ☐ ☐
4. Are signs concerning exiting from buildings, room capacities, floor loading, exposures to x-ray, microwave, or other harmful radiation or substances posted where appropriate? ☐ ☐ ☐ ☐
5. Are other required posters properly displayed, such as:
   a. Industrial Welfare Commission orders regulating wages, hours, and working conditions? ☐ ☐ ☐ ☐
   b. Discrimination in employment prohibited by law? ☐ ☐ ☐ ☐
   c. Notice to employees of unemployment and disability insurance. ☐ ☐ ☐ ☐
   d. Payday notice? ☐ ☐ ☐ ☐

Emergency Action Plan

1. Are alarm systems properly maintained and tested regularly? ☐ ☐ ☐ ☐
2. Is the emergency action plan reviewed and revised periodically? ☐ ☐ ☐ ☐
3 Do employees know their responsibilities: ☐ ☐ ☐ ☐
   a. For reporting emergencies? ☐ ☐ ☐ ☐
   b. During an emergency? ☐ ☐ ☐ ☐
   c. For conducting rescue and medical duties? ☐ ☐ ☐ ☐

Fire Protection

1. Is there a current fire prevention plan? ☐ ☐ ☐ ☐
2. Does the plan describe the type of fire protection equipment and/or ☐ ☐ ☐ ☐
3. Are practices and procedures established to control potential fire hazards and ignition sources? ☐ ☐ ☐ ☐
4. Is local fire department well acquainted with facilities, location, and specific hazards? ☐ ☐ ☐ ☐
5. Is there a fire alarm system and is it certified as required? ☐ ☐ ☐ ☐
6. If you have a fire alarm system, is it tested at least annually? ☐ ☐ ☐ ☐

Exiting or Egress

1. Are all exits marked with an exit sign and illuminated by a reliable light source? ☐ ☐ ☐ ☐
2. Are the directions to exits, when not immediately apparent, marked with visible signs? ☐ ☐ ☐ ☐

3. Are doors, passageways, or stairways that are neither exits nor access to exits and which could be mistaken for exits, appropriately marked "NOT AN EXIT," "TO BASEMENT," "STOREROOM," etc.? ☐ ☐ ☐ ☐

4. Are exit doors side-hinged? ☐ ☐ ☐ ☐

5. Are all exits kept free of obstructions? ☐ ☐ ☐ ☐

6. Are there sufficient exits to permit prompt escape in case of emergency? ☐ ☐ ☐ ☐

7. Are special precautions taken to protect employees during construction and repair operations? ☐ ☐ ☐ ☐

8. Where exiting will be through frameless glass door, glass exit doors, etc., and the doors fully tempered, and do they meet the safety requirements for human impact? ☐ ☐ ☐ ☐

General Work Environment

1. Are all work sites clean and orderly? ☐ ☐ ☐ ☐

2. Are work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant? ☐ ☐ ☐ ☐

3. Are all spilled materials or liquids cleaned up immediately? ☐ ☐ ☐ ☐

4. Are the minimum number of toilets and washing facilities provided? ☐ ☐ ☐ ☐

5. Are all toilets and washing facilities clean and sanitary? ☐ ☐ ☐ ☐

6. Are all work areas adequately illuminated? ☐ ☐ ☐ ☐

Walkways

1. Are aisles and passageways kept clear? ☐ ☐ ☐ ☐

2. Are aisles and walkways marked as appropriate? ☐ ☐ ☐ ☐

3. Are wet surfaces covered with nonslip materials? ☐ ☐ ☐ ☐

4. Are holes in the floor, sidewalk, or other walking surface repaired Properly, covered, or otherwise made safe? ☐ ☐ ☐ ☐

Medical Services And First Aid

1. If medical and first aid facilities are not in proximity to your workplace, is At least one employee on each shift currently qualified to render first aid? ☐ ☐ ☐ ☐

2. Are medical personnel readily available for advice and consultation on Matters of employee health? ☐ ☐ ☐ ☐

3. Are emergency phone numbers posted? ☐ ☐ ☐ ☐

4. Are first aid kits easily accessible to each work area, with necessary Supplies available, periodically inspected, and replenished as needed? ☐ ☐ ☐ ☐

5. Have first aid kit supplies been approved by a physician, indicating they are adequate for a particular area or operation? ☐ ☐ ☐ ☐

XXIX. STAIRWAYS AND LADDERS
XXX. FALL PROTECTION
XXXI. EXCAVATIONS
XXXII. DRILLING

Personnel Safe Work Practices. (3.1)

1.	Only authorized personnel operating drill rig.	☐	☐	☐	☐
2.	Personnel cleared during rig startup.	☐	☐	☐	☐
3.	Personnel clear of rotating parts.	☐	☐	☐	☐
4.	Personnel not positioned under hoisted loads.	☐	☐	☐	☐
5.	Loose clothing and jewelry removed.	☐	☐	☐	☐
6.	Personnel instructed not to approach equipment that has become electrically energized.	☐	☐	☐	☐
7.	Smoking is prohibited around drilling operation.	☐	☐	☐	☐
8.	Personnel wearing appropriate PPE, per HSP.	☐	☐	☐	☐

General (3.2.1)

9.	Daily safety briefing/meeting conducted with crew.	☐	☐	☐	☐
10.	Daily inspection of drill rig and equipment conducted before use.	☐	☐	☐	☐

Drill Rig Placement (3.2.2)

11.	Location of underground utilities identified.	☐	☐	☐	☐
12.	Safe clearance distance maintained from overhead powerlines.	☐	☐	☐	☐
13.	Drilling pad established, when necessary.	☐	☐	☐	☐
14.	Drill rig leveled and stabilized.	☐	☐	☐	☐

Drill Rig Travel (3.2.3)

15.	Rig shut down and mast lowered and secured prior to rig movement.	☐	☐	☐	☐
16.	Tools and equipment secured prior to rig movement.	☐	☐	☐	☐
17.	Only personnel seated in cab are riding on rig during movement.	☐	☐	☐	☐
18.	Safe clearance distance maintained while traveling under overhead powerlines.	☐	☐	☐	☐
19.	Backup alarm or spotter used when backing rig.	☐	☐	☐	☐

Drill Rig Operation (3.2.4)

20.	Kill switch clearly identified and operational.	☐	☐	☐	☐
21.	All machine guards are in place.	☐	☐	☐	☐

22. Rig ropes not wrapped around body parts.	☐	☐	☐	☐
23. Pressurized lines and hoses secured from whipping hazards.	☐	☐	☐	☐
24. Drill operation stopped during inclement weather.	☐	☐	☐	☐
25. Air monitoring conducted per HSP for hazardous atmospheres.	☐	☐	☐	☐
26. Rig placed in neutral when operator not at controls.	☐	☐	☐	☐
Drill Rig Maintenance (3.2.5)				
27. Defective components repaired immediately.	☐	☐	☐	☐
28. Lockout/tagout procedures used prior to maintenance.	☐	☐	☐	☐
29. Cathead in clean, sound condition.	☐	☐	☐	☐
30. Drill rig ropes and wire lines in clean, sound condition	☐	☐	☐	☐
31. Fall protection used for exposures > 6'.	☐	☐	☐	☐
32. Rig in neutral and augers stopped rotating before cleaning.	☐	☐	☐	☐
33. Good housekeeping maintained on and around rig.	☐	☐	☐	☐
Drilling at Hazardous Waste Sites (3.2.6)				
34. Waste disposal according to HSP and Environmental Protection Plan.	☐	☐	☐	☐
35. Appropriate decontamination procedures followed, per HSP>	☐	☐	☐	☐

XXXIII. EARTHMOVING EQUIPMENT
XXXIV. DEMOLITION
XXXVI. HAND AND POWER TOOLS

SAFE WORK PRACTICES (3.1)

1. All tools operated according to manufacture's instructions.	☐	☐	☐	☐
2. All hand and power tools maintained in a safe condition and inspected before each use.	☐	☐	☐	☐
3. Defective tools are tagged and removed from service until repaired.	☐	☐	☐	☐
4. PPE is selected and used according to tool-specific hazards.	☐	☐	☐	☐
5. Power tools are not carried or lowered by cord or hose.	☐	☐	☐	☐
6. Tools are disconnected from energy sources when not in use.	☐	☐	☐	☐
7. Safety guards remain installed or are promptly replaced after repair.	☐	☐	☐	☐
8. Tools are stored properly.	☐	☐	☐	☐

9.	Cordless tools and recharging units conform to electrical standards.	☐	☐	☐	☐
10.	Tools used in explosive environments are rated for such use.	☐	☐	☐	☐
11.	Knife or blade hand tools are used with the proper precautions.	☐	☐	☐	☐
12.	Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stresses.	☐	☐	☐	☐
General (3.2.1)					
13.	PPE is selected and used according to tool-specific hazards anticipated.	☐	☐	☐	☐
14.	Tools are tested daily to assure safety devices are operating properly.	☐	☐	☐	☐
15.	Damaged tools are removed from service until repaired.	☐	☐	☐	☐
16.	Power operated tools designed to accommodate guards and used.	☐	☐	☐	☐
17.	Rotating or moving parts on tools are properly guarded.	☐	☐	☐	☐
18.	Machines designed for fixed locations are secured or anchored.	☐	☐	☐	☐
19.	Floor and bench-mounted grinders are provided with work rests.	☐	☐	☐	☐
20.	Guards are provided at point of operation, nip points, rotating parts.	☐	☐	☐	☐
21.	Fluid used in hydraulic-powered tools is approved fire-resistant fluid.	☐	☐	☐	☐
Electric-Powered Tools (3.2.2)					
22.	Electric tools are double insulated or grounded according to SOP HS-23.	☐	☐	☐	☐
23.	Electric cords are not used for hoisting or lowering tools	☐	☐	☐	☐
24.	Hand-held tools are equipped with appropriate on/off controls.	☐	☐	☐	☐
25.	Electric tools used in damp/wet locations are approved or use GFCI.	☐	☐	☐	☐
26.	Portable, power-driven circular saws are equipped with proper guards.	☐	☐	☐	☐
Abrasive Wheel Tools (3.2.3)					
27.	Employees using abrasive wheel tools are wearing eye protection.	☐	☐	☐	☐
28.	Grinding machines are supplied with sufficient power to maintain spindle speed.	☐	☐	☐	☐
29.	Abrasive wheels are closely inspected and ring-tested before use.	☐	☐	☐	☐
30.	Grinding wheels are properly installed.	☐	☐	☐	☐
31.	Cup-type wheels for external grinding are protected by proper guard.	☐	☐	☐	☐

32.	Portable abrasive wheels used for internal grinding are protected by safety flange.	☐	☐	☐	
33.	Safety flanges are used only with wheels designed to fit the flange.	☐	☐	☐	☐
34.	Safety guards on abrasive wheel tools are mounted properly.	☐	☐	☐	☐
Pneumatic-Powered Tools (3.2.4)					
35.	Tools are secured to hoses or whip by positive means to prevent disconnect.	☐	☐	☐	☐
36.	Safety clips or retainers are installed to prevent attachments being expelled.	☐	☐	☐	☐
37.	Safety devices are installed on automatic fastener feed tools.	☐	☐	☐	☐
38.	Compressed air in not used for cleaning unless reduced to <30 psi, with PPE and guarded.	☐	☐	☐	☐
39.	Manufacturer's safe operating pressure for hoses, pipes, valves, are not exceeded.	☐	☐	☐	☐
40.	Hoses >1/2 inch diameter have safety device at source to reduce pressure upon hose failure.	☐	☐	☐	☐
41.	Airless spray guns have required safety devices installed.	☐	☐	☐	☐
42.	Blast cleaning nozzles are equipped with operating valves, which are held open manually.	☐	☐	☐	☐
43.	Supports are provided for mounting nozzles when not in use.	☐	☐	☐	
44.	Air receivers drains, handholes, and manholes are easily accessible.	☐	☐	☐	☐
45.	Air receivers are equipped with drainpipes, and valves for removal of Accumulated oil and water.	☐	☐	☐	☐
46.	Air receivers are completely drained at required intervals.	☐	☐	☐	☐
47.	Air receivers are equipped with indicating pressure gauges.	☐	☐	☐	☐
48.	Safety valves are tested at regular intervals for assure good operating condition.	☐	☐	☐	☐
49.	Safety, indicating, and controlling devices are installed as required.	☐	☐	☐	☐
Hand Tools(3.2.7)					
50.	Wrenches are not used when jaws are sprung to the point of slippage.	☐	☐	☐	☐
51.	Impact tools are kept free of mushroomed heads.	☐	☐	☐	☐
52.	Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool.	☐	☐	☐	☐

Yargus, Kendall A (SUBASE Kings Bay FE4)

From: Robinson, Anthony (Efdsouth) [RobinsonAB@EFDSOUTH.NAVFAC.NAVY.mil]
Sent: Monday, April 16, 2001 1:38 PM
To: 'Yargus, Kendall A (SUBASE Kings Bay FE4)'
Subject: RE: Semiannual Corrective Action Assessment Report

Ken,
I have the conference call setup for 1300hrs tomorrow. The number is 843-820-7171 password 3747# The call is only for 1 hour. Also, I was just
informed that I have only until 5/4/2001 to come up with an estimate for the
upcoming BOS contractor work we talk about this morning. We just need to come up with an estimate on how much the work is going to cost.

-----Original Message-----
From: Yargus, Kendall A (SUBASE Kings Bay FE4)
[mailto:YargusKA@subasekb.navy.mil]
Sent: Monday, April 16, 2001 10:17 AM
To: Kim Owens [jaowens@jajms.subasekb.navy.mil] (E-mail)
Cc: Robinson, Anthony (Efdsouth)
Subject: Semiannual Corrective Action Assessment Report

Kim:

Anthony Robinson doesn't have any comments on the semiannual corrective action assessment report.

Ken

1:57 AM today, conf call cancelled
1310 - Mike email last night
Anthony cliff today most comments, Mike responded
~~1257 comment~~

Work Plan
Groundwater Remediation at Site 11
Old Camden County Landfill

Naval Submarine Base Kings Bay
Kings Bay, Georgia

Revision No. 00

Contract No. N62467-98-D-0995
Contract Task Order No. 0047

Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

CH2MHILL
Constructors, Inc.

115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

March 2001

1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) with J.A. Jones Environmental Services Company (J.A. Jones) has been contracted by the Department of the Navy, Southern Division Naval Facilities Engineering Command (NAVFAC), to prepare this site-specific Work Plan, under the Remedial Action Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0047. The purpose of this Work Plan is to outline the procedures to be used to perform groundwater remediation at Site 11, Old Camden County Landfill (Site 11) located at Naval Submarine Base (NSB) Kings Bay, Georgia.

The scope of work under this CTO is to perform groundwater remediation in the delineated source area at Site 11 utilizing Fenton's reagent chemical oxidation injection followed by an injection of vegetable oil into the subsurface.

This Work Plan is organized into six sections of text and three appendices as follows.

Section 1.0 Introduction includes the site history and project objectives.

Section 2.0 Project Execution Plan details the previously performed source area delineation effort, the required scope of work, the project schedule, the communications plan, and the traffic control plan. A detailed project schedule is provided in **Appendix A** of this Work Plan.

Section 3.0 Sampling and Analysis Plan (SAP) provides project sample locations, sample collection frequency, and the required laboratory analyses for samples collected during project activities.

Section 4.0 Waste Management Plan discusses the characterization, disposal, onsite management, and transportation of wastes (i.e., well development water, decontamination water, etc.) encountered or generated during project activities. Waste management forms are provided in **Appendix B.**

Section 5.0 Environmental Protection Plan addresses environmental protection for all work completed at NSB Kings Bay.

Section 6.0 Quality Control (QC) **Plan** includes the testing requirements for work described in this Work Plan. The site-specific project organization for this CTO is also included in this section. The QC attachments (i.e., the submittal register, testing plan and log, etc.) are provided in **Appendix C.**

The **Site Health and Safety Plan,** provided as a standalone document in **Appendix D,** addresses project-specific health and safety issues for the remediation activities to be completed at NSB Kings Bay.

1.1 Site History and Project Objectives

1.1.1 Site History

NSB Kings Bay occupies approximately 16,168 acres in Camden County, Georgia. Site 11 is identified as the Old Camden County Landfill, which is now incorporated in NSB Kings Bay. The Old Camden County Landfill was used for municipal solid waste disposal in the 1960s and 1970s. Waste was disposed of by digging trenches, filling the trenches with waste, and then backfilling the trenches with fill. Tetrachloroethene (PCE) was disposed in the landfill at some point during waste disposal activities, which resulted in groundwater contamination at the site. The contaminants of concern at Site 11 include chlorinated volatile organic compounds (VOCs), specifically PCE, and its degradation constituents trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride (VC).

Bechtel Environmental, Inc. (BEI), with Geo-Cleanse International, Inc., performed three phases of chemical oxidation treatment during August 1998 through April 2000. During the entire treatment program, a total of 54 injectors were installed and an approximate total of 34,850 gallons of 50 percent hydrogen peroxide and an equivalent amount of ferrous iron catalyst were delivered to the subsurface.

Phase I chemical oxidation treatment was performed from August 1998 through February 1999. Because of a concentration increase in three piezometers and Injector I-14 following Phase I treatment, BEI conducted a cone penetration testing program in April 1999 to confirm and delineate the horizontal extent of dissolved groundwater contamination.

Phase II chemical oxidation treatment was performed from May 1999 to July 1999 on areas east and west of the Phase I area of concern. Because of a concentration rebound in Injector I-14 following the Phase II treatment, BEI conducted a Geoprobe investigation in August 1999 to investigate and locate the potential new source of PCE at Injector I-14. Excavation of the suspected source area near Injector I-14 was conducted in September 1999. The excavation yielded several 5-gallon containers, one containing a gray-colored, paint looking waste, and one approximate 20-gallon container containing a black sludge type waste. The black waste showed PCE with the highest concentration of all compounds tested.

Phase III chemical oxidation treatment was performed from January 2000 to April 2000 on the delineated source area southeast of Injector I-14. Based on the analytical results from the post-Phase III sampling event conducted on May 30, 2000, a source area of PCE contamination appeared to remain beneath the Phase III injectors.

The post-Phase III sampling event analytical results are summarized below in Table 1-1.

TABLE 1-1
Post-Phase III Sampling Event Analytical Results

	Concentration in micrograms per liter (µg/L)				
Injector ID	PCE	TCE	cis-1,2-DCE	VC	Total Chlorinated Ethenes (TCLE)
I-11	170.0	7.0	6.5I	5U	177.0
I-12	47.0	1.8I	1U	1U	47.0
I-13	41.0	5U	5U	5U	41.0
I-14	32.0	2.8	1.6I	1U	34.8
I-18	99.0	1.6I	1U	1U	99.0
I-24	13.0	1.4I	1.3I	1U	13.0
I-25	81.0	1U	2.0	1U	83.0
I-26	49.0	1U	1.5I	1U	49.0
I-60	10,000.0	100U	100U	100U	10,000.0
I-61	820.0	20U	20U	20U	820.0
I-62	120.0	5U	5U	5U	120.0
I-63	130.0	5U	5U	5U	130.0
I-64	92.0	5U	5U	5U	92.0
I-65	210.0	5U	5U	5U	210.0
I-66	260.0	5U	5U	5U	260.0
I-67	72.0	5U	5.2I	5U	72.0
I-68	4.0	1U	1U	1U	4.0
I-69	36.0	1.8I	1U	1U	36.0

U denotes compound was analyzed for but not detected to the level shown.
µg/L – micrograms per liter
I denotes analyte detected, however the value is between the method detection limit and the practical quantitation limit.

1.1.2 Source Area Delineation Effort

A source area delineation effort was conducted by CCI/J.A. Jones from November 6, 2000 through January 12, 2001 to delineate the horizontal and vertical extent of the potential source area PCE contamination (and its degradation products) beneath the Phase III chemical oxidation treatment injectors.

1.1.2.1 November 6 - 21, 2000 Source Area Delineation Effort

From November 6-21, 2000, the source area delineation effort was completed utilizing a Membrane Interface Probe (MIP)/Geoprobe rig with an onsite mobile laboratory. The MIP technology was utilized to provide a vertical profile of the subsurface on a horizontal 10-foot grid from Injector I-60. The MIP is pushed into the ground using the

Geoprobe rig at a rate of one-foot per minute. A soil conductivity sensor on the probe continuously logs the changes in the subsurface conductivity. A thermister on the probe heats the surrounding soil and water, which volatilizes the contaminants causing them to migrate across a permeable membrane and into the probe. A carrier gas transports the volatilized gases to a lab-grade gas chromatograph (GC) at the surface. The GC results log continuously into a computer and display real time. The MIP data was used to determine the groundwater sample collection locations and intervals. The groundwater sample collection locations are shown on Figures 1-1 and 1-2 and the MIP data and groundwater sample collection intervals and onsite mobile laboratory analytical results are provided in Table 1-2.

Initially, groundwater samples were collected on a horizontal 10-foot grid from Injector I-60, but based on the initial groundwater sample analytical results, the spacing was increased to a 50-foot grid to locate a "clean" boundary. Groundwater samples were collected from each boring using the Geoprobe rig with peristaltic sampling pump and analyzed by the onsite mobile laboratory for United States Environmental Protection Agency (USEPA) SW-846 Method 8021B.

Each boring was abandoned immediately following MIP boring or groundwater sample collection by sealing the boring with grout from the bottom of the boring to the ground surface using a tremie pipe.

Based on the groundwater sample analytical results collected during this initial effort, the vertical interval of contamination in the source area was determined to be from 44 to 48 feet below land surface (bls), however, additional groundwater collection sampling and analysis was determined to be necessary to delineate the horizontal extent of contamination.

1.1.2.2 January 8 - 12, 2001 Source Area Delineation Effort

From January 8-12, 2001, the source area delineation effort was completed utilizing a Geoprobe rig with an offsite laboratory. Groundwater samples were collected on a 25-foot grid centered five feet to the west of Injector I-60 with samples collected from each of nine borings at depths of 36-40 feet bls, 40-44 feet bls, 44-48 feet bls, and 48-52 feet bls and analyzed by an offsite laboratory for USEPA SW-846 Method 8021B.

The groundwater sample collection locations are shown on Figures 1-1 and 1-2 and the groundwater sample collection intervals and offsite laboratory analytical results are provided in Table 1-3.

Each boring was abandoned immediately following groundwater sample collection by sealing the boring with grout from the bottom of the boring to the ground surface using a tremie pipe.

This delineation effort, along with the initial effort, provided sufficient data to determine the horizontal extent of contamination and the area requiring remediation.

1.1.3 Project Objectives

The project objective is to utilize the analytical data collected during the source area delineation effort to design and implement a Fenton's reagent chemical oxidation and

vegetable oil injection strategy to remediate the groundwater contamination located in the delineated source area at Site 11.

The following document prepared by BEI was utilized by CCI/J.A. Jones in its preparation of this Work Plan:

- Bechtel Environmental, Inc., July 2000; Completion Report for In Situ Chemical Oxidation, July 1998 - July 2000, Site 11, Old Camden County Landfill; NSB Kings Bay, Georgia.

Table 1-2
Source Area Delineation Results
November 6 - 21, 2000

Sample Location ID	Sample Collection Interval (feet bls)	Summary of Total Chlorinated Ethenes							
		VC	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE	tCLE	Total VOCs	Maximum MIP Reading (uV)
SP-01	20 to 24	<2	17	<2	24	61	102	102	1.6E+7/3.7E+6
	36 to 40	<2	15	<2	19	180	214	214	1.60E+07
	40 to 44	<2	<2	<2	19	550	569	569	3.80E+06
	44 to 48	<2	7	<2	46	54,000	54,053	54,078	5.80E+06
	48 to 52	<2	45	<2	4	790	839	857	1.50E+06
	52 to 56	<2	40	<2	<2	8	48	90	--
	56 to 60	<2	3	<2	<2	2 J	5	27	--
SP-03	35 to 39	<200	<200	<200	<200	2,300	2,300	2,300	4.30E+06
SP-07	44 to 48	<2	71	<2	<2	2 J	73	114	--
	48 to 52	<2	44	<2	<2	1 J	45	102	--
SP-08	44 to 48	<200	<200	<200	<200	9,400	9,400	9,400	1E+7/3.5E+5
	48 to 52	<20	48	<20	<20	2,900	2,948	3,019	1E+7/2.5E+5
	52 to 56	<2	27	<2	<2	4	31	61	--
	56 to 60	<2	13	<2	<2	1 J	14	37	--
SP-09	44 to 48	<200	<200	<200	<200	9,100	9,100	9,100	2.40E+06
	48 to 52	<200	<200	<200	<200	150 J	150	150	1.50E+06
SP-14	44 to 48	<200	<200	<200	<200	7,500	7,500	7,500	4.80E+06
	48 to 52	<20	22	<20	<20	950	972	972	6.50E+06
	52 to 56	<2	17	<2	<2	1 J	18	47	--
SP-26	44 to 48	<20	15 J	<20	<20	430	445	445	--
SP-27	44 to 48	<20	100	<20	<20	100	200	278	--
	48 to 52	<2	17	<2	<2	<2	17	42	--
SP-29	44 to 48	<200	<200	<200	<200	300	300	300	--

Table 1-2
Source Area Delineation Results
November 6 - 21, 2000

Sample Location ID	Sample Collection Interval (feet bls)	Summary of Total Chlorinated Ethenes					TCLE	Total VOCs	Maximum MIP Reading (uV)
		VC	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE			
	48 to 52	<200	<200	<200	<200	520	520	520	--
SP-31	44 to 48	<2	25	<2	<2	<2	25	80	--
	48 to 52	<2	43	<2	1 J	<2	44	138	--
SP-32	36 to 40	<2	<2	<2	<2	<2	--	15	--
	41 to 45	<2	3	<2	<2	<2	3	47	--
	46 to 50	<2	58	<2	<2	<2	58	189	--

Notes:
J: J qualifier denotes the concentration is estimated.
bls: below land surface
DCE: Dichloroethene
TCE: Trichloroethene
PCE: Tetrachloroethene
TCLE: Total Chlorinated Ethenes
VOCs: Volatile Organic Compounds
MIP: Membrane Interface Probe
uV: microvolts
All concentrations reported in micrograms per liter (ug/L), unless otherwise noted.
TCLE is defined as the summation of PCE, TCE, DCE, and Vinyl Chloride.
Total VOCs is defined as the sum of all detected constituents by USEPA Method 8021B.

Tab 3
Source Area Delineation Results
January 8 - 12, 2001

Sample Location ID	Sample Collection Interval (feet bls)	Summary of Total Chlorinated Ethenes					TCLE	Total VOCs
		VC	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE		
SP-34	36 to 40	<39	900	<64	430	5,300	6,630.0	6,630.0
	40 to 44	<39	200	<64	<31	5,100	5,300.0	53.1
	44 to 48	<39	77 J	<64	<31	11,000	11,077.0	11,077.0
	48 to 52	3.7	46	<0.64	0.5 J	43	93.2	123.6
SP-35	36 to 40	53	62	8.4	22	56	201.4	201.4
	40 to 44	<3.9	37	<6.4	33	1,300	1,370.0	1,375.9
	44 to 48	<24	150	<12	55	22,000	22,205.0	22,205.0
	48 to 52	<3.9	<0.47	<0.64	25	460	485.0	496.0
SP-36	36 to 40	<0.39	<0.47	<0.63	0.38 J	90	90.4	94.0
	40 to 44	<3.9	24	<6.4	10	1,700	1,734.0	1,742.3
	44 to 48	5.2	340	1.8	1.1	14	362.1	413.5
	48 to 52	2.9	14	<0.23	<0.22	0.42 J	17.3	37.7
SP-37	36 to 40	1.2	0.58 J	<0.23	<0.22	6	7.8	13.4
	40 to 44	5.1	180	0.6 J	0.47 J	3.5	189.7	229.8
	44 to 48	1.3	17	<0.23	<0.22	3.7	22.0	36.2
	48 to 52	3.2	11	<0.23	0.31 J	3.8	18.3	36.7
SP-38	36 to 40	<0.39	6.5	<0.64	7	130	143.5	144.9
	40 to 44	<0.39	2.9	<0.64	1.8	90	94.7	96.5
	44 to 48	<39	<47	<64	<31	15,000	15,000.0	15,000.0
	48 to 52	<39	<47	<64	<31	5,100	5,100.0	5,100.0

Table 1-3
Source Area Delineation Results
January 8 - 12, 2001

Sample Location ID	Sample Collection Interval (feet bls)	Summary of Total Chlorinated Ethenes					TCLE	Total VOCs
		VC	cis-1,2-DCE	trans-1,2-DCE	TCE	PCE		
SP-39	36 to 40	<3.9	<4.7	<6.4	4.3 J	1,800	1,804.3	1,804.3
	40 to 44	<3.9	<4.7	<6.4	5.6 J	2,900	2,905.6	2,905.6
	44 to 48	0.55 J	8.5	<0.23	<0.22	190	199.1	212.9
	48 to 52	<4.8	<1.4	<2.3	<2.2	680	680.0	686.9
SP-40	36 to 40	<3.9	<4.7	<6.4	<3.1	200	200.0	200.0
	40 to 44	<0.39	<0.47	<0.64	<0.31	11	11.0	13.8
	44 to 48	3.4	71	<0.64	<0.31	2.8	77.2	95.9
	48 to 52	3.6	85	0.73 J	1.3	1.6	92.2	333.0
SP-41	36 to 40	<3.9	<4.7	<6.4	11	1,500	1,511.0	1,511.0
	40 to 44	2.7	26	<0.64	0.76 J	73	102.5	119.2
	44 to 48	<3.9	<4.7	<6.4	16	1,500	1,516.0	1,520.4
	48 to 52	<3.9	<4.7	<6.4	13	1,200	1,213.0	1,213.0
SP-42	36 to 40	<0.48	0.33 J	<0.23	<0.22	0.51 J	0.8	2.6
	40 to 44	<4.8	<1.4	<2.3	14	2,400	2,414.0	2,425.3
	44 to 48	2.8	62	<0.64	0.44 J	3.4	68.6	131.6
	48 to 52	2.5	69	<0.64	0.81 J	<1.2	72.3	342.6

Notes:
J: J qualifier denotes the concentration is estimated.
bls: below land surface
DCE: Dichloroethene
TCE: Trichloroethene
PCE: Tetrachloroethene
TCLE: Total Chlorinated Ethenes
VOCs: Volatile Organic Compounds
All concentrations reported in micrograms per liter (ug/L)
TCLE is defined as the summation of PCE, TCE, DCE, and Vinyl Chloride.
Total VOCs is defined as the sum of all detected constituents by USEPA Method 8021B.

Page ____ of ____

Date

Originator HALL

Subject SITE 1 - USG KINGSBAY

FIGURE 1-1 SOURCE AREA DELINEATION RESULTS

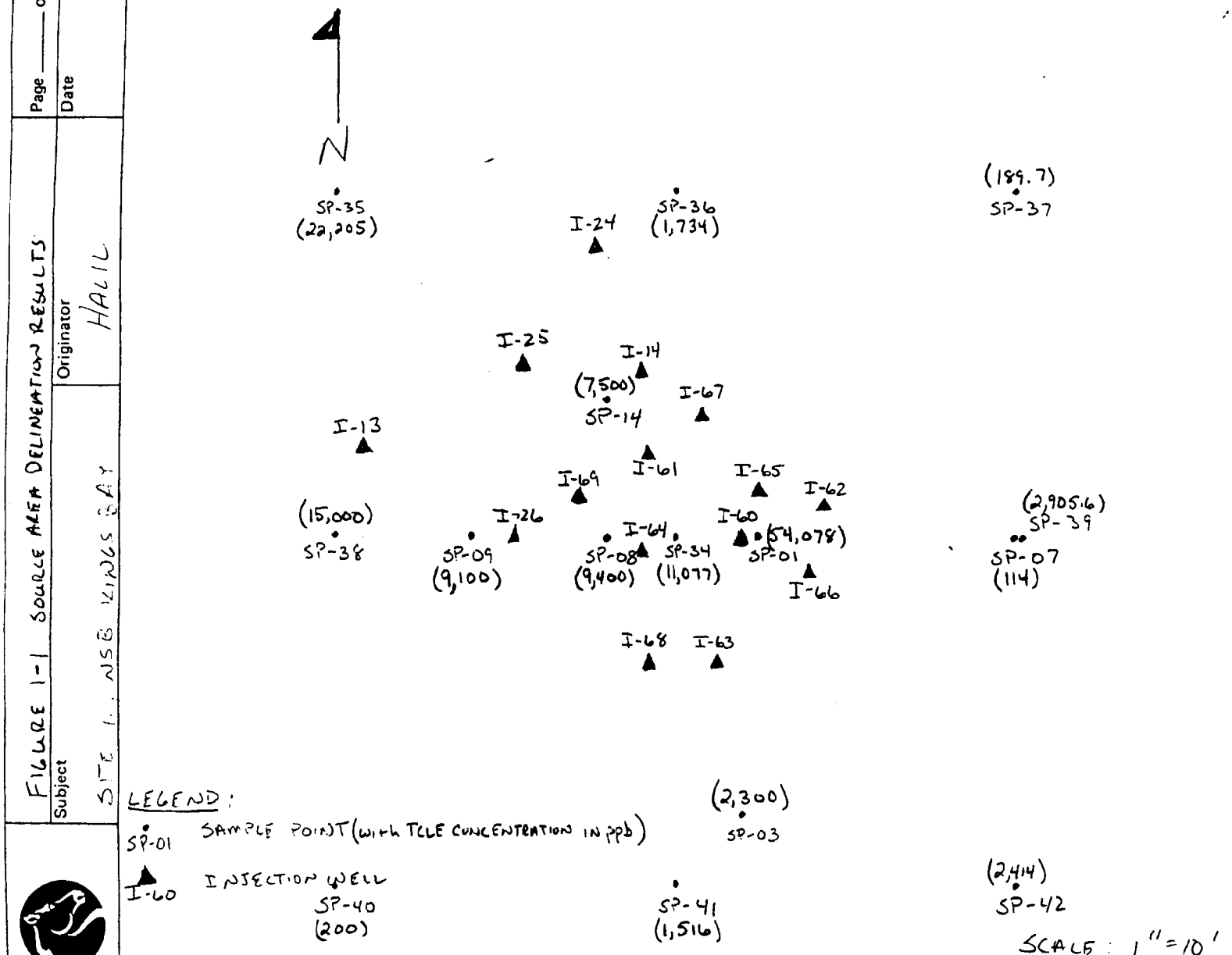


Figure 1-1

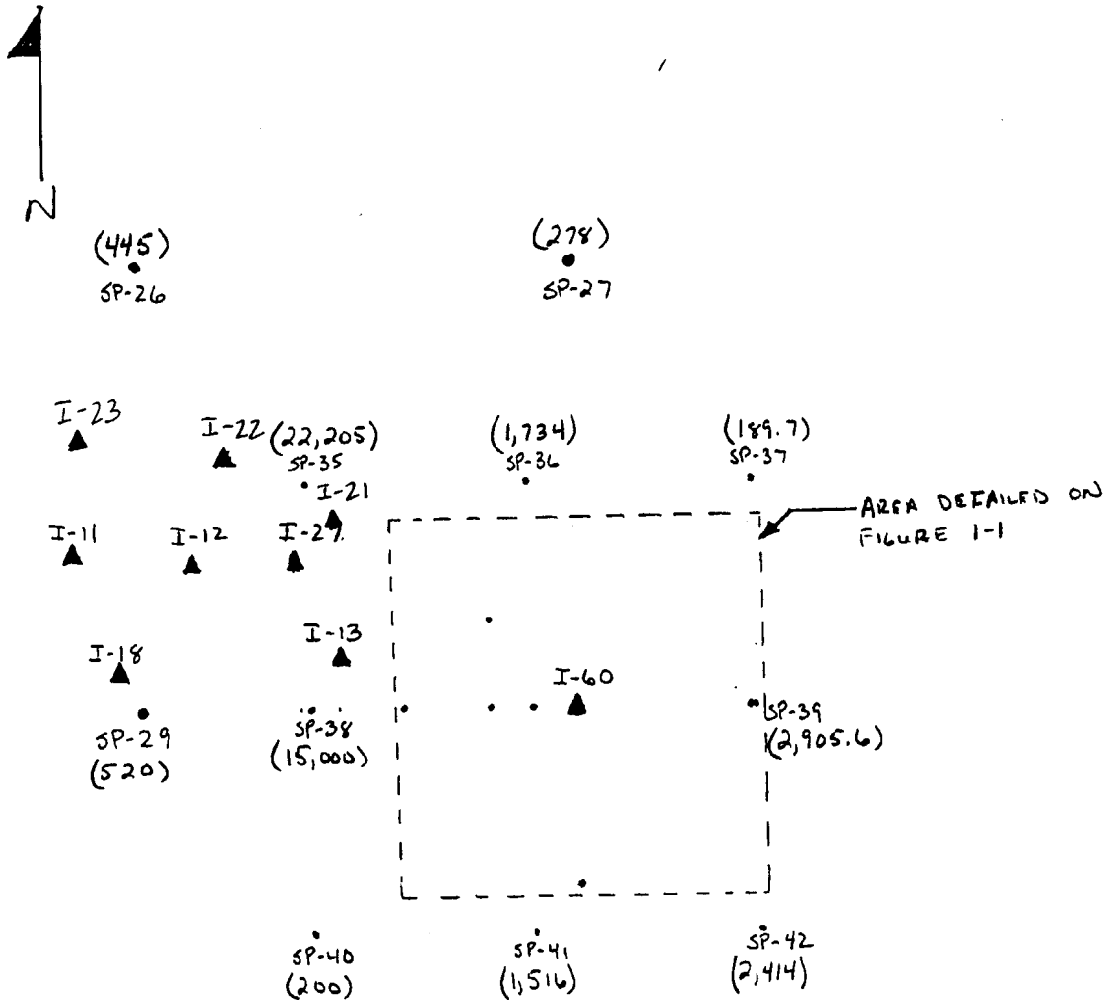
Page ____ of ____

Date

Originator HALL

Subject SITE 11 NCBC KINGS BAY

FIGURE 1-2 SOURCE AREA DELINEATION RESULTS



LEGEND:

SP-26 • SAMPLE POINT (with TCLE concentration in ppb)

I-60 ▲ INJECTION WELL

SP-31 (138)

SP-32 (189)

SCALE: 1" = 20'

Figure 1-2

2.0 Project Execution Plan

The scope of work, project schedule, communications plan and traffic control plan are described in this section.

2.1 Scope of Work

The scope of work for this project includes the following activities:

- Mobilization and Setup of Temporary Facilities and Site Controls
- Fenton's Reagent Chemical Oxidation Injection
- Vegetable Oil Injection
- Site Restoration
- Decontamination
- Demobilization

2.1.1 Mobilization and Setup of Temporary Facilities and Site Controls

This task will consist of the mobilization of personnel and equipment to the work site and the establishment of temporary facilities, consisting of portable sanitary facilities, a decontamination area, site refuge area, and equipment laydown area. Project management and scheduling activities, including contractor coordination, will be achieved from the CCI/J.A. Jones office trailer located at NSB Kings Bay and equipped with telephone and facsimile capabilities. CCI/J.A. Jones will utilize the existing office trailer located at Site 11. Office supplies, field equipment, and personal protective equipment (PPE) will be stored in the office.

Prior to the commencement of site activities, site controls including construction barricades will be installed and the decontamination area, site refuge area, and equipment laydown area will be prepared. If necessary, security fencing will also be installed. CCI/J.A. Jones will coordinate with both the NSB Kings Bay Public Works Center and the Resident Officer in Charge of Construction (ROICC) to acquire utility layout plans of the area. Utilities in the area will be marked with paint and stakes, as appropriate. All marked utility lines in construction areas will be uncovered with hand tools. In addition, the progress of subsurface work will be continuously monitored for evidence of subsurface obstructions.

2.1.2 Chemical Oxidation Injection

The chemical oxidation process to be utilized at the site is an aggressive, pressurized injection of concentrated hydrogen peroxide and ferrous iron catalyst, which together are known as Fenton's reagent and generate a hydroxyl free radical that acts as the active oxidizing agent. The hydroxyl free radical is a powerful, non-selective oxidant. Fenton's reagent oxidizes chlorinated VOCs, such as PCE, to carbon dioxide, water, and chloride. Residual hydrogen peroxide not consumed by oxidation of the chlorinated VOCs naturally decomposes to oxygen and water. Soluble ferrous iron catalyst

amendments will naturally precipitate as ferric iron compounds.

The hydrogen peroxide, in a 25 to 50 percent concentration, will be injected, along with the ferrous iron catalyst, through a series of injectors. A typical injector for a chemical oxidation injection at this site would be constructed of 1.25-inch diameter Schedule 80 black iron riser with a 3-foot long section of 0.01-inch slot, stainless steel well screen. Each injector would be installed with a four-foot thick sand pack consisting of 6/20-grade silica sand, a one-foot thick bentonite seal, and a grouted annulus. The injectors will be installed by either direct-push or hollow stem auger drilling techniques.

The chemical oxidation injector parameters (actual number, placement, and construction details) and hydrogen peroxide and ferrous iron catalyst injection concentrations and methodology are vendor-specific and will be determined by the selected chemical oxidation injection vendor at a later date. The proposed chemical oxidation treatment area is shown on Figure 2-1 and the proposed chemical oxidation treatment zone at the site is from 40 to 48 feet bls as determined by the source area delineation effort.

2.1.3 Vegetable Oil Injection

Chlorinated solvents may undergo biodegradation through three different pathways: as an electron acceptor, as an electron donor, or cometabolism. Under anaerobic conditions, biodegradation of chlorinated solvents usually proceeds through a process called reductive dehalogenation. In general, reductive dehalogenation occurs by sequential dechlorination. For the chlorinated ethenes, dechlorination progresses from PCE to TCE to DCE to VC and ethene. PCE and TCE are the most susceptible of these compounds to reductive dehalogenation because they are the most oxidized. Because these compounds are used as electron acceptors, there must be an appropriate source of carbon for microbial growth and reductive dehalogenation to occur.

The most common approach utilized to stimulate reductive dehalogenation has been the addition of a carbon source dissolved in groundwater. Food-grade vegetable oil is a potential carbon source for microbial growth and the reductive dehalogenation process. The separate phase nature of vegetable oil allows for slow dissolution into groundwater thus making it a slow release carbon source. Vegetable oil is an inexpensive, innocuous carbon source ~~that is~~ not regulated as a contaminant ~~by the~~ USEPA. that was used successfully at ______.

Previous natural attenuation studies at Site 11 have shown reductive dechlorination processes are naturally occurring with the existing anaerobic conditions, therefore the approach to enhance biodegradation of the remaining chlorinated ethenes following chemical oxidation will be to inject vegetable oil as a carbon source for microbial growth and stimulation of the reductive dehalogenation process.

Approximately six weeks following completion of the chemical oxidation injection, the vegetable oil injection will begin. Initially, injection of vegetable oil (specifically food-grade soybean oil) will begin at a location 10 feet upgradient of Injector I-60 to determine the volume and radius of acceptance of the surrounding lithology. Vegetable oil injection will be completed with a Geoprobe rig and the oil will be injected through the 1.25-inch Geoprobe direct-push rods and four-foot well screen. The vegetable oil will be injected from 32 feet bls through 52 feet bls in four-foot intervals. The vegetable oil injection will begin with the simplest method of delivering the vegetable oil into the

injection location (simple gravity feed). If this method is not successful, then a Geoprobe grout pump will be used to inject the vegetable oil under pressure at no more than 10 pounds per square inch. Based upon observations and experience gained during the initial injection, a modification of the injection method to better accommodate the site-specific conditions may be warranted.

Once the volume and radius of acceptance of the surrounding lithology are determined, the full-scale vegetable oil injection will begin. Approximately 150 to 250 gallons of vegetable oil is proposed for injection into each of the 39 injection locations. The actual volume of vegetable oil pumped into each injection location will depend on volume of acceptance of the surrounding lithology. At each injection location, vegetable oil will be injected from 32 feet bls through 52 feet bls in four-foot intervals. The proposed locations for vegetable oil injection are shown on Figure 2-2.

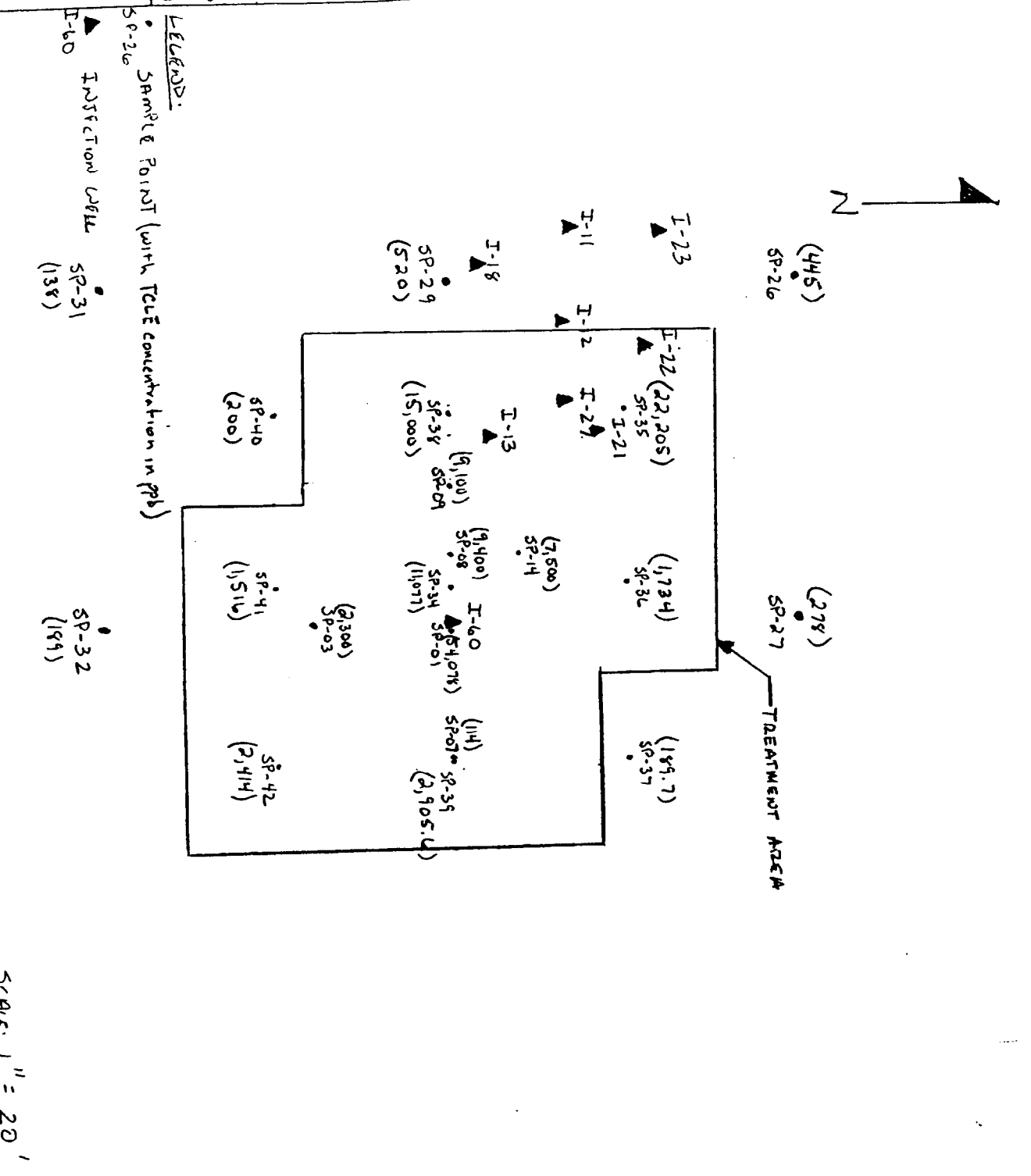
2.1.4 Site Restoration

Areas disturbed during site work will be restored to their previous condition. Restoration of disturbed areas of asphalt or concrete will include subgrade compaction to prevent subsidence, followed by the replacement of asphalt or concrete. Following chemical oxidation injection completion, each injector will be properly abandoned by sealing the injector with grout from the bottom of the well to the ground surface using a tremie pipe.

2.1.5 Decontamination

Personnel and equipment will be properly decontaminated to remove all contamination that may be adhering to personnel or equipment as a result of site activities. Any water accumulated during the decontamination process will be containerized in 55-gallon drums, sampled in accordance with Section 3.0 Sampling and Analysis Plan of this Work Plan, and managed, transported, and disposed in accordance with Section 4.0 Waste Management Plan of this Work Plan. All debris generated by remediation activities will be properly contained and disposed of at a facility permitted to accept the waste. Section 4.0 Waste Management Plan of this Work Plan describes requirements for onsite management and offsite disposal of all wastestreams. Decontamination of

	FIGURE 2-1 TREATMENT AREA		Page ____ of ____
	Subject SITE II NCB ZONE DAY	Originator HALL	Date



FORM NO. 0119-GEN-910-APR93

Figure 2-1

	FIGURE 2-2 VEGETABLE OIL INJECTION LOCATIONS	Page ____ of ____
	Subject: SITE 11 NCBC GULF BAY	Originator: HALL
		Date

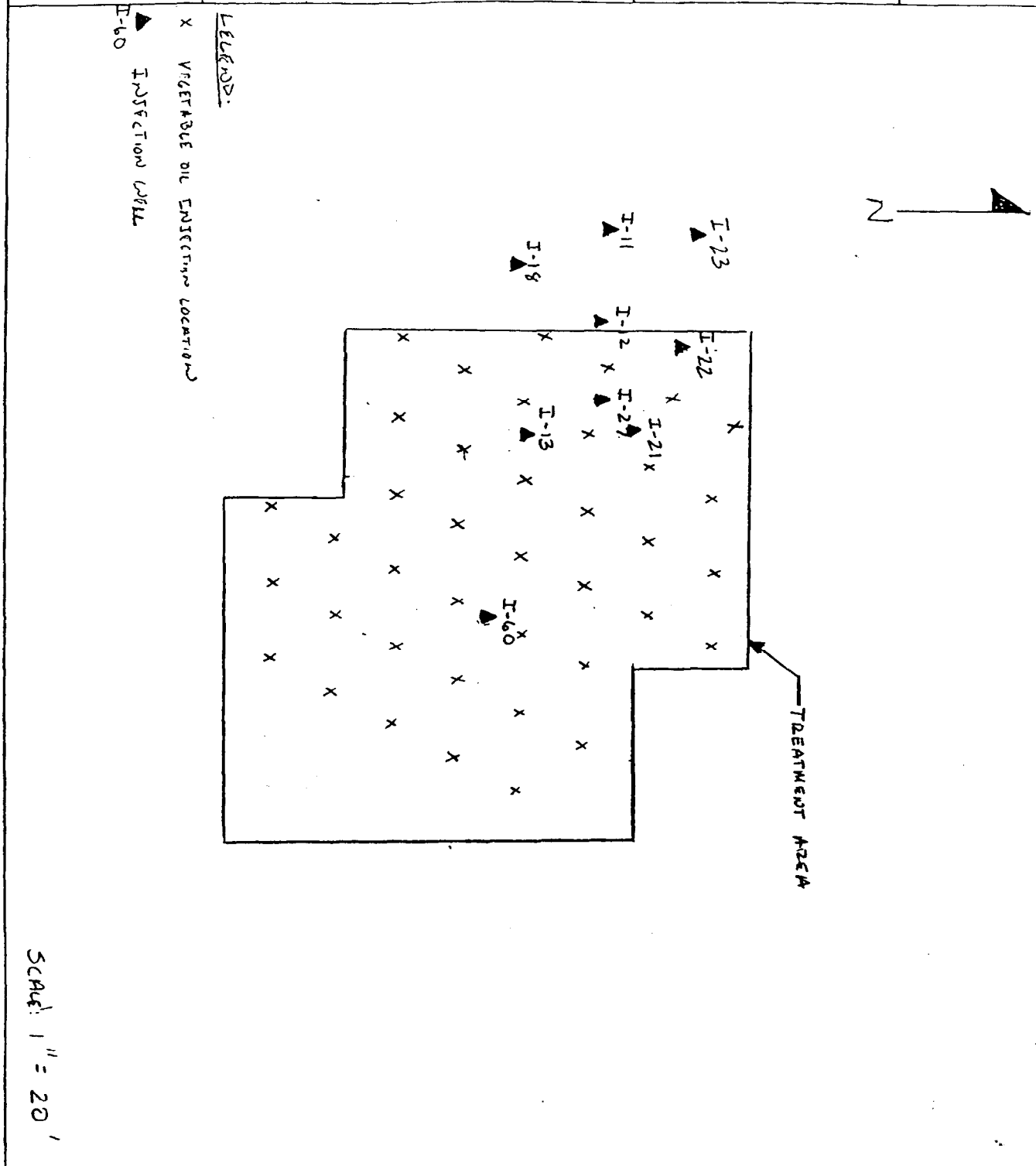


Figure 2-2

personnel and equipment will be performed in accordance with the site-specific Health and Safety Plan provided in Appendix C and the applicable provisions of 29 Code of Federal Regulations (CFR) 1910.120.

2.1.6 Demobilization

During demobilization, temporary facilities, utilities, and equipment will be removed from the site. In addition, any debris or solid waste material remaining from site activities will be removed and properly disposed of offsite in accordance with Section 4.0 Waste Management Plan of this Work Plan.

2.2 Project Schedule

The major project activities and estimated durations for each are outlined below.

- Pre-construction Meeting/Submittal Preparation/Reviews 30 days
- Mobilization 2 days
- Injector Installation 8 days
- Chemical Oxidation Injection 5 days
- Vegetable Oil Injection 10 days
- Construction Completion Report 30 days

CCI/J.A. Jones anticipates the total project duration (from pre-construction conference through submittal of the Construction Completion Report) will be approximately 85 days. This proposed schedule may vary depending on the actual conditions encountered in the field. Appendix A provides a schedule for the work to be performed.

2.3 Communications Plan

A communication matrix outlining the lines of communications for Southern Division, NAVFAC and CCI/J.A. Jones is presented in Table 2-1. Table 2-2 provides a project personnel directory.

TABLE 2-1
Communications Matrix

CCI/J.A. Jones Position	Navy Direct Report
Executive Sponsor Ray Tyler	Contracting Officer (CO) Eva Clement
Program Manager Scott Newman	Jimmy Jones, COTR David Pilarski, ACO
Senior Project Manager Flip Altman	Jimmy Jones, COTR David Pilarski, ACO
CTO Project Manager Sam Ross	Anthony Robinson, RPM Larry Blackburn, NTR/ROICC John Garner, NSB Kings Bay

TABLE 2-2
Project Personnel Directory

Contact	Company
Mr. R. Scott Newman, Program Manager Mr. Flip Altman, Senior Project Manager Ms. Marsha Robinson, Contracts Administration Manager Mr. Bob Nash, Health and Safety Manager Ms. Theresa Rojas, QA/QC Manager	CH2M HILL Constructors, Inc 115 Perimeter Center Place, N.E. Suite 700 Atlanta, GA 30346-1278 770/604-9095
Mr. Sam Ross, Project Manager	J.A. Jones Environmental Services Company 8936 Western Way, Suite 10 Jacksonville, FL 32256 904/363-0911
Ms. Eva Clement, CO	Southern Division Naval Facilities Engineering Command P.O. Box 190010 North Charleston, SC 29419-9010 843/820-5518
Mr. David Pilarski, ACO	843/820-5928
Mr. Jimmy Jones, COTR	As above 843/820-5544
Mr. Anthony Robinson, RPM	As above 843/820-7339
Mr. Larry Blackburn, NTR/ROICC	Southern Division Naval Facilities Engineering Command Resident Officer in Charge of Construction P. O. Box 139, Building 13 NAS Jacksonville, FL 32212-0139 904/542-5571, ext. 117 904/237-1868 (mobile)
Mr. John Garner, NSB Kings Bay Environmental Director	Facilities and Environmental 1063 USS Tennessee Street Building 2015 NSB Kings Bay, Georgia 31547-2606 912/673-2001, ext. 4048

2.4 Traffic Control Plan

Traffic control at the site will be the responsibility of the CCI/J.A. Jones Site Superintendent. CCI/J.A. Jones will minimize disturbance to facility operations during project activities. CCI/J.A. Jones will consult with onsite Navy personnel to evaluate site access, placement of equipment, and traffic flow to minimize the impact of this work to Base operations. CCI/J.A. Jones will review all Navy regulations and standard operating procedures regarding vehicle movement and control inside the Base.

Yargus, Kendall A (SUBASE Kings Bay FE4)

From: Yargus, Kendall A (SUBASE Kings Bay FE4)
Sent: Wednesday, March 28, 2001 9:37 AM
To: Mike Halil (E-mail)
Cc: Garner,John R (SUBASE Kings Bay FE4); Anthony Robinson (E-mail); Cliff Casey (E-mail); Frank Chapelle (E-mail); Owens, Kim C CONT (SUBASE Kings Bay BOSC)
Subject: Comments on work plan

Mike: Here are my comments on the work plan:

1.1.2.2, Source Delineation Effort: Recommend we include some of the discussion from our 30 Jan 2001 meeting:
- This data (drop-off of contaminate levels) is consistent with a small amount of contaminate.
- Natural attenuation is working faster than the contaminates are migrating, but we're taking more aggressive action to quickly achieve cleanup levels specified in our agreement with the state.

2.1.1, Mobilization and Setup of Temporary Facilities and Site Controls: Add third paragraph: Modify our Revised Underground Control Permit #089, dated June 3, 1999, to allow injection of vegetable oil and to allow additional injection wells.

2.1.3, Vegetable Oil Injection:

Second paragraph, does this immobilize the contaminate, in addition to providing a carbon donor?

Third paragraph, recommend we add: This proactive step will address the anticipated rebound and will preclude further rounds of in-depth investigation. Future monitoring will be conducted in accordance with our groundwater monitoring plan.

Fourth paragraph: Part of the reason we wanted to inject vegetable oil right away was the cost savings of getting this done while the pumps and injection wells were still there. Will this still be a significant cost savings, 6 weeks later? If not, vegetable oil injection could be our contingency plan if our routine monitoring shows a need for more aggressive treatment.

Last paragraph: 150-250 gallons of vegetable oil into each of 39 injection points seems like a lot, is that right? We're creating a small amounts of PCE, maybe as little as 2 - 3 pounds per our 30 Jan meeting. The EPA says that a large amount of vegetable oil is toxic at http://www.epa.gov/fedrgstr/EPA-WATER/1997/October/Day-20/w27261.htm. How long will this vegetable oil remain there?

Contingency Plan: In the event that this treatment does not reduce contaminates to acceptable levels, the following contingencies are discussed:

Monitored Natural Attenuation: We will continue to monitor this site and verify that natural attenuation is occurring. Past source removal efforts have reduced the amounts of contaminates to the point that natural attenuation precludes further off-site migration of contaminates above MCLs. Our proposed phase of treatment will further reduce source contaminates, and our proposed vegetable oil injection will further enhance biodegradation.

Oxygen Release Compound: Oxygen release compound may be added to downgradient wells if they exceed acceptable levels for cis-1,2-dichloroethene and vinyl chloride.

In-Situ Oxidation: Further oxidation treatment will not be feasible after vegetable oil injection. We would have to oxidize the vegetable oil along with the targeted contaminate.

Ex-situ groundwater treatment: Groundwater extraction from existing recovery wells is not a viable option at this site. We want to keep contaminate migration to a minimum. Downgradient removal of groundwater speeds up this flow rate, minimizing the opportunity for anaerobic degradation of contaminates.

Sections 3, 4, 5, 6, and Appendix A, B, C, and D are not included. If you're using these sections from the last work plan, I have a comment about:

Section 4, Waste Management Plan: Please specify how to label and where to dispose of purge water, based on what we already know.

Thanks, Ken Yargus, 912-673-2001 ext. 1217

Tracking:

Recipient	Delivery	Read
Mike Halil (E-mail)		
Garner,John R (SUBASE Kings Bay FE4)	Delivered: 3/28/01 9:37 AM	
Anthony Robinson (E-mail)		

Recipient	Delivery	Read
Cliff Casey (E-mail)		
Frank Chapelle (E-mail)		
Owens, Kim C CONT (SUBASE Kings Bay BOSC)		
jaowens@jajms.subasekb.navy.mil		Read: 3/28/01 9:52 AM

Yargus, Kendall A (SUBASE Kings Bay FE4)

From: Yargus, Kendall A (SUBASE Kings Bay FE4)
Sent: Wednesday, March 28, 2001 11:46 AM
To: Mike Halil (E-mail)
Cc: Garner,John R (SUBASE Kings Bay FE4); Anthony Robinson (E-mail); Frank Chapelle (E-mail); Cliff Casey (E-mail); Owens, Kim C CONT (SUBASE Kings Bay BOSC)
Subject: Another comment on work plan

Mike:

Request smoother versions of figures 1-1, 1-2, 2-1. Request concentration isopleths.

Thanks,

Ken

Tracking:

Recipient	Delivery	Read
Mike Halil (E-mail)		
Garner,John R (SUBASE Kings Bay FE4)	Delivered: 3/28/01 11:46 AM	Read: 3/29/01 8:07 AM
Anthony Robinson (E-mail)		
Frank Chapelle (E-mail)		
Cliff Casey (E-mail)		
Owens, Kim C CONT (SUBASE Kings Bay BOSC)		
jaowens@jajms.subasekb.navy.mil		Read: 3/28/01 11:54 AM

Yargus, Kendall A (SUBASE Kings Bay FE4)

From: Robinson, Anthony (Efdsouth) [RobinsonAB@EFDSOUTH.NAVFAC.NAVY.mil]
Sent: Thursday, March 29, 2001 11:37 AM
To: 'Mike Halil'; Chapelle, Frank; John Garner; Yargus, Kendall A (SUBASE Kings Bay FE4); Owens, Kim C CONT (SUBASE Kings Bay BOSC); Casey, Cliff (Efdsouth)
Subject: RE: Site 11

Mike,
Here are my comments:

1. Are you proposing a new Sampling and Analysis Plan, QC Plan, and Site
Health and Safety Plan for this project? What's wrong with writing an addendum to the existing plans?

2. Why are we proposing to inject six weeks following completion of the chemical oxidation injection? Are we proposing post sampling during this
six weeks period?

3. What's the purpose of injecting vegetable oil into each of the 39 injection locations. Some of these points have not been sampled or injected
in years.

-----Original Message-----
From: Mike Halil [mailto:mhalil@vnet.net]
Sent: Tuesday, March 20, 2001 11:47 AM
To: Robinson, Anthony (Efdsouth); Chapelle, Frank; John Garner; Yargus, Kendall A (SUBASE Kings Bay FE4); Owens, Kim C CONT (SUBASE Kings Bay BOSC); Casey, Cliff (Efdsouth)
Subject: Site 11

Hello all,
Attached is my DRAFT remediation plan for Site 11 at Kings Bay. Only the scope of work portion is attached. the rest of the plan (health and safety, qc, etc.) will be written later. I apologize for all the separate files but our scanner is a little messed up at the moment and all I could get scanned were the figures. Please comment on the plan, and please be brutal. The state of georgia has to buy off on this so any additional info anyone thinks is necessary i want to know.

Two things that I think should be in the plan that I have not included are a cleanup goal and a contingency if the veg oil doesnt work (if there is one). These are team decisions and I would like to get everyone's input.

Please let me know when everyone will be able to give me comments.

Thanks,
Mike Halil

Comments from Anthony Robinson, Southern Division

Comment No. 01: Are you proposing a new Sampling and Analysis Plan, QC Plan, and Site Health and Safety Plan for this project? What's wrong with writing an addendum to the existing plans?

Response No. 01: *There will be new versions of the Sampling and Analysis Plan, QC Plan, and Site Health and Safety Plan written for this phase of the project because the first Work Plan only covered the delineation phase. However, references to existing sections will be made as appropriate to eliminate redundancy.*

Comment No. 02: Why are we proposing to inject six weeks following completion of the chemical oxidation injection? Are we proposing post sampling during this six weeks period?

Response No. 02: *The six weeks for vegetable oil injection following the chemical oxidation injection was a time frame that I decided on and is negotiable. Since we hadn't planned on doing post-chemical oxidation injection sampling as decided in the 30 January 2001 meeting, we can inject immediately following the final chemical oxidation injection.*

Comment No. 03: What's the purpose of injecting vegetable oil into each of the 39 injection locations. Some of these points have not been sampled or injected in years.

Response No. 03: *The vegetable oil injection locations are not the existing chemical oxidation injection points. There will be no permanent vegetable oil injection points. Vegetable oil injection will be accomplished through the Geoprobe rods.*

Comments from Cliff Casey, Southern Division

Comment No. 04: The Workplan should specify the collection of sediment samples from the screened interval associated with the chemical oxidation and from 2 Geoprobe push points associated with the vegetable oil injection. The sediments should be analyzed for each of the following:

a) Bioavailable iron. (send a split spoon samples for each location to Cliff Casey and he will get this analysis done). Record with each sample the location and depth.
b) soil bulk density
c) fraction of organic carbon of the soil

Response No 04: *This will be incorporated into the Work Plan. If available, Cliff can you send me the sampling and analysis details for these parameters. Mainly, the bioavailable iron as I will be sending the sample through you and need to know any preservative requirement.*

Comment No. 05: Specify the use of either a feed grade oil that has both nitrogen and phosphorus or plan for the addition of micronutrients to the food grade oil. Often phosphate, nitrate and potassium are deemed to be insufficient to support the required microbial growth. Over the long time period that the oil will be dissolving into the aquifer these micronutrients will likely

be used up if they are not replenished. If you do not plan to add these micro-nutrients, discuss why they are not needed.

Response No. 05: *A food-grade non-hydrogenated soybean oil is expected to be utilized. I have no problem with the theory of adding micronutrients to the oil, but have found no documentation in my research that has included this addition, so I have no formula for this addition. Any information you have would be greatly appreciated.*

Comment No. 06: A tracer such as bromide will be helpful in elucidating the degradation of the CHC's with vegetable oil, the travel time and dispersion. Include the tracer in the oil.

Response No. 06: *A tracer such as bromide will be used.*

Comment No. 07: Provide a data sheet on the vegetable oil including composition, solubility and density.

Response No. 07: *The data sheet will be included in the Work Plan.*

Comment No. 08: The Work plan should state that a survey will be completed for all new Geoprobe injection points and Chemical Oxidation injection wells to 1983 State Plane Coordinates of Georgia.

Response No. 08: *This will be stated in the Work Plan.*

Comment No. 09: Provide as a separate table the coordinates for the most recent MIPS and Geoprobe locations. All of that data will be entered into GIS and we need the coordinates. Provide as an appendix in the Workplan the results of the MIPs and Geoprobe work.

Response No. 09: *The results for the MIPs and Geoprobe work will be included in the Work Plan as an appendix. A table with the coordinates for the locations cannot be added at this time because the points have not been surveyed to date. Surveyor procurement is currently being performed. The coordinates will be added by revision to the Work Plan at a later date.*

Comment No. 10 Add Cliff Casey (843)-820-5561 as Navy Environmental Technical Support to Table 2-2.

Response No. 10: *This will be included.*

Comment No. 11: Provide a timeline in a table or other concise format stating when both water and contaminant chemistry samples will be collected and which samples will be analyzed for what. Note, there should be baseline data collected prior to Chemical Oxidation and also data prior to injection of Vegetable oil. State other sampling times and all analytes as well as analytical methods.

Response No. 11: *According to the 30 January 2001 meeting, no additional sampling was to take place except for the quarterly monitoring of the downgradient monitoring wells by J.A. Jones Management Services. If this has changed, please inform me of the desired parameters and frequency.*

Comments from Ken Yargus, NSB Kings Bay

Comment No. 12: Section 1.1.2.2, Source Delineation Effort. Recommend we include some of the discussion from our 30 Jan 2001 meeting:

This data (drop-off of contaminate levels) is consistent with a small amount of contaminate.

Natural attenuation is working faster than the contaminates are migrating, but we're taking more aggressive action to quickly achieve cleanup levels specified in our agreement with the state.

Response No. 12: *I will add some of the discussion.*

Comment No. 13: Section 2.1.1, Mobilization and Setup of Temporary Facilities and Site Controls. Add third paragraph: Modify our Revised Underground Control Permit #089, dated June 3, 1999, to allow injection of vegetable oil and to allow additional injection wells.

Response No. 13: *I will add this comment.*

Comment No. 14: Section 2.1.3, Vegetable Oil Injection, Second paragraph. Does this immobilize the contaminate, in addition to providing a carbon donor?

Response No. 14: *The oil doesn't necessarily immobilize the contaminate, it slows the movement allowing longer time frames for natural attenuation.*

Comment No. 15: Section 2.1.3, Vegetable Oil Injection, Third paragraph. Recommend we add: This proactive step will address the anticipated rebound and will preclude further rounds of in-depth investigation. Future monitoring will be conducted in accordance with our groundwater monitoring plan.

Response No. 15: *This will be added.*

Comment No. 16: Section 2.1.3, Vegetable Oil Injection, Fourth paragraph. Part of the reason we wanted to inject vegetable oil right away was the cost savings of getting this done while the pumps and injection wells were still there. Will this still be a significant cost savings 6 weeks later? If not, vegetable oil injection could be our contingency plan if our routine monitoring shows a need for more aggressive treatment.

Response No. 16: *I will modify the vegetable oil injection time frame to immediately following the final chemical oxidation injection.*

Comment No. 17: Section 2.1.3, Vegetable Oil Injection, Last paragraph. 150-250 gallons of vegetable oil into each of 39 injection points seems like a lot, is that right? We're treating small amounts of PCE, maybe as little as 2 - 3 pounds per our 30 Jan meeting. The EPA says that a large amount of vegetable oil is

toxic at http://www.epa.gov/fedrgstr/EPAWATER/1997/October/Day-20/w27261.htm. How long will this vegetable oil remain there?

Response No. 17: *This is an estimated quantity of oil. The actual amount will be the amount the formation can handle. It is important that the vegetable oil be incorporated into a very high percentage of the formation pore space.*

Comment No. 18: Contingency Plan. In the event that this treatment does not reduce contaminates to acceptable levels, the following contingencies are discussed:

Monitored Natural Attenuation: We will continue to monitor this site and verify that natural attenuation is occurring. Past source removal efforts have reduced the amounts of contaminates to the point that natural attenuation precludes further off-site migration of contaminates above MCLs. Our proposed phase of treatment will further reduce source contaminates, and our proposed vegetable oil injection will further enhance biodegradation.

Oxygen Release Compound: Oxygen release compound may be added to downgradient wells if they exceed acceptable levels forcis-1,2-dichloroethene and vinyl chloride.

In-Situ Oxidation: Further oxidation treatment will not be feasible after vegetable oil injection. We would have to oxidize the vegetable oil along with the targeted contaminate.

Ex-situ groundwater treatment: Groundwater extraction from existing recovery wells is not a viable option at this site. We want to keep contaminate migration to a minimum. Downgradient removal of groundwater speeds up this flow rate, minimizing the opportunity for anaerobic degradation of contaminates.

Response No. 18: *I would like everyone's opinion for a contingency plan before it is included in the Work Plan.*

Comment No. 19: Sections 3, 4, 5, 6, and Appendix A, B, C, and D are not included. If you're using these sections from the last work plan, I have a comment about:

Section 4, Waste Management Plan: Please specify how to label and where to dispose of purge water, based on what we already know.

Response No. 19: *We will include these sections, but they will be new ones. Your comment will be incorporated.*

Comment No. 20: Request smoother versions of figures 1-1, 1-2, 2-1. Request concentration isopleths.

Response No. 20: *This will be included.*

CCI NAVY RAC

CH2MHILL **Constructors, Inc.**
115 Perimeter Center Place, NE
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30346-1278
TEL 770.604.9095
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October 6, 2000

Mr. Anthony Robinson
Southern Division, Naval Facilities Engineering Command
P.O. Box 190010
North Charleston, SC 29419-9010

RE: Contract No. N62467-98-D-0995
Contract Task Order 0047 – Naval Submarine Base (NSB) Kings Bay – Kings Bay, Georgia
Work Plan for the Source Area Delineation at Site 11, Old Camden County Landfill

Dear Mr. Robinson:

CH2M HILL Constructors, Inc. is pleased to provide two copies of the enclosed Work Plan for the Source Area Delineation at Site 11, Old Camden County Landfill, NSB Kings Bay, Georgia.

If you have any questions or comments regarding the enclosed, please do not hesitate to contact Sam Ross at (904) 777-4812 or at sross@vnet.net.

Sincerely,

CH2M HILL Constructors, Inc.

Samuel M. Ross, P.E. (me)
Project Manager

cc: Larry Blackburn, ROICC
John Garner, NSB Kings Bay
Jimmy Jones, SoDiv (w/o encl.)
CCI Project File No. 160027

3.0 Hazard Evaluation and Control

3.1 Heat and Cold Stress

Reference CH2M HILL SOP HS-09, Heat and Cold Stress

3.1.1 Preventing Heat Stress

The following guidelines relate to heat stress prevention:

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50 to 60 degrees Fahrenheit (°F) should be available. Under severe conditions, drink one to two cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

3.1.2 Symptoms and Treatment of Heat Stress

The symptoms of heat stress are listed in Table 3-1.

TABLE 3-1
Symptoms and Treatment of Heat Stress

	Heat Syncope	Heat Rash (*miliaria rubra*, "prickly heat")	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical attention immediately!

3.1.3 Heat-Stress Monitoring

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (greater than 50 percent), or when the workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute, or 20 beats per minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats per minute, or 20 beats per minute above resting pulse.

3.1.4 Preventing Cold Stress

The following guidelines relate to cold stress prevention:

- Be aware of the symptoms of cold-related disorders, and ***wear proper clothing for the anticipated fieldwork.***

- Consider monitoring the work conditions and adjusting the work schedule, using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- ***Wind-Chill Index.*** This measure relates the dry bulb temperature and the wind velocity. It is used only to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index sometimes is limited in its usefulness because the index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it is used only as a guideline to warn workers when they are in a situation that can cause cold-related illnesses. Used in conjunction with the NSC guidelines, the wind-chill index provides a starting point for adjusting work and warm-up schedules.
- ***NSC Guidelines for Work and Warm-Up Schedules.*** The cold-exposure limits recommended by the NSC can be used in conjunction with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; ***workers should be monitored for symptoms of cold-related illness.*** If symptoms are not observed, the work duration can be increased.
- The wind-chill index and the NSC guidelines are in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* SOP HS-09.

3.1.5 Symptoms and Treatment of Cold Stress

The symptoms and treatment of cold stress are listed in Table 3-2.

TABLE 3-2
Symptoms and Treatment of Cold Stress

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Rewarm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

3.2 Locating Buried Utilities

3.2.1 Local Utility Mark-Out Service

The Base Civil Engineer will be responsible for marking utilities.

3.2.2 Procedures for Locating Buried Utilities

Procedures for locating buried utilities are listed as follows:

- Where available, obtain utility diagrams for the facility.

- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural-gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary, clear locations with a utility-locating instrument (e.g., metal detector).
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually. Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SHSS should confirm that arrangement.

3.3 Biological Hazards and Controls

Biological hazards and controls are listed in Table 3-3.

TABLE 3-3
Biological Hazards and Controls

Hazard and Location	Control Measures
Snakes typically are found in underbrush and tall grassy areas.	If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings.
Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.	Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.
Exposure to **bloodborne pathogens** may occur when rendering first aid or CPR, when coming into contact with medical/other infectious material, with landfill waste or waste streams containing such infectious material.	Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.
Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.	Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SHSS and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

3.4 Tick Bites And Mosquito Bites

3.4.1 Ticks

Reference CH2M HILL HS-03, Tick Bites

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

Prevention against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permanone, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

If bitten by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF): Lyme - a rash that looks like a bullseye with a small welt in the center; RMSF - a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

3.4.2 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southeastern United States it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent.

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35 percent DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35 percent) provides no additional protection.
- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.

- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3 to 15 days.

If you have any questions or to report any suspicious symptoms, contact the project Health and Safety Manager.

3.5 Radiological Hazards and Controls

Refer to CH2M HILL's Corporate Health and Safety Program, Program and Training Manual, and Corporate Health and Safety Program, Radiation Protection Program Manual, for standards of practice for operating in contaminated areas. There are no known radiological hazards associated with this project.

3.6 Hazards Posed by Chemicals Brought on the Site

3.6.1 Hazard Communication

Reference CH2M HILL Hazard Communication Manual

CH2M HILL's *Hazard Communication Program Manual,* which is available from area or regional offices and from the Corporate Human Resources Department in Denver, Colorado. The project manager is to request MSDSs from the client or from the contractors and the subcontractors for chemicals to which CCI employees potentially are exposed. The SHSS is to do the following:

- Give employees required site-specific hazard communication (HAZCOM) training.
- Confirm that inventory of chemicals brought on the site by subcontractors is available.
- Before or as chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with identity of chemical and with hazard warnings, if any.

The chemical products listed in Table 3-4 will be used on the site. Refer to Attachment 2 for MSDSs.

TABLE 3-4
Chemical Hazards

Chemical	Quantity	Location
Hydrogen Peroxide	Tanker or Barrels	Exclusion Zone
Ferrous Sulfate	Barrels	Exclusion Zone
Vegetable Oil	Barrels	Exclusion Zone
Alconox/Liquinox (detergent)	< 1 liter, powder/liquid	Support/Decontamination Zone