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SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORKPLAN FOR SITES 5 AND 16 NSB KINGS BAY GA
7/1/1995
ABB ENVIRONMENTAL

SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORKPLAN FOR SITES 5 AND 16

NAVAL SUBMARINE BASE KINGS BAY
KINGS BAY, GEORGIA

NAVY CLEAN, DISTRICT I
UNIT IDENTIFICATION CODE N42237
CONTRACT NO. N62467-89-D-0317/094

JULY 1995

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
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ASEA BROWN BOVERI

NSB Kings Bay Administrative Record
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The geologic work described and professional opinions rendered in the Supplemental Resource Conservation and Recovery Act Facility Investigation Workplan for Sites 5 and 16 at Naval Submarine Base, Kings Bay, Georgia, were developed in accordance with commonly accepted procedures consistent with applicable standards of practice.

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CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/094 is complete, accurate, and complies with all requirements of this contract.

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SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORKPLAN FOR SITES 5 AND 16

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Unit Identification Number: N42237

Contract Number: N62467-89-D-0317/094

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July 1995

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and cleanup hazardous waste sites for both private sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

A second program to address present hazardous materials management is the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. This program is designed to identify and cleanup releases of hazardous substances at RCRA-permitted facilities. RCRA is the law that requires solid and hazardous wastes to be managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The investigations at Naval Submarine Base (NSB) Kings Bay, Kings Bay, Georgia, are being conducted under the RCRA Corrective Action Program. The Georgia Department of Natural Resources, Environmental Protection Division, oversees the program at the NSB.

The RCRA Corrective Action Program includes the following stages:

- The RCRA Facility Assessment (RFA) and confirmatory sampling identify solid waste management units, evaluate the potential for releases of contaminants, and determine the need for future investigations.

- The RCRA Facility Investigation (RFI) then determines the nature, extent, and fate of contaminant releases.

- Interim Measures are implemented when necessary to control further migration or release of contaminants.
- The Corrective Measures Study identifies and recommends measures for achieving long-term remedial action goals.

Questions regarding the RCRA program at NSB Kings Bay should be addressed to the Public Affairs Office at (912) 673-4714.

EXECUTIVE SUMMARY

Under contract to the U.S. Department of the Navy (Navy), Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), this workplan was prepared for Site 5, Army Reserve Disposal Area, Towhee Trail, and Site 16, Army Reserve Disposal Area, Motor Missile Magazines, at Naval Submarine Base in Kings Bay, Georgia. This workplan was prepared under the Comprehensive Long-term Environmental Action, Navy (CLEAN) Contract No. N62467-89-0317, Contract Task Order No. 094.

Sites 5 and 16 were initially investigated during a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) conducted during 1992 and 1993. The initial RFI included geophysical surveys, soil borings, subsurface soil sampling, monitoring well installation, and six bimonthly groundwater sampling events. The report for the initial RFI included a No Further Action (NFA) proposal for both sites (ABB Environmental Services, Inc. [ABB-ES], 1994). Based on comments from the Georgia Environmental Protection Division (GEPD) on the report of the investigation results, additional information is needed at both sites. The investigative approach for the Supplemental RFI was developed to provide the necessary information needed to support an NFA or monitoring only proposal or determine the need for a site-specific Corrective Action Plan at the sites.

The workplan describes the facility, regulatory setting, sites under investigation, project management, sampling and analyses, data management, and health and safety procedures. The Supplemental RFI will include ground-penetrating radar surveys, soil borings, subsurface soil sampling, installation of monitoring wells, and collection of groundwater samples. The soil and groundwater analytical data will be evaluated using a statistical approach for comparison to background concentrations. A proposal for a background data collection program and statistical approach is being developed separately and will be submitted to GEPD for approval.

TABLE OF CONTENTS

Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Chapter	Title	Page No.
	EXECUTIVE SUMMARY	-iii-
1.0	INTRODUCTION	1-1
1.1	FACILITY DESCRIPTION	1-1
1.2	PURPOSE AND REGULATORY SETTING	1-2
2.0	DESCRIPTION OF CURRENT CONDITIONS	2-1
2.1	ENVIRONMENTAL SETTING	2-1
2.2	SITE DESCRIPTIONS	2-1
3.0	PROJECT MANAGEMENT PLAN	3-1
3.1	PROJECT ORGANIZATION AND RESPONSIBILITIES	3-1
3.2	SCHEDULE	3-2
4.0	SAMPLING AND ANALYSIS PLAN	4-1
4.1	SITE MANAGEMENT	4-1
4.1.1	Mobilization	4-1
4.1.2	Site Access and Control	4-1
4.1.3	Field Monitoring Instrumentation	4-1
4.1.4	Control and Disposal of Investigation-Derived Waste	4-1
4.2	DATA COLLECTION AND SAMPLING PROCEDURES	4-3
4.2.1	Site-specific Background Data Collection	4-3
4.2.2	Site 5 Data Collection	4-3
4.2.3	Site 16 Data Collection	4-9
4.3	SAMPLE HANDLING PROCEDURES	4-13
4.3.1	Sample Containers, Preservation, and Holding Times	4-13
4.3.1.1	Sample Containers	4-14
4.3.1.2	Preservation Techniques	4-14
4.3.2	Sample Handling, Packaging, and Shipping	4-16
4.4	DECONTAMINATION PROCEDURES	4-17
4.4.1	Drilling Rig and Tools	4-17
4.4.2	Sample Containers	4-19
4.4.3	Monitoring Equipment	4-19
4.5	QUALITY CONTROL SAMPLES	4-19
4.6	FIELD DOCUMENTATION PROGRAM	4-21
4.6.1	Field Logbooks	4-21
4.6.2	Field Data Sheets and Logs	4-22
4.6.3	Plans	4-22
4.7	SAMPLE ANALYSES	4-22
4.7.1	Data Quality Objectives (DQOs)	4-22
4.7.1.1	DQO Levels, General Description	4-22
4.7.1.2	Task-Specific DQOs	4-24
4.7.2	Chain of Custody	4-25
4.7.3	Sample Preparation	4-26
4.7.4	Analytical Procedures	4-26
4.7.5	Laboratory Quality Assurance and Quality Control	4-28

TABLE OF CONTENTS (Continued)

Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Chapter	Title	Page No.
5.0	DATA MANAGEMENT PLAN	5-1
5.1	DATA RECORD	5-1
5.1.1	Field Data Management	5-1
5.1.2	Sample Data Management	5-1
5.1.3	Laboratory Data Management	5-1
5.2	DATA REPORTING	5-1

REFERENCES

APPENDICES:

Appendix A: Sampling Procedures
Appendix B: Water-table Surface Contour Maps
Appendix C: Health and Safety Plan

LIST OF FIGURES

Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Figure	Title	Page No.
1-1	Site Location Map	1-3
2-1	Site 5, Army Reserve Disposal Area, Towhee Trail	2-2
2-2	Site 16, Army Reserve Disposal Area, Motor Missile Magazines	2-7
3-1	Project Schedule	3-3
4-1	Site 5, Proposed Ground-Penetrating Radar Screening Survey Area	4-4
4-2	Site 5, Proposed Background Soil Boring and Monitoring Well Location	4-5
4-3	Site 5, Proposed Soil Boring Locations	4-6
4-4	Monitoring Well Diagram, Single Cased, Aboveground Completion	4-8
4-5	Site 16, Proposed Ground-Penetrating Radar Screening Survey Area	4-10
4-6	Site 16, Proposed Soil Boring and Monitoring Well Locations	4-11

LIST OF TABLES

Table	Title	Page No.
2-1	Investigative Chronology	2-3
2-2	Summary of Compounds and Concentrations Detected at Site 5	2-4
2-3	Summary of Compounds and Concentrations Detected at Site 16	2-10
4-1	Sample Container, Holding Times, and Preservation Requirements	4-15
4-2	Quality Control Samples for the Supplemental Resource Conservation and Recovery Act Facility Investigation Field Program	4-20
4-3	Analytical Program	4-27

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ASTM	American Society for Testing and Materials
bls	below land surface
$C_6H_8O_6$	ascorbic acid
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CLP	Contract Laboratory Program (U.S. Environmental Protection Agency)
CLP-RAS	Contract Laboratory Program Routine Analytical Services
CMS	Corrective Measure Study
COC	chain of custody
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
CVAA	cold vapor atomic absorption
°C	Celsius
°F	degrees Fahrenheit
DI	deionized
DQO	data quality objective
DOT	Department of Transportation
EIC	Engineer-in-Charge
eV	electron volts
EZ	Exclusion Zone
FID	flammable ionization detector
FOL	Field Operations Leader
g	gram
GEPD	Georgia Environmental Protection Division (Georgia Department of Natural Resources)
GFCI	ground-fault interrupters
GPR	ground-penetrating radar
H_2SO_4	sulfuric acid
HASP	Health and Safety Plan
HCl	hydrochloric acid
HNO_3	nitric acid
HR	heart rate
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HSR	Hazardous Site Response
HSS	Health and Safety Supervisor
HSWA	Hazardous and Solid Waste Amendments
I.D.	identification
IAS	Initial Assessment Study
IDLH	Immediately Dangerous to Life or Health
IDW	investigation-derived waste

J	estimated value.
KI	potassium iodide
ℓ	liter
LEL	lower explosive limit
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
mℓ	milliliter
mlw	mean low water
MOTKI	Military Ocean Terminal, Kings Bay
MS/MSD	matrix spike and matrix spike duplicate
N	normal
NaOH	sodium hydroxide
Navy	U.S. Department of the Navy
ND	none detected
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NSB	Naval Submarine Base
OSHA	Occupational Safety and Health Administration
OT	oral temperature
OVA	organic vapor analyzer
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyls
PEL/TLV	permissible exposure limit or threshold limit value
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SCBA	self-contained breathing apparatus
SOP	Standard Operating Procedure
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOC	semivolatile organic compound
SWMU	solid waste management unit

TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TOM	Task Order Manager
U.S.	United States (of America)
USEPA	U.S. Environmental Protection Agency
USCS	Unified Soil Classification System
UV	ultraviolet
v	volt
VOC	volatile organic compound

1.0 INTRODUCTION

Under contract to the U.S. Department of the Navy (Navy), Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), this Supplemental Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Workplan was prepared for Site 5, Army Reserve Disposal Area, Towhee Trail, and Site 16, Army Reserve Disposal Area, Motor Missile Magazines, located on the Naval Submarine Base (NSB) at Kings Bay, Georgia. This workplan was prepared under the Comprehensive Long-Term Environmental Action, Navy (CLEAN) Contract No. N62467-89-D-0317, Contract Task Order No. 094. The following sections describe the facility, sites under investigation, regulatory setting, and purpose of the Supplemental RFI.

1.1 FACILITY DESCRIPTION. NSB Kings Bay is located in the southeastern corner of Georgia, approximately 8 miles north of the Georgia-Florida border. The NSB covers 16,168 acres and is located in Camden County. The facilities history is summarized in the following paragraphs of this section. The summary of the facility's history is primarily from the Initial Assessment Study (IAS) from C.C. Johnson and Associates, Inc (1985).

The U.S. Army began operations at NSB Kings Bay in the early 1950's. The property originally was developed as a military ocean terminal. From its inception until June 30, 1965, the terminal was known as the Kings Bay Army Terminal. The Kings Bay Army Terminal was constructed to meet the Department of the Army's requirements for East Coast port facilities capable of transporting ammunition and other explosives in the event of a national emergency. During this time, the Kings Bay Army Terminal was used for training purposes by the U.S. Army Reserve.

On April 1, 1965, as a result of a major reorganization, the terminal was placed under the jurisdiction of the newly organized Military Traffic Management and Terminal Service. On July 1, 1965, the terminal became known as the U.S. Army Military Ocean Terminal, Kings Bay (MOTKI). MOTKI was designed to store ammunition or explosives for about 3 months and was directly subordinate to the Military Ocean Terminal, Southport, North Carolina. Facilities constructed at MOTKI included a 2,000-foot wharf, administrative buildings, work shops, utility buildings, and 47 miles of railroad track for transporting explosives. MOTKI had no assigned military personnel and was maintained and operated by 19 U.S. Civil Service employees for reserve training operations and contingency purposes from 1956 to 1978. The mission of MOTKI was to plan programs, make military repairs, and provide fire prevention and protection functions for the terminal. Because there was no immediate operational need for this installation, it was placed on inactive status from 1956 until July 1, 1978. The facility was used by the U.S. Army for reserve training during that time.

In 1978, the Navy selected MOTKI as the East Coast location for its Fleet Ballistic Missile submarine support facility. On July 1, 1978, the site was established under a developmental status and was named the Naval Submarine Support Base. Construction of a refit facility for one submarine Squadron (T-1) began in 1978 in anticipation of the arrival of 10 Poseidon submarines. In 1979, the Navy moved Squadron 16 from Spain to Kings Bay, and the site's official name became the Naval Submarine Base, Kings Bay.

Currently, NSB Kings Bay supports TRIDENT submarines. New facilities completed in the early 1990's are for crew training, weapons handling and storage, submarine maintenance and repair, personnel support, and housing.

<u>1.2 PURPOSE AND REGULATORY SETTING</u>. As a condition of the current Hazardous and Solid Waste Amendments (HSWA) permit NSB Kings Bay under which is operating, the facility is required to implement an RCRA corrective action program. The RCRA Corrective Action Plan (CAP) (Interim Final) (U.S. Protection Agency [USEPA], 1988) was developed by the USEPA to provide a model for corrective action and uses a four-phase approach to evaluate the condition of solid waste management units (SWMUs) and direct corrective action, if necessary. The first step, an RCRA Facility Assessment, was not formally conducted at NSB Kings Bay by representatives of State and Federal regulatory agencies. However, the Georgia Department of Natural Resources, Environmental Protection Division (GEPD) issued an HSWA permit to the NSB on September 29, 1989. The permit identified four SWMUs (Figure 1-1) suspected to be sources of current or past releases of hazardous substances to the environment:

- Site 5, Army Reserve Disposal Area, Towhee Trail;
- Site 11, Old Camden County Landfill;
- Site 12, Army Reserve Disposal Area, Future Dry Dock (now referred to as the Current Dry Dock); and
- Site 16, Army Reserve Disposal Area, Motor Missile Magazines.

Site 12 was included in the initial RFI but was approved for No Further Action (NFA) by the GEPD after it was remediated during construction of a dry dock. A fifth site, Site 2, is a former fire-fighting training area located within Site 12. A screening investigation planned for Site 2 will be defined under a separate workplan. Site 11 has moved into the Interim Corrective Measures phase of corrective action and is being addressed separately.

The second step of corrective action includes developing an RFI Workplan and conducting an RFI to establish the presence or absence of toxic or hazardous substances and obtain information on the nature and extent of the contamination. Information collected during the RFI stage will be used to establish whether there is a need to implement additional phases of the RCRA CAP. A possible third step, Interim Corrective Measures, would involve controlling the further migration of contaminants and/or controlling potential sources of release and would be implemented if needed. The fourth step, Corrective Measure Study (CMS), would evaluate and recommend specific technical methodologies for achieving long-term remedial action goals. GEPD requires a site-specific CAP to address remedial actions at a site but does not require a CMS for the process.

The investigative approach for the Supplemental RFI at Sites 5 and 16 was developed to provide the necessary information needed to support an NFA or monitoring only proposal or determine the need for a site-specific CAP. If a CAP is needed, the information gathered during the Supplemental RFI will support development of a CAP. Additional information is needed to assess potential contaminants in soil and groundwater relative to background conditions.

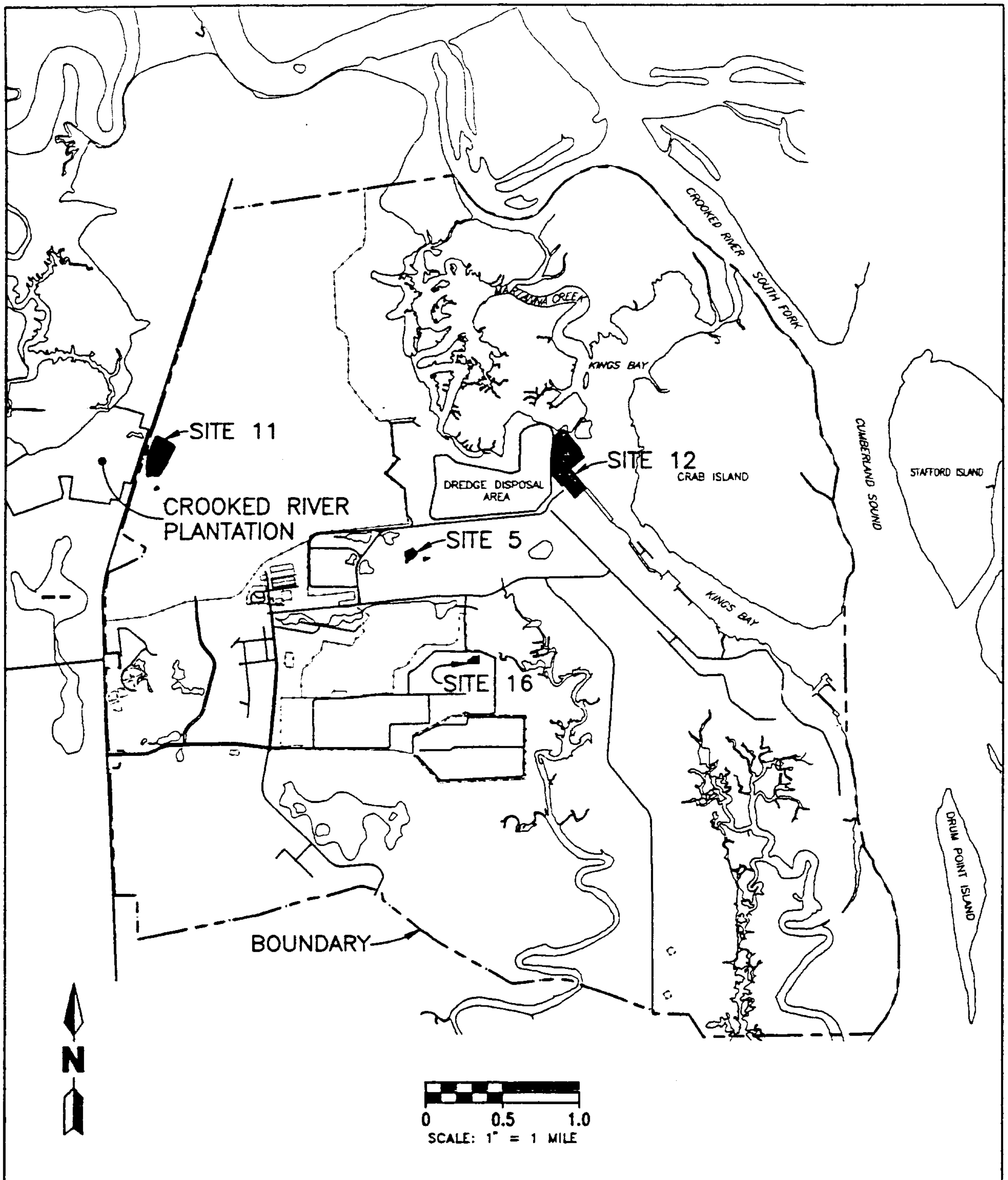

FIGURE 1-1

SITE LOCATION MAP

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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2.0 DESCRIPTION OF CURRENT CONDITIONS

2.1 ENVIRONMENTAL SETTING. In June 1994, an RFI report was submitted to the Navy that addressed the results of the 1992 and 1993 investigations conducted at Sites 5 and 16 (ABB Environmental Services, Inc. [ABB-ES], 1994). Chapter 2.0 of the RFI report addressed topography, surface water, drainage, regional and site-specific hydrogeology, soils, and climate and is incorporated into this workplan by reference. The remainder of this chapter describes conditions at the sites as defined by historical information and previous investigations.

2.2 SITE DESCRIPTIONS.

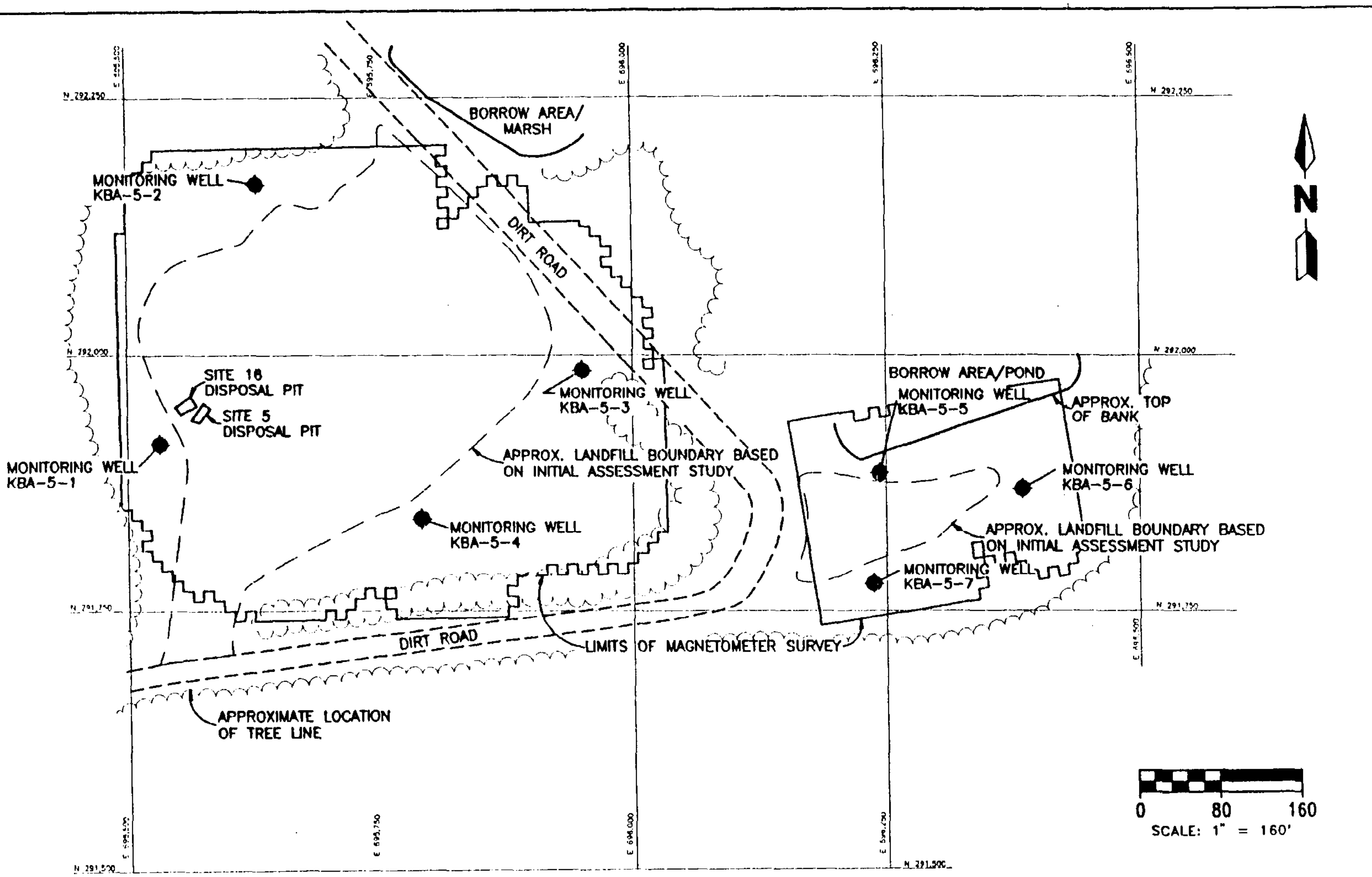
Site 5, Army Reserve Disposal Area, Towhee Trail. Site 5 is located in the west-central part of NSB Kings Bay (see Figure 1-1). The site is composed of two areas covering approximately 8.5 acres (Figure 2-1). The larger part of Site 5 is on the western side of Towhee Trail (a dirt road shown on Figure 2-1) and is approximately 7 acres in area. The smaller part of Site 5 is on the eastern side of Towhee Trail and is approximately 1.5 acres. The larger area of the site measures approximately 550 feet long by 400 feet wide at its maximum width. The smaller part of the site measures approximately 100 feet long by 200 feet wide.

The larger part of Site 5 is an open area currently used for staging fill material (dirt). Periodically, fill material is graded over this part of the site. Occasionally, small amounts of construction rubble are dumped on the surface. The smaller part of Site 5 is a grassy area adjacent to a pond. The pond is a former borrow pit.

Disposal practices described in this paragraph are based on information presented in the IAS prepared by C.C. Johnson and Associates, Inc. (1985). Site 5 was used by the Army Reserve from approximately 1969 to 1974 and ceased operations in 1974. Both sections of the site were excavated to a depth of 5 feet before wastes were placed in them. Wastes were burned twice a year on the western side of Towhee Trail. No burning occurred on the eastern side of the road. Approximately 30 to 40 gallons of diesel fuel and waste engine oil were used to ignite the wastes. It is estimated that during the 5 years the site was in use, 300 to 400 gallons of waste oil and fuel were burned.

Information regarding wastes disposed at Site 5 was obtained during the IAS and included records searches, interviews, and ground and aerial tours (C.C. Johnson, 1985). Based on the IAS, it was estimated that approximately 69,000 cubic yards of waste were placed in the landfill between 1969 and 1974. The wastes included tree stumps, wooden pallets, metal ammunition boxes (some empty and some filled with concrete), aluminum sheeting, concrete blocks, and kitchen waste. In addition, a large pile of dredge spoils and gravel (from abandoned railroad tracks) were reportedly spread over most of the western part of the site. The spoils and gravel were spread to a depth of about 2 feet.

The initial RFI at Site 5 was conducted during 1992 and 1993 (ABB-ES, 1994) and included geophysical surveys, surface soil sampling, subsurface soil sampling, monitoring well installation, and groundwater sampling (Table 2-1). Geophysical investigations were conducted using magnetics and terrain conductivity. Results from the magnetometer survey at Site 5 indicated limited disposal of ferrous



LEGEND

- ● – MONITORING WELL
- ▱ – DRILL CUTTINGS DISPOSAL PIT

FIGURE 2-1

SITE 5, ARMY RESERVE DISPOSAL AREA
TOWHEE TRAIL

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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material. No anomalous conductivity values were recorded during the terrain conductivity survey, which indicates there are no areas of highly conductive groundwater emanating from the site.

Table 2-1
Investigative Chronology

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Investigation	Dates Conducted	Activities[1]
RFI Field Program	January and February 1992	Soil borings Geophysical surveys Subsurface soil sampling Monitoring well installation Slug tests Groundwater sampling event No. 1 Surface soil sampling (Site 5)
RFI Field Program	May 1992	Groundwater sampling event No. 2
RFI Field Program	July 1992	Groundwater sampling event No. 3 Surface soil sampling (Site 5)
RFI Field Program	September 1992	Groundwater sampling event No. 4
RFI Field Program	November 1992	Hydrocone groundwater sampling
RFI Field Program	November 1992	Groundwater sampling event No. 5
RFI Field Program	January 1993	Groundwater sampling event No. 6

[1] Activities listed were conducted at both Site 5 and Site 16 unless otherwise specified.

Source: ABB Environmental Services, Inc., 1994.

Note: RFI = Resource Conservation and Recovery Act (RCRA) Facility Investigation.

Seven monitoring wells (KBA-5-1 through KBA-5-7) were installed around the perimeter of the two areas comprising Site 5. The initial RFI included a groundwater monitoring program composed of six bimonthly sampling events. Analyses for the first two sampling events included USEPA Appendix IX volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs), inorganics, dioxins, and furans. After the second sampling event, the monitoring program was reduced to include VOCs, SVOCs, PCBs, and inorganics. Additionally, during November 1992, groundwater samples were collected from depths below screened intervals of monitoring wells using direct push methods. These samples were analyzed in an onsite laboratory for select VOCs with at least 10 percent of the samples replicated for offsite confirmatory analysis of Target Compound List (TCL) VOCs using USEPA Contract Laboratory Program (CLP) procedures.

Table 2-2 lists the compounds detected in soil and groundwater samples and the corresponding maximum concentrations detected. Also listed in Table 2-2 are the groundwater criteria from Table 1 in Appendix III of the GEPD Hazardous Site Response (HSR) regulation (GEPD, 1994). The sites at the NSB are not legally

Table 2-2
Summary of Compounds and Concentrations Detected at Site 5

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Compounds	HSR Groundwater Criteria[1] (μg/ℓ)	Maximum Concentrations Detected at Site 5	
		Groundwater (μg/ℓ)	Soil (μg/kg)
Organic Compounds			
Acetone	4,000	72	17,000
bis(2-Ethylhexyl)phthalate	6	18	790
Carbon disulfide	4,000	2 J	24 J
4,4'-Dichlorodiphenyldichloroethylene	0.1	ND	0.7 J
Diethylphthalate	5,000	2 J	69 J
Ethylbenzene	700	1 J	ND
Methylene chloride	5	ND	110 J
Aroclor 1260 (PCB)	0.5	ND	53
Toluene	1,000	ND	6 J
Trichlorofluoromethane	2,000	7	3 J
Xylene (total)	10,000	6	21 J
Naphthalene	20	ND	44 J
3- and 4- Methylphenol	--	ND	82 J
4-Methyl-2-pentanone	2,000	3 J	ND
Benzoic acid	--	ND	660 J
Inorganic Compounds			(mg/kg)
Antimony	6	17.0 J	ND
Arsenic	50	135	1.1 J
Barium	2,000	1,080	8.0 J
Beryllium	4	8.2	0.16 J
Cobalt	--	62.6 J	ND
Copper	1,300	249	7.8
Cyanide	200	10.3	5.0
Lead	15	68.9	8.5
Mercury	2	0.51	ND
Selenium	50	6.3	1.8
Silver	100	4.5 J	ND
Sulfide	--	2,100	5,100
Chromium	100	271	8.7
Nickel	100	128	9.2

See notes at end of table.

Table 2-2 (Continued)
Summary of Compounds and Concentrations Detected at Site 5

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Compounds	HSR Groundwater Criteria[1] (µg/ℓ)	Maximum Concentrations Detected at Site 5	
		Groundwater (µg/ℓ)	Soil (mg/kg)
Thallium	2	3.4 J	ND
Tin	--	702 J	ND
Vanadium	200	251	8.5 J
Zinc	2,000	519	10.1
Cadmium	5	27.4	ND

[1] Criteria for groundwater from Table 1 of Appendix III, Media Target Concentrations and Standard Exposure Assumptions of the Hazardous Site Response (Georgia Environmental Protection Division, 1994).

Notes: HSR = Hazardous Site Response.
µg/ℓ = micrograms per liter.
µg/kg = micrograms per kilogram.
J = estimated value.
PCB = polychlorinated biphenyl.
ND = none detected.
mg/kg = milligrams per kilogram.

under the jurisdiction of the HSR regulation because of the facility's RCRA status; however, evaluation of the organic analytical data for groundwater samples from Site 5 in consideration of further action is similar to circumstances covered by the jurisdiction of the HSR regulation. Therefore, the comparison of concentrations detected in groundwater samples to corresponding criteria in the regulation may be appropriate.

No pesticides, herbicides, PCBs, dioxins, or furans were detected in groundwater samples collected from the site during the first and second monitoring events. When the analytical program was reduced, PCBs remained on the list of parameters for monitoring because of low concentrations detected in soil at the site. However, PCBs have not been detected in groundwater samples.

VOCs were detected during the first sampling event, and included acetone, carbon disulfide, 4-methyl-2-pentanone, xylenes, ethylbenzene, and trichlorofluoromethane at concentrations ranging from 1 J microgram per liter ($\mu g/\ell$) to 72 $\mu g/\ell$ (a "J" associated with a reported concentration indicates that the concentration is estimated). No VOCs have been detected in groundwater from Site 5 since the first monitoring event (February 1992).

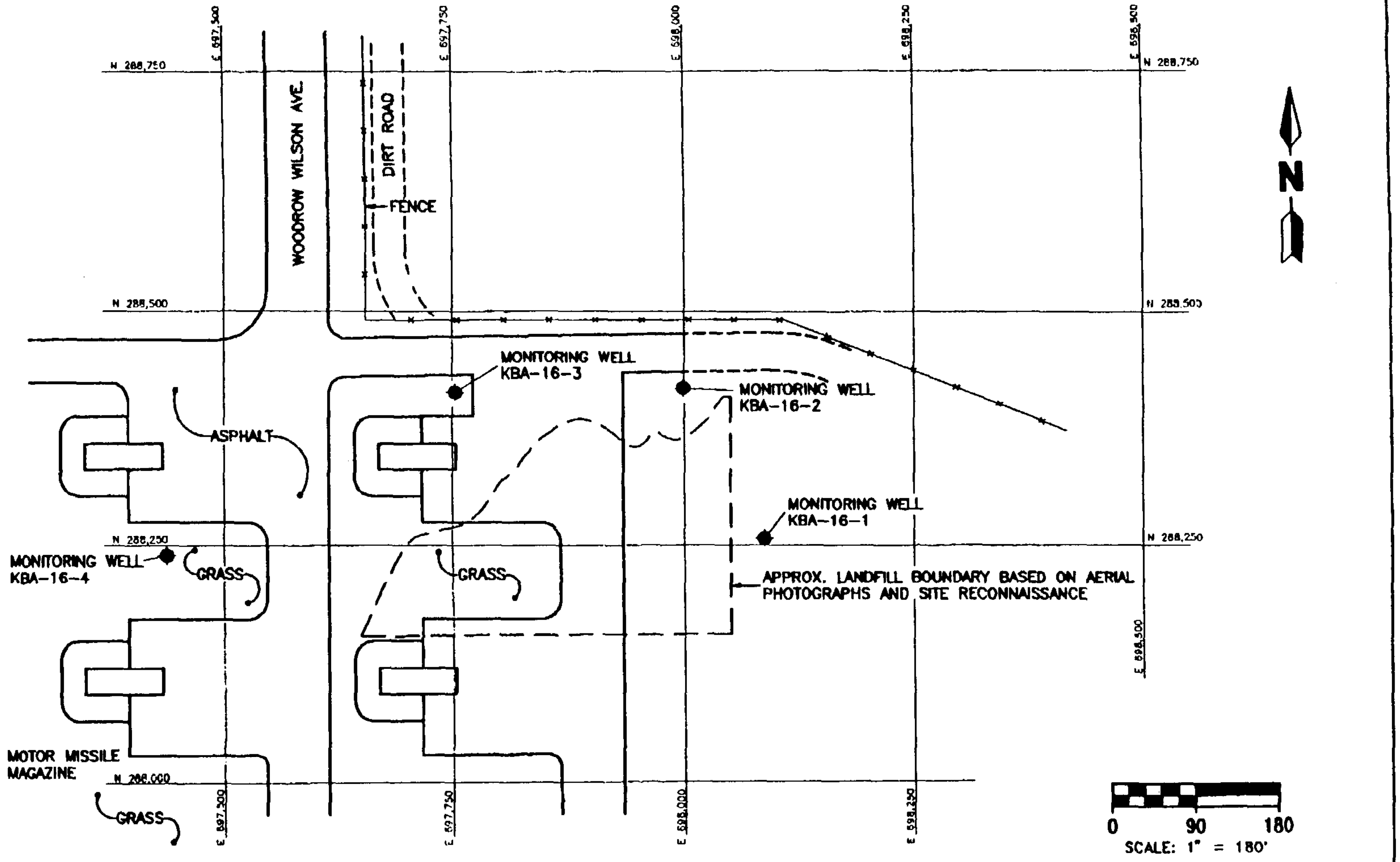
SVOCs detected in groundwater samples from the site were limited to phthalates. Phthalates are commonly introduced into sample media during sampling or analysis. Bis(2-ethylhexyl)phthalate and diethylphthalate were detected in groundwater samples from sampling events in February and May 1992 at concentrations ranging from 2 J to 18 $\mu g/\ell$. These compounds were not detected in groundwater samples collected during four subsequent sampling events.

Unless analytical data from soil samples collected during the Supplemental RFI indicate the site is a potential source of organic chemicals, NFA will be recommended for organic chemicals in groundwater at Site 5.

Concentrations of inorganic analytes detected in groundwater from the site were evaluated without the benefit of a background database. No conclusions can be made regarding the potential for inorganic contaminants in groundwater until completion of the background data collection program. A proposal for a site-specific background sampling program will be developed separately.

Soil samples collected during previous investigations at Site 5 were collected from borings for monitoring wells and may not be suitable for assessing soil contamination within the disposal area caused by releases from waste. Soil contamination will be assessed after soil samples are collected from within the disposal area during the Supplemental RFI. The assessment results will be related to background conditions using a statistical approach. Analytical results for surface soil and subsurface soil samples collected during the initial RFI are discussed in detail in the June 1994 RFI report (ABB-ES, 1994) and are summarized in Table 2-2. These data are not discussed in this Workplan.

<u>Site 16, Army Reserve Disposal Area, Motor Missile Magazines</u>. The Army Reserve Disposal Area, Motor Missile Magazines, is located in the south-central part of the NSB (see Figure 1-1). The site is located east of Woodrow Wilson Avenue. The site covers approximately 1 acre, measuring approximately 250 feet long by 450 feet wide at its maximum dimensions (Figure 2-2).



LEGEND

● – EXISTING MONITORING WELL

FIGURE 2-2

SITE 16, ARMY RESREVE DISPOSAL AREA, MOTOR MISSILE MAGAZINES

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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Site 16 was first identified as a potential source of contamination during the IAS conducted in 1985 by C.C. Johnson and Associates, Inc. The IAS included record searches, interviews, and ground and aerial tours (C.C. Johnson, 1985). During development of the 1991 RFI Workplan (ABB-ES, 1991), field team members used historical aerial photographs and physical landmarks to locate Site 16. A former sewage lagoon and a creek to the north of Site 16, landmarks visible in aerial photographs, were used by field team members to locate the site. The approximate site boundary shown in Figure 2-2 is based on the location identified during the reconnaissance. The 1991 RFI Workplan proposed a magnetometer survey to further delineate the disposal area (ABB-ES, 1991). During the RFI field program in January and February 1992, motor missile magazines were being constructed at Site 16. The construction activities, and metal used in the magazines, prevented using magnetometry at Site 16. Alternate means for delineating the site are proposed in this Supplemental RFI Workplan.

The nature of waste and disposal practices described in this paragraph are based on information presented in the IAS (C.C. Johnson, 1985). Site 16 was used by the Army Reserve from 1958 to 1964. The site was excavated to a depth of 3 to 5 feet before wastes were placed there. Reportedly, burning of waste took place, but it is unknown how often burning occurred or if any fuel was used to ignite the wastes. Approximately 4,000 cubic yards of waste were disposed at the site between 1958 and 1964 including food, wood, trash, scrap metal, tree limbs, and empty paint and solvent cans (about one or two 1-gallon cans per month) (C.C. Johnson, 1985). The site was covered with soil upon closure and is currently the location of motor missile magazines.

The RFI at Site 16 included a geophysical survey, subsurface soil sampling, monitoring well installation, and groundwater sampling (see Table 2-1). Geophysical investigation was limited to a terrain conductivity survey along the downgradient perimeter of the site. Magnetometry could not be used because of interferences from construction activity at the site. Results of the terrain conductivity survey indicated one area of anomalous readings in the vicinity of a buried culvert suspected of influencing the survey.

Four monitoring wells (KBA-16-1 through KBA-16-4) were installed at Site 16. The monitoring well locations were selected based on knowledge of the site location reported in the IAS (C.C. Johnson, 1985) and from aerial photographs and area reconnaissance. GEPD requires three monitoring wells downgradient of the site. Groundwater flow is to the northeast. Existing monitoring well KBA-16-2 is the only monitoring well that satisfies the downgradient criteria. The suitability of the existing monitoring wells will be re-evaluated after additional efforts to confirm the location of the disposal area have been conducted.

The 1992-1993 RFI included a groundwater monitoring program composed of six bimonthly sampling events. Analyses for the first two sampling events included USEPA Appendix IX VOCs, SVOCs, pesticides, herbicides, PCBs, inorganics, dioxins, and furans. After the second sampling event, the monitoring program was reduced to include VOCs, the base and neutral fractions of SVOCs, and inorganics. Additionally, during November 1992, groundwater samples were collected from depths below screened intervals of monitoring wells using direct push methods. These samples were analyzed in an onsite laboratory for select VOCs with at least 10 percent of the samples replicated for offsite confirmatory analysis of TCL VOCs using CLP procedures.

Table 2-3 lists the compounds detected in soil and groundwater samples and the corresponding maximum concentrations detected. Also listed in Table 2-3 are the groundwater criteria from Table 1 in Appendix III of the GEPD HSR regulation (GEPD, 1994). As mentioned previously for Site 5, the NSB sites are not under the jurisdiction of the HSR regulation, but the groundwater criteria in Appendix III of the regulation may be appropriate criteria for evaluations pertaining to groundwater quality.

No pesticides, herbicides, PCBs, dioxins, or furans were detected in groundwater samples from the site during the first two sampling events. When the analytical program was reduced, the base and neutral fractions of the SVOCs remained on the monitoring list because of concentrations of fuel-related SVOCs in one subsurface soil sample from the soil boring for monitoring well KBA-16-2. VOCs detected in groundwater samples included fuel-related VOCs and those suspected of being caused by sampling or laboratory contamination. SVOCs detected in groundwater included one fuel-related compound and phthalates.

Five VOCs, including acetone, toluene, xylenes, ethylbenzene, and 4-methyl-2-pentanone, were detected in groundwater samples from two release detection monitoring wells. Each of these VOCs was detected in only one groundwater sample during the RFI monitoring program. The presence of acetone in one groundwater sample is considered to be a sampling or laboratory artifact. The fuel-related VOCs, xylenes, ethylbenzene, and toluene, were detected at concentrations ranging from 1 J $\mu g/\ell$ to 5 $\mu g/\ell$. 4-Methyl-2-pentanone, a solvent used in paints and varnishes, was detected in one groundwater sample during the first sampling event at a concentration of 3 J $\mu g/\ell$.

SVOCs detected in groundwater samples include naphthalene and phthalates. Naphthalene, a fuel-related SVOC, could be associated with other SVOCs detected in one soil sample from the site. Naphthalene was detected in two groundwater samples from one of the release detection monitoring wells (KBA-16-2) at concentrations of 1 J and 2 J $\mu g/\ell$. Phthalates detected in groundwater samples include bis(2-ethylhexyl)phthalate and di-n-butylphthalate. Concentrations ranged from 1 J to 75 $\mu g/\ell$. The presence of phthalates in groundwater samples is considered incidental to sampling and analysis.

None of the organic analytes exceeded the HSR groundwater criteria in groundwater samples collected during three consecutive sampling events conducted during September and November 1992 and January 1993. These criteria are not applicable under RCRA, but may be appropriate to consider when evaluating the groundwater data. Based on a review of the analytical data from soil samples collected during the Supplemental RFI from within the disposal area, an NFA will be recommended for organic chemicals in groundwater at Site 16.

Similar to Site 5, evaluation of inorganic data from Site 16 was done without the benefit of background groundwater quality data. Also, soil samples collected during previous investigations at Site 16 were collected from monitoring well borings and may not be suitable for assessing soil contamination within the disposal area caused by releases from waste. A separate proposal for a site-specific background sampling program and statistical approach is currently being developed. The inorganic data for soil and groundwater samples from the site will be evaluated using the approved background data set to assess potential contaminants relative to background conditions.

Table 2-3
Summary of Compounds and Concentrations Detected at Site 16

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Compounds	HSR Groundwater Criteria[1] (µg/ℓ)	Maximum Concentrations Detected at Site 16	
		Water (µg/ℓ)	Soil (µg/kg)
Organic Compounds			
Acetone	4,000	10	110
bis(2-Ethylhexyl)phthalate	6	75	1,100
Carbon disulfide	4,000	ND	2 J
4,4'-Dichlorodipenyldichloroethane	0.1	ND	1
Di-n-butylphthalate	4,000	2 J	ND
Ethylbenzene	700	2 J	ND
Toluene	1,000	5	1 J
Xylene (total)	10,000	3 J	9
Naphthalene	20	2 J	ND
4-Methyl-2-pentanone	2,000	3 J	ND
2-Butanone	2,000	ND	10
Acenaphthene	2,000	ND	99 J
Fluorene	1,000	ND	61 J
Phenanthrene	--	ND	130 J
Fluoranthene	1,000	ND	1,000
Pyrene	1,000	ND	1,700
Benzo(a)anthracene	0.1	ND	390
Chrysene	0.2[2]	ND	600
Benzo(b)fluoranthene	0.2	ND	310 J
Benzo(k)fluoranthene	--	ND	280 J
Benzo(a)pyrene	0.2	ND	170 J
Inorganic Compounds			**(mg/kg)**
Antimony	6	23.1 J	ND
Arsenic	50	63.2	0.34 J
Barium	2,000	538	6.4
Beryllium	4	15.9	ND
Cobalt	--	74.4	ND
Copper	1,300	82.8	2.4 J

See notes at end of table.

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Table 2-3 (Continued)
Summary of Compounds and Concentrations Detected at Site 16

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Compounds	HSR Groundwater Criteria[1] (µg/ℓ)	Maximum Concentrations Detected at Site 16	
		Water (µg/ℓ)	Soil (mg/kg)
Cyanide	200	18.5	ND
Lead	15	41.2 J	3.9
Mercury	2	0.82	ND
Selenium	50	10.6	ND
Silver	100	3.6 J	ND
Sulfide	--	2,400	18,300
Chromium	100	256	1,540
Nickel	100	274	3.0 J
Thallium	2	17.3 J	ND
Vanadium	200	257	2.4 J
Zinc	2,000	297	3.4 J
Cadmium	5	3.4 J	ND

[1] Criteria for groundwater from Table 1 of Appendix III, Media Target Concentrations and Standard Exposure Assumptions, of the Hazardous Site Response (Georgia Environmental Protection Agency [GEPD], 1994).

Notes: HSR = Hazardous Site Response.
µg/ℓ = micrograms per liter.
µg/kg = micrograms per kilogram.
ND = none detected.
J = estimated value.
mg/kg = milligrams per kilogram.

3.0 PROJECT MANAGEMENT PLAN

3.1 PROJECT ORGANIZATION AND RESPONSIBILITIES. Key individuals in the project structure are highlighted below.

SOUTHNAVFACENGCOM. SOUTHNAVFACENGCOM is responsible for establishing policy and guidance for the CLEAN program. SOUTHNAVFACENGCOM awards contracts, approves funding, and has primary control of report release and interagency communication.

NSB Kings Bay Environmental Coordinator. The Environmental Coordinator will coordinate and monitor Supplemental RFI activities at NSB Kings Bay. The Environmental Coordinator maintains a working relationship with local, State, and Federal regulatory agencies.

SOUTHNAVFACENGCOM Engineer-in-Charge. The SOUTHNAVFACENGCOM Engineer-in-Charge (EIC) is responsible for the technical and financial management of the Supplemental RFI at NSB Kings Bay. The EIC prepares the project statement of work; develops the project Site Management Plan; manages project scope, schedule, and budget; and provides technical review and approval of all deliverables. The EIC will be responsible for changes in the scope of work determined during Project Managers' Meetings.

Task Order Manager. The Task Order Manager (TOM) for the Supplemental RFI is responsible for evaluating the appropriateness and adequacy of the technical and engineering services provided. The TOM is also responsible for resource management, for confirming that the project fulfills the requirements of the Contract Task Order, and for the daily conduct of work, including integration of input from supporting disciplines and subcontractors.

Supplemental RFI Technical Leader. The Supplemental RFI Technical Leader will be responsible for the quality and completeness of data gathered during the Supplemental RFI field program, including overall management and coordination of fieldwork and supervision and scheduling of work. The Supplemental RFI Leader will also be responsible for the development of the Supplemental RFI Report.

Field Operations Leader. The Field Operations Leader (FOL) will be responsible for the day-to-day execution of the Supplemental RFI field programs. These responsibilities include coordination of activities; record keeping; communication with the Activity, technical leaders, and TOM; adherence to quality assurance and quality control requirements; subcontractor oversight; mobilization of equipment; local agency interaction; and preparation of sampling event reports. The FOL will also ensure that all field activities are performed consistent with the project workplan and supporting documents. These responsibilities include appropriate logging and documentation of standard and approved drilling and monitoring well installation methods to confirm that pertinent drilling and testing information is obtained during the exploration program. Other responsibilities include oversight of sampling activities and site characterization studies.

Technical Director. The Technical Director will be responsible for coordination of technical review of workplans and planning documents, interaction with the technical leaders, and guidance with regulatory and technical requirements.

RCRA Technical Expert. The RCRA Technical Expert will be responsible for providing expertise to the RFI program at NSB Kings Bay. He will provide guidance and input to the direction of activities associated with the program. He will also provide review of documents created by the RFI project team. He has close interaction with the RFI Technical Leader.

3.2 SCHEDULE. Accurate schedule planning, tracking, and reporting are important for expeditious completion of the Supplemental RFI for Sites 5 and 16. For purposes of this Workplan, the schedule is presented in Figure 3-1. The schedule will be updated to reflect actual progress during the project and will be forwarded to the SOUTHNAVFACENGCOM EIC, NSB Kings Bay, and GEPD (if required). The schedule reflects durations and begins at notice to proceed. The schedule assumes ready access to the sites.

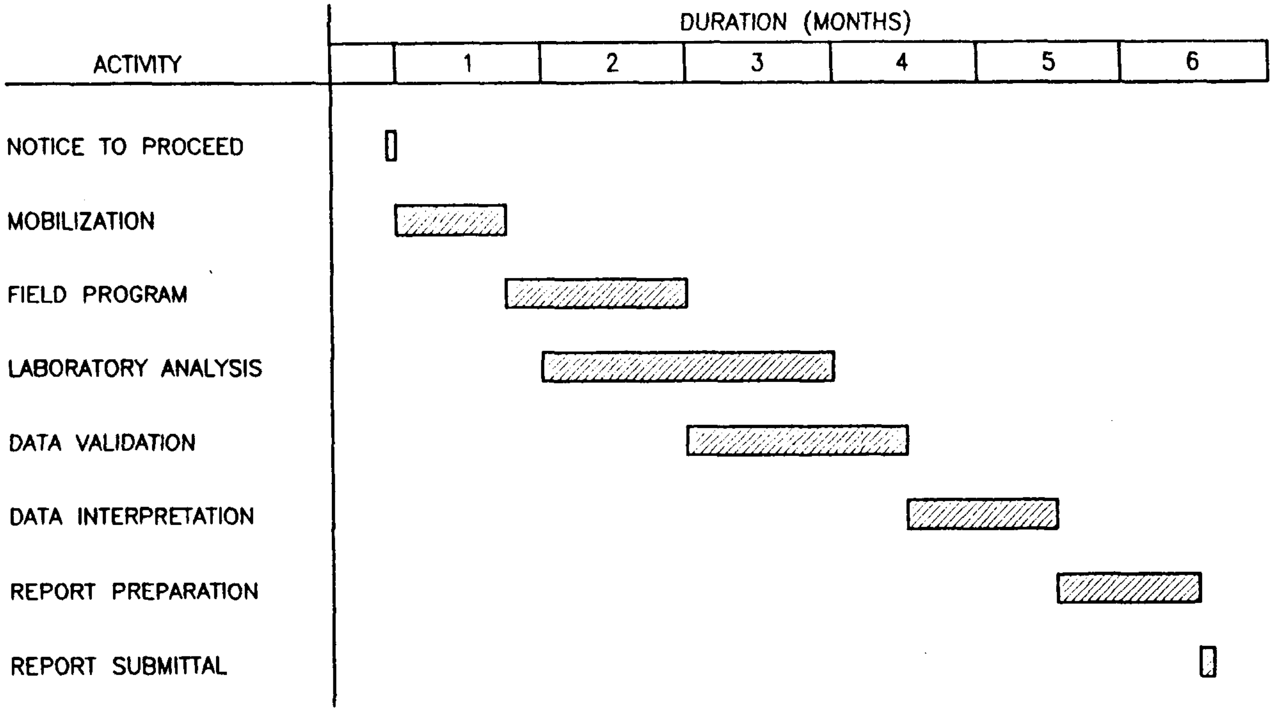

FIGURE 3-1

PROJECT SCHEDULE

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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4.0 SAMPLING AND ANALYSIS PLAN

4.1 SITE MANAGEMENT. The following subsections describe mobilization activities, site access and security clearances, and documentation requirements for the fieldwork.

4.1.1 Mobilization The following activities will be performed at NSB Kings Bay as part of mobilization:

- staking and utility clearance (i.e., excavation permits) for all exploration locations;
- field team orientation, including acquisition of personnel badges and security clearances for work in secure areas; and
- field team and subcontractor health and safety meetings.

4.1.2 Site Access and Control NSB Kings Bay is an active base with various levels of security clearance for different areas of the base. Work is planned in controlled access areas. Where necessary, security police will be notified of the locations of on-base field activities. Badges will be obtained through base security. All sites are accessible from paved or dirt roads maintained by the base.

4.1.3 Field Monitoring Instrumentation The following monitoring instruments may be used during field activities:

- photoionization detector (PID),
- organic vapor analyzer (OVA),
- explosimeter,
- radiation meter,
- pH-temperature-specific conductance meter,
- electronic water level meter,
- metal detector,
- two-way radios or cellular telephones,
- oil-water interface probe, and
- turbidity meter.

Instruments will be calibrated and inspected daily before field activities begin, as suggested by the manufacturers. Calibration information will be recorded in the field logbooks and on a field instrumentation quality assurance form. Monitoring equipment will be protected, as much as possible without hindering operation of the unit, from contamination during field exploration activities. Equipment maintenance will be performed according to manufacturer specifications before field use or by rotating instruments into and out of the field on an instrument performance and maintenance schedule. As appropriate, routine periodic maintenance may be performed as a function of field calibration. Malfunctioning instruments will be repaired or replaced.

4.1.4 Control and Disposal of Investigation-Derived Waste (IDW) IDW associated with the Supplemental RFI field program can include soil cuttings, groundwater, decontamination water and solutions, and expendable materials such as sample gloves, paper towels, and tin foil.

The IDW will be segregated by medium, liquids (groundwater, development water, etc.), and solids (soils, expendables, etc.). Liquid IDW will be derived from two sources: (1) groundwater, generated during sampling and purging of monitoring wells, and (2) wastewater, generated from decontamination procedures. Solid IDW will be derived from three sources: (1) the advancement of soil borings, (2) the installation of monitoring wells, and (3) the disposing of protective clothing, gloves, plastic sheeting, and other expendable materials.

Decontamination activities will be conducted at the decontamination pad at Site 11, Old Camden County Landfill. The decontamination pad is constructed of concrete and drains to a sump on the pad. Decontamination fluids and solids will be collected in the sump. Fluids will be fed into the onsite treatment system at Site 11. Sediments in the sump will be transferred to new, 55-gallon, U.S. Department of Transportation (DOT) approved drums. Drums will be labeled indicating date and contents and recorded in an IDW logbook. These drums will be staged on wooden pallets at the decontamination area. The drums will be covered and temporary secondary containment will be constructed using bales of hay (or other suitable material) and plastic sheeting. Composite samples comprised of aliquots from no more than six drums will be collected and submitted for Toxicity Characteristic Leaching Procedure (TCLP) analyses. Disposal will be evaluated coincident with soil IDW generated during the field work and discussed in this subsection.

Groundwater IDW generated during purging and sampling of monitoring wells will be discharged to the ground surface on the downgradient side of each monitoring well. Groundwater analytical data from previous investigations indicate the groundwater does not contain constituents at concentrations that may cause soil contamination.

Waste soil will be stored in new, 55-gallon, DOT-approved drums with removable lids. Solid waste at each point source will be containerized, secured, transported to an onsite storage area, and staged on wooden pallets. The drums will be covered and temporary secondary containment will be constructed using bales of hay (or other suitable material) and plastic sheeting. A logbook will be kept, in which the sources of the contents in each container will be noted. The amount of solid waste from each point source will also be recorded as accurately as possible. Each drum will be labeled indicating the site, boring locations, contents, and date. Composite samples comprised of aliquots from no more than six drums will be collected and submitted for TCLP analyses. Results of the TCLP analyses will be used to evaluate potential disposal alternatives.

The soil cuttings and decontamination solids (sediment) contained in drums will be handled as hazardous waste until TCLP results are obtained and reviewed. The criteria used to evaluate disposal of the soil and sediment will be background concentrations and TCLP threshold values. If concentrations of analytes are less than background, the material may be spread onsite. If the concentrations are greater than background but less than TCLP threshold values, the material will be disposed in a Subtitle D landfill. If the analyte concentrations exceed TCLP threshold values, the material will be disposed as hazardous waste. The drums may be staged at the sites for up to 90 days, longer if TCLP analyses indicate concentrations below threshold values.

Expendables will be segregated from other solids. Under no circumstance will expendables be combined with soils. Expendables will be double-bagged in plastic bags and disposed in an NSB solid waste dumpster. Excessively soiled material will be washed at the decontamination pad to remove loose particles before disposal.

4.2 DATA COLLECTION AND SAMPLING PROCEDURES.

4.2.1 Site-specific Background Data Collection A site-specific sampling program for collection of background soil and groundwater chemical data is being developed separately and will be submitted to GEPD. The proposed program includes a statistical approach for comparing background chemical data to corresponding data from the sites. The tasks described in Subsections 4.2.2 and 4.2.3 that relate to background data collection will become part of the overall site-specific program.

4.2.2 Site 5 Data Collection The field program for Site 5 includes a ground-penetrating radar (GPR) screening survey, soil sampling, installation of a monitoring well, and groundwater sampling.

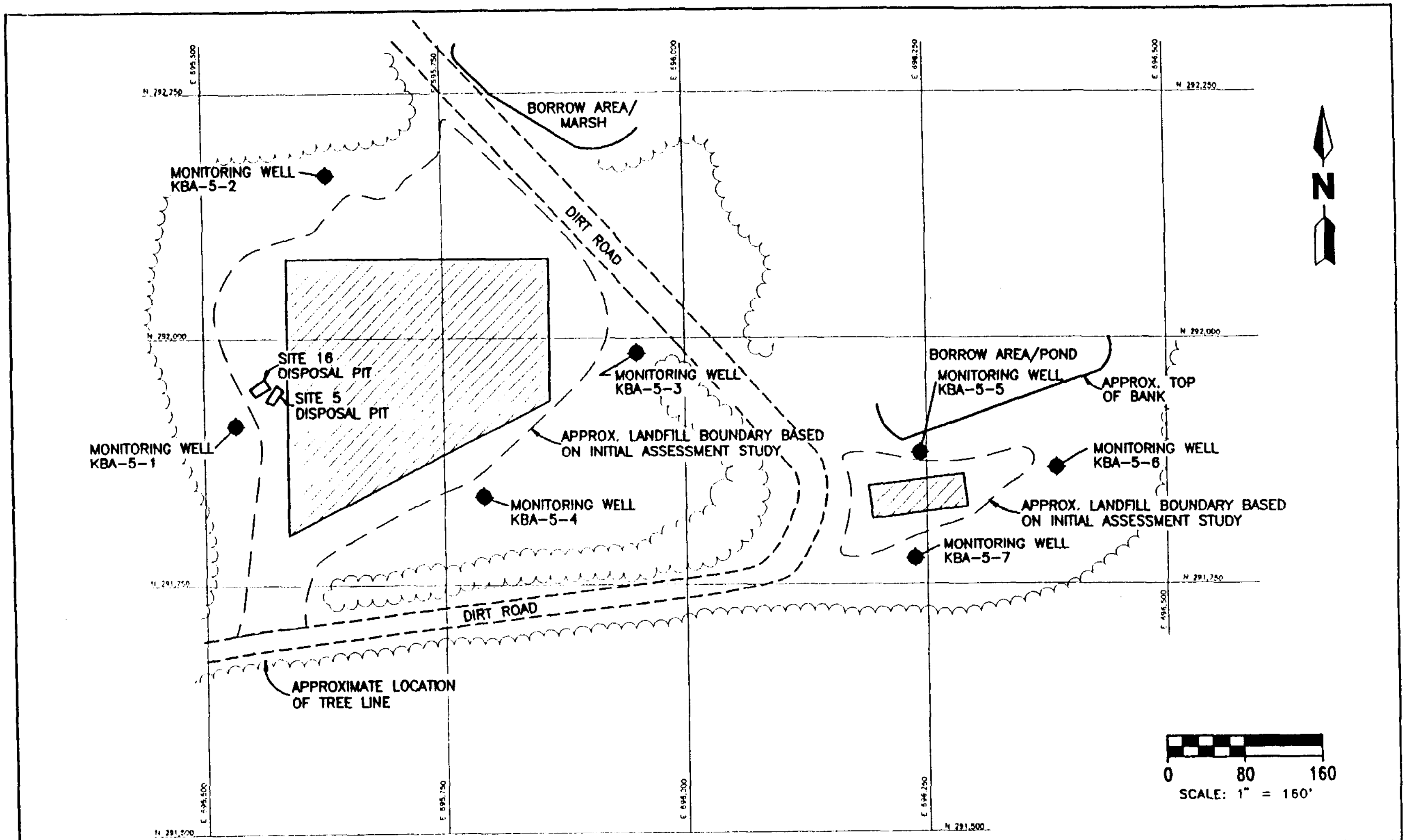
GPR Screening Survey. Soil samples are needed from within the limits of the Site 5 disposal area. Collecting these soil samples will require spoil borings inside the disposal area. A GPR screening survey will be conducted to select soil boring locations that are within the disposal area, but that will not penetrate waste when drilled. Drilling through waste will be avoided because of health and safety concerns. GPR was successfully used in the past at Site 11 for locating soil borings between disposal trenches.

GPR profiling will be conducted using a GSSI System II GPR unit or equivalent. The GPR unit will be equipped with a shallow profiling transducer and antenna (500 megaHertz). Profiling will be conducted along traverse lines within the area indicated by shading on Figure 4-1. The GPR data will be interpreted in the field and boring locations will be staked by the GPR field crew. Boring locations will be selected adjacent to or between areas interpreted as being disposal cells.

Subsurface Soil Sampling. Subsurface soil samples will be collected for chemical analyses from four locations. One location, approximately 200 feet west of Site 5 (Figure 4-2), will be evaluated for use as a site-specific background location. Three other locations are within the disposal areas of Site 5 (Figure 4-3). Two subsurface soil samples, at depths of 3 and 5 feet below land surface (bls), will be collected from each of the four borings. These soil samples will be analyzed for VOC, SVOC, pesticide, PCB, herbicide, and inorganic analytes in accordance with the analytical program described in Section 4.7.

The chemical data from the soil samples from the expected background location will be assessed for inclusion in the background database. Criteria indicative of whether a location may not be suitable for background information will be the detection of organic analytes in soil samples collected from the location. Any organic analytes detected will be evaluated individually to assess whether the detection renders the sample data unusable for background.

Two soil samples from the expected background location will be submitted for grain-size and hydrometer analyses. These samples will be collected from the anticipated screened interval for the background monitoring well and will represent the finest grained material in that interval. These data will be used to develop specifications for the proposed site-specific background monitoring well.



LEGEND

- ● – MONITORING WELL
- ▭ – GROUND PENETRATING RADAR SCREENING SURVEY AREA
- ▱ – DRILL CUTTINGS DISPOSAL PIT

FIGURE 4-1

SITE 5, PROPOSED GROUND PENETRATING RADAR SCREENING SURVEY AREA

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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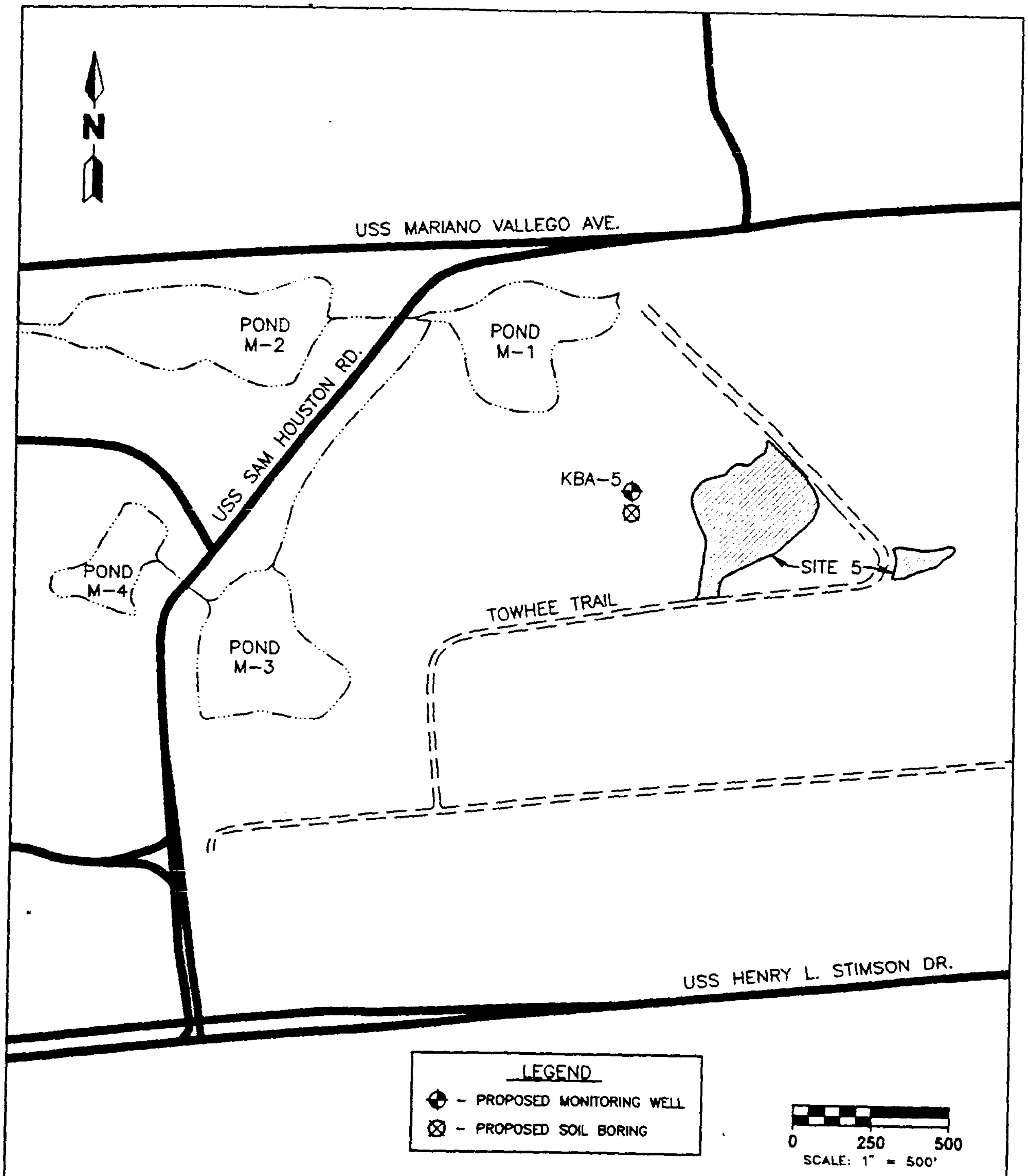

FIGURE 4-2

SITE 5, PROPOSED BACKGROUND SOIL BORING AND MONITORING WELL LOCATION

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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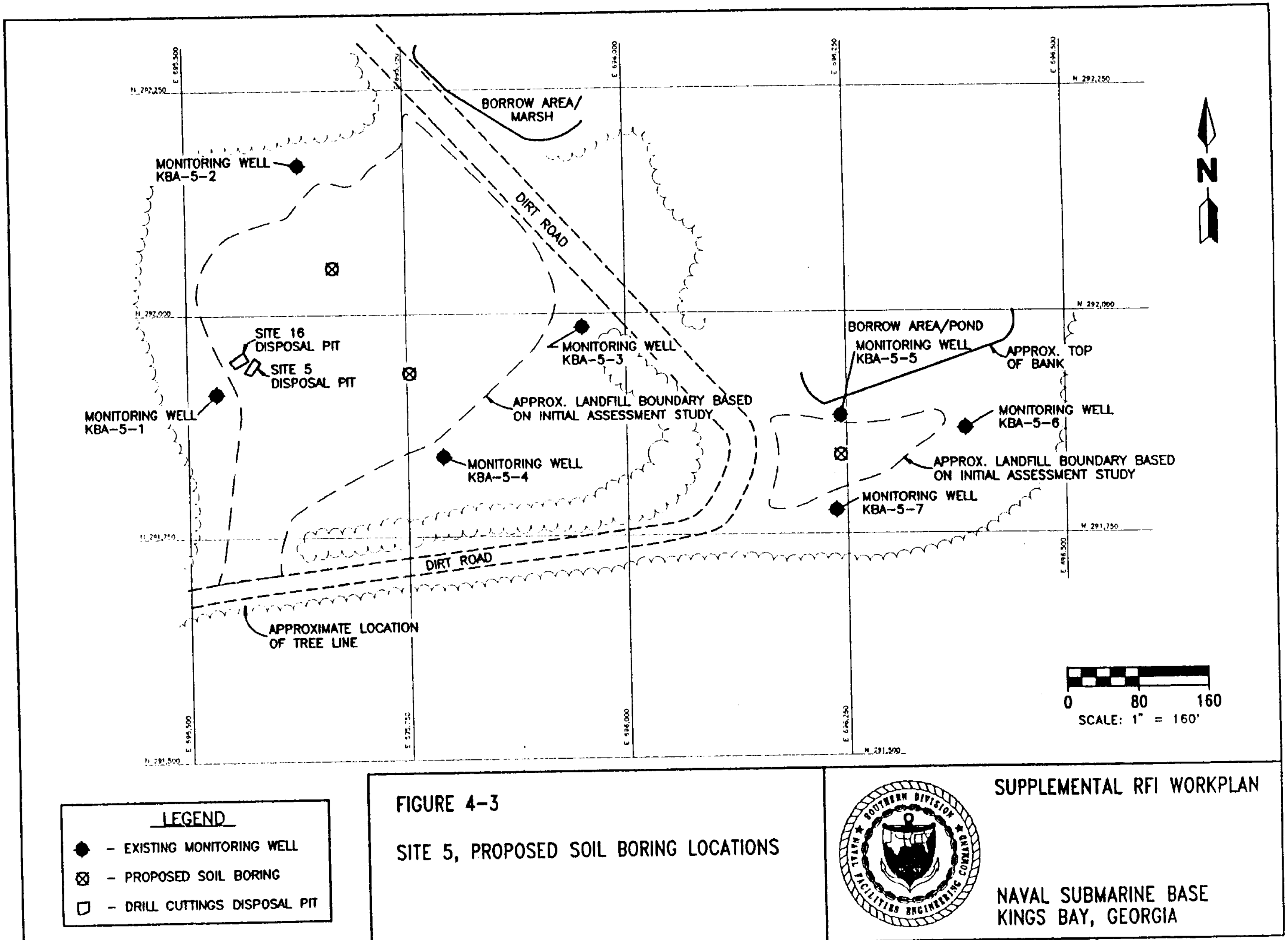

FIGURE 4-3

SITE 5, PROPOSED SOIL BORING LOCATIONS

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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The chemical data from the subsurface soil samples collected from borings within the disposal areas of Site 5 will be used to assess potential contaminants in soil. A statistical approach will be used to assess potential contaminants relative to background concentrations.

Soil borings will be conducted using hollow-stem auger drilling. Subsurface soil samples for chemical analyses will be collected from depths of 3 and 5 feet bls using split-spoon sampling techniques or using hand augers (Appendix A). The objective is to collect soil samples for chemical analyses from within the interval of waste disposal. Samples for grain size and hydrometer analyses from the background boring will be collected from the depth interval expected to contain the screened section of the background monitoring well.

Each soil sample will be collected using a decontaminated sampling device. Decontamination procedures for the samplers are described in Section 4.4. Sample handling procedures for the soil samples are presented in Section 4.3.

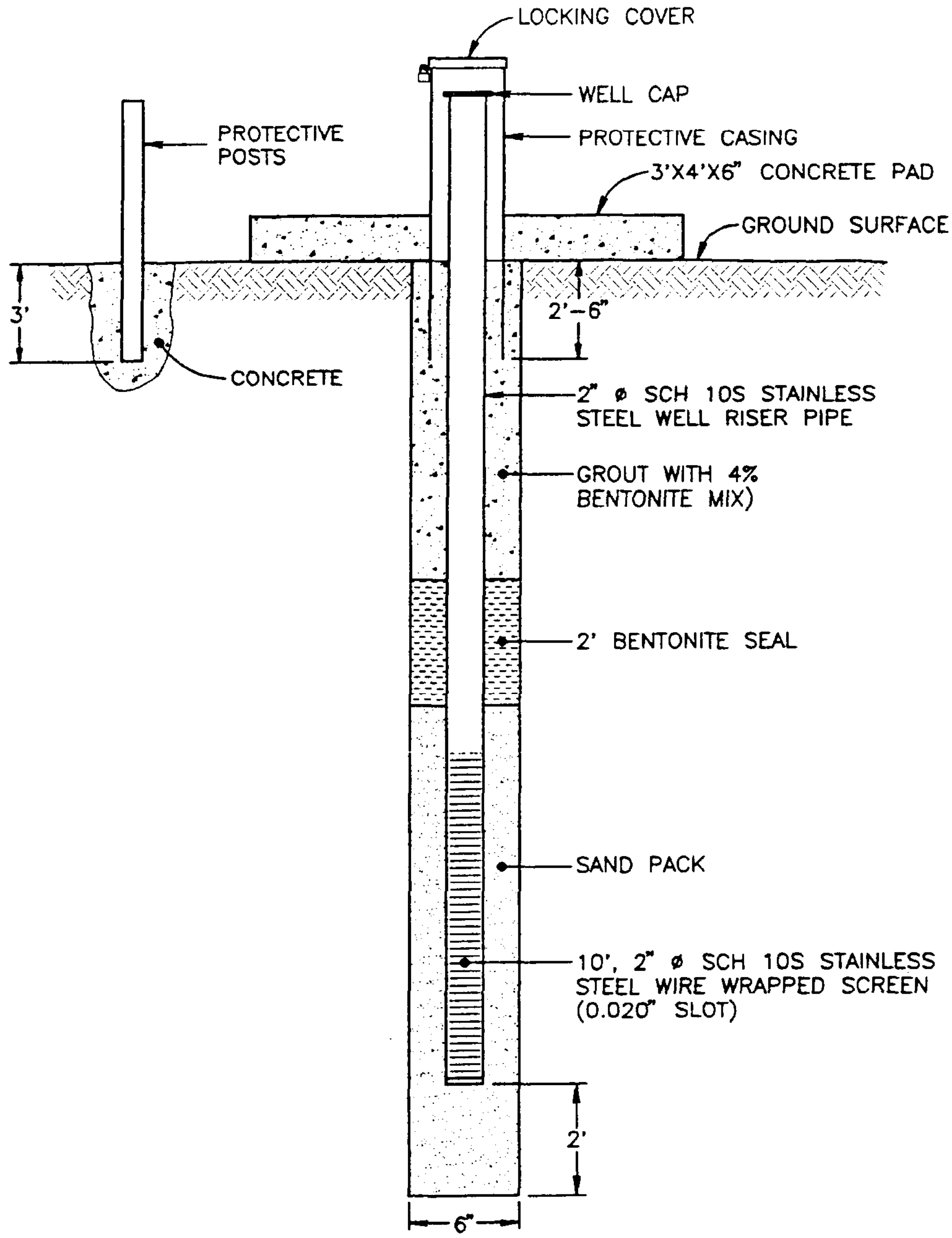
Monitoring Well Installation. One monitoring well (KBA-5-8) will be installed during the Supplemental RFI at Site 5. This monitoring well, located approximately 200 feet west of the disposal area (see Figure 4-2), is expected to be a site-specific background well. The diagram in Figure 4-4 shows the construction of the proposed monitoring well. Appendix B presents water-table surface contour maps developed during the initial RFI at Site 5. The interpreted groundwater flow direction from these maps was used to select the proposed background location.

The monitoring well will be constructed using 2-inch-diameter, schedule 40, flush threaded, polyvinyl chloride (PVC) riser and 10-foot well screen. The monitoring well will be installed using hollow stem auger drilling and well construction techniques. The augers will serve as a tremie pipe during placement of filter pack material. The grain-size distribution of the filter pack and slot size of the well screen will be determined using the grain-size and hydrometer data from subsurface soil samples collected from the expected background location. Specifications for the filter pack and well screen will be developed using the approach described in American Society for Testing and Materials (ASTM) D 5092-90, *Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers*.

The monitoring well will be constructed with 2 feet of well screen above the water table. The filter pack will extend 1.5 to 2 feet above the well screen and will be overlain by 2 feet of bentonite pellets. The depth of the water table will determine if 2 feet of filter pack above the well screen is feasible, allowing for the bentonite seal. The boring for the monitoring well will extend 2 feet below the base of the well screen. Based on the nearly flat terrain, low hydraulic gradient, and depth of monitoring wells located adjacent to the Site 5 disposal areas, the boring for the new monitoring well is expected to be approximately 15 feet deep.

Groundwater Sampling. The groundwater sampling program for Site 5 was developed based on analytical data from the 1992 and 1993 bimonthly groundwater sampling events. Section 2.2 provides a summary of the analytical data and rationale for the groundwater analytical program proposed in this Workplan.

The proposed groundwater monitoring program for the Supplemental RFI at Site 5 includes four quarterly sampling events. The groundwater samples from the seven



NOT TO SCALE

FIGURE 4-4

MONITORING WELL DIAGRAM, SINGLE CASED, ABOVEGROUND COMPLETION

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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existing monitoring wells will be submitted for inorganic analyses. During the first sampling event, groundwater samples from the new monitoring well at the expected background location will be analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, and inorganic constituents. If organic analytes are not detected, the analytical program for future groundwater samples from this monitoring well will be limited to inorganic analyses. Sample handling and analytical procedures for the groundwater monitoring program are presented in Sections 4.3 and 4.7, respectively. Decontamination procedures for sampling equipment and quality control samples for the sampling events are described in Section 4.5. Appendix A contains detailed procedures for purging and sampling monitoring wells.

4.2.3 Site 16 Data Collection The field program for Site 16 includes a GPR screening survey, soil sampling, installation of monitoring wells, and groundwater sampling.

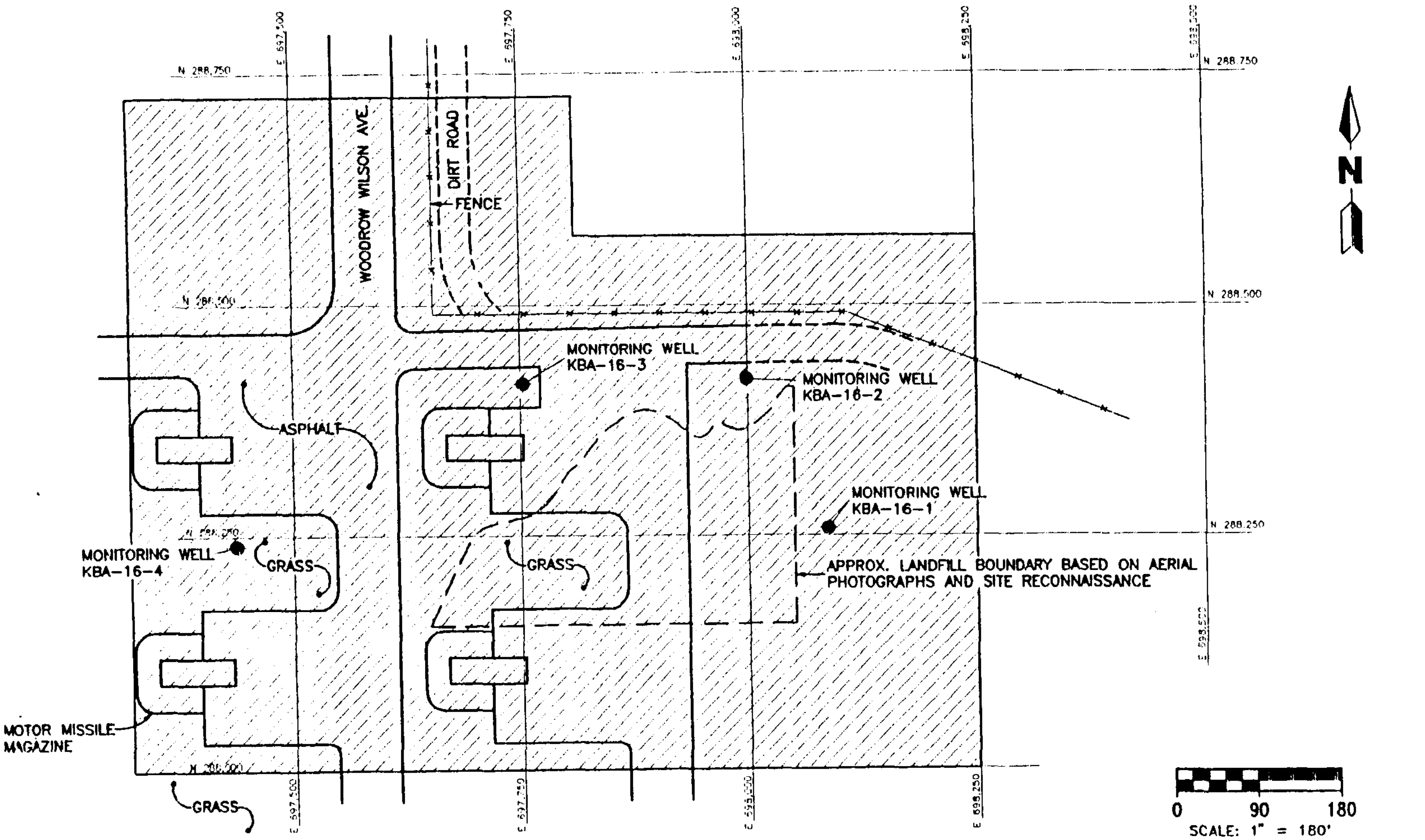
GPR Screening Survey. A GPR screening survey is proposed at Site 16 to assess the area shown in Figure 4-5 for evidence of disposal. Clearance from the NSB to use the GPR equipment in the motor missile magazine area is required and clearance might not be given. The site location and configuration shown in Figure 4-5 are based on review of historical aerial photographs and a site reconnaissance. A former sewage lagoon and creek, landmarks appearing on aerial photographs, were used to locate the site in the field.

The GPR data will be interpreted in the field and used to select a soil boring location within the disposal area that will not penetrate waste when drilled. Drilling through waste will be avoided because of health and safety concerns. GPR was successfully used in the past at Site 11 for locating soil borings between disposal trenches.

GPR profiling will be conducted using a GSSI System III GPR unit or equivalent. The selected GPR unit will be equipped with a shallow profiling transducer and antenna (500 megaHertz). If the initial screening survey data are inconclusive regarding location of the potential disposal area, profiling will be conducted using a GPR unit equipped with a deep profiling transducer and antenna (100 to 300 megahertz) to penetrate fill material that may have been graded over the original surface of the disposal area.

Profiling will be conducted along traverse lines within the area indicated by shading on Figure 4-5. Actual locations of GPR profiles will be determined in the field. Based on GPR screening survey results, traverse lines may extend outside of the area shaded on Figure 4-5. Anomalous areas identified during the screening survey will be staked in the field. The GPR screening data will determine whether sampling activities proposed in this Workplan are relocated to another area suspected of containing disposed wastes.

Subsurface Soil Sampling. Figure 4-6 shows proposed locations for two soil borings at Site 16. Actual locations will be selected based on results of the GPR screening survey. Subsurface soil samples will be collected for chemical and geotechnical analyses. One location, approximately 135 feet south of the disposal area shown in Figure 4-6, is an expected background location. The other location will be within the disposal area. Two subsurface soil samples will be collected from each of the borings and submitted for analyses of VOC, SVOC, pesticide, PCB, herbicide, and inorganic analytes in accordance with the analytical program described in Section 4.7.



LEGEND

- ● – EXISTING MONITORING WELL
- ☐ – GROUND PENETRATING RADAR SCREENING SURVEY AREA

FIGURE 4-5

SITE 16, PROPOSED GROUND PENETRATING RADAR SCREENING SURVEY AREA

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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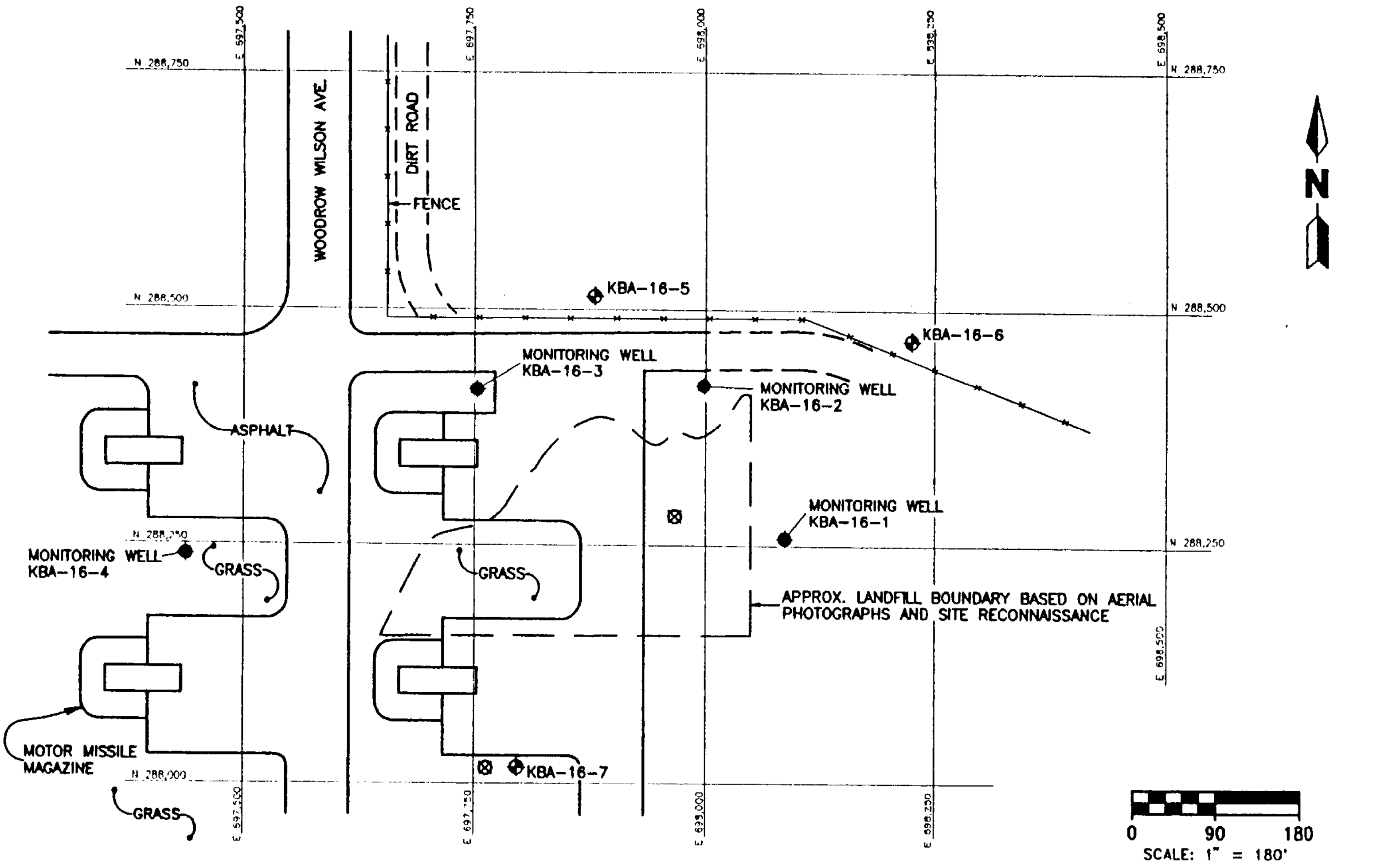

LEGEND

- EXISTING MONITORING WELL
- PROPOSED MONITORING WELL
- PROPOSED SOIL BORING

FIGURE 4-6

SITE 16, PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_4-6\DMF\940927

The chemical data from the soil samples from the expected background location will be assessed for inclusion in the background database. If the chemical data from the expected background location indicates the area is not representative of background conditions, the data will not be used in the background data set. An indicator that the location is not suitable for background information is detection of organic analytes in soil samples collected from the location. Organic analytes detected will be evaluated individually to assess whether the detection renders the sample data unusable for background.

The chemical data from the subsurface soil samples collected from the boring within the disposal area of Site 16 will be used to assess potential contaminants in soil. A statistical approach will be used to assess potential contaminants relative to background concentrations.

In addition to chemical analyses, two soil samples from each of the soil borings will be submitted for grain-size and hydrometer analyses. These data will be used to develop specifications for the monitoring wells.

Subsurface soil samples will be collected from depths of 3 and 5 feet bls using split-spoon sampling techniques or using hand augers (Appendix A). If GPR data indicate the proposed sampling depths are inappropriate compared to the depth of waste (i.e., the waste lies below the proposed sampling intervals), sampling depths will be adjusted to collect the soil samples within the interval of buried waste. Each soil sample will be collected using a decontaminated sampling device. Decontamination procedures for the samplers are described in Section 4.4. Sample handling procedures for the soil samples are presented in Section 4.3. Appendix A contains detailed procedures for split-spoon sampling.

<u>Monitoring Well Installation</u>. Three monitoring wells (KBA-16-5 through KBA-16-7) will be installed at Site 16. Proposed monitoring well locations are shown in Figure 4-6. If the GPR screening survey indicates the proposed monitoring well locations are not situated to monitor the disposal area, the wells will be relocated to more suitable locations.

GEPD requires three monitoring wells downgradient of the site. Existing well KBA-16-2 is the only monitoring well that satisfies the downgradient criteria. If results of the GPR survey indicate Site 16 is not at the suspected location and investigative tasks relocate, then a fourth well may be needed. This fourth well will be installed if the boundaries of the disposal area are redefined and none of the existing wells are downgradient.

One of the proposed monitoring wells, KBA-16-7 on Figure 4-6, is expected to be a background well for the site. The proposed locations of the other two monitoring wells are based on groundwater flow direction indicated by groundwater elevation data collected during the 1992 and 1993 RFI program (Appendix B). Appendix B presents water-table surface contour maps developed during the initial RFI and used to select monitoring well locations for the Supplemental RFI. Monitoring wells KBA-16-5 and KBA-16-6 on Figure 4-6 are for release detection monitoring.

The monitoring wells will be constructed using 2-inch-diameter, schedule 40, flush threaded, PVC riser and 10-foot well screen. The monitoring wells will be installed using hollow stem auger drilling and well construction techniques. The augers will serve as a tremie pipe during placement of the filter pack material. The grain-size distribution of the filter pack and slot size of the well screen will be determined using the grain-size and hydrometer data from subsurface soil samples. Specifications for the filter pack and well screen will be developed using the approach described in ASTM D 5092-90, *Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers*.

Refer to Figure 4-4 for a diagram of monitoring well construction. The monitoring wells will be constructed with 2 feet of the screen above the water table. The filter pack will extend 2 feet above the well screen and will be overlain by 2 feet of bentonite pellets. The boring for the monitoring well will extend 2 feet below the base of the well screen. Based on the depth of existing monitoring wells at Site 16, the borings for the new monitoring wells are expected to be approximately 19 feet deep.

Groundwater Sampling. The groundwater sampling program for Site 16 was developed based on analytical data from the 1992 and 1993 bimonthly groundwater sampling events (ABB-ES, 1994). Section 2.2 provides a summary of the analytical data and rationale for the groundwater analytical program proposed in this Workplan.

Results of the GPR screening survey may cause Supplemental RFI activities to relocate if the disposal area is found to be in another area. The four existing monitoring wells, KBA-16-1 through KBA-16-2, will be assessed for inclusion in the monitoring program based on whether they are appropriately located. If the four existing wells are not appropriately located, they will not be included in the Supplemental RFI groundwater monitoring program.

The proposed groundwater monitoring program for the Supplemental RFI at Site 16 includes four quarterly sampling events. Two of the existing wells, KBA-16-2 and KBA-16-4, will be included in the monitoring program. One of these, KBA-16-2, is included because it is downgradient of the suspected disposal area and the other, KBA-16-4, is a potential site background well. Groundwater samples from the two existing monitoring wells will be submitted for inorganic analyses. During the first sampling event, groundwater samples from the new monitoring wells will be analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, and inorganic constituents. If organic analytes are not detected, the analytical program for future groundwater samples will be limited to inorganic analyses. Sample handling and analytical procedures for the groundwater monitoring program are presented in Sections 4.3 and 4.7, respectively. Decontamination procedures for sampling equipment and quality control samples for the sampling events are described in Section 4.5. Appendix A includes detailed purging and sampling procedures for monitoring wells.

4.3 SAMPLE HANDLING PROCEDURES.

4.3.1 Sample Containers, Preservation, and Holding Times For most sampling episodes, sample containers will be obtained from a Naval Energy and Environmental Support Activity- (NEESA) approved subcontract laboratory. NEESA requires all subcontract laboratories to have a current and comprehensive Quality Assurance Plan (QAP) and sample container requirements that meet USEPA quality assurance requirements.

Preservatives, controlled holding times, and selected container materials may be required to avoid sample degradation or alteration prior to laboratory analysis. Common preservation techniques include pH control, chemical complexation, and refrigeration or freezing. Holding times are controlled to minimize the time between sample collection and analysis, which in turn minimizes the reaction time for potential mechanisms of analyte loss or alteration. Selected container materials may be required to minimize sorption, leaching, or other interactions between the sample and the container. Amber containers may be required to block the sunlight and reduce photolytic degradation in selected analytes. In general, preservatives, holding times, and container materials are selected to inhibit biological activity, retard degradation or other alteration processes, reduce volatility, and/or reduce sorption, leaching, and complexation. Sufficient sample volumes must be collected to accommodate specified analytical methods and to allow for the analysis of laboratory quality assurance and quality control samples, where required.

4.3.1.1 **Sample Containers** In general, samples for organic analyses will be stored in glass containers, and samples for inorganic analyses will be stored in plastic containers. As container specifications depend on the analyte and sample matrix types (as indicated in Table 4-1), separate samples will be collected when both organic and inorganic analyses are required. Containers will be kept in the dark (to minimize biological or photoxidation and photolysis breakdown of constituents) until they reach the analytical laboratory. Approximately 5 to 10 percent of the sample container space will generally be air space ("ullage") to allow for expansion or vaporization if the sample is heated during transport (1 liter of water at 4 degrees Celsius [°C] expands by 15 milliliter [mℓ] if heated to 55 °C). An important exception is containers for VOC analyses; headspace is not allowed in VOC containers. When sample containers are stored onsite, the containers will be kept sealed and away from solvents that are also being stored.

4.3.1.2 **Preservation Techniques** Preservation techniques for selected analytes are presented in Table 4-1. Reagents required for sample preservation will generally be added to the sample containers by the subcontract laboratory prior to shipment. In some instances, preservatives may be added in the field. Samples will be preserved immediately upon collection in the field and placed on ice in ice chests.

Low concentration aqueous samples for metals will be preserved with nitric acid (HNO_3). Samples that should not be immediately preserved in the field include the following.

- Samples collected within a hazardous waste site that are known or thought to be highly contaminated with toxic materials should not be preserved. Barrel, drum, closed container, spillage, or other source samples from hazardous waste sites are not to be preserved with any chemical. These samples may be preserved with ice, if necessary.

- Samples that have extremely low or high pH or samples that may generate potentially dangerous gases should not be preserved.

All samples preserved with chemicals will be clearly labeled. If containers are preserved by a subcontract laboratory, additional preservatives will be from the same source. The following subsections describe the procedures for preparing and adding chemical preservatives. Table 4-1 indicates specific analytes for which these preservatives are recommended.

Table 4-1
Sample Container, Holding Times, and Preservation Requirements

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Parameter	Matrix	Holding Time (from time of collection)	Container	Preservative	Minimum Sample Size[1]
Volatile organic aromatics	Water	14 days	Two 40 mℓ vials with Teflon™-lined caps	4 drops concentrated HCl, 4 °C	40 mℓ
	Soil	14 days	Glass with Teflon™-lined septum	4 °C	10 g
Volatile organic halogenated compounds	Water	14 days	Two 40 mℓ vials with Teflon™-lined caps	4 drops concentrated HCl, 4 °C	40 mℓ
	Soil	14 days	Glass with Teflon™-lined septum	4 °C	10 g
Extractable organics	Water	7 days extraction 40 days analysis	1 ℓ amber glass with Teflon™ liner	4 °C	1,000 mℓ
	Soil	14 days extraction 40 days analysis	Amber glass jar with Teflon™ liner or core tube	4 °C	50 g
Chlorinated herbicides	Water	7 days extraction 30 days analysis	1 ℓ borosilicate glass	4 °C	1,000 mℓ
	Soil	7 days extraction 30 days analysis	1 ℓ borosilicate glass	4 °C	100 g
Organochlorine pesticides and PCB	Water	7 days extraction 30 days analysis	1 ℓ borosilicate glass	4 °C	1,000 mℓ
	Soil	14 days extraction 30 days analysis	1 ℓ borosilicate glass	4 °C	100 g
Metals (other than mercury)	Water	180 days	Polyethylene or glass	HNO_3 to pH <2[2]	100 mℓ
	Soil	180 days	Polyethylene or glass	4 °C	10 g
Mercury (CVAA)	Water	28 days	Polyethylene	HNO_3 to pH <2	100 mℓ
	Soil	28 days	Core tube or glass jar	4 °C	10 g

[1] Additional sample must be collected for matrix spike or matrix spike duplicate samples.

Notes: mℓ = milliliter.
HCl = hydrochloric acid.
°C = degrees Celsius.
g = gram.
ℓ = liter.
PCB = polychlorinated biphenyls.
H_2SO_4 = sulfuric acid.
NaOH = sodium hydroxide.
PCB = polychlorinated biphenyls.
HNO_3 = nitric acid.
CVAA = cold vapor atomic absorption.

Cyanide Preservation. Pre-sample preservation is required to prevent oxidizing agents such as chlorine from decomposing cyanide compounds. To test for oxidizing agents, place a drop of the sample on potassium iodide (KI)-starch test paper; a blue color indicates the need for treatment. Add ascorbic acid ($C_6H_8O_6$) to the sample a few crystals at a time, until a drop of sample produces no color on the KI-starch paper. Then add an additional 0.6 gram of $C_6H_8O_6$ for each liter of sample volume. Add sodium hydroxide (NaOH) solution to raise pH to greater than 12 as described above.

Sulfide can also adversely affect cyanide analyses. To test for sulfide, place a drop of the sample on lead acetate test paper previously moistened with acetic acid buffer solution (pH 4). Darkening of the paper indicates the presence of sulfide. If sulfide is present, add cadmium nitrate powder (to form a yellow cadmium sulfide precipitate) until the lead acetate test yields negative results. Filter the sample to remove precipitate and add NaOH solution to the filtrate (to raise pH above 12). Avoid a large excess of cadmium and a long contact time to minimize a loss by complexation or occlusion of cyanide on the precipitated material.

Sulfide Preservation. Samples for sulfide analysis must be preserved by the addition of 4 drops (0.2 mℓ) of 2 normal (N) zinc acetate solution per 100 mℓ of sample. The sample pH is raised to 9 using NaOH solution (1 to 2 drops). The 2 N zinc acetate solution is made by dissolving 220 grams of zinc acetate in 870 mℓ of distilled water to make 1 liter of solution.

4.3.2 Sample Handling, Packaging, and Shipping Sample packaging and shipping procedures will protect the integrity of the samples and prevent detrimental effects from leakage or breakage. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the DOT and described in the Code of Federal Regulations (CFR) (49 CFR 171 through 177; in particular 172.402h, Packages Containing Samples). In general, these regulations were not intended to hamper shipment of samples collected at controlled or uncontrolled hazardous waste sites or samples collected during emergency responses. However, the USEPA has agreed through a Memorandum of Agreement to package, mark, label, and ship samples observing DOT procedures.

Correct packaging, storing, and shipping of environmental samples will be followed to:

- ensure samples remain sealed in original containers,
- prevent breakage,
- prevent cross contamination of individual samples,
- ensure sample characteristics are preserved,
- prevent contamination to receiving personnel, and
- ensure samples are protected against tampering when not in sampler's possession.

Prior to packaging, each sample container will be inspected to verify correct labeling. Labels will be secured to containers with clear tape. Each container will have a signed and dated custody seal over the cap. Samples will be shipped to the laboratory via commercial ground or air carrier within 24 hours of sample collection.

All breakable sample containers (glass) will be protected with packing. Bubble-pack bags or strips are acceptable. Sample containers may be placed in sealable plastic bags such as a Zip-lock™ type.

Samples will be shipped in durable coolers packed with bubble pack or vermiculite. Samples will be kept cool with double-bagged clean ice. Completed chain-of-custody (COC) forms will be placed in a plastic bag and taped to the inside lid of the shipping container. If COC forms refer to multiple containers, they may be placed in the lead container or each cooler may have a COC for samples contained in the cooler. A signed and dated COC seal will be secured with clear tape over the front and back of the container lid. The container will be sealed by wrapping it in filament tape.

Until relinquished to the carrier, the shipping containers will remain with field personnel or remain in a locked vehicle so as not to be accessible to others. Upon shipping, the laboratory will be contacted and advised of the contents, scheduled arrival date and time, carrier, and number of containers.

<u>4.4 DECONTAMINATION PROCEDURES</u>. Equipment to be decontaminated during this project may include: (1) drill rig, (2) tools, (3) monitoring equipment, (4) respirators, (5) sample containers, and (6) truck or trailer.

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, established by the Health and Safety Officer. The decontamination work tasks will be split or rotated among support and work crews.

<u>4.4.1 **Drilling Rig and Tools**</u> All drilling rigs, drilling and sampling equipment, and all other associated equipment involved in the drilling, test trenching, and sampling activities will be cleaned and decontaminated before entering the designated site. All equipment will be inspected before entering the site to ensure that there are no fluids leaking and that all gaskets and seals are intact. All drilling and associated equipment entering a site will be cleaned of any contaminants that may have been transported from another hazardous waste site, thereby minimizing the potential for cross contamination. Before site drilling activities are initiated, all drilling equipment will be thoroughly cleaned and decontaminated at the designated cleaning and decontamination area at Site 11. The requirements and procedures in the following paragraphs are to be strictly adhered to on all drilling activities.

Any part of the drill rig that is over the borehole (kelly bar or mast, drilling platform, hoist or chain pulldowns, spindles, cathead, buckets, etc.) will be steam cleaned and wire brushed before being brought on the site to remove all rust, soil, and other material that may have come from other sites. The drill rig and other equipment associated with the drilling and sampling activities will be inspected to ensure that all oil, grease, hydraulic fluid, etc., have been removed and all seals and gaskets are intact and there are no fluid leaks. No oils (except for vegetable oil) or grease will be used to lubricate drill stem threads or any other drilling equipment being used over the borehole or in the borehole. If drill stems have a tendency to tighten during drilling, Teflon™

string and/or vegetable oil can be used on the drill stem threads. The drill rig(s) will be steam cleaned and wire brushed, respectively, prior to drilling and test pitting at each location. In addition, all downhole drilling, sampling, and associated equipment that will come into contact with the downhole equipment and sample medium will be cleaned and decontaminated by the following procedures.

1. The equipment will be cleaned with tap water and laboratory grade, phosphate-free detergent, using a brush, if necessary, to remove particulate matter and surface films. Steam cleaning and/or high pressure hot water washing may be necessary to remove matter that is difficult to remove with the brush. Drill rods, Shelby tubes, split spoons, etc., that are hollow or have holes that transmit water or drilling fluids will be cleaned on the inside and on the outside. The steam cleaner and/or high pressure hot water washer will be capable of generating a pressure of at least 2,500 pounds per square inch (psi) and producing hot water and/or steam (200 degrees Fahrenheit [°F] or greater).

2. The equipment will be rinsed thoroughly with tap water (potable).

   Note: Tap water (potable) may be applied with a pump sprayer. All other decontamination liquids (deionized [DI] water, organic-free water, and solvents), however, must be applied with non-interfering containers. These containers will be made of glass, Teflon™, or stainless steel. This aspect of the decontamination procedures used by the driller will be inspected by the site geologist and/or other responsible person prior to beginning operations.

3. The equipment will be rinsed thoroughly with DI water.

4. The equipment will be rinsed with solvent (pesticide-grade isopropanol).

5. The equipment will be rinsed thoroughly with organic-free water and allowed to air dry. It will not be rinsed with DI or distilled water.

   Note: Organic-free water can be processed onsite by purchasing or leasing a mobile deionization-organic filtration system.

   Note: In some cases, when no organic-free water is available, it is permissible (with approval) to omit the organic-free water rinse and allow the equipment to air dry before use.

6. The equipment will be wrapped with aluminum foil, if appropriate, to prevent contamination if equipment is going to be stored or transported. Clean plastic can be used to wrap drill stems, casings, etc., if they have been air dried.

7. Well casing, tremie tubing, etc., that are made of plastic (i.e., PVC) will not be solvent-rinsed during the cleaning and decontamination process. Used plastic materials that cannot be cleaned are not acceptable and will be discarded.

Cleaning and decontamination of all equipment will occur at the decontamination pad at Site 11. The pad is constructed of concrete and drains to a concrete sump. Washing of small equipment such as split-spoon samplers can be done at the drilling location.

Tap water (potable) brought on the site for drilling and cleaning purposes will be contained in a pre-cleaned tank of sufficient size so that drilling activities can proceed without having to stop and haul water. A stainless-steel water tank with a minimum capacity of 1,000 gallons is preferred.

4.4.2 Sample Containers Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site.

4.4.3 Monitoring Equipment Monitoring equipment will be protected as much as possible from contamination. The equipment will be brushed or wiped with a disposable paper wipe and then taken inside, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation.

4.5 QUALITY CONTROL SAMPLES. An estimate of the number and types of quality control samples to be collected for laboratory analyses during each Supplemental RFI task is outlined in Table 4-2. A brief description of quality control samples and frequency of collection is presented below. Selected definitions were obtained from USEPA Region IV Standard Operating Procedures (SOPs) (USEPA, 1991a).

The estimated number of various quality control samples presented in Table 4-2 is based on the following.

- There are multiple field efforts associated with the various media being sampled.
- Four separate groundwater sampling events are represented for Sites 5 and 16.
- Groundwater samples will only be analyzed for inorganics following the first sampling event unless organic compounds are detected in samples from the first event or soil sample analytical data indicate the site is a source of organic chemicals that could contaminate groundwater.
- Rinsate samples will be collected every other day that sampling equipment is decontaminated.
- The proposed number of samples of each media and the corresponding number of days anticipated to complete the sampling is as follows:

	Samples	Days
Subsurface soil	13	3
Groundwater	15 per event	4 per event

Table 4-2
Quality Control Samples for the Supplemental Resource Conservation and Recovery Act Facility Investigation Field Program

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Site 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Sample Type[1]	VOCs SW 8240	VOCs SW 8010/8020	SVOCs SW 8270	Pest/PCB SW 8080	Primary pollutant metals, barium, cobalt, vanadium, and sulfide SW 7000/6010	Cyanide SW 9010	Herbicides SW 8150
Trip blanks	3	4	0	0	0	0	0
Rinsate blanks	2	2	4	4	10	10	4
Source water blanks	1	1	2	2	5	5	2
Field duplicates							
Subsurface soil	2	0	2	2	2	2	2
Groundwater	0	2	2	2	8	8	2
MS/MSD							
Subsurface soil	1	0	1	1	1	1	1
Groundwater	0	1	1	1	4	4	1

[1] Refer to Section 4.5 for collection frequency of quality control samples.

Notes: VOC = volatile organic compound.
SVOC = semivolatile organic compound.
Pest/PCB = organochlorine pesticides and polychlorinated biphenyls.
MS/MSD = matrix spike and matrix spike duplicate.

Duplicate Samples. Duplicate samples are two or more samples collected simultaneously into separate containers from the same source under identical conditions. One duplicate will be collected for every 10 samples of a single matrix except for Level V samples in which the frequency will be 1 every 20 samples. Duplicate samples are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol.

Trip Blanks. Trip blanks are prepared by the laboratory using ASTM Type II water prior to the sampling event and are kept with the investigative samples throughout the sampling event and are packaged and shipped with the investigative samples. These containers should never be opened prior to laboratory analysis. One trip blank will be included with each shipment of samples scheduled for volatile organic analysis. Trip blanks are required for assessing the potential for contaminating samples with VOCs during sampling or in transit.

Equipment Rinsate Blanks. Equipment rinsate blanks are collected by running organic-free deionized water over and/or through sample collection equipment after it has been decontaminated. Equipment rinsate blanks will be collected at a frequency of one sample every other day that equipment is decontaminated. Rinsate samples will be collected from each type of sampling tool used. These blanks are used to assess the adequacy of decontamination procedures and to trace potential cross contamination. Rinsate samples will be analyzed for the same parameters as the respective media samples.

Matrix Spike and Matrix Spike Duplicates. Matrix spike and matrix spike duplicate (MS/MSD) samples are additional samples collected in the field from a single sampling location. These samples are spiked in the laboratory with a known compound (or set of compounds) of known concentrations. The concentration detected after analysis provides an estimate of the amount of compound "lost" (e.g., sorbed to glassware, volatilized, or degraded) during the analytical procedure. A comparison of the original concentration to the final concentration provides data concerning analytical precision and accuracy. One set of MS/MSD samples will be collected per 20 or fewer samples per matrix or every 14 days.

Field Water Blanks. Field water blanks include a complete set of samples collected from each water source used in the investigation. One set of samples will be collected from each water source (potable, DI, and organic free) used at the beginning of each field effort or every 14 days.

4.6 FIELD DOCUMENTATION PROGRAM

Records of all procedures performed during the RFI field investigation will be maintained as described below.

4.6.1 Field Logbooks

Daily reports of investigative activities, including field data, will be kept in bound, weatherproof field logbooks. These logbooks will be maintained by the field team. Field personnel will be responsible for daily data entry in the field logbooks. The FOL will be responsible for reviewing the quality of the data entered in the logbooks and will maintain custody of the logbooks. Data entry into the logbooks, and any other onsite document (e.g., forms and notebooks), will be written in black ink and initialed by the author. Entry errors will be crossed out with a single line and initialed and dated by the author.

Field personnel will record in the field logbooks detailed documentation of daily events. Logbook entries can include such data as the names of onsite personnel, weather conditions, field sketches and maps, and unusual conditions (e.g., well tampering). Investigative and sampling activity entries can include sample designations and locations, sampling equipment used, field measurements, sample collection, sample handling, and shipping and decontamination events.

4.6.2 Field Data Sheets and Logs Field data sheets and logs are used to record specific data collected during the investigation or specific events of the investigation (e.g., lithologic description, equipment calibration, and COC record). Field data sheets and logs will be maintained by field team personnel, who will document sample location and information, field measurements, soil identification, boring information, and equipment calibration. All field data sheets and logs will be maintained in the project files.

4.6.3 Plans A copy of the Supplemental RFI Workplan and RFI report for Sites 5 and 16 will be kept onsite. As appropriate, copies of these plans will be provided to field team members.

4.7 SAMPLE ANALYSES.

4.7.1 Data Quality Objectives (DQOs) DQOs have been developed for the Supplemental RFI at Sites 5 and 16 to ensure that data collected will be of sufficient quality to support decision-making for future response activities at the site. The principal objectives of the Supplemental RFI, and consequently the data generated from field activities, are to satisfy regulatory requirements for performing an RFI. Site-specific questions such as how the data will be used and how much data are required were addressed during the development of the DQOs. In addition, the required data quality was addressed to indicate the magnitude of error that could be tolerated by the data user. The following subsections provide a brief description of DQO levels and identify the levels associated with each Supplemental RFI field task.

4.7.1.1 **DQO Levels, General Description** DQOs refer to standards for analytical precision, accuracy, representativeness, completeness, and comparability (PARCC). Five DQO levels have been defined by the USEPA: Level I, Field Screening; Level II, Field Analysis; Level III, Laboratory Analysis; Level IV, Contract Laboratory Program Routine Analytical Services (CLP-RAS); and Level V, Non-Conventional Parameter Analysis (USEPA, 1991a).

The NEESA has adopted three of these levels as quality assurance requirements, Levels C, D, and E, which correspond with USEPA Levels III, IV, and V, respectively (NEESA, 1988). For the purposes of this document, the USEPA nomenclature (Levels I through V) will be used.

The DQO level needed for a specific task is generally based on the intended use of the data and on the limitations of the analytical instrumentation. Many field screening and field analytical techniques are intended to provide a rapid turn-around time and qualitative data for decision-making in the field. Field techniques necessarily involve rugged instrumentation with less sample preparation and rapid analysis. More precise and accurate analytical methods are used when both qualitative and quantitative data are needed, such as to support site characterization, confirmation, enforcement, treatability, and/or remedial action.

The DQO level also specifies laboratory quality control requirements and the deliverable package associated with the analysis. The five broad categories of data quality used in the Supplemental RFI process are described below.

Level I, Field Screening. Field screening provides rapid real-time results that can be used to determine optimal placement of sampling locations and for health and safety support. Data generated provide information concerning the presence or absence of certain constituents or groups of constituents. The data are generally qualitative rather than quantitative.

Level I sampling requirements include the use of equipment and sampling containers that are clean (soap and tap water), visibly free of contamination, and free of analytes detectable by the screening method employed (USEPA, 1991a).

Level II, Field Analysis. Field analysis includes the use of more sophisticated analytical instruments in the field, including onsite gas chromatographs and mobile laboratories. The data generated may be both qualitative and quantitative, but the degree of quality assurance and quality control (QA/QC) achievable may be more variable than with laboratory analysis.

Level II sampling and equipment requirements include the use of sampling equipment constructed of material that is compatible with the parameters being analyzed (e.g., PVC for inorganic parameter analyses, or chrome-plated material for organic parameter analyses) and field-cleaning procedures that include a potable water and soap scrub followed by a potable water rinse (or steam cleaning or high pressure washing).

The use of potable water is limited only by the parameters being analyzed and the minimum quantitation limits of the analytical method; water containing up to one-half the minimum quantitation limit of the parameters of concern may be used. A minimum of 10 percent of samples collected for DQO Level II analysis should be split for DQO Level III analysis. These samples must be representative of all samples analyzed in the field (USEPA, 1991a).

Level III, Laboratory Analysis. Laboratory analytical data are generated using USEPA-approved methods to achieve a level of confidence set by specified QA/QC protocols. Level III DQOs are appropriate for data collected for most activities including site characterization (i.e., qualitative and quantitative identification of contaminants and contaminant source[s] and extent of migration) and treatability studies.

Level III field methods, decontamination procedures, and sampling equipment construction materials are as specified in the USEPA *Standard Operating Procedures and Quality Assurance Manual* (USEPA, 1991a). Cleaning of downhole drilling or excavation equipment must be performed, as with Level IV requirements, with the exclusion of the DI water rinse, the double rinse with pesticide-grade isopropanol, and the rinse with organic-free water. All other cleaning and decontamination guidance must be followed.

When wells are constructed using materials that are not inert with respect to the contaminants being analyzed, data collected from those wells are DQO Level III or lower for those incompatible analytes, even if DQO Level IV analytical procedures are used.

Level III field quality control sampling requirements include the following.

- One equipment rinsate blank will be collected for every other day equipment is field cleaned.

- One blank of each type of source water will be collected and analyzed during each sampling event. A sampling event is considered to be from the time sampling personnel arrive at the site until these people leave for more than 1 day (NEESA, 1988) or for each 14 days of continuous field work.

- One trip blank will accompany each cooler that is used for transporting samples to be analyzed for VOCs.

- Field duplicates will be collected at a frequency of 10 percent per sample matrix.

Level IV, Contract Laboratory Program. Level IV DQOs are the most stringent and are defined as data collected in accordance with USEPA SOPs (USEPA, 1991a) and analyzed in accordance with the USEPA CLP (USEPA, 1991a; 1991b). Level IV DQOs are not being used for the RFI at Sites 5 and 16 because analyses are not to be performed using CLP protocol.

Level V, Nonconventional Parameter Analysis. Specific site investigations or remedial design characteristics may require the analysis of contaminants or conditions that are nonconventional. The Level V DQOs associated with these types of analysis must, by definition, be defined on an individual basis. The DQOs identified will depend on the specific collection method, decontamination procedures, and analysis to be used. These analyses are non-CLP, USEPA accepted methods, or equivalent.

4.7.1.2 **Task-Specific DQOs** Tasks for the Supplemental RFI at Sites 5 and 16 will involve data collection with DQOs ranging from Level I to Level V. The following discusses the primary tasks for the Supplemental RFI and the associated DQO level.

- **Field Screening, Level I**: Split-spoon samples from discrete depths in soil borings will be screened in the field with an OVA, providing Level I data concerning the presence or absence of volatile compounds.

- **Air Quality Monitoring, Level I**: For health and safety purposes, air quality will be monitored in the breathing zone during soil intrusive studies by OVA or by PID, providing Level I data concerning the presence or absence of volatile compounds.

- **Field Parameter Analysis, Level II**: Field measurements of groundwater temperature, pH, and specific conductance will be performed to screen samples for laboratory analysis and to determine aquifer stabilization during well purging. These measurements are both quantitative and qualitative and the data generated can conform with both Level I and II DQOs.

- **Characterization and Confirmation Sampling, Level III**: Groundwater samples and soil samples collected during the Supplemental RFI will be collected and analyzed in accordance with Level III DQOs. These samples will be used for site chemical characterization and confirmation.

- **Geotechnical Analyses, Level V**: Subsurface soil samples collected to evaluate the geotechnical characteristics of the subsurface soil will be analyzed in conformance with Level V DQOs.

These RFI data will be used, as applicable, for health and safety monitoring and site characterization.

<u>4.7.2 **Chain of Custody**</u> The control of a sample is accomplished through a COC record. COC will be maintained through sample collection, shipment, storage, and analysis as a legal record of possession of the sample.

Possession will be traceable by means of a COC form, which will remain with the samples at all times and bear the name of the person responsible for the samples. Procedures for maintaining the appropriate sample custody information will be in accordance with USEPA Region IV SOPs (USEPA, 1991a).

Samples other than those collected for *in situ* analysis are identified by using a sample label that is attached to the sample container. The following information is included on the sample container label:

- project number,
- field identification or sample station number (a unique number identifying the sample),
- date and time of sample collection,
- type of sample (e.g., water, soil, or sediment) and, possibly, a brief description of the sampling location,
- the signature(s) of the sampler(s),
- whether the sample is preserved or unpreserved,
- the general types of analyses to be conducted, and
- any relevant comments regarding the sample.

A COC form is used to record the custody of all samples or other physical evidence collected and maintained by field personnel. The following information must be supplied in detail to complete the COC record:

- site name and address;
- project number;
- project name;
- signature of sampler in a designated signature blank;

- sampling station number, date, time of sample collection, and a brief description of the type of sample and the sampling location;

- sample bottle type (i.e., 40 mℓ glass) plus the intended analysis (i.e., VOC);

- for each sample the number of containers for each bottle type; and

- field investigator and subsequent transferee(s) signatures. (Both the person relinquishing the samples and the person receiving them must sign the form along with the date and time this occurred.)

When samples are relinquished to a shipping company for transport, the tracking number from the shipping bill or receipt will be recorded on the sample COC form. As necessary, carriers (e.g., United Parcel Service, Federal Express, or Greyhound) will be used to ship samples. In these cases the air bill becomes part of the COC.

All samples will be accompanied by the COC record. The original and at least one copy of the record will be shipped inside the shipping container if samples are shipped. One copy of the record will be retained by the field investigator. The original record will be transmitted to the field investigator after samples are accepted by the laboratory. This copy will become part of the project records. The COC record will be signed and dated upon receipt by the laboratory. Custody tracking will be maintained by the laboratory from sample receipt through storage, analysis, and disposal in accordance with the individual laboratory's QAP.

Use of custody seals will be implemented during shipment of bottles and samples to document the integrity of the samples and bottles. Custody seals will be placed on the sample containers and on the shipping container so that it cannot be opened without breaking the seal. The seals will be signed and dated by the field investigator.

<u>4.7.3 Sample Preparation</u> Aqueous samples and soil samples will be properly prepared and extracted by the laboratory prior to analyses. Extraction methods are dependent upon analytical testing methods. Appropriate extraction methods as indicated by SW 846 (USEPA, 1986) will be followed.

<u>4.7.4 Analytical Procedures</u> Analytical procedures for the investigations at Sites 5 and 16 are designed to assess the presence of soil and groundwater contamination in relation to background. Subsurface soil samples will be analyzed for VOCs, SVOCs, priority pollutant metals, barium, cobalt, vanadium, sulfide, cyanide, pesticides and PCBs, herbicides, grain size, and hydrometer according to the methods outlined in Table 4-3.

Monitoring wells that are installed during this investigation will be sampled for VOCs, SVOCs, priority pollutant metals, barium, cobalt, vanadium, sulfide, cyanide, pesticides and PCBs, and herbicides according to the methods listed in Table 4-3 and described in SW 846 (USEPA, 1986). Existing monitoring wells will be sampled and analyzed for priority pollutant metals, barium, cobalt, vanadium, sulfide, and cyanide.

Table 4-3
Analytical Program

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Site 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Analyte	Method	DQO Level
Volatile organic compounds		
Subsurface soil	SW 8240	III
Groundwater	SW 8010/8020	III
Semivolatile organic compounds		
Subsurface soil	SW 8270	III
Groundwater	SW 8270	III
Priority pollutant metals, barium, cobalt, vanadium, and sulfide		
Subsurface soil	SW 7000/6010	III
Groundwater	SW 7000/6010	III
Cyanide		
Subsurface soil	SW 9010	III
Groundwater	SW 9010	III
Pesticides and PCBs		
Subsurface soil	SW 8080	III
Groundwater	SW 8080	III
Herbicides		
Subsurface soil	SW 8150	III
Groundwater	SW 8150	III
Grain size and hydrometer		
Subsurface soil	ASTM D421/D422	V
TCLP		
IDW soil	SW 1311 extraction and various SW analytical methods	V

Sources: U.S. Environmental Protection Agency, 1986.
American Society for Testing and Materials (ASTM), 1985.
ASTM, 1935.

Notes: DQO = data quality objective.
SW = solid waste.
PCB = polychlorinated biphenyl.
ASTM = American Society for Testing and Material.
TCLP = Toxicity Characteristic Leaching Procedure.
IDW = investigation-derived wastes.

IDW generated during the subsurface soil sampling and monitoring well installation will be containerized in 55-gallon drums. Soil samples from the drums will be collected and analyzed according to TCLP.

Laboratory Selection. The subcontract laboratory will be qualified to perform SW 846 (USEPA, 1986) analyses, will have an active QA/QC program, and will be NEESA approved. This laboratory will conduct all analyses requiring Level III and V DQOs.

4.7.5 Laboratory Quality Assurance and Quality Control The laboratory subcontractor is responsible for generation of a detailed laboratory QAP. This plan will also be approved during the NEESA certification program.

The laboratory will submit quality control reports as specified in the laboratory quality assurance program. The Consultant will review the control charts periodically to ensure that the subcontract laboratory is performing analyses in compliance with SW 846 (USEPA, 1986) criteria.

5.0 DATA MANAGEMENT PLAN

5.1 DATA RECORD. Three broad categories of data management are included in data recording: field data management, sample data management, and laboratory data management. Field data management consists of storing, retrieving, and reporting the results of measurements made from the field. Sample data management consists of tracking the origin, location, and status of a set of chemical data obtained from the analysis of an environmental sample. Laboratory data management consists of storing, retrieving, editing, validating, and reporting the results of the laboratory chemical analyses.

5.1.1 **Field Data Management** Field data management procedures vary depending on the type of data collected. Where appropriate, electronic field data also exist. The main objectives of the field data manager are to store the field data and to ensure the integrity of any reproductions of the field data.

5.1.2 Sample Data Management Sample management begins upon creation of the sample. The sample data manager tracks the life cycle of each sample, and uses milestones in the life cycle as reference points to judge the status of individual samples. Milestones include sample collection, sample receipt by the laboratory, unvalidated sample data receipt, and validated sample receipt, as well as various steps in the process needed to ensure the quality of the electronic data. As each milestone is achieved, the sample data manager records the achievement in a sample data management database.

5.1.3 Laboratory Data Management Laboratory data management begins with receipt of unvalidated data (hard copy and electronic copy) from the laboratory. The laboratory data manager later receives the validated data from the data validator. One hard copy of all of the chemical data is stored in-house to allow access to the raw data. Upon receipt of the validated data, the laboratory data manager uploads the electronic copy into a secure database. At the conclusion of the project, the laboratory data manager archives the electronic data.

5.2 DATA REPORTING. Data reporting of field measurement activities occurs after the site field activities have been approved by the field team leader. Data from the investigation will be arranged and presented in a clear and logical format using tabular, graphical, and other visual display methods.

The data provided by approved contract laboratories will be formatted into summary tables that are easily read and can be included in the final report. A complete listing of all validated data will be prepared and included in the final report also. Where appropriate, graphical displays will be developed to present data. Potentiometric maps developed from water-level elevation data and geologic cross sections are types of graphical presentations that might be expected in the final report.

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APPENDIX A

SAMPLING PROCEDURES

Soil Sample Collection Procedure

Sample collection and documentation procedures for soil include the following steps.

1. Scan the soil with an organic vapor analyzer (OVA) or photoionization detector (PID) and record the results in the field logbook.

2. Visually examine the sample and record its characteristics (e.g., texture, color, consistency, moisture content, layering, and other pertinent data) using the Unified Soil Classification System (USCS).

3. Remove the portion(s) of the sample selected for chemical analysis and place it into appropriate containers. Soil intended for VOC analyses should be collected from the inner portion of the sample, placed in the appropriate sample containers, labeled with the appropriate information, and placed in a cooler with ice, immediately. Soil intended for other types of analyses should be placed in a glass mixing bowl and thoroughly mixed using a stainless-steel spoon or spatula. Once the sample has been thoroughly mixed, sample material should be placed in the appropriate sample containers and stored on ice in ice chests.

4. Discard any excessively disturbed or loose material found in the top portion of the sampler, which may not be representative of the interval sampled. This material will be discarded with other boring spoils at each boring location.

5. Properly label all containers and prepare chain-of-custody documents. Record sample location, description, sample numbers, and other pertinent information in the field logbook.

6. Decontaminate the sampling device in accordance with specified procedures.

The sampler must exercise considerable care while collecting samples for chemical analyses. Methods to assure that high quality samples are collected are described below.

1. Make sure that the sample is obtained from undisturbed soil below the bottom of the borehole. This is accomplished by monitoring or checking depth measurements, observing the sampling process, and examining the sample once it is retrieved.

2. Conserve sample volume because under certain soil conditions it may be difficult or impossible to achieve good sample recovery with split spoons.

Procedures employed to prevent cross contamination during test boring sampling operations include the following.

- Samples are collected immediately after the boring is advanced to the desired sampling elevation.

- The down-hole sampling tools are decontaminated prior to the collection of each sample.

- The boring technique and procedures to be used, particularly the use of drilling fluids, are carefully evaluated for each site.

Purging Technique for Monitoring Wells

Wells will be purged before groundwater sampling to remove stagnant water so that a representative sample may be obtained. Wells will be sampled within 10 hours after purging.

Purging equipment includes:

- pump (centrifugal or submersible), pump tubing, Teflon™ or stainless-steel bailer, and line;

- power source (e.g., generator), if required;

- water-level meter or weighted surveyor tape;

- temperature, conductivity, and pH meters;

- personnel protective equipment as specified in the site-specific Health and Safety Plan (HASP);

- decontamination supplies; and

- drums for storage and disposal of hazardous waste, if required.

Purging of standing well water is considered complete when either five well volumes have been purged, or the well has been pumped dry.

The following methods will be used for well purging.

1. Put on personnel protective clothing and equipment as specified in the site-specific HASP.

2. Open the well cover and check the condition of the wellhead.

3. Calculate the volume of water in the well by measuring the distance from the bottom of the well to the static water level (height of standing water), then measure the inside diameter of the well or casing. Water level measurements should be measured from the same point each time it is measured with minimum measurements made in 1/10th of a foot. Note: more stringent measurements may be required for specific project programs (i.e., 1/100th of a foot). Traditionally, water level measurements are measured from a marked reference point located on the north side of the top of casing of the well.

4. Calculate the well volume by using the follow formula (or its equivalent):

$$v = 5.88d^2h \quad (1)$$

where
h = height of standing water column,
d = inside diameter of well in feet, and
v = volume of water in gallons.

5. Prepare pump and tubing or bailer and lower it into casing.

6. Remove three to five well volumes, recording measurements of pH, specific conductance, and temperature for each volume purged.

7. Purging is complete when three to five well volumes have been removed and parameters of pH, specific conductance, and temperature vary less than 10 percent between consecutive measurements.

8. If the well goes dry during pumping or bailing, purging is considered to be complete.

9. Record pertinent data in the field logbook.

10. Remove the pump assembly or bailer from the well and decontaminate as required.

11. Dispose of produced water as required by the project workplan.

To prevent backflow of purged water into wells, submersible pumps must be equipped with a check valve, and centrifugal pumps must have a foot valve. When sampling for organics or metals, certain precautions must be taken to minimize the risk of contaminating the groundwater sample with the pump. In general, any parts of the pump and tubing that contact the groundwater must be constructed of Teflon™ and stainless steel.

Sampling Procedures for Monitoring Wells

Wells with free product will not be sampled for trace chemical analyses unless necessitated by special circumstances or Navy request. The sampling locations will be recorded in the field logbook and indicated on a site map. Groundwater sampling equipment includes:

- bailers constructed of appropriate material (i.e., Teflon™, stainless steel, or polypropylene);
- clean and unused nylon or monofilament line of sufficient length to lower bailer (new lanyard must be used for each well);
- a pump (type dictated by physical conditions);
- appropriate sample containers with labels and preservatives, as required;

- coolers with wet ice;
- water-level meter and/or other water-level measuring device;
- temperature, conductivity, and pH instruments;
- plastic sheeting;
- decontamination supplies, as required; and
- personnel protective clothing and equipment, if required by the site-specific HASP.

Groundwater sampling procedures include the following steps.

1. Put on protective clothing and equipment as necessary.
2. Prepare the site for sample collection by covering the ground surface around the well head with plastic sheeting.
3. Open the well and note the condition of casing and cap. Check for vapors using vapor analyzing equipment.
4. Determine the static water level and depth to well bottom using a water-level meter or tape. Record this information in the field logbook.
5. Determine the purge volume and purge the well.
6. Arrange sample containers in order of use. VOC samples, if required, will be sampled first, followed in order by SVOC and other samples.
7. Lower bailer or pump intake (as appropriate for parameters of concern) into well. Bailer should enter the water slowly to prevent aeration, particularly when VOC and SVOC samples are being collected. Retrieve the filled bailer to the surface. Try not to allow line or bailer to directly contact the sampler, ground, or other surroundings.
8. Collect the samples in the following manner.
    - Collect VOC samples first. Fill sample vials directly from bailer with as little agitation as possible. Fill until the sample forms a convex meniscus above the top edge of the vial, and then carefully cap the vial. Invert VOC sample bottles and tap to check for air bubbles.
    - Other samples will be placed directly in the appropriate container from the discharge tubing of the pump or bailer in the following order, as applicable: SVOCs; pesticides, PCBs, and herbicides; metals; and cyanide and sulfide.
9. Add preservative (if needed), cap, seal, and properly label all containers. Place filled containers into the cooler(s) immediately.

10. Record sample types and amounts collected and time and date of collection in the field logbook. Prepare chain-of-custody form. Prepare samples for shipment to the laboratory.

11. Decontaminate sampling equipment (as required).

Groundwater sampling (or purging) with a bailer for metals and organic compounds should only be done with a stainless-steel or Teflon™ bailer.

APPENDIX B

WATER-TABLE SURFACE CONTOUR MAPS

Table B-1
Water Level Measurement Data for Sites 5 and 16

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Well Number	Date	Water Level Measured (feet)	Water Elevation (feet mlw)	Top of Casing (feet mlw)
KBA-5-1	02/19/92	7.76	14.31	22.07
	05/06/92	7.95	14.12	
	07/10/92	8.59	13.48	
	09/12/92	8.56	13.51	
	11/12/92	6.34	15.73	
	01/13/93	6.87	15.20	
KBA-5-2	02/19/92	5.26	14.37	19.63
	05/06/92	5.70	13.93	
	07/10/92	6.22	13.41	
	09/12/92	6.05	13.58	
	11/12/92	4.70	14.93	
	01/13/93	4.18	15.45	
KBA-5-3	02/19/92	6.84	14.15	20.99
	05/06/92	7.10	13.89	
	07/10/92	6.85	14.14	
	09/12/92	7.40	13.59	
	11/12/92	6.86	14.13	
	01/13/93	6.14	14.85	
KBA-5-4	02/19/92	7.59	14.13	21.72
	05/06/92	7.84	13.88	
	07/10/92	7.53	14.19	
	09/12/92	8.27	13.45	
	11/12/92	7.56	14.16	
	01/13/93	7.12	14.60	
KBA-5-5	02/19/92	7.32	13.70	21.02
	05/06/92	7.52	13.50	
	07/10/92	7.53	13.49	
	09/12/92	8.06	12.96	
	11/12/92	7.30	13.72	
	01/13/93	6.92	14.10	

See note at end of table.

Table B-1 (Continued)
Water Level Measurement Data for Sites 5 and 16

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Well Number	Date	Water Level Measured (feet)	Water Elevation (feet mlw)	Top of Casing (feet mlw)
KBA-5-6	02/19/92	10.51	12.34	22.85
	05/06/92	9.85	13.00	
	07/10/92	9.70	13.15	
	09/12/92	10.42	12.43	
	11/12/92	9.52	13.33	
	01/13/93	9.49	13.36	
KBA-5-7	02/19/92	7.57	12.93	20.50
	05/06/92	8.04	12.46	
	07/10/92	7.88	12.62	
	09/12/92	8.06	12.44	
	11/12/92	7.68	12.82	
	01/13/93	7.08	13.42	
KBA-16-1	02/22/92	13.32	10.11	23.43
	05/04/92	12.55	10.88	
	07/11/92	11.08	12.35	
	09/11/92	12.43	11.00	
	11/12/92	12.62	10.81	
	01/15/93	13.06	10.37	
KBA-16-2	02/22/92	11.65	9.11	20.76
	05/04/92	10.91	9.85	
	07/11/92	10.48	10.28	
	09/11/92	10.76	10.00	
	11/12/92	10.86	9.90	
	01/15/93	11.00	9.76	
KBA-16-3	02/22/92	11.32	10.55	21.87
	05/04/92	11.75	10.12	
	07/11/92	9.94	11.93	
	09/11/92	10.26	11.61	
	11/12/92	10.90	10.97	
	01/15/93	10.90	10.97	

See note at end of table.

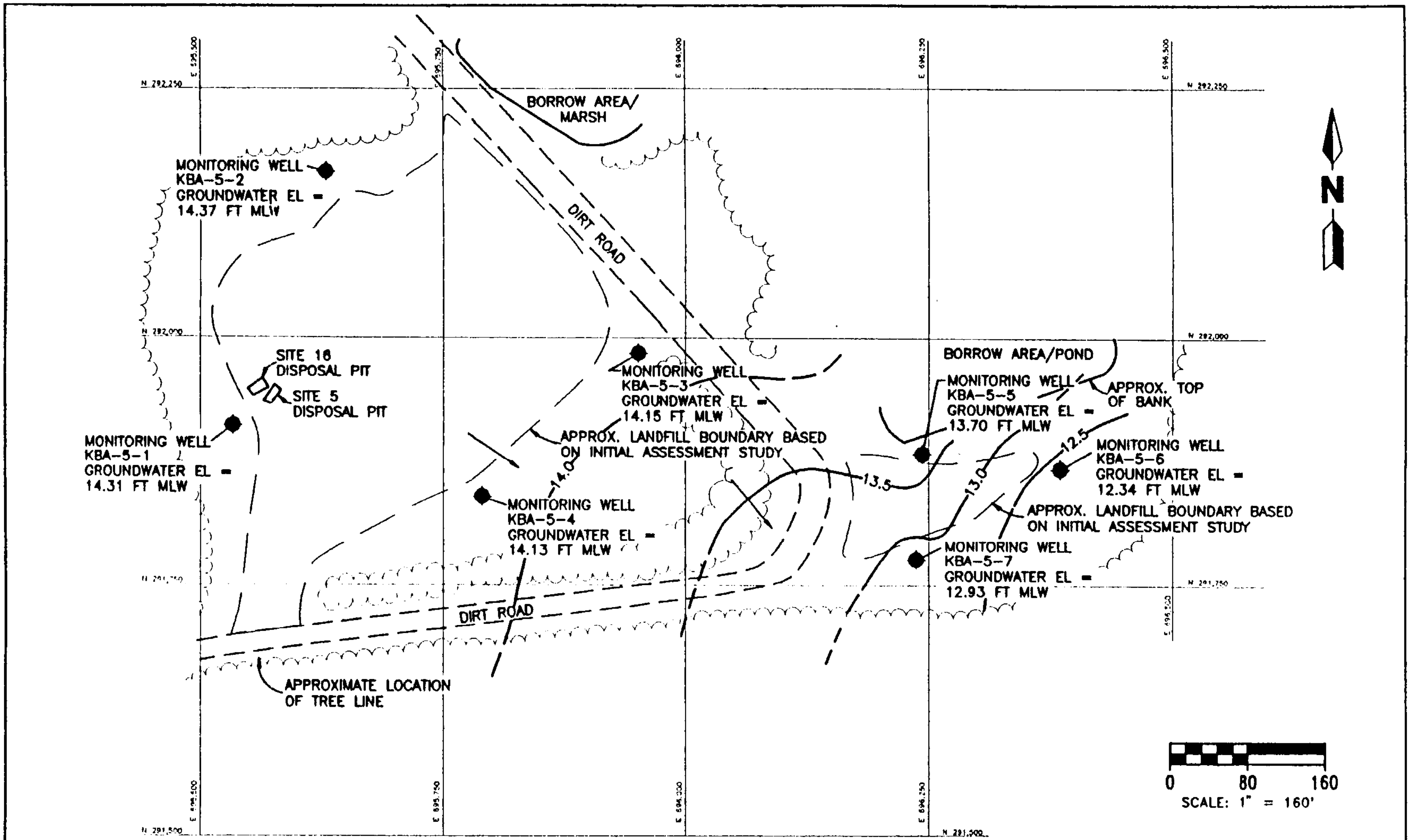
Table B-1 (Continued)
Water Level Measurement Data for Sites 5 and 16

Supplemental Resource Conservation and Recovery Act
Facility Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Well Number	Date	Water Level Measured (feet)	Water Elevation (feet mlw)	Top of Casing (feet mlw)
KBA-16-4	02/22/92	8.65	12.91	21.56
	05/04/92	10.30	11.26	
	07/11/92	7.32	14.24	
	09/11/92	7.98	13.58	
	11/12/92	8.33	13.23	
	01/15/93	8.22	13.34	

Note: mlw = mean low water.

Site 5



LEGEND

- MONITORING WELL
- —14.5— GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- GROUNDWATER FLOW DIRECTION
- DRILL CUTTINGS DISPOSAL PIT

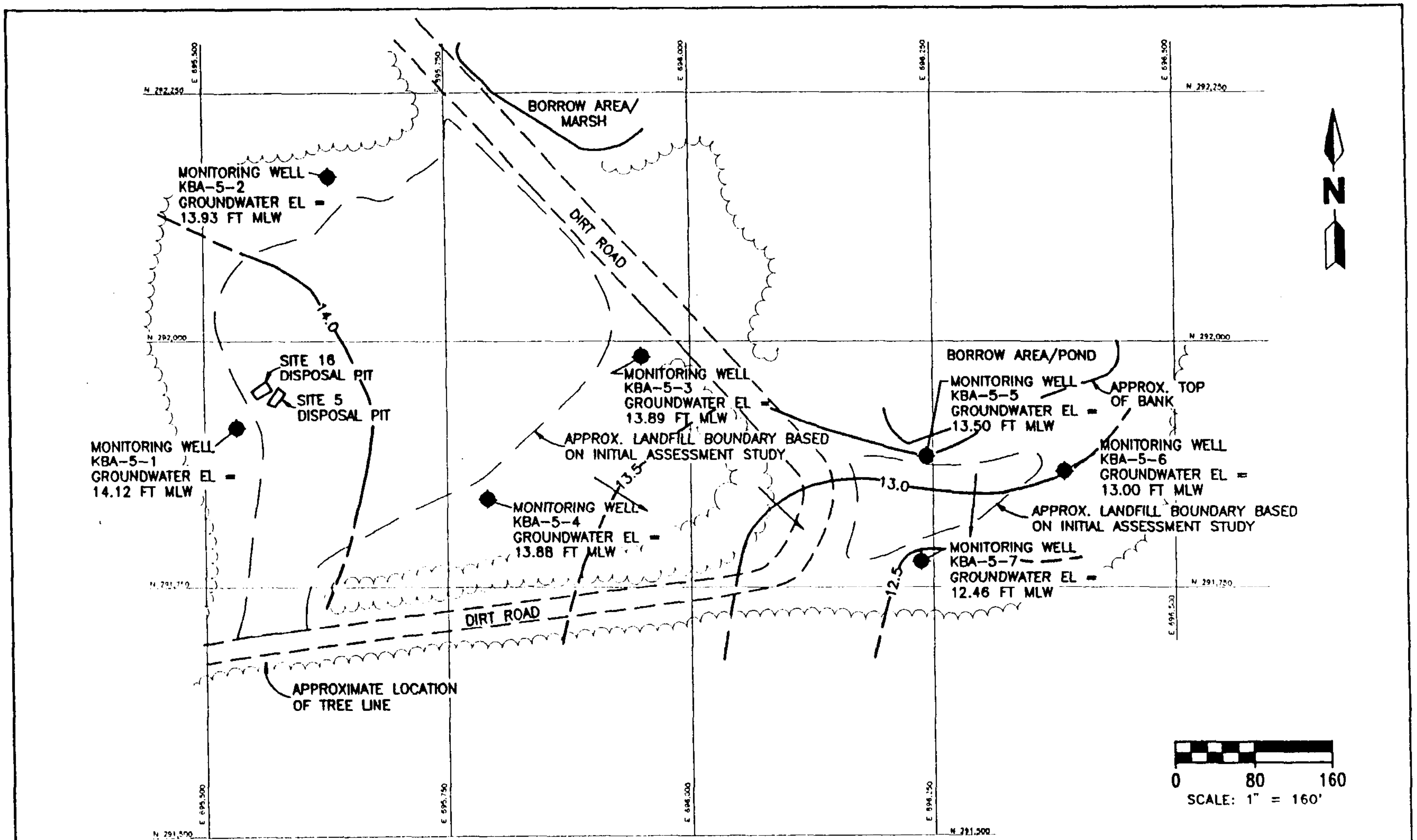
FIGURE B-1

SITE 5, WATER-TABLE SURFACE CONTOUR MAP, FEBRUARY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-1\DMF\940923



LEGEND

- ◆ – MONITORING WELL
- —14.5— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION
- ▢ – DRILL CUTTINGS DISPOSAL PIT

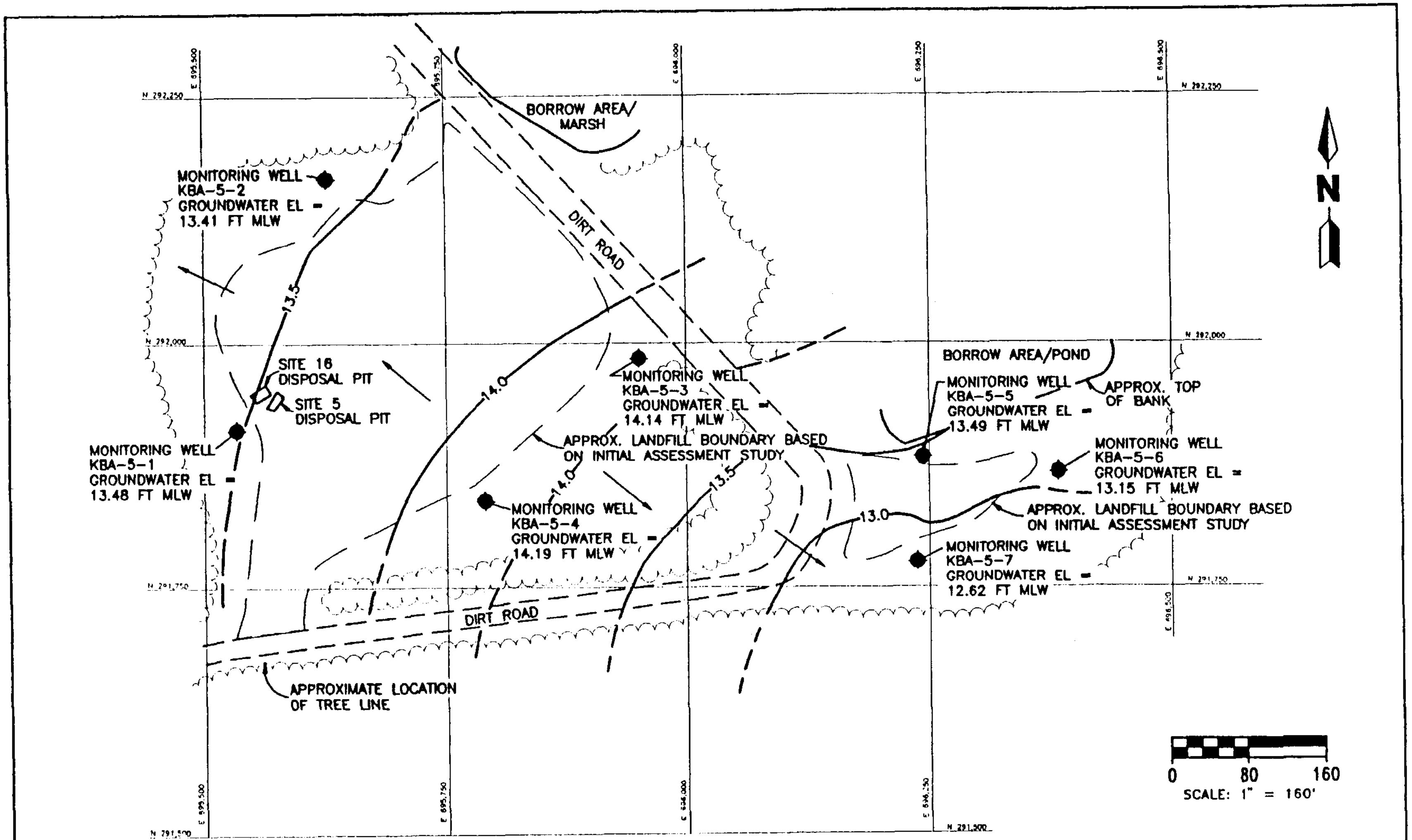
FIGURE B-2

SITE 5, WATER-TABLE SURFACE CONTOUR MAP, MAY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-2\DMF\940927



LEGEND

- ● – MONITORING WELL
- —14.5— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION
- ▱ – DRILL CUTTINGS DISPOSAL PIT

FIGURE B-3

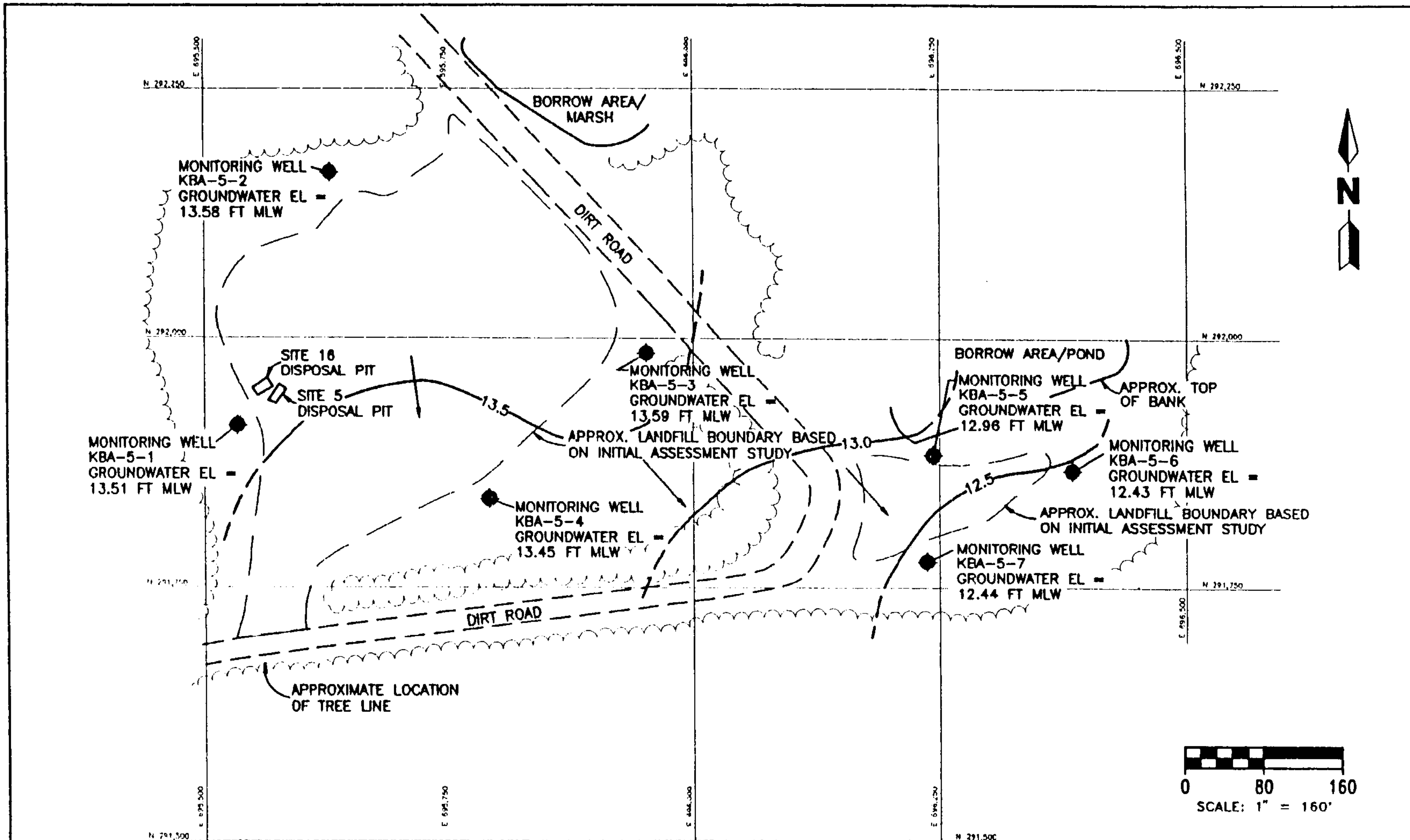
SITE 5, WATER-TABLE SURFACE CONTOUR MAP, JULY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-3\DMF\940923

RFI_5&16.wp
mlv.07.95



LEGEND

- ◆ - MONITORING WELL
- —14.5— - GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ - GROUNDWATER FLOW DIRECTION
- ▢ - DRILL CUTTINGS DISPOSAL PIT

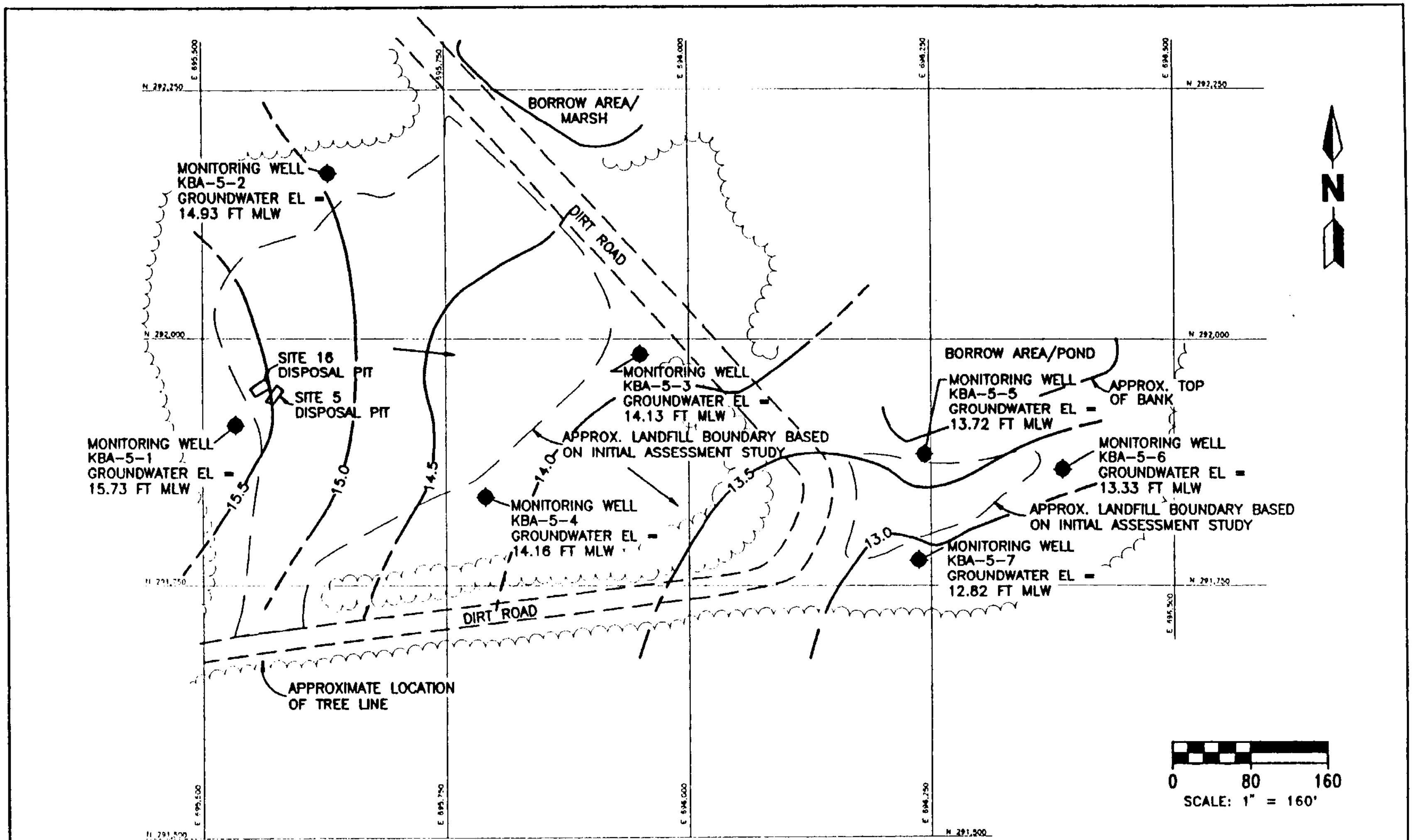
FIGURE B-4

SITE 5, WATER-TABLE SURFACE CONTOUR MAP, SEPTEMBER 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-4\DMF\940923



LEGEND

- ◆ – MONITORING WELL
- —14.5— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION
- ▢ – DRILL CUTTINGS DISPOSAL PIT

FIGURE B-5

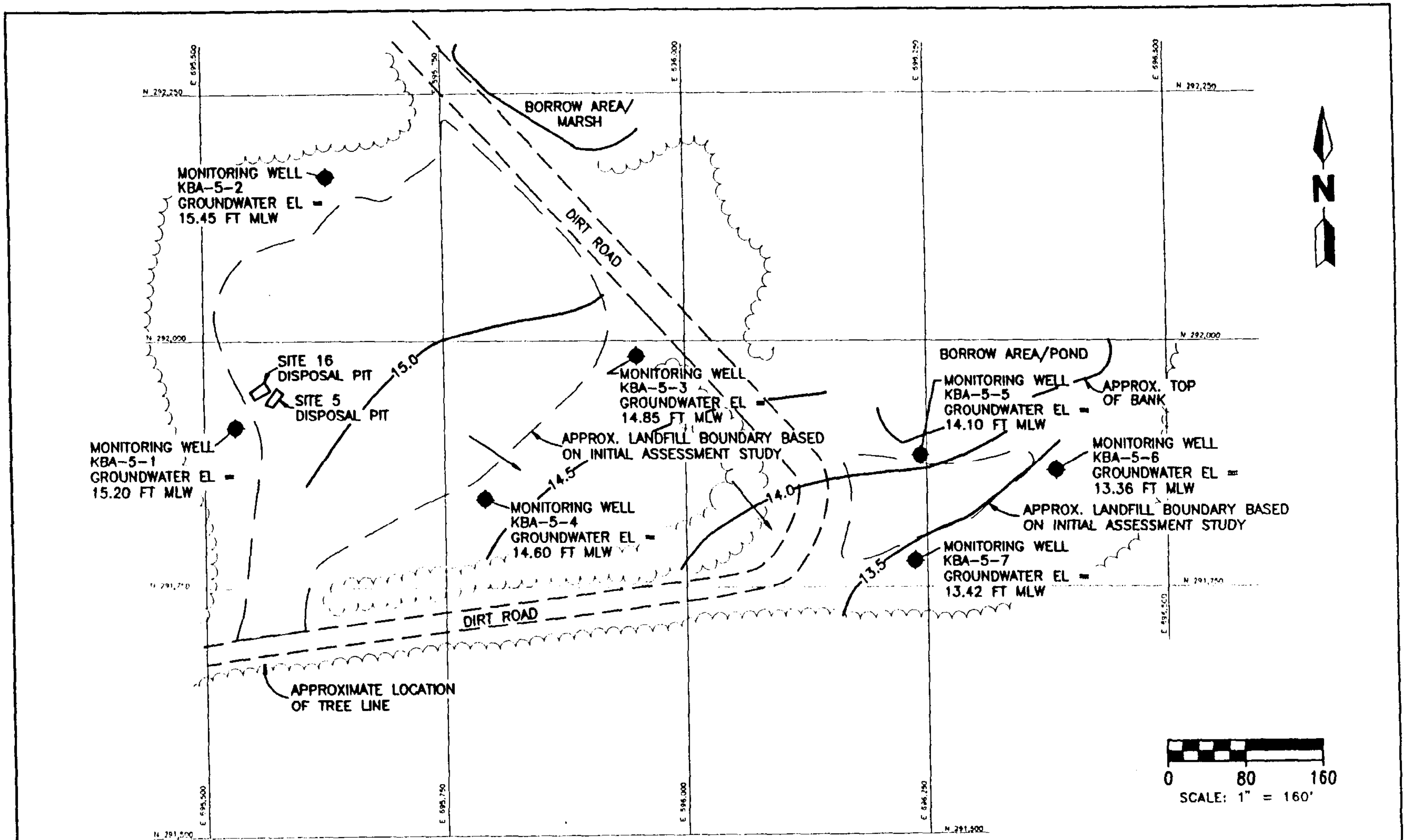
SITE 5, WATER-TABLE SURFACE CONTOUR MAP, NOVEMBER 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-5\DMF\940923

RFI_5&16.wp
mlv.07.95



LEGEND

- ● – MONITORING WELL
- —14.5— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION
- ▢ – DRILL CUTTINGS DISPOSAL PIT

FIGURE B-6

SITE 5, WATER-TABLE SURFACE CONTOUR MAP, JANUARY 1993

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-6\DMF\940927

Site 16

RFI_5&16.wp
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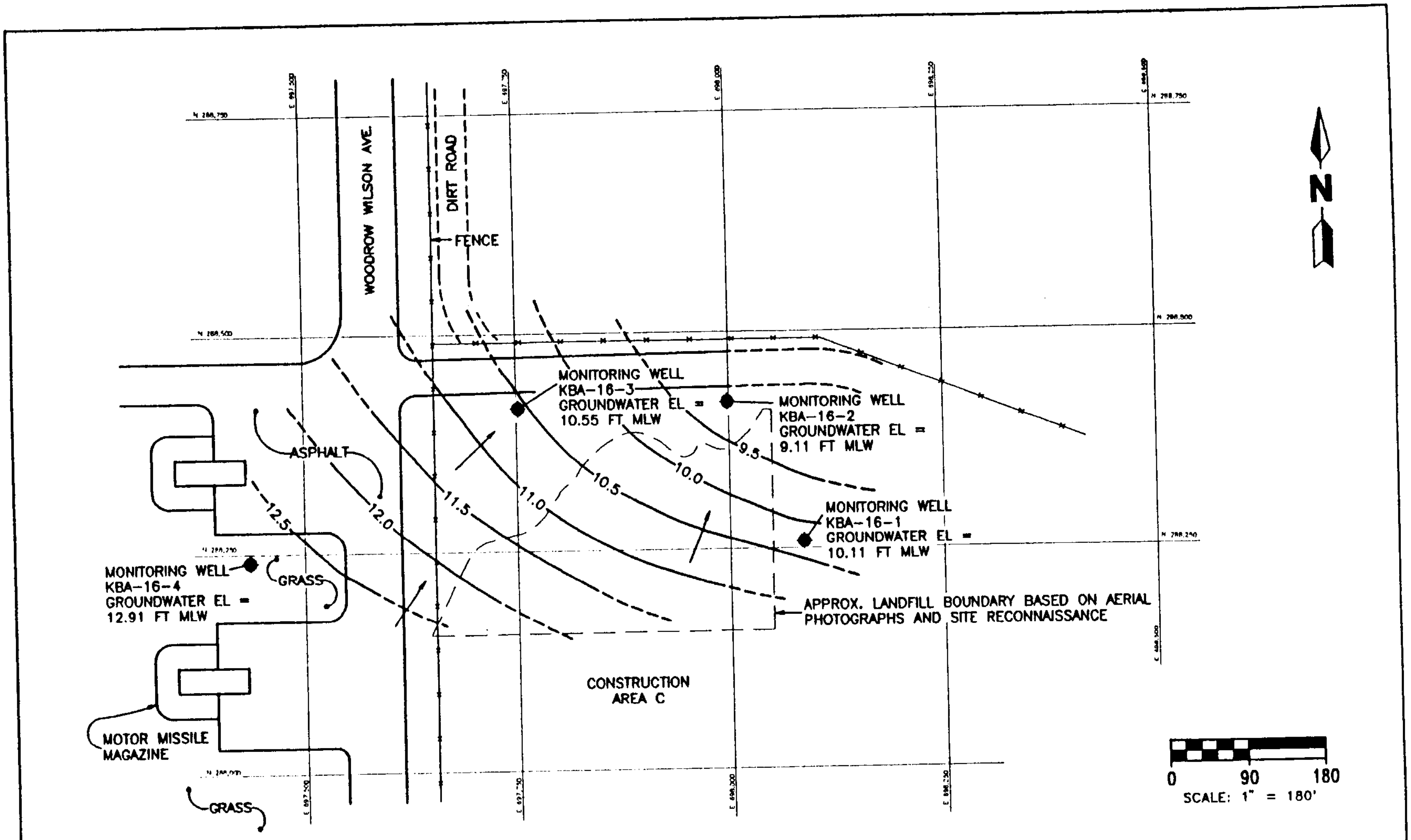


LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION

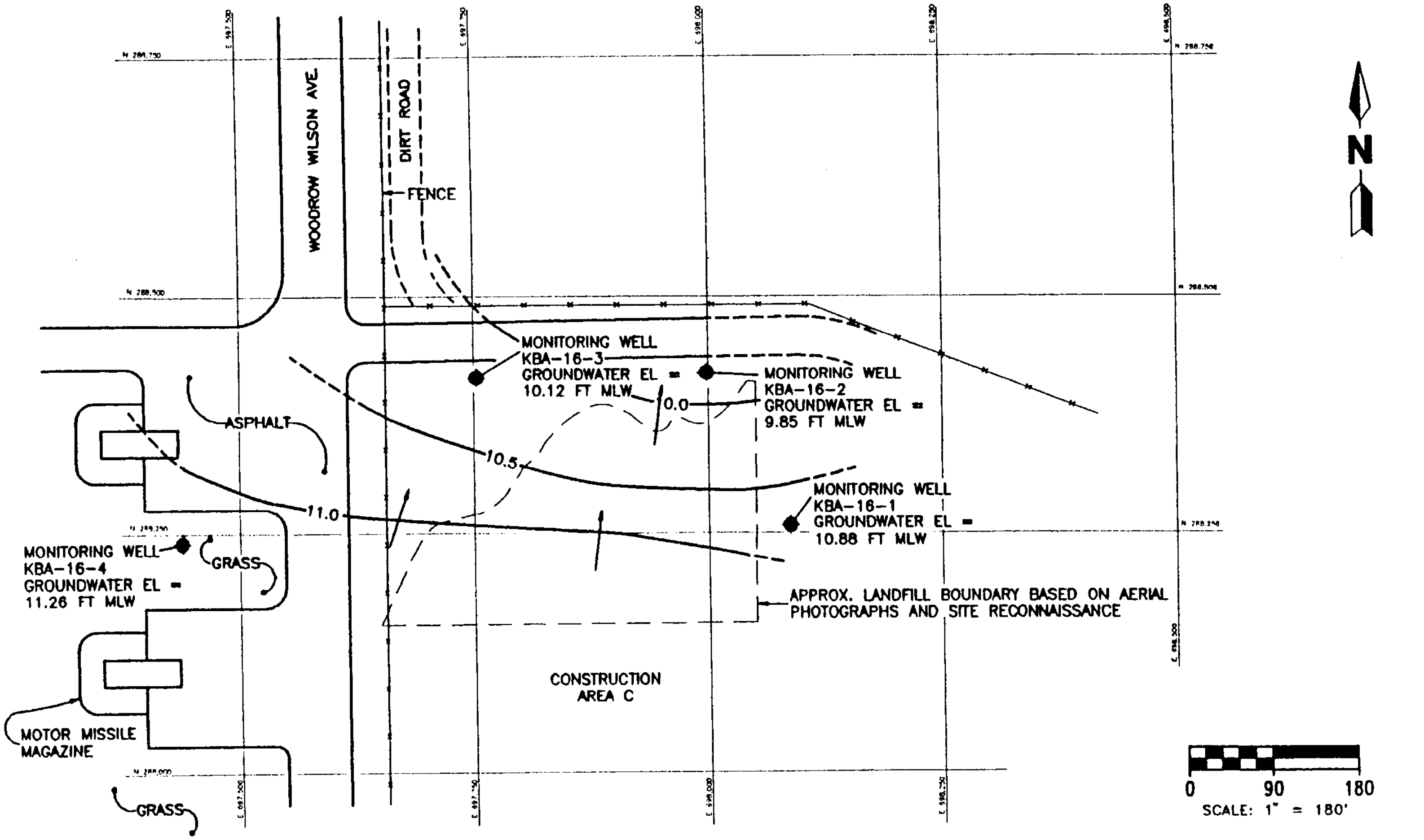
FIGURE B-7

SITE 16, WATER-TABLE SURFACE CONTOUR MAP, FEBRUARY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-7\DMF\940927



LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION

FIGURE B-8

SITE 16, WATER-TABLE SURFACE CONTOUR MAP, MAY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-8\DMF\940926

RFI_5&16.wp
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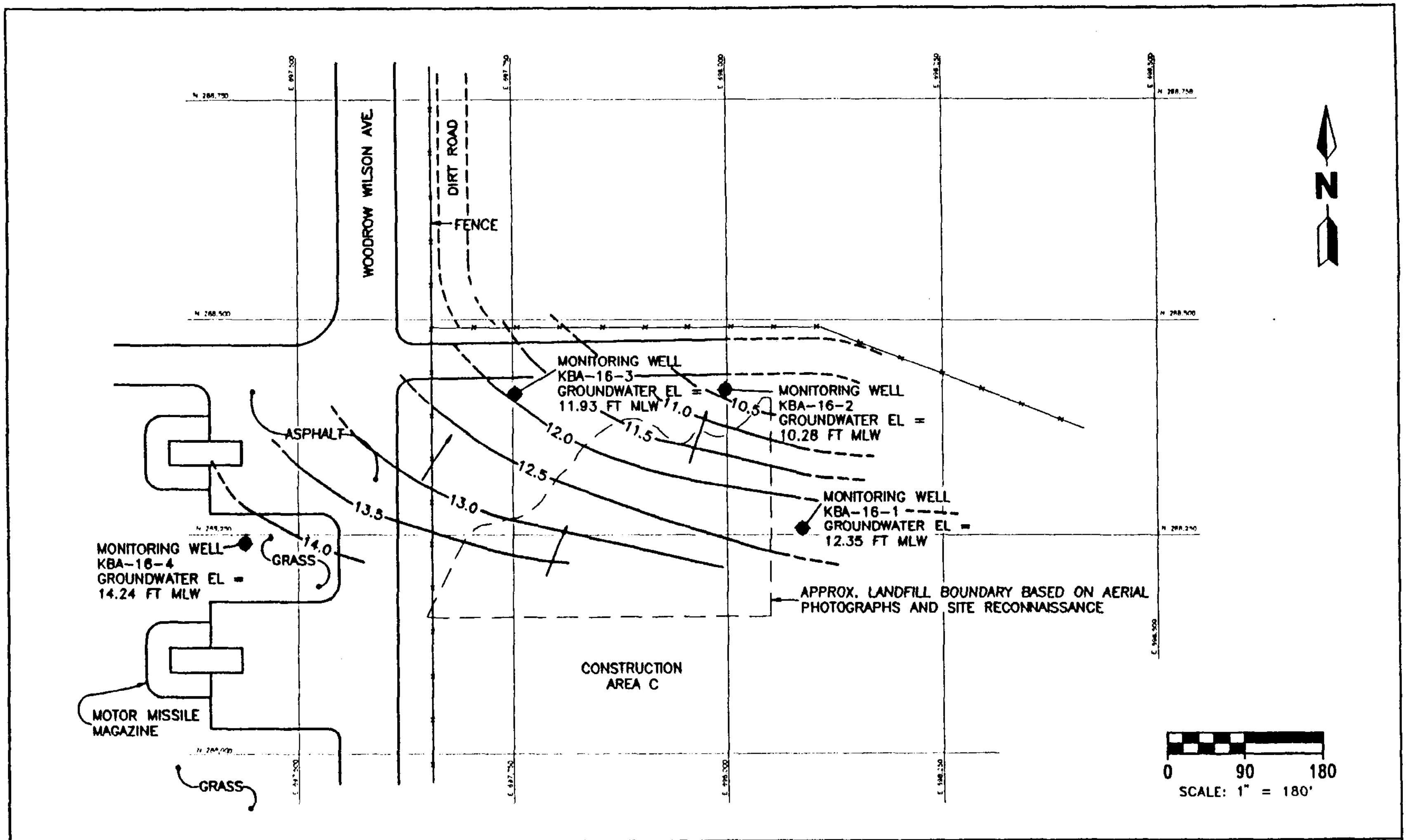


LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION

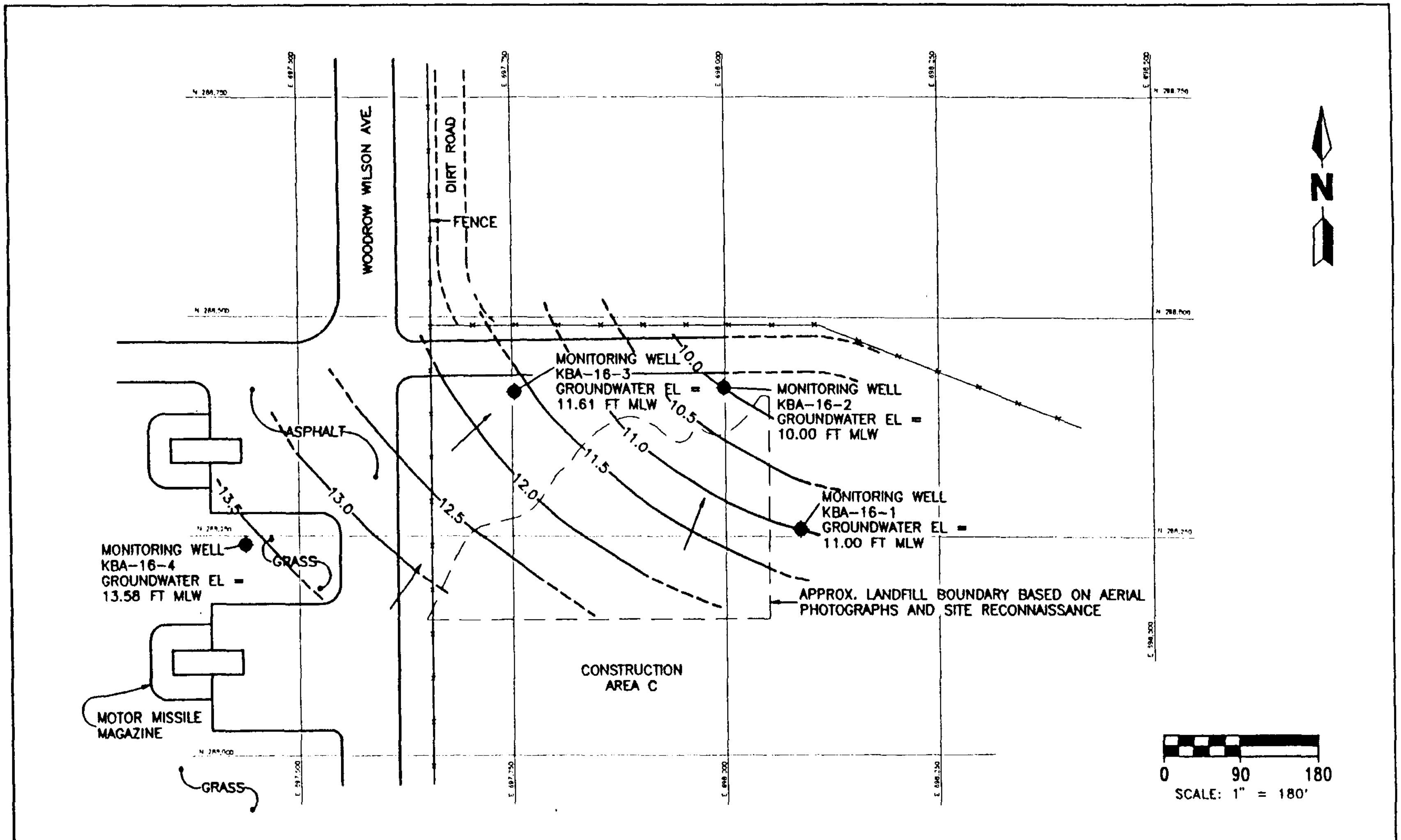
FIGURE B-9

SITE 16, WATER-TABLE SURFACE CONTOUR MAP, JULY 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-9\DMF\940926



LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION

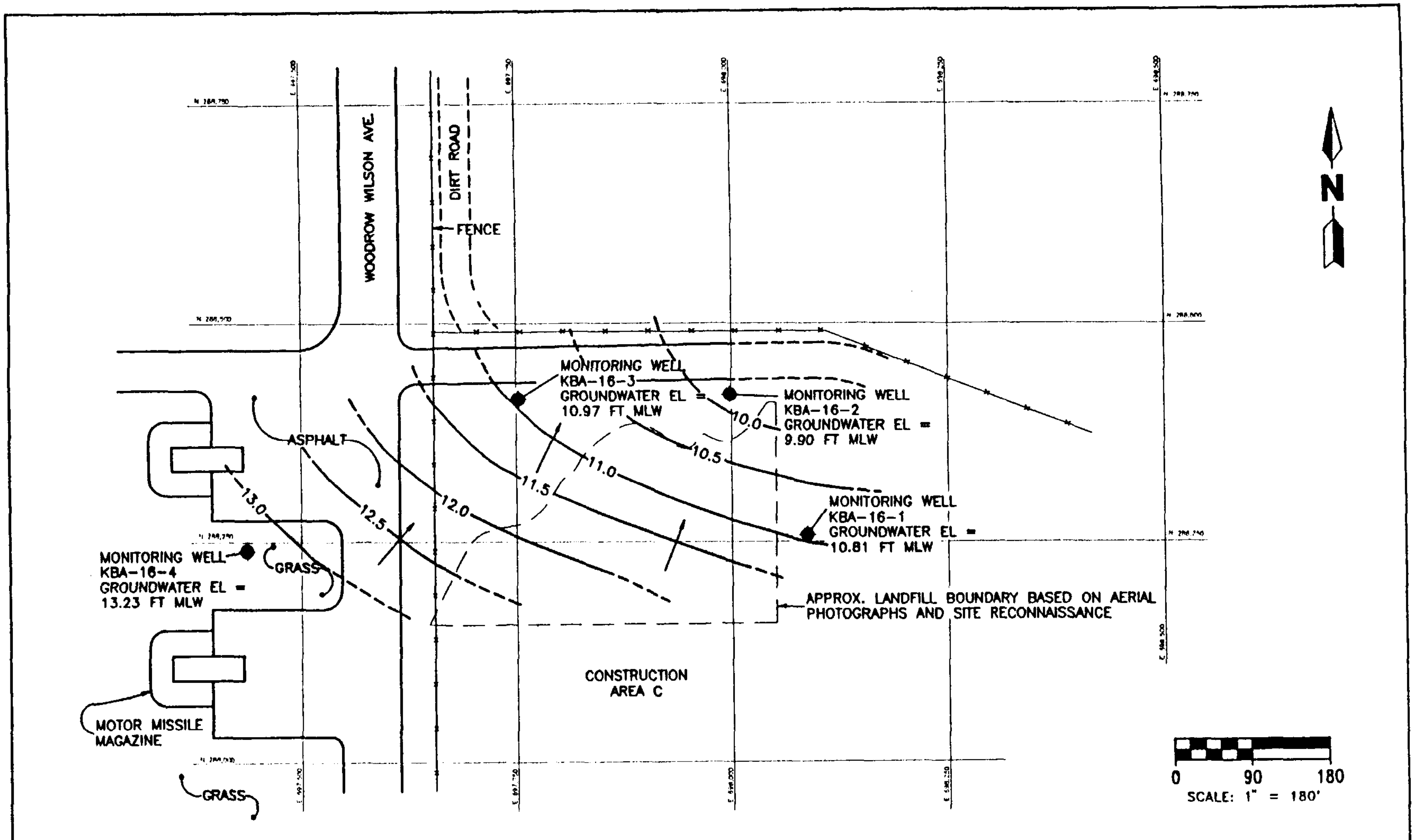
FIGURE B-10

SITE 16, WATER-TABLE SURFACE CONTOUR MAP, SEPTEMBER 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-10\DMF\940927



LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——→ – GROUNDWATER FLOW DIRECTION

FIGURE B-11

SITE 16, WATER-TABLE SURFACE CONTOUR MAP, NOVEMBER 1992

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-11\DMF\940927

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mlv.07.95

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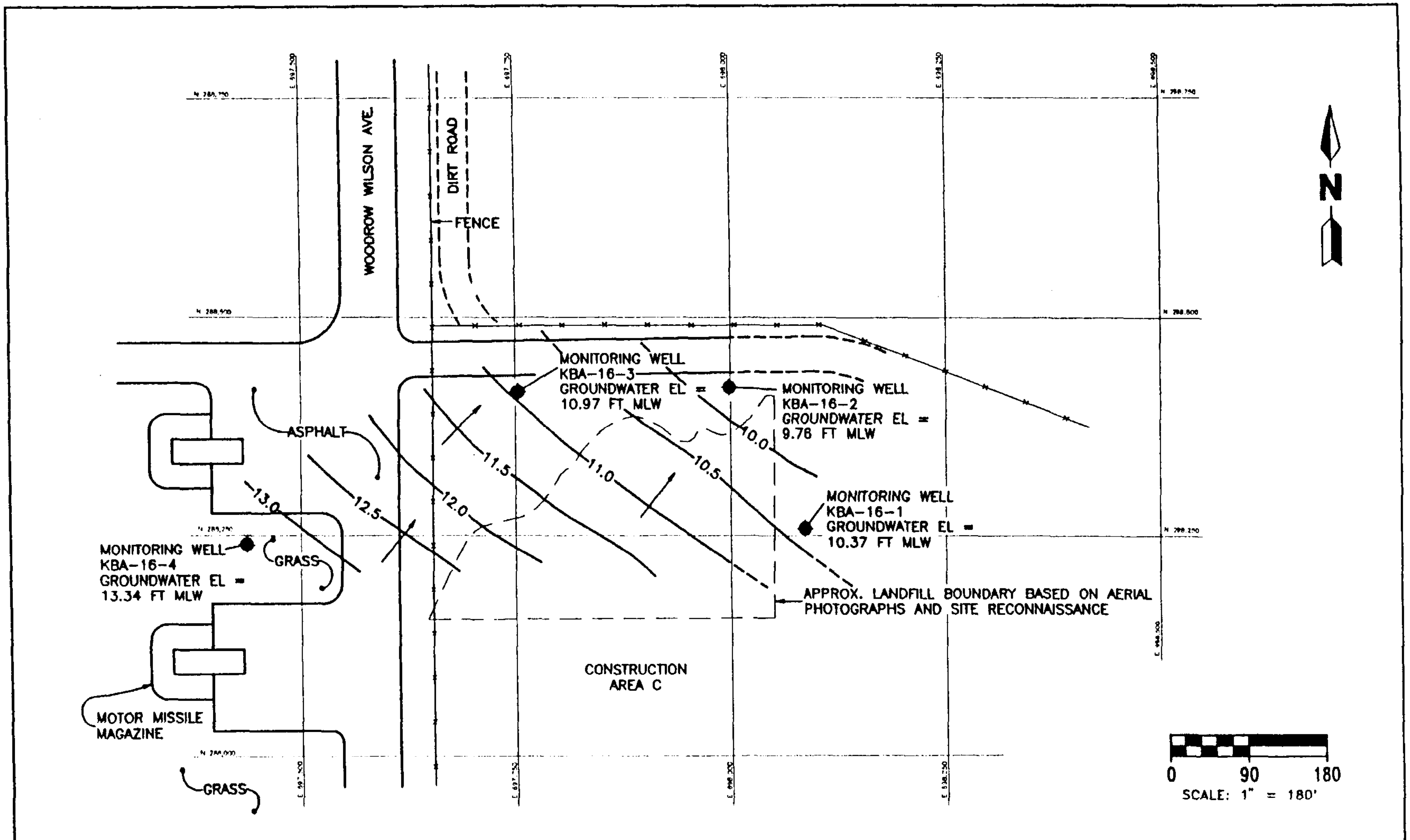
mlv.07.95



LEGEND

- ◆ – MONITORING WELL
- —11.0— – GROUNDWATER POTENTIOMETRIC CONTOUR (FT MLW)
- ——► – GROUNDWATER FLOW DIRECTION

FIGURE B-12

SITE 16, WATER-TABLE SURFACE
CONTOUR MAP, JANUARY 1993

SUPPLEMENTAL RFI WORKPLAN

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-71\FIG_B-12\DMF\940927

APPENDIX C

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

SUPPLEMENTAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORKPLAN FOR SITES 5 AND 16

NAVAL SUBMARINE BASE KINGSBAY
KINGS BAY, GEORGIA

Unit Identification Number: N42237

Contract Number: N62467-89-D-0317

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July 1995

TABLE OF CONTENTS

Appendix C: Health and Safety Plan
Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Chapter	Title	Page No.
1.0	INTRODUCTION	C-5
	1.1 FACILITY DESCRIPTION	C-5
	1.2 PURPOSE AND REGULATORY SETTING	C-5
	1.2.1 Task Order Manager (TOM)	C-5
	1.2.2 Field Operations Leader	C-5
	1.2.3 Health and Safety Officer	C-5
	1.2.4 Other Functional Titles	C-6
	1.3 TRAINING	C-6
	1.4 MEDICAL SURVEILLANCE	C-6
2.0	DESCRIPTION OF CURRENT CONDITIONS	C-8
	2.1 SITE NAME, LOCATION, AND SIZE	C-8
	2.2 SITE HISTORY AND LAYOUT	C-8
	2.3 SCOPE OF WORK (WORKPLAN)	C-8
3.0	TASK ANALYSIS	C-9
	3.1 GROUND-PENETRATING RADAR, SOIL BORING AND MONITORING WELL INSTALLATION, AND GROUNDWATER AND SOIL SAMPLING	C-9
	3.1.1 Hazardous Substances	C-9
	3.1.2 Site Risks	C-9
	3.1.2.1 Health Hazards	C-9
	3.1.2.2 Safety Hazards	C-9
	3.1.2.3 Conclusion and Risk Assessment	C-9
	3.1.3 Protective Measures	C-10
	3.1.3.1 Engineering Controls	C-10
	3.1.3.2 Levels of Protection	C-10
	3.1.4 Monitoring	C-10
	3.1.4.1 Air Sampling	C-10
	3.1.4.2 Personal Monitoring	C-10
4.0	MATERIAL SAFETY DATA SHEETS	C-11
5.0	SITE CONTROL	C-12
	5.1 ZONATION	C-12
	5.2 COMMUNICATIONS	C-12
	5.3 WORK PRACTICES	C-12
6.0	DECONTAMINATION AND DISPOSAL	C-13
	6.1 PERSONNEL DECONTAMINATION	C-13
	6.1.1 Small Equipment Decontamination	C-14
	6.1.2 Heavy Equipment Decontamination	C-14
	6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS	C-14

TABLE OF CONTENTS (Continued)

Appendix C: Health and Safety Plan
Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Chapter	Title	Page No.
7.0	EMERGENCY AND CONTINGENCY PLAN	C-15
	7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION	C-15
	7.2 EVACUATION	C-15
	7.3 EMERGENCY MEDICAL TREATMENT AND FIRST	C-15
8.0	ADMINISTRATION	C-16
	8.1 PERSONNEL AUTHORIZED DOWNRANGE	C-16
	8.2 HEALTH AND SAFETY PLAN APPROVALS	C-17
	8.3 FIELD TEAM REVIEW	C-18
	8.4 MEDICAL DATA SHEET	C-19
	8.5 EMERGENCY TELEPHONE NUMBERS	C-20
	8.6 ROUTES TO EMERGENCY MEDICAL FACILITIES	C-21

Attachments:

Attachment A:	Personal Protective Equipment	C-22
Attachment B:	Monitoring Equipment	C-26
Attachment C:	Zonation	C-28
Attachment D:	Work Practices	C-30
Attachment E:	Temperature Extremes	C-34
Attachment F:	Emergency Planning	C-45
Attachment G:	Health and Safety Forms and Data Sheets	C-50
Attachment H:	Respiratory Protection Program	C-55
Attachment I:	Other	C-65

LIST OF TABLES

Appendix C: Health and Safety Plan
Supplemental Resource Conservation and Recovery Act Facility
Investigation Workplan for Sites 5 and 16
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Table	Title	Page No.
E-1	Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under Calm Conditions)	C-38

GLOSSARY

CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
eV	electron volts
EZ	Exclusion Zone
FID	flame ionization detector
GFCI	ground-fault current interrupters
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
IDLH	Immediately Dangerous to Life or Health
LEL	lower explosive limit
$\mu g/\ell$	micrograms per liter
$\mu g/kg$	micrograms per kilogram
mph	miles per hour
NSB	Naval Submarine Base
OSHA	Occupational Safety and Health Administration
OT	oral temperature
PID	photoionization detector
PPE	personal protective equipment
SCBA	self-contained breathing apparatus
TOM	Task Order Manager
USEPA	U.S. Environmental Protection Agency
UV	ultra violet

1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, the HASP addresses those activities associated with field operations for this project. Compliance with this HASP is required for all personnel entering the site. Attachments to this HASP are as follows:

- Attachment A, Personal Protective Equipment, describes levels of protection and the equipment associated with each level.
- Attachment B, Monitoring Equipment, describes types of monitoring equipment that may be used for health and safety purposes.
- Attachment C, Zonation, describes division of the work area into zones to accommodate the various activities associated with hazardous site operations.
- Attachment D, Work Practices, establishes protocol and guidance for safe operations.
- Attachment E, Temperature Extremes, describes identification and treatment of incidences caused by temperature extremes.
- Attachment F, Emergency Planning, discusses preparation and procedures applicable to situations such as site evacuation.
- Attachment G, Health and Safety forms and Data Sheets, includes an Accident Report form, Occupational Safety and Health Administration (OSHA) poster, and Daily Health and Safety Audit form.
- Attachment H, Respiratory Protection Program, describes the selection and use of respiratory protective devices that may be needed during investigation of hazardous sites.

1.2 PROJECT PERSONNEL.

1.2.1 Task Order Manager (TOM) The TOM is the individual with overall project management responsibilities. Those responsibilities as they relate to health and safety include provision for the development of this site-specific HASP, the necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements, and the means and materials necessary to resolve any health and safety issues that are identified or that develop on the project.

1.2.2 Field Operations Leader The Field Operations Leader is either the TOM or the TOM's designee who is onsite and vested with the authority by the TOM to carry out day-to-day site operations, including interfacing with the site Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The HSO for this project has been designated by the TOM with concurrence of the Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM for the duration of his/her assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the health and safety program. The HSO will investigate all accidents, illnesses, and incidents occurring onsite. The HSO will also conduct safety briefings and site-specific training for onsite personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), OSHA, or other governmental agency personnel visiting a site in response to health and safety issues. The HSO, in consultation with the Health and Safety Supervisor (HSS) or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.2.4 Other Functional Titles The following is a list of other personnel who will be involved in this project and their general responsibilities:

Position Title	Responsibilities
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

1.3 TRAINING. All personnel entering potentially contaminated areas of this site must meet the training requirements of 29 CFR 1910.120. The training requirements are: an initial 40-hour training course on hazardous waste site operations, an 8-hour annual refresher training course, and an 8-hour supervisory course for those personnel who will have supervisory responsibilities on site. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange).

Also, personnel at the site must participate in the site-specific training presentation, which will cover major elements of the site HASP, as well as health and safety procedures regarding an individual's specific job responsibilities and tasks. The site HSO or health and safety designee will provide this training before an individual is permitted to work in a downrange position.

Additional training will be provided as determined by the HSM and may include additional refreshers on personal protective equipment (PPE), instrumentation, cardiopulmonary resuscitation (CPR), first aid, Department of Transportation (DOT) confined space entry, blood-borne pathogen standard, or any other pertinent health- or safety-related subject.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program that meets the requirements of 1910.120. Personnel who have not received medical clearance will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange).

The medical qualifications includes a health monitoring program that consists of an initial medical examination to establish the employee's general health profile. This profile provides important baseline laboratory data for later comparative study and annual examinations. Follow-up examinations are completed annually for all personnel enrolled in the health monitoring program, or more frequently if project assignments warrant testing following specific field activities.

Symptoms of exposure to hazardous materials will be reviewed for each site to indicate to personnel the recognized signs of possible exposure to those materials. This information will be supplemented with a discussion of the need for objectivity in the personal health assessment to account for normal reaction to stressful situations. The HSO will watch for outward evidence of changes in worker health. Symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold, or loss of appetite. Employees will routinely be asked to assess their general state of health during the project. Special medical monitoring may be identified for certain sites.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. Naval Submarine Base (NSB) Kings Bay is located in the southeast corner of Georgia, approximately 8 miles north of the Georgia-Florida border. The NSB covers 16,168 acres and is located in Camden County. Refer to Figure 1-1 of the Workplan for Site Location Map for Sites 5 and 16.

There are two areas of investigation. One is Site 5, Army Reserve Disposal Area, Towhee Trail. Site 5 is located in the west-central part of NSB. The site is composed of two areas and covers approximately 8.5 acres. The other site is Site 16, Army Reserve Disposal Area, Motor Missile Magazines. Site 16 is located in the south-central part of the NSB. The site covers approximately 1 acre.

2.2 SITE HISTORY AND LAYOUT. From the early 1950's through 1965, the operations at NSB Kings Bay were to meet the Department of the Army's requirements for East Coast port facilities capable of transporting ammunition and other explosives in the event of a national emergency. From 1978 to present, the base has served as the Fleet Ballistic Missile submarine support facility that supports submarines.

Site 5 was used from 1969 to 1974 for disposal of tree stumps, wooden pallets, metal ammunition boxes, aluminum sheeting, concrete blocks, and kitchen wastes. The waste was disposed in excavations 5 feet deep. Wastes were burned twice per year using diesel fuel and waste engine oil. The waste disposed in Site 16 consisted of food, wood, trash, scrap metal, tree limbs, and empty paint and solvent cans. The site was excavated to a depth of 3 to 5 feet before the waste was buried. Burning of the waste took place, but it is unknown if fuel was used for burning.

At Site 5, organic compounds were detected in groundwater and soil samples in quantities less than 100 micrograms per liter ($\mu g/\ell$) and there were four compounds detected in soil samples above 100 micrograms per kilogram ($\mu g/kg$), but were suspected to be laboratory artifacts or to be naturally occurring. At Site 16, organic chemicals were detected in concentrations no greater than 100 $\mu g/\ell$ in groundwater samples and 1,000 $\mu g/kg$ in soil samples.

2.3 SCOPE OF WORK (WORKPLAN). Background data will be collected for Sites 5 and 16 for inorganic constituents in soil and groundwater and to assess the presence and extent of soil and groundwater contamination in relation to background.

The following activities will be conducted at the sites: ground penetrating radar surveys, soil borings and soil sample collection, and monitoring well installation and groundwater sample collection.

3.0 TASK ANALYSIS

3.1 GROUND-PENETRATING RADAR, SOIL BORING AND MONITORING WELL INSTALLATION, AND GROUNDWATER AND SOIL SAMPLING.

3.1.1 **Hazardous Substances** Analytical data collected during previous investigations do not suggest that contaminants are present at concentrations that would pose a threat to site workers.

3.1.2 **Site Risks**

3.1.2.1 **Health Hazards** Potential health hazards include exposure to hazardous compounds via dermal contact, inhalation, or ingestion.

3.1.2.2 **Safety Hazards** The potential safety hazards are: the operation of heavy machinery; sampling; temperature extremes; noise; fire and explosion; slips, trips, and falls; electrical hazards; and snake, tick, and spider bites. Confined space entry, excavation and trenching, and drum handling and sampling are not expected to occur.

Heavy Equipment Operations. Only authorized employees are permitted to operate heavy equipment, i.e., backhoes, track hoes, dump trucks, etc. Unauthorized employees are not permitted to ride in cabs of heavy equipment. The operator and site personnel must be aware at all times of the location and pathway of the heavy equipment when in use. It is advisable for operators to wear hearing protection.

Temperature Extremes. Refer to Attachment E for further information on temperature extremes.

Noise. Protection from worker exposure to onsite noise shall comply with 29 CFR 1910.95. Site personnel working near heavy equipment operations are advised to wear hearing protection.

Fire and Explosion. All operations and activities involving the potential for fire and/or explosion hazard shall be conducted in a manner to minimize the risk. The following precautions should be taken to protect against the hazard: monitor the atmosphere for explosive atmospheres, oxygen deficient atmospheres, and flammable vapors; keep all potential ignition sources away; use non-sparking, explosion-proof, or intrinsically safe equipment; and follow safe practices when performing any task that might result in the agitation or release of chemicals.

Slip, Trip, and Fall. Holes, ditches, precariously positioned or sharp objects, slippery surfaces, steep grades, uneven terrain, and unstable surfaces may result in slip, trip, and fall hazards.

Electrical Equipment. Electrical equipment used onsite may pose a hazard to site personnel. Low voltage (12 volts [v]) with ground-fault current interrupters (GFCI) and water tight, corrosion-resistant connecting cables should be used onsite to minimize electrical hazards. In addition, weather shall be monitored. All onsite work activities shall be suspended during electrical storms.

3.1.2.3 **Conclusion and Risk Assessment** Overall, hazards at the site are anticipated to be low. Appropriate work practices and monitoring procedures will be implemented to minimize the risks.

3.1.3 Protective Measures

3.1.3.1 **Engineering Controls** It is not anticipated that engineering controls will be used.

3.1.3.2 **Levels of Protection** The level of protection and action levels are based on the preliminary assessment and findings from previous investigations. This information about the site indicates there is a minimal health hazard to the workers who may perform intrusive activities at the site. If anything unexpected (drums, metal debris that may be a hazardous substance container, strange odors, or elevated readings on the monitoring instruments) is encountered, it would be considered an unknown hazard. Therefore, Level B would be required.

The initial level of protection and upgrade and low grade levels at the site are indicated below based on the work activity. The levels of protection are described in Attachment A.

The inital level of protection is Level D. If the photoionization detector (PID) reads greater than background at the source, upgrade to modified Level D. If the PID reads greater than background in the breathing zone, stop work and the level of protection will be reassessed by the HSO and HSM or HSS. If the elevated levels are sustained readings and the hazard is unknown, then Level B is required.

If the lower explosive limit (LEL) reads greater than or equal to 10 percent, use non-sparking tools. If the LEL reads greater than or equal to 20 percent, stop work and evacuate the site. If O_2 reads less than or equal to 19.5 percent, Level B is required.

3.1.4 Monitoring Monitoring of the work environment will be undertaken to ensure that Immediately Dangerous to Life or Health (IDLH) or other dangerous conditions are identified. At a minimum, this monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

3.1.4.1 **Air Sampling** To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO.

The following sampling equipment will be used at the site. Refer to Attachment A for information on the calibration and maintenance of the equipment.

1. PID or flame ionization detector (FID), and
2. Combustible gas and oxygen meter.

3.1.4.2 **Personal Monitoring** Personal monitoring is undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter onsite. Personal monitoring is conducted on a representative basis. It is not anticipated personal monitoring will be conducted at the site.

4.0 MATERIAL SAFETY DATA SHEETS

In the event that contamination is indicated by results of this or other future investigations, material safety data sheets for contaminants will be incorporated here.

5.0 SITE CONTROL

5.1 ZONATION. The general zonation protocols that should be employed at hazardous waste sites are described in Attachment C. The site-specific zonation that will be used for this project is described as follows. The immediate work area will be considered the Exclusion Zone (EZ) with the appropriate demarcation, an area for decontamination will be considered the Contamination Reduction Zone (CRZ), and all other areas will be considered the Support Zone. All personnel will be required to sign in before entering the site.

5.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)

5.3 WORK PRACTICES. General work practices to be used during field operations are described in Attachment D.

6.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination, which will take place in the contamination reduction zone. Personnel and small equipment decontamination will take place in a designated area at Site 2. Steam cleaning of equipment will be done at the decontamination area at Site 11. Prior to leaving Site 2 for Site 11, soil and grass contamination will be removed.

6.1 PERSONNEL DECONTAMINATION. All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination. A decontamination area has been established at Site 11.

The decontamination procedures described below will be followed by all personnel leaving the site. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination.

Disposable items (i.e., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason to change sooner (e.g., if leaving the EZ). If Level C protection is required, respirator cartridges will be changed daily, unless more frequent changes are deemed appropriate.

If used, respirators will be decontaminated daily and taken from the drop area, the masks will be disassembled, the cartridges discarded, and all other parts placed in a cleansing solution. After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be discarded in the contaminated trash container for disposal. In the morning, respirators will be reassembled and new cartridges installed.

Generalized procedures for removal of protective clothing are listed below.

1. Drop tools, monitors, samples, and trash at designated drop stations.

2. Remove gross contamination from outer boots and gloves with decontamination solution and water. Rinse with water.

3. Remove tape from outer boots and remove boots; discard tape and boots in disposal container (if disposable outer boots are used).

4. Remove tape from outer gloves and remove gloves; discard tape and gloves in disposal container.

5. If the worker has left the EZ to change the air tank on the self-contained breathing apparatus (SCBA) or the canister on the air-purifying respirator, this will be the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned (if disposable overboots are being used), and the joints taped; the worker then returns to duty.

6. Remove outer garments and discard in disposal container.

7. Remove respirator, if utilized, and place or hang in the designated area.

8. Remove inner gloves and discard in disposal container.

Disposable materials such as gloves, Tyvek, and latex overboots will be placed in plastic bags and disposed of in the appropriate manner.

6.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible), without hindering operation of the unit. For example, the PID can be placed in a clear plastic bag to allow for reading the scale and operating the knobs. The PID can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings will be removed and disposed of in appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

6.1.2 Heavy Equipment Decontamination Drilling rigs may become contaminated during investigation activities. They will be cleaned with high-pressure water or steam, followed by a soap and water wash and rinse. Loose material will be removed with a brush. The person performing this activity will usually be at least at the level of protection used during the personnel and monitoring equipment decontamination.

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. Refer to Subsection 4.1.4 in the Workplan for procedures related to control and disposal of decontamination products.

7.0 EMERGENCY AND CONTINGENCY PLAN

This chapter identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Attachment F. The following subsections present site-specific emergency and contingency planning information.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both onsite and offsite will be directed through the HSO or designee.

7.2 EVACUATION. In the event that site evacuation is deemed necessary, all personnel will evacuate the site in an upwind direction if a clear roadway is available. Otherwise, the site will be evacuated by the nearest clear roadway.

7.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured onsite will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 ADMINISTRATION

8.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the TOM and the HSM. Certification involves the completion of appropriate training, a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED PERSONNEL:

______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

* FIRST-AID-TRAINED
\+ CPR-TRAINED

8.2 <u>HEALTH AND SAFETY PLAN APPROVALS</u>. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

L B Harris ____________________ 7-14-95 ____________
Health and Safety Officer Date

[signature] ____________________ 7-14-95 ____________
Task Order Manager Date

Meg MacLeod ____________________ 7-13-95 ____________
Health and Safety Manager Date

8.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

SITE/PROJECT: Supplemental RFI for Sites 5 and 16, NSB Kings Bay

NAME	DATE

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all onsite personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with 1910.120. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required.

Project: ____________________

Name: ____________________

Address: ____________________

Home Telephone: Area Code (   ) __________

Age: ______ Height: ______ Weight: ______

In case of emergency, contact: ____________________

Address: ____________________

Telephone: Area Code (   ) __________

Do you wear contact lenses? Yes (   ) No (   )

Allergies: ____________________

List medication(s) taken regularly: ____________________

Particular sensitivities: ____________________

Previous and/or current medical conditions or exposures to hazardous chemicals:

____

____

Name of Personal Physician: ____________________

Telephone: Area Code (   ) __________

8.5 EMERGENCY TELEPHONE NUMBERS.

Base Security	(912) 673-4444
Rescue Service	(912) 673-3333
Primary Hospital (Gillman Hospital)	(912) 882-4227
Alternate Hospital (Brunswick Hospital)	(912) 264-7000
Base Fire Department	(912) 673-3333
Offsite Emergency Services	(912) 673-3333
Poison Control Center	(800) 962-1253
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(800) 414-8802

Site HSO: ______________________

Field Operations Leader: ______________________

Task Order Manager: ______________________

Contractor HSM: ______________________

Environmental Coordinator: Mike Anderson . . . . (912) 673-4620

8.6 <u>ROUTES TO EMERGENCY MEDICAL FACILITIES</u>. The primary source of medical assistance for the site is:

Gillman Hospital
805 Dillworth Street
St. Marys, Georgia 31558

DIRECTIONS TO PRIMARY:

From Jackson Gate, Stimson Gate, or Franklin Gate (all on Spur 40), travel south to intersection with Highway 40 (also known as Osborne Street). Turn left (south) on Highway 40, travel about 3 miles on Highway 40, take a right (west) on Dillworth Street, travel two blocks, to your right is the hospital.

The alternate source of medical assistance for the site is:

Brunswick Hospital
3100 Kemble Avenue
Parkwood, Georgia 31520

DIRECTIONS TO ALTERNATE:

Exit NSB via Stimson Gate, Franklin Gate, or Jackson Gate. Turn left (south) on Spur 40, travel about 5 miles on Spur 40, take a right on Highway 40 west, continue on Highway 40 west for another 5 miles. Take interstate 95 north, travel about 30 miles, exit on Highway 17, continue north, take a left on Parkwood Drive, travel 10 blocks on Parkwood Drive.

ATTACHMENT A

PERSONAL PROTECTIVE EQUIPMENT

A.1 PERSONAL PROTECTION LEVEL DETERMINATION. The level of personal protective equipment (PPE) required will be determined by the type and levels of waste or spill material present at the site where project personnel may be exposed. In situations where the types of waste or spill material onsite are unknown, the hazards are not clearly established, or the situation changes during onsite activities, the HSO must make a reasonable determination of the level of protection that will ensure the safety of investigators and response personnel until potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses, or other reliable methods. Once the hazards have been determined, protective levels commensurate with the hazards will be used. Protection requirements will be evaluated on a continuous basis to reflect new information as it is acquired.

A.2 LEVELS OF PROTECTION. The following subsections describe the basic composition of the generally recognized protective ensembles to be used for site operations. Specific components for any level of protection will be selected based on hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves, and other equipment, exclusive of respirators, should be used when feasible to minimize risks during decontamination and possible cross-contamination during sample handling.

A.2.1 Level A Level A protection provides the highest level of protection for skin, eyes, and the respiratory system. It is appropriate for conditions where there are potential or actual high concentrations of atmospheric vapors, gases, or particulates. Level A should be used if site operations or work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to the skin or capable of being absorbed through the intact skin. Level A is used primarily for emergency situations or when the following conditions exist: (1) vapors or mists of strong acids, (2) known or probable IDLH atmospheres with dermally active compounds, (3) high atmospheric concentrations of compounds that can be absorbed through the skin, and (4) operations that must be conducted in a confined, poorly ventilated area, where conditions requiring Level A have not yet been eliminated. The fully encapsulating suit and the pressure-demand SCBA or hoseline respirator are the key elements in Level A PPE.

Level A equipment includes the following items:

- SCBA (pressure demand) OR supplied air respirator (pressure demand with escape mask),
- total encapsulating suit,
- coveralls (optional),
- long underwear,
- gloves (outer, chemical-resistant),
- gloves (inner, chemical-resistant),
- boots (chemical-resistant, steel-toed, steel shank),

- hardhat (optional),
- disposable protective suit, gloves, and boots (to be worn over or under encapsulating suit), and
- two-way radios.

<u>A.2.2 Level B</u> Level B protection should be used when the type and atmospheric concentration of substances have been identified and require a high level of respiratory protection; however, the atmospheric contaminant, splashing liquid, or other direct contact will not adversely affect or be absorbed through any exposed skin. This includes atmospheres with IDLH concentrations of specific substances that do not (1) represent a severe skin hazard, or (2) meet the criteria for use of air-purifying respirators. Level B has the same respiratory protection criteria as Level A; however, dermal exposure is not as severe.

Level B equipment includes the following items:

- SCBA (pressure demand) OR supplied air respirator (pressure demand with escape SCBA),
- hooded chemical-resistant clothing (coated Tyvek),
- coveralls (optional),
- gloves (outer, chemical-resistant),
- gloves (inner, chemical-resistant),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- hardhat (optional),
- two-way radio (to be worn under outside protective clothing), and
- face shield (optional).

<u>A.2.3 Level C</u> Level C protection should be used when the atmospheric contaminant, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin. In addition, the types of air contaminants must have been identified, the concentration measured, and an air-purifying respirator must be available that can remove the contaminants. An air-purifying respirator can only be used if the oxygen content in the air is at least 19.5 percent, the contaminant has adequate warning properties (e.g., odor, taste, and irritating effect thresholds within two times the Threshold Limit Value), the concentration of the contaminant does not exceed the IDLH, and the worker has been fit-tested. Level C has the same splash protection as Level B; however, cartridge respirators are used instead of SCBAs.

Level C equipment includes the following items:

- full-face respirator (cartridge),

- hooded chemical-resistant clothing (coated Tyvek),
- coveralls (optional),
- gloves (inner, chemical-resistant),
- gloves (outer, chemical-resistant),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- hardhat (optional),
- escape mask (optional),
- two-way radios (worn under outside protective clothing), and
- face shield (optional).

<u>A.2.4 Level D</u> Level D is a work uniform affording minimal protection and is used for nuisance contaminants only. Level D protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Level D equipment includes the following items:

- coveralls,
- gloves (optional),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- safety glasses or chemical splash goggles (optional),
- hardhat (optional),
- escape mask (optional), and
- face shield (optional).

Note: Modified Level D is Level D with chemical protective clothing, i.e., Tyvek.

ATTACHMENT B

MONITORING EQUIPMENT

The work environment will be monitored to ensure that IDLH or other dangerous conditions are identified. At a minimum, monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

<u>B.1 AIR SAMPLING: EQUIPMENT, CALIBRATION, AND MAINTENANCE</u>. To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct-reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading levels of protection, at the discretion of the site HSO.

<u>B.1.1 Combustible Gas/Oxygen Meter</u> This meter monitors for combustible gases and oxygen. It can be used to determine (1) if an area contains concentrations of combustible gases with readings in percentage of the lower explosive limit (LEL), and (2) the percentage of oxygen. This equipment will be calibrated in accordance with the manufacturer's instructions.

This instrument also is calibrated to methane and monitors combustible gases in the percentage of the lower explosive limit. It will be calibrated in accordance with the manufacturer's instructions.

<u>B.1.2 Photovac Organic Vapor Analyzer 10S50</u> The organic vapor analyzer (OVA) is a total organic vapor analyzer capable of detecting volatile organic compounds (VOCs) that can be ionized by ultraviolet (UV) light. Model 10S50 is commonly used onsite to estimate the presence of VOCs for purposes of crew protection, well screen placement, and selection of samples for further analysis. The principle of operation is twofold: (1) the ambient temperature gas chromatograph, which breaks down mixtures of VOCs into individual components identified by retention time, and (2) detection accomplished by ionization in UV light. The charged component then moves to an electrode which, in turn, results in a meter deflection proportional to the concentration of the contaminant. This instrument does not read out directly in parts per million (ppm) unless calibrated against the material being measured; therefore, results must be interpreted conservatively and with care. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

<u>B.1.3 HNU IS101 and Photovac TIP Photoionization Detector</u> Like the OVA, the photoionization detector (PID) operates on the basis of ionization of the contaminant, which results in a meter deflection proportional to the concentration of the contaminant. In the PID, ionization is caused by a UV light source. The strength of the UV, measured in electron volts (eV), determines which contaminants can be ionized. The HNU can use three different-strength UV sources, including 9.6, 10.2, and 11.7 eV; only the 10.2- and 11.7-eV probes are currently available for field use. The TIP operates using a UV light source of 10.6 eV. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

ATTACHMENT C

ZONATION

The site itself will normally be divided into three zones: (1) the majority of the work area, considered the EZ; (2) limited areas serving as the Support Zone; and (3) an area for decontamination called the Contamination Reduction Zone (CRZ).

C.1 EXCLUSION ZONE. The EZ isolates the area of contaminant generation and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and offsite locations. The EZ is demarcated by the Hot Line (i.e., a tape line or physical barrier). Personnel entering the EZ must (1) enter through the CRZ, (2) wear the prescribed level of protection, and (3) be otherwise authorized to enter the EZ. Any personnel, equipment, or materials exiting the EZ will be considered contaminated. Personnel will be subject to decontamination; equipment and materials will either be subject to decontamination or containerized in uncontaminated devices.

Within the EZ, specific locations or restricted areas (clearly marked or identified) will be established (as necessary) for particular locations or around specific site operations. In the case of well drilling or excavation operations, a restricted area will be established that includes a minimum 30-foot radius from the drill rig or excavation operation. Other restricted areas may include drum areas, active site areas, sources of combustible gases or air contaminants, or other dangerous areas as they are identified. Access for emergency services to areas of specific site operations will be established.

C.2 CONTAMINATION REDUCTION ZONE. Moving out from the EZ, starting at the Hot Line and continuing to the Contamination Control Line, is the CRZ. The CRZ is a transition zone between contaminated and uncontaminated areas of the site. When "hot" or contaminated personnel, equipment, or materials cross the Hot Line, they are assumed to be as hot or contaminated as they are going to be from site operations. Being subjected to the decontamination process, they become less contaminated; when they reach the Contamination Control Line, they are clean and can exit the CRZ without spreading contamination.

Within the CRZ is the Contamination Reduction Corridor, where materials necessary for full personnel and portable equipment decontamination are kept. A separate facility will be established for heavy equipment decontamination. In addition, certain safety equipment (e.g., emergency eye wash, fire extinguisher, stretcher, and first aid kit) are staged in this zone.

C.3 SUPPORT ZONE. The Support Zone is the outermost zone of the site, separated from the CRZ by the Contamination Control Line; it is considered a clean area. Movement of personnel and materials from the Support Zone into the CRZ is generally unrestricted, except as required through access points controlled for administrative purposes. However, only uncontaminated and/or decontaminated personnel or materials may enter the Support Zone from the CRZ.

The Support Zone contains the necessary support facilities (including personal hygiene facilities) for site operations. It also serves as the communications center and source of emergency assistance for operations in the EZ and CRZ. A log of all persons entering the site will be maintained by the HSO, the field operations leader, or the site designee.

ATTACHMENT D

WORK PRACTICES

D.1 GENERAL. Workers will be expected to adhere to the established safe work practices for their respective specialties (e.g., drilling, laboratory analysis, and construction). The need to exercise caution in the performance of specific work tasks is made more acute due to (1) weather conditions, (2) restricted mobility and reduced peripheral vision caused by the protective gear itself, (3) the need to maintain integrity of the protective gear, and (4) the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are the following.

- In any unknown situation, always assume the worst conditions and plan responses accordingly.

- Use the buddy system. Under no conditions will any person be permitted to enter the EZ alone. Establish and maintain communications. In addition to radio communications, it is advisable to develop a set of hand signals, because conditions may greatly impair verbal communications.

- Because no personal protective equipment is 100 percent effective, all personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment or drums on the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground in the EZ or CRZ. Avoid standing in or walking through puddles or stained soil.

- Disposable items will be used, when possible, to minimize risks during decontamination and possible cross-contamination during sample-handling.

- Smoking, eating, or drinking in the work area and before decontamination will not be allowed. Oral ingestion of contaminants is a likely means of introducing toxic substances into the body.

- Avoid heat and other work stresses related to wearing protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.

- Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.

- Conflicting situations that may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the HSO to avoid any motivation or pressure to circumvent established safety policy.

- To the extent feasible, handling of contaminated materials should be done in a remote area, particularly when drummed or other containerized hazardous waste materials are found onsite. Every effort should be made to identify the contents of containers found onsite before they are subject to material-handling applications.

- Personnel must be observant of not only their own immediate surroundings but also that of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while using personnel protective gear because vision, hearing, and communication can be restricted.

- Contact lenses are not allowed to be worn onsite; if corrosive or lachrymose substances enter the eyes, proper flushing is impeded.

- All facial hair that interferes with the face piece fit must be removed before donning a respirator at all sites requiring Level C or Level B protection.

- Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.

- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working while ill during field investigation assignments.

- The site leader, HSO, and sampling personnel will maintain project records in a bound notebook (e.g., daily activities, meetings, incidents, and data). Notebooks will remain onsite for the project duration so that replacement personnel may add information, thereby maintaining continuity. The notebooks and daily records will become part of the permanent project file.

D.2 SITE ENTRY PROCEDURES. In most cases, field teams are not the first onsite investigators. Considerable knowledge of site history and current status allows preparation of a HASP with reasonable assurance that personnel are adequately protected. In the event that sufficient site information is not available to perform a summary risk assessment and assign the appropriate level of personal protective equipment, the following procedures should be followed. It must be understood that verification of the level of contamination (even with background information) will always require some of the following steps.

1. Recognize that presence onsite implies a perceived contamination potential by the client.

2. Assume that the site is contaminated and conduct a site safety reconnaissance, consisting of the following activities.

    - Establish a CRZ (decontamination area).

    - Survey the site at the highest level of protection practicable, beginning with a perimeter survey and gradually covering all areas of proposed activity with the following (as appropriate):

        - HNU PID or equivalent,
        - OVA,
        - radiation survey meter,
        - personal air sampling pumps,
        - chemically reactive indicator tubes,
        - oxygen-deficiency meter, and

- explosive mixture meter.

- Establish a "hot zone."
- Review data, assess risk, and select the appropriate level of protection.

3. Prepare a summary site HASP and document all data acquired.

ATTACHMENT E

TEMPERATURE EXTREMES

E.1 HEAT STRESS. Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there is increased potential for injury, specifically heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

E.1.1 Identification and Treatment

E.1.1.1 Heat Exhaustion

Symptoms. Heat exhaustion usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, the skin is clammy, and he or she may perspire profusely. The pulse is weak and fast; breathing is shallow. The victim may faint unless he or she lies down. This may pass; however, sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.

First Aid. Immediately remove the victim to the CRZ in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock (i.e., have the victim lie down, raise feet 6 to 12 inches, and maintain body temperature but loosen all clothing). If the victim is conscious, it may be helpful to give sips of water. Transport the victim to a medical facility.

E.1.1.2 Heat Stroke

Symptoms. This is the most serious of heat casualties because the body excessively overheats. Body temperatures often are between 107 and 110 degrees Fahrenheit (°F). The victim will have a red face and will not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.

First Aid. Immediately evacuate the victim to a cool and shady area in the CRZ. Remove all protective outer wear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels or ice bags to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling. Do not give stimulants. Transport the victim to a medical facility as soon as possible.

E.1.2 Prevention of Heat Stress One of the major causes of heat casualties is the depletion of body fluids and salts through sweating. Fluids should be maintained in the Support Zone. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade™. The commercial mixes are advised for personnel on low-sodium diets.

During warm weather, a work schedule will be established that allows most work to be conducted during the morning hours, before ambient air temperature levels reach highs.

A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e., an impervious outer garment) with sufficient time allowed for personnel to "cool down" (this may require working in shifts). Two hours is the maximum time between breaks at Level B or C, regardless of temperature. At elevated temperatures, breaks should be scheduled as follows.

Ambient Temperatures (degrees Fahrenheit)	Maximum Time Between Cool Down Breaks (hours)
Above 90	¼
85 to 90	½
80 to 85	1
70 to 80	1½

E.1.3 Heat Stress Monitoring Monitoring of personnel wearing impervious clothing should commence when the ambient temperature reaches 70 °F, with increased frequency if ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85 °F, workers should be monitored for heat stress after every work period. As a screening mechanism of the body's recuperative ability to excess heat, one or more of the following techniques should be used.

1. Measure the heart rate (HR) for 30 seconds, by radial pulse, as early in the resting period as possible. At the beginning of the rest period, the HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the pulse rate is still above 110 beats per minute at the beginning of the next rest period, the following work cycle should again be shortened by 33 percent.

2. Measure oral body temperature with a clinical thermometer, as early as possible in the resting period. At the beginning of the rest period, oral temperature (OT) should not exceed 99 °F. If OT exceeds 99 °F, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the OT again exceeds 99 °F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should also be measured at the end of the rest period to ensure that it has dropped below 99 °F.

3. Maintain good hygienic standards by changing clothes frequently, showering daily, and allowing clothing to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

E.2 COLD STRESS. Cold weather may often cause problems for personnel working outside, even at temperatures above freezing. As temperatures drop below freezing, the potential for cold weather injuries increases dramatically, as does the potential for equipment failure. Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0 °F (-18 degrees Celsius [°C]) or if the windchill factor drops below -29 °F

(-34 °C). These levels represent guidelines that should be used as an action level unless the HSO determines and documents otherwise. Table E-1, which shows equivalent temperatures (i.e., windchill) for a range of ambient conditions, should also be referred.

Snow and ice increase the risks to personnel and operations through reduced visibility, increased potential for falling injuries, reduced onsite mobility, and the increased time required to access the site (or offsite support services).

In view of these factors, it is critical that the HSO establish site-specific safety and operating protocols and that all onsite personnel be made aware of the risks.

<u>E.2.1 Local Cold Injuries</u> Local cold injuries affect specific areas of the body (e.g., fingers, ears, or toes), including the more commonly recognized injuries described in the following subsections.

E.2.1.1 Chilblains Chilblains is a chronic condition affecting the skin and peripheral capillary circulation resulting from prolonged exposure of the bare skin, primarily in the extremities, to temperatures at or below 60 °F. The best method of preventing and treating chilblains is to cover and protect the skin, thereby avoiding prolonged exposure to the cold.

E.2.1.2 Frostbite Frostbite is freezing of the hands, feet, ears, and exposed parts of the face as a result of exposure to very low temperatures. Frostbite occurs when ice crystals form in the fluid in cells of the skin and tissue. As long as blood circulation remains good, frostbite will not occur.

There are three stages of frostbite: incipient frost bite (frostnip), superficial frostbite, and deep frostbite. The classification depends on severity and can range from incipient frostbite (frostnip) which affects the skin, to superficial frostbite which involves the skin and the tissues immediately beneath it, to deep frostbite which is much more serious with damage that may affect deeper tissue and even bone.

<u>Symptoms</u>. Symptoms for each of the three stages of frostbite are described as follows.

- <u>Frostnip</u>. Skin first turns red and then later becomes pale or waxy white. There may be tingling, stinging, aching, an uncomfortable sensation of coldness or numbness, or no noticeable symptoms.

- <u>Superficial Frostbite</u>. The skin turns white or gray-white and is waxy in appearance. It is firm to touch (i.e., does not move easily) and the tissue beneath the skin is soft and resilient. There is a lack of sensation in the area.

- <u>Deep Frostbite</u>. The tissue is pale, cold, and solid with possible blisters and swelling. The hands and feet are especially susceptible to deep frostbite.

Table E-1
Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under Calm Conditions)

Appendix C, Health and Safety Plan
Site 2, Screening Investigation Workplan
Naval Submarine Base Kings Bay
Kings Bay, Georgia

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER *In less than an hour with dry skin. Maximum danger of false sense of security.*	INCREASING DANGER *Danger from freezing of exposed flesh within 1 minute.*	GREATER DANGER *Flesh may freeze within 30 seconds.*

Trenchfoot and immersion foot may occur at any point on this chart.

Source: Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

Notes: mph = miles per hour.
°F = degrees Fahrenheit.

Emergency Treatment of Frostbite. Frostnip is easily treated in the field by the application of body heat, which should be applied before the affected area becomes numb. If frostnip affects your fingers and hands, place them against the skin of your chest or in your armpits. To warm your face, hold a mitten or scarf over the lower part of your face and breathe into it. Thaw frozen spots immediately. Do not rub affected areas.

Superficial frostbite usually responds to the application of body heat, as described previously. If the skin does not respond to body heat or if it resembles the early stages of deep frostbite, follow the emergency treatments listed in the following paragraphs. DO NOT rub affected areas.

For deep frostbite, if possible, the injured person should be taken to a heated shelter to avoid further frostbite. If it can be done without the danger of further frostbite, remove all constricting items (e.g., boots, gloves, and socks) from the injured area. RAPID REWARMING WILL MINIMIZE TISSUE LOSS. If possible, warm the extremities in a carefully controlled water bath (104 to 106 °F) until tips of the fingers or toes turn pink and feeling is restored. If a water bath is not available, either apply wet packs (100 to 112 °F) to the person's body, or gently wrap frostbitten area in blankets or some other warm material.

DO NOT attempt to thaw the affected parts by exercising them or heating them in front of an open fire, heat lamp, radiator, or stove. The person could receive a heat injury as a result of sensation loss.

DO NOT use snow to thaw frostbite. DO NOT rub, massage, or use pressure on the affected areas. Keep the frostbitten parts elevated if possible. Watch to see if CPR is necessary. Give the victim warm drinks such as tea, coffee, or soup. DO NOT GIVE ALCOHOLIC BEVERAGES. Have the victim exercise fingers or toes as soon as possible, but only after they are warmed. DO NOT allow a person with frostbitten feet to walk; walking may cause additional damage.

Medical Treatment of Frostbite.

- Frostnip. Usually does not require medical care.
- Superficial Frostbite. Blisters may require medical care.
- Deep Frostbite. EARLY MEDICAL TREATMENT IS URGENT! Transport the victim to medical care facilities at once.

Prevention of Frostbite. It is far easier to prevent or stop frostbite in earlier stages than to thaw and take care of badly frozen flesh. To protect the body against frostbite, the following precautions should be taken:

- wear enough clothing to protect against the cold and wind;
- wear warm gloves and boots;
- pull a scarf or jacket flap over the lower part of the face or pull a hood tightly around the face;
- occasionally exercise the face, fingers, and toes to keep them warm and to detect any areas that may have become numb; and

- crew members watch each other closely, especially the face, for signs of frostbite.

E.2.1.3 **Immersion Foot** Immersion foot (formerly called trenchfoot) is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground.

Symptoms. In the early stages, the feet and toes are pale, cold, numb and stiff, and walking is difficult. If preventive action is not taken, the feet will swell and ache; in extreme cases, this may result in irreversible damage to the tissues of the foot or leg.

Emergency Treatment of Immersion Foot. Handle feet very gently. DO NOT rub or massage. If necessary, clean feet carefully with soap and warm water, then dry, elevate, and expose to warm but not hot air.

Prevention of Immersion Foot. Because the early stages of immersion foot are not painful, crew members must be constantly on the alert and check feet often when working in cold, wet conditions. Keep feet dry by wearing waterproof footgear and changing socks frequently because perspiration trapped inside waterproof boots or heavy footgear can contribute to immersion foot symptoms. Avoid standing in wet areas. If feet get wet, dry them as soon as possible, warm them with your hands, then use foot powder, and change to dry socks. If you cannot change wet boots and socks, exercise your feet frequently by wriggling your toes and moving your ankles. Never wear tight boots.

E.2.2 Systemic Cold Injuries Systemic injuries are those that affect the entire body system. Severe body cooling, known as systemic hypothermia, can occur at temperatures well above freezing. Hypothermia, which can be fatal, is the progressive lowering of body temperature accompanied by rapid, progressive mental and physical collapse. A large percentage of wilderness deaths are the result of hypothermia.

Hypothermia is caused by exposure to cold and is aggravated by moisture, cold winds, fatigue, hunger, inadequate clothing or shelter, and excessive perspiration from strenuous exercise followed by too rapid cooling.

Hypothermia often occurs between temperatures of 30 to 50 °F, which most people believe are not dangerous. Crew members should be alert for symptoms of hypothermia, especially when temperatures are dropping rapidly or when they must work in rain, snow, or ice.

Hypothermia may occur on land or following submersion in even moderately cold water (i.e., 65 °F or lower). On land, hypothermia may take a full day or more of exposure to develop; however, if the conditions are extremely severe, death may occur within a few hours of initial symptoms.

In cold water, death may seem to be from drowning; in reality, it is usually the result of hypothermia. In water, skin and nearby tissues chill very fast, 10 to 15 minutes, and the temperature of the heart and brain may drop. When the core (i.e., internal body) temperature reaches 90 °F, unconsciousness may occur; when body temperature drops to 80 °F, heart failure is possible.

E.2.2.1 Symptoms In the early stages of hypothermia, the body begins to lose heat faster than it can be produced, and the body makes an effort to stay warm by shivering. When the body can no longer generate enough heat to overcome heat loss and the energy reserves of the body become exhausted, body temperature begins to drop. This affects the ability of the brain to make judgments and also results in loss of muscular control. As the body temperature drops, hypothermia symptoms become increasingly severe, as shown in the following table.

Symptoms Of Hypothermia	Approximate Core Temperature (°F)
Person is conscious, alert with increased respiration. Shivering may become uncontrollable as core temperature nears 95 °F.	Above 95
Person is conscious but disoriented and apathetic. Shivering is present but diminishes as temperature drops. Below 92 °F, respiratory rate gradually diminishes and pupils being to dilate.	95 to 90
Person is semiconscious. Shivering is replaced by muscular rigidity. Pupils are fully dilated at about 86 °F.	90 to 86
Unconscious; diminished respiration.	Below 86
Barely detectable or nondetectable respiration.	Below 80

Note: °F = degrees Fahrenheit.

E.2.2.2 Emergency Treatment of Hypothermia Move hypothermia victim to shelter and warmth as rapidly as possible. In <u>very mild cases</u>, dry clothing and shelter may be all that is needed. Gently remove all of the victim's wet clothing (so energy is not expended by warming and drying wet clothing) and replace it with a dry set. Give the person something warm to drink. DO NOT GIVE ALCOHOLIC BEVERAGES.

ALL OTHER HYPOTHERMIA CASES SHOULD BE CONSIDERED MEDICAL EMERGENCIES. PROVIDE EXTERNAL HEAT IN ANY WAY POSSIBLE! A warm bath (with the water kept between 105 and 110 °F) is the most effective way of warming a victim of hypothermia. NEVER put an UNCONSCIOUS VICTIM in a bathtub.

If it is not possible to give the person a warm bath, use one of the following <u>ALTERNATE METHODS</u>.

- Wrap warm moist towels (or other fabric) around the victim's head, neck, sides, and groin. As the packs cool, rewarm them by adding warm water (approximately 105 °F). Check the temperature of the water with your elbow or the inside of your arm; it should be warm but not hot.

- If you are at a <u>remote outdoor location</u> and cannot use the other method, make a "human sandwich" by placing the unclothed victim in a sleeping bag (or between blankets) with two other undressed persons to provide body-to-body heat transfer. THIS WILL SAVE LIVES. Additional sleeping bags or blankets can be placed over and under the victim.

DO NOT wrap a hypothermia victim in a blanket without an auxiliary source of heat unless it is to protect against any further heat loss before treatment can begin, or you need to go for help and there is no other alternative.

Continue treatment once the victim has stabilized. Give warm liquids and nourishing food if the person is conscious. Check the person for symptoms of frostbite and if necessary, give treatment.

Handle the patient gently and do not allow him or her to walk. Exertion can circulate cold stagnant blood from extremities to the central body and cause "after-drop," in which the patient's core temperature drops below the level that will sustain life. ALCOHOL CONTRIBUTES TO AFTER-DROP.

E.2.2.3 **Medical Care for Hypothermia** HYPOTHERMIA IS A SEVERE EMERGENCY. GET MEDICAL TREATMENT AS SOON AS POSSIBLE. Even persons with mild hypothermia should see a doctor.

E.2.2.4 **Prevention of Hypothermia** In cold weather, never go into the field <u>without</u> wearing adequate clothing. Take a complete change of warm clothes and one or two extra pairs of socks (in plastic bags). Wear or carry a windproof, water-resistant outer jacket and, in rain or snow, wear adequate rain gear.

Stay dry. If your clothing becomes wet from perspiration, rain, snow, or immersion in water, change it as soon as possible. If you start to shiver in a prolonged or violent way, seek shelter at once. Shivering may produce heat but it also uses up energy. Violent shivering may be an early sign of hypothermia.

Avoid accidental immersion in water. Practice boat safety and learn cold water survival techniques. If you fall into water and you are not very close to shore, remain quiet. Keep your head out of water, climb onto the boat, or hold or climb onto any other object that will support you and keep you up out of the water.

<u>E.2.3 Safety and First Aid Equipment</u> In view of the causes, results, and appropriate treatment of cold weather injuries discussed previously, as a minimum, the following safety equipment should be included during cold weather operations:

- extra clothing for all personnel,
- blankets and/or sleeping bag,
- high-energy food and drinking water supply,
- toboggan, and
- tow ropes.

In extreme cold conditions, add the following safety items:

- electric blanket (if an electrical source is available),
- portable emergency generator (with fuel, oil, and cords), and
- space heater and fuel.

<u>E.2.4 General Winter Operations</u> Cold weather conditions can severely affect winter operations. The Site Manager and HSO must plan work schedules and project tasks accordingly.

E.2.4.1 **Preliminary Assessment** If you will be working outdoors in cold weather, assess the local weather conditions through the news media (i.e., radio, television, and newspapers) to determine whether work should progress and/or the amount of preparation needed. Carefully consider questions such as the following.

- What are the typical wind and weather conditions for the period in which you will be working?

- Are the areas in which you will work sheltered or open to the wind?

- Is there a place nearby for periodic warming breaks? Can you obtain or heat warm food and beverages there? Is there a source of drinking water?

- Are there ways to minimize the length of time that crew members will have to work outdoors in the cold?

- If you use a vehicle for a warming area or will use a heater in a closed room, how can you ensure there is adequate ventilation to prevent carbon monoxide poisoning?

E.2.4.2 **Scheduling** Wherever possible, try to schedule work during the least severe weather. Rotate crew members to keep cold exposures short and allow sufficient time for frequent warming breaks. Remember that workers in heavy clothing often need more time to complete the tasks and may become fatigued more easily. Be aware that operations may have to be discontinued if winds increase or the temperature drops.

Because winter days are short, scheduling should allow time for taking care of equipment and supplies before nightfall. Once it becomes dark, it is more difficult to gauge terrain, and temperatures are likely to drop.

E.2.4.3 **Site Access** Snow and ice could make travel on site access roads impossible, or treacherous at best. Personnel should not be allowed to work onsite if conditions could severely hamper the arrival or departure of emergency vehicles. If the route to offsite medical facilities is blocked by snow or ice, an otherwise minor injury could result in a major medical emergency. If conditions warrant, the following provisions should be made:

- snow removal and/or plowing services for site access roads;

- a dependable, four-wheel-drive vehicle available to onsite personnel for transporting an injured person to an offsite medical facility; and

- sleeping bags, blankets, a food supply, and water kept onsite in the event a sudden storm requires personnel to remain overnight.

The HSO is responsible for deciding when weather conditions make site access unsafe, thereby requiring work to stop until conditions improve.

E.2.4.4 **Equipment and Supplies** Obtain equipment and supplies that will help prevent cold stress and will help in the treatment of cold stress disorders. Required equipment includes a reliable ambient temperature thermometer, a wind gauge, and a windchill chart. If the site is potentially windy due to a lack of natural or manmade windbreaks (e.g., trees, valleys, and structures), try to provide means of shielding workers from the wind. If working at a remote location, carry extra food and water because hunger and dehydration contribute to cold stress. If possible, make provisions for hot food and beverages. Ensure that emergency communication equipment is available and operational for crew members working in the cold, at heights, or in remote locations.

Close attention must be given to the effects of cold weather on field equipment. Batteries can be severely affected by cold resulting in disabled radios, air monitoring equipment, sampling pumps, and vehicles. A supply of fresh batteries, a sufficient number of charging units, and a set of automotive jumper cables should be maintained onsite. In addition, the electronics in many field instruments such as PID, LEL, and oxygen meters, as well as the chemical reactions in detector tubes (e.g., Draeger tubes) can also be adversely affected by the cold. The manufacturers' literature must be consulted for minimum operating temperatures.

If at all possible, monitoring well sampling tasks should not be scheduled during cold weather. These tasks generally require the use of relatively delicate pumps; long, uninsulated stretches of tubing; and significant quantities of decontamination solutions. Unless considerable effort is expended to prevent pumps, hoses, decontamination solutions, and sample containers from freezing, attempts to sample monitoring wells in cold weather may be counterproductive. Portable shelters should be considered if cold weather sampling is necessary.

ATTACHMENT F

EMERGENCY PLANNING

F.1 EMERGENCY MEDICAL SERVICES. Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their ability to provide for the needs of onsite project staff. Criteria such as emergency department physician coverage, decontamination capabilities, and available medical specialists will be evaluated.

F.1.1 Onsite First Aid An industrial first-aid kit will be provided at the work site; contents of the kit will be checked weekly and restocked as necessary. Other equipment may include oxygen, backboard and straps, splints, and a cervical collar.

At least one person qualified to perform first aid will be present onsite at all times during work activity. This person will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. Designated first aides will receive regular review training from the American Red Cross or the equivalent.

An eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, and tools.

F.1.2 Transportation to Emergency Treatment A vehicle will be available at all times to transport personnel to the hospital (in the event an ambulance is unnecessary or unavailable). Stretchers will be located at the work site to transport personnel to the vehicle. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

F.2 CONTINGENCY PLANNING. Prior to commencement of onsite activities, the HSO will review safety considerations with the field crew. The HSO has overall responsibility for adherence to the designated safety precautions and assumes the role of onsite coordinator in an emergency response situation.

All onsite personnel will be familiarized with both the primary and secondary route to the nearest hospital (which may be shown on a figure or a local map), as well as the location of the nearest working telephone or radio communication device. A list of emergency telephone numbers will be posted in the trailer.

The local hospital and emergency response team will be advised in advance of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Environmental Medicine Resources, Inc.

Emergency communication will be required to ensure positive preplanned notification of emergency authorities in the event of episodes requiring initiation of contingency plans. Emergency communication will include all or parts of the following.

- Coordinate with local agencies, fire and police departments, the ambulance service, and the hospital emergency room.
- Establish two-way radio communication and a site alarm capable of warning site personnel and summoning assistance (i.e., airborne).

- Design an emergency evacuation plan for residents of nearby homes. Although evacuation is an unlikely event, as a contingency, the HSO will be designated as onsite coordinator and will be responsible for implementing the plan. The HSO will be made aware of the total number of households within a 2,000-foot radius. The HASP will provide the emergency contacts required and a table will provide a list of residences and identifiable operations in the area in the event that evacuation is deemed a possibility for a particular site.

- Investigate possible routes of evacuation prior to any activity.

- If an accident occurs, a copy of an accident report form, provided in Attachment G should be filled out by the HSO and filed with the individual's supervisor or the HSM. A copy should also be retained in the project records.

<u>F.3 POTENTIAL HAZARDS</u>. The most common hazards associated with hazardous waste site investigation include (1) accidents; (2) inhalation, contact, or ingestion of hazardous materials; (3) explosion; and (4) fire.

<u>F.3.1 Accidents</u> Accidents must be handled on a case-by-case basis. Minor cuts, bruises, muscle pulls, and the like will still allow the injured person to undergo reasonably normal decontamination procedures before receiving direct first aid. More serious injuries may not permit complete decontamination procedures to be undertaken, particularly if the nature of the injury is such that the victim should not be moved. In these cases, arrangements will be made with the medical facility and transporter to allow them to take proper precautions. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim onsite without undue hazard. However, if onsite access is limited, accident victims may be transported by field personnel trained for this response to a point accessible by an ambulance.

<u>F.3.2 Contact and/or Ingestion of Hazardous Materials</u> Properly prescribed and maintained protective clothing and adherence to established safety procedures are designed to minimize this hazard. However, it is still possible that contact or ingestion of materials may occur. For example, puncture of a buried drum of liquid during drilling operations might cause the drum contents to contact personnel. Standard first-aid procedures should be followed. The drilling rig will have a tank of water that may be useful in some circumstances, particularly to flush contaminants from any exposed skin areas. Eye-wash bottles will also be maintained at the site for emergencies. In cases of ingestion or anything other than minor contact with known substances, the local Poison Control Center and hospital should be notified and the victim taken there immediately for further treatment and observation.

<u>F.3.3 Explosion</u> The drilling crew should be keenly aware of combustible gas meter readings and should withdraw at any indication of imminently hazardous conditions (i.e., greater than 20 percent LEL). The detection of such conditions will be reported to local agencies for potential execution of the evacuation plan, if the situation is assessed to warrant such response.

<u>F.3.4 Fire</u> The combustible gas meter also warns of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling

the fluids (e.g., methanol and acetone) used for certain decontamination procedures. No smoking or open flames are allowed onsite. Carbon dioxide fire extinguishers will be kept at the drilling rig and in the decontamination area and field office. The fire department, previously informed of site activities, will be called as needed.

F.4 EVACUATION RESPONSE LEVELS. Evacuation responses will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind), (2) site evacuation, and (3) evacuation of surrounding area. Anticipated conditions that require these responses are described in the following subsections.

F.4.1 Withdrawal Upwind (100 Feet or More) Withdrawing upwind (100 feet or more) will be required when (1) ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn (the work crew may return after donning greater respiratory protection and/or assessing the situation as transient and past), (2) a breach in protective clothing or minor accident occurs (the work crew may return when the tear or other malfunction is repaired and first aid or decontamination has been administered), or (3) the respirator malfunctions requiring replacement.

F.4.2 Site Evacuation Evacuation of the site will be required when (1) ambient air conditions contain explosive and persistent levels of combustible gas or excessive levels of toxic gases, (2) a fire or major accident occurs, or (3) explosion is imminent or has occurred.

F.4.3 Surrounding Area Evacuation The area surrounding the site will be evacuated when persistent, unsuppressible toxic, or explosive vapors from test pits or borings (e.g., pressure release from punctured drum) are released, or air quality monitored at several points downwind assess danger to the surrounding area.

F.5 EVACUATION PROCEDURES.

F.5.1 Withdrawal Upwind The work crew will continually observe general wind directions while onsite. (A simple wind sock may be set up near the work site for visual determinations.) Upon observing conditions that warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or farther, as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the HSO and a member of the crew may return to the work site to determine whether the conditions noted were transient or persistent. If persistent, an alarm should be raised to notify onsite personnel of the situation and the need to leave the site or don SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The HSM and client will be notified of conditions. When access to the site is restricted and escape is thereby hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

F.5.2 Site Evacuation After determining that site evacuation is warranted, the work crew will proceed upwind of the work site and notify the security force, HSO, and field office of site conditions. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation, where the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, they will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and implemented by the HSO.

F.5.3 Evacuation of Surrounding Area When the HSO determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated onsite personnel will initiate evacuation of the immediate offsite area without delay.

ATTACHMENT G

HEALTH AND SAFETY FORMS AND DATA SHEETS

ABB ENVIRONMENTAL SERVICES, INC.
ACCIDENT REPORT

SITE INFORMATION:

Site:______________________________ Job Number:______________

Location:______________________________

Location of Accident (if different from above):______________________________

Did injury involve ABB-ES employee?:________ Subcontractor?:________ Other?:________

PERSONAL INFORMATION:

Name of Injured Person:______________________________

Address of Injured Person:______________________________

SSN:____________ DOB:____________ Marital Status:____________

Department:____________________ Date of Hire:____________________

ACCIDENT INFORMATION:

Date of Accident:____________ Time of Accident:________ Other Conditions:________

Name of Witness:______________________________ Telephone No.:____________

Address:______________________________

Accident Category:
- ☐ Chemical Exposure ☐ Physical Injury ☐ Motor ☐ Fire
- ☐ Property Damage (list): ____________ ☐ Other:____________

Severity:
- ☐ Medical Treatment ☐ Non-disabling ☐ Disabling ☐ Fatality
- ☐ Estimated Amount of Property Damage:____________

Classification of Injury:

☐ Heat Burns	☐ Allergic Reaction	☐ Lacerations	☐ Fracture
☐ Chemical Burns	☐ Bites	☐ Punctures	☐ Dislocations
☐ Radiation Burns	☐ Poison Ivy	☐ Abrasions	☐ Nausea
☐ Toxic-Respiratory	☐ Heat Stroke	☐ Sprains	☐ Headache
☐ Toxic-Dermal	☐ Cold Exposure	☐ Bruises	☐ Faint/Dizzy
☐ Toxic Ingestion	☐ Blisters	☐ Concussion	

☐ Other:______________________________

If chemical exposure, list all possible contaminants of concern:______________________________

____

____

Part(s) of Body Affected:____________Degree of Disability:____________

Date Medical Care Received:_____Emergency Service:________Follow-up Examination Needed:________

Name and Address of Medical Facility:______________________________

____

Name of Attending Physician:____________Telephone Number:____________

Date/Time Employee went back to work:____________Employee on Restricted Duty?________

Estimated Number of Days Away from Work:____________

CAUSE OF INJURY/ACCIDENT:

Causitive agent(s) most directly related to accident (e.g., object, substance, material, machinery, equipment, or weather):____________________

Were there unsafe mechanical/physical/environmental condition(s) at the time of the accident?:__________

Did an unsafe act contribute to the accident? If yes, specify:__________

Did personal factors contribute to the accident (e.g., improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, or horseplay.):__________

ACCIDENT PREVENTION:

Level of Personal Protective Equipment required in the HASP:__________

Was injured using required equipment?:______. If not, how did actual equipment differ from what was required in the HASP. Describe:__________

Was personal protective equipment required in the HASP adequate for site conditions?__________

If no, what additional equipment was needed?:__________

What can be done to prevent a re-occurrence of this type of accident? (e.g., ventilation, machine modification/ guarding, modification of work practices, or additional training.):__________

NARRATIVE:

Provide a detailed description of how and why the accident occurred. Include objects, equipment, tools, circumstances of assigned duties, weather, etc. Be specific.:__________

Signature of Preparer:__________ Date:__________

Signature of Site Manager:__________ Date:__________

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

EMPLOYERS

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm or employees. Employers must comply with occupational safety and health standards issued under the Act.

EMPLOYEES

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

INSPECTION

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

COMPLAINT

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides the employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discriminatory action.

CITATION

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

PROPOSED PENALTY

The Act provides for mandatory civil penalties against employers of up to $7,000 for each serious violation and for optional penalties of up to $7,000 for each nonserious violation. Penalties of up to $7,000 per day may be proposed for failure to correct violations within the proposed time period and for each day the violation continues beyond the prescribed abatement date. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $70,000 for each such violation. A violation of posting requirements can bring a penalty of up to $7,000.

There are also provisions for criminal penalties. Any willful violation resulting in the death of any employee, upon conviction, is punishable by a fine of up to $250,000 (or $500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment. Falsifying records, reports, or applications is punishable by a fine of $10,000 or up to six months in jail or both.

VOLUNTARY ACTIVITY

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control employee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for health such as training.

VOLUNTARY ACTIVITY

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. These programs are usually administered by the State labor or Health department or a State university.

POSTING INSTRUCTIONS

Employees in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or facsimile) in a conspicuous place where notices to employees are customarily posted.

More Information
Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia	(404) 347-3573
Boston, Massachusetts	(617) 565-7164
Chicago, Illinois	(312) 353-2220
Dallas, Texas	(214) 767-4731
Denver, Colorado	(303) 844-3061
Kansas City, Missouri	(816) 426-5861
New York, New York	(212) 337-2378
Philadelphia, Pennsylvania	(215) 596-1201
San Francisco, California	(415) 744-6670
Seattle, Washington	(206) 442-5930

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OSHA 2203

Lynn Martin, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

To report suspected fire hazards, imminent danger safety and health hazards in the workplace, or other job safety and health emergencies, such as toxic waste in the workplace, call OSHA's 24-hour hotline: 1-800-321-OSHA.

N.6 DAILY HEALTH AND SAFETY AUDIT

Site Name:______________________________ **Date:**__________

Auditor:______________________________

SEND COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER

		YES	NO	N/A	COMMENTS
					Use back of form if more space is needed
1.	Safety meeting held today?				
2.	Emergency procedures discussed during safety meeting?				
3.	Vehicle available on-site for transportation to the hospital?				
4.	At least two persons trained in CPR and first-aid on-site?				
5.	Proper PPE being worn as specified in the HASP?				
	Level of PPE being worn: __________				
6.	PPE adequate for work conditions?				
	If not, give reason: __________				
	Upgrade/downgrade to PPE level: __________				
7.	If Level B, back-up/emergency person suited up (except for air)?				
8.	Monitoring equipment calibrated?				
9.	Monitoring equipment in good condition?				
10.	Monitoring equipment used properly?				
11.	Other monitoring equipment needed?				
	List: __________				
12.	Monitoring equipment covered with plastic to minimize contamination?				
13.	Decon line set up property?				
14.	Proper cleaning fluid used for known or suspected contaminants?				
15.	Proper decon procedures used?				
16.	Decon personnel wearing proper PPE?				
17.	Equipment decontaminated?				
18.	Samples decontaminated?				
19.	Disposable items changed twice a day or more often if needed?				
20.	Proper collection and disposal of contaminated PPE?				
21.	Proper collection and disposal of decon fluid?				
22.	Buddy system used?				
23.	Equipment kept off drums and ground?				
24.	Kneeling or sitting on drums or ground now allowed?				
25.	Personnel avoid standing or walking through puddles or stained soil?				
26.	Zones established?				
27.	If night work to be conducted, adequate illumination?				
28.	Smoking, eating, or drinking in the Exclusion Zone or CRZ not allowed?				
29.	To the extent feasible, contaminated materials handled remotely?				
30.	Entry into excavations not allowed unless properly shored or sloped?				
31.	All unusual situations on-site listed in HASP?				
	If not, what? __________				
	Action taken? __________				
	HASP revised? __________				
32.	All confined spaces identified?				
	If not, list: __________				
33.	Confined Space Checklists used?				
34.	Confined Space Checklists completely and correctly filled out?				

ALL DEFICIENCIES MUST BE CORRECTED IMMEDIATELY!

ATTACHMENT H

RESPIRATORY PROTECTION PROGRAM

H.1 INTRODUCTION. This program was developed to govern the selection and use of respiratory protective devices. The program is intended to comply with OSHA requirements as set forth in 29 CFR 1910.134(b). The scope of this program is limited to activities related to field investigations of potentially hazardous waste disposal sites.

H.2 PERSONNEL REQUIREMENTS. All personnel assigned to field activities at hazardous or potentially hazardous locations are enrolled in the medical surveillance program. This program must include a spirometry test. The test is a measure of the respiratory system status. No personnel may be assigned to the use of or may withdraw from stock any respiratory protective device without a physician's certification that use of the device will not be injurious to health. Psychological limitations (e.g., claustrophobia) are also considered in personnel assignments. Training in the use of the selected device and fit testing, as described herein, are also required.

Personnel will not be assigned duties that require a respirator when facial hair, skullcaps, or eyeglasses will interfere with a proper fit. Contact lenses may not be worn with any respiratory protective device. Eyeglass frames that fit inside the respirator facepiece are provided as necessary.

H.3 APPLICABLE EQUIPMENT. The following respiratory protective equipment may be selected for using during an investigation at a site:

- full-face chemical/mechanical air-purifying respirators,
- SCBA,
- full-face airline-supplied breathing apparatus, and
- 5-minute escape air supply.

This equipment is intended for use on an as-needed basis, to be determined by an evaluation of onsite conditions. Respiratory protective equipment should not be used arbitrarily by any person. Selection criteria are presented separately; training is required in the use of each type of equipment before drawing from stock.

H.4 PERSONNEL TRAINING. Training of personnel in the proper use and care of respiratory protective equipment is considered essential to the success of the program. Training encompasses the following topics:

- respiratory protection principles,
- selection of appropriate equipment,
- use of equipment,
- maintenance of equipment, and
- fit testing.

Information regarding each topic is presented as standard respiratory protection procedures in the corporate health and safety program manual.

H.5 PROGRAM ADMINISTRATION AND DOCUMENTATION. Administration of the Respiratory Protection Program is the responsibility of the HSM, and includes the following:

- respirator selection,
- personnel training,
- fit testing,
- respirator maintenance,
- documentation,
- program evaluation and improvements, and
- personnel pulmonary testing and certification.

Fit testing and respirator maintenance is performed by the company of the person onsite. All fit-testing and respirator maintenance is conducted under the administration of the HSM. Major maintenance is performed by manufacturer-certified technicians only. Personnel training in respiratory protection is one aspect of the HSM's ongoing personnel training programs. Program evaluation is a dynamic process, occurring each time a project HASP is prepared.

Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of the respiratory protection program is achieved through several media, as follows.

- Documentation of respirator selection is included in the hazard assessment of each site's HASP.

- Documentation of personnel training is maintained in both hard copy and computerized files.

- Documentation of medical surveillance is achieved indirectly by maintaining a list of enrolled employees in the health monitoring program, and directly through physician certification of personnel allowed to be assigned respiratory protective devices.

- Using the appropriate form, documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center and with the HSM or designee.

- Documentation of site surveillance is required both by this program and by the HASP for each site. Records of site surveillance are created by the HSO and maintained in project files.

- Respirator inspection and maintenance records are created and maintained by the equipment manager for each respirator, SCBA, and escape respirator.

Inspection and documentation occurs either before each unit is removed from stock and when it is returned, or monthly.

H.6 INSPECTION, MAINTENANCE, AND STORAGE.

H.6.1 Introduction Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator, in one sense, is more dangerous than not wearing a respirator at all. Personnel wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance because they generally are used infrequently, and then in the most hazardous and demanding circumstances. Serious injury or death can result from wearing a defective device during an emergency escape or rescue. The respirator program includes the following components:

- inspection for defects (including a leak check),
- cleaning and disinfecting,
- repair as required, and
- proper and sanitary storage of equipment.

H.6.2 Inspection for Defects The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Two types of inspections will be performed: (1) while the respirator is in use, and (2) while it is being cleaned. Because the use and cleaning will be performed primarily by the same personnel, these inspections may become concurrent.

H.6.3 Frequency of Inspection OSHA requires that "All respirators be inspected before and after each use," and that those not used routinely (i.e., emergency escape and rescue devices) "shall be inspected after each use and at least monthly...." Obviously, emergency escape and rescue devices do not require inspection before each use.

H.6.4 Inspection Procedures Respirator inspection will include checking of the following:

- tightness of the connections;
- facepiece;
- valves;
- connecting tubes; and
- canisters, filters, or cartridges.

In addition, the regulator and warning devices on a SCBA will be checked for proper functions.

H.6.5 Field Inspection of Air-purifying Respirators Routinely used air-purifying respirators will be checked as follows before and after each use.

1. Examine the facepiece for:

    - excessive dirt;

    - cracks, tears, holes, or physical distortion of shape from improper storage;

- inflexibility of rubber facepiece (stretch and knead to restore flexibility);

- cracked or badly scratched lenses in full facepieces;

- incorrectly mounted full facepiece lenses, or broken or missing mounting clips; and

- cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s).

2. Examine the head straps or head harness for:

   - breaks,

   - loss of elasticity,

   - broken or malfunctioning buckles and attachments, and

   - excessively worn serrations on head harness, which might permit slippage (full facepieces only).

3. Examine the exhalation valve for the following after removing the cover:

   - foreign material (e.g., detergent residue, dust particles, or human hair under valve seat);

   - cracks, tears, or distortion in the valve material;

   - improper insertion of the valve body in the facepiece;

   - cracks, breaks, or chips in the valve body, particularly the sealing surface;

   - missing or defective valve cover; and

   - improper installation of the valve in the valve body.

4. Examine the air-purifying element(s) for:

   - incorrect cartridge, canister, or filter for the hazard;

   - incorrect installation, loose connections, missing or worn gasket, or cross-threading in the holder;

   - expired shelf-life date on the cartridge or canister;

   - cracks or dents in the outside case of the filter, cartridge, or canister indicated by the absence of sealing material, tape, or foil over the inlet; and

   - identical cartridges if more than one are used.

H.6.6 Care and Cleaning of Self-contained Breathing Apparatus The proper care of SCBAs involves the following:

- inspection for defects,
- cleaning and disinfecting,
- repair, and
- storage.

The following checklist is to be used by personnel whenever they check out a SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repairperson.)

1. Preliminary Inspection. Check to ensure that:

   - high-pressure hose connector is tight on cylinder fitting,
   - bypass valve is closed,
   - mainline valve is closed,
   - there is no cover or obstruction on regulator outlet, and
   - pressure in the tank is at least 1,800 pounds per square inch (psi).

2. Backpack and Harness Assembly.

   - Straps
     - visually inspect for complete set
     - visually inspect for frayed or damaged straps that may break during use
   - Buckles
     - visually inspect for mating ends
     - check locking function
   - Backplate and Cylinder Lock
     - visually inspect backplate for cracks and for missing rivets or screws
     - visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged

3. Cylinder and Cylinder Valve Assembly.

   - Cylinder
     - physically check cylinder to ensure that it is tightly fastened to backplate
     - check hydrostatic test date to ensure that it is current

- visually inspect cylinder for large dents or gouges in metal

- Head and Valve Assembly

  - visually inspect cylinder for presence of valve lock

  - visually inspect cylinder gauge for condition of face, needle, and lens

  - open cylinder valve and listen or feel for leakage around packing (if leakage is noted, do not use until repaired); note function of valve lock

4. Regulator and High-pressure Hose.

   - High-pressure Hose and Connector. Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)

   - Regulator and Low-pressure Alarm

     - Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure).

     - Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.

     - Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 seconds. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

     - Open cylinder valve.

     - Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.

     - Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.

5. Facepiece and Corrugated Breathing Tube.

- Facepiece

  - Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.

  - Retaining clamp properly in place, visually inspect lens for proper seal in rubber facepiece, and for cracks or large scratches.

  - Visually inspect exhalation valve for visible deterioration or foreign materials buildup.

- Breathing Tube and Connector

  - Stretch breathing tube and visually inspect for deterioration and holes.

  - Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.

  - Perform a negative pressure test on facepiece.

    a. Don backpack and facepiece.

    b. With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.

    c. Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 seconds. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.

6. Storage of Units. Check that:

- cylinder is refilled as necessary and unit is cleaned and inspected;

- cylinder valve is closed;

- high-pressure hose connector is tight on cylinder;

- pressure is bled off high-pressure hose and regulator;

- bypass valve is closed;

- mainline valve is closed;

- all straps are completely loosened and laid straight; and

- facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals.

H.6.7 Cleaning and Sanitizing Any good detergent may be used, followed by a disinfecting rinse or a combination disinfectant-detergent for a one-step operation. Reliable, effective disinfectants can be made from readily available household solutions, including the following.

- Hypochlorite solution (50 ppm of chlorine) can be made by adding approximately 2 milliliters of bleach (e.g., Clorox™) to 1 liter of water, or 2 tablespoons of bleach per gallon of water. A 2-minute immersion disinfects the respirators.

- Aqueous solution of iodine (50 ppm of iodine) can be made by adding approximately 0.8 milliliter of tincture of iodine per liter of water, or 1 teaspoon of tincture of iodine per gallon of water. A 2-minute immersion is sufficient to disinfect the respirators.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140 °F; however, to ensure adequate cleaning, it should not be less than 120 °F.

H.6.8 Rinsing The cleaned and disinfected respirators should be rinsed thoroughly in water (140 °F maximum) to remove all traces of detergent and disinfectant. This is important for preventing dermatitis.

H.6.9 Drying The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes; however, care must be taken not to damage or distort the facepieces.

H.6.10 Reassembly and Inspection To avoid contamination, the clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area. The inspection procedures were discussed previously; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking. The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks. For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check should be performed.

H.6.11 Maintenance and Repair Replacement or repair should be done only by trained, experienced persons using parts designed for the respirator. Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device. This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low-pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

H.6.12 Respirator Storage Respirators must be stored properly to protect against the following:

- dust,
- sunlight,
- heat,
- extreme cold,
- excessive moisture,
- damaging chemicals, and
- mechanical damage.

Damage and contamination of respirators may occur if they are stored on a workbench; in a tool cabinet or toolbox among heavy tools, greases, and dirt; or in a vehicle.

ATTACHMENT I

OTHER

I.1 ILLUMINATION. Site operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light, downrange operations must halt in time to permit personnel and equipment to exit the EZ and proceed through decontamination before dusk. Conversely, operations will not be permitted to begin until lighting is adequate.

I.2 SANITATION. Provisions must be made for sanitation facilities for the site work force. At a minimum, the provision of toilet facilities must meet the requirements of 29 CFR 1910.120(n), which includes one facility for less than 20 employees, or one toilet and one urinal for every 40 employees, up to 200; then one of each for every 50 employees. If it is a mobile crew and they have transport readily available, the requirements do not apply.